part 1

International Trade Relations
The previous chapter discussed the importance of international trade. This chapter answers the following questions: (1) What constitutes the basis for trade—that is, why do nations export and import certain products? (2) At what terms of trade are products exchanged in the world market? (3) What are the gains from international trade in terms of production and consumption? This chapter addresses these questions, first by summarizing the historical development of modern trade theory and next by presenting the contemporary theoretical principles used in analyzing the effects of international trade.

Historical Development of Modern Trade Theory

Modern trade theory is the product of an evolution of ideas in economic thought. In particular, the writings of the mercantilists, and later those of the classical economists—Adam Smith, David Ricardo, and John Stuart Mill—have been instrumental in providing the framework of modern trade theory.

The Mercantilists

During the period 1500–1800, a group of writers appeared in Europe who were concerned with the process of nation building. According to the mercantilists, the central question was how a nation could regulate its domestic and international affairs so as to promote its own interests. The solution lay in a strong foreign-trade sector. If a country could achieve a favorable trade balance (a surplus of exports over imports), it would realize net payments received from the rest of the world in the form of gold and silver. Such revenues would contribute to increased spending and a rise in domestic output and employment. To promote a favorable trade balance, the mercantilists advocated government regulation of trade. Tariffs, quotas, and other commercial policies were proposed by the mercantilists to minimize imports in order to protect a nation’s trade position.1

By the eighteenth century, the economic policies of the mercantilists were under strong attack. According to David Hume’s price-specie-flow doctrine, a favorable trade balance was possible only in the short run, for over time it would automatically be eliminated. To illustrate, suppose England were to achieve a trade surplus that resulted in an inflow of gold and silver. Because these precious metals would constitute part of England’s money supply, their inflow would increase the amount of money in circulation. This would lead to a rise in England’s price level relative to that of its trading partners. English residents would therefore be encouraged to purchase foreign-produced goods, while England’s exports would decline. As a result, the country’s trade surplus would eventually be eliminated. The price-specie-flow mechanism thus showed that mercantilist policies could provide at best only short-term economic advantages.2

The mercantilists were also attacked for their static view of the world economy. To the mercantilists, the world’s wealth was fixed. This meant that one nation’s gains from trade came at the expense of its trading partners; not all nations could simultaneously enjoy the benefits of international trade. This view was challenged with the publication in 1776 of Adam Smith’s Wealth of Nations. According to Smith (1723–1790), the world’s wealth is not a fixed quantity. International trade permits nations to take advantage of specialization and the division of labor, which increase the general level of productivity within a country and thus increase world output (wealth). Smith’s dynamic view of trade suggested that both trading partners could simultaneously enjoy higher levels of production and consumption with trade. Smith’s trade theory is further explained in the next section.

Why Nations Trade: Absolute Advantage

Adam Smith, a classical economist, was a leading advocate of free trade (open markets) on the grounds that it promoted the international division of labor. With free trade, nations could concentrate their production on goods they could make most cheaply, with all the consequent benefits of the division of labor.

Accepting the idea that cost differences govern the international movement of goods, Smith sought to explain why costs differ among nations. Smith maintained that productivities of factor inputs represent the major determinant of production cost. Such productivities are based on natural and acquired advantages. The former include factors relating to climate, soil, and mineral wealth, whereas the latter include special skills and techniques. Given a natural or acquired advantage in the production of a good, Smith reasoned that a nation would produce that good at lower cost, becoming more competitive than its trading partner. Smith thus viewed the determination of competitiveness from the supply side of the market.3

Smith’s concept of cost was founded upon the labor theory of value, which assumes that within each nation, (1) labor is the only factor of production and is homogeneous (of one quality) and (2) the cost or price of a good depends exclusively upon the amount of labor required to produce it. For example, if the United States uses less labor to manufacture a yard of cloth than the United Kingdom, the U.S. production cost will be lower.

Smith’s trading principle was the principle of absolute advantage: in a 2-nation, 2-product world, international specialization and trade will be beneficial when one nation has an absolute cost advantage (that is, uses less labor to produce a unit of output) in one good and the other nation has an absolute cost advantage in the other good. For the world to benefit from specialization, each nation must have a good that it is absolutely more efficient in producing than its trading partner. A nation will import those goods in which it has an absolute cost disadvantage; it will export those goods in which it has an absolute cost advantage.

An arithmetic example helps illustrate the principle of absolute advantage. Referring to Table 2.1 on page 30, suppose workers in the United States can produce 5 bottles of wine or 20 yards of cloth in an hour’s time, while workers in the United Kingdom


can produce 15 bottles of wine or 10 yards of cloth in an hour’s time. Clearly, the United States has an absolute advantage in cloth production; its cloth workers’ productivity (output per worker hour) is higher than that of the United Kingdom, which leads to lower costs (less labor required to produce a yard of cloth). In like manner, the United Kingdom has an absolute advantage in wine production.

According to Smith, each nation benefits by specializing in the production of the good that it produces at a lower cost than the other nation, while importing the good that it produces at a higher cost. Because the world uses its resources more efficiently as the result of specializing, there occurs an increase in world output, which is distributed to the two nations through trade. All nations can benefit from trade, according to Smith.

### Why Nations Trade: Comparative Advantage

According to Smith, mutually beneficial trade requires each nation to be the least-cost producer of at least one good that it can export to its trading partner. But what if a nation is more efficient than its trading partner in the production of all goods? Dissatisfied with this looseness in Smith’s theory, David Ricardo (1772–1823) developed a principle to show that mutually beneficial trade can occur even when one nation is absolutely more efficient in the production of all goods.4

Like Smith, Ricardo emphasized the supply side of the market. The immediate basis for trade stemmed from cost differences between nations, which were underlaid by their natural and acquired advantages. Unlike Smith, who emphasized the importance of absolute cost differences among nations, Ricardo emphasized comparative (relative) cost differences. Ricardo’s trade theory thus became known as the principle of comparative advantage. Indeed, countries often develop comparative advantages, as shown in Table 2.2.

According to Ricardo’s comparative-advantage principle, even if a nation has an absolute cost disadvantage in the production of both goods, a basis for mutually beneficial trade may still exist. The less efficient nation should specialize in and export the good in which it is relatively less inefficient (where its absolute disadvantage is least). The more efficient nation should specialize in and export that good in which it is relatively more efficient (where its absolute advantage is greatest).

To demonstrate the principle of comparative advantage, Ricardo formulated a simplified model based on the following assumptions:

1. The world consists of two nations, each using a single input to produce two commodities.
2. In each nation, labor is the only input (the labor theory of value). Each nation has a fixed endowment of labor, and labor is fully employed and homogeneous.

### TABLE 2.1

A Case of Absolute Advantage When Each Nation Is More Efficient in the Production of One Good

<table>
<thead>
<tr>
<th>World Output Possibilities in the Absence of Specialization</th>
<th>Output per Labor Hour</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nation</td>
<td>Wine</td>
</tr>
<tr>
<td>United States</td>
<td>5 bottles</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>15 bottles</td>
</tr>
</tbody>
</table>


### TABLE 2.2

Examples of Comparative Advantages in International Trade

<table>
<thead>
<tr>
<th>Country</th>
<th>Product</th>
</tr>
</thead>
<tbody>
<tr>
<td>Canada</td>
<td>Lumber</td>
</tr>
<tr>
<td>Israel</td>
<td>Citrus fruit</td>
</tr>
<tr>
<td>Italy</td>
<td>Wine</td>
</tr>
<tr>
<td>Jamaica</td>
<td>Aluminum ore</td>
</tr>
<tr>
<td>Mexico</td>
<td>Tomatoes</td>
</tr>
<tr>
<td>Saudi Arabia</td>
<td>Oil</td>
</tr>
<tr>
<td>China</td>
<td>Textiles</td>
</tr>
<tr>
<td>Japan</td>
<td>Automobiles</td>
</tr>
<tr>
<td>South Korea</td>
<td>Steel, ships</td>
</tr>
<tr>
<td>Switzerland</td>
<td>Watches</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>Financial services</td>
</tr>
</tbody>
</table>
3. Labor can move freely among industries within a nation but is incapable of moving between nations.

4. The level of technology is fixed for both nations. Different nations may use different technologies, but all firms within each nation utilize a common production method for each commodity.

5. Costs do not vary with the level of production and are proportional to the amount of labor used.

6. Perfect competition prevails in all markets. Because no single producer or consumer is large enough to influence the market, all are price takers. Product quality does not vary among nations, implying that all units of each commodity are identical.
product are identical. There is free entry to and exit from an industry, and the price of each product equals the product’s marginal cost of production.

7. Free trade occurs between nations; that is, no government barriers to trade exist.

8. Transportation costs are zero. Consumers will thus be indifferent between domestically produced and imported versions of a product if the domestic prices of the two products are identical.

9. Firms make production decisions in an attempt to maximize profits, whereas consumers maximize satisfaction through their consumption decisions.

10. There is no money illusion; that is, when consumers make their consumption choices and firms make their production decisions, they take into account the behavior of all prices.

11. Trade is balanced (exports must pay for imports), thus ruling out flows of money between nations.

Table 2.3 illustrates Ricardo’s comparative-advantage principle when one nation has an absolute advantage in the production of both goods. Assume that in one hour’s time, U.S. workers can produce 40 bottles of wine or 40 yards of cloth, while U.K. workers can produce 20 bottles of wine or 10 yards of cloth. According to Smith’s principle of absolute advantage, there is no basis for mutually beneficial specialization and trade, because the United States is more efficient in the production of both goods.

Ricardo’s principle of comparative advantage, however, recognizes that the United States is four times as efficient in cloth production (40/10 = 4) but only twice as efficient in wine production (40/20 = 2). The United States thus has a greater absolute advantage in cloth than in wine, while the United Kingdom has a smaller absolute disadvantage in wine than in cloth. Each nation specializes in and exports that good in which it has a comparative advantage—the United States in cloth, the United Kingdom in wine. The output gains from specialization will be distributed to the two nations through the process of trade.

Like Smith, Ricardo asserted that both nations can gain from trade.

Concerning U.S. trade patterns during the 1980s and 1990s, in which the United States realized large trade deficits (imports exceeded exports) with Japan, some doomsayers appeared to believe that Japan could outproduce the United States in virtually everything. Those who foresaw a flood of imports from Japan causing the United States to deindustrialize and become a nation of fast-food restaurants seemed to be suggesting that the United States did not have a comparative advantage in anything.

It is possible for a nation not to have an absolute advantage in anything; but it is not possible for one nation to have a comparative advantage in everything and the other nation to have a comparative advantage in nothing. That’s because comparative advantage depends on relative costs. As we have seen, a nation having an absolute disadvantage in all goods would find it advantageous to specialize in the production of the good in which its absolute disadvantage is least. There is no reason for the United States to surrender and let Japan produce all of everything. The United States would lose and so would Japan, because world output would be reduced if U.S. resources were left idle. The idea that a nation has nothing to offer confuses absolute advantage and comparative advantage.

Although the comparative-advantage principle is used to explain international trade patterns, people are not generally concerned with which nation

<table>
<thead>
<tr>
<th>Nation</th>
<th>Wine</th>
<th>Cloth</th>
</tr>
</thead>
<tbody>
<tr>
<td>United States</td>
<td>40 bottles</td>
<td>40 yards</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>20 bottles</td>
<td>10 yards</td>
</tr>
</tbody>
</table>
has a comparative advantage when they purchase something. A person in a candy store does not look at Swiss chocolate and U.S. chocolate and say, “I wonder which nation has the comparative advantage in chocolate production?” The buyer relies on price, after allowing for quality differences, to tell which nation has the comparative advantage. It is helpful, then, to illustrate how the principle of comparative advantage works in terms of money prices, as seen in “Exploring Further 2.1” at the end of this chapter.

Production Possibilities Schedules

Ricardo’s law of comparative advantage suggested that specialization and trade can lead to gains for both nations. His theory, however, depended on the restrictive assumption of the labor theory of value, in which labor was assumed to be the only factor input. In practice, however, labor is only one of several factor inputs.

Recognizing the shortcomings of the labor theory of value, modern trade theory provides a more generalized theory of comparative advantage. It explains the theory using a production possibilities schedule, also called a transformation schedule. This schedule shows various alternative combinations of two goods that a nation can produce when all of its factor inputs (land, labor, capital, entrepreneurship) are used in their most efficient manner. The production possibilities schedule thus illustrates the maximum output possibilities of a nation. Note that we are no longer assuming labor to be the only factor input, as Ricardo did.

Figure 2.1 on page 34 illustrates hypothetical production possibilities schedules for the United States and Canada. By fully using all available inputs with the best available technology during a given time period, the United States could produce either 60 bushels of wheat or 120 autos or certain combinations of the two products. Similarly, Canada could produce either 160 bushels of wheat or 80 autos or certain combinations of the two products.

Just how does a production possibilities schedule illustrate the concept of comparative cost? The answer lies in the slope of the production possibilities schedule, which is referred to as the marginal rate of transformation (MRT). The MRT shows the amount of one product a nation must sacrifice to get one additional unit of the other product:

\[
MRT = \frac{\Delta \text{Wheat}}{\Delta \text{Autos}}
\]

This rate of sacrifice is sometimes called the opportunity cost of a product. Because this formula also refers to the slope of the production possibilities schedule, the MRT equals the absolute value of the production possibilities schedule’s slope.

In Figure 2.1, the MRT of wheat into autos gives the amount of wheat that must be sacrificed for each additional auto produced. Concerning the United States, movement from the top endpoint on its production possibilities schedule to the bottom endpoint shows that the relative cost of producing 120 additional autos is the sacrifice of 60 bushels of wheat. This means that the relative cost of each auto produced is 0.5 bushel of wheat sacrificed \((60/120 = 0.5)\)—that is, the \(MRT = 0.5\). Similarly, Canada’s relative cost of each auto produced is 2 bushels of wheat—that is, Canada’s \(MRT = 2\).

Trading Under Constant-Cost Conditions

This section illustrates the principle of comparative advantage under constant opportunity costs. Although the constant-cost case may be of limited relevance to the real world, it serves as a useful pedagogical tool for analyzing international trade. The discussion focuses on two questions. First, what are the basis for trade and the direction of trade? Second, what are the potential gains from trade, for a single nation and for the world as a whole?

Referring to Figure 2.1, notice that the production possibilities schedules for the United States and Canada are drawn as straight lines. The fact that these schedules are linear indicates that the relative costs of the two products do not change as the economy shifts its production from all wheat to all autos, or anywhere in between. For the United States, the relative cost of an auto is 0.5 bushel of
wheat as output expands or contracts; for Canada, the relative cost of an auto is 2 bushels of wheat as output expands or contracts.

There are two reasons for constant costs. First, the factors of production are perfect substitutes for each other. Second, all units of a given factor are of the same quality. As a country transfers resources from the production of wheat into the production of autos, or vice versa, the country will not have to resort to resources that are less well suited for the production of the good. Therefore, the country must sacrifice exactly the same amount of wheat for each additional auto produced, regardless of how many autos it is already producing.

**Basis for Trade and Direction of Trade**

Let us now examine trade under constant-cost conditions. Referring to Figure 2.1, assume that in autarky (the absence of trade) the United States prefers to produce and consume at point A on its production possibilities schedule, with 40 autos and 40 bushels of wheat. Assume also that Canada produces and consumes at point A’ on its production possibilities schedule, with 40 autos and 80 bushels of wheat.

The slopes of the two countries’ production possibilities schedules give the relative cost of one product in terms of the other. The relative cost of producing an additional auto is only 0.5 bushel of wheat for the United States but is 2 bushels of wheat for Canada. According to the principle of comparative advantage, this situation provides a basis for mutually favorable specialization and trade owing to the differences in the countries’ relative costs. As for the direction of trade, we find the United States specializing in and exporting autos and Canada specializing in and exporting wheat.
Production Gains from Specialization

The law of comparative advantage asserts that with trade each country will find it favorable to specialize in the production of the good of its comparative advantage and will trade part of this for the good of its comparative disadvantage. In Figure 2.1, the United States moves from production point A to production point B, totally specializing in auto production. Canada totally specializes in wheat production by moving from production point A’ to production point B’ in the figure. Taking advantage of specialization can result in production gains for both countries.

We find that prior to specialization, the United States produces 40 autos and 40 bushels of wheat. But with complete specialization, the United States produces 120 autos and no wheat. As for Canada, its production point in the absence of specialization is at 40 autos and 80 bushels of wheat, whereas its production point under complete specialization is at 160 bushels of wheat and no autos. Combining these results, we find that both nations together have experienced a net production gain of 40 autos and 40 bushels of wheat under conditions of complete specialization. Table 2.4(a) summarizes these production gains.

Consumption Gains from Trade

In the absence of trade, the consumption alternatives of the United States and Canada are limited to points along their domestic production possibilities schedules. The exact consumption point for each nation will be determined by the tastes and preferences in each country. But with specialization and trade, the two nations can achieve posttrade consumption points outside their domestic production possibilities schedules; that is, they can thus consume more wheat and more autos than they could consume in the absence of trade. Thus, trade can result in consumption gains for both countries.

The set of posttrade consumption points that a nation can achieve is determined by the rate at which its export product is traded for the other country’s export product. This rate is known as the terms of trade. The terms of trade defines the relative prices at which two products are traded in the marketplace.

| TABLE 2.4 |

Gains from Specialization and Trade: Constant Opportunity Costs

(a) Production Gains from Specialization

<table>
<thead>
<tr>
<th>Before Specialization</th>
<th>After Specialization</th>
<th>Net Gain (Loss)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Autos</td>
<td>Wheat</td>
</tr>
<tr>
<td>United States</td>
<td>40</td>
<td>40</td>
</tr>
<tr>
<td>Canada</td>
<td>40</td>
<td>80</td>
</tr>
<tr>
<td>World</td>
<td>80</td>
<td>120</td>
</tr>
</tbody>
</table>

(b) Consumption Gains from Trade

<table>
<thead>
<tr>
<th>Before Trade</th>
<th>After Trade</th>
<th>Net Gain (Loss)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Autos</td>
<td>Wheat</td>
</tr>
<tr>
<td>United States</td>
<td>40</td>
<td>40</td>
</tr>
<tr>
<td>Canada</td>
<td>40</td>
<td>80</td>
</tr>
<tr>
<td>World</td>
<td>80</td>
<td>120</td>
</tr>
</tbody>
</table>
Under constant-cost conditions, the slope of the production possibilities schedule defines the domestic rate of transformation (domestic terms of trade), which represents the relative prices at which two commodities can be exchanged at home. For a country to consume at some point outside its production possibilities schedule, it must be able to exchange its export good internationally at a terms of trade more favorable than the domestic terms of trade.

Assume that the United States and Canada achieve a terms-of-trade ratio that permits both trading partners to consume at some point outside their respective production possibilities schedules (Figure 2.1). Suppose that the terms of trade agreed on is a 1:1 ratio, whereby 1 auto is exchanged for 1 bushel of wheat. Based on these conditions, let line \( tt \) represent the international terms of trade for both countries. This line is referred to as the trading possibilities line (note that it is drawn with a slope having an absolute value of 1).

Suppose now that the United States decides to export, say, 60 autos to Canada. Starting at post-specialization production point \( B \) in the figure, the United States will slide along its trading possibilities line until point \( C \) is reached. At point \( C \), 60 autos will have been exchanged for 60 bushels of wheat, at the terms-of-trade ratio of 1:1. Point \( C \) then represents the U.S. posttrade consumption point. Compared with consumption point \( A \), point \( C \) results in a consumption gain for the United States of 20 autos and 20 bushels of wheat. The triangle \( BCD \) showing the U.S. exports (along the horizontal axis), imports (along the vertical axis), and terms of trade (the slope) is referred to as the trade triangle.

Distributing the Gains from Trade

Our trading example has assumed that the terms of trade agreed to by the United States and Canada will result in both trading partners’ benefiting from trade. But where will this terms of trade actually lie? A shortcoming of Ricardo's principle of comparative advantage was its inability to determine the actual terms of trade. The best description that Ricardo could provide was only the outer limits within which the terms of trade would fall. This is because the Ricardian theory relied solely on domestic cost ratios (supply conditions) in explaining trade patterns; it ignored the role of demand.

To visualize Ricardo’s analysis of the terms of trade, recall our trading example of Figure 2.1. We
assumed that for the United States the relative cost of producing an additional auto was 0.5 bushels of wheat, whereas for Canada the relative cost of producing an additional auto was 2 bushels of wheat. Thus, the United States had a comparative advantage in autos, whereas Canada had a comparative advantage in wheat. Figure 2.2 on page 38 illustrates these domestic cost conditions for the two countries. For each country, however, we have translated the domestic cost ratio, given by the negatively sloped production possibilities schedule, into a positively sloped cost-ratio line.

According to Ricardo, the domestic cost ratios set the outer limits for the equilibrium terms of trade. If the United States is to export autos, it should not accept any terms of trade less than a ratio of 0.5:1, indicated by its domestic cost-ratio line. Otherwise, the U.S. posttrade consumption point would lie inside its production possibilities schedule. The United States would clearly be better

Maytag Slashes Costs to Survive in Global Appliance Market

Maytag dishwashers have Mexican wiring, Chinese motors, and are assembled in a gigantic factory in Jackson, Tennessee. Although this three-tiered method of manufacturing is known as a “triad strategy,” Maytag refers to it as attempting to survive in a competitive global market.

For many years, Maytag’s bulky appliances—like refrigerators and washing machines—were relatively insulated from foreign competition because their large size made them expensive to transport across the ocean. By 2003, however, declining labor and production costs in Asia offset high shipping costs, permitting some imported appliances to be marketed in the United States at lower prices.

On this side of the ocean, Maytag’s American competitors—Whirlpool and General Electric (GE)—turned Mexico into a strategic site for producing appliances for the U.S. market. In Mexico, GE owns almost half of the largest appliance manufacturer and Whirlpool has full control of the second-largest. Both companies are shipping Mexican-manufactured appliances to the United States by the truckload, suggesting that Maytag’s largest import threat is its own American rivals.

Because of low-priced imports, Maytag had to rethink how and where to manufacture dishwashers, washing machines, and refrigerators. It knew its triad strategy resulted in efficiencies, but in order to avert a massive relocation of production out of the United States, and slash American jobs, Maytag wanted to remain as close to its retail market as possible. In producing dishwashers, Maytag purchases motors from a GE plant in China because China provides the lowest price, and wires harnesses for dishwashers in Mexico because rapid changes in demand make it efficient to supply from a close location.

Maytag’s new method of production began in the late 1990s, when other companies had already located in Mexico. Instead of constructing a factory there, Maytag rented a small plant and instructed each division to ascertain what amounts of their subassembly work could be sent there. Subassembly work is generally labor intensive, but not very skill intensive. This strategy reduced Maytag’s costs because Mexican workers earn lower wages than U.S. workers. Since then, the company has purchased another plant in Mexico for subassembly work.

Maytag does the same cost calculations with its other products. It disassembled one of GE’s side-by-side refrigerators manufactured in Mexico and concluded that it could not compete with GE without building its side-by-sides in Mexico as well. As a result, Maytag built a factory in Mexico that produces only those models. In another case, profit margins on refrigerators with the freezer on top were so small due to inexpensive imports that Maytag decided to stop producing them. Instead, it licensed a company in South Korea to make this particular model and ship them to America under the Maytag name. This strategy was tied to the closing of a refrigerator factory in Illinois, where those models had been produced.

off without trade than with trade. The U.S. domestic cost-ratio line therefore becomes its no-trade boundary. Similarly, Canada would require a minimum of 1 auto for every 2 bushels of wheat exported, as indicated by its domestic cost-ratio line; any terms of trade less than this rate would be unacceptable to Canada. The no-trade boundary line for Canada is thus defined by its domestic cost-ratio line.

For gainful international trade to exist, a nation must achieve a posttrade consumption location at least equivalent to its point along its domestic production possibilities schedule. Any acceptable international terms of trade has to be more favorable than or equal to the rate defined by the domestic price line. The region of mutually beneficial trade is thus bounded by the cost ratios of the two countries.

**Equilibrium Terms of Trade**

As noted, Ricardo did not explain how the actual terms of trade would be determined in international trade. This gap was filled by another classical economist, John Stuart Mill (1806–1873). By bringing into the picture the intensity of the trading partners’ demands, Mill could determine the actual terms of trade for Figure 2.2. Mill’s theory is known as the theory of reciprocal demand. It asserts that within the outer limits of the terms of trade, the actual terms of trade is determined by the relative strength of each country’s demand for the other country’s product. Simply put, production costs determine the outer limits to the terms of trade, while reciprocal demand determines what the actual terms of trade will be within these limits.

Referring to Figure 2.2, if Canadians are more eager for U.S. autos than Americans are for Canadian wheat, the terms of trade would end up close to the Canadian cost ratio of 2:1. Thus, the terms of trade would improve for the United States. However, if Americans are more eager for Canadian wheat than Canadians are for U.S. autos, the terms of trade would fall close to the U.S. cost ratio of 0.5:1, and the terms of trade would improve for Canadians.

The reciprocal-demand theory best applies when both nations are of equal economic size, so that the demand of each nation has a noticeable effect on market price. If two nations are of unequal economic size, however, it is possible that the relative demand strength of the smaller nation will be dwarfed by that of the larger nation. In this case, the domestic exchange ratio of the larger nation will prevail. Assuming the absence of monopoly elements working in the markets, the small nation can export as much of the commodity as it desires, enjoying large gains from trade.

Consider trade in crude oil and autos between Venezuela and the United States before the rise of

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the OPEC (Organization of Petroleum Exporting Countries) oil cartel. Venezuela, as a small nation, accounted for only a very small share of the U.S.–Venezuelan market, whereas the U.S. market share was overwhelmingly large. Because Venezuelan consumers and producers had no influence on market price levels, they were in effect price takers. In trading with the United States, no matter what the Venezuelan demand was for crude oil and autos, it was not strong enough to affect U.S. price levels. As a result, Venezuela traded according to the U.S. domestic price ratio, buying and selling autos and crude oil at the price levels existing within the United States.

The example just given implies the following generalization: If two nations of approximately the same size and with similar taste patterns participate in international trade, the gains from trade will be shared about equally between them. However, if one nation is significantly larger than the other, the larger nation attains fewer gains from trade while the smaller nation attains most of the gains from trade. This situation is characterized as the importance of being unimportant. What’s more, when nations are very dissimilar in size, there is a strong possibility that the larger nation will continue to produce its comparative-disadvantage good because the smaller nation is unable to supply all of the world’s demand for this product.

**Terms-of-Trade Estimates**

As we have seen, the terms of trade affect a country’s gains from trade. How are the terms of trade actually measured?

The commodity terms of trade (also referred to as the barter terms of trade) is a frequently used measure of the international exchange ratio. It measures the relationship between the prices a nation gets for its exports and the prices it pays for its imports. This is calculated by dividing a nation’s export price index by its import price index, multiplied by 100 to express the terms of trade in percentages:

\[
\text{Terms of Trade} = \frac{\text{Export Price Index}}{\text{Import Price Index}} \times 100
\]

An improvement in a nation’s terms of trade requires that the prices of its exports rise relative to the prices of its imports over the given time period. A smaller quantity of export goods sold abroad is required to obtain a given quantity of imports. Conversely, a deterioration in a nation’s terms of trade is due to a rise in its import prices relative to its export prices over a time period. The purchase of a given quantity of imports would require the sacrifice of a greater quantity of exports.

Table 2.5 gives the commodity terms of trade for selected countries. With 1995 as the base year (equal to 100), the table shows that by 2002 Norway’s index of export prices was 108, an

<table>
<thead>
<tr>
<th>Country</th>
<th>Export Price Index</th>
<th>Import Price Index</th>
<th>Terms of Trade</th>
</tr>
</thead>
<tbody>
<tr>
<td>Norway</td>
<td>108</td>
<td>70</td>
<td>154</td>
</tr>
<tr>
<td>China</td>
<td>87</td>
<td>84</td>
<td>104</td>
</tr>
<tr>
<td>Argentina</td>
<td>83</td>
<td>82</td>
<td>101</td>
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<tr>
<td>United States</td>
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<tr>
<td>Australia</td>
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<td>Germany</td>
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<tr>
<td>France</td>
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<td>64</td>
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<tr>
<td>Japan</td>
<td>71</td>
<td>81</td>
<td>88</td>
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</tbody>
</table>

increase of 8 percent. During the same period, the index of Norway’s import prices fell by 30 percent, to a level of 70. Using the terms-of-trade formula, we find that Norway’s terms of trade rose by 54 percent \[\frac{(108/70) \times 100 = 154}{100} = 154\] over the period 1995–2002. This means that to purchase a given quantity of imports, Norway had to sacrifice 54 percent fewer exports; conversely, for a given number of exports, Norway could obtain 54 percent more imports.

Although changes in the commodity terms of trade indicate the direction of movement of the gains from trade, their implications must be interpreted with caution. Suppose there occurs an increase in the foreign demand for U.S. exports, leading to higher prices and revenues for U.S. exporters. In this case, an improving terms of trade implies that the U.S. gains from trade have increased. However, suppose that the cause of the rise in export prices and terms of trade is falling productivity of U.S. workers. If this results in reduced export sales and less revenue earned from exports, we could hardly say that U.S. welfare has improved. Despite its limitations, however, the commodity terms of trade is a useful concept. Over a long period, it illustrates how a country’s share of the world gains from trade changes and gives a rough measure of the fortunes of a nation in the world market.

### Dynamic Gains from Trade

The previous analysis of the gains from international trade stressed specialization and reallocation of existing resources. However, these gains can be dwarfed by the effect of trade on the country’s growth rate and thus on the volume of additional resources made available to, or utilized by, the trading country. These are known as the dynamic gains from international trade, as opposed to the static effects of reallocating a fixed quantity of resources.

We have learned that international trade tends to be about a more efficient use of an economy’s resources, which leads to higher output and income. Over time, increased income tends to result in more saving and, thus, more investment in equipment and manufacturing plants. This additional investment generally results in a higher rate of economic growth. Moreover, opening an economy to trade may lead to imported investment goods, such as machinery, which fosters higher productivity and economic growth. In a roundabout manner, the gains from international trade grow larger over time. Empirical evidence has shown that countries that are more open to international trade tend to grow faster than closed economies.6

Free trade also increases the possibility that a firm importing a capital good will be able to locate a supplier who will provide a good that more nearly meets its specifications. The better the match, the larger is the increase in the firm’s productivity, which promotes economic growth.

Economies of large-scale production represent another dynamic gain from trade. International trade allows small and moderately sized countries to establish and operate many plants of efficient size, which would be impossible if production were limited to the domestic market. For example, the free access that Mexican and Canadian firms have to the U.S. market, under the North American Free Trade Agreement (NAFTA), allows them to expand their production and employ more specialized labor and equipment. This has led to increased efficiency and lower unit costs for these firms.

Finally, increased competition can be a source of dynamic gains from trade. For example, General Motors had extensive monopoly power in the U.S. automobile market during the 1950s–1960s. Lack of effective competition allowed it to become lethargic in terms of innovation and product development. The advent of foreign competition in subsequent decades forced General Motors to increase its productivity and reduce unit costs. This has resulted in lower prices and a greater diversity of vehicles that Americans could purchase.

Simply put, besides providing static gains rising from the reallocation of existing productive resources, trade might also generate dynamic gains by stimulating economic growth. Proponents of free trade note the many success stories of growth.

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through trade. However, the effect of trade on growth is not the same for all countries. In general, the gains tend to be less for a large country such as the United States than for a small country such as Belgium.

Changing Comparative Advantage

Although international trade can promote dynamic gains in terms of increased productivity, the comparative advantage realized by producers of a particular good can vanish over time when productivity growth falls behind that of foreign competitors. In the post–World War II era, for example, many U.S. steel companies produced steel in aging plants in which productivity lagged behind that of foreign companies. This contributed to U.S. steel companies’ loss of market share to foreign firms. Other U.S. industries that went the way of steel were machine tools and consumer electronics. By the 1990s, Japanese computer suppliers had begun to compete effectively with U.S. producers in markets including printers, floppy-disk drives, and dynamic random-access memory chips. This was particularly disturbing to those who considered computers to be a treasure of U.S. technology and a hallmark of U.S. competitiveness. Let us see how changing comparative advantage relates to our trade model.

Figure 2.3 illustrates the production possibilities schedules, for computers and automobiles, of the United States and Japan under conditions of constant opportunity cost. Note that the MRT of automobiles into computers initially equals 1.0 for the United States and 2.0 for Japan. The United States thus has a comparative advantage in the production of computers and a comparative disadvantage in auto production.

Suppose both nations experience productivity increases in manufacturing computers but no productivity change in manufacturing automobiles. Assume that the United States increases its computer-manufacturing productivity by 50 percent (from 100 to 150 computers) but that Japan increases its computer-manufacturing productivity by 300 percent (from 40 to 160 computers).

Because of these productivity gains, the production possibilities schedule of each country rotates outward and becomes flatter. More output can now be produced in each country with the same amount of resources. Referring to the new production possibilities schedules, the MRT of automobiles into...
computers equals 0.67 for the United States and 0.5 for Japan. The comparative cost of a computer in Japan has thus fallen below that in the United States. For the United States, the consequence of lagging productivity growth is that it loses its comparative advantage in computer production. But even after Japan achieves comparative advantage in computers, the United States still has a comparative advantage in autos; the change in manufacturing productivity thus results in a change in the direction of trade. The lesson of this example is that producers who fall behind in research and development, technology, and equipment tend to find their competitiveness dwindling.

It should be noted, however, that all countries realize a comparative advantage in some product or service. For the United States, the growth of international competition in industries such as steel may make it easy to forget that the United States continues to be a major exporter of aircraft, paper, instruments, plastics, and chemicals.

### Trading Under Increasing-Cost Conditions

The preceding section illustrated the comparative-advantage principle under constant-cost conditions. But in the real world, a good’s opportunity costs may increase as more of it is produced. Based on studies of many industries, economists think the opportunity costs of production increase with output rather than remain constant for most goods. The principle of comparative advantage must be illustrated in a modified form.

**Increasing opportunity costs** give rise to a production possibilities schedule that appears **concave**, or bowed outward from the diagram’s origin. In Figure 2.4, with movement along the production possibilities schedule from A to B, the opportunity cost of producing autos becomes larger and larger in terms of wheat sacrificed. Increasing costs mean that the **MRT** of wheat into autos rises as more autos are produced. Remember that the **MRT** is measured by the absolute slope of the production possibilities schedule at a given point. With movement from production point A to production point B, the respective tangent lines become **steeper**—their slopes increase in absolute value. The **MRT** of wheat into autos rises, indicating that each additional auto produced requires the sacrifice of increasing amounts of wheat.

Increasing costs represent the usual case in the real world. In the overall economy, increasing costs may result when inputs are imperfect substitutes for each other. As auto production rises and wheat production falls in Figure 2.4, inputs that are less and less adaptable to autos are introduced into that line of production. To produce more autos requires more and more of such resources and thus an increasingly greater sacrifice of wheat. For a **particular product**, such as autos, increasing cost is explained by the principle of diminishing
marginal productivity. The addition of successive units of labor (variable input) to capital (fixed input) beyond some point results in decreases in the marginal production of autos that is attributable to each additional unit of labor. Unit production costs thus rise as more autos are produced.

Under increasing costs, the slope of the concave production possibilities schedule varies as a nation locates at different points on the schedule. Because the MRT equals the production possibilities schedule’s slope, it will also be different for each point on the schedule. In addition to considering the supply factors underlying the production possibilities schedule’s slope, we must also take into account the demand factors (tastes and preferences), for they will determine the point along the production possibilities schedule at which a country chooses to consume.

Increasing-Cost Trading Case

Figure 2.5 shows the production possibilities schedules of the United States and Canada under conditions of increasing costs. In Figure 2.5(a), assume that in the absence of trade the United States is located at point A along its production possibilities schedule; it produces and consumes 5 autos and 18 bushels of wheat. In Figure 2.5(b), assume that in the absence of trade Canada is located at point A’ along its production possibilities schedule, producing and consuming 17 autos and 6 bushels of wheat. For the United States, the relative cost of wheat into autos is indicated by the slope of line $t_{U.S.}$, tangent to the production possibilities schedule at point A (1 auto = 0.33 bushels of wheat). In like manner, Canada’s relative cost of wheat into autos is denoted by the slope of line $t_{C}$ (1 auto = 3 bushels of wheat). Because line $t_{U.S.}$ is flatter than line $t_{C}$, autos are relatively cheaper in the United States and wheat is relatively cheaper in Canada. According to the law of comparative advantage, the United States will export autos and Canada will export wheat.

As the United States specializes in auto production, it slides downward along its production possibilities schedule from point A toward point B. The relative cost of autos (in terms of wheat) rises, as implied by the increase in the (absolute) slope of the production possibilities schedule. At the same
time, Canada specializes in wheat. As Canada moves upward along its production possibilities schedule from point $A'$ toward point $B'$, the relative cost of autos (in terms of wheat) decreases, as evidenced by the decrease in the (absolute) slope of its production possibilities schedule.

The process of specialization continues in both nations until (1) the relative cost of autos is identical in both nations and (2) U.S. exports of autos precisely equal Canada’s imports of autos, and conversely for wheat. Assume that this situation occurs when the domestic rates of transformation (domestic terms of trade) of both nations converge at the rate given by line $tt$. At this point of convergence, the United States produces at point $B$, while Canada produces at point $B'$. Line $tt$ becomes the international terms-of-trade line for the United States and Canada; it coincides with each nation’s domestic terms of trade. The international terms of trade are favorable to both nations because $tt$ is steeper than $t_{U.S.}$ and flatter than $t_C$.

What are the production gains from specialization for the United States and Canada? Comparing the amount of autos and wheat produced by the two nations at their points prior to specialization with the amount produced at their postspecialization production points, we see that there are gains of 3 autos and 3 bushels of wheat. The production gains from specialization are shown in Table 2.6(a).

What are the consumption gains from trade for the two nations? With trade, the United States can choose a consumption point along international terms-of-trade line $tt$. Assume that the United States prefers to consume the same number of autos as it did in the absence of trade. It will export 7 autos for 7 bushels of wheat, achieving a posttrade consumption point at $C$. The U.S. consumption gains from trade are 3 bushels of wheat, as shown in Figure 2.5(a) and also in Table 2.6(b). The U.S. trade triangle, showing its exports, imports, and terms of trade, is denoted by triangle $BCD$.

In like manner, Canada can choose to consume at some point along international terms-of-trade line $tt$. Assuming that Canada holds constant its consumption of wheat, it will export 7 bushels of

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**TABLE 2.6**

Gains from Specialization and Trade: Increasing Opportunity Costs

(a) Production Gains from Specialization

<table>
<thead>
<tr>
<th>Before Specialization</th>
<th>After Specialization</th>
<th>Net Gain (Loss)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Autos</td>
<td>Wheat</td>
</tr>
<tr>
<td>United States</td>
<td>5</td>
<td>18</td>
</tr>
<tr>
<td>Canada</td>
<td>17</td>
<td>6</td>
</tr>
<tr>
<td>World</td>
<td>22</td>
<td>24</td>
</tr>
</tbody>
</table>

(b) Consumption Gains from Trade

<table>
<thead>
<tr>
<th>Before Trade</th>
<th>After Trade</th>
<th>Net Gain (Loss)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Autos</td>
<td>Wheat</td>
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<tr>
<td>United States</td>
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<tr>
<td>World</td>
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</tr>
</tbody>
</table>
wheat for 7 autos and wind up at posttrade consumption point $C'$. Its consumption gain of 3 autos is also shown in Table 2.6(b). Canada’s *trade triangle* is depicted in Figure 2.5(b) by triangle $B'C'D'$. Note that Canada’s trade triangle is identical to that of the United States.

In this chapter, we discussed the autarky points and posttrade consumption points for the United States and Canada by assuming “given” tastes and preferences (demand conditions) of the consumers in both countries. In “Exploring Further 2.2” at the end of this chapter, we introduce indifference curves to show the role of each country’s tastes and preferences in determining the autarky points and how gains from trade are distributed.

**Partial Specialization**

One feature of the increasing-cost model analyzed here is that trade generally leads each country to specialize only partially in the production of the good in which it has a comparative advantage. The reason for *partial specialization* is that increasing costs constitute a mechanism that forces costs in two trading nations to converge. When cost differentials are eliminated, the basis for further specialization ceases to exist.

Figure 2.5 assumes that prior to specialization the United States has a comparative cost advantage in producing autos, whereas Canada is relatively more efficient at producing wheat. With specialization, each country produces more of the commodity of its comparative advantage and less of the commodity of its comparative disadvantage. Given increasing-cost conditions, unit costs rise as both nations produce more of their export commodities. Eventually, the cost differentials are eliminated, at which point the basis for further specialization ceases to exist.

When the basis for specialization is eliminated, there exists a strong probability that both nations will produce some of each good. This is because costs often rise so rapidly that a country loses its comparative advantage vis-à-vis the other country before it reaches the endpoint of its production possibilities schedule. In the real world of increasing-cost conditions, partial specialization is a likely result of trade.

**Comparative Advantage Extended to Many Products and Countries**

In our discussion so far, we have used trading models in which only two goods are produced and consumed and in which trade is confined to two countries. This simplified approach has permitted us to analyze many essential points about comparative advantage and trade. But the real world of international trade involves more than two products and two countries; each country produces thousands of products and trades with many countries. To move in the direction of realism, it is necessary to understand how comparative advantage functions in a world of many products and many countries. As we will see, the conclusions of comparative advantage hold when more realistic situations are encountered.

**More Than Two Products**

When a large number of goods are produced by two countries, operation of comparative advantage requires that the goods be ranked by the degree of comparative cost. Each country exports the product(s) in which it has the greatest degree of comparative advantage. Conversely, each country imports the product(s) in which it has greatest comparative disadvantage.

Figure 2.6 on page 46 illustrates the hypothetical arrangement of six products—chemicals, jet planes, computers, autos, steel, and semiconductors—in rank order of the comparative advantage of the United States and Japan. The arrangement implies that chemical costs are lowest in the United States relative to Japan, whereas the U.S. cost advantage in jet planes is not quite as pronounced. Conversely, Japan enjoys its greatest comparative advantage in semiconductors.

This product arrangement clearly indicates that, with trade, the United States will produce and export chemicals and that Japan will produce and export semiconductors. But where will the cutoff point lie between what is exported and what is imported? Between computers and autos? Or will Japan produce computers and the United States produce only
chemicals and jet planes? Or will the cutoff point fall along one of the products rather than between them—so that computers, for example, might be produced in both Japan and the United States?

The cutoff point between what is exported and what is imported depends on the relative strength of international demand for the various products. One can visualize the products as beads arranged along a string according to comparative advantage. The strength of demand and supply will determine the cutoff point between U.S. and Japanese production. A rise in the demand for steel and semiconductors, for example, leads to price increases that move in favor of Japan. This leads to rising production in the Japanese steel and semiconductor industries.

**More Than Two Countries**

When many countries are included in a trading example, the United States will find it advantageous to enter into multilateral trading relationships. Figure 2.7 illustrates the process of multilateral trade for the United States, Japan, and OPEC. The arrows in the figure denote the directions of exports. The United States exports jet planes to OPEC, Japan imports oil from OPEC, and Japan exports semiconductors to the United States. The real world of international trade involves trading relationships even more complex than this triangular example.
bilateral trade to balance between nations than between individuals. The predictable result is that a nation will realize a trade surplus (exports of goods exceed imports of goods) with trading partners that buy a lot of the things that we supply at low cost. Also, a nation will realize a trade deficit (imports of goods exceed exports of goods) with trading partners that are low-cost suppliers of goods that we import intensely.

Consider the trade “deficits” and “surpluses” of a dentist who likes to snow ski. The dentist can be expected to run a trade deficit with ski resorts, sporting goods stores, and favorite suppliers of items like shoe repair, carpentry, and garbage collection. Why? The dentist is highly likely to buy these items from others. On the other hand, the dentist can be expected to run trade surpluses with his patients and medical insurers. These trading partners are major purchasers of the services provided by the dentist. Moreover, if the dentist has a high rate of saving, the surpluses will substantially exceed the deficits.

The same principles are at work across nations. A country can expect to run sizable surpluses with trading partners that buy a lot of the things the country exports, while trade deficits will be present with trading partners that are low-cost suppliers of the items imported.

What would be the effect if all countries entered into bilateral trade agreements that balanced exports and imports between each pair of countries? The volume of trade and specialization would be greatly reduced, and resources would be hindered from moving to their highest productivity. Although exports would be brought into balance with imports, the gains from trade would be lessened.

### Exit Barriers

According to the principle of comparative advantage, an open trading system results in a channeling of resources from uses of low productivity to those of high productivity. Competition forces high-cost plants to exit, leaving the lowest-cost plants to operate in the long run. In practice, the restructuring of inefficient companies can take a long time because they often cling to capacity by nursing along antiquated plants. Why do companies delay plant closing when profits are subnormal and overcapacity exists? Part of the answer lies in the existence of exit barriers, various cost conditions that make lengthy exit a rational response by companies.

Consider the case of the U.S. steel industry. Throughout the past three decades, industry analysts maintained that overcapacity has been a key problem facing U.S. steel companies. Overcapacity has been caused by factors such as imports, reduced demand for steel, and installation of modern technology that allowed greater productivity and increased output of steel with fewer inputs of capital and labor.

Traditional economic theory envisions hourly labor as a variable cost of production. However, the U.S. steel companies’ contracts with the United Steelworkers of America, the labor union, make hourly labor a fixed cost instead of a variable cost, at least in part. The contracts call for many employee benefits such as health and life insurance, pensions, and severance pay when a plant is shut down as well as unemployment benefits.

Besides employee benefits, other exit costs tend to delay the closing of antiquated steel plants. These costs include penalties for terminating contracts to supply raw materials and expenses associated with writing off undepreciated plant assets. Steel companies also face environmental costs when they close plants. They are potentially liable for cleanup costs at their abandoned facilities for treatment, storage, and disposal costs that can easily amount to hundreds of millions of dollars. Furthermore, steel companies cannot realize much by selling their plants’ assets. The equipment is unique to the steel industry and is of little value for any purpose other than producing steel. What’s more, the equipment in a closed plant is generally in need of major renovation because the former owner allowed the plant to become antiquated prior to closing. Simply put, exit barriers hinder the market adjustments that occur according to the principle of comparative advantage.

### Empirical Evidence on Comparative Advantage

We have learned that Ricardo’s theory of comparative advantage implies that each country will
export goods for which its labor is relatively productive compared with that of its trading partners. Does his theory accurately predict trade patterns? A number of economists have put Ricardo’s theory to empirical tests.

The first test of the Ricardian model was made by the British economist G.D.A. MacDougall in 1951. Comparing the export patterns of 25 separate industries for the United States and the United Kingdom for the year 1937, MacDougall tested the Ricardian prediction that nations tend to export goods in which their labor productivity is relatively high. Of the 25 industries studied, 20 fit the predicted pattern. The MacDougall investigation thus supported the Ricardian theory of comparative advantage. Using different sets of data, subsequent studies by Balassa and Stern also supported Ricardo’s conclusions.7

A more recent test of the Ricardian model comes from Stephen Golub, who examined the relationship between relative unit labor costs (the ratio of wages to productivity) and trade for the United States vis-à-vis the United Kingdom, Japan, Germany, Canada, and Australia. He found that relative unit labor cost helps to explain trade patterns for these nations. The U.S. and Japanese results lend particularly good support for the Ricardian model, as shown in Figure 2.8. The figure displays a scatter plot of U.S.–Japan trade data showing a clear negative correlation between relative exports and relative unit labor costs for 33 industries investigated.

Although there is empirical support for the Ricardian model, it is not without limitations. Labor is not the only factor input. Allowance should be made where appropriate for production and distribution costs other than direct labor. Differences in product quality also explain trade patterns in industries such as automobiles and footwear. We should therefore proceed with caution in explaining a nation’s competitiveness solely on

the basis of labor productivity and wage levels. The next chapter will further discuss this topic.

### Outsourcing and Free Trade

Recall that the argument for free trade is founded on the theory of comparative advantage developed by David Ricardo in 1817. It states that if each nation produces what it does best and allows trade, all will realize lower prices and higher levels of output, income, and consumption than could be achieved in isolation. However, is free trade relevant in the 2000s?

When Ricardo formulated his theory, major factors of production—climate, soil, geography, and even most workers—could not move to other nations. However, critics of Ricardo note that in today’s world, important resources—technology, capital, and ideas—can easily shift around the globe. Comparative advantage is weakened if resources can move to wherever they are most productive: in today’s case, to a relatively few nations with abundant cheap labor. In this case, there are no longer shared gains—some nations win and others lose.8

Critics see a major change in the world economy caused by three developments. First, strong educational systems produce millions of skilled workers in developing nations, especially in China and India, who are as capable as the most highly educated workers in advanced nations but can work at a much lower cost. Second, inexpensive Internet technology allows many workers to be located anywhere. Third, new political stability permits technology and capital to move more freely around the globe.

Critics fear that the United States may be entering a new situation in which American workers will encounter direct world competition at almost every job category—from the machinist to the software engineer to the medical analyst. Anyone whose job does not entail daily face-
face interaction may now be replaced by a lower-paid, equally skilled worker across the globe. American jobs are being sacrificed not because of competition from foreign firms, but because of multinational corporations, often headquartered in America, that are slashing expenses by locating operations in low-wage nations.

**Advantage of Outsourcing**

However, not everyone agrees with the claim that comparative advantage no longer applies in today’s world. They note that it is technology, not the movement of labor, that is creating new opportunities for trade in services, and this does not negate the case for free trade and open markets.9

Technologies such as computers and the Internet have made the U.S. service sector a candidate for outsourcing on a global scale. High-tech

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companies such as IBM can easily outsource software programming to India, and American medical centers are relying on Indian doctors to process data. Indeed, it seems that policy makers have few options to slow down this process of rapid technological change, although several state governments are considering laws that restrict contracting with businesses that outsource from low-wage countries.

Proponents of outsourcing maintain that it can create a win-win situation for the global economy. Obviously, outsourcing benefits a recipient country, say India. Some of its people work for, say a subsidiary of Delta Airlines of the United States and make telephone reservations for Delta’s travelers. Moreover, incomes increase for Indian vendors supplying goods and services to the subsidiary, and the Indian government receives addi-
As the firm’s managers watched Nike, Reebok, and other rivals shift production abroad at the millennium, they came to think that producing close to their customers could give them an advantage in quick turnaround on new products and in fulfilling orders for shoe stores. How could New Balance manufacture shoes in the United States when Nike and Reebok couldn’t? Mainly by using the latest production techniques adopted by American firms in higher-skilled industries. For example, in New Balance’s factories workers operate shoe-stitching machines that use cameras to scan the edges of material. Working in small teams, staffers are trained to master a variety of skills. As a result, New Balance’s U.S. factories, which manufacture 25 percent of its shoes, have little downtime.

To increase worker efficiency, New Balance trains its workers intensely, even enrolling them in 22-hour courses. The firm also makes large capital investments in its U.S. factories, including massive robots whose arms swing around the production floor, picking up shoe uppers, joining them with soles, and placing them on conveyor belts to be packaged. New Balance has also switched from incentive wages, based on the number of shoes workers produce, to hourly rates. Hourly rates allow staff to concentrate on training and upgrading their skills, and to internalize that the competition is workers in foreign plants, not other workers next to them.

The combination of technology and small teams has reduced the cost disadvantage of manufacturing shoes in the United States. New Balance’s American workers produce a pair of shoes in just 24 minutes, versus about 3 hours in the Chinese factories that manufacture the same product. If the American workers were no more productive than those in China, New Balance’s labor costs in the United States, where it pays $14 an hour in wages and benefits, would be a noncompetitive $44 per pair of shoes. But the company has slashed the labor cost to $4 a pair versus $1.30 in China, where wages are about 40 cents an hour. The remaining $2.70 labor cost differential is a manageable 4 percent of a typical $70 pair of shoes, and it’s offset by the advantages of producing in the United States, where New Balance can fill store orders faster than rivals and respond more quickly to new footwear trends.

Of course, many of the millions of American jobs that have moved abroad over the decades could probably never have been upgraded enough to offset the wide wage discrepancy with less-developed countries. But New Balance’s experience provokes the question of whether Congress might offer tax credits or other incentives to U.S. companies that invest in training or technology for low-skilled production.

for U.S. companies such as Dell and AT&T and additional jobs for American workers.

- **Repatriated earnings.** Delta’s Indian subsidiary returns its earnings to the parent company; these earnings are ploughed back into the U.S. economy. Many offshore providers are in fact U.S. companies that repatriate earnings.

Catherine Mann of the Institute for International Economics analyzed the outsourcing of manufactured components by U.S. telecommunications and computer firms in the 1990s. She found that outsourcing reduced the prices of computers and communications equipment by 10 percent to 30 percent. This stimulated the investment boom in information technology and fostered the rapid expansion of information technology jobs. Also, she contends that the offshoring of information technology services will have a similar effect, creating jobs for American workers to design and implement information technology packages for a range of industries and companies.\(^\text{10}\)

Simply put, proponents of outsourcing contend that if U.S. companies can’t locate work abroad they will become less competitive in the global economy as their competitors reduce costs by outsourcing. This will weaken the U.S. economy and threaten more American jobs. They also note that job losses tend to be temporary and that the creation of new industries and new products in the United States will result in more lucrative jobs for Americans. As long as the U.S. workforce retains its high level of skills and remains flexible as companies position themselves to improve their productivity, high-value jobs will not disappear in the United States.

## Burdens of Outsourcing

Of course, these benefits to the United States do not eliminate the burden on Americans who lose their jobs or find lower-wage ones due to foreign outsourcing. American labor unions often lobby Congress to prevent outsourcing, and several U.S. states have considered legislation to severely restrict their governments from contracting with companies that move jobs to low-wage developing countries.

So far, the debate about the benefits and costs of outsourcing has emphasized jobs rather than wages. However, the risks to the latter may be more significant. Over the past three decades, the wages of low-skilled American workers, those with a high school education or less, decreased both in real terms and relative to the wages of skilled workers, especially those having a college education or higher. Technological change and outsourcing caused the demand for low-skilled American workers to decline. Now the outsourcing of high-skilled jobs threatens to shift demand away from high-skilled workers to cheaper substitutes in Asia. Like the assembly-line revolution that reduced demand for skilled artisan workers during England’s industrial revolution, the new wave of outsourcing may prove to be a technical change that decreases demand for many U.S. skilled workers. Although the outsourcing of high-skilled American jobs may yield economic benefits for the nation, there may be a sizable number of losers as well.\(^\text{11}\)

Many observers feel that the plight of the displaced worker must be increasingly addressed if free trade and outsourcing are to be widely accepted by the American public. Training programs and generous severance packages, accompanied by insurance programs, are among the measures that could lessen the adverse effects of people suffering job losses due to outsourcing. Some economists call for the insuring of full-time workers who lose jobs. The program would compensate those workers for, say, 70 percent of the wages they missed from the time they were laid off to the time they were reemployed, as well as offer health-care subsidies, for up to two years. The program would be funded by cost savings that companies realize when conducting outsourcing. U.S. government taxes are another possible source of funding for the program. The notion of this proposal is that if the U.S. economy as a whole benefits from outsourcing, some of the benefits should be shared with those whose lives are disrupted by it. As outsourcing grows, so will the importance of government policies in health-care insurance and pension portability, in education and training, and unemployment-compensation programs that enhance the skills and mobility of American workers.

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Summary

1. To the mercantilists, stocks of precious metals represented the wealth of a nation. The mercantilists contended that the government should adopt trade controls to limit imports and promote exports. One nation could gain from trade only at the expense of its trading partners because the stock of world wealth was fixed at a given moment in time and because not all nations could simultaneously have a favorable trade balance.

2. Smith challenged the mercantilist views on trade by arguing that, with free trade, international specialization of factor inputs could increase world output, which could be shared by trading nations. All nations could simultaneously enjoy gains from trade. Smith maintained that each nation would find it advantageous to specialize in the production of those goods in which it had an absolute advantage.

3. Ricardo argued that mutually gainful trade is possible even if one nation has an absolute disadvantage in the production of both commodities compared with the other nation. The less productive nation should specialize in the production and export of the commodity in which it has a comparative advantage.

4. Comparative costs can be illustrated with the production possibilities schedule. This schedule indicates the maximum amount of any two products an economy can produce, assuming that all resources are used in their most efficient manner. The slope of the production possibilities schedule measures the marginal rate of transformation, which indicates the amount of one product that must be sacrificed per unit increase of another product.

5. Under constant-cost conditions, the production possibilities schedule is a straight line. Domestic relative prices are determined exclusively by a nation’s supply conditions. Complete specialization of a country in the production of a single commodity may occur in the case of constant costs.

6. Because Ricardian trade theory relied solely on supply analysis, it was not able to determine actual terms of trade. This limitation was addressed by Mill in his theory of reciprocal demand. This theory asserts that within the limits to the terms of trade, the actual terms of trade is determined by the intensity of each country’s demand for the other country’s product.

7. The comparative advantage accruing to manufacturers of a particular product in a particular country can vanish over time when productivity growth falls behind that of foreign competitors. Lost comparative advantages in foreign markets reduce the sales and profits of domestic companies as well as the jobs and wages of domestic workers.

8. In the real world, nations tend to experience increasing-cost conditions. Thus, production possibilities schedules are drawn concave to the diagram’s origin. Relative product prices in each country are determined by both supply and demand factors. Complete specialization in production is improbable in the case of increasing costs.

9. According to the comparative-advantage principle, competition forces high-cost producers to exit from the industry. In practice, the restructuring of an industry can take a long time because high-cost producers often cling to capacity by nursing along obsolete plants. Exit barriers refer to various cost conditions that make lengthy exit a rational response by high-cost producers.

10. The first empirical test of Ricardo’s theory of comparative advantage was made by MacDougall. Comparing the export patterns of the United States and the United Kingdom, MacDougall found that wage rates and labor productivity were important determinants of international trade patterns. A more recent test of the Ricardian model, done by Golub, also supports Ricardo.
Key Concepts and Terms

- Autarky (page 34)
- Basis for trade (page 28)
- Commodity terms of trade (page 39)
- Community indifference curve (page 60)
- Complete specialization (page 36)
- Constant opportunity costs (page 33)
- Consumption gains (page 35)
- Dynamic gains from international trade (page 40)
- Exit barriers (page 47)
- Free trade (page 29)
- Gains from international trade (page 28)
- Importance of being unimportant (page 39)
- Increasing opportunity costs (page 42)
- Indifference curve (page 60)
- Labor theory of value (page 29)
- Marginal rate of transformation (MRT) (page 33)
- Mercantilists (page 28)
- No-trade boundary (page 38)
- Outer limits for the equilibrium terms of trade (page 37)
- Partial specialization (page 45)
- Price-specie-flow doctrine (page 29)
- Principle of absolute advantage (page 29)
- Principle of comparative advantage (page 30)
- Production gains (page 35)
- Production possibilities schedule (page 33)
- Region of mutually beneficial trade (page 38)
- Terms of trade (page 28)
- Theory of reciprocal demand (page 38)
- Trade triangle (page 36)
- Trading possibilities line (page 36)

Study Questions

1. Identify the basic questions with which modern trade theory is concerned.
2. How did Smith’s views on international trade differ from those of the mercantilists?
3. Develop an arithmetic example that illustrates how a nation could have an absolute disadvantage in the production of two goods and could still have a comparative advantage in the production of one of them.
4. Both Smith and Ricardo contended that the pattern of world trade is determined solely by supply conditions. Explain.
5. How does the comparative-cost concept relate to a nation’s production possibilities schedule? Illustrate how differently shaped production possibilities schedules give rise to different opportunity costs.
6. What is meant by constant opportunity costs and increasing opportunity costs? Under what conditions will a country experience constant or increasing costs?
7. Why is it that the pretrade production points have a bearing on comparative costs under increasing-cost conditions but not under conditions of constant costs?
8. What factors underlie whether specialization in production will be partial or complete on an international basis?
9. The gains from specialization and trade are discussed in terms of production gains and consumption gains. What do these terms mean?
10. What is meant by the term trade triangle?
11. With a given level of world resources, international trade may bring about an increase in total world output. Explain.
12. Xtra! For a tutorial of this question, go to http://carbaughxtra.swlearning.com

The maximum amount of steel or aluminum that Canada and France can produce if they fully use all the factors of production at their disposal with the best technology available to them is shown (hypothetically) in Table 2.7.
Assume that production occurs under constant-cost conditions. On graph paper, draw the production possibilities schedules for Canada and France; locate aluminum on the horizontal axis and steel on the vertical axis of each country’s graph. In the absence of trade, assume that Canada produces and consumes 600 tons of aluminum and 300 tons of steel and that France produces and consumes 400 tons of aluminum and 600 tons of steel. Denote these autarky points on each nation’s production possibilities schedule.

a. Determine the \( MRT \) of steel into aluminum for each nation. According to the principle of comparative advantage, should the two nations specialize? If so, which product should each country produce? Will the extent of specialization be complete or partial? Denote each nation’s specialization point on its production possibilities schedule. Compared to the output of steel and aluminum that occurs in the absence of trade, does specialization yield increases in output? If so, by how much?

b. Within what limits will the terms of trade lie if specialization and trade occur? Suppose Canada and France agree to a terms-of-trade ratio of 1:1 (1 ton of steel = 1 ton of aluminum). Draw the terms-of-trade line in the diagram of each nation. Assuming that 500 tons of steel are traded for 500 tons of aluminum, are Canadian consumers better off as the result of trade? If so, by how much? How about French consumers?

c. Describe the trade triangles for Canada and France.

### Table 2.7

<table>
<thead>
<tr>
<th>Steel and Aluminum Production</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
<tr>
<td>Canada</td>
</tr>
<tr>
<td>Steel (tons)</td>
</tr>
<tr>
<td>500</td>
</tr>
<tr>
<td>Aluminum (tons)</td>
</tr>
<tr>
<td>1500</td>
</tr>
<tr>
<td>France</td>
</tr>
<tr>
<td>Steel (tons)</td>
</tr>
<tr>
<td>1200</td>
</tr>
<tr>
<td>Aluminum (tons)</td>
</tr>
<tr>
<td>800</td>
</tr>
</tbody>
</table>

### Table 2.8

<table>
<thead>
<tr>
<th>Steel and Auto Production</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
<tr>
<td>Japan</td>
</tr>
<tr>
<td>Steel (Tons)</td>
</tr>
<tr>
<td>520</td>
</tr>
<tr>
<td>Autos</td>
</tr>
<tr>
<td>0</td>
</tr>
<tr>
<td>500</td>
</tr>
<tr>
<td>600</td>
</tr>
<tr>
<td>350</td>
</tr>
<tr>
<td>1100</td>
</tr>
<tr>
<td>200</td>
</tr>
<tr>
<td>1300</td>
</tr>
<tr>
<td>0</td>
</tr>
<tr>
<td>South Korea</td>
</tr>
<tr>
<td>Steel (Tons)</td>
</tr>
<tr>
<td>1200</td>
</tr>
<tr>
<td>Autos</td>
</tr>
<tr>
<td>0</td>
</tr>
<tr>
<td>900</td>
</tr>
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<td>400</td>
</tr>
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<td>600</td>
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<td>650</td>
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<td>200</td>
</tr>
<tr>
<td>800</td>
</tr>
<tr>
<td>0</td>
</tr>
<tr>
<td>810</td>
</tr>
</tbody>
</table>
and South Korea until their relative product prices, or \( MRT \)s, become equal. With specialization, suppose the \( MRT \)s of the two nations converge at \( MRT = 1 \). Starting at Japan’s autarky point, slide along its production possibilities schedule until the slope of the tangent line equals 1. This becomes Japan’s production point under partial specialization. How many tons of steel and how many autos will Japan produce at this point? In like manner, determine South Korea’s production point under partial specialization. How many tons of steel and how many autos will South Korea produce? For the two countries, do their combined production of steel and autos with partial specialization exceed their output in the absence of specialization? If so, by how much?

e. With the relative product prices in each nation now in equilibrium at 1 ton of steel equal to 1 auto (\( MRT = 1 \)), suppose 500 autos are exchanged at this terms of trade.

(1) Determine the point along the terms-of-trade line at which Japan will locate after trade occurs. What are Japan’s consumption gains from trade?

(2) Determine the point along the terms-of-trade line at which South Korea will locate after trade occurs. What are South Korea’s consumption gains from trade?

14. For a tutorial of this question, go to http://carbaughxtra.swlearning.com

Table 2.9 gives hypothetical export price indexes and import price indexes (1990 = 100) for Japan, Canada, and Ireland. Compute the commodity terms of trade for each country for the period 1990–2004. Which country’s terms of trade improved, worsened, or showed no change?

15. Why is it that the gains from trade could not be determined precisely under the Ricardian trade model?

16. What is meant by the theory of reciprocal demand? How does it provide a meaningful explanation of the international terms of trade?

17. How does the commodity terms-of-trade concept attempt to measure the direction of trade gains?

**TABLE 2.9**

Export Price and Import Price Indexes

<table>
<thead>
<tr>
<th>Country</th>
<th>Export Price Index</th>
<th>Import Price Index</th>
</tr>
</thead>
<tbody>
<tr>
<td>Japan</td>
<td>100 150</td>
<td>1990 2004</td>
</tr>
<tr>
<td>Canada</td>
<td>100 175</td>
<td>1990 175</td>
</tr>
<tr>
<td>Ireland</td>
<td>100 167</td>
<td>1990 190</td>
</tr>
</tbody>
</table>
2.1 For a look at some international data from the United Nations’ home page, go to http://unstats.un.org/unsd

2.2 The Web site of the World Trade Organization offers a number of avenues to explore, including a brief biographical sketch of David Ricardo, information on recent world trade and output growth, and a summary of the arguments in favor of free trade. You can find them at http://www.wto.org

2.3 For a skeptical look at free trade, go to the United Auto Workers’ home page and read some of the articles in the online magazines. Also, Ralph Nader’s organization, Public Citizen Global Trade Watch, has created a site that supports this skepticism of free trade. These two sites can be found at http://www.uaw.org and http://www.citizen.org/trade/index.cfm

To access NetLink Exercises and the Virtual Scavenger Hunt, visit the Carbaugh Web site at http://carbaugh.swlearning.com.

Log onto the Carbaugh Xtra! Web site (http://carbaughxtra.swlearning.com) for additional learning resources such as practice quizzes, help with graphing, and current events applications.
2.1 Exploring Further

Comparative Advantage in Money Terms

To illustrate comparative advantage in money terms, refer to the comparative-advantage example of Table 2.3 (page 32), which assumes that labor is the only input and is homogeneous. Recall that (1) the United States has an absolute advantage in the production of both cloth and wine; and (2) the United States has a comparative advantage in cloth production, while the United Kingdom has a comparative advantage in wine production. This information is restated in Table 2.10. As we shall see, even though the United Kingdom is absolutely less efficient in producing both goods, it will export wine (the product of its comparative advantage) when its money wages are so much lower than those of the United States that it is cheaper to make wine in the United Kingdom. Let us see how this works.

Suppose the wage rate is $20 per hour in the United States, as indicated in Table 2.10. If U.S. workers can produce 40 yards of cloth in an hour, the average cost of producing a yard of cloth is $0.50 ($20/40 yards = $0.50 per yard); similarly, the average cost of producing a bottle of wine in the United States is $0.50. Because Ricardian theory assumes that markets are perfectly competitive, in the long run a product’s price equals its average cost of production. The prices of cloth and wine produced in the United States are shown in the table.

Suppose now that the wage rate is £5 (5 British pounds) per hour in the United Kingdom. Thus, the average cost (price) of producing a yard of cloth in the United Kingdom is £0.50 (£5/10 yards = £0.50 per yard), and the average cost (price) of producing a bottle of wine is £0.25. These prices are also shown in Table 2.10.

Is cloth less expensive in the United States or the United Kingdom? In which nation is wine less expensive? When U.S. prices are expressed in dollars and U.K. prices are expressed in pounds, we cannot answer this question. We must therefore express all prices in terms of one currency—say, the U.S. dollar. To do this, we must know the prevailing exchange rate.

<table>
<thead>
<tr>
<th>Nation</th>
<th>Labor Input</th>
<th>Hourly Wage Rate</th>
<th>Cloth (Yards) Quantity</th>
<th>Cloth (Yards) Price</th>
<th>Wine (Bottles) Quantity</th>
<th>Wine (Bottles) Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>United States</td>
<td>1 hour</td>
<td>$20</td>
<td>40</td>
<td>$0.50</td>
<td>40</td>
<td>$0.50</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>1 hour</td>
<td>£5</td>
<td>10</td>
<td>£0.50</td>
<td>20</td>
<td>£0.25</td>
</tr>
<tr>
<td>United Kingdom*</td>
<td>1 hour</td>
<td>$8</td>
<td>10</td>
<td>$0.80</td>
<td>20</td>
<td>$0.40</td>
</tr>
</tbody>
</table>

*Dollar prices of cloth and wine, when the prevailing exchange rate is $1.60 = £1. This exchange rate was chosen for this example because at other exchange rates it would not be possible to have balanced trade and balance in the foreign-exchange market.
rate at which the pound and the dollar trade for each other.

Suppose the dollar/pound exchange rate is $1.60 = £1. In Table 2.10, we see that the U.K. hourly wage rate (£5) is equivalent to $8 at this exchange rate (£5 × $1.60 = $8). The average dollar cost of producing a yard of cloth in the United Kingdom is $0.80 ($8/10 yards = $0.80 per yard), and the average dollar cost of producing a bottle of wine is $0.40 ($8/20 bottles = $0.40 per bottle). Compared to the costs of producing these products in the United States, we see that the United Kingdom has lower costs in wine production but higher costs in cloth production. The United Kingdom thus has a comparative advantage in wine.

We conclude that even though the United Kingdom is not as efficient as the United States in the production of wine (or cloth), its lower wage rate in terms of dollars more than compensates for its inefficiency. At this wage rate, the U.K. average cost in dollars of producing wine is less than the U.S. average cost. With perfectly competitive markets, the U.K. selling price is lower than the U.S. selling price, and the United Kingdom exports wine to the United States.
Indifference Curves and Trade

In this section, we introduce indifference curves to show the role of each country’s tastes and preferences in determining the autarky points and how gains from trade are distributed.

The role of tastes and preferences can be illustrated graphically by a consumer’s indifference curve. An **indifference curve** depicts the various combinations of two commodities that are equally preferred in the eyes of the consumer—that is, yield the same level of satisfaction (utility). The term **indifference curve** stems from the idea that the consumer is indifferent among the many possible commodity combinations that provide identical amounts of satisfaction.

Figure 2.9 illustrates a consumer’s indifference map, which consists of a set of indifference curves. Referring to indifference curve I, a consumer is just as happy consuming, say, 6 bushels of wheat and 1 auto at point A as consuming 3 bushels of wheat and 2 autos at point B. All combination points along an indifference curve are equally desirable because they yield the same level of satisfaction. Besides this fundamental characteristic, indifference curves have several other features:

- Indifference curves pass through every point in the figure;
- Indifference curves slope downward to the right;
- Indifference curves are bowed in (convex) to the diagram’s origin;
- Indifference curves never intersect each other;
- Indifference curves lying farther from the origin (higher curves) represent greater levels of satisfaction.

Having developed an indifference curve for one individual, can we assume that the preferences of all consumers in the entire nation could be added up and summarized by a **community indifference curve**? Strictly speaking, the answer is no, because it is impossible to make interpersonal comparisons of satisfaction. For example, person A may prefer a lot of coffee and little sugar, whereas person B
prefers the opposite. The dissimilar nature of individuals’ indifference curves results in their being noncomparable. Despite these theoretical problems, a community indifference curve can be used as a pedagogical device that depicts the role of consumer preferences in international trade.

Using indifference curves, let us now develop a trade example to restate the basis-for-trade and the gains-from-trade issues. Figure 2.10 depicts the trading position of the United States. The United States in the absence of trade will maximize satisfaction if it can reach the highest attainable indifference curve.

**FIGURE 2.10**

*Indifference Curves and Trade*

A nation benefits from international trade if it can achieve a higher level of satisfaction (indifference curve) than it can attain in the absence of trade. Maximum gains from trade occur at the point where the international terms-of-trade line is tangent to a community indifference curve.
curve, given the production constraint of its production possibilities schedule. This will occur when the U.S. production possibilities schedule is just tangent to indifference curve $I$, at point $A$. At this point, the U.S. relative price ratio is denoted by line $t_{U.S.}$, which equals the absolute slope of the production possibilities curve at that point.

Suppose that the United States has a comparative advantage vis-à-vis Canada in the production of autos. The United States will find it advantageous to specialize in auto production until the two countries' relative prices of autos equalize. Suppose this occurs at production point $B$, where the U.S. price rises to Canada's price, depicted by line $tt$. Also suppose that $tt$ becomes the international terms-of-trade line. Starting at production point $B$, the United States will export autos and import wheat, trading along line $tt$. The immediate problem the United States faces is to determine the level of trade that will maximize its satisfaction.

Suppose that the United States exchanges 6 autos for 50 bushels of wheat at terms of trade $tt$. This would shift the United States from production point $B$ to posttrade consumption point $D$. But the United States would be no better off with trade than it was in the absence of trade. This is because in both cases the consumption points are located along indifference curve $I$. Trade volume of 6 autos and 50 bushels of wheat thus represents the minimum acceptable volume of trade for the United States. Any smaller volume would force the United States to locate on a lower indifference curve.

Suppose instead that the United States trades 22 autos for 183 bushels of wheat. The United States would move from production point $B$ to posttrade consumption point $E$. With trade, the United States would again locate on indifference curve $I$, resulting in no gains from trade. From the U.S. viewpoint, trade volume of 22 autos and 183 bushels of wheat therefore represents the maximum acceptable volume of trade. Any greater volume would find the United States moving to a lower indifference curve.

Trading along terms-of-trade line $tt$, the United States can achieve maximum satisfaction if it exports 15 autos and imports 125 bushels of wheat. The U.S. posttrade consumption location would be at point $C$ along indifference curve $II$, the highest attainable level of satisfaction. Comparing point $A$ and point $C$ reveals that with trade the United States consumes more wheat, but fewer autos, than it does in the absence of trade. Yet point $C$ is clearly a preferable consumption location. This is because under indifference-curve analysis, the gains from trade are measured in terms of total satisfaction rather than in terms of number of goods consumed.