Comparative Advantage and Factor Endowments

CHAPTER 4

Learning Objectives

After studying this chapter, students will be able to:

- **4.1** **Use the Heckscher-Ohlin Trade Model to analyze trade patterns between two countries with two inputs and two outputs.**
- **4.2** **Predict the impacts on different factors of production of trade-opening.**
- **4.3** **Discuss the limits of the HO model.**
- **4.4** **List and describe determinants of trade patterns that are not a result of factor endowments.**
- **4.5** **Describe the controversies surrounding the impact of international trade on wages and jobs.**
- **4.6** **Give examples of the determinants of international migration and its impact on comparative advantage.**

INTRODUCTION: THE DETERMINANTS OF COMPARATIVE ADVANTAGE

The theory of comparative advantage presented in the previous chapter assumed that countries have different levels of productivity without going into the reasons behind the differences. In this chapter, the emphasis is on the factor endowments of labor, capital, and resources found inside a country. We hypothesize that these factor endowments determine a country's opportunity costs of production and its comparative advantage. We also look more closely at the role of trade in causing changes in production and the consequent impacts on wages earned by workers and profits and rents earned by owners of capital and resources. This analysis helps clarify the opposition to expanded trade that comes from people who fear that it will reduce the demand for their labor or capital and lead to a decline in income.

MODERN TRADE THEORY

LO 4.1 Use the Heckscher-Ohlin Trade Model to analyze trade patterns between two countries with two inputs and two outputs.

In Chapter 3, comparative advantage depended on each country's relative productivity, which was given by assumption at the start of the discussion. Smith and Ricardo thought that each country would have its own technology, its own climate, and its own resources and that differences among nations would give rise to productivity differences. In the twentieth century, several economists developed a more detailed explanation of trade in which the comparative advantage of a country depends on its endowments of the inputs (called *factors of production,* or simply, *factors*) that are used to produce each good. The theory has various names: the Heckscher-Ohlin theory (HO), the Heckscher-Ohlin-Samuelson theory, or the Factor Proportions theory. They all refer to the same set of ideas.

The HO Trade Model

The HO trade model begins with the observation that nations are endowed with different levels of each input (factors). Furthermore, each output has a different technology for its production and requires different combinations and levels of the various inputs. Steel production, for example, requires a lot of iron ore, coking material, semiskilled labor, and some expensive capital equipment. Clothing production requires unskilled and semiskilled workers with rudimentary capital equipment in the form of sewing machines.

In order to analyze how the availability of inputs creates productivity differences, we first define **factor abundance** and **factor scarcity**. Table 4.1 illustrates the concepts with a numerical example. The capital-labor ratio of the United States (K_{us}/L_{us}) is $^{50}/_{150}$, or $^{1}/_{3}$. Canada's (K_{can}/L_{can}) is $^{2}/_{10}$, or $^{1}/_{5}$. Because the United States' capital-labor ratio is higher than Canada's $(K_{us}/L_{us} > K_{can}/L_{can})$, the United States is the relatively capital-abundant country and Canada is the relatively labor-abundant country. Note that Canada's absolute labor endowment is less than that of the United States, but Canada is still considered labor-abundant because it has more labor relative to its capital.

Relative abundance of a factor implies that in autarky its relative cost is less than in countries where it is relatively scarcer. Conversely, relatively scarce resources are more expensive. Consequently, capital is relatively cheap and labor is relatively expensive in the United States, and vice versa for Canada. It follows

TABLE 4.1 An Example of Factor Abundance

	United States	Canada
Capital	50 machines	2 machines
Labor	150 workers	10 workers

The United States is capital abundant and Canada is labor abundant.

that economies have relatively lower costs in the production of goods where the technology calls for greater quantities of the abundant factor and smaller quantities of the scarce factor. In this example, Canada will have a lower opportunity cost in production that uses relatively more labor and relatively less capital, while the United States will have a lower opportunity cost in production that uses relatively more capital and less labor.

The **Heckscher-Ohlin (HO) trade theory** makes this point. It asserts that a country's comparative advantage lies in the production of goods that intensively use relatively abundant factors. To clarify, consider the United States. It is richly endowed with a wide variety of factors. It has natural resources in the form of rich farmland and extensive forests. It has highly skilled labor, such as scientists, engineers, and managers. The wealth of the nation has enabled it to create an abundance of physical capital, both public and private. Its exports, therefore, should include agricultural products, particularly those requiring skilled labor and physical capital, and all sorts of machinery and industrial goods that require intensive input of physical capital and scientific and engineering skills.

One leading U.S. export is commercial jet aircraft—a product that requires a vast array of physical capital and scientific, engineering, and managerial talent. The United States is also a major exporter of grains and grain products, such as vegetable oils. These are produced with relatively small labor inputs, very large capital inputs (combines, tractors, and so on), farmland, and a great deal of scientific research and development that has produced hybrid seeds, pesticides, herbicides, and other agricultural inputs.

Gains from Trade in the HO Model

In the Ricardian model we assume that each country faces a constant set of trade-offs: two loaves of bread for three tons of steel (United States) or three loaves of bread for one ton of steel (Canada). The constant costs of the Ricardian model stem from the fact that there is one homogeneous input—labor, which can be used to make bread or steel. Workers do not vary in their skills, and since there is no capital input, each worker is as productive as the next. Consequently, when labor is reallocated from bread to steel, or vice versa, the trade-off is always at a constant rate.

In the HO model, we have a multiplicity of inputs—labor, capital, farmland—so each worker may be equipped with a different quantity of supporting inputs, such as capital. Obviously, at the end of the day a worker with a $5 shovel will have dug a smaller hole than one equipped with a $150,000 earth-moving machine. Furthermore, the quality of labor and capital can vary. Some labor is skilled, and some is unskilled. Certain jobs require scientific or other technical training, while others require basic literacy or even less. Similarly, capital can be low- or high-tech, and resources such as farmland have different fertility and climate characteristics. In effect, each important qualitative difference can be treated as a key characteristic of a separate input, so unskilled and skilled labor can be considered different factors.

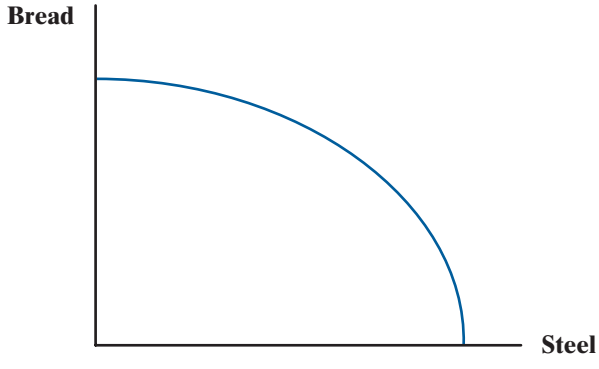
If a country has multiple inputs with various suitabilities for different tasks, we can no longer assume a production possibilities curve (PPC) with constant costs. Rather, the economy is assumed to have increasing costs, which implies that each

country has a rising opportunity cost for each type of production. Consequently, as the United States or Canada moves labor, capital, and land into bread production, each additional unit of bread leads to a greater loss of steel output than the one before. The reason is straightforward: If more bread is wanted, resources must be taken out of steel. The optimal strategy is to move resources that are relatively good at bread production, but poor at steel production. This leads to the greatest gain in bread with the smallest loss of steel. The next shift in production, toward more bread, cuts deeper into the stock of resources used for steel production, and in all likelihood there will not be resources to move that are as good at bread and as poor at steel as the previous production shift. Consequently, in order to get the same increase in bread, more steel must be given up than before. This result is symmetric, so shifts going the other way, toward more steel, cause the opportunity cost of steel to rise with each shift. Figure 4.1 illustrates a PPC with increasing costs.

As with constant costs, the trade-off between bread and steel is equal to the slope of the PPC. Since the PPC is curved, its slope changes at every point, and we must measure the trade-off at the point of production. For example, in Figure 4.2, if the United States is producing at point A, then the opportunity cost of an additional ton of steel is equivalent to the slope of the PPC at point A. Since the PPC is a curve rather than a straight line, the slope is measured by drawing a tangent line at the point of production and measuring its slope.

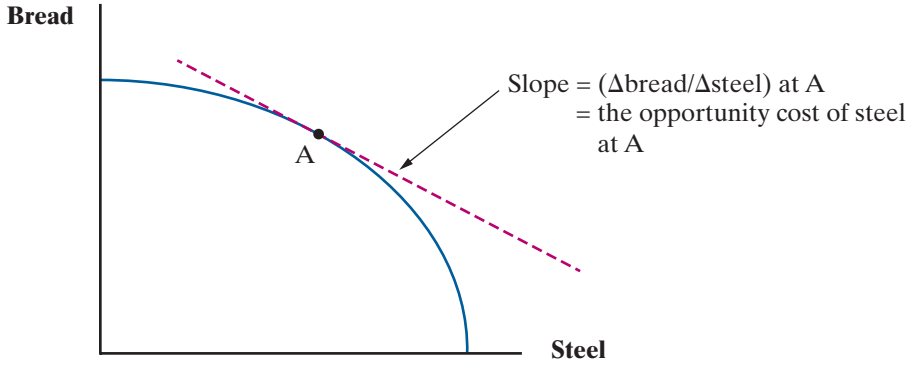
Most of the analysis of the gains from trade discussed in Chapter 3 carries over into the HO model. In order to demonstrate this, assume that point A is the U.S. production point in autarky and that at point A the opportunity cost of steel is 0.67 loaves of bread. This means that the slope of the tangent at A is −0.67. Also assume that Canada's opportunity cost of steel is above that of the United States at 3 loaves of bread per ton, the same as before and that after trade begins, the world price, or trade price, is 2 loaves of bread per ton of steel, the same as the example shown in Chapter 3. After trade opens, the United States can continue to produce at A and not trade, or it can produce at A and move along its consumption possibilities curve

FIGURE 4.1 The United States' PPC with Increasing Costs



Moving from left to right, the opportunity cost of another unit of steel increases.

FIGURE 4.2 Opportunity Costs and the Slope of the PPC

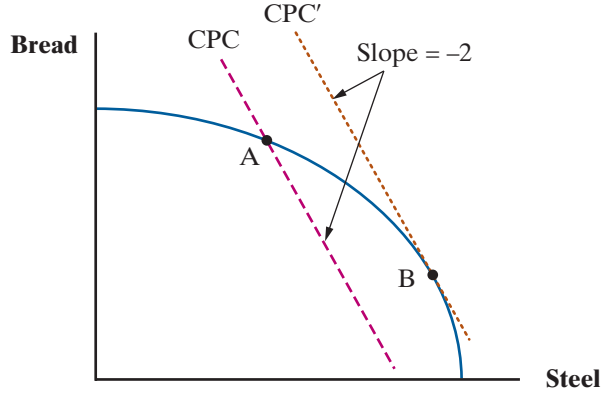


The opportunity cost of steel is measured by the slope of the tangent at the point of production.

(CPC), trading steel for bread. As before, line CPC is both the trade line showing the rate at which bread and steel exchange for each other, and it is the CPC since it shows the possible consumption bundles when production is at A and trade occurs.

In Figure 4.3, CPC' is a trade line that is tangent to the PPC at point B, an alternative production point to the right of A and closer to the steel axis. If the United States exploits its comparative advantage and shifts toward increased steel production, increasing costs come into play. Moving toward the steel axis raises the marginal cost of steel output. As production rises, the gap between the opportunity cost of production and the trade price narrows until, finally, they are equal at point B. Further increases in steel production would push the cost above its value in trade; therefore, they are not warranted.

FIGURE 4.3 Gains from Trade in the HO Model



CPC is the trade line if production is at A. Production at B maximizes income.

At point B, the opportunity cost of steel equals its trade price. Since the model is symmetric and the opportunity cost and trade price of bread are the inverse of the steel, the same equivalency holds for bread. To the left of B, the opportunity cost of steel (bread) is less (greater) than the trade price, so more (less) production is warranted. To the right of B, the opportunity cost of steel (bread) is greater (less) than the trade price, so less (more) production is warranted. Only at point B does the opportunity cost equal the trade price. Since no other changes can make the United States better off, point B is the production combination that maximizes income.

Graphically, the superiority of point B can be seen by first comparing B to A. Point B is clearly superior to A in terms of the consumption possibilities because for every point along CPC there is another point on CPC' that offers more of both goods. That is, CPC' lies above and to the right of CPC. Since a greater combination of both goods is available if the United States produces at B and trades, B is superior to A. Furthermore, when the trade price is 2, every other production point along the PPC leads to smaller consumption bundles. That is, at any other production point, a trade line with a slope of −2 that passes through the point will lie below and to the left of CPC', representing smaller combinations of steel and bread. Consequently, point B maximizes income by creating the largest possible consumption bundle.

The notion of gains from trade in the HO model is nearly the same as in the Ricardian model. The only significant difference is that specialization is not complete in the HO model. The United States continues to make some bread, and Canada makes some steel.

TRADE AND INCOME DISTRIBUTION

LO 4.2 Predict the impacts on different factors of production of trade-opening.

Recall that in the Ricardian model of comparative advantage, the nation as a whole gained from trade, and, by assumption, we ruled out the potentially harmful effects of trade on some members of society. When trade began, the economy shifted from one point on its production frontier to a different point. Workers that were affected by the production shift simply moved out of the declining industry and into the expanding one. Everyone had the same skills, and each type of production required only labor, so everyone had access to a job, and everyone benefited from both the fall in the price of the imported good and the rise in the price of the exported one.

The HO trade model is a more sophisticated way to analyze the gains and losses from trade because it drops these unrealistic assumptions. Labor can be divided into two or more skill categories, other types of inputs can be included, and industries can require different mixes of the various inputs. Under these more realistic assumptions, it can be shown that while trade benefits the nation as a whole, some groups within the nation benefit more than others, and some will actually be harmed. Furthermore, it can be shown that there is a systematic relationship between the factor endowments of a country and the winners and losers

from trade. Opening the discussion to an analysis of winners and losers adds an important and necessary element of realism. We are all aware that not everyone favors increased trade, and without an analysis of trade's income distribution effects, we have no basis for understanding the opposition to increased trade.

The Stolper-Samuelson Theorem

Everyone's income depends on the inputs that he or she supplies to the economy. Labor earns wages that may be high or low, depending on the skill level; owners of capital earn profits; landowners earn rents. The amount of income earned per unit of input depends on the demand for the inputs as well as their supply. The demand for a particular input is sometimes referred to as a **derived demand** because it is derived indirectly from the demand for the output that it is used to produce. If the output is in high demand, and consequently its price is high, then the inputs that are used to produce it will benefit by receiving higher returns.

In general, any change in the economy that alters the price of outputs will have a direct impact on incomes. We have seen that trade causes output prices to change by causing an increase in export prices and a decrease in import prices. The movement of prices causes a change in the demand for each factor and leads to a change in the returns paid to each factor. Hence, trade affects income distribution.

When trade begins and output prices change, some resources leave the sector that produces imported goods and move into the sector that produces exports. In the HO model, unlike the simple Ricardian model, different goods are produced with different combinations of inputs, so the movement along the production possibilities frontier causes a change in the demand for each input. Factors that are used intensively in the imported goods sector will find that the demand for their services has shrunk—and so has their income. Conversely, factors used intensively in the export sector will experience an increase in the demand for their services and in their incomes. In sum, when trade begins, incomes of the factors used intensively in the import sector fall, and incomes of the factors used intensively in the export sector rise.

These effects are summarized in the **Stolper-Samuelson theorem**, which is derived from the HO theory. The Stolper-Samuelson theorem says that an increase in the price of a good raises the income earned by factors that are used intensively in its production. Conversely, a fall in the price of a good lowers the income of the factors that it uses intensively.

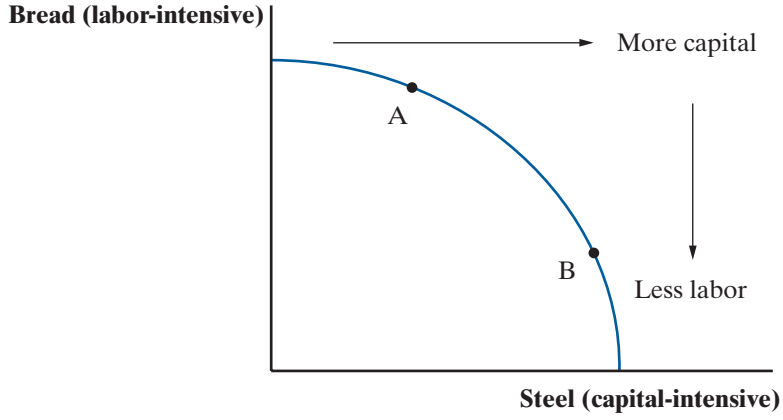
Figure 4.4 illustrates these tendencies. Suppose that the United States and Canada can make bread or steel, using capital and labor. Also suppose that bread is the labor-intensive product, shown as follows:

$$K^b/L^b < K^s/L^s$$

and that the United States is relatively well endowed with capital, compared to Canada, as follows:

$$K_{can}/L_{can} < K_{us}/L_{us}.$$

FIGURE 4.4 The Stolper-Samuelson Theorem



Movement along the PPC from A to B reduces the economy's demand for labor and increases its demand for capital.

According to the HO theory, the United States will have a comparative advantage in steel, which it will export in return for Canadian bread. In Figure 4.4, after trade begins, the United States moves along its PPC toward the steel axis from point A to point B.

As the United States shifts along its PPC, the change in the mix of goods produced leads to lower demands for labor and higher demands for capital. The steel industry will pick up some of the labor laid off in the bread industry, but since it is not as labor intensive as bread, its increase in labor demand is less than the fall in labor demand in the bread industry. The net result is that labor experiences a fall in demand, leading to a fall in wages and income earned. Note that Stolper-Samuelson does not state that all factors used in the export industries are better off or that all factors used in the import competing industry get hurt. Rather, the abundant factor that is used to determine comparative advantage and exports is favored, and the scarce factor sees a decline in its income, regardless of industry.

The Stolper-Samuelson theorem is a starting point for understanding the income distribution effects of trade, but it tells only part of the story. An extension of the theorem, called the **magnification effect**, shows that the change in output prices has a magnified effect on factor incomes. For example, if after opening trade bread prices decline by 75 percent, then the fall in labor income will be greater than 75 percent. Similarly, if the price of an export good (steel) rises by 50 percent, for example, incomes earned by the intensively used factors in the export sector (capital) rise more than 50 percent.

The ultimate effects on income of an opening of trade depend on the flexibility of the affected factors. If labor is stuck in bread production and unable to move to the steel sector, it could be hurt much worse than if it were completely

flexible to move. Another example illustrates this point: Within the debate over U.S.–Mexico free trade, there was a small but intense controversy surrounding avocado production. Mexico has a comparative advantage in avocados because it is well endowed with the necessary inputs (a particular quality of land and climate, together with unskilled labor and a little capital). If free trade were to open in the avocado market, the owners of avocado orchards in California argued that they would find their investments in land, equipment, and avocado trees worthless. Why would anyone pay $1 or more per avocado when Mexican ones cost 25¢ or less? However, many of the California avocado groves are located in the suburbs of sprawling metropolitan regions, and presumably, if the land were worthless for avocado production, it could be put to valuable use in another line of production—for example, as housing developments. Consequently, the income of the landowners may not decline in the long run, although in the short run landowners may be unable to put their land to an alternative use. In order to build these considerations into a trade model, we must turn to a short-run version of the HO model.

The Specific Factors Model

In the short run, the ability of factors to move between different output sectors is more limited. For example, suppose stiffer competition in the world steel industry causes American steelworkers to take pay cuts, and perhaps some to lose their jobs. In the long run, most of the laid-off steelworkers will find jobs outside the steel sector, but in the short run, they are stuck with cuts in pay and layoffs. Similarly, physical capital is usually dedicated to a particular use and cannot be converted to producing a different product, and, as we have seen, land is usually tied up in a particular use and cannot be switched to something else instantaneously. In the long run, however, plants and equipment can be redirected to a different line of production, land can be put to different uses, and workers find jobs doing something else.

In order to highlight the ability of labor and other factors to find alternative employment in the long run but not in the short run, economists sometimes add conditions to the HO model. Suppose there are three factors—land, labor, and capital—and two goods—steel and bread. Assume that the production of steel takes capital and labor, while bread takes land and labor. In this version of the HO model, labor is the variable factor because its use varies between both goods. Land and capital are the specific factors because their use is specific to bread and steel, respectively.

The model just described is an example of the **specific factors model**, a special case of the HO model. The HO model assumes that factors migrate easily from one sector to another—from steel to bread, for example. In the specific factors model (Table 4.2), each good is produced with a specific factor that is used only in the production of that good, and a variable factor that is used to produce both goods. The specific factors (land and capital) are immobile and cannot move

TABLE 4.2 A Specific Factors Model

	Outputs	
Inputs	**Bread**	**Steel**
Specific factors	Land	Capital
Variable factors	Labor	Labor

The specific factors of land and capital can be used to produce only one good. The variable factor of labor is used in both bread and steel production.

between bread and steel, while the variable factor (labor) is completely mobile between industries.

The determinants of comparative advantage with a specific factors model are similar to the analysis with an HO model. As with HO, comparative advantage depends on factor endowments. The main difference in the two models is that the specific factor plays a critical role. Suppose that Canada is relatively well endowed with land and that the United States is relatively well endowed with capital. Then Canada exports bread, and the United States exports steel. The reasoning is the same as with the HO model. Since Canada is well endowed with the specific factor used to make bread, its opportunity cost of bread production is lower than it is in the United States, where land is relatively less abundant. Similarly, steel uses capital, which is abundant in the United States and relatively scarce in Canada.

The analysis of the income distribution effects of trade is straightforward. When trade opens, each country follows its comparative advantage and moves toward greater specialization. The shift in production reduces the demand for the specific factor that is used in the industry that shrinks and the income of the factor declines. For example, Canada cuts back on steel production in order to concentrate on bread. Canadian owners of capital are hurt, since the structure of the economy moves away from the production of capital-intensive steel, while Canadian landowners experience precisely the opposite effect. Their incomes rise as the demand for land to produce bread exports rises. In the United States, landowners lose and capital owners win.

In this example, the income distribution effects of trade on labor, the variable factor, are indeterminate. Since labor is mobile, workers laid off in the declining sector find employment in the expanding sector. Canadian workers find that steel is cheaper, so they are better off to the extent that they consume products that embody steel. On the other hand, the fact that the world price of bread is above the price that Canadians paid in autarky means that they are worse off to the extent that their income goes to buy bread. The net effect on Canadian labor depends on which effect is strongest, rising bread prices or falling steel prices. U.S. workers face rising steel prices and falling bread prices, and, again, the net effect is ambiguous and depends on their consumption patterns.

CASE STUDY

Comparative Advantage in a Single Natural Resource

Natural resources are a source of comparative advantage in many countries. Chile has copper, Botswana has diamonds, and Saudi Arabia has oil. Crude oil is probably the most important geopolitical resource today, and it is certainly the largest resource market. In fact, other than currency trading, international trade in crude oil exceeds the volume and value of any other good or service. According to the World Trade Organization, trade in oil and other fuels was more than 1.96 trillion (millions of millions) dollars in 2017.

Comparative advantage in crude oil production depends largely on a country's endowment of oil, and as everyone is aware, countries in the Middle East have a majority of the world's proven reserves of crude oil. Table 4.3 shows the ten countries with the world's largest reserves and the share of fuel products in their total exports.

Oil is valuable. Consequently, when countries are endowed with crude oil reserves, capital and labor are pulled into the sector because it is the most valuable use of inputs. It is also a clear example of following comparative advantage based on resource endowments. There is a downside, however, as the potential returns from developing an oil industry can make it difficult to

TABLE 4.3 Ten Largest Oil Reserves

Country	Reserves*(2017)	Fuel Exports as a Percent of Total Exports (2017)
Venezuela	301	96.9
Saudi Arabia	266	75.0
Canada	170	22.3
Iran	158	63.2
Iraq	143	99.7
Kuwait	102	89.8
UAE	98	20.1
Russia	80	62.9
Libya	48	92.5
Nigeria	37	85.8

*Billions (thousands of millions) of barrels, given current technology.

Data from U.S. Energy Information Administration and World Trade Organization.

(*continued*)

develop other economic activities. This is evident in Table 4.3, which shows that oil's share of total exports is high for most countries. Most of the economies listed are one-product economies.

The problem of a single, valuable resource that crowds out the development of other economic activities is called a **resource curse**. The resource curse is not inevitable for economies with large endowments of oil or some other valuable mineral—Canada, for instance, has overcome it—but it poses a challenge, and it gives caution to the idea that resources are always a path to prosperity. Other types of resource curses have been noted when a country has a sudden discovery of gold or another valuable mineral. Regardless of the resource behind the curse, in all cases where it is not overcome, labor and capital are concentrated in the extraction of one natural resource, and it becomes difficult to develop a diversified economy. When the price of the dominant commodity fluctuates, national income is altered in a very short amount of time and can result in severe macroeconomic instability and alternating boom and bust cycles.

A further problem of a large endowment of a single resource is that it often causes political turmoil. There are strong incentives to try to gain control of the resource, leading to factions in leadership and political strife as different groups struggle with each other. The promise of significant wealth can easily lead to corruption in countries with weak governments, as politicians buy the political support they need. In the worse cases, civil war is a possibility.

Not every country with resources suffers from a resource curse. Strong institutions to guard against corruption, and commitment to education, skills, and savings can develop the human capital and financial capital that a country needs in order to diversify its economy and provide for the inevitable day when the resource is no longer as valuable. Canada has done this, and the United Arab Emirates (UAE) is following a similar path.

EMPIRICAL TESTS OF THE THEORY OF COMPARATIVE ADVANTAGE

LO 4.3 Discuss the limits of the HO model.

All the popular theories of trade are variations on the idea of comparative advantage, and each theory makes predictions about the goods that a country will export and import. Therefore, it should be relatively straightforward to test each theory by holding its predictions up to actual trade flows and seeing if the two match. Unfortunately, empirical tests of trade theories are more difficult to conduct than they are to describe. Part of the problem is that it is difficult to measure variables such as factor endowments and prices in autarky.

The trade theories presented here and in Chapter 3 are the two most widely accepted by economists—the Ricardian theory of trade, based on relative productivities, and the HO theory, based on factor endowments. In the Ricardian

theory discussed in Chapter 3, comparative advantage depended on relative productivity. This model is easier to test because it is easier to measure labor productivity than factor endowments. Consequently, it is not surprising that statistical tests of the Ricardian theory have been more successful. In general, they have confirmed the hypothesis that trade patterns between pairs of countries are determined to a significant degree by the relative differences in their labor productivities. More specifically, as labor productivity in a particular industry increases, the greater the likelihood the country becomes a net exporter of the good.

Tests of the HO theory of trade have been mixed. One of the problems for researchers in this area is that it is difficult to obtain a uniform set of measurements of factor endowments. In the presentation of the model in this chapter, only two inputs were considered, although we expanded that to three when we covered the specific factors model. In reality, there are many more than three factors. There are different kinds of labor (unskilled, semiskilled, managerial, technical, and so on), and there are many varieties of natural resources and capital. None of these categories has standardized definitions, and consequently each type of labor, capital, and natural resource is measured differently in each country. As a result, formal statistical analyses of tests of the HO theory have concluded that measurement errors in the data are a major problem.

Nevertheless, the consensus among economists seems to be that endowments matter, although they are far from the whole story. Even if it were possible to measure factor endowments accurately, technological differences between countries would not be captured, and these can be a significant source of productivity differences. In addition to technology, other important determinants of trade patterns not considered by the factor endowment theory are economies of scale, corporate structure, and economic policy.

While the theory of trade based on factor endowments receives mixed empirical support, it nevertheless remains the foundation of most economists' thinking about trade. This may seem curious, but there is actually a good reason for it. While factor endowments cannot explain all of the world's trade patterns, they do explain a significant part of them. Therefore, it is useful to begin with factor endowments and to supplement this view with other ideas. Perhaps most importantly, the factor endowment schema is a useful way to categorize the income distribution effects of trade. For both of these reasons, the HO model and its variations remain at the core of international economics.

EXTENSIONS OF THE HO MODEL

LO 4.4 List and describe determinants of trade patterns that are not a result of factor endowments.

Several alternative trade models build on the idea of comparative advantage but with an emphasis on real-world characteristics of trading countries and traded goods. For example, the gravity model considers geographical location as a factor, while the product cycle emphasizes changes that occur as production matures

and becomes more routine. A third alternative asks why a significant share of trade is between branches of the same company located in different countries.

The Gravity Model

One of the simplest yet most accurate models in its predictions is the **gravity model** of trade. As the name implies, this model is borrowed from Newton's theory that the gravitational attraction of two bodies in space is a function of their size and distance from each other. In the domain of trade, size is measured by GDP, and distance is an actual measurement of the geographical distance between their main commercial centers. Larger countries have more output to trade and more demand for goods produced abroad, while the closer any two countries are, the easier and less expensive it is to move goods. Hence, the gravity model predicts more trade between countries when one or both economies are larger and when they are located close to each other.

A few examples will clarify these relationships. There are two reasons why Mexico's most important trading partner, by far, is the United States: distance and GDP. The United States and Mexico have a shared border, which makes transport costs less than shipping goods to Europe, Asia, or South America, and the U.S. market is large and can absorb a lot of Mexican output. At the same time, the large U.S. economy enables it to supply a disproportionate share of Mexican imports. Another example is U.S. trade with Korea versus U.S. trade with Japan. They are each approximately a similar distance from the United States, but the greater size of the Japanese economy ultimately causes U.S. trade with it to be greater than U.S. trade with Korea.

Note that the gravity model does not directly take into consideration trade barriers, levels of income per person, or other relevant characteristics of countries or products. Those elements are clearly important in the real world, but even though they are ignored, the gravity model is the best model for predicting the amount of trade between countries. Note also that it does not try to predict what is traded or the determinants of comparative advantage.

The Product Cycle

The **product cycle** model of trade was developed by Raymond Vernon. The model is an insightful analysis that incorporates ideas about the evolution of manufactured goods and technology. One of its greatest strengths is that it can explain exports of sophisticated manufactured goods from countries that have shortages of skilled labor and capital.

Vernon pointed out that many manufactured products, such as automobiles, electronic devices, and new appliances, go through a product cycle in which the inputs change over time. Initially, when these goods are brand new, there is a great deal of experimentation in both the characteristics of the final product and its manufacturing process. For example, when computer tablets were first developed, there was a wide variety of different forms to choose from. Each had different sets of options—often even within the same technology—and the size of the device, memory capacity, connectability, and other features were not standardized.

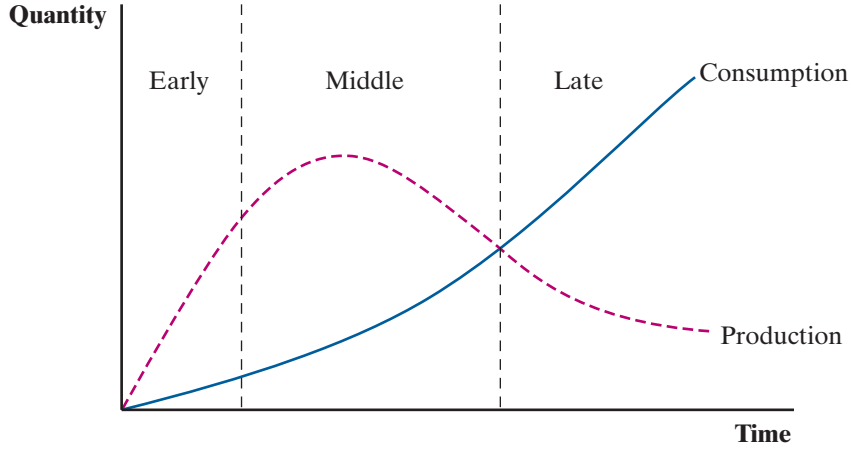
In this early stage of production, manufacturers need to be near a high-income market, where consumer feedback is greatest. Experimentation with basic design features requires information about the market's reaction. Consequently, there must be a consumer base with substantial income and skilled marketing to advertise information about the product. In addition, on the input side, experimentation and improvement in design and manufacturing require scientific and engineering inputs, along with capital that is willing to risk failure and an initial period of little or no profits. Both the consumption side and the production side necessitate that product research, development, and initial production take place in industrial countries.

Over time, however, the product begins to leave the early phase of its development and production and enters the middle phase (see Figure 4.5 and Figure 4.6). The product itself begins to be standardized in size, features, and manufacturing process. Experimentation with fundamentally new designs begins to wane as product development shifts toward incremental improvements in a basic design. In the middle phase, production begins to shift to countries with low labor costs. Standardized manufacturing routines are increasingly common, using low-skilled and semiskilled labor in assembly-type operations.

Countries reach the late phase of the product cycle when consumption in high-income nations begins to exceed production. At this point, an increasing share of the world's output is moving to developing countries where abundant unskilled and semiskilled labor keeps labor costs low. The pressure on high-income countries in the late phase is to turn toward innovation of new products, which starts the cycle over again.

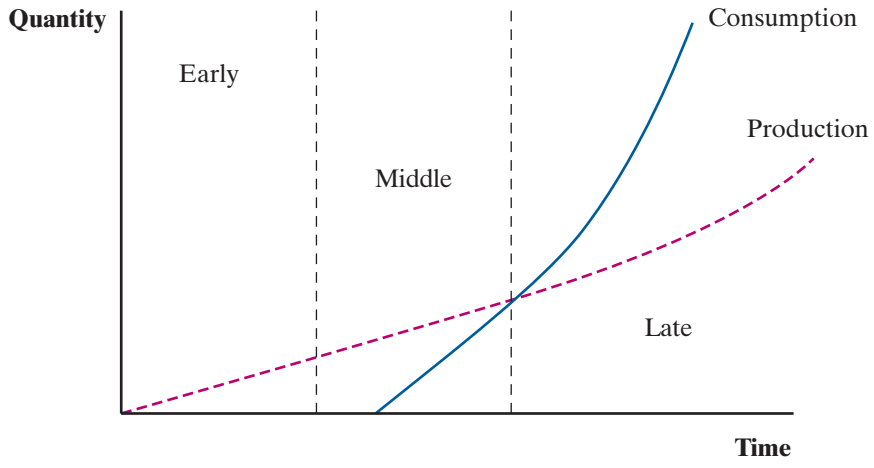
The product cycle is a more elaborate story about technology than either the Ricardian or HO models. It may seem to differ fundamentally from those

FIGURE 4.5 The Product Cycle in High-Income Countries



Many manufactured goods experience a product cycle of innovation, stabilization, and standardization.

FIGURE 4.6 The Product Cycle in Low-Income Countries



Low-income countries begin producing during the middle period when product design and production techniques begin to stabilize.

models, but in fact it is very similar. At its core is a story about opportunity costs. As manufacturing processes become standardized, they can be performed by relatively unskilled labor. In effect, the blend of inputs changes over time, from highly skilled scientific, engineering, and marketing elements to basic unskilled and semiskilled labor. Consequently, the opportunity cost of production in developing countries becomes lower than the cost in high-income countries. In essence, it's the Ricardian story once again.

CASE STUDY

United States–China Trade

According to the IMF, China's GDP in 2020 was approximately $14.9 trillion, with a population of 1.4 billion. It is currently the United States' largest partner for the trade in manufactured goods and services. China was the United States' third largest manufactured products export market in 2020, and China was the United States' largest provider of manufactured goods imports in 2020. The US–China trade supports approximately 2.6 million jobs in the United States in various industries. China's exports to the United States changed from labor-intensive products to more capital-intensive products, and China became the United States' major provider of advanced technology products. China's labor endowment and the product cycle explains a large share of its exports to the United States.

Top Chinese exports to the United States, 2020		Top United States exports to China, 2020	
Item	**$ billion**	**Item**	**$ billion**
Electrical machinery	111	Electrical machinery	17
Machinery	97	Oilseeds and soybeans	15
Toys and sports equipment	26	Machinery	14
Furniture and bedding	23	Mineral fuels	10
Various textile articles	21	Optical and medical instruments	9.5

Source: Office of the United States Trade Representative, 2021
https://ustr.gov/countries-regions/china-mongolia-taiwan/peoples-republic-china

China experienced a phenomenal transformation of its industrial development and export structure: in the 1980s, more than 50 percent of its exports consisted of animal and agricultural products, crude oil, and coal; now it is the world's largest manufacturer, with the industrial sector covering all production sectors. Three of the top Chinese exported products in 2020 are relatively unsophisticated ones that use the abundance of labor and relatively a small amount of capital: toys and sports equipment, furniture and bedding, and textile articles.

The comparative advantage of China is still in labor-intensive manufactured products, but it has started to shift toward the high-skilled manufacturing sector. But it is important to mention that the high-tech manufacturing sector contains not only advanced technologies but also assembly activities required for high-tech finished products—a very important part of the production made for Chinese exports.

Foreign Trade Versus Foreign Investment

In the product cycle, firms invest abroad instead of exporting, and some of the output may be imported back into the home country. This pattern is very different from the simple HO model, where countries export one good and import

another. First, it implies that under the conditions outlined in the product cycle, firms prefer to invest abroad rather than to export. That is, they substitute foreign investment for foreign trade. Second, the part of the output that they ship from their foreign operation back into the home country is international trade, but it is handled entirely within a single firm. That is, they engage in **intrafirm trade**: international trade between a parent company and a foreign-owned affiliate.

Intrafirm trade is difficult to measure, but in the mid-1990s, it was estimated that about one-third of U.S. merchandise exports and two-fifths of merchandise imports were intrafirm. Most foreign investment, however, is not for the purpose of exporting but rather is intended to supply the market where the foreign investment is located. Whether for trade purposes or not, the selection of foreign investment instead of foreign trade poses a number of questions for economists and business scholars. Why do firms sometimes prefer to set up foreign-based operations instead of buying imports directly from a separate company located overseas? Or, if the foreign investment is for the purpose of selling in the foreign market, why don't companies export directly to the market instead of producing there? In essence, the questions are the same because both ask about the circumstances that cause foreign investment rather than foreign trade.

The product cycle provides one answer to these questions, but it is an incomplete answer because it does not explain why a firm would invest in China instead of in Mexico. If labor costs are the only reason, then Africa would have the most foreign investment instead of the least of any continent. Furthermore, the product cycle is unable to explain why the greatest proportion of foreign investment goes to developed, industrial countries in Europe and North America, where the comparative advantages are the same as or similar to those of the countries that supply the most foreign investment. According to United Nations data, high-income countries normally provide and receive the vast bulk of foreign investment; since the financial crisis, they have received "only" 65 percent of foreign investment (while making over 80 percent), which is down from a more normal 75 percent received before the crisis but is still nearly two-thirds of all foreign direct investment.

Research into the trade-offs between investing abroad versus exporting from a home base acknowledges the importance of both the microeconomic characteristics of firms and the macroeconomic characteristics of countries that attract foreign investment. Microeconomic factors look at the internal constraints and opportunities of individual firms, while macroeconomic factors take into account the conditions inside countries that cause them to be suitable locations for a foreign firm to invest. The analytical framework that combines both sets of characteristics is known as the **OLI theory** of foreign direct investment. Its founder, John Dunning, offered it as an eclectic theory combining many different microeconomic and macroeconomic elements.

OLI is an acronym for *ownership-location-internalization*. In Dunning's analysis, firms investing abroad own an asset that gives them a competitive advantage in the world market (ownership). The asset may be something tangible, such as a patent, an innovation, a blueprint, or a trade secret; or it may be something intangible, such as a trademark or the firm's reputation. In either case, ownership of a valuable asset confers a potential advantage on the firm. Second, the firm will

seek a production location that offers advantages (location). These may be in the form of low input costs, a large customer base, or an ability to produce a better product more efficiently due to the surrounding economic environment. Cheap labor is only one possibility, and if it does not come with a good infrastructure of roads and utilities, does not supply the skills that employers need, or is too far from the product's final market, then the fact that wages are low will not overcome the country's disadvantages.

Third, and most abstractly, the firm that invests abroad tries to capture within itself all the advantages that ownership of its asset confers (internalization). A firm that invests abroad can, if it chooses, simply sell the rights to its asset and let a foreign firm do the production—and, in fact, many firms operate this way. That is, as an alternative, the investing firm can sell a license to its technology or its trademark or its trade secrets. Some firms, however, choose to take on the added costs of setting up production in a foreign location. There are many potential reasons for this choice, including the fear of theft or copy of its technology, the problem of monitoring and enforcing a contract with a foreign firm, and the concern that production mistakes by the foreign firm may hurt the reputation or trademark of the home country firm. Whatever the reason, the investing firm decides that it benefits more if it internalizes the advantages of asset ownership within itself rather than sells those advantages to another firm.

Dunning's analysis has been added to and extended by a large number of scholars who have found it to be a robust and adaptable description of the behavior of many firms. It is not a theory of trade because it describes the circumstances that motivate firms to invest abroad rather than to engage in trade, but it does not contradict trade theory. Rather, it simply states that firms are internationally mobile and will use the comparative advantages they find in different locations. In this sense, it demonstrates how those advantages motivate individual firms to adapt their own behavior.

Off-Shoring and Outsourcing

Off-shoring and **outsourcing** are frequently used terms but with varying definitions. In this text, off-shoring is defined as the movement of some or all of a firm's activities to a location outside the home country; outsourcing is the reassignment of activities to another firm, either inside or outside the home country. All combinations of off-shoring and outsourcing are possible. Some firms off-shore but do not outsource, choosing to use a **foreign affiliate**, which is defined as a foreign-based operation owned by the firm in the home country. Other firms may off-shore and outsource, choosing to use a foreign firm to produce some of their inputs.

Transportation, information, and communication innovations, such as modern container cargo ships, computing power, and satellite communications, made it possible for firms to think about moving some or all of their production abroad. In the 1990s, as the Internet expanded and data processing costs fell, seaports added capacity for moving standardized shipping containers, and off-shoring gained momentum. The new technologies made it possible for home-country firms to successfully manage foreign branch operations and partnerships. New technologies

also lowered the cost of finding foreign suppliers and partners. As an example, consider a firm in the 1980s that wanted to off-shore and possibly outsource production to a foreign economy with lower labor costs. In a world with fax machines but no video conferencing and expensive international communication costs, coordination with foreign affiliates and suppliers was complicated and expensive. Issues of quality control, product redesign or change, and delivery times were much more difficult to manage from a distance. But with the development of modern communication technologies, information flows quickly and inexpensively across international boundaries, and off-shoring is more easily managed.

One of the greatest effects of this new trend toward international production is that firms can utilize the comparative advantages of different economies by locating different processes in different countries. A good example of this is the automobile industry. Automobiles have many thousands of parts. Some are highly sophisticated electronics or components that use specialized metal alloys. Some parts require large amounts of capital, research, and skilled engineering inputs, while others are assembled or produced with less skilled labor and little capital. Modern information and communications technologies, along with advances in transportation systems, enable the auto industry to manage the production of parts in many different places simultaneously. Engines may be made in Mexico, transmissions in Japan, electronics in the United States and Canada, brakes in Brazil, and additional parts from many other countries. Most automobiles today contain parts from many countries.

Economists refer to this as a **global value chain**. It implies that each step in the production process can be identified and separated from other steps. Each can be located in a different country or region, but each adds value to the final product. Each component or part of a final product such as a car, a bicycle, a cell phone, or a computer might be made wherever there is a comparative advantage in the type of production that part requires. This does not imply that there are no limits to offshoring, however, as moving parts to the final assembly destination and then moving the final product to market can be expensive. Modern container cargo ships have dramatically lowered costs and increased productivity in shipping, but costs are far from zero. Hence, many industries still tend to cluster regionally, particularly when the final product is bulky or expensive to move.

The development of global value chains is disruptive. Previously, goods were made in one place and exported to another. Now, components of a final product can be produced in many different places, assembled somewhere, and exported. As a result, many exports depend on the availability of imports, and some industries that appear to be mainly producing for the domestic market may actually be selling their output to firms that incorporate it into a product that is exported. This change, from producing in one place and selling in another to a global value chain that links different production steps located in firms in widely dispersed locations, is disruptive. It has increased productivity, but it has also changed the location of some manufacturing, hurt some individuals and communities while benefiting others, forced firms to reexamine their corporate strategies, and distorted our statistics on international trade in ways that make some industries appear less dependent on trade than they actually are.

CASE STUDY

Mexico's Participation in Global Value Chains

Trade statistics show which goods and services are imported and exported, but they do not show which industries are embedded in global value chains or how individual countries participate in global production systems. The classic case is the iPhone described in the next case study. This case study briefly discusses some of the new concepts that are emerging in the study of global value chains, with an emphasis on Mexico as an illustrative example.

Mexico is the world's thirteenth-largest exporter of merchandise goods and the largest in Latin America. After decades of inward-looking policies that downplayed international trade, it began a systematic remaking of its economy in the late 1980s. Today, it is a relatively open economy with a large number of free trade agreements, including with the United States, Canada, the European Union, and countries in Latin America and the Pacific Basin. The reorientation of Mexico's trade policies and its implementation of many free trade agreements have embedded the economy in global value chains in ways that statistics on exports and imports fail to capture.

For example, economists interested in value added trade have begun to measure the foreign value added contained in a country's exports. This is a measure of the share of the value of a country's exports that is produced by foreign firms located outside the country. The key here is not so much the ownership issue as it is the location of production. Some firms have foreign value added in their output because they incorporate imported inputs into their production. The percentage of foreign value in an industry or firm's exports is a measure of its **backward linkages**, where *backward* refers to the production linkages upstream or with firms that produce in earlier production stages. Backward linkages are determined by proximity to trading partners (gravity), the size of the economy (which partially determines its ability to source inputs domestically), and its own mineral resources (fewer minerals, more backward linkages). Backward linkages in the global economy developed rapidly from the mid-1990s up to the global financial crisis of 2007–2009, after which they have fallen slightly. In Mexico's case, extensive linkages to global production networks, especially those shared with the United States and Canada, have continued to increase the foreign value share of its exports. According to the latest data (2015), 36.4 percent of the value of Mexico's exports is produced outside Mexico. The foreign value share is particularly high in information and communication technology (ICT) and electronics (58.4%) and motor vehicles (48%).

Another question of interest is the share of domestic value added purchased by foreigners. When measured for specific industries, it offers a view into the industry's export orientation. Traditional export statistics are somewhat misleading in this regard since an industry might sell its products to domestic

(*continued*)

firms that incorporate it into their own output and then export their product. Overall, Mexican value added is increasingly export oriented and driven by foreign consumption. In 2015, the share of domestic value added that was purchased by foreigners was 21.6 percent.

Several other statistics are helpful in understanding how individual countries and specific industries participate in global value chains. One in particular is the services content of exports. The amount of measured services trade has grown dramatically over the past few decades, but even so it is underestimated. This is because the production of merchandise goods exports often uses significant quantities of services. When a good is exported, the entire value is counted as a merchandise good export, even though it embodies a significant amount of services in its production. In 2015, services contributed 44.3 percent of the value of Mexico's exports, of which 14.3 percent was foreign services embodied in the intermediate inputs that were used to make Mexican exports.

THE IMPACT OF TRADE ON WAGES AND JOBS

LO 4.5 Describe the controversies surrounding the impact of international trade on wages and jobs.

Manufacturing in North America and Europe has struggled for decades. As a share of GDP and as a share of overall employment, it has been on a long, downward trend. At the same time, wage inequality has increased, rather slowly at first and then more rapidly in the 1980s. Wage inequality has been particularly severe in the United States and has primarily affected younger workers and workers with less education or fewer skills. These trends in manufacturing employment and wages raise a couple of questions about trade. Are industrialized countries losing jobs to developing countries? Does trade with low-wage countries cause wages to fall in high-wage countries?

Economic theory offers insight into the issue of the overall number of jobs in the economy. In the medium run and long run, the absolute number of jobs depends mainly on factors such as the age and size of the population, labor market policies, and the business cycle. While trade may have a short-run effect as well, particularly if firms cannot compete against imports or if sudden opportunities for export expansion appear, these impacts are outweighed by macroeconomic policies affecting the entire domestic economy over the medium and long runs. By comparison, changes in trade flows usually affect one or two manufacturing industries and a small share of overall GDP.

While trade is not the main determinant of the number of jobs in most economies, it might affect the kinds of jobs or the sectors of the economy where jobs are available. For example, manufacturing employment in the United States and most high-income countries has been falling for quite a while. Throughout the 1980s and 1990s, most economists thought that the reductions in manufacturing employment in all industrial countries resulted from productivity gains, not

trade. Manufacturing is easier to automate than services and as a consequence has much faster rates of productivity growth than services. Many services, on the other hand, have stagnant or very slow rates of productivity growth. Often, the same number of workers is required today as a century ago; one haircut, for example, still takes one barber, and modern musicians are no more "productive" at playing Bach's *Brandenburg Concertos* than they were in the 1700s. When incomes rise, we consume more services and more manufactured goods, but because the services require more or less the same number of workers per unit of output and manufactured goods can be made with fewer workers per unit, a growing share of our total employment ends up in services.

More recently, some economists have seriously questioned the idea that manufacturing is shrinking because productivity in that sector is increasing more rapidly. For example, an influential study has shown that communities in the United States that have industries that compete with Chinese-made products have experienced a number of negative effects, including higher unemployment rates, lower labor force participation, and reduced wages. The authors of the study believe that exposure to competition with China may explain as much as one-fourth of the overall decline in manufacturing employment in the United States. Another influential study by a Nobel Prize–winning economist and his coauthor points out that nearly all of the growth in the number of jobs has been in services and other sectors that do not produce tradable goods. They argue that many U.S. businesses have outsourced their inputs to firms in foreign countries so that middle-skill manufacturing is disappearing while very high-skill manufacturing jobs remain. Both of these studies support the idea that trade may have changed the composition of jobs in the United States in a way that does not favor manufacturing, even if the total number of jobs in all other sectors of the economy has grown significantly.

The second issue concerns the impact of trade with less-developed countries (LDCs) on the wages of workers in the advanced industrial economies. This question has been studied by many economists, and the general consensus until relatively recently was that trade may have caused some of the decline in wages for the less skilled (and, hence, some of the increase in wage inequality), but it was responsible for only a small share of the overall changes. Most economists thought that technological changes that reduced the role of unskilled and semiskilled labor in manufacturing were the primary causes of the increasing gap in wages between the skilled and the unskilled. In the late 1990s, however, the gap in wages between the skilled and unskilled stopped increasing, and after approximately 2000, everyone's wages stagnated except the top 1 percent of the income distribution.

The consensus among economists is that there is no consensus about the impact of trade on wages. We know that export industries tend to pay more, but we do not know if trade is responsible for the stagnation in wages or if it is but one of many factors or perhaps has no impact at all on wages. This is an area of very active research as economists try to understand how trade might cause the wage stagnation and decline that we observe in many parts of the U.S. economy. If trade has played a far larger role in the growth of wage inequality or wage stagnation than is generally recognized, then the policy conclusions about trade are

not likely to change much. In either case, where trade is responsible for inequality or lower wages and where it is not, there is a need for education and training programs targeted at the less skilled. Chapters 6 and 7 will show that blocking trade to protect jobs is extraordinarily expensive and doing so to protect wages could make things worse in the long run.

CASE STUDY

Do Trade Statistics Give a Distorted Picture of Trade Relations? The Case of the iPhone 3G

Off-shoring enables firms to cut up their production chain and move different parts of the production process to different global locations. We know that car parts come from around the globe and any vehicle labeled "Made in America" or any other country is likely to have components from a wide range of countries. Modern production processes span the globe, particularly when we examine sophisticated high-technology products. Firms find it advantageous to off-shore and to outsource different pieces of the production process and then bring the parts together for assembly in a completely different country. The iPhone is a case in point.

A 2009 investigation of the cost of components for an iPhone 3G revealed that four countries produced the majority of the value of the phone: Japan, Korea, Germany, and the United States. Since Apple is not a manufacturer, it outsources all of its production and off-shores a large part as well. When assembled, the cost of assembly and of materials for the iPhone3 was $178.96. This price is not the retail price since it does not include additional costs such as marketing, royalties, transportation, and insurance, and it omits the dealer mark-up. The $178.96 price tag can be thought of as the price of the materials and components that go into the iPhone plus assembly costs. China's contribution to the value added is $6.50, which is the value of the assembly of components coming from Japan, Korea, Germany, and the United States. After the iPhone is assembled, it is ready for shipping. If it is sold in the United States, then U.S. import statistics will record a $178.96 import from China (not counting insurance and transportation). The United States' contribution to the cell phone's manufacture was $10.75, so trade statistics will record the iPhone 3G as a net deficit for the United States, equal to $178.96 minus $10.75, or $168.21. This is odd if you consider that China's contribution to the iPhone's manufacture was only $6.50. If we reexamine the situation by looking only at value added in each country, the U.S. "iPhone trade balance with China" was actually in surplus: $10.75 minus $6.50 or $4.25. Correspondingly, U.S. actual trade deficits with Japan, Korea, and Germany are larger than official statistics

indicate since most of its value was created in Japan (33 percent), Germany (17 percent), Korea (13 percent), and a host of other countries.

Analysis of China's production reveals systematic patterns in the share of export value added created in China. The WTO estimates that 32 percent of the value of China's exports was value created outside China in 2011, but the pattern varies by industry. Exports of goods produced with large amounts of unskilled and semiskilled labor, such as apparel, footwear, or toys, have most of their value added from Chinese inputs of labor and capital, while exports of sophisticated electronics draw much more of their value from outside the country. Looking at many countries worldwide, natural resource products like oil or iron ore are almost entirely produced in the exporting country, while final products with many parts, such as consumer electronics or automobiles, are more likely to be produced in many countries, leaving the final exporter of the finished product with a smaller share of the overall value creation.

Some economists, including a previous director general of the WTO, think that this type of mischaracterization of trade flows inadvertently contributes to greater trade tensions. Accordingly, the WTO began an initiative some years ago to measure trade flows in terms of value added rather than total value in the hopes that this would bring greater clarity to the actual source of the value of exports and help reduce trade tensions between low-wage exporting countries and high-wage importing ones. An additional reason for trying to understand which countries contribute to the production of a product is that it tells us whether firms in developing countries are participating in the value chains of multinational companies and whether they are moving up into areas of increasing technological sophistication.

MIGRATION AND TRADE

LO 4.6 Give examples of the determinants of international migration and its impact on comparative advantage.

According to the Migration Policy Institute and the United Nations Population Division, in 2017 there were an estimated 258 million international migrants spread across the globe. Nearly two-thirds were living in high-income countries, and almost 20 percent were in the United States alone. In our presentation of the HO model, international migration was not taken into account. Workers are allowed to move between sectors in the model but not between countries. This is an important consideration since international migration alters the labor endowments that the model assumes to be fixed.

Economists have long studied migration, as have sociologists, demographers, political scientists, and other social scientists. Each discipline brings its own tools of analysis and contributes another piece to our understanding of the determinants and effects of migration. Sociologists and anthropologists, for example, have helped to clarify that the decision to migrate is often a family decision or, in

some cases, a community decision to send one of its members abroad. Political scientists have helped to clarify how migration policies are set and enforced, or not enforced, as the case may be. The economic view of migration tends to understand it in terms of the individual migrant and the underlying incentives to migrate. In this view, economic incentives play a major role by determining the factors that cause migrants to leave and the factors that attract them to a particular destination.

Economists refer to **supply-push factors** as the forces inside a country that cause people to think about leaving. Push factors include recessions, long-run structural changes that cause job dislocations, wars, natural disasters, and anything else that makes life difficult at home. Examples of structural changes include the transformations of Central European economies from socialism to capitalism, Latin American economic reforms, or industrial development in Asia and Africa. In the near future, we can expect large migrations from changing agricultural patterns and the inundation of coastal areas as a result of climate change.

Demand-pull factors are the forces that pull migrants to a particular country or place within a country. Key factors include the cost of reaching a particular destination, the probability of finding a job, and the wage that will be earned. The wage gap between developed countries and developing countries explains a large share of the flow of migrants, but other factors are important as well. The business cycle in the receiving country, its migration policies, and the overall set of opportunities encountered by foreign workers are all important demand-pull factors.

A third factor determining migration is the existence of **social networks**. Migrants do not scatter randomly around a desirable destination but instead congregate in certain places. This is partly due to job opportunities, but it also reflects the fact that migration is hard and expensive, and the presence of family or community members makes it a little easier. The supply of information about the new locale is better if there are already migrants who can report home on conditions and who can help newcomers become established with a place to live, a job, and familiar faces to ward off loneliness.

In theory, if the endowment of a particular factor increases, then the relative abundance of the factor and, potentially, its comparative advantage also change. In practice, labor inflows are often used to produce services that are not traded. For example, two countries with large percentages of foreigners in their population are Qatar (86.5 percent of residents are immigrants) and the United Arab Emirates (70.0 percent of residents are immigrants). A large share of the foreign workers in those countries are Filipinos, Palestinians, and other migrants who work as domestics, providing cleaning, cooking, day care, and other services that cannot be traded. These migrants do not have a direct impact on the host country's comparative advantage since the labor is not used to produce tradable goods (although they free up citizens to work in the export sector). However, many migrant workers are also engineers and business specialists who provide technical expertise to the oil and gas industry. Without some high-skilled migrant labor, it is possible that production in these oil- and gas-producing countries would be much more limited.

Most international migration is from developing to developed countries. For example, in the 1980s and 1990s, civil wars in Central America produced large outflows of Salvadorian and Guatemalan immigrants to the United States, many of whom settled in California, where some found employment in apparel manufacturing. California's apparel sector added over 40,000 jobs between 1983 and 1997 (a growth of almost 50 percent), largely based on the availability of low-wage, unskilled immigrant workers. Given that apparel is a declining sector in the United States, immigrant labor appears to have postponed the decline of the industry in California for about a decade. Other U.S. examples of where immigration influences comparative advantage include certain agricultural crops that depend on abundant supplies of immigrant labor and the tourism industry. In these cases, increases in the supply of unskilled labor shifted production toward industries that intensely use that factor of production.

Summary

- The Heckscher-Ohlin (HO) model hypothesizes that comparative advantage is based on national differences in factor endowments. Countries export goods that have production requirements that are intensive in the nation's relatively abundant factors. They import goods that require intensive input from the nation's relatively scarce factors.
- The HO model has implications for the income distribution effects of trade. The opening of trade favors the abundant factor and reduces the use of the scarce factor. Consequently, the income or returns earned by the abundant factor rises, while it falls for the scarce factor. A corollary to the HO model, called the *Stolper-Samuelson theorem,* describes these effects.
- In the specific factors model, some factors of production are assumed to be immobile between different outputs. Consequently, when trade expands the production of a good, the specific factor used to produce it experiences a rise in the demand for its services and an increase in its income. The specific factor used to produce the imported good experiences a fall in the demand for its services, and its income declines. The specific factors model can be viewed as a short- to medium-run version of the HO model.
- Empirical tests of the theory of comparative advantage give mixed results. While underlying productivity differences explain a significant share of trade, national differences in factor endowments are less successful at explaining trade patterns.
- Several alternative trade models have been hypothesized. Most are elaborations of the theory of comparative advantage. Two of the most popular alternative trade theories are the theory of the product cycle and the gravity model of trade. The product cycle focuses on the speed of technological change and the life history of many manufactured items through periods of innovation, stabilization, and standardization. The gravity model does not

try to predict the specific goods that are traded but instead looks at the size of the economies and the distance between trading partners to predict which countries are likely to have more extensive or less extensive trade relations.

- Off-shoring is the movement of some or all of a firm's activities to another country. Outsourcing is the reassignment of activities to another firm, in either a domestic or a foreign location. Both have been advanced by the telecommunications and information revolutions and have led to the development of global value chains.
- In the medium to long run, trade has little or no effect on the total number of jobs in a country. The abundance or scarcity of jobs is a function of labor market policies, incentives to work, and the macroeconomic policies of the central bank and government. In the short run, trade may reduce jobs in an industry that suffers a loss in its competitiveness, just as it may increase jobs in an industry with growing competitiveness. Trade may also affect the kinds of jobs and the economic sectors that grow or shrink.
- There is no consensus among economists about the impact of trade on wages. Recent research seems to point toward the possibility trade plays some role in the pattern of wage stagnation and the decline of recent years, but it is uncertain if its role is direct or indirect and if it is large or small. This question is not settled and is an area of very active research.
- International migration can alter a country's comparative advantage, although in practice most countries do not receive enough migrants or a sufficiently long enough flow of migrants to cause long-run changes. Migrants are motivated by supply-push factors in their home country, demand-pull factors in the receiving country, and social networks that provide information and resources for settling in the new country.

Vocabulary

backward linkage
demand-pull factors
derived demand
factor abundance
factor scarcity
foreign affiliate
global value chain
gravity model
Heckscher-Ohlin (HO) trade theory
intrafirm trade
magnification effect
off-shoring
OLI theory
outsourcing
product cycle
resource curse
social networks
specific factors model
Stolper-Samuelson theorem
supply-push factors