



Interdependence and the Gains from Trade

Consider your typical day. You wake up in the morning and pour yourself juice from oranges grown in Florida and coffee from beans grown in Brazil. Over breakfast, you watch a news program broadcast from New York on your television made in Japan. You get dressed in clothes made of cotton grown in Georgia and sewn in factories in Thailand. You drive to class in a car made of parts manufactured in more than a dozen countries around the world. Then you open up your economics textbook written by an author living in Massachusetts, published by a company located in Ohio, and printed on paper made from trees grown in Oregon.

Every day, you rely on many people, most of whom you have never met, to provide you with the goods and services that you enjoy. Such interdependence is possible because people trade with one another. Those people providing you goods and services are not acting out of generosity. Nor is some government agency directing them to satisfy your desires. Instead, people provide you and other consumers with the goods and services they produce because they get something in return.

In subsequent chapters, we examine how our economy coordinates the activities of millions of people with varying tastes and abilities. As a starting point for

this analysis, here we consider the reasons for economic interdependence. One of the *Ten Principles of Economics* highlighted in Chapter 1 is that trade can make everyone better off. In this chapter, we examine this principle more closely. What exactly do people gain when they trade with one another? Why do people choose to become interdependent?

The answers to these questions are key to understanding the modern global economy. In most countries today, many goods and services consumed are imported from abroad, and many goods and services produced are exported to foreign customers. The analysis in this chapter explains interdependence not only among individuals but also among nations. As we will see, the gains from trade are much the same whether you are buying a haircut from your local barber or a T-shirt made by a worker on the other side of the globe.

A PARABLE FOR THE MODERN ECONOMY

To understand why people choose to depend on others for goods and services and how this choice improves their lives, let's look at a simple economy. Imagine that there are two goods in the world: meat and potatoes. And there are two people in the world—a cattle rancher and a potato farmer—each of whom would like to eat both meat and potatoes.

The gains from trade are most obvious if the rancher can produce only meat and the farmer can produce only potatoes. In one scenario, the rancher and the farmer could choose to have nothing to do with each other. But after several months of eating beef roasted, boiled, broiled, and grilled, the rancher might decide that self-sufficiency is not all it's cracked up to be. The farmer, who has been eating potatoes mashed, fried, baked, and scalloped, would likely agree. It is easy to see that trade would allow them to enjoy greater variety: Each could then have a steak with a baked potato or a burger with fries.

Although this scene illustrates most simply how everyone can benefit from trade, the gains would be similar if the rancher and the farmer were each capable of producing the other good, but only at great cost. Suppose, for example, that the potato farmer is able to raise cattle and produce meat, but that he is not very good at it. Similarly, suppose that the cattle rancher is able to grow potatoes but that her land is not very well suited for it. In this case, the farmer and the rancher can each benefit by specializing in what he or she does best and then trading with the other.

The gains from trade are less obvious, however, when one person is better at producing *every* good. For example, suppose that the rancher is better at raising cattle *and* better at growing potatoes than the farmer. In this case, should the rancher choose to remain self-sufficient? Or is there still reason for her to trade with the farmer? To answer this question, we need to look more closely at the factors that affect such a decision.

PRODUCTION POSSIBILITIES

Suppose that the farmer and the rancher each work 8 hours per day and can devote this time to growing potatoes, raising cattle, or a combination of the two. The table in Figure 1 shows the amount of time each person requires to produce 1 ounce of each good. The farmer can produce an ounce of potatoes in 15 minutes

and an ounce of meat in 60 minutes. The rancher, who is more productive in both activities, can produce an ounce of potatoes in 10 minutes and an ounce of meat in 20 minutes. The last two columns in the table show the amounts of meat or potatoes the farmer and rancher can produce if they work an 8-hour day producing only that good.

Panel (b) of Figure 1 illustrates the amounts of meat and potatoes that the farmer can produce. If the farmer devotes all 8 hours of his time to potatoes, he produces 32 ounces of potatoes (measured on the horizontal axis) and no meat. If he devotes all his time to meat, he produces 8 ounces of meat (measured on the vertical axis) and no potatoes. If the farmer divides his time equally between the two activities, spending 4 hours on each, he produces 16 ounces of potatoes and 4 ounces of meat. The figure shows these three possible outcomes and all others in between.

This graph is the farmer's production possibilities frontier. As we discussed in Chapter 2, a production possibilities frontier shows the various mixes of output that an economy can produce. It illustrates one of the *Ten Principles of Economics* in Chapter 1: People face trade-offs. Here the farmer faces a trade-off between producing meat and producing potatoes.

FIGURE 1

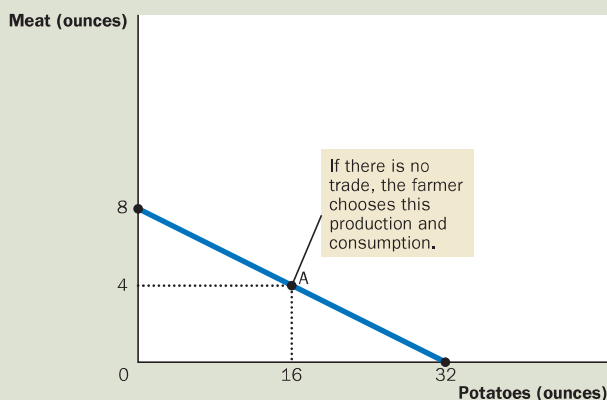
The Production Possibilities Frontier

Panel (a) shows the production opportunities available to the farmer and the rancher. Panel (b) shows the combinations of meat and potatoes that the farmer can produce. Panel (c) shows the combinations of meat and potatoes that the rancher can produce. Both production possibilities frontiers are derived assuming that the farmer and rancher each work 8 hours per day. If there is no trade, each person's production possibilities frontier is also his or her consumption possibilities frontier.

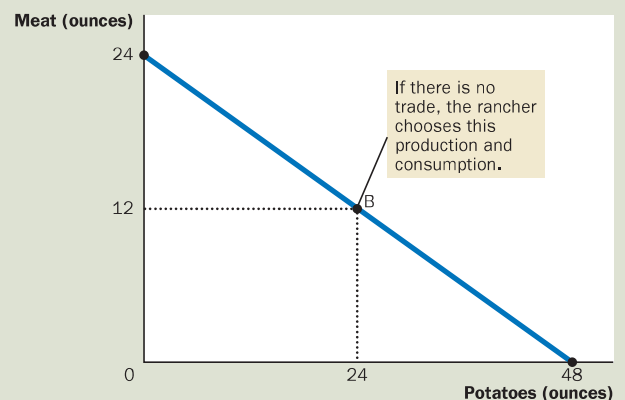
(a) Production Opportunities

	Minutes Needed to Make 1 Ounce of:		Amount Produced in 8 Hours	
	Meat	Potatoes	Meat	Potatoes
Farmer	60 min/oz	15 min/oz	8 oz	32 oz
Rancher	20 min/oz	10 min/oz	24 oz	48 oz

(b) The Farmer's Production Possibilities Frontier



(c) The Rancher's Production Possibilities Frontier



You may recall that the production possibilities frontier in Chapter 2 was drawn bowed out. In that case, the rate at which society could trade one good for the other depended on the amounts that were being produced. Here, however, the farmer's technology for producing meat and potatoes (as summarized in Figure 1) allows him to switch between the two goods at a constant rate. Whenever the farmer spends 1 hour less producing meat and 1 hour more producing potatoes, he reduces his output of meat by 1 ounce and raises his output of potatoes by 4 ounces—and this is true regardless of how much he is already producing. As a result, the production possibilities frontier is a straight line.

Panel (c) of Figure 1 shows the production possibilities frontier for the rancher. If the rancher devotes all 8 hours of her time to potatoes, she produces 48 ounces of potatoes and no meat. If she devotes all her time to meat, she produces 24 ounces of meat and no potatoes. If the rancher divides her time equally, spending 4 hours on each activity, she produces 24 ounces of potatoes and 12 ounces of meat. Once again, the production possibilities frontier shows all the possible outcomes.

If the farmer and rancher choose to be self-sufficient rather than trade with each other, then each consumes exactly what he or she produces. In this case, the production possibilities frontier is also the consumption possibilities frontier. That is, without trade, Figure 1 shows the possible combinations of meat and potatoes that the farmer and rancher can each produce and then consume.

These production possibilities frontiers are useful in showing the trade-offs that the farmer and rancher face, but they do not tell us what the farmer and rancher will actually choose to do. To determine their choices, we need to know the tastes of the farmer and the rancher. Let's suppose they choose the combinations identified by points A and B in Figure 1: The farmer produces and consumes 16 ounces of potatoes and 4 ounces of meat, while the rancher produces and consumes 24 ounces of potatoes and 12 ounces of meat.

SPECIALIZATION AND TRADE

After several years of eating combination B, the rancher gets an idea and goes to talk to the farmer:

RANCHER: Farmer, my friend, have I got a deal for you! I know how to improve life for both of us. I think you should stop producing meat altogether and devote all your time to growing potatoes. According to my calculations, if you work 8 hours a day growing potatoes, you'll produce 32 ounces of potatoes. If you give me 15 of those 32 ounces, I'll give you 5 ounces of meat in return. In the end, you'll get to eat 17 ounces of potatoes and 5 ounces of meat every day, instead of the 16 ounces of potatoes and 4 ounces of meat you now get. If you go along with my plan, you'll have more of *both* foods. [To illustrate her point, the rancher shows the farmer panel (a) of Figure 2.]

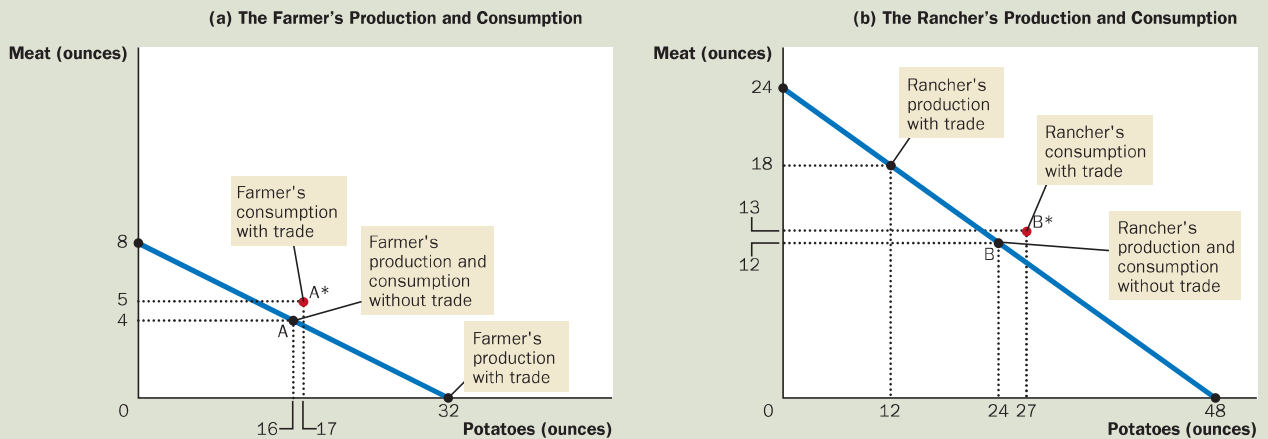
FARMER: (sounding skeptical) That seems like a good deal for me. But I don't understand why you are offering it. If the deal is so good for me, it can't be good for you too.

RANCHER: Oh, but it is! Suppose I spend 6 hours a day raising cattle and 2 hours growing potatoes. Then I can produce 18 ounces of meat and 12 ounces of potatoes. After I give you 5 ounces of my meat in exchange for 15 ounces of your potatoes, I'll end up with 13 ounces of meat and 27 ounces of potatoes, instead of the 12 ounces of meat and

FIGURE 2

The proposed trade between the farmer and the rancher offers each of them a combination of meat and potatoes that would be impossible in the absence of trade. In panel (a), the farmer gets to consume at point A* rather than point A. In panel (b), the rancher gets to consume at point B* rather than point B. Trade allows each to consume more meat and more potatoes.

How Trade Expands the Set of Consumption Opportunities



(c) The Gains from Trade: A Summary

	Farmer		Rancher	
	Meat	Potatoes	Meat	Potatoes
Without Trade:				
Production and Consumption	4 oz	16 oz	12 oz	24 oz
With Trade:				
Production	0 oz	32 oz	18 oz	12 oz
Trade	Gets 5 oz	Gives 15 oz	Gives 5 oz	Gets 15 oz
Consumption	5 oz	17 oz	13 oz	27 oz
GAINS FROM TRADE:				
Increase in Consumption	+1 oz	+1 oz	+1 oz	+3 oz

24 ounces of potatoes that I now get. So I will also consume more of both foods than I do now. [She points out panel (b) of Figure 2.]

FARMER: I don't know. . . . This sounds too good to be true.

RANCHER: It's really not as complicated as it first seems. Here—I've summarized my proposal for you in a simple table. [The rancher shows the farmer a copy of the table at the bottom of Figure 2.]

FARMER: (after pausing to study the table) These calculations seem correct, but I am puzzled. How can this deal make us both better off?

RANCHER: We can both benefit because trade allows each of us to specialize in doing what we do best. You will spend more time growing potatoes and less time raising cattle. I will spend more time raising cattle and

less time growing potatoes. As a result of specialization and trade, each of us can consume more meat and more potatoes without working any more hours.

QUICK QUIZ Draw an example of a production possibilities frontier for Robinson Crusoe, a shipwrecked sailor who spends his time gathering coconuts and catching fish. Does this frontier limit Crusoe's consumption of coconuts and fish if he lives by himself? Does he face the same limits if he can trade with natives on the island?

COMPARATIVE ADVANTAGE: THE DRIVING FORCE OF SPECIALIZATION

The rancher's explanation of the gains from trade, though correct, poses a puzzle: If the rancher is better at both raising cattle and growing potatoes, how can the farmer ever specialize in doing what he does best? The farmer doesn't seem to do anything best. To solve this puzzle, we need to look at the principle of *comparative advantage*.

As a first step in developing this principle, consider the following question: In our example, who can produce potatoes at a lower cost—the farmer or the rancher? There are two possible answers, and in these two answers lie the solution to our puzzle and the key to understanding the gains from trade.

ABSOLUTE ADVANTAGE

absolute advantage
the ability to produce a good using fewer inputs than another producer

One way to answer the question about the cost of producing potatoes is to compare the inputs required by the two producers. Economists use the term **absolute advantage** when comparing the productivity of one person, firm, or nation to that of another. The producer that requires a smaller quantity of inputs to produce a good is said to have an absolute advantage in producing that good.

In our example, time is the only input, so we can determine absolute advantage by looking at how much time each type of production takes. The rancher has an absolute advantage both in producing meat and in producing potatoes because she requires less time than the farmer to produce a unit of either good. The rancher needs to input only 20 minutes to produce an ounce of meat, whereas the farmer needs 60 minutes. Similarly, the rancher needs only 10 minutes to produce an ounce of potatoes, whereas the farmer needs 15 minutes. Based on this information, we can conclude that the rancher has the lower cost of producing potatoes, if we measure cost by the quantity of inputs.

OPPORTUNITY COST AND COMPARATIVE ADVANTAGE

opportunity cost
whatever must be given up to obtain some item

There is another way to look at the cost of producing potatoes. Rather than comparing inputs required, we can compare the opportunity costs. Recall from Chapter 1 that the **opportunity cost** of some item is what we give up to get that item. In our example, we assumed that the farmer and the rancher each spend 8 hours a day working. Time spent producing potatoes, therefore, takes away from time available for producing meat. When reallocating time between the two goods, the rancher and farmer give up units of one good to produce units of the other, thereby moving along the production possibilities frontier. The opportunity cost measures the trade-off between the two goods that each producer faces.

Let's first consider the rancher's opportunity cost. According to the table in panel (a) of Figure 1, producing 1 ounce of potatoes takes 10 minutes of work. When the rancher spends those 10 minutes producing potatoes, she spends 10 minutes less producing meat. Because the rancher needs 20 minutes to produce 1 ounce of meat, 10 minutes of work would yield $\frac{1}{2}$ ounce of meat. Hence, the rancher's opportunity cost of producing 1 ounce of potatoes is $\frac{1}{2}$ ounce of meat.

Now consider the farmer's opportunity cost. Producing 1 ounce of potatoes takes him 15 minutes. Because he needs 60 minutes to produce 1 ounce of meat, 15 minutes of work would yield $\frac{1}{4}$ ounce of meat. Hence, the farmer's opportunity cost of 1 ounce of potatoes is $\frac{1}{4}$ ounce of meat.

Table 1 shows the opportunity costs of meat and potatoes for the two producers. Notice that the opportunity cost of meat is the inverse of the opportunity cost of potatoes. Because 1 ounce of potatoes costs the rancher $\frac{1}{2}$ ounce of meat, 1 ounce of meat costs the rancher 2 ounces of potatoes. Similarly, because 1 ounce of potatoes costs the farmer $\frac{1}{4}$ ounce of meat, 1 ounce of meat costs the farmer 4 ounces of potatoes.

Economists use the term **comparative advantage** when describing the opportunity cost of two producers. The producer who gives up less of other goods to produce Good X has the smaller opportunity cost of producing Good X and is said to have a comparative advantage in producing it. In our example, the farmer has a lower opportunity cost of producing potatoes than the rancher: An ounce of potatoes costs the farmer only $\frac{1}{4}$ ounce of meat, but it costs the rancher $\frac{1}{2}$ ounce of meat. Conversely, the rancher has a lower opportunity cost of producing meat than the farmer: An ounce of meat costs the rancher 2 ounces of potatoes, but it costs the farmer 4 ounces of potatoes. Thus, the farmer has a comparative advantage in growing potatoes, and the rancher has a comparative advantage in producing meat.

Although it is possible for one person to have an absolute advantage in both goods (as the rancher does in our example), it is impossible for one person to have a comparative advantage in both goods. Because the opportunity cost of one good is the inverse of the opportunity cost of the other, if a person's opportunity cost of one good is relatively high, the opportunity cost of the other good must be relatively low. Comparative advantage reflects the relative opportunity cost. Unless two people have exactly the same opportunity cost, one person will have a comparative advantage in one good, and the other person will have a comparative advantage in the other good.

comparative advantage
the ability to produce a good at a lower opportunity cost than another producer

COMPARATIVE ADVANTAGE AND TRADE

The gains from specialization and trade are based not on absolute advantage but on comparative advantage. When each person specializes in producing the good

TABLE 1

	Opportunity Cost of:	
	1 oz of Meat	1 oz of Potatoes
Farmer	4 oz potatoes	$\frac{1}{4}$ oz meat
Rancher	2 oz potatoes	$\frac{1}{2}$ oz meat

The Opportunity Cost of Meat and Potatoes

for which he or she has a comparative advantage, total production in the economy rises. This increase in the size of the economic pie can be used to make everyone better off.

In our example, the farmer spends more time growing potatoes, and the rancher spends more time producing meat. As a result, the total production of potatoes rises from 40 to 44 ounces, and the total production of meat rises from 16 to 18 ounces. The farmer and rancher share the benefits of this increased production.

We can also look at the gains from trade in terms of the price that each party pays the other. Because the farmer and rancher have different opportunity costs, they can both get a bargain. That is, each benefits from trade by obtaining a good at a price that is lower than his or her opportunity cost of that good.

Consider the proposed deal from the viewpoint of the farmer. The farmer gets 5 ounces of meat in exchange for 15 ounces of potatoes. In other words, the farmer buys each ounce of meat for a price of 3 ounces of potatoes. This price of meat is lower than his opportunity cost for an ounce of meat, which is 4 ounces of potatoes. Thus, the farmer benefits from the deal because he gets to buy meat at a good price.

Now consider the deal from the rancher's viewpoint. The rancher buys 15 ounces of potatoes for a price of 5 ounces of meat. That is, the price of potatoes is $\frac{1}{3}$ ounce of meat. This price of potatoes is lower than her opportunity cost of an ounce of potatoes, which is $\frac{1}{2}$ ounce of meat. The rancher benefits because she gets to buy potatoes at a good price.

The moral of the story of the farmer and the rancher should now be clear: *Trade can benefit everyone in society because it allows people to specialize in activities in which they have a comparative advantage.*

THE PRICE OF THE TRADE

The principle of comparative advantage establishes that there are gains from specialization and trade, but it leaves open a couple of related questions: What determines the price at which trade takes place? How are the gains from trade shared between the trading parties? The precise answer to these questions is beyond the scope of this chapter, but we can state one general rule: *For both parties to gain from trade, the price at which they trade must lie between the two opportunity costs.*

In our example, the farmer and rancher agreed to trade at a rate of 3 ounces of potatoes for each ounce of meat. This price is between the rancher's opportunity cost (2 ounces of potatoes per ounce of meat) and the farmer's opportunity cost (4 ounces of potatoes per ounce of meat). The price need not be exactly in the middle for both parties to gain, but it must be somewhere between 2 and 4.

To see why the price has to be in this range, consider what would happen if it were not. If the price of meat were below 2 ounces of potatoes, both the farmer and the rancher would want to buy meat, because the price would be below their opportunity costs. Similarly, if the price of meat were above 4 ounces of potatoes, both would want to sell meat, because the price would be above their opportunity costs. But there are only two members of this economy. They cannot both be buyers of meat, nor can they both be sellers. Someone has to take the other side of the deal.

A mutually advantageous trade can be struck at a price between 2 and 4. In this price range, the rancher wants to sell meat to buy potatoes, and the farmer wants to sell potatoes to buy meat. Each party can buy a good at a price that is lower



FYI

The Legacy of Adam Smith and David Ricardo

Economists have long understood the gains from trade. Here is how the great economist Adam Smith put the argument:

It is a maxim of every prudent master of a family, never to attempt to make at home what it will cost him more to make than to buy. The tailor does not attempt to make his own shoes, but buys them of the shoemaker. The shoemaker does not attempt to make his own clothes but employs a tailor. The farmer attempts to make neither the one nor the other, but employs those different artificers. All of them find it for their interest to employ their whole industry in a way in which they have some advantage over their neighbors, and to purchase with a part of its produce, or what is the same thing, with the price of part of it, whatever else they have occasion for.

This quotation is from Smith's 1776 book *An Inquiry into the Nature and Causes of the Wealth of Nations*, which was a landmark in the analysis of trade and economic interdependence.

Smith's book inspired David Ricardo, a millionaire stockbroker, to become an economist. In his 1817 book

Principles of Political Economy and Taxation, Ricardo developed the principle of comparative advantage as we know it today. He considered an example with two goods (wine and cloth) and two countries (England and Portugal). He showed that both countries can gain by opening up trade and specializing based on comparative advantage.

Ricardo's theory is the starting point of modern international economics, but his defense of free trade was not a mere academic exercise. Ricardo put his beliefs to work as a member of the British Parliament, where he opposed the Corn Laws, which restricted the import of grain.



David Ricardo

The conclusions of Adam Smith and David Ricardo on the gains from trade have held up well over time. Although economists often disagree on questions of policy, they are united in their support of free trade. Moreover, the central argument for free trade has not changed much in the past two centuries. Even though the field of economics has broadened its scope and refined its theories since the time of Smith and Ricardo, economists' opposition to trade restrictions is still based largely on the principle of comparative advantage.

PHOTO: © BETTMANN/CORBIS

than his or her opportunity cost. In the end, both of them specialize in the good for which he or she has a comparative advantage and are, as a result, better off.

QUICK QUIZ Robinson Crusoe can gather 10 coconuts or catch 1 fish per hour. His friend Friday can gather 30 coconuts or catch 2 fish per hour. What is Crusoe's opportunity cost of catching one fish? What is Friday's? Who has an absolute advantage in catching fish? Who has a comparative advantage in catching fish?

APPLICATIONS OF COMPARATIVE ADVANTAGE

The principle of comparative advantage explains interdependence and the gains from trade. Because interdependence is so prevalent in the modern world, the principle of comparative advantage has many applications. Here are two examples, one fanciful and one of great practical importance.



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SHOULD TIGER WOODS MOW HIS OWN LAWN?

Tiger Woods spends a lot of time walking around on grass. One of the most talented golfers of all time, he can hit a drive and sink a putt in a way that most casual golfers only dream of doing. Most likely, he is talented at other activities too. For example, let's imagine that Woods can mow his lawn faster than anyone else. But just because he *can* mow his lawn fast, does this mean he *should*?

To answer this question, we can use the concepts of opportunity cost and comparative advantage. Let's say that Woods can mow his lawn in 2 hours. In that same 2 hours, he could film a television commercial for Nike and earn \$10,000. By contrast, Forrest Gump, the boy next door, can mow Woods's lawn in 4 hours. In that same 4 hours, he could work at McDonald's and earn \$20.

In this example, Woods has an absolute advantage in mowing lawns because he can do the work with a lower input of time. Yet because Woods's opportunity cost of mowing the lawn is \$10,000 and Forrest's opportunity cost is only \$20, Forrest has a comparative advantage in mowing lawns.

The gains from trade in this example are tremendous. Rather than mowing his own lawn, Woods should make the commercial and hire Forrest to mow the lawn. As long as Woods pays Forrest more than \$20 and less than \$10,000, both of them are better off.

SHOULD THE UNITED STATES TRADE WITH OTHER COUNTRIES?

Just as individuals can benefit from specialization and trade with one another, as the farmer and rancher did, so can populations of people in different countries. Many of the goods that Americans enjoy are produced abroad, and many of the goods produced in the United States are sold abroad. Goods produced abroad and sold domestically are called **imports**. Goods produced domestically and sold abroad are called **exports**.

imports

goods produced abroad and sold domestically

exports

goods produced domestically and sold abroad

To see how countries can benefit from trade, suppose there are two countries, the United States and Japan, and two goods, food and cars. Imagine that the two countries produce cars equally well: An American worker and a Japanese worker can each produce one car per month. By contrast, because the United States has more and better land, it is better at producing food: A U.S. worker can produce 2 tons of food per month, whereas a Japanese worker can produce only 1 ton of food per month.

The principle of comparative advantage states that each good should be produced by the country that has the smaller opportunity cost of producing that good. Because the opportunity cost of a car is 2 tons of food in the United States but only 1 ton of food in Japan, Japan has a comparative advantage in producing cars. Japan should produce more cars than it wants for its own use and export some of them to the United States. Similarly, because the opportunity cost of a ton of food is 1 car in Japan but only $\frac{1}{2}$ car in the United States, the United States has a comparative advantage in producing food. The United States should produce more food than it wants to consume and export some to Japan. Through specialization and trade, both countries can have more food and more cars.

In reality, of course, the issues involved in trade among nations are more complex than this example suggests. Most important among these issues is that each country has many citizens with different interests. International trade can make some individuals worse off, even as it makes the country as a whole better off.

When the United States exports food and imports cars, the impact on an American farmer is not the same as the impact on an American autoworker. Yet, contrary to the opinions sometimes voiced by politicians and pundits, international trade is not like war, in which some countries win and others lose. Trade allows all countries to achieve greater prosperity.

QUICK QUIZ Suppose that a skilled brain surgeon also happens to be the world's fastest typist. Should she do her own typing or hire a secretary? Explain.



In The News

The Changing Face of International Trade

A decade ago, no one would have asked which nation has a comparative advantage in slaying ogres. But technology is rapidly changing the goods and services that are traded across national borders.

Ogre to Slay? Outsource It to Chinese

By David Barboza

Fuzhou, China—One of China's newest factories operates here in the basement of an old warehouse. Posters of *World of Warcraft* and *Magic Land* hang above a corps of young people glued to their computer screens, pounding away at their keyboards in the latest hustle for money.

The people working at this clandestine locale are "gold farmers." Every day, in 12-hour shifts, they "play" computer games by killing onscreen monsters and winning battles, harvesting artificial gold coins and other virtual goods as rewards that, as it turns out, can be transformed into real cash.

That is because, from Seoul to San Francisco, affluent online gamers who lack the time and patience to work their way up to the higher levels of gamedom are willing to pay the young Chinese here to play the early rounds for them.

"For 12 hours a day, 7 days a week, my colleagues and I are killing monsters," said



a 23-year-old gamer who works here in this makeshift factory and goes by the online code name Wandering. "I make about \$250 a month, which is pretty good compared with the other jobs I've had. And I can play games all day."

He and his comrades have created yet another new business out of cheap Chinese labor. They are tapping into the fast-growing world of "massively multiplayer online games," which involve role playing and often revolve around fantasy or warfare in medieval kingdoms or distant galaxies. . . .

For the Chinese in game-playing factories like these, though, it is not all fun and

games. These workers have strict quotas and are supervised by bosses who equip them with computers, software and Internet connections to trash online trolls, gnomes and ogres.

As they grind through the games, they accumulate virtual currency that is valuable to game players around the world. The games allow players to trade currency to other players, who can then use it to buy better armor, amulets, magic spells and other accoutrements to climb to higher levels or create more powerful characters.

The Internet is now filled with classified advertisements from small companies—many of them here in China—auctioning for real money their powerful figures, called avatars. . . .

"It's unimaginable how big this is," says Chen Yu, 27, who employs 20 full-time gamers here in Fuzhou. "They say that in some of these popular games, 40 or 50 percent of the players are actually Chinese farmers."

Source: *New York Times*, December 9, 2005.

CONCLUSION

You should now understand more fully the benefits of living in an interdependent economy. When Americans buy tube socks from China, when residents of Maine drink orange juice from Florida, and when a homeowner hires the kid next door to mow the lawn, the same economic forces are at work. The principle of comparative advantage shows that trade can make everyone better off.

Having seen why interdependence is desirable, you might naturally ask how it is possible. How do free societies coordinate the diverse activities of all the people involved in their economies? What ensures that goods and services will get from those who should be producing them to those who should be consuming them? In a world with only two people, such as the rancher and the farmer, the answer is simple: These two people can bargain and allocate resources between themselves. In the real world with billions of people, the answer is less obvious. We take up this issue in the next chapter, where we see that free societies allocate resources through the market forces of supply and demand.

SUMMARY

- Each person consumes goods and services produced by many other people both in the United States and around the world. Interdependence and trade are desirable because they allow everyone to enjoy a greater quantity and variety of goods and services.
- There are two ways to compare the ability of two people in producing a good. The person who can produce the good with the smaller quantity of inputs is said to have an *absolute advantage* in producing the good. The person who has the smaller opportunity cost of producing the good is said to have a *comparative advantage*. The gains from trade are based on comparative advantage, not absolute advantage.
- Trade makes everyone better off because it allows people to specialize in those activities in which they have a comparative advantage.
- The principle of comparative advantage applies to countries as well as to people. Economists use the principle of comparative advantage to advocate free trade among countries.

KEY CONCEPTS

absolute advantage, *p. 54*
 opportunity cost, *p. 54*

comparative advantage, *p. 55*
 imports, *p. 58*

exports, *p. 58*

QUESTIONS FOR REVIEW

1. Under what conditions is the production possibilities frontier linear rather than bowed out?
2. Explain how absolute advantage and comparative advantage differ.
3. Give an example in which one person has an absolute advantage in doing something but another person has a comparative advantage.
4. Is absolute advantage or comparative advantage more important for trade? Explain your reasoning using the example in your answer to Question 3.
5. Will a nation tend to export or import goods for which it has a comparative advantage? Explain.
6. Why do economists oppose policies that restrict trade among nations?

PROBLEMS AND APPLICATIONS

1. Maria can read 20 pages of economics in an hour. She can also read 50 pages of sociology in an hour. She spends 5 hours per day studying.
 - a. Draw Maria's production possibilities frontier for reading economics and sociology.
 - b. What is Maria's opportunity cost of reading 100 pages of sociology?
2. American and Japanese workers can each produce 4 cars a year. An American worker can produce 10 tons of grain a year, whereas a Japanese worker can produce 5 tons of grain a year. To keep things simple, assume that each country has 100 million workers.
 - a. For this situation, construct a table analogous to the table in Figure 1.
 - b. Graph the production possibilities frontier of the American and Japanese economies.
 - c. For the United States, what is the opportunity cost of a car? Of grain? For Japan, what is the opportunity cost of a car? Of grain? Put this information in a table analogous to Table 1.
 - d. Which country has an absolute advantage in producing cars? In producing grain?
 - e. Which country has a comparative advantage in producing cars? In producing grain?
 - f. Without trade, half of each country's workers produce cars and half produce grain. What quantities of cars and grain does each country produce?
 - g. Starting from a position without trade, give an example in which trade makes each country better off.
3. Pat and Kris are roommates. They spend most of their time studying (of course), but they leave some time for their favorite activities: making pizza and brewing root beer. Pat takes 4 hours to brew a gallon of root beer and 2 hours to make a pizza. Kris takes 6 hours to brew a gallon of root beer and 4 hours to make a pizza.
 - a. What is each roommate's opportunity cost of making a pizza? Who has the absolute advantage in making pizza? Who has the comparative advantage in making pizza?
 - b. If Pat and Kris trade foods with each other, who will trade away pizza in exchange for root beer?
 - c. The price of pizza can be expressed in terms of gallons of root beer. What is the highest price at which pizza can be traded that would make both roommates better off? What is the lowest price? Explain.
4. Suppose that there are 10 million workers in Canada and that each of these workers can produce either 2 cars or 30 bushels of wheat in a year.
 - a. What is the opportunity cost of producing a car in Canada? What is the opportunity cost of producing a bushel of wheat in Canada? Explain the relationship between the opportunity costs of the two goods.
 - b. Draw Canada's production possibilities frontier. If Canada chooses to consume 10 million cars, how much wheat can it consume without trade? Label this point on the production possibilities frontier.
 - c. Now suppose that the United States offers to buy 10 million cars from Canada in exchange for 20 bushels of wheat per car. If Canada continues to consume 10 million cars, how

much wheat does this deal allow Canada to consume? Label this point on your diagram. Should Canada accept the deal?

5. England and Scotland both produce scones and sweaters. Suppose that an English worker can produce 50 scones per hour or 1 sweater per hour. Suppose that a Scottish worker can produce 40 scones per hour or 2 sweaters per hour.
 - a. Which country has the absolute advantage in the production of each good? Which country has the comparative advantage?
 - b. If England and Scotland decide to trade, which commodity will Scotland trade to England? Explain.
 - c. If a Scottish worker could produce only 1 sweater per hour, would Scotland still gain from trade? Would England still gain from trade? Explain.
6. The following table describes the production possibilities of two cities in the country of Baseballia:

	Pairs of Red Socks per Worker per Hour	Pairs of White Socks per Worker per Hour
Boston	3	3
Chicago	2	1

- a. Without trade, what is the price of white socks (in terms of red socks) in Boston? What is the price in Chicago?
 - b. Which city has an absolute advantage in the production of each color sock? Which city has a comparative advantage in the production of each color sock?
 - c. If the cities trade with each other, which color sock will each export?
 - d. What is the range of prices at which trade can occur?
7. Suppose that in a year an American worker can produce 100 shirts or 20 computers, while a Chinese worker can produce 100 shirts or 10 computers.
 - a. Graph the production possibilities curve for the two countries. Suppose that without trade the workers in each country spend half their time producing each good. Identify this point in your graph.
 - b. If these countries were open to trade, which country would export shirts? Give a specific

numerical example and show it on your graph. Which country would benefit from trade? Explain.

- c. Explain at what price of computers (in terms of shirts) the two countries might trade.
 - d. Suppose that China catches up with American productivity so that a Chinese worker can produce 100 shirts or 20 computers. What pattern of trade would you predict now? How does this advance in Chinese productivity affect the economic well-being of the citizens of the two countries?
8. An average worker in Brazil can produce an ounce of soybeans in 20 minutes and an ounce of coffee in 60 minutes, while an average worker in Peru can produce an ounce of soybeans in 50 minutes and an ounce of coffee in 75 minutes.
 - a. Who has the absolute advantage in coffee? Explain.
 - b. Who has the comparative advantage in coffee? Explain.
 - c. If the two countries specialize and trade with each other, who will import coffee? Explain.
 - d. Assume that the two countries trade and that the country importing coffee trades 2 ounces of soybeans for 1 ounce of coffee. Explain why both countries will benefit from this trade.
9. Are the following statements true or false? Explain in each case.
 - a. "Two countries can achieve gains from trade even if one of the countries has an absolute advantage in the production of all goods."
 - b. "Certain very talented people have a comparative advantage in everything they do."
 - c. "If a certain trade is good for one person, it can't be good for the other one."
 - d. "If a certain trade is good for one person, it is always good for the other one."
 - e. "If trade is good for a country, it must be good for everyone in the country."
10. The United States exports corn and aircraft to the rest of the world, and it imports oil and clothing from the rest of the world. Do you think this pattern of trade is consistent with the principle of comparative advantage? Why or why not?