MODERN PRINCIPLES: MICROECONOMICS

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Economies of Scale and Creating Competition

One way that specialization and trade increase total production is by increasing knowledge. Specialization and trade also make it profitable to use specialized machines. A person who must grow his own wheat and bake his own bread cannot afford a combine thresher or ovens that bake bread in assembly line fashion. A combine thresher that speeds the separation of grain from husk by 20 percent, for example, isn't worth the expense when you have just 10 acres to thresh, but at 1,000 acres, the savings can be significant. Similarly, the cost per loaf of bread is lower when 25,000 loaves of bread are produced an hour, as is true in a modern bakery, than when 100 loaves of bread are produced in a day. By specializing and trading, people can take advantage of the cost savings associated with large-scale production. Economists call those cost savings **economies of scale.**

Economies of scale mean that costs per unit fall with increases in production.

Taking advantage of economies of scale is one reason why many European countries have joined the European Union (EU), an agreement to remove many trade barriers between member nations by creating a single market. The EU was inspired by the creation of a single market called the "United States" by the original American states and it has many of the same benefits. It makes no more sense for every country to have its own automobile or aircraft manufacturer than it does for every U.S. state to have its own auto and aircraft manufacturer. Instead, by forming a single market, countries in the EU can specialize and every country can benefit from the cost savings that occur when automobiles and aircraft are produced with specialized, large-scale production techniques.

Economies of scale are closely related to another advantage of international trade, creating competition. If an industry enjoys large economies of scale but trade barriers prevent competition from foreign producers, there will be only a few domestic firms. Without foreign competition, these firms will have the ability to raise prices and reduce output.

In the 1980s, for example, so-called voluntary export restraints reduced imports of Japanese automobiles into the United States. As a result, U.S. consumers had to pay more for Japanese automobiles, about $1,300 extra. But it wasn't only buyers of Japanese automobiles who faced higher prices. Buyers of domestic automobiles also had to pay more, about $660 more per car. Prices of domestic cars increased because GM, Ford, and Chrysler knew that with less pressure from international competition, they could increase prices. The profits of the big three went up during this period and consumers bore the costs.

International trade keeps domestic firms competitive and on their toes. Interestingly, so long as domestic firms know that foreign firms stand ready to compete, domestic firms cannot raise their prices by much. Thus, consumers can benefit from a free trade policy even if no trade actually occurs!

Comparative Advantage

A third reason to trade is to take advantage of differences. Brazil, for example, has a climate ideally suited to growing sugar cane, China has an abundance of low-skilled workers, and the United States has one of the best-educated workforces in the world. Taking advantage of these differences suggests that world production can be maximized when Brazil produces sugar, China assembles iPods, and the United States devotes its efforts to designing the next generation of electronic devices.

Absolute advantage is the ability to produce the same good using fewer inputs than another producer.

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Comparative advantage: It's a good thing

Martha Stewart may be the world's best ironer but she doesn't do her own ironing. Every hour Martha spends ironing is an hour less she has to run her billion-dollar business. The cost of ironing is too high for Martha Stewart, even if she is the world's best.

Martha can be most productive if she does what she does *most* best.

Taking advantage of differences is even more powerful than it looks. We say that a country has an **absolute advantage** in production if it can produce the same good using fewer inputs than another country. But to benefit from trade, a country need not have an absolute advantage in production. For example, even if the United States did have the world's best climate for growing sugar, it might still make sense for Brazil to grow sugar and for the United States to design iPods, if the U.S. had a bigger advantage in designing iPods than it did in growing sugar.

Here's another example of what economists call comparative advantage. Martha Stewart doesn't do her own ironing. Why not? Martha Stewart may in fact be the world's best ironer but she is also good at running her business. If Martha spent more time ironing and less time running her business, her blouses might be pressed more precisely but that would be a small gain compared to the loss from having someone else run her business. It's better for Martha if she specializes in running her business and then trades some of her income for other goods, such as ironing services, and of course many other goods and services as well.

The idea of comparative advantage is subtle but important. In order to give a precise definition, let's explore comparative advantage using a simple model. Suppose that there are just two goods, computers and shirts, and one input, labor. Assume that in Mexico, it takes 12 units of labor to make one computer and 2 units of labor to produce one shirt, and in the United States it takes 1 unit of labor to produce either good. Notice that the United States can produce both computers and shirts using less labor than in Mexico. Thus, in this example, the United States has an absolute advantage in both computers and shirts. Table 8.1 summarizes.

Since the United States can produce computers and shirts using less labor than Mexico, it's natural to wonder whether the United States has anything to gain from trade with its less productive neighbor. Mexicans may similarly wonder whether they have everything to lose from trading with their more productive neighbor. Both of these fears are unfounded. Mexico and the United States can each benefit from trade. Let's see how.

First, let's use the information in Table 8.1 to calculate the cost of shirts and computers. But remember from Chapter 2 that the real cost of producing a good is not the money cost but the *opportunity cost*, the best alternative that society must give up to get the good. Thus, we will calculate the opportunity cost of shirts and computers. We begin with shirts in the United States because that case is easy and requires only some easy-to-use ratios. The United States can produce one additional shirt by producing one less computer so the opportunity cost of a shirt in the United States is one computer.

TABLE 8.1 Labor Units Required to Produce Computers and Shirts in Mexico and the United States

Country	1 Computer	1 Shirt
Mexico	12	2
United States	1	1

What about Mexico? Mexico can produce an additional shirt by producing one-sixth less of a computer. In other words, by moving 2 units of labor—which could produce one-sixth of a computer—from computer production to shirt production, Mexico can produce one additional shirt.

Now here is the key. The (opportunity) cost of a shirt in the United States is one computer but the (opportunity) cost of a shirt in Mexico is just one-sixth of a computer. Thus, even though Mexico is less productive than the United States, Mexico has a lower cost of producing shirts! Since Mexico has the lowest opportunity cost of producing shirts, we say that Mexico has a **comparative advantage** in producing shirts.

A country has a **comparative advantage** in producing goods for which it has the lowest opportunity cost.

Now let's look at the opportunity cost of producing computers. Again, the trade-off for the United States is easy to see: It can produce one additional computer by giving up one shirt so the cost of one computer is one shirt. But to produce one additional computer in Mexico requires giving up six shirts! Thus, the United States has the lowest cost of producing computers or, economists say, it has a comparative advantage in producing computers. Table 8.2 summarizes.

We now know that the United States has a high cost of producing shirts and a low cost of producing computers. In Mexico, it's the reverse: Mexico has a low cost of producing shirts and a high cost of producing computers.

TABLE 8.2 Opportunity Costs

Country	Opportunity Cost of 1 Computer	Opportunity Cost of 1 Shirt
Mexico	6 Shirts	1/6 of a Computer
United States	1 Shirt	1 Computer

Mexico is the low cost producer of shirts.

The United States is the low cost producer of computers.

The theory of comparative advantage says that to increase its wealth a country should produce the goods it can make at low cost and buy what it can make only at high cost. Thus, the theory says the United States should make computers and buy shirts. Similarly, the theory says that Mexico should make shirts and buy computers. Let's use some numbers to see whether the theory holds up in our example.

Suppose that both Mexico and the United States have 24 units of labor and they each devote 12 units to producing computers and 12 units to producing shirts. Using the figures from Table 8.1, we can see that Mexico will produce one computer and six shirts and the United States will produce 12 computers and 12 shirts. At first, there is no trade so production in each country is equal to consumption. Table 8.3 summarizes.

Notice that total production is 13 computers and 18 shirts. Now, can Mexico and the United States make themselves better off through trade? Yes.

Imagine that Mexico moves 12 units of its labor out of computer production and into shirt production. Thus, Mexico specializes completely by allocating all 24 units of its labor to shirt production, thereby producing 12 shirts. Similarly, suppose that the United States moves 2 units of its labor out of shirt production and into computers—thus producing 14 computers and 10 shirts. The situation is now as in Table 8.4.

TABLE 8.3 Production = Consumption in Mexico and the United States (No Trade)

Country labor allocation (computers, shirts)	Computers	Shirts
Mexico (12, 12)	1	6
United States (12, 12)	12	12
Total Production	13	18

Now compare total production in Table 8.3 with total production in Table 8.4. Total production has increased with specialization! By specializing as comparative advantage would dictate, the two countries can increase total production by one computer and four shirts.

TABLE 8.4 Production in Mexico and the United States (Specialization)

Country labor allocation (computers, shirts)	Computers	Shirts
Mexico (0, 24)	0	12
United States (14, 10)	14	10
Total Production	14	22

So to finish the story, can you now see a way in which both Mexico and the United States can be made better off? Sure! Imagine that the United States trades one computer to Mexico in return for three shirts. Mexico is now able to consume one computer and nine shirts (three more shirts than before trade; compare with Table 8.3), while the United States is able to consume 13 computers (one more than before

trade) and 13 shirts (one more than before trade). Both Mexico and the United States are better off, as Table 8.5 illustrates.

TABLE 8.5 Consumption in Mexico and the United States (Specialization and Trade)

Country	Computers	Shirts
Mexico	1	9 (+3)
United States	13 (+1)	13 (+1)
Total Consumption	14	22

Thus, when each country produces according to its comparative advantage and then trades, total production and consumption increase. Importantly, both Mexico and the United States gain from trade even though the United States is more productive than Mexico at producing *both* computers and shirts.

The theory of comparative advantage not only explains trade patterns but it also tells us something remarkable: a country (or a person) will *always* be the low-cost seller of some good. The reason is clear: the greater the advantage a country has in producing A, the greater the cost to it of producing B. If you are a great pianist, the cost to you of doing anything else is very high. Thus, the greater your advantages in being a pianist, the greater the incentive you have to trade with other people for other goods. It's the same way for countries. The more productive the United States is at producing computers, the greater its demand will be to trade for shirts. Thus, countries with high productivity can always benefit by trading with lower productivity countries, and countries with lower productivity need never fear that higher productivity countries will outcompete them in all goods.

When people fear that a country can be outcompeted in everything, they are making a common mistake, namely confusing absolute advantage with comparative advantage. A producer has an absolute advantage over another producer if it can produce more output from the same input. But what makes trade profitable is differences in comparative advantage, and a country will always have some comparative advantage.

Thus, everyone can benefit from trade. From the world's greatest genius down to the person of below average ability, no person or country is so productive or so unproductive that they cannot benefit by inclusion in the worldwide division of labor. The theory of comparative advantage tells us something vital about world trade and about world peace. Trade unites humanity.

see the invisible hand

Comparative Advantage and Wages Comparative advantage is a difficult story to grasp. Most of the world hasn't got it yet so don't be too surprised if it takes you some time as well. You may at first be bothered by the fact that we did not explicitly discuss wages. Won't a country like the United States be uncompetitive in trade with low-wage countries like Mexico?

In fact, wages are in our model, we just need to bring them to the surface. Doing so will provide another perspective on comparative advantage.

In our model, there is only one type of labor that can be used to produce either computers or shirts. In a free market, all workers of the same type will earn the same wage.* So, in this model there is just one wage in Mexico and one wage in the United States. We can calculate the wage in Mexico by summing up the total value of *consumption* in Mexico and dividing by the number of workers.† We can perform a similar calculation for the United States. To do

* In a free market, the same good will tend to sell for the same price everywhere. Imagine that the wages in computer manufacturing exceed the wages in shirt manufacturing. Everyone wants a higher wage so workers in the shirt industry will try to move to the computer industry. As the supply of workers in computer manufacturing increases, however, wages in the computer sector will fall. And, as the supply of workers in shirt manufacturing decreases, wages in that sector will increase. Only when workers of the same type are paid the same wage is there no incentive for workers to move.

† We calculate the value of consumption because at the end of the day workers care about what they consume, not what they produce.

this, we need only a price for computers and a price for shirts. Let's suppose that computers sell for \$300 and shirts for \$100 (this is consistent with trading one computer for three shirts as we did earlier). Let's look first at the situation with no trade (see Table 8.3). The value of Mexican consumption is 1 × \$300 plus 6 × \$100 for a total of \$900. Since there are 24 workers, the average wage is \$37.50. The value of U.S. consumption is 12 × \$300 + 12 × \$100 = \$4,800 so the U.S. wage is \$200.

Now consider the situation with trade (see Table 8.5). The value of Mexican consumption is now 1 × \$300 + 9 × \$100 = \$1,200 for a wage of \$50 while the U.S. wage is now \$216.67 (check it!). Wages in both countries have gone up, just as expected.

But notice that the wage in Mexico is lower than the wage in the United States, both before and after trade. The reason is that the productivity of labor is lower in Mexico. Ultimately, it's the productivity of labor that determines the wage rate. Specialization and trade lets workers make the most of what they have—it raises wages as high as possible given productivity—but trade does not directly increase productivity.* Trade makes both Einstein and his less clever accountant better off, but it doesn't make the accountant a skilled scientist like Einstein.

In summary, workers in the United States often fear trade because they think that they cannot compete with low-wage workers in other countries. Meanwhile, workers in low-wage countries fear trade because they think that they cannot compete with high productivity countries like the United States! But differences in wages reflect differences in productivity. High productivity countries have high wages, low productivity countries have low wages. Trade means that workers in both countries can raise their wages to the highest levels allowed for by their productivities.

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Adam Smith (1723–1790) author of the *Wealth of Nations* and one of the greatest economists of all time. When Smith could not finish teaching one semester, he told his students he would refund their tuition. When the students refused the refund saying they had learned so much already, Smith wept. We, however, will not refund the purchase price of this book even if you only read half of it. We are not as good economists as was Adam Smith.

Adam Smith on Trade

As promised, we have so far talked about trade without distinguishing it much from "international trade." Adam Smith had an elegant summary connecting the argument for trade to that for international trade:

> It is the 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. What is prudence in the conduct of every private family can scarce be folly in that of a great kingdom. If a foreign country can supply us with a commodity cheaper than we ourselves can make it, better buy it of them with some part of the produce of our own industry employed in a way in which we have some advantage.[2]

CHECK YOURSELF

- What does specialization do to productivity? Why?
- How does trade let us benefit from the advantages of specialization?
- Alex Rodriguez is a premier baseball player. Being so athletic, he also would be very good at mowing his lawn, much better than Harry who mows lawns for a living. Why would Alex Rodriguez pay Harry to do his lawn rather than do it himself?

Analyzing Trade with Supply and Demand

Now that we have discussed some of the fundamental reasons for trade, let's look at trade—and trade restrictions—using tools that you are already familiar with: demand and supply.

* Trade can increase productivity by allowing for exploitation of economies of scale, improving the division of knowledge, and diffusing information about advanced production techniques. These advantages of trade are important but the logic of comparative advantage does not require an increase in productivity.