CHAPTER 2

Modern Principles of Economics:

The Power of Trade and Comparative Advantage

Facts and Tools

1. Use the idea of the "division of knowledge" to answer the following questions.

a. Which country has more knowledge: Utopia, where in the words of Karl Marx, each person knows just enough about hunting, fishing, and cattle raising to "hunt in the morning, fish in the afternoon, [and] rear cattle in the evening," or Drudgia, where one-third of the population learns only about hunting, one-third only about fishing, and one-third only about cattle raising?

b. Which planet has more knowledge: Xeroxia, each of whose one million inhabitants knows the same list of one million facts, or Differentia, whose one million inhabitants each know a different set of one million facts? How many facts are known in Xeroxia? How many facts are known in Differentia?

> **Solution**
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> 1. a. There is more knowledge in Drudgia.
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> b. In Xeroxia, people know one million facts. In Differentia, people know one trillion facts, a million times more. We would expect Differentia to have a higher standard of living.

2. In the *Wealth of Nations*, Adam Smith said that one reason specialization makes someone more productive is because "a man commonly saunters a little in turning his hand from one sort of employment to another." How can you use this observation to improve your pattern of studying for your four or five college courses this semester?

> **Solution**
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> 2. You should set aside long blocks of time (perhaps 1 to 2 hours) for each individual course, rather than switching every 15 minutes from reading biology to reading economics and back again. Every time you switch jobs, you waste some time getting used to the new task.

3. "Opportunity cost" is one of the tougher ideas in economics. Let's make it easier by starting with some simple examples. In the following examples, find the opportunity cost: Your answer should be a rate, as in "1.5 widgets per year" or "6 lectures per month." Ignoring Adam Smith's insight from the previous question, assume that these relationships are simple linear ones, so that if you put in twice the time you get twice the output, and half the time yields half the output.

a. Erin has a choice between two activities: She can repair one transmission per hour or she can repair two fuel injectors per hour. What is the opportunity cost of repairing one transmission?

b. Katie works at a customer service center and every hour she has a choice between two activities: answering 200 telephone calls per hour or responding to 400 emails per hour. What is the opportunity cost of responding to 400 phone calls?

c. Deirdre has a choice between writing one more book this year or five more articles this year. What is the opportunity cost of writing half a book this year, in terms of articles?

4. a. American workers are commonly paid much more than Chinese workers. *True or false*: This is largely because American workers are typically more productive than Chinese workers.
b. Julia Child, an American chef (and World War II spy) who reintroduced French cooking to Americans in the 1960s, was paid much more than most American chefs. *True or false*: This was largely because Julia Child was much more productive than most American chefs.

5. According to the *Wall Street Journal* (August 30, 2007, "In the Balance"), it takes about 30 hours to assemble a vehicle in the United States. Let's use that fact plus a few invented numbers to sum up the global division of labor in auto manufacturing. In international economics, "North" is shorthand for the high-tech developed countries of East Asia, North America, and Western Europe, while "South" is short-hand for the rest of the world. Let's use that shorthand here.

a. Consider the following productivity table: Which region has an absolute advantage at making high-quality cars? And low-quality cars?

	Number of Hours to Make One High-Quality Car	Number of Hours to Make One Low-Quality Car
North	30	20
South	60	30

b. Using the information in the productivity table, estimate the opportunity cost of making high- or low-quality cars in the North and in the South. Which region has a comparative advantage (i.e., lowest opportunity cost) for manufacturing high-quality cars? For low-quality cars?

	Opportunity Cost of Making One High-Quality Car	Opportunity Cost of Making One Low-Quality Car
North	_____low-quality cars	_____high-quality cars
South	_____low-quality cars	_____high-quality cars

c. One million hours of labor are available for making cars in the North, and another 1 million hours of labor are available for making cars in the South

In a no-trade world, let's assume that two-thirds of the auto industry labor in each region is used to make high-quality cars and one-third is used to make low-quality cars. Solve for how many of each kind

of car will be produced in North and South, and add up to determine total global output of each type of car. (Why will both kinds of cars be made? Because the low-quality cars will be less expensive.)

	Output of High-Quality Cars	Output of Low-Quality Cars
North		
South		
Global output		

d. Now allow specialization. If each region completely specializes in the type of car in which it holds the comparative advantage, what will global output of high-quality cars be? Of low-quality cars? In the following table, report your answers. Is global output in each kind of car higher than before? (We'll solve a problem with the final step of trade in the Thinking and Problem Solving section.)

	Output of High-Quality Cars	Output of Low-Quality Cars
North		
South		
Global output		

Solution

5. a. North has an absolute advantage at both high-quality and low-quality cars.
b. After calculating opportunity costs horizontally within countries, compare them vertically across countries to determine who has a comparative advantage. North's comparative advantage is high-quality cars (lower opportunity cost of making high-quality cars). South's comparative advantage is low-quality cars (lower opportunity cost of making low-quality cars).

	Opportunity Cost of Making One High-Quality Car	Opportunity Cost of Making One Low-Quality Car
North	1.5 low-quality cars	2/3 high-quality cars
South	2 low-quality cars	0.5 high-quality cars

c. Output with no trade.

	Output of High-Quality Cars	Output of Low-Quality Cars
North	22,222	16,667
South	11,111	11,111
Global output	33,333	27,778

d. Given this setup, the number of high-quality cars is identical with specialization and the number of low-quality cars increases:

	Output of High-Quality Cars	Output of Low-Quality Cars
North	33,333	0
South	0	33,333
Global output	33,333	33,333

6. It has been reported that John Lennon was once asked whether Ringo was the best drummer in the world, and he quipped, "He's not even the best drummer in the Beatles!" (Paul also drummed on some of the White Album.) Assuming that this story is true and that Lennon was correct, explain, using economics, why it could still make sense to have Ringo on drums.

Solution

6. Even if Paul were a better drummer than Ringo, Ringo could have a comparative advantage in drumming. If Paul was a little bit better than Ringo on drums and much better than Ringo at playing bass and singing (surely true), then the total output of The Beatles could be increased by not having the best drummer on drums.

Thinking and Problem Solving

7. Fit each of the following examples into one of these reasons for trade:

I. Division of knowledge
II. Comparative advantage

a. Two recently abandoned cats, Bingo and Tuppy, need to quickly learn how to catch mice in order to survive. If they also remain well groomed, they stand a better chance of surviving: Good grooming reduces the risk of disease and parasites. Each cat could go it alone, focusing almost exclusively on learning to catch mice. The alternative would be for Bingo to specialize in learning how to groom well and for Tuppy to specialize in learning how to catch mice well.

b. Supreme Court Chief Justice John Roberts hires attorneys who are less skilled than himself to do routine legal work.

Solution

7. a. Division of knowledge
b. Comparative advantage

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8. Nobel Laureate Paul Samuelson said that comparative advantage is one of the few ideas in economics that is both "true and not obvious." Since it's not obvious, we should practice with it a bit. In each of the cases, who has the absolute advantage at each task, and who has the comparative advantage?

a. In 30 minutes, Kana can either make miso soup or she can clean the kitchen. In 15 minutes, Mitchell can make miso soup; it takes Mitchell an hour to clean the kitchen.

b. In one hour, Ethan can bake 20 cookies or lay the drywall for two rooms. In one hour, Sienna can bake 100 cookies or lay the drywall for three rooms.

c. Kara can build two glass sculptures per day or she can design two full-page newspaper advertisements per day. Sara can build one glass sculpture per day or design four full-page newspaper ads per day.

d. Data can write 12 excellent poems per day or solve 100 difficult physics problems per day. Riker can write one excellent poem per day or solve 0.5 difficult physics problems per day.

Solution

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8. a. Mitchell's absolute and comparative advantages are at miso; Kana's absolute and comparative advantages are at cleaning.

b. Sienna has an absolute advantage at both, but her comparative advantage is at baking cookies. Ethan's comparative advantage is at laying drywall.

c. Kara's absolute and comparative advantages are at sculpture, while Sara's absolute and comparative advantages are at newspaper ad design.

d. Data has an absolute advantage at both, but Riker has a comparative advantage at writing poetry.

9. The federal education reform law known as No Child Left Behind requires every state to create standardized tests that measure whether students have mastered key subjects. Since the same test is given to all students in the same grade in the state, this encourages all schools within a state to cover the same material. According to the division of knowledge model, what are the costs of this approach?

Solution

9. The cost is that with everyone knowing the same thing, our "hive mind," our social knowledge, is less powerful than it could be. For instance, some parts of a state might emphasize statistics courses in high school while other parts might emphasize geometry and other parts might emphasize number theory. Each could be useful at a particular place and time, but few students would have the time to master all three fields. But it's not necessary for everyone to master all three: It's enough to have a few (thousand) people who master each field, just in case a need arises. Undergraduate university education is more specialized than high school, graduate university education is more specialized yet. Indeed, the ideal of a graduate education is that at some point the PhD candidate knows something that no one else in the world knows!

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10. In this chapter, we've often emphasized how specialization and exchange can create more *output*. But sometimes the output from voluntary exchange is difficult to measure and doesn't show up in GDP statistics. In each of the following cases, explain how the two parties involved might be able to make themselves *both* better off just by making a voluntary exchange.

a. Alan received two copies of *Gears of War* as birthday gifts. Burton received two copies of *Halo* as birthday gifts.

b. Jeb has a free subscription to *Field and Stream* but isn't interested in hunting. George has a free subscription to the *Miami Herald* but isn't all that interested in Florida news.

c. Pat has a lot of love to give, but it is worthless unless received by another. Terry is in the same sad situation.

Solution

10. a. Alan could give one of his copies of *Gears* to Burton, who could offer one of his copies of *Halo* to Alan.

b. They could swap free subscriptions and both be better off, especially if both men have the last name Bush. At the very least, both parties are no worse off after the exchange.

c. If they offer love to each other, both will be better off at no cost—a classic positive-sum game.

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11. Many people talk about manufacturing jobs leaving the United States and going to other places, like China. Why isn't it possible for all jobs to leave the United States and go overseas (as some people fear)?

12. Suppose the following table shows the number of labor hours needed to produce airplanes and automobiles in the United States and South Korea, but one of the numbers is unknown.
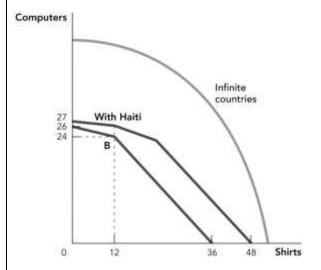
	Number of Hours to Produce One Airplane	Number of Hours to Produce One Auto
South Korea	2,000	?
United States	800	5

a. Without knowing the number of labor hours required to produce an auto in South Korea, you can't figure out which country has the comparative advantage in which good. Can you give an example of a number for the empty cell of the table that would give the United States the comparative advantage in the production of airplanes? What about South Korea?

b. Who has the absolute advantage in the production of airplanes? What about autos?

c. What exact number would you have to place in the empty cell of the table for it to be impossible that trade between the United States and South Korea could benefit both nations?

13. In the chapter, you saw how to create a production possibilities frontier for the United States and Mexico. Let's take a look at how to combine these PPFs to make one PPF for the U.S.–Mexico trade alliance. You'll use the same set of axes that was used in the chapter: computers on the vertical axis and shirts on the horizontal axis. Refer to Figure 2.1 and Table 2.1 as needed.

a. First, you need to plot the endpoints of the PPF by figuring out the maximum numbers of computers and shirts. If both the United States and Mexico produced only computers, how many would they produce? What if they only produced shirts? Plot these two points and label them as *A* (all computers) and *Z* (all shirts). The PPF for the U.S.–Mexico trade alliance is going to look a little different from the PPFs for the individual countries, so we don't want to simply connect the two points with a straight line. We need to figure out the rate at which the U.S.–Mexico trade alliance gives up computers to get shirts (or vice versa).

b. Starting at point *A*, if citizens of the United States or Mexico decided they wanted more shirts, where would those shirts be produced? Why? What do you think the PPF should look like as the U.S.–Mexico trade alliance initially moves away from point *A*?

c. Starting at point *Z*, if citizens of the United States or Mexico decided they wanted more computers, where would those computers be produced? Why? What do you think the PPF should look like as the U.S.–Mexico trade alliance initially moves away from point *Z*?

d. Plot the point at which each country is completely specializing in the good for which it has the comparative advantage. Label this point B. Connect points *A, B,* and *Z*. This is the PPF for the U.S.–Mexico trade alliance. Can you describe how this PPF is a combination of the two nations' separate PPFs?

e. Suppose now that a third nation, Haiti, enters the trade alliance. In Haiti, the opportunity cost of a computer is 12 shirts, and Haiti has the labor necessary to produce 1 computer (or 12 shirts). Can you draw a new PPF for the U.S.–Mexico–Haiti trade alliance?

f. Okay, what will happen to the PPF as more and more countries join the trade alliance? What would it look like with an infinite number of countries?

Solution

13. The United States could produce 24 computers or 24 shirts. Mexico could produce two computers or 12 shirts.

a. If both countries devote all of their resources to producing computers, they could produce 26 computers (24 + 2). Point *A* should be placed at the point (0, 26). If both countries devote all of their resources to producing shirts, they could produce 36 shirts (24 + 12). Point *Z* should be placed at the point (36, 0).

b. The United States has an opportunity cost of one computer per shirt. In Mexico, one shirt carries an opportunity cost of $(2/12) = (1/6)$ computer. Mexico has the lower opportunity cost of producing shirts, so it should be the first to reduce computer production in order to produce shirts.

c. The United States has an opportunity cost of one shirt per computer and Mexico has the opportunity cost of 6 shirts per computer. The United States has the lower opportunity cost of producing computers, and so would be the first to reduce shirt production in order to produce computers.

d. If Mexico produces only shirts and the United States produces only computers, their combined output would be 12 shirts and 24 computers. Point *B* should be placed at (12, 24).

e. and f. See the PPF for the U.S.–Mexico–Haiti trade alliance in the figure above. When we add a country to the World PPF, the frontier shifts out but it also tends to become more concave, or bounded out. Mexico was a lower-cost producer of shirts than the United States, which is why the first part of the World PPF starting from 0 shirts has a lower, or flatter, slope. Haiti has an even lower cost of producing shirts than Mexico, so when we add Haiti, the initial slope starting from 0 shirts is even flatter—which means that we can have more shirts and give up fewer computers. In the same way, when we add countries that are even more productive at producing computers (i.e., a high cost of producing shirts) than the United States, the PPF gets steeper (starting from zero computers on the horizontal axis). Therefore, we can get lots of computers just by giving up a few shirts.

In other words, by allocating production first to where it can be done at the lowest cost, countries can increase the total amount produced beyond the sum of each country's individual production, which is another way of expressing comparative advantage and the gains from trade.

Challenges

14. In the computers and shirts example from the chapter, the United States traded one computer to Mexico in exchange for three shirts. This is not just an arbitrary ratio of shirts to computers, however. Let's explore the *terms of trade* a little bit more.

a. Why is trading away a computer for three shirts a good trade for the United States? Why is it also a good deal for Mexico?

b. What if, instead, the agreed-upon terms of trade were one computer for eight shirts? Would this trade still benefit both the United States and Mexico?

c. What is the maximum (and minimum) number of shirts that a computer can trade for if the United States and Mexico are both to benefit from the trade?

Solution

14. a. This is a good deal for the United States, because it only gave up one shirt to produce the computer, so receiving three shirts benefits the United States. It is a good deal for Mexico because Mexico would have to give up six shirts to produce one computer on its own, so if Mexico can gain one computer by giving up only three shirts, this deal makes that country better off.

b. This trade would benefit the United States, since it will still be receiving more shirts (eight) than it gave up in order to produce the computer (one). However, this would not benefit Mexico because Mexico could have produced its own computer at an opportunity cost of just eight shirts, which would be a better deal than trading at this rate.

c. The number of shirts traded for each computer must be higher than one so that it benefits the United States but less than six so that it benefits Mexico.

15. Go to www.Ted.com and watch Thomas Thwaites's talk, "How I built a toaster—from scratch." How much money and time do you think Thwaites spent building his toaster? How long do you think it would have taken Thwaites to earn enough money in, say, a minimum wage job to buy a toaster? Comment on the division of labor and the importance of specialization in increasing productivity.

Solution

15. Thwaites seems to have spent several thousand dollars and about a year to "build" his toaster, which probably would have killed him had he tried to plug it in. If he had gone to Walmart, Thwaites could have bought a toaster for about $15 or two hours of work at the minimum wage. In other words, the division of labor and specialization meant that Thwaites' productivity was multiplied by a factor of at least one thousand. Due to the power of specialization and comparative advantage, Thwaites and you and I are able purchase goods that we could not have produced on our own without much, much greater effort and expense if at all.