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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 1. a. There is more knowledge in Drudgia.
   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 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 examples below, 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 of a book this year, in terms of articles?

| Solution | **3.** | **a.** 2 fuel injectors. |

    b. 800 emails.

    c. 2.5 articles.

4. a. American workers are typically 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.

| Solution | **4.** | **a.** True. Productivity differences are the biggest reason for wage differences. |

    b. True. Although Julia Child could not cook a 3-minute egg any faster than any other chef, her valuable output included her television show and many cookbooks. Thus, as a celebrity chef and cookbook author, Julia Child produced much more GDP than the typical restaurant chef and was more productive.

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 shorthand for the rest of the world. Let's use that shorthand here.

    a. Consider the productivity table below: 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 above, 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. There are 1 million hours of labor available for making cars in the North, and another 1 million hours of labor 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 table below, 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. Conan O'Brien has been a talk show host since 1993, but he began his career in comedy as a writer: first at the *Harvard Lampoon* while in college, then eventually at *Saturday Night Live* and *The Simpsons*. Given that he is such an accomplished comedy writer, it might be surprising to learn that his current talk show staff includes over a dozen writers. How can you explain this using the material covered in the chapter? Is Conan not capable enough a writer to write his own show, or is there some other explanation? Suppose none of Conan's writers are as funny a writer as he is; is it still possible that hiring a writing staff makes the show funnier?

Solution **6.** There are many tasks involved in creating a funny and successful talk show; it's not all just writing. So while Conan may be a very accomplished writer, he may also have other skills that he contributes to the show in different ways: producing, leading, hosting, forming a creative vision, preparing for interviews, etc. If Conan decided to write every sketch and every monologue joke, the monologues might be funnier, but other parts of the show would suffer too much. His advantage as a host and producer, and leader and visionary must be greater than his advantage as a writer. It makes perfect sense for him to hire writers who can execute his vision even if not perfectly, so that he can dedicate more time to the other activities that make the show funny. For example, if he had to write every sketch, he might not have time to come up with as many sketch *ideas,* so the show overall would be less funny.

Thinking and Problem Solving

1. 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 para-sites. 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. Former President Bill Clinton, a graduate of Yale Law School, hires attorneys who are less skilled than himself to do routine legal work.

Solution **1. a.** Division of knowledge
b. Comparative advantage

2. 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 below, 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 **2.** **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.

3. 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 **3.** 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!

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

   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.

5. Here's another specialization and exchange problem. This problem is wholly made-up, so that you won't be able to use your intuition about the names of countries or the products to figure out the answer.

   a. Consider the productivity table below: Which country has an absolute advantage at making rotids? At making taurons?

	Number of Hours to Make One Rotid	Number of Hours to Make One Tauron
Mandovia	50	100
Ducennia	150	200

   b. Using the information in the productivity table above, estimate the opportunity cost of making rotids and taurons in Mandovia and Ducennia. Which country has a comparative advantage at manufacturing rotids? At making taurons?

	Opportunity Cost of Making One Rotid	Opportunity Cost of Making One Tauron
Mandovia	_____taurons	_____rotids
Ducennia	_____taurons	_____rotids

   c. There are 1 billion hours of labor available for making products in Mandovia, and 2 billion hours of labor available for making products in Ducennia. In a no-trade world, let's assume that half the labor in each region gets used to make each product. (In a semester-long international trade course, you'd build a bigger model that would determine just how the workers get divided up according to the forces of supply and demand.) Fill in the table.

	Output of Rotids	Output of Taurons
Mandovia		
Ducennia		
Total output		

   d. Now, allow specialization. If each country completely specializes in the product in which they hold the comparative advantage, what will global output of rotids be? Of taurons? Is total output of each product higher than before?

	Output of Rotids	Output of Taurons
Mandovia		
Ducennia		
Total output		

e. Finally, let's open up trade. Trade has to make both sides better off (or at least no worse off), and in this problem as in most negotiations, there's more than one price that can do so (just think about haggling over the price of a car or a house). Let's pick out a case that makes one side better off, and leaves the other side just as well off as in a no-trade world. The price both sides agree to is three rotids for two taurons. Ship 5 million taurons in one direction, and 7.5 million rotids in the other direction (you'll have to figure out on your own which way the trade flows). In the table below, calculate the amount that each country gets to consume. Which country is better off under this set of prices? Which one is exactly as well off as before?

	Consumption of Rotids	Consumption of Taurons
Mandovia		
Ducennia		
Total consumption		

f. This time, the trade negotiations turn out differently: It's two rotids for one tauron. Have the correct country ship 10 million rotids, have the other send 5 million taurons, and fill out the table below. One way to make sure you haven't made a mistake is to make sure that "total consumption" is equal to "total output" from part d: We can't create rotids and taurons out of thin air! Are both countries better off than if there were no trade? Which country likes this trade deal better than the deal from part e?

	Consumption of Rotids	Consumption of Taurons
Mandovia		
Ducennia		
Total consumption		

Solution **5. a.** Mandovia has an absolute advantage at everything.
   b. In the table below, "★★" is used to identify comparative advantage.

	Opportunity Cost of Making One Rotid	Opportunity Cost of Making One Tauron
Mandovia	0.5 taurons★★	2 rotids
Ducennia	0.75 taurons	1.33 rotids★★

   c.

	Output of Rotids	Output of Taurons
Mandovia	10 million	5 million
Ducennia	6.67 million	5 million
Total output	16.67 million	10 million

d. Total output for taurons has not increased, but the total output of rotids is higher after specialization.

	Output of Rotids	Output of Taurons
Mandovia	20 million	0 million
Ducennia	0	10 million
Total output	20 million	10 million

e. Notice that at these prices, Ducennia is actually worse off than in the no-trade world of part c. Mandovia is much better off.

	Consumption of Rotids	Consumption of Taurons
Mandovia	15 million	5 million
Ducennia	5 million	5 million
Total consumption	20 million	10 million

f. Mandovia is exactly as well off as in the no-trade world; Ducennia is better off than in the no-trade world.

	Consumption of Rotids	Consumption of Taurons
Mandovia	10 million	5 million
Ducennia	10 million	5 million
Total consumption	20 million	10 million

6. 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)?

Solution **6.** This is not possible because every nation has to have a comparative advantage in something. The greater China's comparative advantage in manufacturing, for example, the greater the United States' comparative advantage must be in some other type of production. (This can be seen in Table 2.1: The numbers in each row are just reciprocals, so the lower the opportunity cost of a shirt in Mexico, the greater the opportunity cost of a computer in Mexico.) The more and more that firms want to locate manufacturing processes in countries like China, the more that those countries would give up (the higher the opportunity cost) if they pursued other nonmanufacturing activities. Even if it were cheaper to produce everything in China—thus giving China something like an absolute advantage in all production—trade is based on comparative advantage, not absolute advantage.

7. Suppose the table below 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?

Solution 7. a. Any number less than 12.5 will give the United States the comparative advantage in airplanes. Any number higher than 12.5 will give South Korea the comparative advantage in airplanes.

b. The United States clearly has the absolute advantage in the production of airplanes. We do not know who has the absolute advantage in the production of autos. If the missing number is greater than 5, the United States has the absolute advantage in autos; if the missing number is less than 5, South Korea has the absolute advantage.

c. If the missing number was exactly equal to 12.5, then the opportunity cost of one airplane would be 160 autos in both countries. In this case, no possible benefits exist from trade, because neither country can produce either good at a lower cost than can the other country.

Challenges

1. 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 was 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 1. 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, which 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 six 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.

2. 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 **2.** 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. Thwaites was able to purchase something that he could not have produced on his own without much, much greater effort and expense if at all.