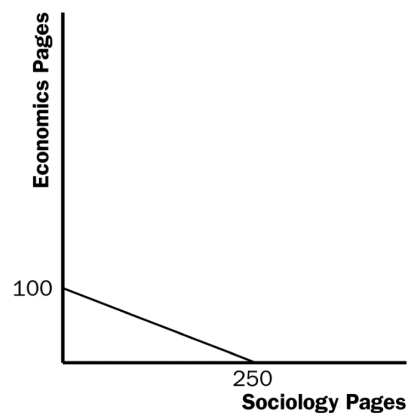


## EE211 Section 1

### Homework 1 Answers

- 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.

- Draw Maria's production possibility frontier for reading economics and sociology.



If Maria spends all 5 hours studying economics, she can read 100 pages, so that is the vertical intercept of the production possibilities frontier. If she spends all 5 hours studying sociology, she can read 250 pages, so that is the horizontal intercept. The opportunity costs are constant, so the production possibilities frontier is a straight line.

- What is Maria's opportunity cost of reading 100 pages of sociology?

It takes Maria 2 hours to read 100 pages of sociology. In that time, she could read 40 pages of economics. So, the opportunity cost of 100 pages of sociology is 40 pages of economics.

- American and Japanese workers can each produce 4 cars per year. An American worker can produce 10 tons of grain per year, while a Japanese worker can produce 5 tons of grain per year. To keep things simple, assume that each country has 100 millions workers.

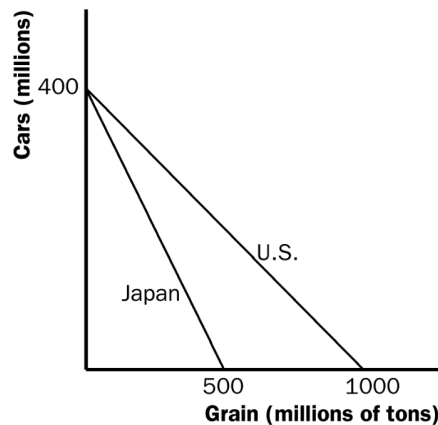
- Graph the production possibility frontier for American and Japanese economies.

|       | Workers needed to make: |                  |
|-------|-------------------------|------------------|
|       | One Car                 | One Ton of Grain |
| U.S.  | 1/4                     | 1/10             |
| Japan | 1/4                     | 1/5              |

- For the United States, what is the opportunity cost of a car? Of grain? For Japan, what is the opportunity cost of a car?

With 100 million workers and 4 cars per worker, if either economy were devoted completely to cars, it could make 400 million cars. Because a U.S. worker can produce 10 tons of grain, if the United States produced only grain it would

produce 1,000 million tons. Because a Japanese worker can produce 5 tons of grain, if Japan produced only grain it would produce 500 million tons. These are the intercepts of the production possibilities frontiers shown in the figure. Note that because the trade-off between cars and grain is constant for both countries, the production possibilities frontiers are straight lines.



- c. Which country has an absolute advantage in producing cars? In producing grain?

Because a U.S. worker produces either 4 cars or 10 tons of grain, the opportunity cost of one car is  $2\frac{1}{2}$  tons of grain, which is  $\frac{10}{4}$ . Similarly, the U.S. opportunity cost of a ton of grain is  $\frac{2}{5}$  car (4 divided by 10). Because a Japanese worker produces either 4 cars or 5 tons of grain, the opportunity cost of one car is  $1\frac{1}{4}$  tons of grain, which is  $\frac{5}{4}$  and the Japanese opportunity cost of a ton of grain is  $\frac{4}{5}$  car. This results in the following table:

|       | Opportunity Cost of:                         |                                              |
|-------|----------------------------------------------|----------------------------------------------|
|       | One Car (in terms of tons of grain given up) | One Ton of Grain (in terms of cars given up) |
| U.S.  | $2\frac{1}{2}$                               | $\frac{2}{5}$                                |
| Japan | $1\frac{1}{4}$                               | $\frac{4}{5}$                                |

Neither country has an absolute advantage in producing cars, because they are equally productive (the same output per worker); the United States has an absolute advantage in producing grain, because it is more productive (greater output per worker).

- d. Which country has a comparative advantage in producing cars? In producing grain?

Japan has a comparative advantage in producing cars, because it has a lower opportunity cost in terms of grain given up. The United States has a comparative advantage in producing grain, because it has a lower opportunity cost in terms of cars given up.

- e. Without trade, half of each country's workers produce cars, and half produce grain. What are the quantities of cars and grain does each country produce?

With half the workers in each country producing each of the goods, the United States would produce 200 million cars (50 million workers times 4 cars each) and 500 million tons of grain (50 million workers times 10 tons each). Japan would produce 200 million cars (50 million workers times 4 cars each) and 250 million tons of grain (50 million workers times 5 tons each).

3. Diego and Darnell are roommates. They spend most of their time studying, but they leave some time for their favorite activities: making pizza and brewing root beer. Diego takes 4 hours to brew a gallon of root beer and 2 hours to make a pizza. Darnell 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?

Diego's opportunity cost of making a pizza is  $\frac{1}{2}$  gallon of root beer, because he could brew  $\frac{1}{2}$  gallon in the time (2 hours) it takes him to make a pizza.

Darnell's opportunity cost of making a pizza is  $\frac{2}{3}$  gallon of root beer, because he could brew  $\frac{2}{3}$  of a gallon in the time (4 hours) it takes him to make a pizza.

Diego has an absolute advantage in making pizza because he can make one in 2 hours, while it takes Darnell 4 hours.

Because Diego's opportunity cost of making pizza is less than Darnell's, Diego has a comparative advantage in making pizza.

- b. If Diego and Darnell trade foods with each other, who will trade pizza in exchange for root beer?

Because Diego has a comparative advantage in making pizza, he will make pizza and exchange it for root beer that Darnell makes.

- 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.

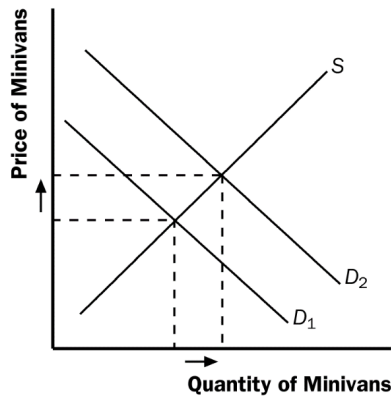
The highest price of pizza in terms of root beer that will make both roommates better off is  $\frac{2}{3}$  of a gallon of root beer. If the price were higher than that, then Darnell would prefer making his own pizza (at an opportunity cost of  $\frac{2}{3}$  of a gallon of root beer) rather than trading for pizza that Diego makes.

The lowest price of pizza in terms of root beer that will make both roommates better off is  $\frac{1}{2}$  gallon of root beer. If the price were lower than that, then Diego would prefer

making his own root beer (he can make 1/2 gallon of root beer instead of making a pizza) rather than trading for root beer that Darnell makes.

4. Consider the market for minivans. For each of the events listed here, identify which of the determinants of demand or supply are affected. Also, indicate whether demand or supply increases or decreases. Then, draw a diagram to show the effect on the price and quantity of minivans.

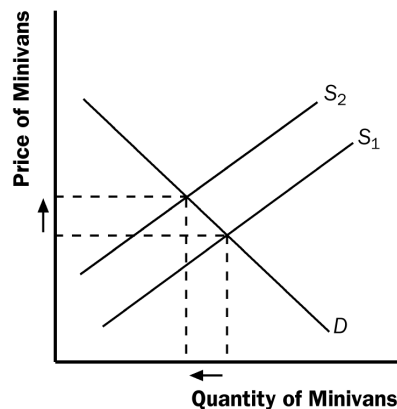
- a. People decide to have more children.



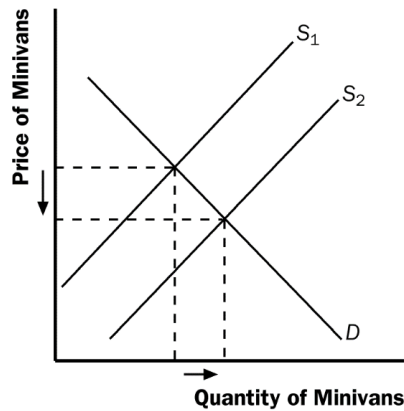
If people decide to have more children, they will want larger vehicles for hauling their kids around, so the demand for minivans will increase. Supply will not be affected. The result is a rise in both the price and the quantity sold.

- b. A strike by steelworkers raises steel prices.

If a strike by steelworkers raises steel prices, the cost of producing a minivan rises and the supply of minivans decreases. Demand will not be affected. The result is a rise in the price of minivans and a decline in the quantity sold.

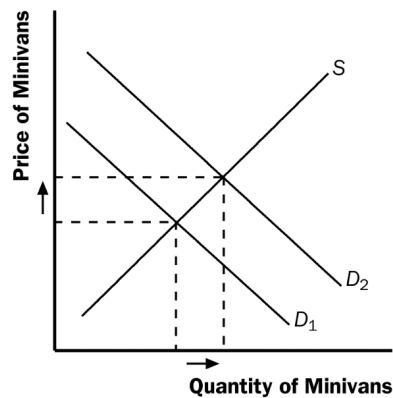


- c. Engineers develop new automated machinery for the production of minivans.



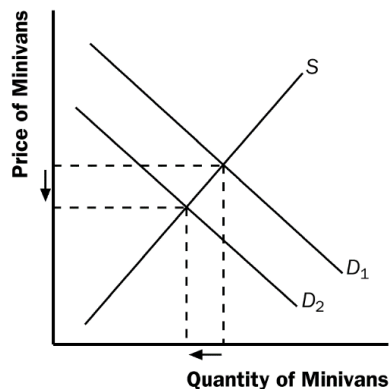
The development of new automated machinery for the production of minivans is an improvement in technology. This reduction in firms' costs will result in an increase in supply. Demand is not affected. The result is a decline in the price of minivans and an increase in the quantity sold.

- d. The price of sports utility vehicles rises.



The rise in the price of sport utility vehicles affects minivan demand because sport utility vehicles are substitutes for minivans. The result is an increase in demand for minivans. Supply is not affected. The equilibrium price and quantity of minivans both rise.

- e. A stock market crash lowers people's wealth.



The reduction in peoples' wealth caused by a stock-market crash reduces their income, leading to a reduction in the demand for minivans, because minivans are likely a normal good. Supply is not affected. As a result, both the equilibrium price and the equilibrium quantity decline.

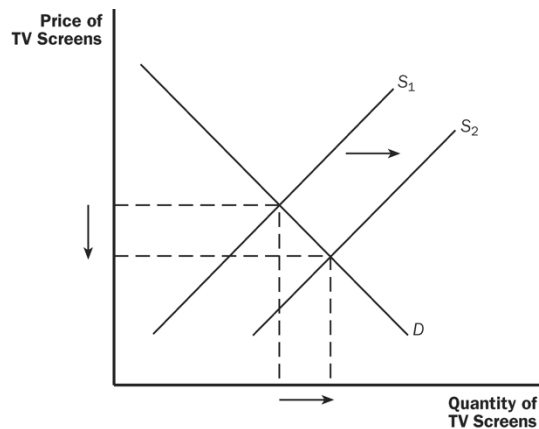
5. Consider the market for video streaming services, TV screens, and tickets at movie theatres.

a. For each pair, identify whether they are complements or substitutes:

- video streaming and TV screens.
- video streaming and movie tickets.
- TV screens and movie tickets.

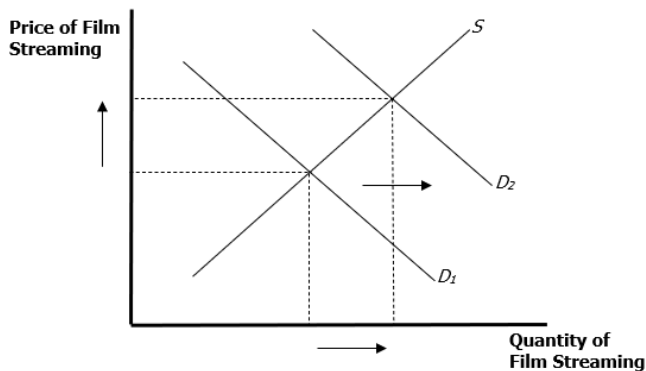
Video streaming services and TV screens are likely to be complements because you cannot watch a video without a television. Video streaming services and movie tickets are likely to be substitutes because a movie can be watched at a theater or at home. TV screens and movie tickets are likely to be substitutes for the same reason.

b. Suppose a technological advance reduces the cost of manufacturing TV screens. Draw a diagram to show what happens in the market for TV screens.

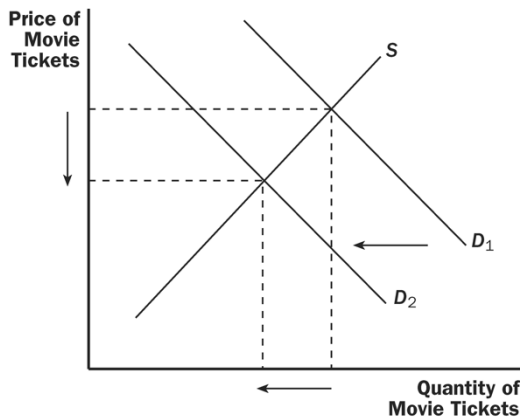


The technological improvement would reduce the cost of producing a TV screen, shifting the supply curve to the right. The demand curve would not be affected. The result is that the equilibrium price will fall, while the equilibrium quantity will rise.

c. Draw two more diagrams to show how the change in the market for TV screens affects the markets for video streaming and movie theatres.



The reduction in the price of TV screens would lead to an increase in the demand for video streaming services because TV screens and video streaming are complements. The effect of this increase in the demand for video streaming is an increase in both the equilibrium price and quantity.

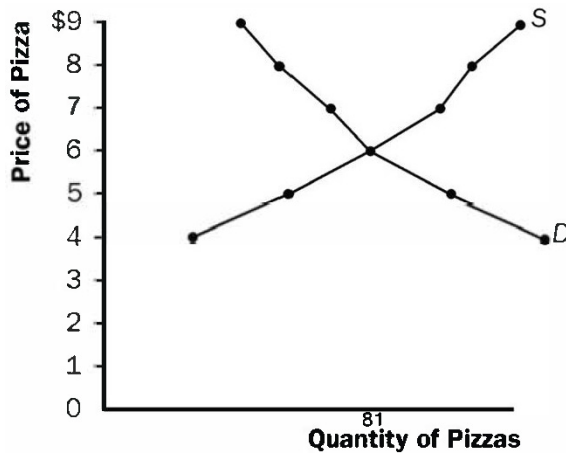


The reduction in the price of TV screens would cause a decline in the demand for movie tickets because TV screens and movie tickets are substitute goods. The decline in the demand for movie tickets would lead to a decline in the equilibrium price and quantity sold.

6. The market for pizza has the following demand and supply schedules:

| Price | Quantity demanded | Quantity supplied |
|-------|-------------------|-------------------|
| \$4   | 135 pizzas        | 26 pizzas         |
| 5     | 104               | 53                |
| 6     | 81                | 81                |
| 7     | 68                | 98                |
| 8     | 53                | 110               |
| 9     | 39                | 121               |

- a. Graph the demand and supply curves. What are the equilibrium price and quantity in this market?



Quantity supplied equals quantity demanded at a price of \$6 and quantity of 81 pizzas.

- b. If the actual price in this market were **above** the equilibrium price, what would drive the market toward equilibrium?

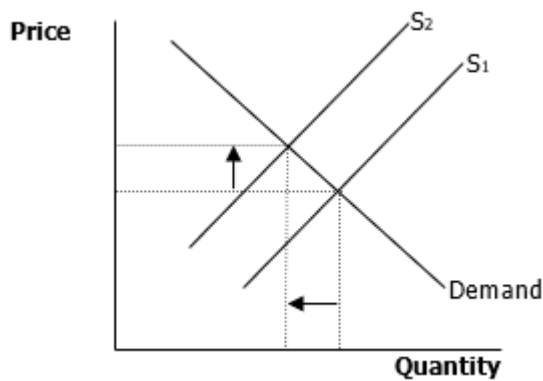
If the price were above \$6, quantity supplied would exceed quantity demanded, so suppliers would reduce the price to gain sales.

- c. If the actual price in this market were **below** the equilibrium price, what would drive the market toward equilibrium?

If the price were below \$6, quantity demanded would exceed quantity supplied, so suppliers could raise the price without losing sales. In both cases, the price would continue to adjust until it reached \$6, the only price at which there is neither a surplus nor a shortage.

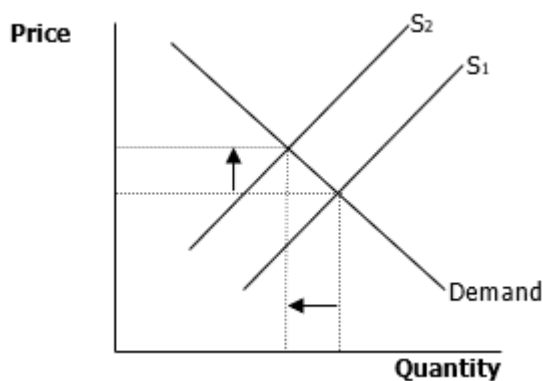
7. Cups of coffee and donuts are complements. Both have inelastic demand. A hurricane destroys half the coffee bean crop. Use appropriately labeled diagrams to answer the following questions.

- a. What happens to the price of coffee beans?



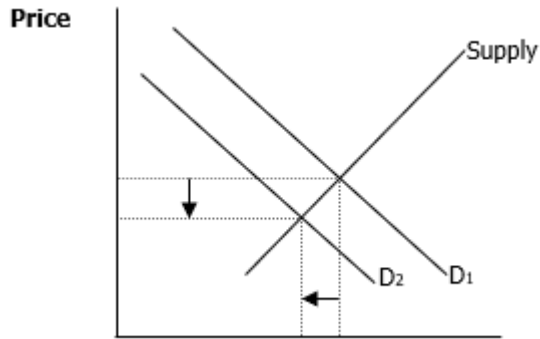
When a hurricane destroys half of the crop, the supply of coffee beans decreases, the price of coffee beans increases, and the quantity decreases.

- b. What happens to the price of a cup of coffee? What happens to total expenditure on cups of coffee?



When the price of coffee beans, an important input into the production of a cup of coffee, increases, the supply of cups of coffee decreases, the price of a cup of coffee increases, and the quantity decreases. Because cups of coffee have an inelastic demand, when the price of a cup of coffee increases, the total expenditure on coffee increases.

- c. What happens to the price of donuts? What happens to total expenditure on donuts?



When the price of coffee increases and the quantity demanded of coffee decreases, consumers demand fewer donuts because coffee and donuts are complements. When demand decreases, the price of donuts decreases. Because donuts have an inelastic demand, when the price of donuts decreases, the total expenditure on donuts decreases.

8. Suppose that your demand schedule for pizza is as follows:

| Price | Quantity demanded<br>(income = \$20,000) | Quantity demanded<br>(income = \$24,000) |
|-------|------------------------------------------|------------------------------------------|
| \$8   | 40 pizzas                                | 50 pizzas                                |
| 10    | 32                                       | 45                                       |
| 12    | 24                                       | 30                                       |
| 14    | 16                                       | 20                                       |
| 16    | 8                                        | 12                                       |

- a. Use the midpoint method to calculate your price elasticity of demand as the price of pizza increases from \$8 to \$10 if (i) your income is \$20,000 and (ii) your income is \$24,000.

If your income is \$20,000, your price elasticity of demand as the price of pizzas rises from \$8 to \$10 is  $[(40 - 32)/36]/[(10 - 8)/9] = 0.22/0.22 = 1$ . If your income is \$24,000, the elasticity is  $[(50 - 45)/47.5]/[(10 - 8)/9] = 0.11/0.22 = 0.5$ .

- b. Calculate your income elasticity of demand as your income increases from \$20,000 to \$24,000 if (i) the price is \$12 and (ii) the price is \$16.

If the price is \$12, your income elasticity of demand as your income increases from \$20,000 to \$24,000 is  $[(30 - 24)/27]/[(24,000 - 20,000)/22,000] = 0.22/0.18 = 1.22$ . If the price is \$16, your income elasticity of demand as your income increases from \$20,000 to \$24,000 is  $[(12 - 8)/10]/[(24,000 - 20,000)/22,000] = 0.40/0.18 = 2.22$ .

9. Consider public policy aimed at smoking.
- a. Studies indicate that the price elasticity of demand for cigarettes is about 0.4. If a pack of cigarettes currently costs \$5 and the government wants to reduce smoking by 20 percent, by how much should it increase the price?

With a price elasticity of demand of 0.4, reducing the quantity demanded of cigarettes by 20% requires a 50% increase in price, because  $20/50 = 0.4$ . With the price of cigarettes currently \$5, this would require an increase in the price to \$8.33 a pack using the midpoint method (note that  $(\$8.33 - \$5)/\$6.67 = .50$ ).

- b. If the government permanently increases the price of cigarettes, will the policy have a larger effect on smoking one year from now or five years from now?

The policy will have a larger effect five years from now than it does one year from now. The elasticity is larger in the long run, because it may take some time for people to reduce their cigarette usage. The habit of smoking is hard to break in the short run.

- c. Studies also find that teenagers have a higher price elasticity of demand than adults. Why might this be true?

Because teenagers do not have as much income as adults, they are likely to have a higher price elasticity of demand. Also, adults are more likely to be addicted to cigarettes, making it more difficult to reduce their quantity demanded in response to a higher price.