

Consumer and Producer Surplus

1. Determine the amount of consumer surplus generated in each of the following situations.
 - a. Leon goes to the clothing store to buy a new T-shirt, for which he is willing to pay up to \$10. He picks out one he likes with a price tag of exactly \$10. When he is paying for it, he learns that the T-shirt has been discounted by 50%.
 - b. Alberto goes to the music store hoping to find a used copy of *Nirvana's Nevermind* for up to \$30. The store has one copy of the record selling for \$30, which he purchases.
 - c. After soccer practice, Stacey is willing to pay \$2 for a bottle of mineral water. The 7-Eleven sells mineral water for \$2.25 per bottle, so she declines to purchase it.

Solution

1.
 - a. Leon's consumer surplus is \$5. This is the difference between how much he is willing to pay (\$10) and how much he does pay (\$5).
 - b. Since Alberto's willingness to pay is \$30 and the price of the record is \$30, he gets zero consumer surplus.
 - c. No trade takes place because Stacey's willingness to pay is less than the price. So no consumer surplus is created.
2. Determine the amount of producer surplus generated in each of the following situations.
 - a. Gordon lists his old Lionel electric trains on eBay. He sets a minimum acceptable price, known as his *reserve price*, of \$75. After five days of bidding, the final high bid is exactly \$75. He accepts the bid.
 - b. So-Hee advertises her car for sale in the used-car section of the student newspaper for \$2,000, but she is willing to sell the car for any price higher than \$1,500. The best offer she gets is \$1,200, which she declines.
 - c. Sanjay likes his job so much that he would be willing to do it for free. However, his annual salary is \$80,000.

Solution

2.
 - a. Gordon will receive no producer surplus since the price received for the trains is equal to his cost.
 - b. No trade takes place because So-Hee's cost is \$1,500, which is higher than the price of \$1,200 she is offered. So no producer surplus is created.
 - c. Sanjay's cost is zero. The price he is paid for his time is \$80,000, so his producer surplus is \$80,000.
3. There are six potential consumers of computer games, each willing to buy only one game. Consumer 1 is willing to pay \$40 for a computer game, consumer 2 is willing to pay \$35, consumer 3 is willing to pay \$30, consumer 4 is willing to pay \$25, consumer 5 is willing to pay \$20, and consumer 6 is willing to pay \$15.
 - a. Suppose the market price is \$29. What is the total consumer surplus?
 - b. The market price decreases to \$19. What is the total consumer surplus now?
 - c. When the price fell from \$29 to \$19, how much did each consumer's individual consumer surplus change? How does total consumer surplus change?

Solution

- 3. a.** Consumer 1 buys a game since her willingness to pay is greater than the price. She gains $\$40 - \$29 = \$11$.
- Consumer 2 buys a game since his willingness to pay is greater than the price. He gains $\$35 - \$29 = \$6$.
- Consumer 3 buys a game since her willingness to pay is greater than the price. She gains $\$30 - \$29 = \$1$.
- The total consumer surplus is $\$11 + \$6 + \$1 = \18 .
- b.** Consumer 1 buys a game since her willingness to pay is greater than the price. She gains $\$40 - \$19 = \$21$.
- Consumer 2 buys a game since his willingness to pay is greater than the price. He gains $\$35 - \$19 = \$16$.
- Consumer 3 buys a game since her willingness to pay is greater than the price. She gains $\$30 - \$19 = \$11$.
- Consumer 4 buys a game since his willingness to pay is greater than the price. He gains $\$25 - \$19 = \$6$.
- Consumer 5 buys a game since her willingness to pay is greater than the price. She gains $\$20 - \$19 = \$1$.
- The total consumer surplus is $\$21 + \$16 + \$11 + \$6 + \$1 = \55 .
- c.** Total consumer surplus increases by $\$55 - \$18 = \$37$ as a result of the price decrease. For consumers 1, 2, and 3 (the consumers who would also have bought games at the higher price), individual consumer surplus increases by \$10 each, the amount of the price reduction. This accounts for \$30 of the increase in consumer surplus. But consumers 4 and 5 now also get consumer surplus, since the lower price leads them to buy computer games also. Consumer 4 gets \$6 of consumer surplus, and consumer 5 gets \$1, accounting for the remaining \$7 of additional consumer surplus.
- 4. a.** In an auction, potential buyers compete for a good by submitting bids. Adam Galinsky, a social psychologist at Northwestern University, compared eBay auctions in which the same good was sold. He found that, on average, the higher the number of bidders, the higher the sales price. For example, in two auctions of identical iPods, the one with the higher number of bidders brought a higher selling price. According to Galinsky, this explains why smart sellers on eBay set absurdly low opening prices (the lowest price that the seller will accept), such as 1 cent for a new iPod. Use the concepts of consumer and producer surplus to explain Galinsky's reasoning.
- b.** You are considering selling your vintage 1969 convertible Volkswagen Beetle. If the car is in good condition, it is worth a lot; if it is in poor condition, it is useful only as scrap. Assume that your car is in excellent condition but that it costs a potential buyer \$500 for an inspection to learn the car's condition. Use what you learned in part a to explain whether or not you should pay for an inspection and share the results with all interested buyers.

Solution

4. a. The higher the sales price, the greater the producer surplus received by a seller. So Galinsky's observation that a larger number of bidders results in a higher sales price means that a seller will want to take actions that increase the number of bidders for her good. The way to do this is to set a lower opening price. When the opening price is low, the seller is allowing more of the total surplus to be available to the winning bidder at the beginning of the auction. A potential buyer is more likely to bid if the opening price is low because he believes he can get a large share of the total surplus (that is, a large amount of consumer surplus) if he wins. If no one else bids, the bidder will indeed get that large amount of consumer surplus. But a low opening price also attracts other bidders, which, on average, increases the selling price and delivers more of the total surplus to the seller.
- b. If each potential bidder for your car has to pay the \$500 inspection cost or take the chance of paying for a car that is nearly worthless, then very few people will bid for your car. And as shown in part a, with fewer bidders it is likely that you will receive less for your car than if you had a larger number of bidders. Many more people, though, will bid for your car if they are able to find out, for free, that it is in excellent condition. So it would be smart of you to increase the number of potential bidders by paying for the inspection report yourself and sharing it freely.
5. Assume that due to an increase in demand, the average domestic airline fare increased from \$319.85 in the fourth quarter of 2013 to \$328.12 in the first quarter of 2014, an increase of \$8.27. The number of passenger tickets sold in the fourth quarter of 2013 was 151.4 million. Over the same period, the airlines' costs remained roughly the same: the price of jet fuel averaged around \$2 per gallon in both quarters and airline pilots' salaries remained roughly the same, averaging \$117,060 per year in 2013).

Can you determine precisely by how much producer surplus has increased as a result of the \$8.27 increase in the average fare? If you cannot be precise, can you determine whether it will be less than, or more than, a specific amount?

Solution

5. Without knowing the exact supply curve, you cannot be specific about the increase in producer surplus. If the quantity of tickets supplied had not changed, producer surplus would have increased by $\$8.27 \times 151.4 \text{ million} = \1.252 billion . But since supply curves normally slope upward and because the price has increased, producer surplus will have increased by more than \$1.252 billion.

6. The accompanying table shows the supply and demand schedules for used copies of the third edition of this textbook. The supply schedule is derived from offers at Amazon.com. The demand schedule is hypothetical.

Price of book	Quantity of books demanded	Quantity of books supplied
\$55	50	0
60	35	1
65	25	3
70	17	3
75	14	6
80	12	9
85	10	10
90	8	18
95	6	22
100	4	31
105	2	37
110	0	42

- a. Calculate consumer and producer surplus at the equilibrium in this market.
- b. Now the fourth edition of this textbook becomes available. As a result, the willingness to pay of each potential buyer for a second-hand copy of the third edition falls by \$20. In a table, show the new demand schedule and again calculate consumer and producer surplus at the new equilibrium.

Solution

6. a. The equilibrium price is \$85, and 10 copies are bought and sold. Starting with the buyers with the highest willingness to pay, the first two buyers' willingness to pay is \$105, and so they each receive consumer surplus of $\$105 - \$85 = \$20$. The next two buyers' willingness to pay is \$100, and so they each receive consumer surplus of $\$100 - \$85 = \$15$. The next two buyers' willingness to pay is \$95, and so they each receive consumer surplus of $\$95 - \$85 = \$10$. The next two buyers' willingness to pay is \$90, and so they each receive consumer surplus of $\$90 - \$85 = \$5$. The next two buyers' willingness to pay is \$85, and so they each receive consumer surplus of $\$85 - \$85 = \$0$. All remaining potential buyers receive no consumer surplus since their willingness to pay is below the market price. Total consumer surplus is therefore $2 \times \$20 + 2 \times \$15 + 2 \times \$10 + 2 \times \$5 = \$100$.

Starting with the sellers with the lowest cost, the first seller's cost is \$60, and so she receives producer surplus of $\$85 - \$60 = \$25$. The next two sellers' cost is \$65, and so they each receive producer surplus of $\$85 - \$65 = \$20$. The next three sellers' cost is \$75, and so they each receive producer surplus of $\$85 - \$75 = \$10$. The next three sellers' cost is \$80, and so they each receive producer surplus of $\$85 - \$80 = \$5$. The next seller's cost is \$85, and so she receives producer surplus of $\$85 - \$85 = \$0$. All remaining potential sellers receive no producer surplus since their cost is above the market price. Total producer surplus is therefore $1 \times \$25 + 2 \times \$20 + 3 \times \$10 + 3 \times \$5 = \$110$.

- b. The new demand schedule is shown in the accompanying table.

Price of book	Quantity of books demanded	Quantity of books supplied
\$55	14	0
60	12	1
65	10	3
70	8	3
75	6	6
80	4	9
85	2	10

The equilibrium price is \$75, and 6 copies are bought and sold. Starting with the buyers with the highest willingness to pay, the first two buyers' willingness to pay is \$85, and so they each receive consumer surplus of $\$85 - \$75 = \$10$. The next two buyers' willingness to pay is \$80, and so they each receive consumer surplus of $\$80 - \$75 = \$5$. The next two buyers' willingness to pay is \$75, and so they each receive consumer surplus of $\$75 - \$75 = \$0$. All remaining potential buyers receive no consumer surplus since their willingness to pay is below the market price. So total consumer surplus is $2 \times \$10 + 2 \times \$5 = \$30$.

Starting with the sellers with the lowest cost, the first seller's cost is \$60, and so she receives producer surplus of $\$75 - \$60 = \$15$. The next two sellers' cost is \$65, and so they each receive producer surplus of $\$75 - \$65 = \$10$. The next three sellers' cost is \$75, and so they each receive producer surplus of $\$75 - \$75 = \$0$. All remaining potential sellers receive no producer surplus since their cost is above the market price. Total producer surplus is therefore $1 \times \$15 + 2 \times \$10 = \$35$.

7. On Thursday nights, a local restaurant has a pasta special. Ari likes the restaurant's pasta, and his willingness to pay for each serving is shown in the accompanying table.

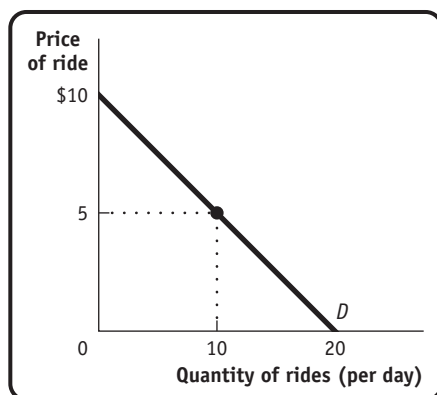
Quantity of pasta (servings)	Willingness to pay for pasta (per serving)
1	\$10
2	8
3	6
4	4
5	2
6	0

- a. If the price of a serving of pasta is \$4, how many servings will Ari buy? How much consumer surplus does he receive?
- b. The following week, Ari is back at the restaurant again, but now the price of a serving of pasta is \$6. By how much does his consumer surplus decrease compared to the previous week?

- c. One week later, he goes to the restaurant again. He discovers that the restaurant is offering an “all-you-can-eat” special for \$25. How much pasta will Ari eat, and how much consumer surplus does he receive now?
- d. Suppose you own the restaurant and Ari is a typical customer. What is the highest price you can charge for the “all-you-can-eat” special and still attract customers?

Solution

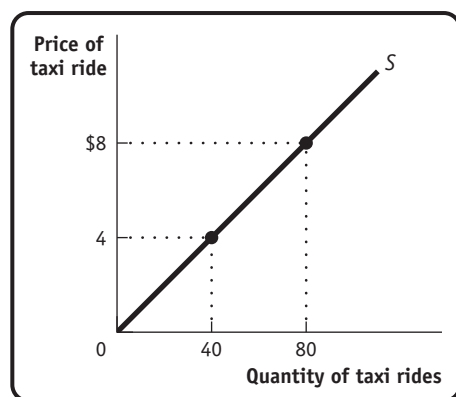
7.
 - a. Ari will buy four servings of pasta. His consumer surplus is equal to \$12, that is: $(\$10 - \$4) + (\$8 - \$4) + (\$6 - \$4) + (\$4 - \$4) = \$12$.
 - b. Ari will buy three servings of pasta. His consumer surplus is $(\$10 - \$6) + (\$8 - \$6) + (\$6 - \$6) = \$6$, so his consumer surplus falls by \$6, from \$12 to \$6.
 - c. If there is an “all-you-can-eat” special, the price Ari pays per serving is zero. Therefore, he will eat six servings of pasta. The total amount he is willing to pay for those six servings is \$30, the sum of the amounts he is willing to pay for each individual serving. Since he actually pays \$25, his consumer surplus is \$5.
 - d. When there is an “all-you-can-eat” special, Ari will consume six servings, which, if free, would give him consumer surplus of \$30. Therefore, the most he is willing to pay for an “all-you-can-eat” special is \$30. If Ari is a typical customer, this is the highest price you can charge for the special.
8. You are the manager of Fun World, a small amusement park. The accompanying diagram shows the demand curve of a typical customer at Fun World.



- a. Suppose that the price of each ride is \$5. At that price, how much consumer surplus does an individual consumer get? (Recall that the area of a right triangle is $\frac{1}{2} \times$ the height of the triangle \times the base of the triangle.)
- b. Suppose that Fun World considers charging an admission fee, even though it maintains the price of each ride at \$5. What is the maximum admission fee it could charge? (Assume that all potential customers have enough money to pay the fee.)
- c. Suppose that Fun World lowered the price of each ride to zero. How much consumer surplus does an individual consumer get? What is the maximum admission fee Fun World could charge?

Solution

8. a. From the demand curve, you can see that with a price per ride of \$5, the customer takes 10 rides. At this point her consumer surplus is $\frac{1}{2} \times (\$10 - \$5) \times 10 = \$25$.
- b. Since a consumer obtains consumer surplus of \$25 from going to Fun World when each ride costs \$5, that is the most that she would be willing to pay to go there. And it is therefore the maximum admission fee that Fun World could charge. (Charging consumers both an entrance fee and a price for each unit of a good bought is called a *two-part tariff*.)
- c. If Fun World charged nothing for each ride, a typical consumer would consume 20 rides, and this would give her a consumer surplus of $\frac{1}{2} \times \$10 \times 20 = \100 . This is the maximum admission fee that Fun World can charge with a price per ride of zero.
9. The accompanying diagram illustrates a taxi driver's individual supply curve (assume that each taxi ride is the same distance).



- a. Suppose the city sets the price of taxi rides at \$4 per ride, and at \$4 the taxi driver is able to sell as many taxi rides as he desires. What is this taxi driver's producer surplus? (Recall that the area of a right triangle is $\frac{1}{2} \times$ the height of the triangle \times the base of the triangle.)
- b. Suppose that the city keeps the price of a taxi ride set at \$4, but it decides to charge taxi drivers a "licensing fee." What is the maximum licensing fee the city could extract from this taxi driver?
- c. Suppose that the city allowed the price of taxi rides to increase to \$8 per ride. Again assume that, at this price, the taxi driver sells as many rides as he is willing to offer. How much producer surplus does an individual taxi driver now get? What is the maximum licensing fee the city could charge this taxi driver?

Solution

9. a. At a price of \$4, the taxi driver supplies 40 rides. His producer surplus is therefore $\frac{1}{2} \times \$4 \times 40 = \80 .
- b. Since the taxi driver's producer surplus is \$80, this is the most he is willing to pay to supply 40 rides at \$4. So it is the most the city can charge him as a licensing fee.
- c. At a price of \$8, the taxi driver supplies 80 rides, making his producer surplus $\frac{1}{2} \times \$8 \times 80 = \320 . So \$320 is the most the city can charge as a licensing fee when the price per ride is \$8.

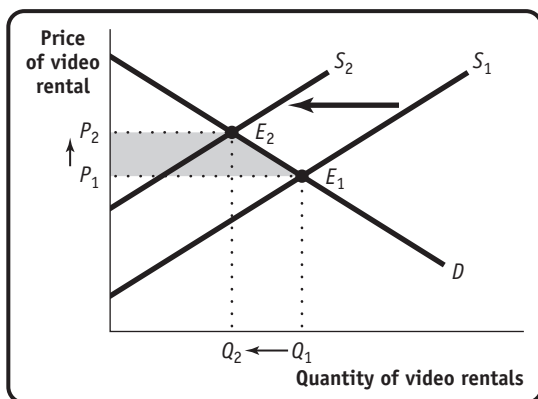
- 10.** In 2010, a New York district judge ruled in a copyright infringement lawsuit against the popular file-sharing website LimeWire and in favor of the 13 major record companies that had brought the lawsuit. The record companies, including Sony, Virgin, and Warner Brothers, had alleged that the file-sharing service encourages users to make illegal copies of copyrighted material. Allowing Internet users to obtain music for free limits the record companies' right to dispose of the music as they choose; in particular, it limits their right to give access to their music only to those who have paid for it. In other words, it limits the record companies' property rights.
- If everyone obtained music and video content for free from websites such as LimeWire, instead of paying the record companies, what would the record companies' producer surplus be from music sales? What are the implications for record companies' incentive to produce music content in the future?
 - If the record companies had lost the lawsuit and music could be freely downloaded from the Internet, what do you think would happen to mutually beneficial transactions (the producing and buying of music) in the future?

Solution

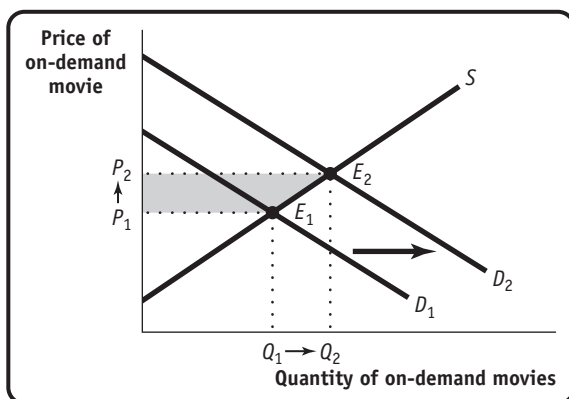
- 10.**
- If everyone obtained music and video content for free, record companies' producer surplus from producing music and videos would be zero. They would have no incentive to produce this content and so would not produce it in the future.
 - As a result of the limited property rights, many otherwise mutually beneficial transactions would not occur.
- 11.** Hollywood screenwriters negotiate a new agreement with movie producers stipulating that they will receive 10% of the revenue from every video rental of a movie they authored. They have no such agreement for movies shown on on-demand television.
- When the new writers' agreement comes into effect, what will happen in the market for video rentals—that is, will supply or demand shift, and how? As a result, how will consumer surplus in the market for video rentals change? Illustrate with a diagram. Do you think the writers' agreement will be popular with consumers who rent videos?
 - Consumers consider video rentals and on-demand movies substitutable to some extent. When the new writers' agreement comes into effect, what will happen in the market for on-demand movies—that is, will supply or demand shift, and how? As a result, how will producer surplus in the market for on-demand movies change? Illustrate with a diagram. Do you think the writers' agreement will be popular with cable television companies that show on-demand movies?

Solution

11. a. The payment to writers will increase the cost of providing video rentals. In the accompanying diagram, the supply curve shifts leftward from S_1 to S_2 , the equilibrium price of video rentals rises from P_1 to P_2 , and the quantity of video rentals bought and sold falls from Q_1 to Q_2 . As a result, consumer surplus will decrease by the shaded amount. The writers' agreement will not be popular with consumers.



- b. The higher price of video rentals will make on-demand movies more popular. They are substitute goods, and the demand for them will increase when the price of video rentals rises. In the accompanying diagram, the demand curve shifts rightward from D_1 to D_2 , the equilibrium price rises from P_1 to P_2 , and the equilibrium quantity rises from Q_1 to Q_2 . Producer surplus will increase by the shaded amount. This change will be popular with the cable television companies that show on-demand movies.



WORK IT OUT

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