

## >> Consumer and Producer Surplus

### Section 2: Producer Surplus and the Supply Curve



Just as buyers of a good would have been willing to pay more for their purchase than the price they actually pay, sellers of a good would have been willing to sell it for less than the price they actually receive. We can therefore carry out an analysis of producer surplus and the supply curve that is almost exactly parallel to that of consumer surplus and the demand curve.

#### Cost and Producer Surplus

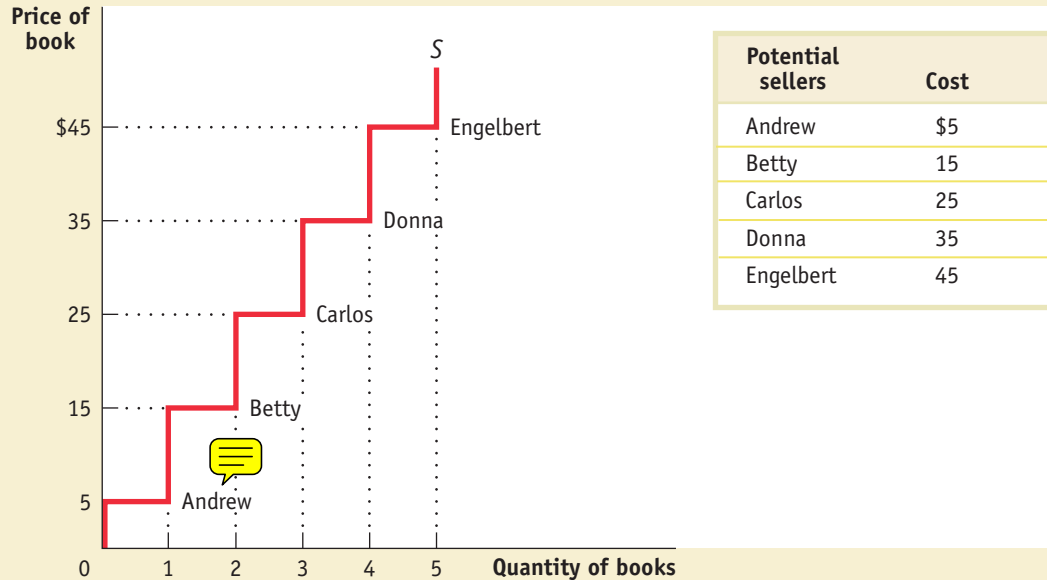
Consider a group of students who are potential sellers of used textbooks. Because they have different preferences, the various potential sellers differ in the price at which they are willing to sell their books. The table in Figure 6-6 shows the prices at which several different students would be willing to sell. Andrew is willing to sell the book as long as he can get anything more than \$5; Betty won't sell unless she can get at least \$15; Carlos, unless he can get \$25; Donna, unless she can get \$35; Engelbert, unless he can get \$45.

A potential seller's **cost** is the lowest price at which he or she is willing to sell a good.



The lowest price at which a potential seller is willing to sell has a special name in economics: it is called the seller's **cost**. So Andrew's cost is \$5, Betty's is \$15, and so on.

**Figure 6-6** The Supply Curve for Used Textbooks



The supply curve illustrates sellers' cost, the lowest price at which a potential seller is willing to sell the good, and quantity supplied at that price. Each of the five students here has one book to sell and each has a different cost, as indicated in

the accompanying table. At a price of \$5 the quantity supplied is one (Andrew), at \$15 it is two (Andrew and Betty), and so on until you reach \$45, the price at which all five students are willing to sell.

Using the term *cost*, which people normally associate with the monetary cost of producing a good, may sound a little strange when applied to sellers of used textbooks. The students don't have to manufacture the books, so it doesn't cost the student who sells a book anything to make that book available for sale, does it?

Yes, it does. A student who sells a book won't have it later, as part of a personal collection. So there is an *opportunity cost* to selling a textbook, even if the owner has completed the course for which it was required. And remember that one of the basic principles of economics is that the true measure of the cost of doing anything is always its opportunity cost—the real cost of something is what you give up to get it.

So it is good economics to talk of the minimum price at which someone will sell a good as the “cost” of selling that good, even if he or she doesn't spend any money to make the good available for sale. Of course, in most real-world markets the sellers are also those who produce the good—and therefore *do* expend money to make the good available for sale. In this case the cost of making the good available for sale *includes* monetary costs—but it may also include other opportunity costs.

Getting back to the example, suppose that Andrew sells his book for \$30. Clearly he has gained from the transaction: he would have been willing to sell for only \$5, so he has gained \$25. This gain, the difference between the price he actually gets and his cost—the minimum price at which he would have been willing to sell—is known as his **individual producer surplus**.

Just as we derived the demand curve from the willingness to pay of different consumers, we can derive the supply curve from the cost of different producers. The step-shaped curve in Figure 6-6 shows the supply curve implied by the costs shown in the accompanying table. At a price less than \$5, none of the students are willing to sell; at a price between \$5 and \$15, only Andrew is willing to sell, and so on.

As in the case of consumer surplus, we can add the individual producer surpluses of sellers to calculate the **total producer surplus**, the total gains to sellers in the market. Economists use the term **producer surplus** to refer to either total or indi-



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**Individual producer surplus** is the net gain to a seller from selling a good. It is equal to the difference between the price received and the seller's cost.

**Total producer surplus** in a market is the sum of the individual producer surpluses of all the sellers of a good. Economists use the term **producer surplus** to refer both to individual and to total producer surplus.

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**TABLE 6-2****Producer Surplus When the Price of a Used Textbook Is \$30**

Potential seller	Cost	Price received	Individual producer surplus = price received – cost
Andrew	\$5	\$30	\$25
Betty	15	30	15
Carlos	25	30	5
Donna	35	—	—
Engelbert	45	—	—
<b>Total producer surplus: \$45</b>			

vidual producer surplus. Table 6-2 shows the net gain to each of the students who would sell a used book at a price of \$30: \$25 for Andrew, \$15 for Betty, and \$5 for Carlos. The total producer surplus is  $\$25 + \$15 + \$5 = \$45$ .

As with consumer surplus, the producer surplus gained by those who sell books can be represented graphically. Figure 6-7 reproduces the supply curve from Figure 6-6. Each step in that supply curve is one book wide and represents one seller. The height of Andrew's step is \$5, his cost. This forms the bottom of a rectangle, with \$30, the price he actually receives for his book, forming the top. The area of this rectangle,  $(\$30 - \$5) \times 1 = \$25$ , is his producer surplus. So the producer surplus Andrew gains from selling his book is the *area of the dark red rectangle* shown in the figure.

Let's assume that the campus bookstore is willing to buy all the used copies of this book that students are willing to sell at a price of \$30. Then, in addition to Andrew, Betty and Carlos will also sell their books. They will also benefit from their sales, though not as much as Andrew, because they have higher costs. Andrew, as we have

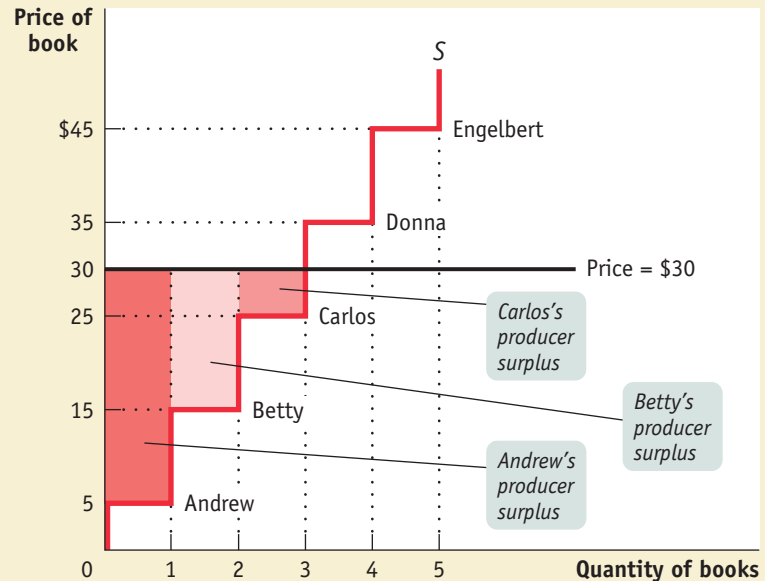
seen, gains \$25. Betty gains a smaller amount: since her cost is \$15, she gains only \$15. Carlos gains even less, only \$5.

Again, as with consumer surplus, we have a general rule for determining the total producer surplus from sales of a good: *The total producer surplus from sales of a good at a given price is the area above the supply curve but below that price.*

**Figure 6-7**

### Producer Surplus in the Used-Textbook Market

At a market price of \$30, Andrew, Betty, and Carlos each sell a book but Donna and Engelbert do not. Andrew, Betty, and Carlos get individual producer surpluses equal to the difference between the market price and their cost, illustrated here by the shaded rectangles. Donna and Engelbert each have a cost that is greater than the market price of \$30, so they are unwilling to sell a book and therefore receive zero producer surplus. The total producer surplus is given by the entire shaded area, the sum of the individual producer surpluses of Andrew, Betty, and Carlos, equal to  $\$25 + \$15 + \$5 = \$45$ .



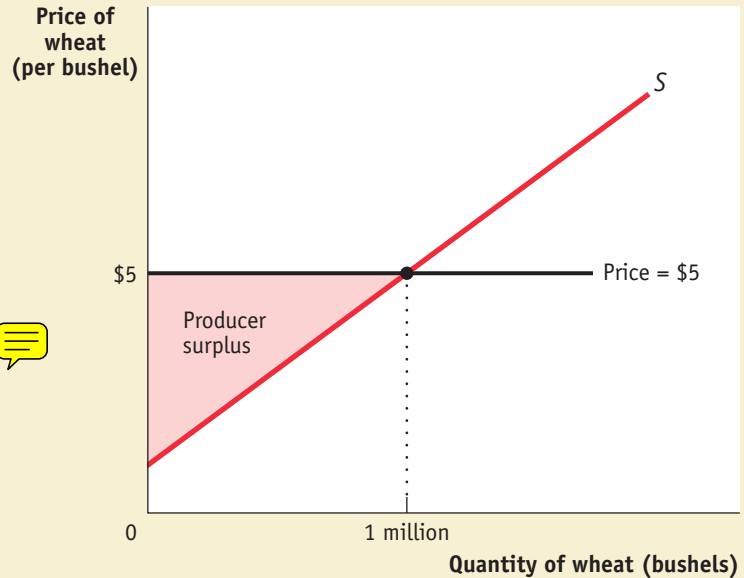
This rule applies both to examples like the one shown in Figure 6-7, where there are a small number of producers and a step-shaped supply curve, and to more realistic examples where there are many producers and the supply curve is more or less smooth.

Consider, for example, the supply of wheat. Figure 6-8 shows how the producer surplus depends on the price per bushel. Suppose that, as shown in the figure, the price is \$5 per bushel and farmers supply 1 million bushels. What is the benefit to the farmers

**Figure 6-8**

### Producer Surplus

Here is the supply curve for wheat. At a price of \$5 per bushel, farmers supply 1 million bushels. The producer surplus at this price is equal to the shaded area: the area above the supply curve but below the price. This is the total gain to producers—farmers in this case—from supplying their product when the price is \$5.



from selling their wheat at a price of \$5? Their producer surplus is equal to the shaded area in the figure—the area above the supply curve but below the price of \$5 per bushel.

## Changes in Producer Surplus



If the price of a good rises, producers of the good will experience an increase in producer surplus, though not all producers gain the same amount. Some producers would have produced the good even at the original price; they will gain the entire price increase on every unit they produce. Other producers will enter the market because of the higher price; they will gain only the difference between the new market price and their cost.

Figure 6-9 is the supply counterpart of Figure 6-5 in “Section 1: Consumer Surplus and the Demand Curve.” It shows the effect on producer surplus of a rise in the price of wheat from \$5 to \$7 per bushel. The increase in producer surplus is the entire shaded area, which consists of two parts. First, there is a red rectangle corresponding to the gains of those farmers who would have supplied wheat even at the original \$5 price. Second, there is an additional pink triangle that corresponds to the gains of those farmers who would not have supplied wheat at the original price but are drawn into the market by the higher price.

If the price were to fall from \$7 to \$5 per bushel, the story would run in reverse. The whole shaded area would now be the decline in producer surplus, the fall in the area above the supply curve but below the price. The loss would consist of two parts, the loss to farmers who would still grow wheat at a price of \$5 (the red rectangle) and the loss to farmers who decide not to grow wheat because of the lower price (the pink triangle).

Figure 6-9

### A Rise in the Market Price Increases Producer Surplus

A rise in the market price of wheat from \$5 to \$7 leads to an increase in the quantity supplied and an increase in producer surplus. The change in the total producer surplus is given by the sum of the shaded areas: the total area above the supply curve but between the old and new prices. The red area represents the gain to the farmers who would have supplied 1 million bushels at the original price of \$5; they each receive an increase in producer surplus of \$2 for each of those bushels. The triangular pink area represents the increase in producer surplus achieved by the farmers who supply the additional 500,000 bushels because of the higher price. Similarly, a fall in the market price of wheat generates a decrease in producer surplus equal to the shaded areas.

