

Firms in Perfectly Competitive Markets

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At the Chicago Board of Trade (CBOT), prices are set by thousands of buyers interacting with thousands of sellers. The goods in question are standardized (e.g., grade A winter wheat) and information is readily available. Every buyer and seller in the market knows the price, the quantity, and the quality of the wheat available. Transaction costs are negligible. For example, if a news story breaks on an infestation in the cotton crop, the price of cotton will rise immediately. CBOT price information is used to determine the value of some commodities throughout the world.

CHICAGO BOARD OF TRADE



A firm must answer two critical questions: What price should we charge for the goods and services we sell, and how much should we produce?

The answers to these two questions will depend on the market structure.

The behavior of firms will depend on the number of firms in the market, the ease with which firms can enter and exit the market, and the ability of firms to differentiate their products from those of other firms. There is no typical industry. An industry might include one firm that dominates the market, or it might consist of thousands of smaller firms that each produce a small fraction of the market supply. Between these two end points are many other industries. However, because we cannot examine each industry individually, we break them into four main categories: perfect competition, monopoly, monopolistic competition, and oligopoly.

In a perfectly competitive market, the market price is the critical piece of information that a firm needs to know. A firm in a perfectly competitive market can sell all it wants at the market price. A firm in a perfectly competitive market is said to be a price taker, because it cannot appreciably affect the market price for its output or the market price for its inputs. For example, suppose a Washington apple grower decides that he wants to get out of the family business and go to work for Microsoft. Because he may be one of 50,000 apple growers in the United States, his decision will not appreciably change the price of the apples, the production of apples, or the price of inputs.

A Perfectly Competitive Market

12.1

What are the characteristics of a firm in a perfectly competitive market?

What is a price taker?

A Perfectly Competitive Market

This chapter examines perfect competition, a market structure characterized by (1) many buyers and sellers, (2) identical (homogeneous) products, and (3) easy market entry and exit. Let's examine these characteristics in greater detail.

Many Buyers and Sellers

In a perfectly competitive market, there are *many buyers and sellers*, perhaps thousands or conceivably millions. Because each firm is so small in relation to the industry, its production decisions have no impact on the market—each regards price as something over which it has no control. For this reason, perfectly competitive firms are called price takers: They must take the price given by the market because their influence on price is insignificant. If the price of wheat in the wheat market is \$5 a bushel, then individual wheat farmers will receive \$5 a bushel for their wheat. Similarly, no single buyer of wheat can influence the price of wheat, because each buyer purchases only a small amount of wheat. We will see how this relationship works in more detail in Section 12.2.



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Why do they call firms in a perfectly competitive market price takers?

Identical (Homogeneous) Products

Consumers believe that all firms in perfectly competitive markets *sell identical (or homogeneous) products*. For example, in the wheat market, we are assuming it is not possible to determine any significant and consistent qualitative differences in the wheat produced by different farmers. Wheat produced by Farmer Jones looks, feels, smells, and tastes like that



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Can the owner of this orchard charge a noticeably higher price for apples of similar quality to those sold at the orchard down the road? What if she charges a lower price for apples of similar quality? How many apples can she sell at the market price?



What are the three characteristics of a perfectly competitive market?

produced by Farmer Smith. In short, a bushel of wheat is a bushel of wheat. The products of all the firms are considered to be perfect substitutes.

Easy Entry and Exit

Product markets characterized by perfect competition *have no significant barriers to entry or exit*. Therefore it is fairly easy for entrepreneurs to become suppliers of the product or, if they are already producers, to stop supplying the product. “Fairly easy” does not mean that any person on the street can instantly enter the business but rather that the financial, legal, educational, and other barriers to entering the business are modest, enabling large numbers of people to overcome the barriers and enter the business, if they so desire, in any given period. If buyers can easily switch from one seller to another and sellers can easily enter or exit the industry, then they have met the perfectly competitive condition of easy entry and exit. Because of this easy market entry, perfectly competitive markets generally consist of a large number of small suppliers.

A perfectly competitive market is approximated most closely in highly organized markets for securities and agricultural commodities, such as the New York Stock Exchange or the Chicago Board of Trade. Wheat, corn, soybeans, cotton, and many other agricultural products are sold in perfectly competitive markets. Although all the criteria for a perfectly competitive market are rarely met, a number of markets come close to satisfying them. Even when all the assumptions don’t hold, it is important to note that studying the model of perfect competition is useful because many markets resemble perfect competition—that is, markets in which firms face highly elastic (flat) demand curves and relatively easy entry and exit. The model also gives us a standard of comparison. In other words, we can make comparisons with the perfectly competitive model to help us evaluate what is going on in the real world.

SECTION QUIZ



- Perfectly competitive markets tend to have a ____ number of sellers and a(n) ____ entry.
 - large; easy
 - large; difficult
 - small; easy
 - small; difficult
- In perfectly competitive markets, products are ____ and sellers are _____.
 - homogeneous; price takers
 - homogeneous; price searchers
 - substantially different; price takers
 - substantially different; price searchers.
- Perfectly competitive markets have ____ sellers, each of which produces a ____ share of industry output.
 - few; substantial
 - few; small
 - many; substantial
 - many; small

(continued)

SECTION QUIZ (Cont.)



4. Which of the following is false about perfect competition?
 - a. Perfectly competitive firms sell homogeneous products.
 - b. A perfectly competitive industry allows easy entry and exit.
 - c. A perfectly competitive firm must take the market price as given.
 - d. A perfectly competitive firm produces a substantial fraction of the industry output.
 - e. All of the above are true.
 5. An individual, perfectly competitive firm
 - a. may increase its price without losing sales.
 - b. is a price maker.
 - c. has no perceptible influence on the market price.
 - d. sells a product that is differentiated from those of its competitors.
-
1. Why do firms in perfectly competitive markets involve homogeneous goods?
 2. Why does the absence of significant barriers to entry tend to result in a large number of suppliers?
 3. Why does the fact that perfectly competitive firms are small relative to the market make them price takers?

Answers: 1. a 2. a 3. d 4. d 5. c

An Individual Price Taker's Demand Curve

12.2

- Why won't individual price takers raise or lower their prices?
- Can individual price takers sell all they want at the market price?

- Will the position of individual price takers' demand curves change when market price changes?

An Individual Firm's Demand Curve

In perfectly competitive markets, buyers and sellers must accept the price that the market determines, so they are said to be *price takers*. The market price and output are determined by the intersection of the market supply and demand curves, as seen in Exhibit 1(b). As we stated earlier, perfectly competitive markets have many buyers and sellers and the goods offered for sale are essentially identical. Consequently, no buyer or seller can influence the market price. They take the market price as given.

For example, no single consumer of wheat can influence the market price of wheat because each buyer purchases such a small percentage of the total amount sold in the wheat market. Likewise, each wheat farmer sells relatively small amounts of almost identical wheat, so the farmer has little control over wheat prices.

Individual wheat farmers know that they cannot dispose of their wheat at any figure higher than the current market price; if they attempt to charge a higher price, potential buyers will simply make their purchases from other wheat farmers. Further, the farmers certainly would not knowingly charge a lower price, because they could sell all they want at the market price.

Likewise, in a perfectly competitive market, individual sellers can change their outputs, and it will not alter the market price. The large number of sellers who are selling identical products

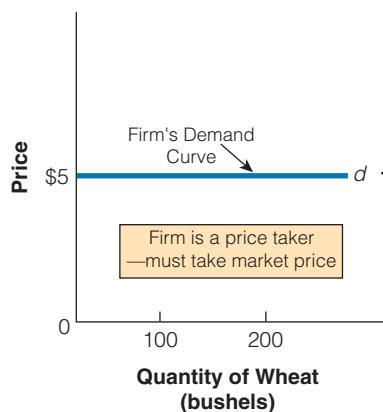


Can an individual wheat farmer influence the market price of wheat? Can an individual consumer of wheat influence the market price of wheat?

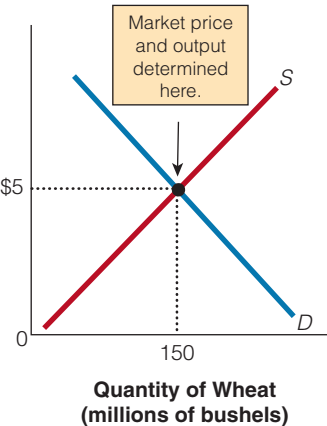
section 12.2
exhibit 1

Market and Individual Firm Demand Curves in a Perfectly Competitive Market

a. Individual Firm Demand Curve



b. Market Supply and Demand Curve



At the market price for wheat, \$5, the individual farmer can sell all the wheat he wishes. Because each producer provides only a small fraction of industry output, any additional output will have an insignificant impact on market price. The firm's demand curve is perfectly elastic at the market price.



Why is the perfectly competitive firm's demand curve perfectly elastic?

make this situation possible. Each producer provides such a small fraction of the total supply that a change in the amount he offers does *not* have a noticeable effect on market equilibrium price. In a perfectly competitive market, then, an individual firm can sell as much as it wishes to place on the market at the prevailing price; the demand, as seen by the seller, is perfectly elastic.

It is easy to construct the demand curve for an individual seller in a perfectly competitive market. Remember, she won't charge more than the market price because no one will buy it, and she won't charge less because she can sell all she wants at the market price. Thus, the farmer's demand curve is horizontal over the entire range of output that she could possibly produce. If the prevailing market price of the product is \$5, the farmer's demand curve will be represented graphically by a horizontal line at the market price of \$5, as shown in Exhibit 1(a).

In short, both consumers and producers are price takers in the perfectly competitive market. Consumers, for the most part, are price takers. Consumers cannot generally affect the prices they pay. However, in a number of market situations the producer can affect the market price and we will study those in the following chapters.

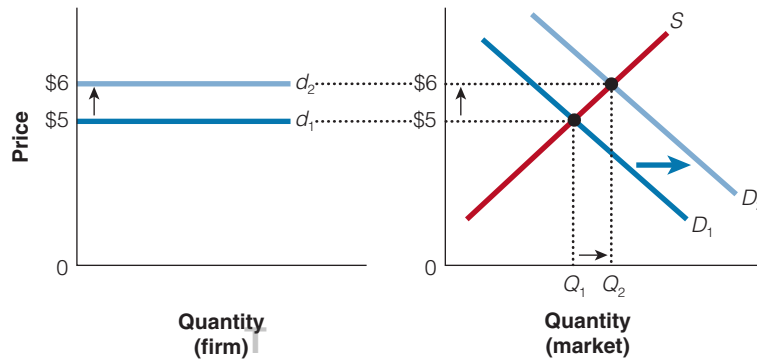
A Change in Market Price and the Firm's Demand Curve

To say that under perfect competition producers regard price as a given is not to say that price is constant. The *position* of the firm's demand curve varies with every change in the market price. In Exhibit 2, we see that when the market price for wheat increases, say as a result of an increase in market demand, the price-taking firm will receive a higher price for all its output. Or when the market price decreases, say as a result of a decrease in market demand, the price-taking firm will receive a lower price for all its output.

In effect, sellers are provided with current information about market demand and supply conditions as a result of price changes. It is an essential aspect of the perfectly competitive model that sellers respond to the signals provided by such price movements, so they must alter their behavior over time in the light of actual experience, revising their production decisions to reflect changes in market price. In this respect, the perfectly competitive model is straightforward; it does not assume any knowledge on the part of individual buyers and sellers about market demand and supply—they only have to know the price of the good they sell.



What happens to the perfectly competitive firm's demand curve if there is an increase in the market price?

section 12.2
exhibit 2
Market Prices and the Position of a Firm's Demand Curve


The position of the firm's demand curve will vary with every change in the market price.

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SECTION QUIZ

1. Which of the following is false?
 - a. A perfectly competitive firm cannot sell at any price higher than the current market price and would not knowingly charge a lower price, because it could sell all it wants at the market price.
 - b. In a perfectly competitive market, individual sellers can change their output without altering the market price.
 - c. In a perfectly competitive industry, the firm's demand curve is downward sloping.
 - d. The perfectly competitive model does not assume any knowledge on the part of individual buyers and sellers about market demand and supply—they only have to know the price of the good they sell.
2. When market demand shifts _____, a perfectly competitive firm's demand curve shifts _____.
 - a. rightward; upward
 - b. rightward; downward
 - c. leftward; upward
 - d. leftward; downward
 - e. Both (a) and (d) are correct.
3. When will a perfectly competitive firm's demand curve shift?
 - a. never
 - b. when the market demand curve shifts
 - c. when new producers enter the industry in large numbers
 - d. when either (b) or (c) occurs
4. In a market with perfectly competitive firms, the market demand curve is _____ and the demand curve facing each individual firm is _____.
 - a. upward sloping; horizontal
 - b. downward sloping; horizontal
 - c. horizontal; downward sloping
 - d. horizontal; upward sloping
 - e. horizontal; horizontal

(continued)

SECTION QUIZ (Cont.)



1. Why would a perfectly competitive firm not try to raise or lower its price?
2. Why can we represent the demand curve of a perfectly competitive firm as perfectly elastic (horizontal) at the market price?
3. How does an individual perfectly competitive firm's demand curve change when the market price changes?
4. If the marginal cost facing every producer of a product shifted upward, would the position of a perfectly competitive firm's demand curve be likely to change as a result? Why or why not?

Answers: 1. c 2. e 3. c 4. b

12.3

Profit Maximization

What is total revenue?

What is average revenue?

What is marginal revenue?

Why does the firm maximize profits where marginal revenue equals marginal cost?

Revenues in a Perfectly Competitive Market

The objective of the firm is to maximize profits. To maximize profits, the firm wants to produce the amount that maximizes the difference between its total revenues and total costs. In this section, we will examine the different ways to look at revenue in a perfectly competitive market: total revenue, average revenue, and marginal revenue.

Total Revenue

total revenue (TR) the product price times the quantity sold

Total revenue (TR) is the revenue that the firm receives from the sale of its products. Total revenue from a product equals the price of the good (P) times the quantity (q) of units sold ($TR = P \times q$). For example, if a farmer sells 10 bushels of wheat a day for \$5 a bushel, his total revenue is \$50 ($\5×10 bushels). (Note: We will use the lowercase letter q to denote the single firm's output and reserve the uppercase letter Q for the output of the entire market. For example, q would be used to represent the output of one lettuce grower, while Q would be used to represent the output of all lettuce growers in the lettuce market.)

Average Revenue and Marginal Revenue

average revenue (AR) total revenue divided by the number of units sold

Average revenue (AR) equals total revenue divided by the number of units of the product sold ($TR \div q$, or $[P \times q] \div q$). For example, if the farmer sells 10 bushels at \$5 a bushel, total revenue is \$50 and average revenue is \$5 per bushel ($\$50 \div 10$ bushels). Thus, in perfect competition, average revenue is equal to the price of the good.

marginal revenue (MR) the increase in total revenue resulting from a one-unit increase in sales

Marginal revenue (MR) is the additional revenue derived from the production of one more unit of the good. In other words, marginal revenue represents the increase in total revenue that results from the sale of one more unit ($MR = \Delta TR \div \Delta q$). In a perfectly competitive market, because additional units of output can be sold without reducing the price of the product, marginal revenue is constant at all outputs and equal to average revenue. For

section 12.3
exhibit 1
Revenues for a Perfectly Competitive Firm

Quantity (q)	Price (P)	Total Revenue ($TR = P \times q$)	Average Revenue ($AR = TR/q$)	Marginal Revenue ($MR = \Delta TR/\Delta q$)
1	\$5	\$ 5	\$5	\$5
2	5	10	5	5
3	5	15	5	5
4	5	20	5	5
5	5	25	5	5

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example, if the price of wheat per bushel is \$5, the marginal revenue is \$5. Because total revenue is equal to price multiplied by quantity ($TR = P \times q$), as we add one additional unit of output, total revenue will always increase by the amount of the product price, \$5. Marginal revenue facing a perfectly competitive firm is equal to the price of the good.

In perfect competition, then, we know that marginal revenue, average revenue, and price are all equal: $P = MR = AR$. These relationships are clearly illustrated in the calculations presented in Exhibit 1.



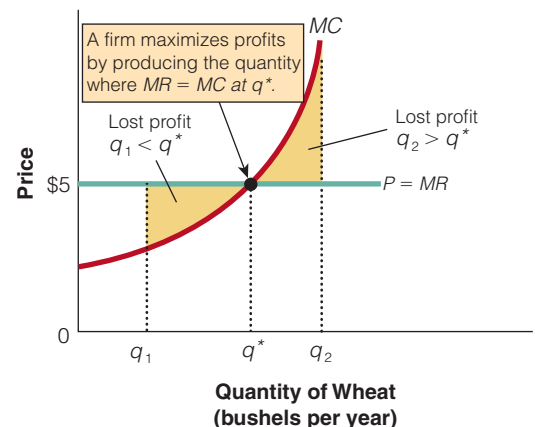
How does a perfectly competitive firm decide how much to produce and at what price?

How Do Firms Maximize Profits?

Now that we have discussed the firm's cost curves (in Chapter 11) and its revenues, we are ready to see how a firm maximizes its profits. A firm's profits equal its total revenues minus its total costs. However, at what output level must a firm produce and sell to maximize profits? In all types of market environments, the firm will maximize its profits at the output that maximizes the difference between total revenue and total cost, which is at the same output level at which marginal revenue equals marginal cost.

Equating Marginal Revenue and Marginal Cost

The importance of equating marginal revenue and marginal cost is seen in Exhibit 2. As output expands beyond zero up to q^* , the marginal revenue derived from each unit of the expanded output exceeds the marginal cost of that unit of output, so the expansion of output creates additional profits. This addition to profit is shown as the leftmost shaded section in Exhibit 2. As long as marginal revenue exceeds marginal cost, profits continue to grow. For example, if the firm decides to produce q_1 , the firm sacrifices potential profits, because the marginal revenue from producing more output is greater than the marginal cost. Only at q^* , where $MR = MC$, is the output level just right—not too large, not too small. Further expansion of output beyond q^* will lead to losses on the additional output (i.e., decrease the firm's overall profits), because $MC > MR$. For example, if the firm produces q_2 , the firm incurs losses on the output produced

section 12.3
exhibit 2
Finding the Profit-Maximizing Level of Output


At any output below q^* —at q_1 , for example—the marginal revenue (MR) from expanding output exceeds the added costs (MC) of that output, so additional profits can be made by expanding output. Beyond q^* —at q_2 , for example—marginal costs exceed marginal revenue, so output expansion is unprofitable and output should be reduced. The profit-maximizing level of output is at q^* , where the profit-maximizing output rule is followed—the firm should produce the level of output where $MR = MC$.

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section 12.3
exhibit 3
Cost and Revenue Calculations for a Perfectly Competitive Firm

Quantity (1)	Total Revenue (2)	Total Cost (3)	Profit ($TR - TC$) (4)	Marginal Revenue $\Delta TR/\Delta q$ (5)	Marginal Cost ($\Delta TC/\Delta q$) (6)	Change in Profit ($MR - MC$) (7)
0	\$ 0	\$ 2	\$-2			
1	5	4	1	\$5	\$2	\$3
2	10	7	3	5	3	2
3	15	11	4	5	4	1
4	20	16	4	5	5	0
5	25	22	3	5	6	-1

profit-maximizing level of output

a firm should always produce at the output where $MR = MC$



Should we focus on profit per unit or total profit?

beyond q^* ; the firm should reduce its output. Only at output q^* , where $MR = MC$, can we find the **profit-maximizing level of output**.

Be careful not to make the mistake of focusing on profit per unit rather than total profit. That is, you might think that at q_1 , if MR is much greater than MC , the firm should not produce more because the profit per unit is high at this point. However, that would be a mistake because a firm can add to its total profits as long as $MR > MC$ —that is, all the way to q^* .

The Marginal Approach

We can use the data from the table in Exhibit 3 to find Farmer Jones's profit-maximizing position. Columns 5 and 6 show the marginal revenue and marginal cost, respectively. The first bushel of wheat that Farmer Jones produces has a marginal revenue of \$5 and a marginal cost of \$2; so producing that bushel of wheat increases profits by \$3 ($\$5 - \2). The second bushel of wheat produced has a marginal revenue of \$5 and a marginal cost of \$3; so producing that bushel of wheat increases profits by \$2 ($\$5 - \3). Farmer Jones wants to produce those units and more. That is, as long as marginal revenue exceeds marginal cost, producing and selling those units add more to revenues than to costs; in other words, they add to profits. However, once he expands production beyond four units of output, Farmer Jones's costs are less than his marginal revenues, and his profits begin to fall. Clearly, Farmer Jones should not produce beyond four bushels of wheat.

Let's take another look at profit maximization, using the table in Exhibit 3. Comparing columns 2 and 3—the calculations of total revenue and total cost, respectively—we see that Farmer Jones maximizes his profits at output levels of three or four bushels, where he will make profits of \$4. In column 4—profit—you can see that there is no higher level of profit at any of the other output levels. Producing five bushels would reduce profits by \$1, because marginal revenue, \$5, is less than the marginal cost, \$6. Consequently, Farmer Jones would not produce this level of output. If $MR > MC$, Farmer Jones should increase production; if $MR < MC$, Farmer Jones should decrease production.

In the next section we will use the profit-maximizing output rule to see what happens when changes in the market cause the price to fall below average total cost and even below average variable costs. We will introduce the three-step method to determine whether the firm is making an economic profit, minimizing its losses, or should be temporarily shut down.

SECTION QUIZ

- The marginal revenue of a perfectly competitive firm
 - decreases as output increases.
 - increases as output increases.
 - is constant as output increases and is equal to price.
 - increases as output increases and is equal to price.



(continued)

SECTION QUIZ (Cont.)



2. A perfectly competitive firm seeking to maximize its profits would want to maximize the difference between
 - a. its marginal revenue and its marginal cost.
 - b. its average revenue and its average cost.
 - c. its total revenue and its total cost.
 - d. its price and its marginal cost.
 - e. either (a) or (d).
3. If a perfectly competitive firm's marginal revenue exceeded its marginal cost,
 - a. it would cut its price in order to sell more output and increase its profits.
 - b. it would expand its output but not cut its price in order to increase its profits.
 - c. it would raise its price and expand its output to increase its profits.
 - d. none of the above would be true.
4. Which of the following is true?
 - a. Total revenue is price times the quantity sold.
 - b. Average revenue is total revenue divided by the quantity sold.
 - c. Marginal revenue is the change in total revenue from the sale of an additional unit of output.
 - d. In a competitive industry, the price of the good equals both the average revenue and the marginal revenue.
 - e. All of the above are true.

-
1. How is total revenue calculated?
 2. How is average revenue derived from total revenue?
 3. How is marginal revenue derived from total revenue?
 4. Why is marginal revenue equal to price for a perfectly competitive firm?

Answers: 1. c 2. c 3. b 4. e

Short-Run Profits and Losses

12.4

- How do we determine whether a firm is generating an economic profit?
- How do we determine whether a firm is experiencing an economic loss?

- How do we determine whether a firm is making zero economic profits?
- Why doesn't a firm produce when price is below average variable cost?

In the previous section, we discussed how to determine the profit-maximizing output level for a perfectly competitive firm. How do we know whether a firm is actually making economic profits or losses?

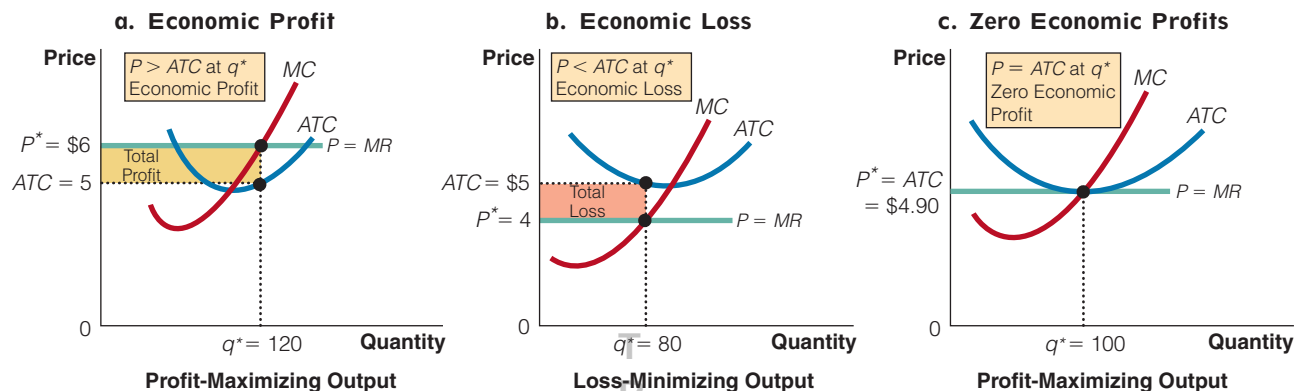
The Three-Step Method

What Is the Three-Step Method?

Determining whether a firm is generating economic profits, economic losses, or zero economic profits at the profit-maximizing level of output, q^* , can be done in three easy steps. First, we will walk through these steps, and then we will apply the method to three situations for a hypothetical firm in the short run in Exhibit 1.

section 12.4
exhibit 1

Short-Run Profits, Losses, and Zero Economic Profits



In (a), the firm is earning short-run economic profits of \$120. In (b), the firm is suffering losses of \$80. In (c), the firm is making zero economic profits, with the price just equal to the average total cost in the short run.

1. Find where marginal revenue equals marginal cost and proceed straight down to the horizontal quantity axis to find q^* , the profit-maximizing output level.
2. At q^* , go straight up to the demand curve and then to the left to find the market price, P^* . Once you have identified P^* and q^* , you can find total revenue at the profit-maximizing output level, because $TR = P \times q$.
3. The last step is to find the total cost. Again, go straight up from q^* to the average total cost (ATC) curve and then left to the vertical axis to compute the average total cost *per unit*. If we multiply average total cost by the output level, we can find the total cost ($TC = ATC \times q$).

If total revenue is greater than total cost at q^* , the firm is generating economic profits. If total revenue is less than total cost at q^* , the firm is generating economic losses. If total revenue is equal to total cost at q^* , there are zero economic profits (or a normal rate of return).

Alternatively, to find total economic profits, we can take the product price at P^* and subtract the average total cost at q^* . This will give us per-unit profit. If we multiply this by output, we will arrive at total economic profit $(P^* - ATC) \times q^* = \text{Total economic profit}$.

Remember, the cost curves include implicit and explicit costs—that is, we are covering the opportunity costs of our resources. Therefore, even with zero economic profits, no tears should be shed, because the firm is covering both its implicit and explicit costs. Because firms are also covering their implicit costs, or what they could be producing with these resources in another endeavor, economists sometimes call this zero economic profit a *normal rate of return*. That is, the owners are doing as well as they could elsewhere, in that they are getting the normal rate of return on the resources they invested in the firm.

The Three-Step Method in Action

Exhibit 1 shows three different short-run equilibrium positions; in each case, the firm is producing at a level where marginal revenue equals marginal cost. Each of these alternatives shows that the firm is maximizing profits or minimizing losses in the short run.

Assume that three alternative prices—\$6, \$5, and \$4—are available for a firm with given costs. In Exhibit 1(a), the firm receives \$6 per unit at an equilibrium level of output ($MR = MC$) of 120 units. Total revenue ($P \times q^*$) is $\$6 \times 120$, or \$720. The average total cost at 120 units of output is \$5, and the total cost ($ATC \times q^*$) is \$600. Following the three-step method, we can calculate that this firm is earning a total economic profit of \$120. Or we can calculate total economic profit by using the following equation: $(P^* - ATC) \times q^* = (\$6 - \$5) \times 120 = \120 .



Why do economists sometimes call a zero economic profit a normal rate of return?

In Exhibit 1(b), the market price has fallen to \$4 per unit. At the equilibrium level of output, the firm is now producing 80 units of output at an average total cost of \$5 per unit. The total revenue is now \$320 ($\4×80), and the total cost is \$400 ($\5×80). We can see that the firm is now incurring a total economic loss of \$80. Or we can calculate total economic profit by using the following equation: $(P^* - ATC) \times q^* = (\$4 - \$5) \times 80 = -\80 .

In Exhibit 1(c), the firm is earning zero economic profits, or a normal rate of return. The market price is \$4.90, and the average total cost is \$4.90 per unit for 100 units of output. In this case, economic profits are zero, because total revenue, \$490, minus total cost, \$490, is equal to zero. This firm is just covering all its costs, both implicit and explicit. Or we can calculate total economic profit by using the following equation: $(P^* - ATC) \times q^* = \$4.90 - \$4.90 \times 100 = \0 .

Evaluating Economic Losses in the Short Run

A firm generating an economic loss faces a tough choice: Should it continue to produce or should it shut down its operation? To make this decision, we need to add another variable to our discussion of economic profits and losses: average variable cost. Variable costs are costs that vary with output—for example, wages, raw material, transportation, and electricity. If a firm cannot generate enough revenues to cover its variable costs, it will have larger losses if it operates than if it shuts down (when losses are equal to fixed costs). That is, the firm will shut down if its total revenue ($p \times q$) is less than its variable costs (VC). If we divide $p \times q$ by q , we get p , and if we divide VC by q we get AVC, so if $p < AVC$, a profit-maximizing firm will shut down. Thus, a firm will not produce at all unless the price is greater than its average variable cost.

Operating at a Loss

At price levels greater than or equal to the average variable cost, a firm may continue to operate in the short run even if its average total cost—variable and fixed costs—is not completely covered. That is, the firm may continue to operate even though it is experiencing an economic loss. Why? Because fixed costs continue whether the firm produces or not; it is better to earn enough to cover a portion of fixed costs than to earn nothing at all.

For example, a restaurant may decide to stay open for lunch even with few customers if its revenues can cover variable costs. Many of a restaurant's costs are fixed—rent, insurance, kitchen appliances, pots, pans, tableware, and so on. These are sunk costs in the short run, so shutting down for lunch would not reduce these costs.

The restaurant's lunch decision hinges on whether or not the revenue from the few lunchtime customers can cover the variable costs like staff and extra food. If the restaurant owner cannot cover the variable costs at lunchtime, she shuts it down for lunch.

Similarly, a grocery store may stay open all night even if it anticipates only a few customers. To the person on the street, this may look unprofitable. However, the relevant question to the store owner is not whether all the costs can be covered, but whether the additional sales from staying open all night cover the variable costs of electricity, staff, and extra food. Many businesses that are “failing” may continue to operate because they can cover their variable costs and at least part of their fixed costs, like rent.

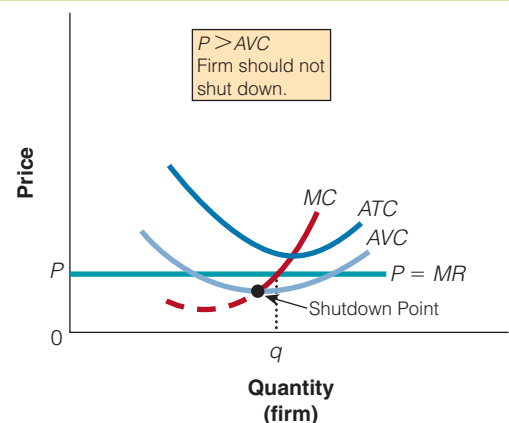
In Exhibit 2, price is less than average total cost but more than average variable cost. In this case, the firm



Why doesn't a firm just shut down whenever it is making economic losses?

section 12.4 exhibit 2

Short-Run Losses: Price Above AVC but Below ATC



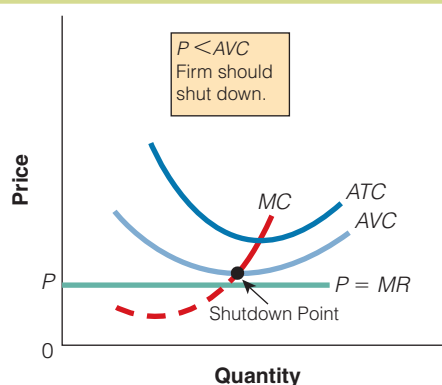
In this case, the firm operates in the short run but incurs a loss because $P < ATC$. Nevertheless, $P > AVC$, and revenues cover variable costs and partially defray fixed costs. This firm will leave the industry in the long run unless prices are expected to rise in the near future; but in the short run, it continues to operate at a loss as long as $P > AVC$, the shutdown point.



Why might a restaurant stay open at lunch even though there are only a few customers?

section 12.4 exhibit 3

Short-Run Losses: Price Below AVC

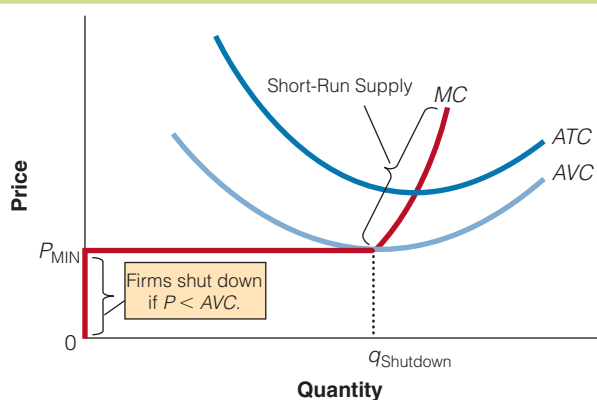


Because its average variable cost exceeds price at all levels of output, this firm would cut its losses by discontinuing production.

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section 12.4 exhibit 4

The Firm's Short-Run Supply Curve



If price is less than average variable cost, the firm's losses would be smaller if it shut down and stopped producing. That is, if $P < AVC$, the firm is better off producing zero output. Hence, the firm's short-run supply curve is the marginal cost curve above average variable cost.



Is the shutdown rule ($P < AVC$) related to a perfectly competitive firm's supply curve?

short-run supply curve
the portion of the MC curve above the AVC curve

produces in the short run, but at a loss. To shut down would make this firm worse off, because it can cover at least *some* of its fixed costs with the excess of revenue over its variable costs.

The Decision to Shut Down

Exhibit 3 illustrates a situation in which the price a firm is able to obtain for its product is below its average variable cost at all ranges of output. In this case, the firm is unable to cover even its variable costs in the short run. Because the firm is losing even more than the fixed costs it would lose if it shut down, it is more logical for the firm to cease operations. Hence, if $P < AVC$, the firm can cut its losses by shutting down.

The Short-Run Supply Curve

As we have just seen, at all prices above the minimum AVC , a firm produces in the short run even if average total cost (ATC) is not completely covered; at all prices below the minimum AVC , the firm shuts down. The firm produces above the minimum AVC even if it is incurring economic losses because it can still earn enough in total revenues to cover all its average variable cost and a portion of its fixed costs, which is better than not producing and earning nothing at all.

In graphical terms, the **short-run supply curve** of an individual competitive seller is identical to the portion of the MC curve that lies above the minimum of the AVC curve. As a cost relation, this curve shows the marginal cost of producing any *given output*; as a supply curve, it shows the *equilibrium output* that the firm will supply at various prices in the short run. The thick line in Exhibit 4 is the firm's supply curve—the portion of MC above its intersection with AVC . The declining portion of the MC curve has no

significance for supply, because if the price falls below the average variable cost, the firm is better off shutting down—producing no output. The shutdown point is at the minimum point on the average variable cost curve where the output level is $q_{\text{Shut Down}}$. Beyond the point of lowest AVC, the marginal costs of successively larger amounts of output are progressively greater, so the firm will supply larger and larger amounts only at higher prices.

Deriving the Short-Run Market Supply Curve

The **short-run market supply curve** is the summation of all the individual firms' supply curves (that is, the portion of the firms' MC above AVC) in the market. Because the short run is too brief for new firms to enter the market, the market supply curve is the summation of *existing* firms. For example, in Exhibit 5, at P_1 , each of the 1,000 identical firms in the industry produces 500 bushels of wheat per day at point a, in Exhibit 5(a); and the quantity supplied in the market is 500,000 bushels of wheat, point A, in Exhibit 5(b). We can again sum horizontally at P_2 ; the quantity supplied for each of the 1,000 identical firms is 800 bushels of wheat per day at point b in Exhibit 5(a), so the quantity supplied for the industry is 800,000 bushels of wheat per day, point B in Exhibit 5(b). Continuing this process gives us the market supply curve for the wheat market. In a market of 1,000 identical wheat farmers, the market supply curve is 1,000 times the quantity supplied by each firm, as long as the price is above AVC.



Because the demand for summer camps will be lower during the off-season, it is likely that revenues may be too low for the camp to cover its variable costs, and the owner will choose to shut down. Remember, the owner will still have to pay the fixed costs: property tax, insurance, the costs associated with the building and land. However, if the camp is not in operation during the off-season, the owner will at least not have to pay the variable costs: salaries for the camp staff, food, and electricity.

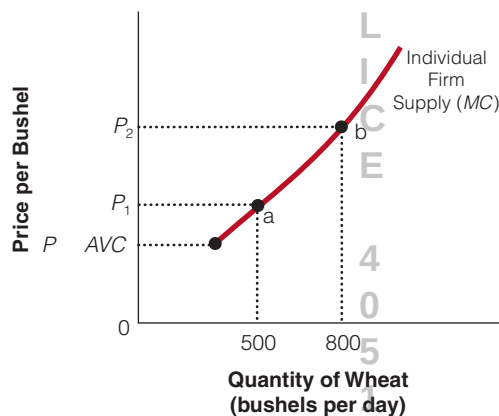
short-run market supply curve

the horizontal summation of the individual firms' supply curves in the market

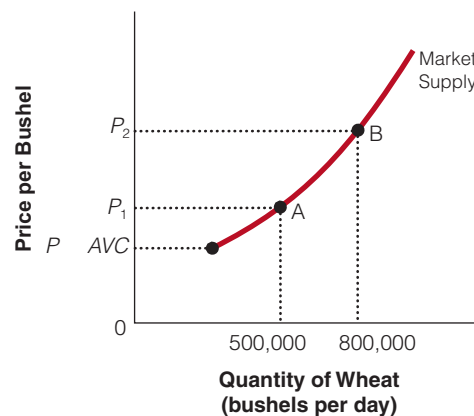
section 12.4 exhibit 5

Deriving the Short-Run Market Supply Curve

a. Individual Firm Supply Curve for Wheat



b. Market Supply Curve for Wheat



The short-run supply curve is the horizontal summation of the individual firms' supply curves (each firm's marginal cost curve above AVC), shown in (a). In a market of 1,000 identical wheat farmers, the market supply curve is 1,000 times the quantity supplied by each firm, shown in (b).

use

what you've learned

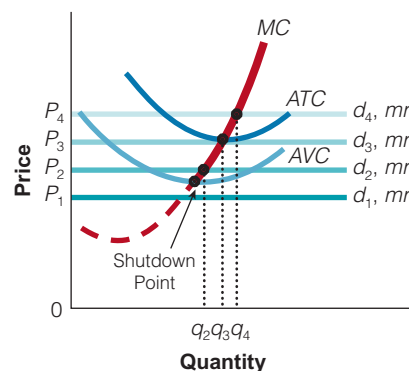
Reviewing the Short-Run Output Decision

Exhibit 6 shows the firm's short-run output at these various market prices: P_1 , P_2 , P_3 , and P_4 .

At the market price of P_1 , the firm would not cover its average variable cost—the firm would produce zero output, because the firm's losses would be smaller if it shut down and stopped producing. At the market price of P_2 , the firm would produce at the loss-minimizing output of q_2 units. It would operate rather than shut down, because it could cover all its average variable costs and some of its fixed costs. At the market price of P_3 , the firm would produce q_3 units of output and make zero economic profit (a normal rate of return). At the market price of P_4 , the firm would produce q_4 units of output and be making short-run economic profits.

section 12.4
exhibit 6

The Short-Run Output Decision



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Evaluating Short-Run Economic Losses

Q Lei-ann is one of many florists in a medium-size urban area. That is, we assume that she works in a market similar to a perfectly competitive market and operates, of course, in the short run. Lei-ann's cost and revenue information is shown in Exhibit 7. Based on this information, what should Lei-ann do in the short run, and why?

A Fixed costs are unavoidable unless the firm goes out of business. Lei-ann really has two decisions in the short run—either to operate or to shut down temporarily. In Exhibit 7, we see that Lei-ann makes \$2,000 a day in total revenue, but her daily costs (fixed and variable) are \$2,500. She has to pay her workers, pay for fresh flowers, and pay for the fuel used by her drivers in picking up and delivering flowers. She must also pay the electricity bill to heat her shop and keep her refrigerators going to protect her flowers. That is, every day, poor Lei-ann is losing \$500; but she still might want to operate the shop despite the loss. Why? Lei-ann's average variable cost (comprising flowers, transportation, fuel, daily wage earners, and so on) amounts to



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If Lei-ann cannot cover her fixed costs, will she continue to operate?

\$1,500 a day; her fixed costs (insurance, property taxes, rent for the building, and refrigerator payments) are \$1,000 a day. Now, if Lei-ann does not operate, she will save on her variable cost—\$1,500 a day—but she will be out the \$2,000 a day she makes in revenue from selling her flowers. Thus, every day she operates, she is better off than if she had not operated at all. That is, if the firm can cover the average variable cost, it is better off operating than

(continued)

use

what you've learned

Evaluating Short-Run Economic Losses (Cont.)

not operating. But suppose Lei-ann's VC were \$2,100 a day. Then Lei-ann should not operate, because every day she does, she is \$100 worse off than if she shut down altogether. In short, a firm will shut down if $TR < VC$ or $(P \times q) < VC$. If we divide both sides by q , the firm will shut down if $P < AVC$ or $(P \times q)/q < VC/q$.

Why does Lei-ann even bother operating if she is making a loss? Perhaps the economy is in a recession and the demand for flowers is temporarily down, but Lei-ann thinks things will pick up again in the next few months. If Lei-ann is right and demand

picks up, her prices and marginal revenue will rise, and she may have a chance to make short-run economic profits.

section 12.4 exhibit 7

Lei-ann's Daily Revenue and Cost Schedule

Total Revenue	\$2,000
Total Costs	2,500
Variable Costs	1,500
Fixed Costs	1,000

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SECTION QUIZ

- If a perfectly competitive firm's marginal revenue exceeded its marginal cost,
 - it would cut its price in order to sell more output and increase its profits.
 - it would expand its output but not cut its price in order to increase its profits.
 - it is currently earning economic profits.
 - both (a) and (c) are true.
 - both (b) and (c) are true.
- A perfectly competitive firm maximizes its profit at an output in which
 - total revenue exceeds total cost by the greatest dollar amount.
 - marginal cost equals the price.
 - marginal cost equals marginal revenue.
 - all of the above are true.
- In perfect competition, at a firm's short-run profit-maximizing (or loss minimizing) output,
 - its marginal revenue equals zero.
 - its price could be greater or less than average cost.
 - its marginal revenue will be falling.
 - both (b) and (c) will be true.
- The minimum price at which a firm would produce in the short run is the point at which
 - price equals the minimum point on its marginal cost curve.
 - price equals the minimum point on its average variable cost curve.
 - price equals the minimum point on its average total cost curve.
 - price equals the minimum point on its average fixed cost curve.

(continued)

SECTION QUIZ (Cont.)



5. A profit-maximizing perfectly competitive firm would never knowingly operate at an output level at which
 - a. it would lose more than its total fixed costs.
 - b. it was not earning a positive economic profit.
 - c. it was not earning a zero economic profit.
 - d. it was not earning an accounting profit.
6. If a perfectly competitive firm finds that price is greater than AVC but less than ATC at the quantity where its marginal cost equals the market price,
 - a. the firm will produce in the short run but may eventually go out of business.
 - b. the firm will produce in the short run, and new entrants will tend to enter the industry over time.
 - c. the firm will immediately shut down.
 - d. the firm will be earning economic profits.
 - e. both b and d are true.
7. The short-run supply curve of a perfectly competitive firm is
 - a. its MC curve.
 - b. its MC curve above the minimum point of AVC .
 - c. its MC curve above the minimum point of ATC .
 - d. none of the above.

1. How is the profit-maximizing output quantity determined?
2. How do we determine total revenue and total cost for the profit-maximizing output quantity?
3. If a profit-maximizing, perfectly competitive firm is earning a profit because total revenue exceeds total cost, why must the market price exceed average total cost?
4. If a profit-maximizing, perfectly competitive firm is earning a loss because total revenue is less than total cost, why must the market price be less than average total cost?
5. If a profit-maximizing, perfectly competitive firm is earning zero economic profits because total revenue equals total cost, why must the market price be equal to the average total cost for that level of output?
6. Why would a profit-maximizing, perfectly competitive firm shut down rather than operate if price was less than its average variable cost?
7. Why would a profit-maximizing, perfectly competitive firm continue to operate for a period of time if price was greater than average variable cost but less than average total cost?

Answers: 1. b 2. d 3. b 4. b 5. a 6. a 7. b

12.5

Long-Run Equilibrium

📁 When an industry is earning profits, will it encourage the entry of new firms?

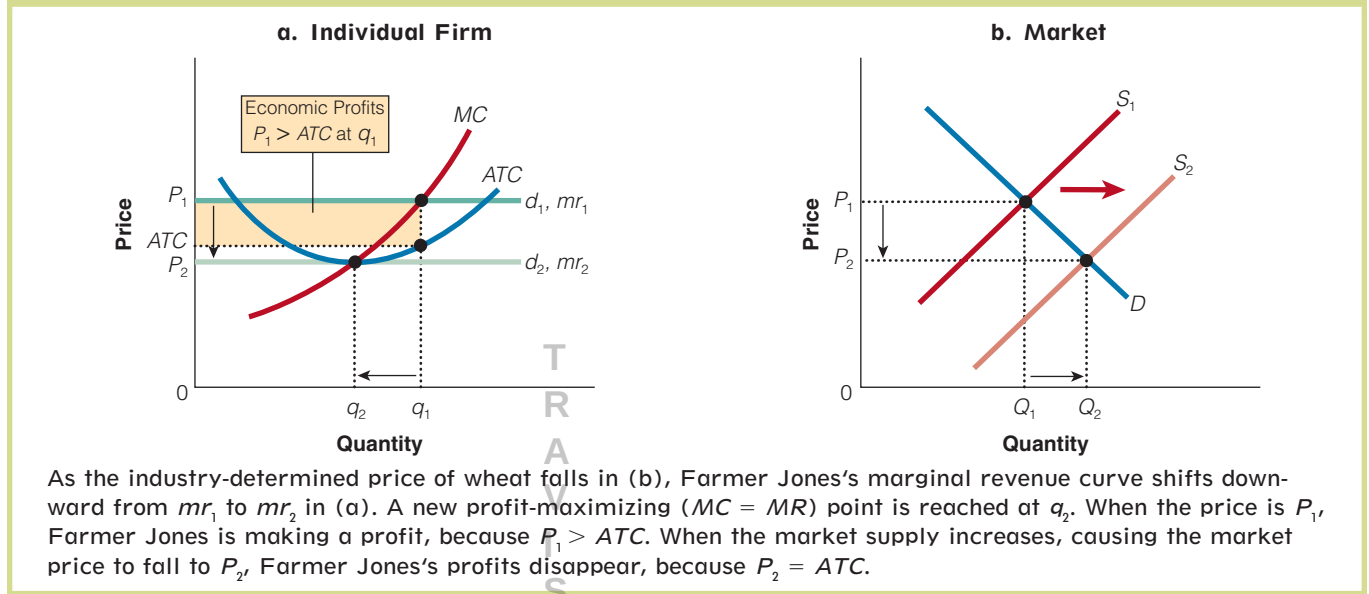
📁 Why do perfectly competitive firms make zero economic profits in the long run?



Do economic profits and losses provide incentives for perfectly competitive firms to enter or exit?

Economic Profits and Losses Disappear in the Long Run

If farmers are able to make economic profits producing wheat, what will their response be in the long run? Farmers will increase the resources that they devote to the lucrative business of producing wheat. Suppose Farmer Jones is making an economic profit (he is

section 12.5
exhibit 1
Profits Disappear with Entry


earning an above-normal rate of return) producing wheat. To make even more profits, he may take land out of producing other crops and plant more wheat. Other farmers or people who are holding land for speculative purposes may also decide to plant wheat on their land.

As word gets out that wheat production is proving profitable, it will cause a supply response—the market supply curve will shift to the right as more firms enter the industry and existing firms expand, as shown in Exhibit 1(b). With this shift, the quantity of wheat supplied at any given price is greater than before. It may take a year or even longer, of course, for the complete supply response to take place, simply because it takes some time for information on profit opportunities to spread and still more time to plant, grow, and harvest the wheat. Note that the effect of increasing supply, other things being equal, is a reduction in the equilibrium price of wheat.

Suppose that, as a result of the supply response, the price of wheat falls from P_1 to P_2 . The impact of the change in the market price of wheat, over which Farmer Jones has absolutely no control, is simple. If his costs don't change, he moves from making a profit ($P_1 > ATC$) to zero economic profits ($P_2 = ATC$), as shown in Exhibit 1(a). In long-run equilibrium, perfectly competitive firms make zero economic profits. Remember, a zero economic profit means that the firm actually earns a normal return on the use of its capital. Zero economic profit is an equilibrium or stable situation because any positive economic (above-normal) profit signals resources into the industry, beating down prices and therefore revenues to the firm.

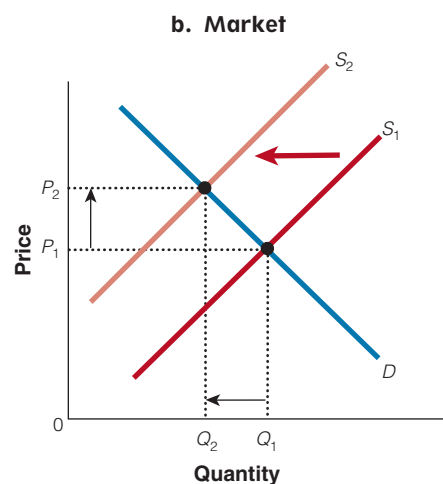
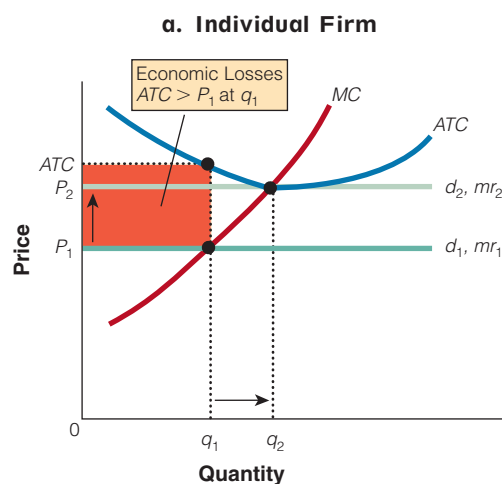
Any economic losses signal resources to leave the industry, causing supply reductions that lead to increased prices and higher firm revenues for the remaining firms. For example, in Exhibit 2 we see a firm that continues to operate despite its losses—ATC is greater than P_1 at q_1 . With losses, however, some firms will exit the industry, causing the market supply curve to shift from S_1 to S_2 and driving up the market price to P_2 . This price increase reduces the losses for the firms remaining in the industry, until the losses are completely eliminated at P_2 . The remaining firms will maximize profits by producing at q_2 .



In the late 1990s, when organic food was in its infancy, an organic apple grower could sell apples at a much higher price than regular apples. A price that covered more than its cost of production—an economic profit. Today, there are many more organic farmers, increasing market supply and decreasing the market price and moving firms toward zero economic profits—normal rate of return.

section 12.5
exhibit 2

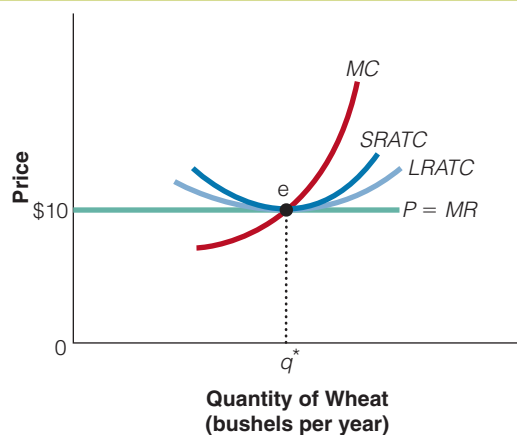
Losses Disappear with Exit



When firms in the industry suffer losses, some firms will exit in the long run, shifting the market supply curve to the left from S_1 to S_2 . This shift causes market price to rise from P_1 to P_2 and market output to fall from Q_1 to Q_2 . When the price is P_1 , the firm is incurring a loss, because ATC is greater than P_1 at q_1 . When the market supply decreases from S_1 to S_2 , it causes the market price to rise and the firm's losses disappear, because $P_2 = ATC$.

section 12.5
exhibit 3

The Long-Run Competitive Equilibrium



In the long run in perfect competition, a stable situation or equilibrium is achieved when economic profits are zero. In this case, at the profit-maximizing point where $MC = MR$, short-run and long-run average total costs are equal. Industry wide supply shifts would change prices and average revenue, wiping out any losses or profits that develop in the short run and leading to the situation depicted in the exhibit.

units of output, where profits and losses are zero. Only at zero economic profits is there no tendency for firms to either enter or leave the industry.

The Long-Run Equilibrium for the Competitive Firm

The long-run competitive equilibrium for a perfectly competitive firm is illustrated graphically in Exhibit 3. At the equilibrium point, e (where $MC = MR$), short-run and long-run average total costs are also equal. The average total cost curves touch the marginal cost and marginal revenue (demand) curves at the equilibrium output point. Because the marginal revenue curve is also the average revenue curve, average revenue and average total cost are equal at the equilibrium point. The long-run equilibrium in perfect competition depicted in Exhibit 3 has an interesting feature. Note that the equilibrium output occurs at the lowest point on the average total cost curve. As you may recall, this occurs because the marginal cost curve must intersect the average total cost curve at the latter curve's lowest point. Hence, the equilibrium condition in the long run in perfect competition is for each firm to produce at the output that minimizes average total cost. At this long-run equilibrium, all firms in the industry earn zero economic

profit; consequently, new firms have no incentive to enter the market, and existing firms have no incentive to exit the market.

SECTION QUIZ



1. The entry of new firms into an industry will likely
 - a. shift the industry supply curve to the right.
 - b. cause the market price to fall.
 - c. reduce the profits of existing firms in the industry.
 - d. do all of the above.
2. In long-run equilibrium under perfect competition, price does not equal which of the following?
 - a. long-run marginal cost
 - b. minimum average total cost
 - c. average fixed cost
 - d. marginal revenue
 - e. average revenue
3. Which of the following is true?
 - a. Economic profits encourage the entry of new firms, which shift the market supply curve to the right.
 - b. Any positive economic profits signal resources into the industry, driving down prices and revenues to the firm.
 - c. Any economic losses signal resources to leave the industry, leading to supply reduction, higher prices, and increased revenues.
 - d. Only at zero economic profits is there no tendency for firms to either enter or exit the industry.
 - e. All of the above are true.
4. The exit of firms from an unprofitable industry
 - a. will shift the market supply curve left.
 - b. will cause the market price to rise.
 - c. will increase the economic profits of the firms that remain.
 - d. will do all of the above.
5. In long-run equilibrium, firms make zero _____ profits, earning a _____ rate of return.
 - a. economic; normal
 - b. economic; zero
 - c. accounting; normal
 - d. accounting; zero

-
1. Why do firms enter profitable industries?
 2. Why does entry eliminate positive economic profits in a perfectly competitive industry?
 3. Why do firms exit unprofitable industries?
 4. Why does exit eliminate economic losses in a perfectly competitive industry?
 5. Why is a situation of zero economic profits a stable long-run equilibrium situation for a perfectly competitive industry?

Answers: 1. d 2. c 3. e 4. d 5. a

12.6

Long-Run Supply

What are constant-cost industries?

What is productive efficiency?

What are increasing-cost industries?

What is allocative efficiency?

What are decreasing-cost industries?

The preceding sections considered the costs for an individual, perfectly competitive firm as it varies output, on the assumption that the prices it pays for inputs (costs) are given. However, when the output of an entire industry changes, the likelihood is greater that changes in costs will occur. How will the changes in the number of firms in an industry affect the input costs of individual firms? In this section, we develop the long-run supply (LRS) curve. As we will see, the shape of the long-run supply curve depends on the extent to which input costs change with the entry or exit of firms in the industry. We will look at three possible types of industries, when considering long-run supply: constant-cost industries, increasing-cost industries, and decreasing-cost industries.

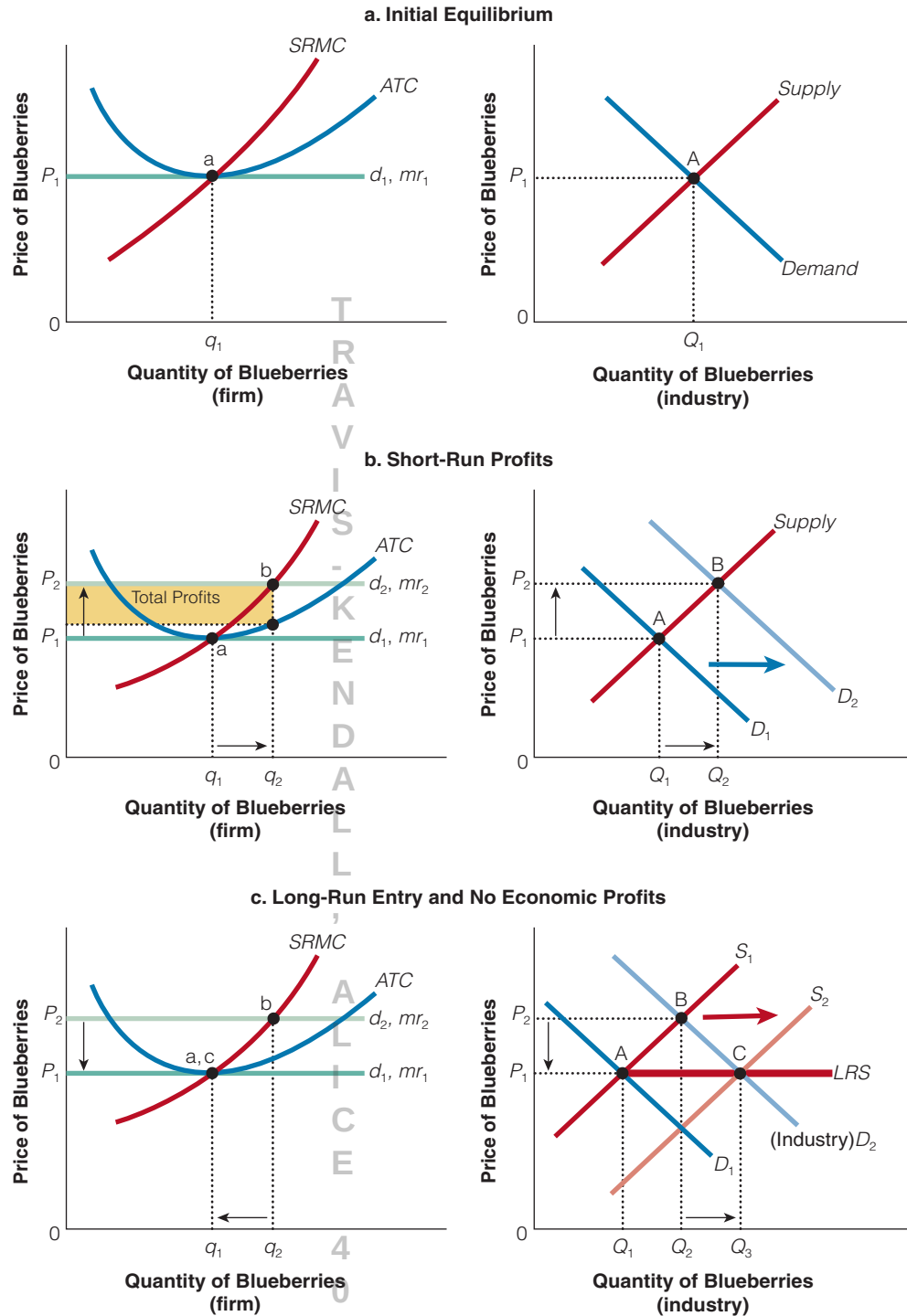
A Constant-Cost Industry

constant-cost industry
an industry where input prices (and cost curves) do not change as industry output changes

In a **constant-cost industry**, the prices of inputs do not change as output is expanded. The industry may not use inputs in sufficient quantities to affect input prices. For example, say the firms in the industry use a lot of unskilled labor, but the industry is small. Therefore, as output expands, the increase in demand for unskilled labor will not cause the market wage for unskilled labor to rise. Similarly, suppose a paper clip maker decides to double its output. It is highly unlikely that its demand for steel will have an impact on steel prices, because its demand for the input is so small.

Once long-run adjustments are complete, by necessity each firm operates at the point of lowest long-run average total cost, because supply shifts with entry and exit, eliminating profits. Therefore, each firm supplies the market with the quantity of output that it can produce at the lowest possible long-run average total cost.

In Exhibit 1, we can see the impact of an unexpected increase in market demand. Suppose that recent reports show that blueberries can lower cholesterol, lower blood pressure, and significantly reduce the risk of all cancers. The increase in market demand for blueberries leads to a price increase from P_1 to P_2 as the firm increases output from q_1 to q_2 , and blueberry industry output increases from Q_1 to Q_2 , as seen in Exhibit 1(b). The increase in market demand generates a higher price and positive profits for existing firms in the short run. The existence of economic profits will attract new firms into the industry, causing the short-run supply curve to shift from S_1 to S_2 and lowering price until excess profits are zero. This shift results in a new equilibrium, point C in Exhibit 1(c). Because the industry is one with constant costs, industry expansion does not alter firms' cost curves, and the industry long-run supply curve is horizontal. That is, the long-run equilibrium price is at the same level that prevailed before demand increased; the only long-run effect of the increase in demand is an increase in industry output, as more firms enter that are just like existing firms [shown in Exhibit 1(c)]. The long-run supply curve is horizontal when the market has free entry and exit, there are a large number of firms with identical costs and input prices are constant. Because these strong assumptions do not generally hold, we will now discuss when the long-run supply curve has a positive or negative slope. Studies have shown that retail trade may fall into the category of a constant-cost industry, because output can be expanded or contracted without a noticeable impact on input prices. The same may be true of the banking industry.

section 12.6
exhibit 1
Demand Increase in a Constant-Cost Industry


An unexpected increase in market demand for blueberries leads to an increase in the market price in (b). The new market price leads to positive profits for existing firms, which attracts new firms into the industry, shifting market supply from S_1 to S_2 in (c). This increased short-run industry supply curve intersects D_2 at point C. Each firm (of a new, larger number of firms) is again producing at q_1 and earning zero economic profits.

An Increasing-Cost Industry

increasing-cost industry
an industry where input prices rise (and cost curves rise) as industry output rises

In an **increasing-cost industry**, a more common scenario, the cost curves of individual firms rise as the total output of the industry increases. Increases in input prices (upward shifts in cost curves) occur as larger quantities of factors are employed in the industry. When an industry utilizes a large portion of an input, input prices will rise when the industry uses more of the input.

Increasing cost conditions are typical of “extractive” industries, such as agriculture, fishing, mining, and lumbering, which utilize large portions of the total supply of specialized natural resources such as land or mineral deposits. As the output of such an industry expands, the increased demand for the resources raises the prices that must be paid for their use. Because additional resources of giving quality cannot be produced, greater supplies can be obtained (if at all) only by luring them away from other industries, or by using lower-quality (and less-productive, thus higher-cost) resources.

Wheat production is a typical example of an increasing-cost industry. As the output of wheat increases, the demand for land suitable for the production of wheat rises, and thus the price paid for the use of land of any given quality increases.

If there were a construction boom in a fully employed economy, would it be more costly to get additional resources like skilled workers and raw materials? Yes, if this is an increasing-cost industry, the industry can only produce more output if it gets a higher price because

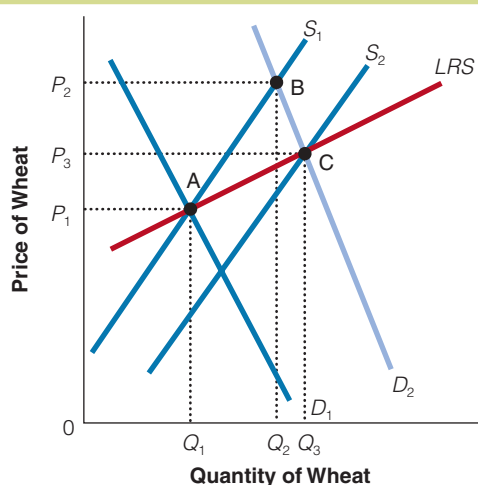
the firm’s costs of production rise as output expands. As new firms enter and output expands, the increase in demand for inputs causes the price of inputs to rise—the cost curves of all construction firms shift upward as the industry expands. Or consider a downtown building boom where the supply of workers who are willing to work on tall skyscrapers is very inelastic; a very steep supply of labor curve. The high demand for these few workers causes their wages to rise sharply and the cost of skyscrapers to rise. The industry can produce more output but only at a higher price, enough to compensate the firm for the higher input costs. In an increasing-cost industry, the long-run supply curve is upward sloping.

For example, in Exhibit 2, we see that an unexpected increase in the market demand for wheat will shift the market demand curve from D_1 to D_2 . Consequently, price will increase from P_1 to P_2 in the short run and the industry output increases from Q_1 to Q_2 . The typical firm (farm) will have positive short-run profits and expand output. With the presence of short-run economic profits, new firms will enter the industry, shifting the short-run market supply curve to the right from S_1 to S_2 . The prices of inputs, like farm land, fertilizer, seed, farm machinery, and so on, will be bid up by competing farmers, causing the firm’s marginal and long-run average cost curves to rise. The cost increases mean that the market supply curve shifts right less than it would in a constant-cost industry. This leads to an upward-sloping long-run industry supply curve, as seen in Exhibit 2.

Another example is provided by the airlines. Growth in the airline industry results in more congestion of airports and airspace. That is, as the output of the airline industry increases, the firm’s cost increases, *ceteris paribus*. This situation of an upward-sloping long-run industry supply curve is what economists call *external diseconomies of scale*—factors that are beyond the firm’s control (that is, external) raise the

section 12.6 exhibit 2

Increasing-Cost Industry



The unexpected increase in demand for wheat shifts the demand curve from D_1 to D_2 . The increase in demand leads to higher prices from P_1 to P_2 . The short-run economic profits induce other firms to enter the industry. This causes the short-run supply curve to shift right, from S_1 to S_2 . As new firms enter and output expands, the increase in demand for inputs causes the price of inputs to rise, leading to higher cost curves for the firm. This means the supply curve does not shift rightward as much as in the constant-cost industry. The new long-run equilibrium is at P_3 and Q_3 . The LRS is positively sloped. This means the industry must receive a higher market price to produce more output, Q_3 , because the increased output causes input prices to rise.

firm's costs as industry output expands. In contrast, recall the discussion of diseconomies of scale in the last chapter where the costs were internal to the firm—increased costs due to managing a larger firm.

A Decreasing-Cost Industry

It is also possible that an expansion in the output of an industry can lead to a reduction in input costs and shift the MC and ATC curves downward, and the market price falls because of *external economies of scale*. We use the term *external* because the cost decreases are external to the firm; no one firm can gain by its own expansion. That is, the gains occurs when the total industry's output expands. The new long-run market equilibrium has more output at a lower price—that is, the long-run supply curve for a **decreasing-cost industry** is downward sloping (not shown).

decreasing-cost industry
an industry where input prices fall (and cost curves fall) as industry output rises

Consider a new mining region, developed in an area remote from railroad facilities back in the days before motor vehicles. So long as the total output of the mines were small, the ore was hauled by wagon, an extremely expensive form of transportation. But when the number of mines increased, and the total output of the region rose substantially, it became feasible to construct a railroad to serve the area. The railroad lowered transportation costs and reduced the costs of all firms in the industry. As a practical matter, decreasing-cost industries are rarely encountered, at least over a large range of output. However, some industries may operate under decreasing-cost conditions in the short intervals of output expansion when continued growth makes possible the supply of materials or services at reduced cost. A larger industry might benefit from improved transportation or financial services, for example.

This situation might occur in the computer industry. The firms in the industry may be able to acquire computer chips at a lower price as the industry's demand for computer chips rises. Why? Perhaps it is because the computer chip industry can employ cost-saving techniques that become more economical at higher levels of output. That is, the marginal and average costs of the firm fall as input prices fall because of expanded output in the industry.

Perfect Competition and Economic Efficiency

In this chapter, we have seen that a firm in a perfectly competitive market produces at the minimum point of the ATC curve in the long run and charges a price equal to that cost. Because competitive firms are producing using the least-cost method, the minimum value of resources is being used to produce a given level of output. This leads to lower product prices for consumers. In short, **productive efficiency** requires that firms produce goods and services in the least costly way, where $P = \text{Minimum } ATC$, as seen in Exhibit 3 in section 12.5 on page 340. However, productive efficiency alone does not guarantee that markets are operating efficiently—society must also produce the goods and services that society wants most. This leads us to what economists call allocative efficiency.

productive efficiency
where a good or service is produced at the lowest possible cost

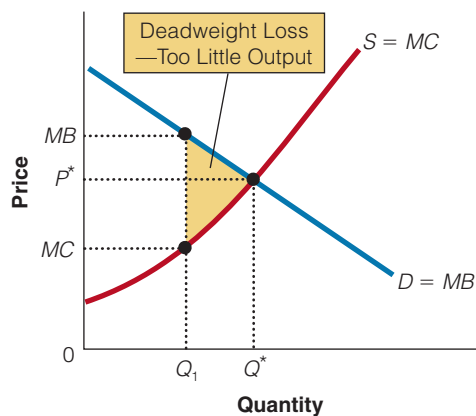
We say that the output that results from equilibrium conditions of market demand and market supply in perfectly competitive markets achieve an efficient allocation of resources.

At the intersection of market supply and market demand, we find the competitive equilibrium price, P^* , and the competitive equilibrium output, Q^* . In competitive markets, market supply equals market demand, and $P = MC$. When $P = MC$, buyers value the last unit of output by the same amount that it cost sellers to produce it. If buyers value the last unit by more than the marginal cost of production, resources are not being allocated efficiently, as at Q_1 in Exhibit 3(a). Think of the demand curve as the marginal benefit curve ($D = MB$) and the supply curve as the marginal cost curve ($S = MC$). According to the rule of rational choice, we should pursue an activity as long as the expected marginal benefits are greater than the expected marginal costs. For example, in Exhibit 3(a), if Q_1 is produced, then the marginal benefits from producing additional units are greater than the marginal costs. The

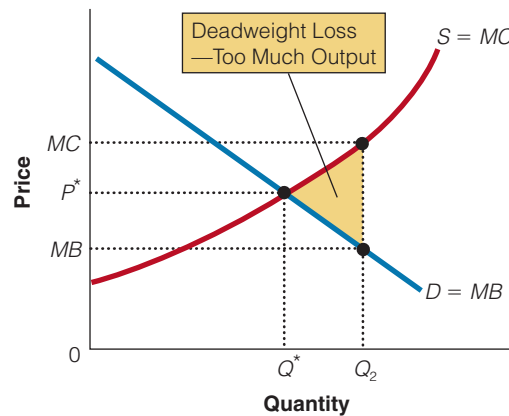
section 12.6
 exhibit 3

Allocative Efficiency and Perfect Competition

a. Producing Less Than the Competitive Level of Output Lowers Welfare



b. Producing More Than the Competitive Level of Output Lowers Welfare



The demand curve measures the marginal benefits to the consumer and the supply curve measures the marginal cost to the sellers. At P^* and Q^* , resources are being allocated efficiently—the marginal benefits of these resources are equal to the marginal cost of these resources. If Q_1 is produced, then the marginal benefits from producing additional units are greater than the marginal costs. Society gains from expanding output up to the point where $MB = MC$ at Q^* . If output is expanded beyond Q^* ($MC > MB$) society gains from a reduction in output back to Q^* .



What is the difference between productive efficiency and allocative efficiency?

allocative efficiency

where $P = MC$ and production will be allocated to reflect consumer preferences

shaded area is deadweight loss. That is, at Q_1 , resources are not being allocated efficiently, and output should be expanded.

We can also produce too much output. For example, if output is expanded beyond Q^* in Exhibit 3(b), the cost to sellers for producing the good is greater than the marginal benefit to consumers. The shaded area is deadweight loss. Society would gain from a reduction in output back to Q^* . Once the competitive equilibrium is reached, the buyers' marginal benefit equals the sellers' marginal cost. That is, in a competitive market, producers efficiently use their scarce resources (labor, machinery, and other inputs) to produce what consumers want. In this sense, perfect competition achieves **allocative efficiency**.

? SECTION QUIZ

- If the domino-making industry is a constant-cost industry, one would expect the long-run result of an increase in demand for dominos to include
 - a greater number of firms and a higher price.
 - a greater number of firms and the same price.
 - the same number of firms and a higher price.
 - the same number of firms and the same price.
- In an increasing-cost industry, an unexpected increase in demand would lead to what result in the long run?
 - higher costs and a higher price
 - higher costs and a lower price
 - no change in costs or prices
 - impossible to determine from the information given



(continued)

SECTION QUIZ (Cont.)



3. Which of the following is true?
 - a. In constant-cost industries, the cost curves of the firm are not affected by changes in the output of the entire industry.
 - b. In an increasing-cost industry, the cost curves of the individual firms rise as total output increases.
 - c. A decreasing-cost industry has a downward-sloping long-run supply curve; firms experience lower cost as industry expands.
 - d. All of the above are true.
4. Which of the following is true?
 - a. Productive efficiency occurs in perfect competition because the firm produces at the minimum of the ATC curve.
 - b. Allocative efficiency occurs when $P = MC$; production is allocated to reflect consumers' want.
 - c. Both (a) and (b) are true.
 - d. None of the above is true.
5. In an increasing-cost industry, an increase in industry demand would lead to _____ number of firms and _____ firms' average cost curves in the long run.
 - a. no change in the; no change in
 - b. no change in the; an upward shift in
 - c. an increase in the; no change in
 - d. an increase in the; an upward shift in the

-
1. What must be true about input costs as industry output expands for a constant-cost industry?
 2. What must be true about input costs as industry output expands for an increasing-cost industry?
 3. What would be the long-run equilibrium result of an increase in demand in a constant-cost industry?
 4. What would be the long-run equilibrium result of an increase in demand in an increasing-cost industry?

Answers: 1. b 2. a 3. d 4. c 5. d

Interactive Summary

Fill in the blanks:

1. Perfect competition is a market structure involving a(n) _____ number of buyers and sellers, a(n) _____ product, and _____ market entry and exit.
2. Perfectly competitive firms are _____, who must accept the market price as determined by the forces of demand and supply.
3. Because perfectly competitive markets have _____ buyers and sellers, each firm is so _____ in relation to the industry that its production decisions have no impact on the market.
4. Because consumers believe that all firms in a perfectly competitive market sell _____ products, the products of all the firms are perfect substitutes.
5. Because of _____ market entry and exit, perfectly competitive markets generally consist of a(n) _____ number of small suppliers.
6. In a perfectly competitive industry, each producer provides such a(n) _____ fraction of the total supply that a change in the amount he or she offers does not have a noticeable effect on the market price.
7. Because perfectly competitive sellers can sell all they want at the market price, their demand curve is _____ at the market price over the _____ range of output that they could possibly produce.
8. The objective of a firm is to maximize profits by producing the amount that maximizes the difference between its _____ and _____.

9. Total revenue for a perfectly competitive firm equals the _____ times the _____.
10. _____ equals total revenue divided by the number of units of the product sold.
11. _____ is the additional revenue derived from the sale of one more unit of the good.
12. In perfect competition, we know that _____ and price are equal.
13. In all types of market environments, firms will maximize profits at that output which maximizes the difference between _____ and _____, which is the same output level where _____ equals _____.
14. At the level of output chosen by a competitive firm, total cost equals _____ times quantity, while total revenue equals _____ times quantity.
15. If total revenue is greater than total costs at its profit-maximizing output level, a firm is generating _____. If total revenue is less than total costs, the firm is generating _____. If total revenue equals total costs, the firm is earning _____.
16. If a firm cannot generate enough revenues to cover its _____ costs, then it will have larger losses if it operates than if it shuts down in the short run.
17. The loss a firm would bear if it shuts down would be equal to _____.
18. When price is less than _____ but more than _____, a firm produces in the short run, but at a loss.
19. The short-run supply curve of an individual competitive seller is identical with that portion of the _____ curve that lies above the minimum of the _____ curve.
20. The short-run market supply curve is the horizontal summation of the individual firms' supply curves, providing that _____ are not affected by increased production by existing firms.
21. If perfectly competitive producers are currently making economic profits, the market supply curve will shift to the right over time as more firms _____ and existing firms _____.
22. As entry into a profitable industry pushes down the market price, producers will move from a situation where price _____ average total cost to one where price _____ average total cost.
23. Only at _____ is the tendency for firms either to enter or leave the business eliminated.
24. The long-run equilibrium output in perfect competition occurs at the lowest point on the average total cost curve, so the equilibrium condition in the long run in perfect competition is for firms to produce at that output that minimizes the _____.
25. The shape of the long-run supply curve depends on the extent to which _____ change with the entry or exit of firms in the industry.
26. In a constant-cost industry, the prices of inputs _____ as output is expanded.
27. In an increasing-cost industry, the cost curves of the individual firms _____ as the total output of the industry increases.
28. There is a(n) _____ efficiency in perfect competition because the firm produces at the minimum of the ATC curve.
29. There is _____ efficiency in perfect competition because $P = MC$ and production is allocated to reflect consumers' wants.
30. Once the competitive equilibrium is reached, the buyers' _____ equals the sellers' _____.

Answers: 1. large; homogeneous (standardized); easy 2. price takers 3. many; small 4. identical (homogeneous) 5. easy; large 6. small 7. horizontal; entire 8. total revenues; total costs 9. market price; quantity of units sold 10. Average revenue 11. Marginal revenue 12. marginal revenue 13. total revenue; total costs; marginal revenue; marginal costs 14. average total cost; the market price 15. economic profits; economic losses; zero economic profits 16. variable 17. fixed costs 18. average total costs; average variable costs 19. marginal cost; average variable cost 20. input prices 21. enter the industry; expand 22. exceeds; equals 23. zero economic profits 24. average total cost curve 25. input costs 26. do not change 27. rise 28. productive 29. allocative 30. marginal benefit; marginal cost

Key Terms and Concepts

total revenue (TR) 328

average revenue (AR) 328

marginal revenue (MR) 328

profit-maximizing level of output 330

short-run supply curve 334

short-run market supply curve 335

constant-cost industry 342

increasing-cost industry 344

decreasing-cost industry 345

productive efficiency 345

allocative efficiency 346

Section Quiz Answers

12.1 A Perfectly Competitive Market

1. Why do firms in perfectly competitive markets involve homogeneous goods?

For there to be a large number of sellers of a particular good, so that no seller can appreciably affect the market price (i.e., sellers are price takers), the goods in question must be the same, or homogeneous.

2. Why does the absence of significant barriers to entry tend to result in a large number of suppliers?

With no significant barriers to entry, it is fairly easy for entrepreneurs to become suppliers of a product. With such easy entry, as long as an industry is profitable it will attract new suppliers, typically resulting in large numbers of sellers.

3. Why does the fact that perfectly competitive firms are small relative to the market make them price takers?

If a perfectly competitive firm sells only a small amount relative to the total market supply, even sharply reducing its output will make virtually no difference in the market quantity supplied; therefore, it will make virtually no difference in the market price. In this case, a firm is able to sell all it wants at the market equilibrium price but is unable to appreciably affect that price; therefore, it takes the market equilibrium price as given—that is, it is a price taker.

12.2 An Individual Price Taker's Demand Curve

1. Why would a perfectly competitive firm not try to raise or lower its price?

A perfectly competitive firm is able to sell all it wants at the market equilibrium price. Therefore, it has no incentive to lower prices (sacrificing revenues and therefore profits) in an attempt to increase sales. Because other firms are willing to sell perfect substitutes for each other's product (because goods are homogeneous) at the market equilibrium price, trying to raise the price would lead to the firm losing all its sales. Therefore, it has no incentive to try to raise its price, either.

2. Why can we represent the demand curve of a perfectly competitive firm as perfectly elastic (horizontal) at the market price?

If a perfectly competitive firm can sell all it would like at the market equilibrium price, the demand

curve it faces for its output is perfectly elastic (horizontal) at that market equilibrium price.

3. How does an individual perfectly competitive firm's demand curve change when the market price changes?

If a perfectly competitive firm can sell all it would like at the market equilibrium price, it faces a perfectly elastic demand curve at the market equilibrium price. Therefore, anything that changes the market equilibrium price (any of the market demand curve shifters or the market supply curve shifters) will change the price at which each perfectly competitive firm's demand curve is perfectly elastic (horizontal).

4. If the marginal cost facing every producer of a product shifted upward, would the position of a perfectly competitive firm's demand curve be likely to change as a result? Why or why not?

Yes. If the marginal cost curves facing each producer shifted upward, a decrease (leftward shift) would occur in the industry supply curve. This shift would result in a higher market price that each producer takes as given, which would shift each producer's horizontal demand curve upward to that new market price.

12.3 Profit Maximization

1. How is total revenue calculated?

Total revenue is equal to the price times the quantity sold. However, because the quantity sold at that price must equal the quantity demanded at that price (to sell a product you need a willing buyer), it can also be described as price times quantity demanded at that price.

2. How is average revenue derived from total revenue?

Average or per-unit revenue for a given quantity of output is just the total revenue from that quantity of sales divided by the quantity sold.

3. How is marginal revenue derived from total revenue?

Marginal revenue is the change in total revenue from the sale of one more unit of output. It can be either positive (total revenue increases with output) or negative (total revenue decreases with output).

4. Why is marginal revenue equal to price for a perfectly competitive firm?

If a perfectly competitive seller can sell all it would like at the market equilibrium price, it can sell one more

unit at that price without having to lower its price on the other units it sells (which would require sacrificing revenues from those sales). Therefore, its marginal revenue from selling one more unit equals the market equilibrium price, and its horizontal demand curve therefore is the same as its horizontal marginal revenue curve.

12.4 Short-Run Profits and Losses

1. How is the profit-maximizing output quantity determined?

The profit-maximizing output is the output where marginal revenue equals marginal cost (because profits increase for every unit of output for which marginal revenue exceeds marginal cost).

2. How do we determine total revenue and total cost for the profit-maximizing output quantity?

At the profit-maximizing quantity, total revenue is equal to average revenue (price) times quantity (because average revenue is total revenue divided by quantity), and total cost is equal to average cost times quantity (because average cost equals total cost divided by quantity).

3. If a profit-maximizing, perfectly competitive firm is earning a profit because total revenue exceeds total cost, why must the market price exceed average total cost?

If total revenue exceeds total cost, total revenue divided by the quantity of output, which is average revenue or price, must also exceed total cost divided by the same quantity of output, which is average total cost, for that level of output.

4. If a profit-maximizing, perfectly competitive firm is earning a loss because total revenue is less than total cost, why must the market price be less than average total cost?

If total revenue is less than total cost, total revenue divided by the quantity of output, which is average revenue or price, must also be less than total cost divided by the same quantity of output, which is average total cost, for that level of output.

5. If a profit-maximizing, perfectly competitive firm is earning zero economic profits because total revenue equals total cost, why must the market price be equal to the average total cost for that level of output?

If total revenue equals total cost, total revenue divided by the quantity of output, which is average revenue or price, must also be equal to total cost divided by the same quantity of output, which is average total cost, for that level of output.

6. Why would a profit-maximizing, perfectly competitive firm shut down rather than operate if price was less than its average variable cost?

If a firm shuts down, its losses will equal its fixed costs (because it has no revenue or variable costs). If a firm operates, and revenues exactly cover variable costs, it will also suffer losses equal to fixed costs. But if a firm cannot cover even all its variable costs with its revenues, it will lose its fixed costs plus part of its variable costs. But because these losses are greater than the losses from shutting down, a firm would choose to shut down rather than continue to operate in this situation.

7. Why would a profit-maximizing, perfectly competitive firm continue to operate for a period of time if price was greater than average variable cost but less than average total cost?

If price was greater than average variable cost but less than average total cost, a firm would be earning losses and would eventually go out of business if that situation continued. However, in the short run, as long as revenues more than covered variable costs, losses from operating would be less than the losses from shutting down (these losses equal total fixed cost), as at least part of fixed costs would be covered by revenues; so a firm would continue to operate in the short run in this situation.

12.5 Long-Run Equilibrium

1. Why do firms enter profitable industries?

Profitable industries generate a higher rate of return to productive assets than other industries. Therefore, firms will enter such industries in their search for more profitable uses for their assets.

2. Why does entry eliminate positive economic profits in a perfectly competitive industry?

Entry eliminates positive economic profits (above-normal rates of return) in a perfectly competitive industry because entry will continue as long as economic profits remain positive (rates of return are higher than in other industries), that is, until no more positive economic profits can be earned.

3. Why do firms exit unprofitable industries?

Unprofitable industries generate lower rates of return to productive assets than other industries. Therefore, firms will exit such industries in their search for more profitable uses for their assets elsewhere.

4. Why does exit eliminate economic losses in a perfectly competitive industry?

Exit eliminates negative economic profits (below-normal rates of return) in a perfectly competitive

industry because exit will continue as long as economic profits remain negative (rates of return are lower than in other industries); that is, until no firms are experiencing economic losses.

5. Why is a situation of zero economic profits a stable long-run equilibrium situation for a perfectly competitive industry?

A situation of zero economic profits is a stable long-run equilibrium situation for a perfectly competitive industry because that situation offers no profit incentives for firms to either enter or leave the industry.

Input costs increase as industry output expands for an increasing-cost industry (which is why it is an increasing-cost industry).

3. What would be the long-run equilibrium result of an increase in demand in a constant-cost industry?

The long-run equilibrium result of an increase in demand in a constant-cost industry is an increase in industry output with no change in price, because output will expand as long as price exceeds the constant level of long-run average cost.

4. What would be the long-run equilibrium result of an increase in demand in an increasing-cost industry?

The long-run equilibrium result of an increase in demand in an increasing-cost industry is an increase in industry output (but a smaller increase than in the constant-cost case) and a higher price. Output will expand as long as price exceeds long-run average cost; but that expansion of output increases costs by raising input prices, so in the long run prices just cover the resulting higher costs of production.

12.6 Long-Run Supply

1. What must be true about input costs as industry output expands for a constant-cost industry?

Input costs remain constant as industry output expands for a constant-cost industry (which is why it is a constant-cost industry).

2. What must be true about input costs as industry output expands for an increasing-cost industry?

Problems

- Which of the following are most likely to be perfectly competitive?
 - Chicago Board of Trade
 - fast-food industry
 - computer software industry
 - New York Stock Exchange
 - clothing industry
- Using the following information, which of the industries described are perfectly competitive? Check the perfectly competitive market characteristics each industry possesses and determine whether it is a perfectly competitive industry.

Industry	Many Firms and Buyers	Identical Products	Ease of Entry and Exit	Perfectly Competitive Market?
New York taxi business: City issues a limited number of permits.	☐	☐	☐	_____
Commercial aircraft industry: The costs of starting such a business are significant.	☐	☐	☐	_____
Window washing business: Low cost of entry and limited specialized training.	☐	☐	☐	_____
Fast-food business: Restaurant chains produce meals that are distinct.	☐	☐	☐	_____
Broccoli farming: There are many producers of broccoli, which requires no special growing conditions.	☐	☐	☐	_____

3.

Output	Total Cost	Total Revenue
0	\$ 30	\$ 0
1	45	25
2	65	50
3	90	75
4	120	100
5	155	125

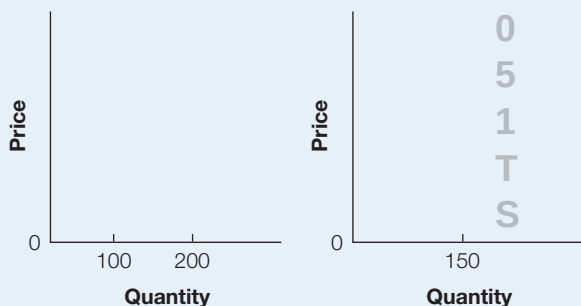
Given these data, determine AR , MR , P , and the short-run profit-maximizing (loss-minimizing) level of output.

4. Illustrate the $SRATC$, AVC , MC , and MR curves for a perfectly competitive firm that is operating at a loss. What is the output level that minimizes losses? Why is it more profitable to continue producing in the short run rather than shut down?
5. Industry councils promote the consumption of particular types of farm products. These groups urge us to “Drink Milk” or “Eat Apples.” Very little advertising is done by individual farmers. Using your understanding of the perfectly competitive market, explain this advertising strategy.
6. Complete the following table and identify the profit-maximizing output.

a.

Quantity	Price	Total Revenue	Marginal Revenue	Marginal Cost	Total Profit
10	\$12	\$120	\$12	\$ 8	\$25
11	12	_____	_____	9	_____
12	12	_____	_____	11	_____
13	12	_____	_____	12	_____
14	12	_____	_____	14	_____

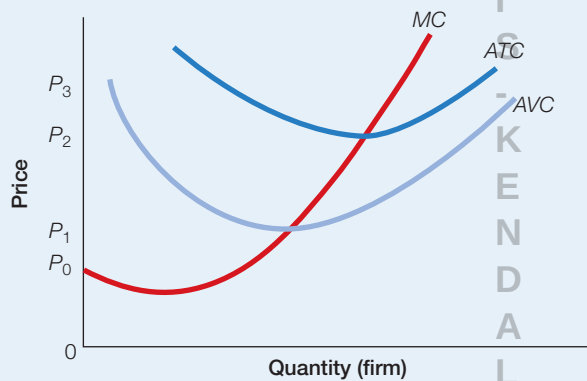
- b. What is true about marginal revenue and marginal costs when profit is maximized?
 - c. What would be the profit-maximizing level of output if price fell to \$9?
7. Explain why the following conditions are typical under perfect competition in the long run.
 - a. $P = MC$
 - b. $P = \text{minimum } ATC$
8. Discuss the following questions.
 - a. Why must price cover AVC if firms are to continue to operate?
 - b. If the firm is covering its AVC but not all its fixed costs, will it continue to operate in the short run? Why or why not?
 - c. Why is it possible for price to remain above the average total cost in the short run but not in the long run?
9. At a price of \$5, the profit-maximizing output for a perfectly competitive firm is 1,000 units per year. If the average total cost is \$3 per unit, what will be the firm's profit? If the average total cost is \$6 per unit, what will be the firm's profit? What is the relationship between profit, price, and average total cost?
10. Use the following diagram to answer (a), (b), and (c).



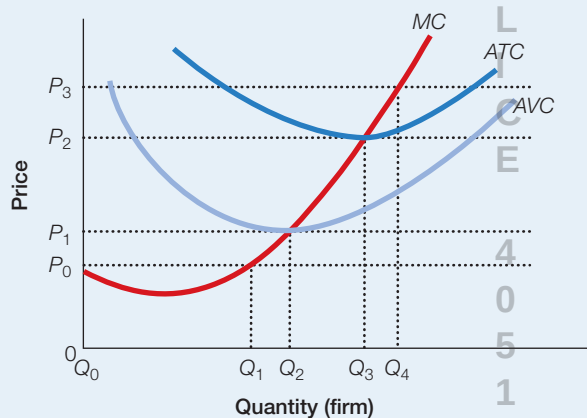
- Illustrate the relationship between a perfectly competitive firm's demand curve and the market supply and demand curve.
 - Illustrate the effects of an increase in market demand on a perfectly competitive firm's demand curve.
 - Illustrate the effects of a decrease in market demand on a perfectly competitive firm's demand curve.
11. Complete the following table for a perfectly competitive firm, and indicate its profit-maximizing output.

Quantity	Price	Total Revenue	Marginal Revenue	Total Cost	Marginal Cost	Total Profit
6	\$10	\$ _____	\$ _____	\$30	\$3	\$30
7	_____	_____	_____	35	_____	_____
8	_____	_____	_____	42	_____	_____
9	_____	_____	_____	51	_____	_____
10	_____	_____	_____	62	_____	_____
11	_____	_____	_____	75	_____	_____
12	_____	_____	_____	90	_____	_____

12. Use the following diagram to answer (a)–(d).

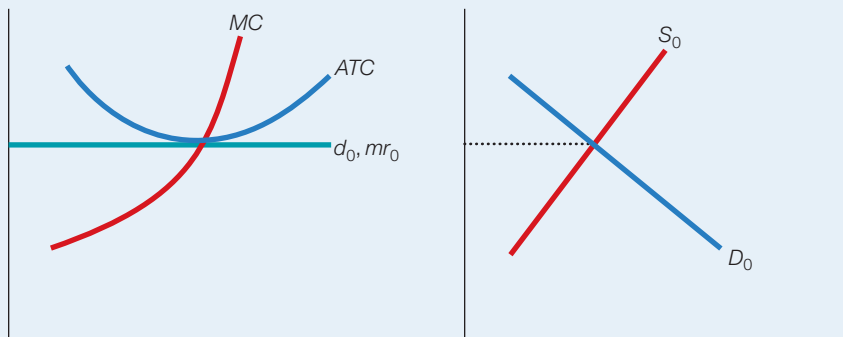


- How much would a perfectly competitive firm produce at each of the indicated prices?
 - At which prices is the firm earning economic profits? Zero economic profits? Negative economic profits?
 - At which prices would the firm shut down?
 - Indicate what this firm's supply curve would be.
13. Use the following diagram to answer (a)–(d).



- How much would a perfectly competitive firm produce at each of the indicated prices?
- At which prices is the firm earning economic profits? Zero economic profits? Negative economic profits?
- At which prices would the firm shut down?
- Indicate what this firm's supply curve would be.

14. Use the following diagrams to answer (a) and (b).



- a. Show the effect of an increase in demand on the perfectly competitive firm's price, marginal revenue, output, and profits in the short run.
 - b. Show the long-run effects of an increase in demand for the industry and the effects on a perfectly competitive firm's price, marginal revenue, output, and profits for a constant-cost industry.
15. In *The Wealth of Nations*, Adam Smith wrote, "Every individual endeavors to employ his capital so that its produce may be of greatest value. He generally neither intends to promote the public interest, nor knows how much he is promoting it. He intends only his own security, only his own gain. And he is led by an invisible hand to promote an end which was no part of his intention. By pursuing his own interest he frequently promotes that of society more effectively than when he really intends to promote it." How does the story of long-run equilibrium in a perfectly competitive industry illustrate Adam Smith's invisible hand?
16. Graph and explain the adjustments to long-run equilibrium when market demand decreases in a constant-cost industry.
17. Evaluate the following statements. Determine whether each is true or false and explain your answer.
- a. If economic profits are zero, firms will exit the industry in the long run.
 - b. A firm cannot maximize profits without minimizing costs.
 - c. If a firm is minimizing costs, it must be maximizing profits.
18. Describe what would happen to the industry supply curve and the economic profits of the firms in a competitive industry if those firms were currently earning economic profits. What if they were currently earning economic losses?
19. Given the industry description, identify each of the following as an increasing- or constant-cost industry.
- a. Major League Baseball: Uses the majority of pitchers. As the number of pitchers used increased, the quality declines.
 - b. Fast-food restaurants: Uses a relatively small share of land and unskilled labor in most cities.
 - c. Trucking industry: Uses a large portion of the trained and experienced drivers, especially long-distance drivers.

Monopoly and Antitrust

- 13.1 Monopoly: The Price Maker
- 13.2 Demand and Marginal Revenue in Monopoly
- 13.3 The Monopolist's Equilibrium
- 13.4 Monopoly and Welfare Loss
- 13.5 Monopoly Policy
- 13.6 Price Discrimination and Peak Load Pricing

Richard Branson, the owner of Virgin Atlantic Airlines, currently has a monopoly on commercial space travel. Here is an ad for space travel. Book your place in space now and join around 340 Virgin Galactic astronauts who will venture into space. Tickets cost \$200,000 and deposits start at \$20,000. If you are interested in discussing your reservation with us directly, please fill in the form below and we will be in touch as soon as possible to answer any questions you may have. Or you can contact

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one of our “local” Accredited Space Agents around the world. They have been specially selected and trained by us to handle all aspects of your spaceflight reservation.

Virgin Galactic Mission Control

Monopoly is at the other end of the spectrum from perfect competition. Pure monopoly is a market with a single seller. Because it is the sole supplier, a monopoly faces the market demand curve for its product.

Consequently, the monopolist has control over the market price—it is a price maker. The monopolist can choose any combination of price and quantity along its market demand curve. But do not confuse ability with incentive. The monopolist, just like the perfectly competitive firm, will maximize profits (or minimize losses) by producing at the output level where $MR = MC$.

A pure monopoly, with literally one seller, is rare in the real world. But situations in which a few firms compete with each other are quite common. For example, Microsoft’s Windows system, certain patented prescription drugs, the DeBeers diamond company, and your cable company are all examples of near monopolies. All of these firms have some monopoly power—control over prices and output.

In this chapter, we will see how a monopolist determines the profit-maximizing price and output. We will also compare monopoly and perfect competition to see which is more efficient. Does the monopoly equilibrium solution lead to higher prices and lower output levels than the perfectly competitive equilibrium solution? If so, what can the government do about it?

13.1

Monopoly: The Price Maker

What is a monopoly?

Why is pure monopoly rare?

What are the sources of monopoly power?

What is a natural monopoly?

What Is a Monopoly?

monopoly
the single supplier of a product that has no close substitute

A true or pure **monopoly** exists when a market consists of only one seller of a product with no close substitute and natural or legal barriers to prevent competition from new entrants. The reason a monopoly is the only firm in the market is because other firms cannot enter—there are barriers to entry. In monopoly, the firm and “the industry” are one and the same. Consequently, the firm sets the price of the good, because the firm faces the industry demand curve and can pick the most profitable point on that demand curve. Monopolists are price makers (rather than price takers) that try to pick the price that will maximize their profits.

Pure Monopoly Is a Rarity

Few goods and services truly have only one producer. One might think of a small community with a single bank, a single newspaper, or even a single grocery store. Even in these situations, however, most people can bank out of town, use a substitute financial institution, buy out-of-town newspapers or read them on the Web, go to a nearby town to buy groceries, and so on. Near-monopoly conditions exist, but absolutely pure monopoly is unusual.

One market in which there is typically only one producer of goods and services within an area is public utilities. In any given market, usually only one company provides natural gas or supplies water. Moreover, governments themselves provide many services for which they are often the sole provider—sewer services, fire and police protection, and military protection. Most of these situations resemble a pure monopoly. However, for most of these goods and services, substitute goods and services are available. People heating their homes

with natural gas can switch to electric heat (or vice versa). In some areas, residents can even substitute home-collected rainwater or well water for what the local water company provides.

Even though the purist may correctly deny the existence of monopoly, the number of situations where monopoly conditions are closely approximated is numerous enough to make the study of monopoly more than a theoretical abstraction; moreover, the study of monopoly is useful in clarifying certain desirable aspects of perfect competition.

Barriers to Entry

A monopolist can use several ways to make it very difficult for other firms to overcome barriers to entry. For example, a monopolist might prevent potential rivals from entering the market by establishing legal barriers, taking advantage of economies of scale, or controlling important inputs.

Legal Barriers

In the case of legal barriers, the government might franchise only one firm to operate an industry, as is the case for postal services in most countries. The government can also provide licensing designed to ensure a certain level of quality and competence. Workers in many trade industries must obtain government licensing—hair stylists, bartenders, contractors, electricians, and plumbers, for instance.

Also, the government could award patents that encourage inventive activity. It can cost millions of dollars to develop a new drug or computer chip, for example, and without a patent to recoup some of the costs, a company would certainly be less motivated to pursue inventive activity. As long as the patent is in effect, the company has the potential to enjoy monopoly profits for many years. After all, why would a firm engage in costly research if any company could take a free ride on their discovery and produce and sell the new drug or computer chip?

Economies of Scale

The situation in which one large firm can provide the output of the market at a lower cost than two or more smaller firms is called a **natural monopoly**. With a natural monopoly, it is more efficient to have one firm produce the good. The reason for the cost advantage is economies of scale; that is, *ATC* falls as output expands throughout the relevant output range, as seen in Exhibit 1. Public utilities, such as water, gas, and electricity, are examples of natural monopoly. It is less costly for one firm to lay down pipes and distribute water than for competing firms to lay down a maze of competing pipes. That is, a single water company can supply the town water more efficiently than a large number of competing firms.

Control over an Important Input

Another barrier to entry could exist if a firm had control over an important input. For example, from the late nineteenth century to the early 1940s, the Aluminum Company of America (Alcoa) had a monopoly in the production of aluminum. Its monopoly power was guaranteed because of its control over an important ingredient in the production of aluminum—bauxite.



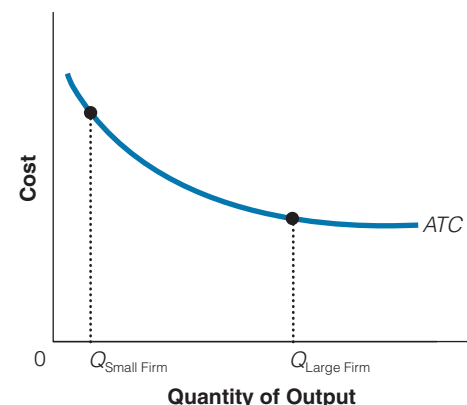
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If pure monopoly is a rarity, why do we study monopoly?

natural monopoly
a firm that can produce at a lower cost than a number of smaller firms can

section 13.1 exhibit 1

Economies of Scale



The firm has economies of scale over the relevant range of output with declining average total costs. When one firm can produce the total output at a lower cost than several small firms, it is called a natural monopoly.

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However, the ownership of key resources is rarely the source of monopoly power. Many goods are traded internationally, and resources are owned by many different people around the world. It is uncommon that a firm would control the worldwide supply of a resource that did not have a close substitute.

news Is a Diamond Monopoly Forever?

At one time, the De Beers diamond company had control of roughly 80 percent of the world's output of diamonds. However, today De Beers accounts for less than 40 percent of diamond production. Increased competition and the discovery of new diamond deposits has finally broken the monopoly in the diamond industry. A number of producers from countries such as Russia, Canada, and Australia chose to start distributing diamonds outside of the De Beers channel, thus effectively ending the monopoly. De Beers realized it was no longer profitable to buy diamonds to keep them off the market. Also, the demand for diamond jewelry had fallen. To keep its share of the market from falling further, De Beers has differentiated its diamonds by branding with a mark visible only with a microscope. Other diamond firms have followed suit to assure customers that these diamonds are mined under ethical and environmentally friendly conditions. By branding diamonds, sellers are assuring their



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customers that they are not buying “blood” diamonds that have been exported from war-ravaged areas of Africa where the revenues are used to bolster military efforts. De Beers's new strategy has been effective; it is now more profitable today with a 40 percent market share than when it maintained an 80 percent market share.

SECTION QUIZ

1. Pure monopoly is defined as
 - a. an industry consisting of a single seller.
 - b. a market structure that involves many substitute products.
 - c. a market in which many rival firms compete for sales.
 - d. a market structure consisting of a single buyer.
2. For a true, or pure, monopoly,
 - a. there is only one seller of the product.
 - b. no close substitutes are available.
 - c. the firm and the industry are the same.
 - d. it must be virtually impossible for other firms to overcome barriers to entry.
 - e. all of the above are true.



(continued)

SECTION QUIZ (Cont.)



3. Which of the following is inconsistent with monopoly?
 - a. a single seller
 - b. economies of scale
 - c. $MR < P$
 - d. free entry and exit
 - e. selling in the elastic portion of the demand curve in order to maximize profits
4. Which of the following is potentially a barrier to entry into a product market?
 - a. patent protection on the design of the product
 - b. economies of scale in the product market
 - c. government licensing of the product's producers
 - d. the control of a crucial input necessary to produce the product
 - e. all of the above

1. Why does monopoly depend on the existence of barriers to entry?
2. Why is a pure monopoly a rarity?
3. Why does the government grant some companies, such as public utilities, monopoly power?

Answers: 1. a 2. e 3. d 4. e

Demand and Marginal Revenue in Monopoly

13.2

 How does the demand curve for a monopolist differ from that for a perfectly competitive firm?

 Why is marginal revenue less than price in monopoly?

In monopoly, the market demand curve may be regarded as the demand curve for the firm's product because the monopoly firm *is* the market for that particular product. The demand curve indicates the quantities that the firm can sell at various possible prices. In monopoly, the demand curve for the firm's product declines as additional units are placed on the market—the demand curve is downward sloping. In monopoly, the firm cannot set both its price and the quantity it sells. That is, a monopolist would love to sell a larger quantity at a high price, but it can't. If the monopolist raises the price, the amount sold will fall; if the monopolist lowers the price, the amount sold will rise.

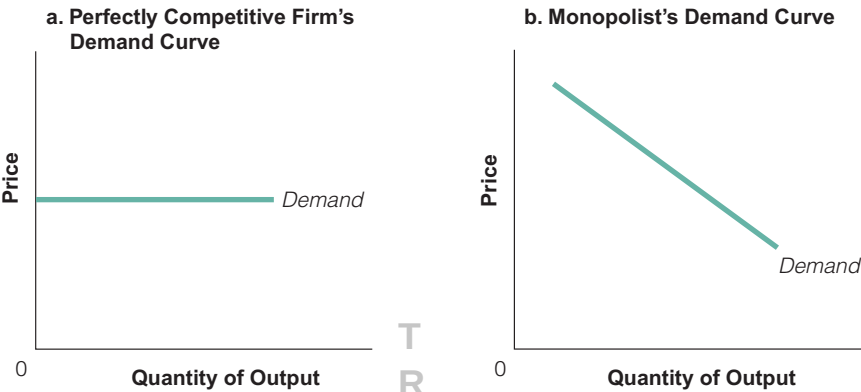
Recall that in perfect competition, many buyers and sellers of homogeneous goods (resulting in a perfectly elastic demand curve) mean that competitive firms can sell all they want at the market price. They face a horizontal demand curve. The firm takes the price of its output as determined by the market forces of supply and demand. Monopolists, and all other firms that are price makers, face a downward-sloping demand curve. If the monopolist raises its price, it will lose some—but not all—of its customers. The two demand curves are displayed side by side in Exhibit 1.



Why can't a monopolist set both its price and the quantity it sells?

section 13.2
exhibit 1

Comparing Demand Curves: Perfect Competition versus Monopoly



The demand curve for a perfectly competitive firm is perfectly elastic; competitive firms can sell all they want at the market price. The firm is a price taker. The demand curve for a monopolist is downward sloping; if the monopolist raises its price, it will lose some but not all of its customers. The monopolist is a *price maker*. Because a monopoly has no close competitors, it can change the product price by adjusting its output.

section 13.2
exhibit 2

Total, Marginal, and Average Revenue

Price	Quantity	Total Revenue ($TR = P \times Q$)	Average Revenue ($AR = TR/Q$)	Marginal Revenue ($MR = \Delta TR/\Delta Q$)
\$6	0	—	—	
5	1	\$5	\$5	\$5
4	2	8	4	3
3	3	9	3	1
2	4	8	2	−1
1	5	5	1	−3

In Exhibit 2, we see the price of the good, the quantity of the good, the *total revenue*, which is the quantity sold times the price ($TR = P \times Q$), and the *average revenue*, that is, the amount of revenue the firm receives per unit sold ($AR = TR \div Q$). The average revenue is simply the price per unit sold, which is exactly equal to the market demand curve, and the *marginal revenue* (MR)—the amount of revenue the firm receives from selling an additional unit—is equal to $\Delta TR \div \Delta Q$.

Taking the information from Exhibit 2, we can create the demand and marginal revenue curves as seen in Exhibit 3. We see that the marginal revenue is always less than the price of the good. To understand why, suppose the firm cuts its price from \$4 to \$3.

To induce a third daily customer to purchase the good, the firm must cut its price to \$3. In doing so, it gains \$3 in revenue from the newest customer—the output effect. However, it loses \$2 in revenue because each of the first two customers are now paying \$1 less than previously—the price effect. The marginal revenue is \$1 ($\$3 - \2), which is less than the price of the good (\$3).

Exhibit 3 graphs the relationship between the demand curve and the marginal revenue curve for a monopolist. Because *a monopolist's marginal revenue is always less than the*

ECS
economic
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Monopolists, and all other firms that are price makers, face a downward-sloping demand curve. If the monopolist raises its price, it will lose some—but not all—of its customers.

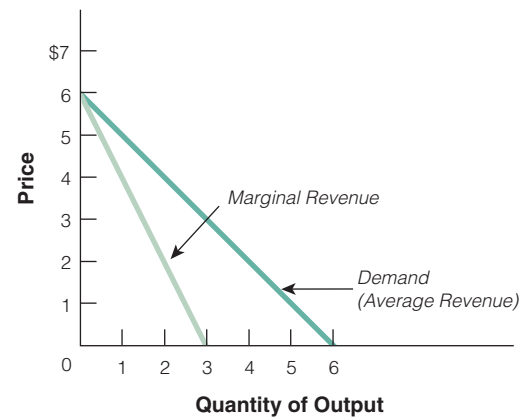
price, the marginal revenue curve will always lie below the demand curve, as shown in Exhibit 3. Recall that in perfect competition, the firm could sell all it wanted at the market price, and the price was equal to marginal revenue. However, in monopoly, if the seller wants to expand output, it will have to lower the price on *all* units; the monopolist receives additional revenue from the new unit sold—the output effect, but will receive less revenue on all the units it was previously selling—the price effect. Thus, when the monopolist cuts the price to attract new customers, the old customers benefit.

In Exhibit 4, we can compare marginal revenue for the competitive firm with marginal revenue for the monopolist. The firm in perfect competition can sell another unit of output without lowering its price; hence, the marginal revenue from selling its last unit of output is the market price. That is, when the perfectly competitive firm increases output by one unit, it receives the market price for that unit and it does not receive any less for the units that it was already selling. However, the monopolist has a downward-sloping demand curve. To sell an extra unit of output, the price falls from P_1 to P_2 , and the monopolist loses area c in Exhibit 4(b). Because the monopolist must lower the price on every unit it sells, it will cut into revenue it was originally selling. Consequently, a monopolist's marginal revenue is less than price.

It is important to note that even though a monopolist can set its price anywhere it wants, it will not set its price as high as possible—be careful not to confuse ability with incentive. As we will see in the next section, some prices along the demand curve will not be profitable for a firm. In other words, the monopolist can enhance profits by either lowering the price or raising it, depending on the circumstances.

section 13.2 exhibit 3

Demand and Marginal Revenue for the Monopolist



To sell more output, the monopolist must accept a lower price on all units sold—the price effect; the monopolist receives additional revenue from the new unit sold—the output effect, but less revenue on all the units it was previously selling. Thus, the marginal revenue curve for the monopolist always lies below the demand curve.

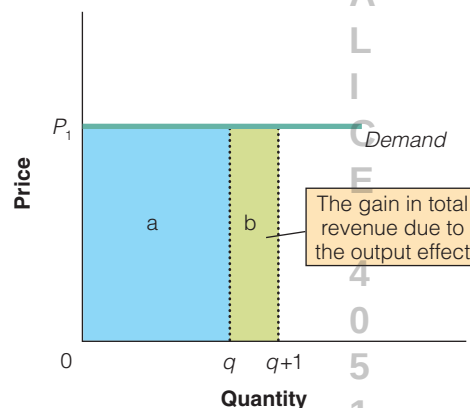


Why is the monopolist's marginal revenue always less than the price?

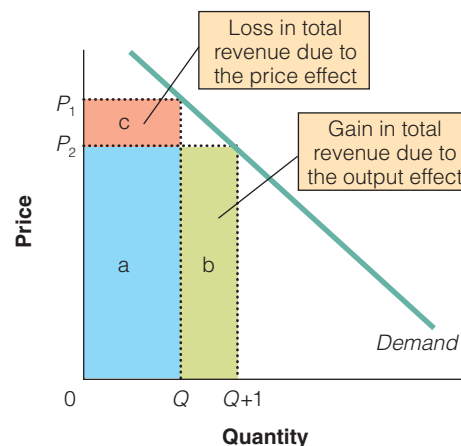
section 13.2 exhibit 4

Marginal Revenue—Competitive Firm versus Monopolist

a. Perfect Competitive Firm's Demand Curve



b. Monopolist's Demand Curve



Area b in (a) represents the marginal revenue from an extra unit of output ($q + 1$) for the firm in perfect competition. The competitive firm's marginal revenue (area b) is equal to the market price, P_1 ($P_1 \times 1$). Area b is the gain in total revenue from the output effect and area c is the loss in total revenue from the price effect. Notice there is no price effect for the perfectly competitive firm. The marginal revenue for the monopolist is the change in total revenue ($b - c$) for one more unit of output ($Q + 1$); this is less than the price, P_2 .

Use

what you've learned

Demand and Marginal Revenue

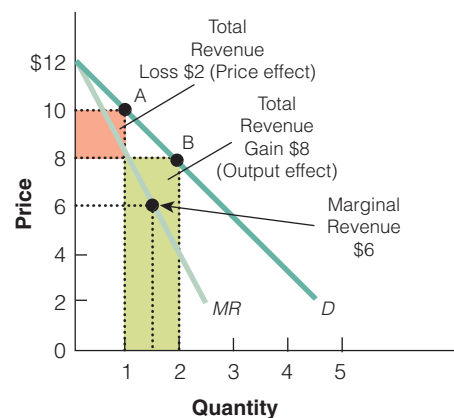
Q Using the concepts of total revenue and marginal revenue, show why marginal revenue is less than price in a monopoly situation. Suppose a monopolist wants to expand output from one unit to two units. To sell two units rather than one, the monopolist must lower its price from \$10 to \$8, as shown in Exhibit 5. Will the marginal revenue be less than the price?

A In Exhibit 5, we see that to sell two units, the monopolist will have to lower the price on both units to \$8. That is, the seller doesn't receive \$10 for unit one and \$8 for unit two but receives \$8 for both units. Therefore, what happens to marginal revenue? This answer involves two parts: First, a loss in revenue, \$2, occurs from selling the first unit at \$8 instead of \$10. Second, the gain in revenue from the additional output—the second unit—is \$8. Thus, the marginal revenue is \$6 (\$8 – \$2), which is less than the price of the good, \$8. The monopolist's marginal revenue will always be less than the price of the downward-sloping demand curve.

section 13.2 exhibit 5

The Demand and Marginal Revenue Curve

Price	Quantity	Total Revenue	Marginal Revenue
\$10	1	\$10	
8	2	16	\$6
6	3	18	2



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The Monopolist's Price in the Elastic Portion of the Demand Curve

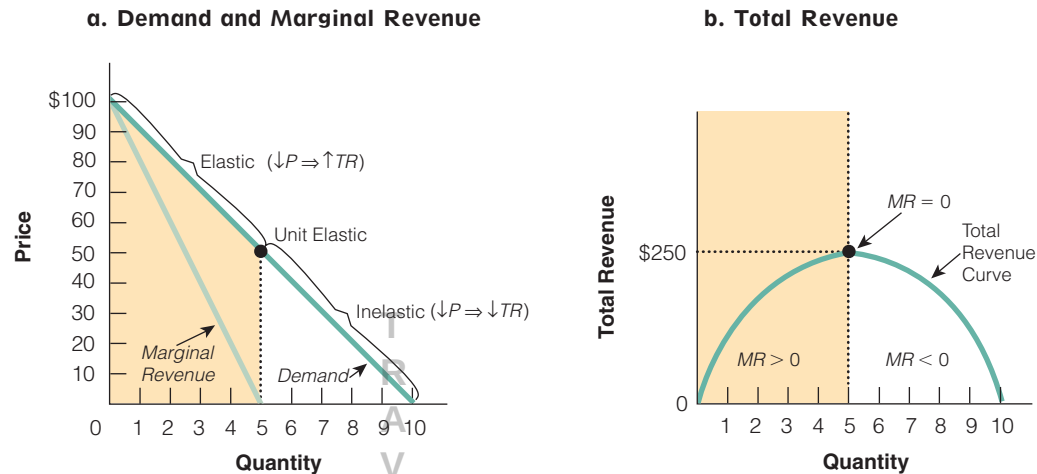
The relationships between the elasticity of demand and the marginal and total revenue are shown in Exhibit 6. In Exhibit 6(a), elasticity varies along a linear demand curve. Recall from Chapter 6 that above the midpoint, the demand curve is elastic ($E_D > 1$); below the midpoint, it is inelastic ($E_D < 1$); and at the midpoint, it is unit elastic ($E_D = 1$). How does elasticity relate to total and marginal revenue? In the elastic portion of the curve shown in Exhibit 6(b), when the price falls, total revenue rises and marginal revenue is positive. In the inelastic region of the demand curve, when the price falls, total revenue falls, and marginal revenue is negative. At the midpoint of the linear demand curve in Exhibit 6(b), the total revenue curve reaches its highest point and $MR = 0$.

For example, suppose the price falls on the top half of the demand curve in Exhibit 6(a) from \$90 to \$80; total revenue increases from \$90 ($\90×1) to \$160 ($\80×2), and marginal revenue is positive at \$70. Because a reduction in price leads to an increase in total revenue, the demand curve is elastic in this region. Now suppose the price falls from \$20 to \$10 on the lower portion of the demand curve; total revenue falls from \$160 ($\20×8) to \$90 ($\10×9), and marginal revenue is negative at $-\$70$. Because a reduction in price leads to a decrease in total revenue, the demand curve is inelastic in this region.

A monopolist will never knowingly operate on the inelastic portion of its demand curve, because increased output will lead to lower total revenue in this region. Not only are total revenues falling, but total costs will rise as the monopolist produces more output. Similarly, if the monopolist were to lower its output, it could increase its total revenue and lower its total costs (because it costs less to produce fewer units), leading to greater economic profits.



Why would a monopolist not operate on the bottom half of the demand curve?

section 13.2
exhibit 6
The Relationship between the Elasticity of Demand and Total and Marginal Revenue


In (a), we see that along a linear demand curve, the elastic segment lies above the midpoint, the inelastic segment lies below the midpoint, and at the midpoint the demand is unit elastic. When demand is elastic, a decline in price will increase total revenue; when demand is inelastic, a decline in price will lead to a decrease in total revenue. In (b), we see that over the range from zero to five units, total revenue is rising, so marginal revenue is positive. Over the range from five units to ten units, total revenue is falling, so marginal revenue is negative. At five units of output, total revenue is maximized at \$250 ($\50×5), so marginal revenue is zero.

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SECTION QUIZ

- The monopolist's demand curve is
 - upward sloping.
 - downward sloping.
 - horizontal, like the perfectly competitive firm's demand curve.
 - The monopolist does not have a demand curve.
- In monopoly, the firm
 - is a price taker.
 - will only operate on the bottom half of its demand curve.
 - cannot set both its price and the quantity sold; if the monopolist reduces output, the price will rise, and if the monopolist expands output, the price will fall.
 - All of the above are true.
- In monopoly,
 - the firm's demand curve is the market demand curve for the product.
 - the marginal revenue is less than the price.
 - the firm can set its price anywhere but will enhance its profits by raising or lowering the price, depending on the circumstances.
 - all of the above are true.

(continued)

SECTION QUIZ (Cont.)



4. Which of the following is true?
 - a. The monopolist's marginal revenue will always be less than the price because of its downward-sloping demand curve.
 - b. In order to sell more output, the monopolist must accept a lower price on all units sold.
 - c. The monopolist will receive additional revenue from the sale of an additional new unit but will receive less revenue on all of the units it was previously selling as well.
 - d. All of the above statements are true.
-
1. Why are the market and firm demand curves the same for a monopoly?
 2. Why is a monopoly a price maker, but a perfectly competitive firm a price taker?
 3. Why is marginal revenue less than price for a profit-maximizing monopolist?
 4. Why would a monopolist never knowingly operate in the inelastic portion of its demand curve?

Answers: 1. b. 2. c 3. d 4. d

13.3

The Monopolist's Equilibrium

How does the monopolist decide what output to produce?

How does the monopolist decide what price to charge?

How do we know whether the monopolist is making a profit?

How do we know whether the monopolist is incurring a loss?

Can the monopolist's economic profits last into the long run?

How Does the Monopolist Determine the Profit-Maximizing Output?

In the preceding section, we saw how a monopolist could choose any point along a demand curve. However, the monopolist's decision as to what level of output to produce depends on more than the marginal revenue derived at various outputs. The firm faces production costs; and the monopolist, like the perfect competitor, will maximize profits at that output where $MR = MC$. This point is demonstrated graphically in Exhibit 1.

As you can see in Exhibit 1, at output level Q_1 , the marginal revenue exceeds the marginal cost of production, so it is profitable for the monopolist to expand output. Profits continue to grow until output Q_M is reached. Beyond that output, say at Q_2 , the marginal cost of production exceeds the marginal revenue from production, so profits decline. The monopolist should cut production back to Q_M . Therefore, the equilibrium output is Q_M . At this output, marginal cost and marginal revenue are equal.



What are the three steps to determine whether a monopolist is making an economic profit, an economic loss, or just breaking even (zero economic profit)?

Three-Step Method for the Monopolist

Let's return to the three-step method we used in Chapter 12. Determining whether a firm is generating positive economic profits, economic losses, or zero economic profits at the profit-maximizing level of output, Q_M , can be done in three easy steps.

1. Find where marginal revenue equals marginal cost and proceed straight down to the horizontal (quantity) axis to find Q_M , the profit-maximizing output level for the monopolist.
2. At Q_M , go straight up to the demand curve and then to the left to find the market price, P_M . Once you have identified P_M and Q_M , you can find total revenue at the profit-maximizing output level, because $TR = P \times Q$.
3. The last step is to find total cost. Again, go straight up from Q_M to the average total cost (ATC) curve and then left to the vertical axis to compute the average total cost at Q_M . If we multiply average total cost by the output level, we can find the total cost ($TC = ATC \times Q$).

Profits for a Monopolist

Exhibit 1 does not show what profits, if any, the monopolist is actually making. This missing information is found in Exhibit 2, which shows the equilibrium position for a monopolist, this time adding an average total cost (ATC) curve. As we just discussed, the firm produces where $MC = MR$, at output Q_M . At output Q_M (100) and price P_M (\$6) the firm's total revenue is equal to DAQ_M0 , which is $P_M \times Q_M$ (\$600). At output Q_M , the firm's total cost is CBQ_M0 , which is $ATC \times Q_M$ (\$400). In Exhibit 2, we see that total revenue is greater than total cost, so the firm has a total profit of area DABC. Or, $P_M - ATC$ (price minus average total cost) is the per-unit profit, \$2. The width of the box (segment CB) is the quantity sold (0 to Q_M), 100 units. Hence, the area of the box is the monopoly firm's total profit, \$200 (per-unit profit $\times$ quantity sold).

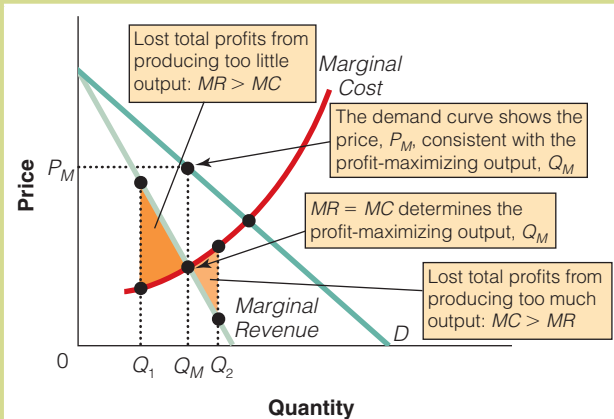
In perfect competition, profits in an economic sense will persist only in the short run. In the long run, new firms will enter the industry and increase industry supply, thereby driving down the price of the good and eliminating profits. In monopoly, however, profits are not eliminated, because one of the conditions for monopoly is that barriers to entry exist. Other firms cannot enter, so economic profits can persist in the long run.

Losses for the Monopolist

It is easy to imagine a monopolist ripping off consumers by charging prices that result in long-run economic profits. However, many companies with monopoly power have gone out of business. Imagine that you received a patent on a bad idea such as a roof ejection seat for a helicopter, or that you had the sole rights to turn an economics textbook into a screenplay for a motion picture. Although you may be the sole supplier of a product, you are not guaranteed that consumers will demand your product. Even without a close substitute for your product, you will always face competition for the consumer dollar, and other goods may provide greater satisfaction.

section 13.3 exhibit 1

Equilibrium Output and Price for a Monopolist

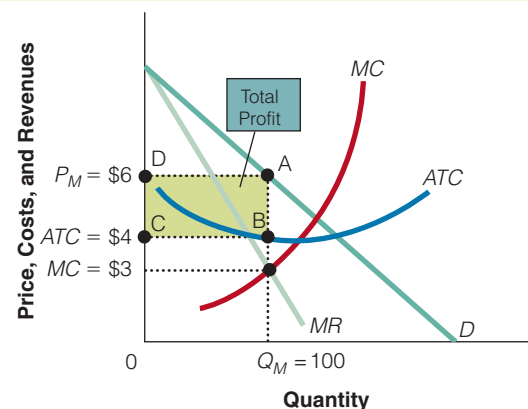


The monopolist maximizes profits at that quantity where $MR = MC$, that is, at Q_M . At Q_M the monopolist finds P^* by extending a vertical line up to the demand curve and over to the vertical axis to find the price. Rather than charging a price equal to marginal cost or marginal revenue at their intersection, however, the monopolist charges the price that customers are willing to pay for that quantity as indicated on the demand curve at P_M . At Q_1 , $MR > MC$, and the firm should expand output. At Q_2 , $MC > MR$, the firm should cut back production.

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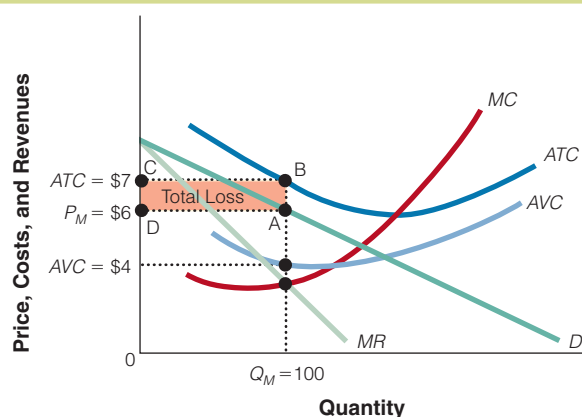
section 13.3 exhibit 2

A Monopolist's Profits



The intersection of MR and MC determines Q_M , the profit-maximizing level of output. The demand curve shows the price that can be charged for Q_M . Total profits equal the area DABC—the difference between total revenues (DAQ_M0) and total costs (CBQ_M0).

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section 13.3
exhibit 3
A Monopolist's Losses


Total loss equals CBAD—the difference between total cost ($CB_{Q_M,0}$) and total revenue ($DA_{Q_M,0}$).

Exhibit 3 illustrates loss in a monopoly situation. In this graph, notice that the demand curve is below the average total cost curve. In this case, the monopolist will incur a loss, because of insufficient demand to cover the average total cost at any price and output combination along the demand curve. At Q_M , total cost, $CB_{Q_M,0}$, is greater than total revenue, $DA_{Q_M,0}$, so the firm incurs a total loss of CBAD. Or total revenue is \$600 ($P_M \times Q_M = \6×100) and total cost is \$700 ($ATC \times Q_M = \7×100), for an economic loss of \$100. Notice that the total revenue is great enough to cover the variable costs of \$400 ($TVC = \4×100). That is, the firm can reduce its losses by operating rather than shutting down in the short run. However, in monopoly as in perfect competition, a firm will go out of business in the long run if it cannot generate enough revenue to cover its total costs.

In summary, if total revenue is greater than total cost at Q_M , the firm generates a total economic profit; and if total revenue is less than total cost at Q_M , the firm generates a total economic

loss. If total revenue is equal to total cost at Q_M , the firm earns zero economic profit. Remember, the cost curves include implicit and explicit costs, so in this case, the monopolist is covering the total opportunity costs of its resources and earning a normal profit or rate of return.



Why will entry eliminate economic profits for perfectly competitive firms, but not for monopolies?

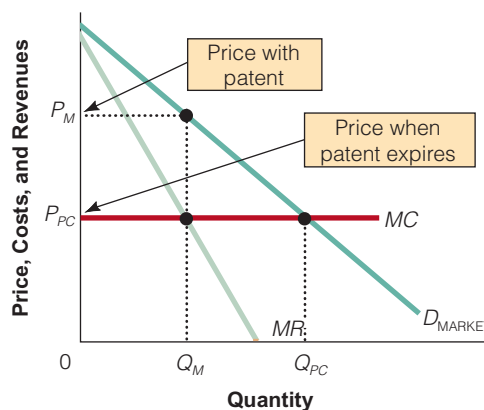
Patents

Governments confer one form of monopoly power through patents and copyrights. A patent puts the government's police power behind the patent-holder's exclusive right to make a product for a specified period (up to 20 years) without anyone else being able to make an identical product. As Exhibit 4 suggests, the patent gives the supplier at least temporary



Without patents, would some lifesaving drugs have been invented? Some drugs cost millions of dollars in research. Without the protection of a patent, the firm might not have been able to make profits from its inventive activity for very long, which is why the government issues patents that last up to 20 years. However, after the patent expires, many popular drugs soon lose their protection. Lipitor lost its patent in November of 2011. In most cases, less costly generic drugs hit the market soon after patent expiration. Prices then move closer to the competitive price, although perhaps not all the way to the competitive level, as some companies are able to keep customers through brand loyalty.

Some studies have shown prices falling over 30 percent after generics are introduced into the market. The generic market makes up almost 65 percent of the U.S. prescription drug market as many insurance plans encourage or require their subscribers to use generics.

section 13.3
exhibit 4
Impact of Patent Protection on Equilibrium Price and Quantity


Patent power allows the firm to charge the higher monopoly price, P_M , which is well above the marginal cost of producing that good. However, when the patent expires, the price falls to a position closer to the perfectly competitive price, P_{PC} .

monopoly power over that good or service. The firm with the patent can then price its product well above marginal costs, at P_M . In Exhibit 4, the marginal cost of producing the drug is constant, which is true for many prescription drugs. When the patent expires, the price of the patented good or service usually falls substantially with the entry of competing firms into the market. The price will fall toward the perfectly competitive price P_{PC} , and the output will increase toward Q_{PC} .

Why does the government give inventors this limited monopoly power, raising the prices of pharmaceutical drugs and other “vital” goods? The rationale is simple. Without patents, inventors would have little incentive to incur millions of dollars in research and development expenses to create new products (e.g., lifesaving drugs), because others could immediately copy the idea and manufacture the products without incurring the research expenses. Similarly, copyrights stimulate creative activity of other kinds, giving writers the incentive to write books that earn royalties and are not merely copied for free. The enormous number of computer programs written for home computers reflects the fact that program writers receive royalties from the sale of each copy sold; that is why they and the firms they work for vehemently oppose unauthorized copying of their work.

SECTION QUIZ

1. A profit-maximizing monopolist sets
 - a. the product price where marginal cost equals marginal revenue.
 - b. output where marginal cost equals marginal revenue.
 - c. output where marginal cost equals average revenue.
 - d. output where demand equals average total cost.
 - e. price equal to the highest dollar amount that any customer is willing to pay.
2. For a monopolist,
 - a. its demand curve is downward sloping.
 - b. its marginal revenue is less than price.
 - c. existing economic profits can be sustained over time.
 - d. all of the above are true.
3. If a profit-maximizing monopolist is currently charging a price on the inelastic portion of its demand curve, it should
 - a. raise price and decrease output.
 - b. lower price and increase output.
 - c. reduce both output and price.
 - d. hold output constant and raise price.
 - e. do none of the above.
4. If a monopolist had a zero marginal cost of production, it would maximize profits by choosing to produce a quantity where
 - a. demand was inelastic.
 - b. demand was unit elastic.
 - c. demand was elastic.
 - d. It is impossible to determine where along a demand curve such a monopolist would choose to produce.

(continued)

SECTION QUIZ (Cont.)



5. Which of the following is *not* true about a profit-maximizing monopolist?
 - a. The monopolist faces the downward-sloping market demand curve.
 - b. The monopolist always earns an economic profit.
 - c. The price of output exceeds marginal revenue.
 - d. The monopolist chooses output where marginal revenue equals marginal cost.
 - e. All of the above are true.
-
1. What is a monopolist's principle for choosing the profit-maximizing output?
 2. How do you find the profit-maximizing price for a monopolist?
 3. For a monopolist making positive economic profits, what must be true about the relationship between price and average total cost?
 4. For a monopolist making negative economic profits, what must be true about the relationship between price and average total cost?
 5. Why, unlike perfectly competitive firms, can a monopolist continue to earn positive economic profits in the long run?

Answers: 1. b 2. d 3. a 4. b 5. b

13.4

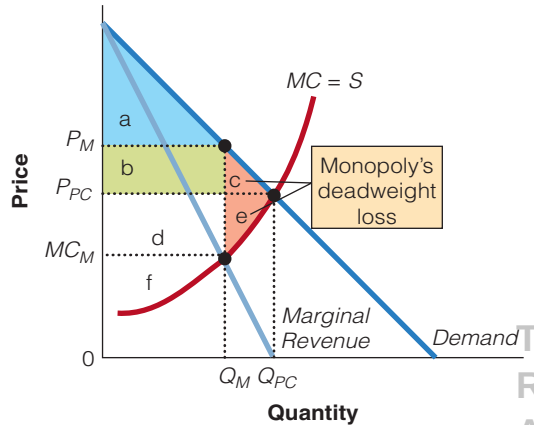
Monopoly and Welfare Loss

- How does monopoly lead to inefficiencies?
- Does monopoly retard innovation?
- What is the welfare loss in monopoly?

Does Monopoly Promote Inefficiency?

Monopoly is often considered to be bad. Two main objections form the basis for concerns about the establishment of monopoly power. First, on equity grounds, many people feel that it is not “fair” for monopoly owners to have persistent economic profits when they work no harder than other firms. However, to most economists, the more serious objection is that monopolies result in market inefficiencies. That is, monopoly leads to a lower output and higher prices than would exist under perfect competition. Exhibit 1 demonstrates why. In monopoly, the firm produces output Q_M and charges price P_M . Suppose, however, that perfect competition exists and the industry is characterized by many small firms that could produce output with the same efficiency (at the same cost) as one large firm. Then the marginal cost curve shown in Exhibit 1 is the sum of all the individual marginal cost curves of the individual firms, which is the industry supply curve.

In the perfectly competitive market, the equilibrium price and quantity would be determined where the marginal cost (or supply) curve intersects with the demand curve, at output Q_{PC} and price P_{PC} . Thus, the competitive equilibrium solution provides for more output and lower prices than the solution prevailing in monopoly, which leads to the major efficiency objection to monopoly: Monopolists charge higher prices and produce less output. This situation may also be viewed as “unfair,” in that consumers are burdened more than under the alternative competitive arrangement.

section 13.4
exhibit 1
Perfect Competition versus Monopoly


Compared with perfect competition, the monopolist's equilibrium price is higher, P_M , and its equilibrium output is lower, Q_M . Also notice that P_M is greater than MC_M , which means that the value of the last unit produced by the monopolist (P_M) is greater than the cost (MC_M), so from society's point of view the monopolist is producing too little output. Under monopoly, consumer surplus is area a , producer surplus is area $b + d + f$, and the deadweight loss of monopoly is $c + e$.

	Perfect Competition	Monopoly	Change
Consumer Surplus	$a + b + c$	a	$-b - c$
Producer Surplus	$d + e + f$	$b + d + f$	$b - e$
Welfare	$a + b + c + d + e + f$	$a + b + d + f$	$-c - e$

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Welfare Loss in Monopoly

In addition to the monopolist producing lower levels of output at higher prices, notice that the monopolist produces at an output where the price (P_M) is greater than the marginal cost (MC_M). Because $P > MC$, the value to society from the last unit produced is greater than its costs (MC_M). That is, the monopoly is *not* producing enough of the good from society's perspective. We call the area $c + e$ in Exhibit 1 the welfare or deadweight loss due to monopoly. In perfect competition, the equilibrium is P_{PC} and the equilibrium quantity is Q_{PC} . Consumer surplus is area $a + b + c$, and the product surplus is area $d + e + f$. In monopoly, the equilibrium price is higher at P_M and the equilibrium quantity is lower at Q_M . Under monopoly, consumer surplus is area a , producer surplus is area $b + d + f$, and lost welfare or the deadweight loss of monopoly is $c + e$.

The actual amount of the welfare loss in monopoly is of considerable debate among economists. Estimates vary from between one-tenth of 1 percent to 6 percent of national income. The variation depends on the researchers' estimates of elasticity of demand, whether firm or industry data were used, whether adjustments for profits were made (for the inclusion of royalties and intangibles), and whether the researcher included some proxy for scarce resources used in attempting to create the monopoly.



Why is monopoly less efficient than perfect competition?

Does Monopoly Retard Innovation?

Another argument against monopoly is that a lack of competition tends to retard technological advancement. Monopolists become comfortable, reaping their monopolistic profits, so they do not work hard at product improvement, technical advances designed to promote efficiency, and so forth. The American railroad is sometimes cited as an example of this situation. Early in the last century, railroads had strong monopoly power, but they did not spend much on research or development; they did not aggressively try to improve rail transport. Consequently, technical advances in substitute modes of transportation—like cars, trucks, and airplanes—led to a loss of monopoly power for the railroads.

However, the notion that monopoly retards all innovation can be disputed. Many near monopolists are, in fact, important innovators. Companies such as Microsoft, IBM, Polaroid,

use

what you've learned

The Welfare Cost of Monopoly

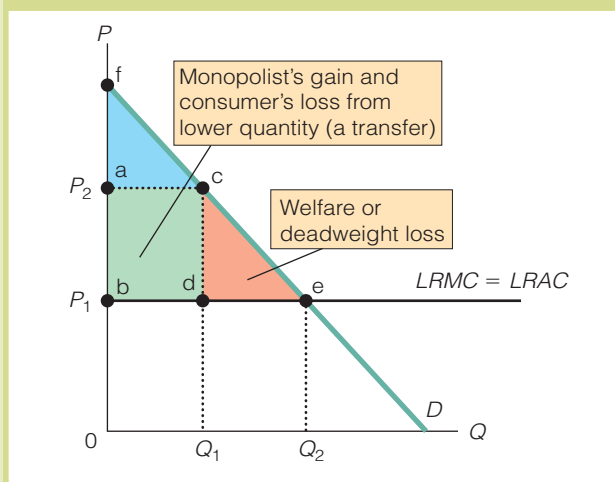
Q The output level set by the monopolist is inefficient from society's standpoint, but the profits are not. Why?

A The net loss resulting from lower output is what economists call the welfare cost of monopoly. However, society as a whole does not lose from monopoly profits. Why? Because the income is not lost, but it is transferred from consumers to producers (stockholders and workers). The monopolist gains at the expense of consumers who pay a higher price for a monopolist's product than they would if the product were produced by a perfectly competitive firm. This situation is depicted in Exhibit 2.

The welfare loss is graphically represented by area cde. It is the difference between how much consumers value quantity Q_2 minus Q_1 , which is Q_1ceQ_2 , and how much they would have to give up for it, Q_1deQ_2 . You may recall from Chapter 7 that

section 13.4 exhibit 2

The Welfare Cost of Monopoly



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this area represents *consumer surplus*. Under perfectly competitive conditions, however, area $abdc$ would also be part of the consumer's surplus. In sum, the loss to society from monopoly is area cde , and area $abdc$ is merely a transfer of consumer surplus to monopoly profits.



Can monopoly change the level of innovation?

and Xerox have all, at one time or another, had strong market positions, in some instances approaching monopoly secured by patent protection, but they were also important innovators. Indeed, innovation helps firms initially obtain a degree of monopoly status, because patents can give a monopoly to new products and/or cost-saving technology. Even the monopolist wants more profits, and any innovation that lowers costs or expands revenues creates profits for the monopolist. In addition, because patents expire, a monopolist may be expected to innovate in order to obtain additional patents and preserve its monopoly power. Therefore, the incentive to innovate might well exist in monopolistic market structures.

SECTION QUIZ

- Monopolists are like perfectly competitive firms in that
 - both maximize profits at the output level where marginal revenue equals marginal cost.
 - both could be earning either profits or losses in the short run.
 - both are in industries with downward-sloping demand curves.
 - all of the above are true of both of them.
 - (a) and (b) are true of both of them, but not (c).



(continued)

SECTION QUIZ (Cont.)



2. Monopoly is unlike perfect competition in that
 - a. a monopolist's price is greater than marginal cost.
 - b. there are no barriers to entry into a monopoly industry.
 - c. a monopolist earns an economic profit only if its price is greater than ATC .
 - d. all of the preceding are ways in which monopoly is unlike perfect competition.
 - e. (a) and (b), but not (c), are ways in which monopoly is unlike perfect competition.
3. A price-taking firm and a monopolist are alike in that
 - a. price equals marginal revenue for both.
 - b. both maximize profits by choosing an output where marginal revenue equals marginal cost, provided that price exceeds average variable cost.
 - c. price exceeds marginal cost at the profit-maximizing level of output for both.
 - d. in the long run, both earn zero economic profits.
4. Which of the following is true of perfect competition but not true of monopoly?
 - a. The firm's average total cost curve is U-shaped.
 - b. Marginal revenue is equal to price.
 - c. A profit-maximizing firm chooses output where marginal revenue equals marginal cost.
 - d. Profits may exist in the short run.
5. Objections to monopolies do *not* include which of the following?
 - a. They reduce output below the efficient level of output that would be produced in perfect competition.
 - b. They reduce the price below what would be charged in perfect competition.
 - c. They charge a price that is greater than marginal cost.
 - d. They create a welfare cost.
 - e. All of the preceding are objections to monopolies.
6. Which of the following statements is true?
 - a. Monopoly results in smaller output and a higher price than would be the case under perfect competition.
 - b. The monopolist produces at an output where $P > MC$ and the marginal value to society of the last unit produced is greater than its marginal cost.
 - c. The monopoly is not producing enough output from society's standpoint.
 - d. Monopoly may lead to greater concentration of economic power and could retard innovation.
 - e. All of the above statements are true.

-
1. Why does the reduced output under monopoly cause inefficiency?
 2. Does monopoly power retard innovation? Why or why not?
 3. What does the welfare cost of monopoly represent? How is it measured?
 4. How can economies of scale lead to monopoly? How could it result in monopoly increasing rather than decreasing market output, relative to the competitive market structure?
 5. Can monopoly be the result of a new innovation that leaves consumers better off than before? Why or why not?

Answers: 1. e 2. a 3. b 4. b 5. b 6. e

13.5

Monopoly Policy

What is the objective of antitrust policy?

What is average cost pricing?

What is regulation?

Because monopolies pose certain problems with respect to efficiency, equity, and power, the public, through its governments, must decide how to deal with the phenomenon. Two major approaches to dealing with such problems are commonly employed: antitrust policies and regulation. It should be pointed out that in these discussions, the word *monopoly* is sometimes used in a loose, general sense to refer to imperfectly competitive markets, not just to “pure” monopoly.

Antitrust Policies

Perhaps the most obvious way to deal with monopoly is to make it illegal. The government can bring civil lawsuits or even criminal actions against businesspeople or corporations engaged in monopolistic practices. By imposing costs on monopolists that can be either monetary or nonmonetary (such as the fear of lawsuits or even jail sentences), antitrust policies reduce the profitability of monopoly.

Antitrust Laws

The first important law regulating monopoly was the Sherman Antitrust Act. The Sherman Act prohibited “restraint of trade”—price fixing and collusion—but narrow court interpretation of the legislation led to a number of large mergers, such as U.S. Steel. Some important near-monopolies were broken up, however. For example, in 1911, the Standard Oil Trust, which controlled most of the country’s oil refining, and the American Tobacco Co., which had similar dominance in tobacco, were both forcibly divided up into smaller companies.

policy
application

Collusion

Ivy League schools have been charged with illegally colluding to fix the price of scholarships. Ivy League schools wanted to make sure they did not get into a “scholarship war,” so the participating schools collectively met and fixed scholarship packages. Students would then pick their schools on the basis of academic quality, not the size of the scholarship package. These activities guaranteed that any student applying to more than one of these schools would be offered the same financial package. The Justice Department charged the eight Ivy League schools and MIT with an illegal conspiracy to set prices and required these schools to stop their collusion on tuition, salaries, and financial aid by signing a consent order.



DOUG MENUEZ/GETTY IMAGES

Antitrust Acts Strengthened

Antitrust efforts were strengthened by subsequent legislation, the most important of which was the Clayton Act in 1914. Additional legislation in the same year created the Federal Trade Commission (FTC), which became the second government agency concerned with anti-trust actions. The Clayton Act made it illegal to engage in predatory pricing—setting prices to drive out competitors or deter potential entrants in order to ensure higher prices in the future. The Clayton Act also prohibited mergers if it led to weakened competition. Not all of the later legislation actually served to enhance competition. A case in point is the Robinson-Patman Act of 1936 (forbidding most forms of price discrimination) and the Cellar-Kefauver Act in 1950, legislation that toughened restrictions on mergers that reduced competition.

However, antitrust laws may have costs as well as benefits because mergers may lead to lower costs and greater efficiency. A number of banks recently merged, lowering costs. So good antitrust policy must be able to recognize which mergers are desirable and which are not.



What do antitrust laws do?

Promoting More Price Competition

Many professional associations restrict the promotion of price competition by prohibiting advertising among their members. Recently, both the FTC and the Justice Department

in the news Is Microsoft a Monopoly?

Government prosecutors argued that Microsoft engaged in a pattern of using its monopoly power to crush its rivals and prevent real competition from developing. In June 2001, a federal appeals court unanimously threw out a lower court order to break Microsoft into two companies. However, the appeals court did find that the company repeatedly abused its monopoly power in the software business.

According to competitor Larry Ellison, “They repeatedly broke the law. They said to Compaq: If you want to get a good price for Windows, you better not put Netscape on that computer. That is using an existing monopoly, Windows, to obtain a new monopoly in browsers. That’s an explicit violation of the Sherman Antitrust Act. They did it over and over again.”

A settlement was finally reached in November 2002 that led to some restrictions on Microsoft’s business practices.

consider this:

It appears that the Microsoft case has less to do with the degree of monopoly power and more to do with the abuse of that power. Specifically, antitrust is about actions taken to form, extend, or maintain the monopoly. However, we have to ask the question: Are consumers necessarily worse

off as a result of a few powerful computer companies that temporarily dominate the industry? Because of potential economies of scale in production and technology, the monopoly may be short lived. Are the barriers to entry in the computer industry insurmountable? The history of the computer industry includes several success stories of individuals with great ideas who have successfully broken into the industry. In addition, Microsoft and Intel are at least partially responsible for making computer power what it is today—providing consumers with low-priced, innovative products. By bundling Internet Explorer into the Windows operating system, the government claimed that Microsoft was expanding its market power in the computer industry. This apparently allowed Windows to win the browser wars, virtually knocking Netscape Navigator out of the market. The government believed there would have been more competition if Microsoft had not bundled its package and given its browser away for “free.” Every Windows user had a copy of Internet Explorer.

When the dust settled Microsoft had to agree to some business restrictions but was allowed to keep its browser as part of its operating system.

In 2005, the European Union cracked down on Microsoft because it bundled its media player with its Windows operation system. Microsoft was fined and required to offer both bundled and unbundled versions of its operating system.

SOURCE: Staff, “Is Microsoft a Monopoly?” *Business Week*, 26 February 2001.

successfully attacked these types of restrictions on the grounds that they violate the antitrust laws. They have been spurred on in their efforts by consumer groups who noticed that prices tend to be much lower when price competition is allowed to flourish. Thus, optometrists were prodded to advertise the price of eyeglasses; pharmacists, the price of commonly prescribed drugs; and even lawyers, the price of a divorce.

Have Antitrust Policies Been Successful?

The success of antitrust policies can be debated. It is true that few giant monopolies were disbanded as a consequence of antitrust policies. Studies showed little change in the degree of monopoly/oligopoly power in the first 100 years or so of U.S. antitrust legislation. Manufacturing, as a whole, actually became more concentrated; that is, fewer firms are now in the industry. However, it is likely that at least some anticompetitive practices were prevented simply by the existence of laws prohibiting monopoly-like practices. Although the laws were probably enforced in an imperfect fashion, on balance they impeded monopoly influences to some degree, at least.



Why don't we want to break up a natural monopoly?

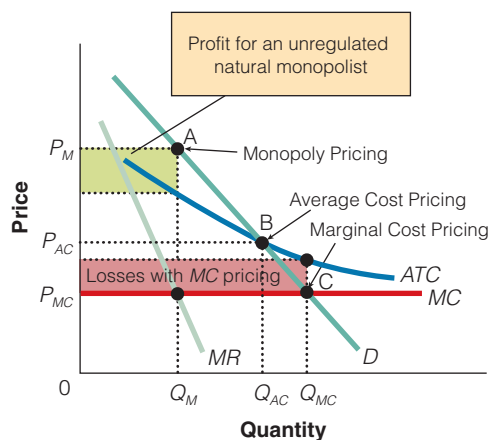
Government Regulation

Government regulation is an alternative approach to dealing with monopolies. Under regulation, a company would not be allowed to charge any price it wants. Suppose the government does not want to break up a natural monopoly in the water or power industry. Remember that natural monopolies occur when one large firm can produce as much output as many smaller firms but at a lower average cost per unit. The government may decide to regulate the monopoly price, but what price does it let the firm charge? The goal is to achieve the efficiency of large-scale production without permitting the high monopoly prices and low output that can promote allocative *inefficiency*.

The basic policy dilemma that regulators often face in attempting to fix maximum prices can be illustrated rather easily. Consider Exhibit 1. Without regulation, say the profit-maximizing monopolist operates at point A—at output Q_M and price P_M . At this output, the price exceeds the average total cost, so economic profits exist, as seen in Exhibit 1. However, the monopolist is producing relatively little output and is charging a relatively high price, and it is producing at a point where price is above marginal cost. This point is not the best from society's perspective.

section 13.5
exhibit 1

Marginal Cost Pricing versus Average Cost Pricing



The marginal cost (MC) curve is less than the average total cost (ATC) curve for the natural monopolist as the average cost falls. If the monopolist is unregulated, it could produce a relatively small level of output, Q_M , at a relatively high price, P_M , and make an economic profit. If regulators require the natural monopolist to use marginal cost pricing, the monopoly will lose money, because P_{MC} is less than ATC. Average cost pricing (at point B) would permit firms to make a normal rate of return, where $P_{AC} = ATC$. The monopolist's unregulated output at point A is not optimal from society's standpoint, and the optimal output at point C is not feasible without subsidy.

Allocative Efficiency

From society's point of view, what would be the best price and output position? As we discussed in Chapter 12, the best position is at the competitive equilibrium output, where $P = MC$, because the equilibrium price represents the marginal value of output. The marginal cost represents society's opportunity costs of making the good as opposed to something else. Where price equals marginal cost, society matches marginal value and marginal cost—that is, it achieves allocative efficiency, as seen at point C in Exhibit 1.

Can the Regulated Monopolist Operate at $P = MC$?

Unfortunately, the natural monopoly cannot operate profitably at the allocative efficient point, where $P = MC$, indicated as point C in Exhibit 1. At point C, the intersection of the demand and marginal cost curves, average total cost is greater than price. The optimal output, then, is an output that results in losses for the producer. Any regulated business that produced for long at this “optimal” output would go bankrupt; it would be impossible to attract new capital to the industry.

Therefore, the “optimal” output from a welfare perspective is not really viable, because firms incur losses. The regulators cannot force firms to price their products at P_{MC} and to sell Q_{MC} output, because they would go out of business. Indeed, in the long run, the industry’s capital would deteriorate as investors failed to replace old capital as it became worn out or obsolete. If the monopolist’s unregulated output at point A is not optimal from society’s standpoint, and the short-run optimal output at point C is not feasible from the monopolist’s standpoint, where should the regulated monopolist be allowed to operate?

One possible solution to the problem is for the government to subsidize the losses associated with marginal cost pricing. However, the burden of this solution would ultimately fall on the taxpayers, as the government would have to raise the money to pay for the losses.

The Compromise: Average Cost Pricing

A compromise between monopoly pricing and marginal cost pricing is found at point B in Exhibit 1, at output Q_{AC} , which is somewhere between the excessively low output and high prices of an unregulated monopoly and the excessively high output and low prices achieved when prices are equated with marginal cost pricing. At point B, price equals average total cost. The monopolist is permitted to price the product where economic profit is zero, earning a normal economic profit or rate of return, such as firms experience in perfect competition in the long run. This compromise is called **average cost pricing**.

In the real world, regulators often permit utilities to receive a “fair and reasonable” return that is a rough approximation to that suggested by average cost pricing, at point B. Point B would seem “fair” in that the monopolist is receiving rewards equal to those that a perfect competitor would ordinarily receive—no more, no less. Point B permits more output at a significantly lower price than is possible at point A, where the monopolist is unregulated, even though output is still somewhat less and price somewhat more than that suggested by point C, the socially optimum or best position.

average cost pricing
setting price equal to
average total cost

Difficulties in Average Cost Pricing

Inaccurate Calculations of Costs

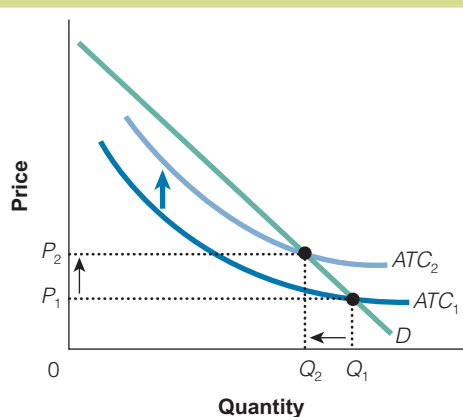
The actual implementation of a rate (price) that permits a “fair and reasonable” return is more difficult than the analysis suggests. The calculations of costs and values are difficult. In reality, the firm may not know exactly what its demand and cost curves look like, which forces regulatory agencies to use profits, another somewhat ambiguous target, as a guide. If profits are “too high,” lower the price; if profits are “too low,” raise the price. In addition, what if the regulated firm has more information than the regulators do about its firm, workers, and technology—*asymmetric information*? If the firm can persuade regulators that its average cost is higher than it actually is, then the regulated price could be set higher, closer to the monopoly price.

No Incentives to Keep Costs Down

Another problem is that average cost pricing offers the monopolist no incentive to reduce costs. That is, if the firm’s costs rise from ATC_1 to ATC_2 in Exhibit 2, the price will rise from P_1 to P_2 . If costs fall, the firm’s price will fall. In either scenario, the firm will still be earning a normal

section 13.5
exhibit 2

Changes in Average Costs



An increase in average total cost leads to a higher price and lower output (P_2Q_2); lower average total cost leads to a lower price and greater output (P_1Q_1). However, both situations lead to a normal rate of return. Because the regulated firm has little incentive to minimize costs, average total cost would have a tendency to rise.

rate of return. In other words, if the regulatory agency sets the price at any point where the ATC curve intersects the demand curve, the firm will earn a normal rate of return. Thus, if the agency is going to set the price wherever ATC intersects the demand curve, the firm might just think, Why not let average costs rise? Why not let employees fly first class and dine in the finest restaurants? Why not buy concert tickets and season tickets to sporting events? And if the regulated monopolist knows that the regulators will reduce prices if costs fall, the regulated monopolist does not benefit from lower costs. Regulators have tackled this problem by allowing the regulated firm to keep some of the profits that come from lower costs; that is, they do not adhere strictly to average cost pricing.

Special Interest Groups

In the real world, consumer groups are constantly battling for lower utility rates, while the utilities themselves are lobbying for higher rates so they can approach the monopoly profits indicated by point A in Exhibit 1. Decisions are not always made in a calm, objective, dispassionate atmosphere free from outside involvement. It is precisely the political economy of rate setting that disturbs some critics of this approach to dealing with the monopoly problem. For example, a rate-making commissioner could become friendly with a utility company, believing that he could obtain a nice job after his tenure as a regulator expires. The temptation would be great for the commissioner to be generous to the utilities. On the other hand, the tendency might be for regulators to bow to pressure from consumer groups. A politician who wants to win votes can almost always succeed by attacking utility rates and promising rate “reform” (lower rates). If zealous rate regulators listen too closely to consumer groups and push rates down to a level indicated by point C in Exhibit 1, the industry might be too unstable to attract capital for expansion.

In recent years, we have seen a trend away from regulation toward competition. For example, after AT&T was broken up by the courts in 1982, the long-distance market became very competitive, and local telephone service is much more competitive now than in the past. Technological advances now allow us to separate the production of electronic power or natural gas from the distributor, which will ultimately lead to greater competition in these markets. Some states have already started deregulation in the electricity market.



What makes average cost pricing so difficult?

SECTION QUIZ

1. A natural monopoly is defined as an industry in which
 - a. one firm can produce the entire industry output at a lower average cost than can two or more firms.
 - b. a single firm controls crucial inputs to the production process.
 - c. one firm is especially large relative to other firms that could enter the industry.
 - d. a single seller exists as a result of patent protection.
2. If regulators set a price according to marginal cost pricing, the firm will
 - a. earn positive economic profits.
 - b. make zero economic profits.
 - c. suffer an economic loss.
 - d. earn the same level of profits as it would absent regulation.

(continued)

SECTION QUIZ (Cont.)



3. Average cost pricing for a natural monopoly will
 - a. result in the socially efficient level of output.
 - b. result in a less than socially efficient level of output.
 - c. result in a greater than socially efficient level of output.
 - d. result in the firm suffering economic losses.
 - e. result in the firm earning economic profit.
4. Under average cost pricing by a natural monopoly,
 - a. price is greater than marginal cost.
 - b. a welfare cost will be incurred.
 - c. the producer will earn a normal rate of return.
 - d. a producer experiences little or no incentive to hold down costs.
 - e. all of the preceding are true.
5. Which of the following is not a limitation that regulators face when they implement average cost pricing?
 - a. Average cost pricing provides little or no incentive for firms to keep costs down.
 - b. The accurate calculation of a firm's costs is difficult.
 - c. Decisions are political and often influenced by special interests.
 - d. All of the preceding are limitations faced by regulators implementing average cost pricing.
6. Which of the following statements is true?
 - a. Antitrust policies are government policies designed to reduce the profitability of a monopoly and push production closer to the social optimum.
 - b. Antitrust laws can promote greater competition.
 - c. Average cost pricing sets price equal to marginal cost, where the demand curve intersects the marginal cost curve.
 - d. Both (a) and (b) are true.

-
1. What alternative ways of dealing with the monopoly problem are commonly used?
 2. How do antitrust laws promote greater price competition?
 3. What price and output are ideal for allocative efficiency for a regulated natural monopolist? Why is an unregulated natural monopolist unlikely to pick this solution?
 4. What is average cost pricing? How is it different from marginal cost pricing?
 5. What are some difficulties encountered when regulators try to implement average cost pricing for natural monopolies?
 6. Why might a job with a regulated natural monopolist that is allowed to earn a "fair and reasonable" return have more perks (noncash forms of compensation) than a comparable job in a nonregulated firm?

Answers: 1. d 2. c 3. b 4. e 5. d 6. d

13.6

Price Discrimination and Peak Load Pricing

What is price discrimination?

Why does price discrimination exist?

Does price discrimination work when reselling is easy?

What is peak load pricing?

Price Discrimination

Sometimes sellers will charge different customers different prices for the same good or service when the cost of providing that good or service does not differ among customers. This practice is called **price discrimination**. Under certain conditions, the monopolist finds it profitable to discriminate among various buyers, charging higher prices to those who are more willing to pay and lower prices to those who are less willing to pay.

price discrimination
the practice of charging different consumers different prices for the same good or service



Why is it unlikely that competitive firms will price discriminate?

Conditions for Price Discrimination

The ability to practice price discrimination is not available to all sellers. To practice price discrimination, the following three conditions must hold:

Market Power

Price discrimination is possible only with market power. A monopoly, an oligopoly, a monopolistically competitive firm, or a cartel may be able to price discriminate. In cases with a large number of competing firms, discrimination is less likely because competitors tend to undercut the high prices charged by the firms that are engaging in price discrimination.

Market Segregation

Price discrimination can only occur if the demand curves for markets, groups, or individuals are different. If the demand curves are not different, a profit-maximizing monopolist would charge the same price in both markets. Price discrimination requires the ability to separate customers according to their willingness to pay. That is, consumers must differ in their sensitivity to price (elasticity of demand) and firms must be able to identify how consumers differ in their sensitivities to price.

Difficulty in Reselling

For price discrimination to work, the person buying the product at a discount must have difficulty in reselling the product to customers being charged more. Otherwise, those getting the items cheaply would want to buy extra amounts of the product at the discounted price and sell it at a profit to others. Price differentials between groups erode if reselling is easy.

Price Discrimination and the Profit-Maximization Motive

Price discrimination results from the profit-maximization motive. Our graphical analysis of monopoly described the demand curve for the product and the corresponding marginal revenue curve. Sometimes, however, different groups of people have different demand curves

and therefore react differently to price changes. A producer can make more money by charging these different buyers different prices. For example, if the price of a movie is increased from \$10 to \$15, many kids who would attend at \$10 may have to stay home at \$15, as they (and perhaps their parents) balk at paying the higher price. The impact of raising prices on attendance may be less, however, for adults, who have higher incomes in the first place and for whom the ticket price may represent a smaller part of the expenses of an evening out.

Thus, a different demand curve applies for those, say, under 2, as opposed to those who are older. Specifically, the elasticity of demand with respect to price is greater for children than for adults, meaning that the demand and marginal revenue curves for children is different from the curves for adults. Assume, for simplicity, that the marginal cost is constant. The profit-maximizing movie theater owner will price where the constant marginal costs equal marginal revenue for each group. As you can see in Exhibit 1(a), the demand curve for children is relatively elastic—firms will charge these customers a lower price. The adult demand curve, shown in Exhibit 1(b), is less elastic; firms will charge adult customers a higher price. But in order for price discrimination to be feasible, the seller must be able to successfully distinguish members of targeted groups, and prevent resale between groups. So a movie theater must not allow the children to be able to resell tickets to adults. This is why theaters will often print out separate children tickets.

Examples of Price Discrimination

Other examples of price discrimination in the United States are plentiful. Here are just a few.

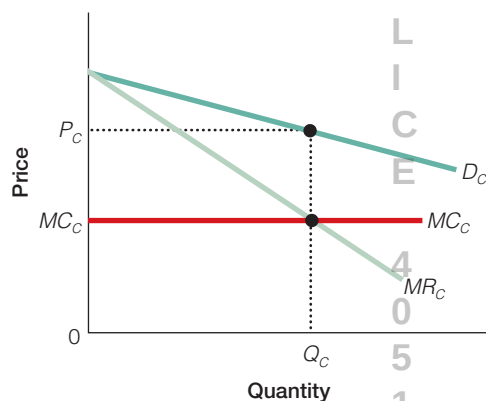


Disneyland practices price discrimination. During the off-season, locals are charged less than out-of-town visitors. If nonlocals have a greater willingness to pay (a less elastic demand curve) for the park hopper ticket (which is good for both Disneyland and its next-door neighbor, California Adventure) than locals do, Disneyland can increase its profits with this pricing strategy as long as it can prevent reselling. Charging both groups the same price is not in the best interest of Disneyland.

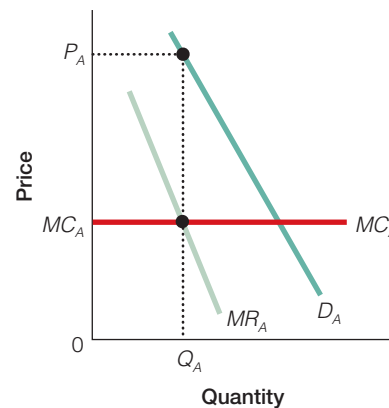
section 13.6 exhibit 1

Price Discrimination in Movie Ticket Prices

a. Children's Demand Curve for Movie Tickets



b. Adult's Demand Curve for Movie Tickets



If the movie theaters in the area have some monopoly power and if children have a lower willingness to pay than adults, then movie theaters can increase profits by price discriminating. Because children's demand curve for movie tickets is relatively more elastic than the adult's demand curve for movie tickets, the firm finds it profitable to charge the two different groups a different price. To maximize profit, the firm charges the group with the less elastic demand curve (adults) a higher price and the group with the more elastic demand curve (children) a lower price.



How does price discrimination increase a firm's profits?

Airline Tickets

Seats on airplanes usually go for different prices. They sell high-priced, no-strings-attached fares, and they sell restricted fares—tickets that require Saturday night layovers or must be purchased weeks in advance. This airline pricing strategy allows the airlines to discriminate against business travelers, who usually have little advance warning, travel on the weekdays, and are not as willing to spend their weekends away from home and family. Because business travelers have a high willingness to pay (a relatively inelastic demand curve), the airlines can charge them higher prices. If the airlines were to cut prices for these clients, their revenues would fall. On the other hand, the personal traveler (perhaps a vacationer) can choose among many substitutes, such as other modes of transportation and different times. In short, the personal traveler has a lower willingness to pay (a relatively elastic demand curve). Thus, the airlines can clearly make more money by charging a higher price to those who have a higher willingness to pay (less elastic demand) and a lower price to those who have a lower willingness to pay (more elastic demand)—those who are willing to book in advance and stay over on Saturday nights. If the airlines charged a higher single price to everyone, those with a lower willingness to pay would not travel; if they charged a lower single price to everyone, they would lose profits by receiving less revenue from those who were willing to pay more.

Coupons

The key to price discrimination is observing the difference in demand curves for different customers. The coupon cutter, who spends an hour looking through the Sunday paper for coupons, will probably have a relatively more elastic demand curve than, say, a busy and wealthy physician or executive. Consequently, firms charge a lower price to customers with a lower willingness to pay (more elastic demand)—the coupon cutter—and a higher price to those who don't use coupons (less elastic demand).

Use

what you've learned

Price Discrimination Over Time

Q Why do people pay a lot more for a hardcover book than a paperback book?

A Sometimes firms engage in price discrimination over time to increase their profits. Although a hardcover book is only slightly more expensive to publish, the real reason for the price differential between hardcover and paperback books is the price elasticity of demand. Some people are willing to pay a higher price to be among the first to read a book; the demand curve is relatively inelastic for these devoted fans. Other individuals have a more elastic demand curve for these goods and are willing to wait for the book to come out in paperback. Other customers, such as libraries, find that paperbacks are not durable enough to be good substitutes for hardbacks. Sellers are able to profit from this



XINHUALANDOV

Why do hardcover texts come out before the paperback version?

difference in elasticities of demand by charging more to those who are more willing to pay and charging a lower price to those who are less willing to pay. Thus, book publishers are able to profit.

College and University Tuition

Another example of price discrimination is the financial aid packages given by many colleges and universities. That is, even though colleges do not charge different tuitions to different students, they do offer different financial aid packages. Furthermore, to receive financial aid, parents must disclose their family income and wealth. In short, students who are well off financially tend to pay more for their education than do students who are less well off.

Quantity Discounts

Another form of price discrimination occurs when customers buy in large quantities, as with public utilities and wholesalers. But even stores will sell a six-pack of soda for less than six single cans. For example, the local bagel shop might sell you a baker's dozen, where you get 13 bagels for the price of 12. This type of price discrimination allows the producer to charge a higher price for the first unit than for, say, the 20th. This form of price discrimination is effective because a buyer's willingness to pay declines as additional units are purchased.



ANDERSEN ROSS/JUPITER IMAGES

Why is the price a lot higher to launder a woman's blouse than a man's shirt? Why are women charged more for haircuts than are men? Are these differences based on costs—perhaps it is more costly to launder a delicate blouse or cut longer hair? Or is it a form of price discrimination where one group may have a greater willingness to pay than the other group?

The Welfare Effects of Price Discrimination

In Exhibit 2, we analyze the welfare effects of perfect price discrimination using consumer and producer surplus and then compare this with perfect competition and single-price monopoly. When the firm is able to perfectly price discriminate, each unit is sold at its **reservation price**; that is, the firm sells each unit at the maximum amount that the customer would be willing to pay. Because each customer pays exactly the amount he is willing to pay, the marginal revenue is the same as the demand curve.

In Exhibit 2, we see that the firm sells its first unit at P_1 to the customer who is willing to pay the most. The marginal cost for producing that good is MC , so the firm makes $P_1 - MC$ on that unit. For each successive unit, the firm receives a lower price (moving down the demand curve) and has a higher marginal cost (moving up the marginal cost curve). The firm will continue to sell units as long as price exceeds marginal cost. Perfect price discrimination leads to an economically efficient level of output because price equals marginal cost on the last unit sold. However, what is efficient may not always be viewed as fair. In particular, consumers may not be happy with the outcome because the entire surplus ($a + b + c + d + f$) goes to the monopolist in the form of producer surplus. Consumer surplus is zero because each consumer pays exactly the amount she is willing to pay—her reservation price.

In Exhibit 2, we see that in the competitive market, the equilibrium is established at the intersection of the demand curve and the marginal cost curve, where the equilibrium price is P_{PC} and the equilibrium quantity is Q_{PC} . The perfectly competitive market is efficient because price equals marginal cost. Consumer surplus is $a + b + c$, producer surplus is $d + f$, and total welfare is maximized ($a + b + c + d + f$). The deadweight loss is zero.

reservation price
the maximum amount a customer would be willing to pay for a unit of output



STEPHEN CHERNIN/STRINGER/GETTY IMAGES

You can go to TKTS booth on the day of a Broadway play and often get a substantial discount on theater tickets. This is a form of price discrimination where once producers know how many empty seats they have, they offer discounts to fill the rest. Once the show starts, an empty seat brings in no revenue. By offering tickets at a heavy discount to those who are willing to wait in line, the theater is able to increase attendance and raise revenue.

use

what you've learned

Price Discrimination and Coupons

Q Bill loves to go through the Sunday paper and cut out supermarket coupons. How do you think Bill's coupon-clipping habits apply to the concept of price discrimination?

A Often the key to price discrimination is observing the differences in customers' demand curves. For example, Bill, a full-time student who finds it relaxing to look through the Sunday paper for coupons, may have a relatively more elastic demand curve than, say, a wealthy neurosurgeon who enjoys sailing and golfing on Sundays.

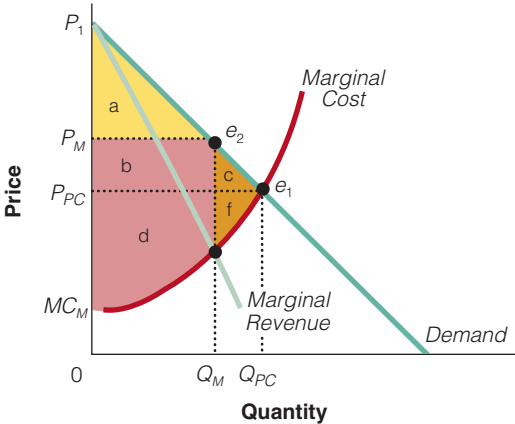


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PHOTO EDIT

section 13.6

exhibit 2

The Welfare Effects of Perfect Price Discrimination



In perfect competition, the market equilibrium price is P_{PC} and the market equilibrium quantity is Q_{PC} . Consumer surplus is area $a + b + c$, producer surplus is area $d + f$, and there is no deadweight loss. In a single-price monopoly, the monopoly equilibrium price is P_M and the equilibrium quantity is Q_M . Compared with perfect competition, consumer surplus falls to area a , producer surplus is area $b + d$, and the deadweight loss is area $c + f$. In perfect price discrimination, the monopolist sells each unit at the buyer's reservation price—the consumer surplus falls to zero, producer surplus increases to area $a + b + c + d + f$, and there is no deadweight loss.

	Perfect Competition	Single Price Monopoly	Perfect Price Discrimination
Customer Surplus	$a + b + c$	a	0
Producer Surplus	$d + f$	$b + d$	$a + b + c + d + f$
Total Welfare	$a + b + c + d + f$	$a + b + d$	$a + b + c + d + f$
Deadweight Loss	0	$c + f$	0

We can also see in Exhibit 2 that if the monopolist charges a single price (the monopoly price), deadweight loss is area $c + f$; that is, some potential buyers value the good at more than the marginal cost but are not able to buy the good at the monopoly price. The market is not efficient because $P > MC$ at Q_M . In this market, the consumer surplus is area a , and the producer surplus is area $b + d$. While consumers receive the most consumer surplus from perfect competition, they are better off with the single-price monopoly than with perfect price discrimination, where consumer surplus is totally eliminated.

use

what you've learned

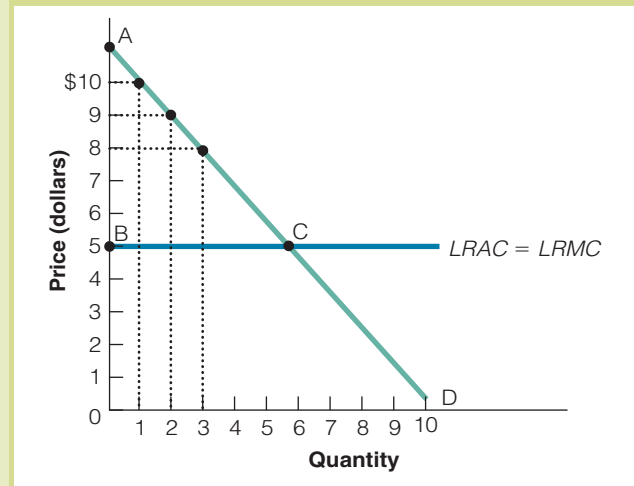
Perfect Price Discrimination

Q Why does no social-welfare loss occur when a monopolist practices perfect price discrimination?

A A perfect price discriminating monopolist obtains the maximum price along the demand curve for each unit of output. For example, in Exhibit 3, the monopolist charges \$10 for the first unit of output, \$9 for the second, \$8 for the third, and so on. The demand curve represents the firm's marginal revenue curve, and profits are maximized at the output level at which the *LRMC* equals *MR*, or in this case, *LRMC* equals *P*. (Constant costs are assumed for simplicity.) The marginal social benefits, represented by the demand price of the last unit sold (\$5), equal marginal social costs, *LRMC*, and social welfare cannot be improved by increasing or decreasing output. Thus, the perfect price discriminating monopolist charges the competitive price, \$5, on only the last unit sold and produces the competitive output level, 6 units. The consumer

section 13.6
exhibit 3

Perfect Price Discrimination



surplus that would have arisen in perfect competition, area ABC (the difference between what consumers are willing to pay and what they actually pay), is transferred to the monopolist as a profit.

Market conditions obviously do not permit perfect price discrimination to be carried out to any significant extent. It is much too difficult to know each consumer's demand curve. However, rough approximations of perfect price discrimination are possible. Lawyers, accountants, and doctors might try to figure out whether their customers are rich or poor and charge accordingly. Car dealers might try to figure out how much a prospective buyer is willing to pay. We do know that price discrimination increases the monopolist's profits; otherwise, it would simply charge a single uniform price to all its customers.

Peak Load Pricing

In our earlier discussion of price discrimination, we assumed that the marginal costs associated with selling output over time were constant, but this assumption is not always true. Sometimes producers will charge different prices during different periods because the demand and the cost of producing the product vary over time. For a number of goods and services, demand peaks at particular times—bridges, roads, and tunnels during rush hour traffic; telephone services during business hours; electricity during late summer afternoons; movie theaters on weekend evenings; and amusement parks and ski resorts during holidays.

In price discrimination, we saw that prices reflected different demands from buyers. With **peak load pricing**, demand levels and costs are different. Peak load pricing leads to greater efficiency because consumer prices reflect the higher marginal costs of production during peak periods. That is, buyers pay higher prices for goods and services during peak periods and lower prices during nonpeak periods.

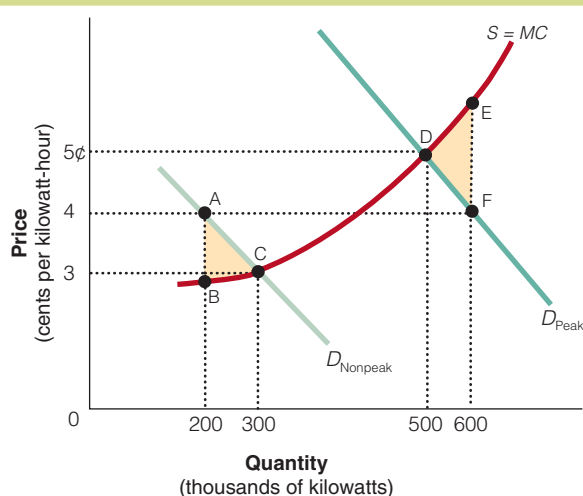
Suppose a regulatory agency for an electric utility company is deciding whether to change its pricing strategy from constant pricing to peak load pricing. In Exhibit 4, the utility

peak load pricing

when producers charge different prices during different periods because the demand and the cost of producing a product vary over time

section 13.6
exhibit 4

Peak Load Pricing



Demand for some goods and services fluctuates considerably and predictably between peak and nonpeak periods. It is more efficient to charge a higher price, 5 cents, during peak periods (when marginal costs are higher) and a lower price, 3 cents, during nonpeak periods (when marginal costs are lower) compared with charging a single price, 4 cents, at all times.

company is presently charging 4 cents per kilowatt-hour 24 hours a day. This constant price is based on the average cost to the electricity company in the combined peak and nonpeak periods. Notice, however, that a separate demand curve applies for each of two different times of day. Let's look at the nonpeak demand curve first. During nonpeak hours, at a price of 4 cents, customers will purchase 200,000 kilowatts. If we look at the marginal cost of producing 200,000 kilowatts (by looking at the supply curve), we see that it costs less than 3 cents per kilowatt-hour. This solution is clearly not efficient because society would be better off if the marginal benefit (demand curve) was equal to the marginal cost (supply curve), which is where supply intersects demand—at a price of 3 cents and a quantity of 300,000 kilowatt-hours (point C).

Now let's look at the demand curve during peak hours. Notice that if the company stuck with its price of 4 cents per kilowatt-hour, it would sell 600,000 kilowatts. However, how much does it cost to produce 600,000 kilowatts? Looking at the supply curve, we see that the marginal cost is more than 6 cents per kilowatt-hour. This solution is not efficient because, once again, society would be better off if the marginal benefit (demand curve) equaled the marginal cost (supply curve), which is where supply intersects demand—at a price of 5 cents and a quantity of 500,000 kilowatt-hours (point D).

In sum, the most economically efficient solution is to charge the lower price during the nonpeak period and the higher price during the peak period. The gain from peak load pricing, compared with constant pricing, can be seen graphically as the sum of the two shaded triangles in Exhibit 4. With this pricing strategy, consumers have an incentive to give their appliances a rest during the peak period when the cost of providing electricity is the highest.



Why is peak load pricing more efficient than charging a constant price?

SECTION QUIZ

- A price-discriminating monopolist will
 - price where marginal revenue equals marginal cost for each different group of demanders.
 - charge a higher price to those with a greater willingness to pay (the more inelastic demanders).
 - have to face customers who have a difficult time reselling the good to others who were charged more.
 - do all of the preceding.
- A price-discriminating monopolist will tend to charge a lower price to students if it believes that student demand is
 - more elastic than that of other demanders.
 - more inelastic than that of other demanders.
 - unit elastic.
 - graphically represented by a vertical curve.
- Which of the following is not true of successful price discriminators?
 - They could make greater profits by charging everyone a higher, uniform price.
 - Their customers must differ in their willingness to pay.
 - Their customers must have difficulty reselling the good to other customers.
 - They must have monopoly power.

(continued)

SECTION QUIZ (Cont.)



4. Price discrimination may be a rational strategy for a profit-maximizing monopolist when
 - a. it has no opportunity for reselling across market segments.
 - b. it has a substantial opportunity for reselling across market segments.
 - c. consumers are unable to be segmented into identifiable markets.
 - d. the willingness to pay is the same across all customers.

1. How do we define price discrimination?
2. Why does price discrimination arise from the profit-maximization motive?
3. Why is preventing resale the key to successful price discrimination?
4. Why is it generally easier to price discriminate for services than for goods?
5. What principle will a profit-maximizing monopolist use in trying to price discriminate among different groups of customers?
6. How can offering quantity discounts increase a producer's profits?
7. Why does perfect price discrimination lead to the economically efficient level of output while reducing consumer surplus to zero?
8. What does perfect price discrimination do to the deadweight cost of monopoly?
9. Why is peak load pricing more efficient than constant pricing for a good with sharp swings in demand over time?

Answers: 1. d 2. a 3. a 4. a

Interactive Summary

Fill in the blanks:

1. A true or pure monopoly exists in cases of only _____ seller of a product for which no close substitute is available.
2. Monopolists are _____ rather than price takers.
3. A monopolist's barriers to entry can include _____, _____, and _____.
4. _____ include franchising, licensing, and patents.
5. The situation in which one large firm can provide the output of the market at a lower cost than two or more smaller firms is called a(n) _____.
6. A barrier to entry is control over an important _____, such as Alcoa's control over bauxite in the 1940s and De Beers's control over much of the world's output of diamonds.
7. In monopoly, the market demand curve may be regarded as the demand curve for the _____ because it is the market for that particular product.
8. If a monopolist reduces output, the price will _____; if the monopolist expands output, the price will _____.
9. In monopoly, if the seller wants to expand output, it will have to lower its price on _____ units.
10. The monopolist, like the perfect competitor, will maximize profits at that output where _____ = MC.
11. The monopolist, unlike the perfect competitor, will not maximize profits at that output where _____ = MC.
12. If at a monopolist's profit-maximizing price and output, the price is less than _____, the monopolist is generating economic losses.

13. In monopoly, economic profits are not eliminated by entry, because one of the conditions for monopoly is that _____ exist.
14. Patents and copyrights are examples of _____ power designed to provide an incentive to develop new products.
15. The major efficiency objection to monopoly is that a monopolist charges _____ prices and produces _____ output than would exist under perfect competition.
16. A monopolist produces at an output where the price is _____ than its marginal cost, so the value to society from the last unit produced is _____ than its marginal cost.
17. An argument against monopoly is that a lack of competition tends to retard _____ advance; but, in fact, many near monopolists are important innovators.
18. Three major approaches to dealing with the monopoly problem are commonly used: _____ policies, _____, and _____ ownership.
19. It is likely that at least some anticompetitive practices have been prevented by _____ policies simply by their prohibition of monopoly-like practices.
20. The goal of government regulation as an alternative approach to dealing with monopolies is to achieve the efficiency of large-scale production without permitting the _____ monopoly prices and _____ output that can cause allocative inefficiency.
21. From society's point of view, allocative efficiency occurs where the price of the good is equal to _____. But with natural monopoly, at the "optimal" level of output for allocative efficiency, _____ are incurred.
22. A compromise between unregulated monopoly and marginal cost pricing is _____ pricing, where the monopolist is permitted to price the product where price equals _____.
23. Average cost pricing _____ the incentives for a monopolist to find ways to reduce its costs.
24. _____ occurs when sellers charge different customers different prices for the same good or service when the cost does not differ.
25. In the case of a number of competing firms, price discrimination is _____ likely because competitors tend to undercut the _____ prices charged.
26. A profit-maximizing seller will charge a(n) _____ price for more inelastic demanders and a(n) _____ price for more elastic demanders.
27. The profit-maximizing rule for a price discriminating monopolist is to price where _____ equals _____ for each different group of demanders.
28. For price discrimination to work, the person buying the product at a discount must have difficulty in _____ the product to customers being charged more.
29. _____, which allow sellers to charge a higher price for the first unit than for later units, are another form of price discrimination.

Answers: 1. one 2. price makers 3. legal barriers; economies of scale; control of important inputs 4. Legal barriers to entry 5. natural monopoly 6. input 7. firm 8. rise; fall 9. all 10. MR 11. P 12. average total cost 13. barriers to entry 14. barriers to entry 15. higher; less 16. greater; greater 17. technological 18. antitrust; regulation; public 19. antitrust 20. high; low 21. marginal cost; losses 22. average cost; average total cost 23. reduces 24. Price discrimination 25. less; high 26. higher; lower 27. marginal revenue; marginal cost 28. reselling 29. Quantity discounts

Key Terms and Concepts

monopoly 356
natural monopoly 357

average cost pricing 375
price discrimination 378

reservation price 381
peak load pricing 383

Section Quiz Answers

13.1 Monopoly: The Price Maker

1. Why does monopoly depend on the existence of barriers to entry?

If a monopoly were unusually profitable (earning a higher than normal rate of return), entry by other firms would occur, driving its economic profits down and increasing the number of sellers, unless some barrier to entry prevented it.

2. Why is a pure monopoly a rarity?

Pure monopolies are a rarity because there are very few goods or services for which there are no close substitutes and for which there is only one producer.

3. Why does the government grant some companies, such as public utilities, monopoly power?

In some industries, it is inherently inefficient to have more than one firm producing the good or service (i.e., the good or service is a natural monopoly).

13.2 Demand and Marginal Revenue in Monopoly

1. Why are the market and firm demand curves the same for a monopoly?

The market and firm demand curves are the same for a monopoly because a monopoly is the only seller of the product under consideration. Since a monopolist is the only seller in the industry, its demand curve is the industry or market demand curve.

2. Why is a monopoly a price maker, but a perfectly competitive firm a price taker?

A perfectly competitive firm is a price taker because it cannot appreciably change the quantity offered for sale on a market, and therefore it cannot change the equilibrium market price appreciably. However, since a monopoly controls the quantity offered for sale, it can alter the price by changing its output—it “makes” the price through its decision of how much to produce.

3. Why is marginal revenue less than price for a profit-maximizing monopolist?

For a monopolist, selling an additional unit requires it to reduce its price, and reducing its price reduces its revenues from units it was selling before at its previous higher price. Therefore, the monopolist's marginal revenue equals price minus this lost

revenue from the reduced price on other units, and is less than price as a result.

4. Why would a monopolist never knowingly operate in the inelastic portion of its demand curve?

To maximize its profits, a monopolist will produce the output where marginal revenue equals marginal cost. But since marginal cost will be positive, this requires that marginal revenue is also positive at the profit-maximizing level. Since a positive marginal revenue means that total revenue increases as quantity sold increases along a demand curve, and this only occurs if demand is relatively elastic (the elasticity of demand is greater than one), this means that a monopolist will always choose to operate on the elastic portion of its demand curve.

13.3 The Monopolist's Equilibrium

1. What is a monopolist's principle for choosing the profit-maximizing output?

A monopolist's principle for choosing the profit-maximizing output is the same as for a perfectly competitive firm: Produce all those units for which marginal revenue exceeds marginal cost, resulting in a profit-maximizing equilibrium quantity where marginal revenue equals marginal cost. The differences between a monopoly and a perfectly competitive firm arise because marginal revenue also equals price for a perfectly competitive firm, but marginal revenue is less than price for a monopolist.

2. How do you find the profit-maximizing price for a monopolist?

A monopolist produces the quantity where marginal revenue equals marginal cost. The height of its demand curve at that quantity indicates the price at which that profit-maximizing quantity can be sold.

3. For a monopolist making positive economic profits, what must be true about the relationship between price and average total cost?

Just as with a perfectly competitive firm, for a monopoly to be earning economic profits, its total revenue must exceed total cost at the profit-maximizing output. But this means that price (average revenue) must also exceed average cost at the profit-maximizing output level for positive economic profits to be earned.

4. For a monopolist making negative economic profits, what must be true about the relationship between price and average total cost?

Just as with a perfectly competitive firm, for a monopoly to be earning negative economic profits, its total revenue must be less than its total cost at the profit-maximizing output. But this means that price (average revenue) must also be less than average cost at the profit-maximizing output level for negative economic profits to be earned.

5. Why, unlike perfectly competitive firms, can a monopolist continue to earn positive economic profits in the long run?

Unlike perfectly competitive firms, a monopolist can continue to earn positive economic profits in the long run, because barriers to entry keep entrants, whose entry would erode those economic profits, from entering the industry.

13.4 Monopoly and Welfare Loss

1. Why does the reduced output under monopoly cause inefficiency?

The reduced output and higher prices under monopoly cause inefficiency because some units for which the marginal value (indicated by willingness to pay along the demand curve) exceeds the marginal cost are no longer exchanged (unlike in perfect competition), eliminating the net gains that such trades would have generated.

2. Does monopoly power retard innovation? Why or why not?

Monopoly has been claimed to retard innovation, but many near-monopolists are important innovators. Therefore the incentive to innovate exists in monopolistic as well as competitive market structures.

3. What does the welfare cost of monopoly represent? How is it measured?

The welfare cost of monopoly represents the net gains from trade (the difference between the marginal values of those goods indicated by the demand curve and the marginal costs of producing them) from those units of a good that would have been traded, but are no longer traded because of the output restriction of monopoly. It is measured by the area between the demand curve and the marginal cost curve for those units that are no longer traded because of the monopoly output restriction.

4. How can economies of scale lead to monopoly? How could it result in monopoly increasing rather than decreasing market output, relative to the competitive market structure?

Economies of scale can lead to monopoly because output can be produced at lower costs on a larger

scale than on a smaller scale, and this efficiency (cost) advantage can result in a larger firm outcompeting smaller firms. Industries with economies of scale over the entire range of industry output therefore tend toward monopoly. But if the production cost savings are greater than the price increasing effect of monopoly output restriction, the result of such a monopoly would be a lower price and a higher quantity than would be the case with a larger number of firms (i.e., a more competitive market structure).

5. Can monopoly be the result of a new innovation that leaves consumers better off than before? Why or why not?

A new innovation may result in its innovator having a monopoly on it, which would give its creator incentives to raise prices and reduce outputs like any other monopoly. But for that monopoly innovator to attract customers away from the products customers currently purchase, those customers must expect to be made better off buying the product at the price charged. This means that such a monopoly has no ability to harm consumers compared to their earlier situation, but can make them better off.

13.5 Monopoly Policy

1. What alternative ways of dealing with the monopoly problem are commonly used?

The monopoly problem (with respect to efficiency, equity, and power) is commonly dealt with through antitrust policies, regulation, and public ownership.

2. How do antitrust laws promote greater price competition?

Antitrust laws promote more price competition by making monopolistic practices and restrictions on price competition illegal.

3. What price and output are ideal for allocative efficiency for a regulated natural monopolist? Why is an unregulated natural monopolist unlikely to pick this solution?

The efficient price and output are where demand (marginal value) equals marginal cost, since this guarantees that every mutually beneficial trade takes place. However, with economies of scale (falling average cost curves), marginal cost is less than average cost for a natural monopolist, so that marginal cost prices would result in economic losses. An unregulated natural monopolist would not choose such a solution.

4. What is average cost pricing? How is it different from marginal cost pricing?

Average cost pricing is a regulatory approach to natural monopoly that permits the regulated natural monopolist to earn a normal rate of return on

capital investment (zero economic profits). Zero economic profits requires that total revenues equal total (opportunity) costs, which requires that average revenue, or price, equals average cost. Forcing such a natural monopolist to charge prices equal to marginal cost would require a price below average cost, because marginal cost is less than average cost for a natural monopolist, implying losses to the producer, which is not sustainable over the long run.

5. What are some difficulties encountered when regulators try to implement average cost pricing for natural monopolies?

Difficulties encountered when regulators try to implement average cost pricing include difficulties in calculating costs, eroded incentives for regulated firms to keep costs down, and the risk that the regulatory agency will make decisions on a political rather than on an economic basis.

6. Why might a job with a regulated natural monopolist that is allowed to earn a “fair and reasonable” return have more perks (noncash forms of compensation) than a comparable job in a nonregulated firm?

A regulated natural monopolist that is allowed to earn a “fair and reasonable” rate of return has little or no incentive to keep costs down, since reducing costs won’t allow them to earn higher profits as a result. Those potential profits the monopolist is not allowed to keep are converted instead into business expenses that benefit the management, such as lavish perks (first-class air travel, hotels, meals, etc.).

13.6 Price Discrimination and Peak Load Pricing

1. How do we define price discrimination?

Price discrimination is defined as charging different customers different prices for the same good or service.

2. Why does price discrimination arise from the profit-maximization motive?

Price discrimination arises from the profit-maximization motive because different customers react differently to price changes (i.e., they have different elasticities of demand). Therefore, profit-maximization implies treating these different customers differently.

3. Why is preventing resale the key to successful price discrimination?

If customers who are being charged different prices for the same goods can resell the goods among themselves, the lower price group will resell to the higher price group, undermining the seller’s ability

to charge a higher price to the groups with more inelastic demand curves.

4. Why is it generally easier to price discriminate for services than for goods?

Preventing resale is a key to successful price discrimination, and it is typically easier to prevent resale of services provided directly to customers than for goods sold to them (e.g., it is harder to resell a gall bladder surgery or plumbing repairs than to resell a computer).

5. What principle will a profit-maximizing monopolist use in trying to price discriminate among different groups of customers?

A profit-maximizing monopolist will attempt to charge higher prices to those who are more willing to pay (more inelastic demanders), and lower prices to those who are less willing to pay (more elastic demanders).

6. How can offering quantity discounts increase a producer’s profits?

Quantity discounts can allow a producer to charge a lower price for additional units, without having to reduce the price on the earlier units; it is effective because a buyer’s willingness to pay declines as additional units are purchased.

7. Why does perfect price discrimination lead to the economically efficient level of output while reducing consumer surplus to zero?

Perfect price discrimination allows a seller to sell each unit for a price equal to the buyer’s reservation price, which eliminates any consumer surplus. But since a perfect price discriminating monopolist need not lower its price on previous units when it sells more, its marginal revenue is the same as its price, so when it produces to the output level where marginal revenue equals marginal cost, it also produces to the output level where price equals marginal cost, which is the efficient level of output.

8. What does perfect price discrimination do to the deadweight cost of monopoly?

Since perfect price discrimination makes marginal revenue equal to price for each unit sold, such a monopolist has no reason to restrict output to increase profits; with no incentive to reduce output below the efficient level, there would be no deadweight cost.

9. Why is peak load pricing more efficient than constant pricing for a good with sharp swings in demand over time?

A constant price would result in price being too low in the peak demand period, and too high in the low demand period; both of these pricing “errors” would cause a deadweight cost that could be avoided by peak load pricing.

Problems

- Which of the following could be considered a monopoly?
 - Kate Hudson (an actress)
 - De Beers diamond company
 - the only doctor in a small town
 - Ford Motor Company
- Barriers to entry are important in the creation of monopolies because they keep competitors out of the industry. Although many types of barriers exist, historically, ownership of an essential resource, government patents and licenses, and large entry costs have served as the primary barriers to entry. For each of the following cases, indicate which type of barrier created the monopoly.
 - In the 1940s, Aluminum Company of America owned all of the world's known bauxite deposits.
 - The local cable TV company has the only government issued license to supply services in the area.
 - The pharmaceutical company, MAXCO, invents and patents a new drug curing baldness.
 - In the 1950s, AT&T provided long-distance telephone service by stringing millions of miles of copper wiring across the United States.
- Is it optimal for the monopolist to operate on the inelastic portion of the demand curve? Why or why not?
- Fill in the missing data in the following table for a monopolist.

Quantity	Price	Total Revenue	Marginal Revenue	Demand Elastic or Inelastic?
1	\$11	_____	_____	_____
2	10	_____	_____	_____
3	9	_____	_____	_____
4	8	_____	_____	_____
5	7	_____	_____	_____
6	6	_____	_____	_____
7	5	_____	_____	_____
8	4	_____	_____	_____
9	3	_____	_____	_____
10	2	_____	_____	_____
11	1	_____	_____	_____

- Assume that the monopolist in problem 4 had fixed costs of \$10 and a constant marginal cost of \$4 per unit. Add columns to the above table for Total Cost, Marginal Cost, and Profit.
- The Mobile Phone Company has served Mobile, Alabama, since the 1930s as a government-authorized natural monopoly. The following table describes a portion of the demand curve for long-distance service facing Mobile Phone Company.
 - Complete the table.

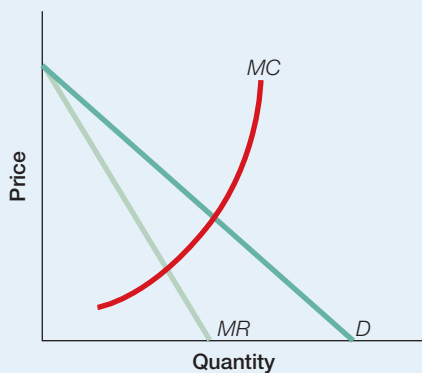
MOBILE PHONE COMPANY DEMAND FOR PHONE HOURS				
Quantity	Price	Total Revenue	Marginal Revenue	Elastic or Inelastic?
30	\$3.65	_____	_____	_____
31	3.58	_____	_____	_____
32	3.50	_____	_____	_____
33	3.43	_____	_____	_____
34	3.35	_____	_____	_____
35	3.27	_____	_____	_____
36	3.20	_____	_____	_____
37	3.12	_____	_____	_____
38	3.05	_____	_____	_____

Quantity	Price	Total Revenue	Marginal Revenue	Elastic or Inelastic?
39	2.97	_____	_____	_____
40	2.89	_____	_____	_____
41	2.82	_____	_____	_____
42	2.74	_____	_____	_____
43	2.67	_____	_____	_____
44	2.59	_____	_____	_____
45	2.51	_____	_____	_____
46	2.44	_____	_____	_____
47	2.36	_____	_____	_____
48	2.29	_____	_____	_____
49	2.21	_____	_____	_____
50	2.13	_____	_____	_____

- b. How does the company's marginal revenue change as the price changes? What is the relationship between marginal revenue and price?
- c. At what price does demand become inelastic?
- d. What will happen to the elasticity of demand when a new company, Mobile Phones of Mobile, starts a competing wireless phone company?
7. The following table shows the demand for water and cost conditions for the New South Springdale Water Utility, a pure monopoly.
- a. Complete the table.

Quantity (gallons)	Price (per gallon)	Total Revenue	Marginal Revenue	Marginal Costs	Average Total Costs	Profit
100	\$1.28	_____	_____	\$0.15	\$1.252	_____
101	1.27	_____	_____	0.18	1.241	_____
102	1.26	_____	_____	0.21	1.231	_____
103	1.25	_____	_____	0.23	1.221	_____
104	1.24	_____	_____	0.26	1.212	_____

- b. What is true about the relationship between marginal revenue and marginal costs when profit is the greatest?
- c. Suppose the government imposed a tax on the firm of \$103, which the firm had to pay even if it went out of business. What would be the profit-maximizing level of output? What would happen to profits? Would the firm stay in business?
8. A patent gives a firm a monopoly in production of the patented good. While the monopoly profits provide an incentive for firms to innovate, the monopoly power imposes a cost on consumers. Why do consumers suffer a cost? Is it greater than the profits earned by the monopolist?
9. Use the accompanying diagram to answer a–c.

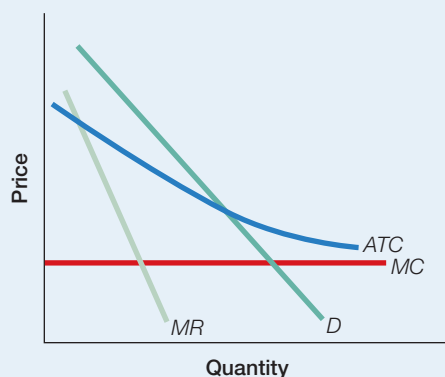


- a. Assuming the monopolist indicated in the diagram produced at all, indicate its profit-maximizing quantity and price.
 - b. Add an *ATC* curve that would show this monopolist earning an economic profit.
 - c. Add an *ATC* curve that would show this monopolist experiencing an economic loss.
10. If economic profits were zero, would a monopolist stay in business? Why might it be possible for a monopolist to earn positive economic profits in the long run?
 11. What is meant by “the welfare loss” of monopoly? Why does no welfare loss occur if a monopolist successfully practices perfect price discrimination?
 12. Consider the data in the following table:

Price	Quantity	Fixed Cost	Variable Cost
\$100	0	\$60	\$ 0
90	1	60	25
80	2	60	40
70	3	60	50
60	4	60	70
50	5	60	100
40	6	60	140
30	7	60	190
20	8	60	250

A simple monopolist with these fixed and variable cost schedules maximizes profits at what level of output?

13. Explain how each of the following is a form of price discrimination.
 - a. a student discount at the movie theater
 - b. long-distance phone service that costs 15 cents per minute for the first 10 minutes and 5 cents per minute after 10 minutes
 - c. a psychic who charges each customer his or her maximum reservation price for palm readings
 - d. a senior citizen breakfast discount at a local restaurant
 - e. coupon discounts on laundry detergent
14. In October of 1999, Coca-Cola announced that it was considering testing a new vending machine that was temperature sensitive. The price of the soft drinks in the machines would be higher on hot days. The *Miami Herald* story read “Soda jerks.” How is this practice a form of price discrimination? How can the placement of the vending machines create a monopoly? What if other vending machines are close by and are not owned by Coca-Cola?
15. Compare the size of the welfare (deadweight) loss under monopoly in the case of perfect price discrimination and under the standard case of simple monopoly. Explain.
16. Use the accompanying diagram to answer a–c.



- a. Indicate the efficient result on the graph.
- b. Illustrate the profits or losses from the efficient result in (a).
- c. Show the average cost-pricing solution. What profits are earned with that approach?

17. Governments around the world are allowing competition in the production of goods and services that have historically been considered natural monopolies. Competition has been introduced in industries such as the local telephone service and electricity provision. Why might the introduction of competition increase the efficiency of these industries?
18. The Mississippi Bridge Authority operates a toll bridge that crosses the river near St. Louis. Traffic over the bridge includes tourist traffic and commercial traffic. It also includes commuters who work in St. Louis but live on the Illinois side of the river.
 - a. Would you expect demand for bridge use to differ at different times during the day? Why?
 - b. How might costs differ in these time periods?
 - c. What would be the effects of charging a higher toll to cross the bridge during busy times?

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