7 The Competitive Firm

LEARNING OBJECTIVES

After reading this chapter, you should know:

LO1. What a perfectly competitive firm is.

LO2. How a competitive firm maximizes profit.

LO3. How a competitive firm's supply curve is derived.

Apple computer would love to raise the price of downloading music from its iTunes store. It isn't likely to do so, however, because too many other firms also offer digital downloads. If Apple raises its prices, customers might sign up with another company.

Your campus bookstore may be in a better position to raise prices. On most college campuses there's only one bookstore. If the campus store increases the price of books or supplies, most of its customers (you) will have little choice but to pay the higher tab.

As we discover in this and the next few chapters, the degree of competition in product markets is a major determinant of product prices, quality, and availability. Although all firms are in business to make a profit, their profit opportunities are limited by the amount of competition they face.

This chapter begins an examination of how businesses make price and production decisions. We first explore the nature of profits and how they're computed. We then observe how one type of firm—a perfectly competitive one—can *maximize* its profits by selecting the right rate of output. The following questions are at the center of this discussion:

- **What are *profits*?**
- **What are the unique characteristics of competitive firms?**
- **How much output will a competitive firm produce?**

The answers to these questions will shed more light on how the *supply* of goods and services is determined in a market economy.

THE PROFIT MOTIVE

The basic incentive for producing goods and services is the expectation of profit. *Owning* plant and equipment isn't enough. To generate a current flow of income, one must *use* that plant and equipment to produce and sell goods.

Profit is the difference between a firm's sales revenues and its total costs. It's the residual that the owners of a business receive. That profit residual may flow to the sole owner of a corner grocery store, or to the group of stockholders who collectively own a large corporation. In either case, it's the quest for profit that motivates people to own and operate a business (or a piece thereof).

profit: The difference between total revenue and total cost.

Other Motivations

Profit isn't the only thing that motivates producers. Like the rest of us, producers also worry about social status and crave recognition. People who need to feel important, to control others, or to demonstrate achievement are likely candidates for running a business. Many small businesses are maintained by people who gave up 40-hour weeks, $50,000 incomes, and a sense of alienation in exchange for 80-hour weeks, $45,000 incomes, and a sense of identity and control.

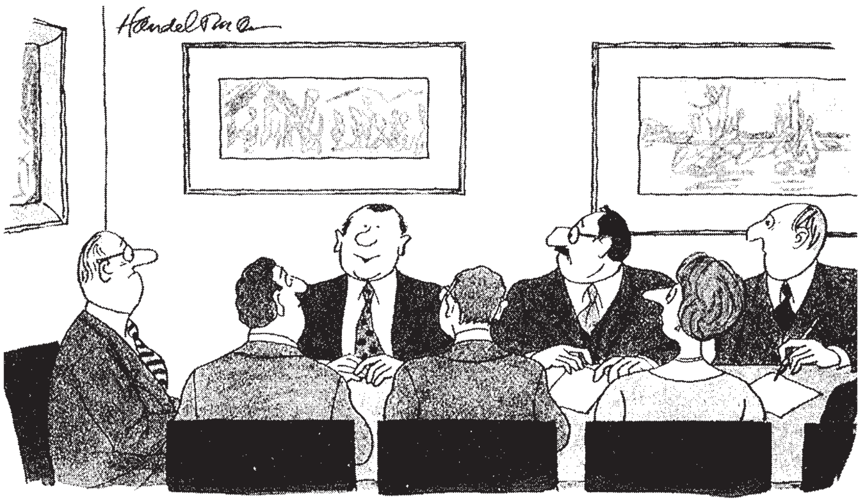
In large corporations, the profit motive may lie even deeper below the surface. Stockholders of large corporations rarely visit corporate headquarters. The people who manage the corporation's day-to-day business may have little or no stock in the company. Such nonowner-managers may be more interested in their own jobs, salaries, and self-preservation than in the profits that accrue to the stockholding owners. If profits suffer, however, the corporation may start looking for new managers. The accompanying cartoon notwithstanding, the "bottom line" for virtually all businesses is the level of profits.

Is the Profit Motive Bad?

If it weren't possible to make a profit, few people would choose to supply goods and services. Yet the general public remains suspicious of the profit motive. As the News on the next page indicates, one out of four people thinks the profit motive is bad. An even higher percentage believes the profit motive results in *inferior* products at inflated prices.

As we'll see, the profit motive *can* induce business firms to pollute the environment, restrict competition, or maintain unsafe working conditions. However, ***the profit motive also encourages businesses to produce the goods and services consumers desire, at prices they're willing to pay.*** The profit motive, in fact, moves the "invisible hand" that Adam Smith said orchestrates market outcomes.

Topic Podcast:
Profit Maximization



"You know what I think, folks? Improving technology isn't important. Increased profits aren't important. What's important is to be warm, decent human beings."

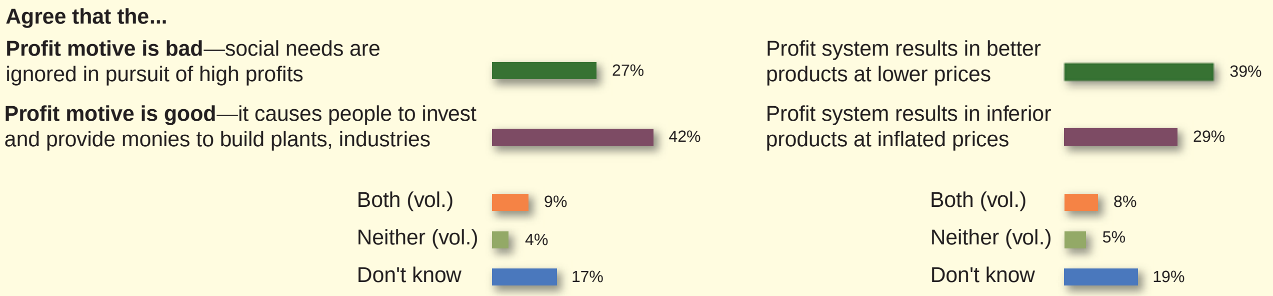
Analysis: The principal motivation for producing goods and services is to earn a profit. Although other goals may seem desirable, businesses that fail to earn a profit won't survive.

IN THE NEWS

Are Profits Bad?

The following responses to a Roper survey are typical of public opinion about profits.

Source: *The American Enterprise*, November–December 1993. Reprinted by permission of *The American Enterprise*, www.TAEmag.com.



Analysis: The profit motive is the primary incentive for supplying goods and services. Many consumers are distrustful of that motive, however.

ECONOMIC VS. ACCOUNTING PROFITS

Although profits might be a necessary inducement for producers, most consumers feel that profits are too high. And that may be so in many cases. But most consumers have no idea how much profit U.S. businesses actually make. Public *perceptions* of profit are seven or eight times higher than actual profits. The typical consumer believes that 35 cents of every sales dollar goes to profits. In reality, average profit per sales dollar is closer to 5 cents.

Faulty perceptions of profits aren't confined to the general public. As surprising as it might seem, most businesses also measure their profits incorrectly.

Economic Profits

economic cost: The value of all resources used to produce a good or service; opportunity cost.

explicit costs: A payment made for the use of a resource.

implicit cost: The value of resources used, even when no direct payment is made.

economic profit: The difference between total revenues and total economic costs.

Everyone agrees that profit represents the difference between total revenues and total costs. Where people part ways is over the decision of what to include in total costs. Recall from Chapter 6 how economists compute costs. **Economic cost** refers to the value of *all* resources used in production, whether or not they receive an explicit payment. By contrast, most businesses count only **explicit costs**—that is, those they actually write checks for. They typically don't take into account the **implicit costs** of the labor or land and buildings they might own. As a result, they understate costs.

If businesses (and their accountants) understate true costs, they'll overstate true profits. Part of the accounting "profit" will really be compensation to unpaid land, labor, or capital used in the production process. ***Whenever economic costs exceed explicit costs, observed (accounting) profits will exceed true (economic) profits.*** Indeed, what appears to be an accounting profit may actually disguise an economic loss, as illustrated by Mr. Fujishige's strawberry farm once located right next to Disneyland (see News). To determine the **economic profit** of a business, we must subtract all implicit factor costs from observed accounting profits:

$$\text{Economic profit} = \text{total revenue} - \text{total economic cost}$$

$$= \text{accounting profit} - \text{implicit costs}$$

IN THE NEWS

Strawberry Fields Forever?

ANAHEIM, CALIFORNIA—Hiroshi Fujishige is a successful strawberry farmer. For over 40 years he has been earning a profit growing and selling strawberries and other produce from his 58-acre farm. Mr. Fujishige could make even more money if he stopped growing strawberries. His 58-acre strawberry patch is located across the street from Disneyland. The people from Disney have offered him $32 million just to *lease* the farm; developers have offered as much as $2 million per acre to *buy* the land. But Mr. Fujishige, who lives in a tiny house on the farm he bought 45 years ago (for $2500!) isn't selling. "I'm a farmer, and I've been farming since I got out of high school in 1941," he says. As long as he can make a profit from strawberries, he says, he'll keep growing them.

Source: *Washington Post*, March 9, 1994. **© 1994, *The Washington Post.* Excerpted with permission.** www.washingtonpost.com

Analysis: Mr. Fujishige thought he was making a profit because he miscalculated costs. His *implicit* costs were enormous. When Mr. Fujishige died in 1998 his family sold the strawberry farm to Disneyland for its new California Adventure theme park.

Suppose, for example, that Table 7.1 accurately summarizes the revenues and costs associated with a local drugstore. Monthly sales revenues amount to $27,000. Explicit costs paid by the owner-manager include the cost of merchandise bought from producers for resale to consumers ($17,000), wages to the employees of the drugstore, rent and utilities paid to the landlord, and local sales and business taxes. When all these explicit costs are subtracted from total revenue, we're left with an *accounting profit* of $6,000 per month.

The owner-manager of the drugstore may be quite pleased with an accounting profit of $6,000 per month. He's working hard for this income, however. To keep his store running, the owner-manager is working 10 hours per day, 7 days a week. This adds up to 300 hours of labor per month. Were he to work this hard for someone else, his labor would be compensated explicitly—with a paycheck. Although he doesn't choose to pay himself this way, his labor still represents a real resource cost. To compute *economic* profit, we must subtract this implicit cost from the drugstore's accounting profits. Suppose the owner could earn $10 per hour in the best alternative job. Multiplying this wage rate ($10) by the number of hours he works in the drugstore (300), we see that the implicit cost of his labor is $3,000 per month.

The owner has also used his savings to purchase inventory for the store. He purchased the goods on his shelves for $120,000. If he had invested his savings in some other business, he could have earned a return of 10 percent per year. This forgone return represents a real cost. In this case, the implicit return (opportunity cost) on his capital investment amounts to $12,000 per year (10 percent × $120,000), or $1,000 per month.

TABLE 7.1
The Computation of Economic Profit

Total (gross) revenues per month	$27,000
less explicit costs:	
Cost of merchandise sold	$17,000
Wages to cashier, stock, and delivery help	2,500
Rent and utilities	800
Taxes	700
Total explicit costs	$21,000
Accounting profit (revenue minus explicit costs)	$ 6,000
less implicit costs:	
Wages of owner-manager, 300 hours @ $10 per hour	$ 3,000
Return on inventory investment, 10% per year on $120,000	1,000
Total implicit costs	$ 4,000
Economic profit (revenue minus *all* costs)	$ 2,000

To calculate economic profit, we must take account of *all* costs of production. The economic costs of production include the implicit (opportunity) costs of the labor and capital a producer contributes to the production process. The accounting profits of a business take into account only explicit costs paid by the owner. Reported (accounting) profits will exceed economic profits whenever implicit costs are ignored.

To calculate the *economic* profit this drugstore generates, we count both explicit and implicit costs. Hence, we must subtract all implicit factor payments (costs) from reported profits. The residual in this case amounts to $2,000 per month. That's the drugstore's *economic* profit.

Note that when we compute the drugstore's economic profit, we deduct the opportunity cost of the owner's capital. Specifically, we assumed that his funds would have reaped a 10 percent return somewhere else. In effect, we've assumed that a "normal" rate of return is 10 percent. This **normal profit** (the opportunity cost of capital) is an economic cost. Rather than investing in a drugstore, the owner could have earned a 10 percent return on his funds by investing in a fast-food franchise, a music store, a steel plant, or some other production activity. By choosing to invest in a drugstore instead, the owner was seeking a *higher* return on his funds—more than he could have obtained elsewhere. In other words, ***economic profits represent something over and above "normal profits."***

normal profit: The opportunity cost of capital; zero economic profit.

Our treatment of "normal" returns as an economic cost leads to a startling conclusion: On average, economic profits are zero. Only firms that reap *above-average* returns can claim economic profits. This seemingly strange perspective on profits emphasizes the opportunity costs of all economic activities. ***A productive activity reaps an economic profit only if it earns more than its opportunity cost.***

Entrepreneurship

Naturally, everyone in business wants to earn an economic profit. But relatively few people can stay ahead of the pack. To earn economic profits, a business must see opportunities that others have missed, discover new products, find new and better methods of production, or take above-average risks. In fact, economic profits are often regarded as a reward to entrepreneurship, the ability and willingness to take risks, to organize factors of production, and to produce something society desires.

Consider the local drugstore again. People in the neighborhood clearly want such a drugstore, as evidenced by its substantial sales revenue. But why should anyone go to the trouble and risk of starting and maintaining one? We noted that the owner-manager *could* earn $3,000 in wages by accepting a regular job plus $1,000 per month in returns on capital by investing in an "average" business. Why should he take on the added responsibilities and risk of owning and operating his own drugstore?

The inducement to take on the added responsibilities of owning and operating a business is the potential for economic profit, the extra income over and above normal factor payments. In the case of the drugstore owner, this extra income is the economic profit of $2,000 (Table 7.1). In the absence of such additional compensation, few people would want to make the extra effort required.

Risk

Don't forget, however, that the *potential* for profit is not a *guarantee* of profit. Quite the contrary. Substantial risks are attached to starting and operating a business. Tens of thousands of businesses fail every year, and still more suffer economic losses. From this perspective, profit also represents compensation for the risks incurred in owning or operating a business.

MARKET STRUCTURE

Not all businesses have an equal opportunity to earn an economic profit. The opportunity for profit may be limited by the *structure* of the industry in which the firm is engaged. One of the reasons Microsoft is such a profitable company is that it has long held a **monopoly** on computer operating systems. As the supplier of virtually all operating systems, Microsoft can raise software prices without losing many customers. T-shirt shops, by contrast, have to worry about all the other stores that sell similar products in the area (see News). Faced with so much competition, the owner of a T-shirt shop doesn't have the power to raise prices, or accumulate economic profits.

monopoly: A firm that produces the entire market supply of a particular good or service.

IN THE NEWS

T-Shirt Shop Owner's Lament: Too Many T-Shirt Shops

The small Texas beach resort of South Padre Island boasts white sand, blue skies (much of the time), the buoyant waters of the Gulf of Mexico and, at last count, more than 40 T-shirt shops.

And that's a problem for Shy Oogav, who owns one of those shops. "Every day you have to compete with other shops," he says. "And if you invent something new, they will copy you."

Padre Island illustrates a common condition in the T-shirt industry—unbridled, ill-advised growth. Many people believe T-shirts are the ticket to a permanent vacation—far too many people. "In the past years, everything that closed opened up again as a T-shirt shop," says Maria C. Hall, executive director of the South Padre Island Chamber of Commerce.

Mr. Oogav, a 29-year-old immigrant from Israel, came to South Padre Island on vacation six years ago, thought he had found paradise and stayed on. He subsequently got a job with one of the town's T-shirt shops, which then numbered fewer than a dozen. Now that he owns his own shop, and the competition has quadrupled, his paradise is lost. "I don't sleep at night," he says, morosely.

—Mark Pawlosky

Analysis: The ability to earn a profit depends on how many other firms offer similar products. A perfectly competitive firm, facing numerous rivals, has difficulty maintaining prices or profits.

Figure 7.1 illustrates various **market structures.** At one extreme is the monopoly structure in which only one firm produces the entire supply of the good. At the other extreme is **perfect competition.** In perfect competition a great many firms supply the same good.

There are relatively few monopolies or perfectly competitive firms in the real world. Most of the 20 million businesses in the United States fall between these extremes. They're more accurately characterized by gradations of *imperfect* competition—markets in which competition exists, but individual firms still retain some discretionary power over prices. In a *duopoly,* two firms supply the entire market. In an *oligopoly,* like credit-card services, a handful of firms (Visa, MasterCard, American Express) dominate. In *monopolistic competition,* like fast-food restaurants, there are enough firms to ensure some competition, but not so many as to preclude some limited monopoly-type power. We examine all these market structures in later chapters, after we establish the nature of perfect competition.

market structure: The number and relative size of firms in an industry.

perfect competition: A market in which no buyer or seller has market power.

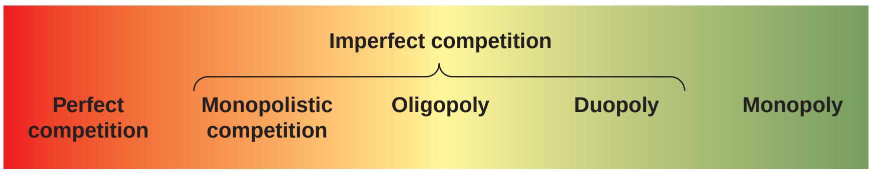


FIGURE 7.1
Market Structures

The number and relative size of firms producing a good vary across industries. Market structures range from perfect competition (a great many firms producing the same good) to monopoly (only one firm). Most real-world firms are along the continuum of *imperfect* competition. Included in that range are duopoly (two firms), oligopoly (a few firms), and monopolistic competition (many firms).

THE NATURE OF PERFECT COMPETITION

Structure

A perfectly competitive industry has several distinguishing characteristics, including

- ***Many firms***—Lots of firms are competing for consumer purchases.
- ***Identical products***—The products of the different firms are identical, or nearly so.
- ***Low-entry barriers***—It's relatively easy to get into the business.

The T-shirt business has all these traits, which is why storeowners have a hard time maintaining profits (see previous News).

Price Takers

Because they always have to contend with a lot of competition, T-shirt shops can't increase profits by raising T-shirt prices. More than 1 billion T-shirts are sold in the United States each year, by tens of thousands of retail outlets. In such a competitive industry the many individual firms that make up the industry are all *price takers:* They take the price the market sets. A competitive firm can sell all its output at the prevailing market price. If it boosts its price above that level, consumers will shop elsewhere. In this sense, a perfectly competitive firm has no **market power**—no ability to control the market price for the good it sells.

market power: The ability to alter the market price of a good or service.

At first glance, it might appear that all firms have market power. After all, who's to stop a T-shirt shop from raising prices? The important concept here, however, is *market* price, that is, the price at which goods are actually sold. If one shop raises its price to $15 and 40 other shops sell the same T-shirts for $10, it won't sell many shirts, and maybe none at all.

You may confront the same problem if you try to sell this book at the end of the semester. You might want to resell this textbook for $60. But you'll discover that the bookstore won't buy it at that price. With many other students offering to sell their books, the bookstore knows it doesn't have to pay the $60 you're asking. Because you don't have any market power, you have to accept the going price if you want to sell this book.

The same kind of powerlessness is characteristic of the small wheat farmer. Like any producer, the lone wheat farmer can increase or reduce his rate of output by making alternative production decisions. But his decision won't affect the market price of wheat.

Even the largest U.S. wheat farmers can't change the market price of wheat. The largest wheat farm produces nearly 100,000 bushels of wheat per year. But *2 billion* bushels of wheat are brought to market every year, so another 100,000 bushels simply won't be noticed. In other words, ***the output of the lone farmer is so small relative to the market supply that it has no significant effect on the total quantity or price in the market.***

A distinguishing characteristic of *powerless* firms is that, individually, they can sell all the output they produce at the prevailing market price. We call all such producers **competitive firms;** they have no independent influence on market prices. ***A perfectly competitive firm is one whose output is so small in relation to market volume that its output decisions have no perceptible impact on price.***

competitive firm: A firm without market power, with no ability to alter the market price of the goods it produces.

Market Demand Curves vs. Firm Demand Curves

It's important to distinguish between the market demand curve and the demand curve confronting a particular firm. T-shirt shops don't contradict the law of demand. The quantity of T-shirts purchased in the market still depends on T-shirt prices. That is, the *market* demand curve for T-shirts is still downward-sloping. A single T-shirt shop faces a *horizontal* demand curve only because its share of the market is so small that changes in its output don't disturb market equilibrium.

Collectively, though, individual firms do count. If all 40 of the T-shirt shops on South Padre Island (see previous News) were to increase shirt production at the same time, the market equilibrium would be disturbed. That is, a competitive market composed of individually powerless producers still sees a lot of action. The power here resides in the collective action of all the producers, however, not in the individual action of any one. Were T-shirt production to increase so abruptly, the shirts could be sold only at lower prices, in accordance with the downward-sloping nature of the *market* demand curve.

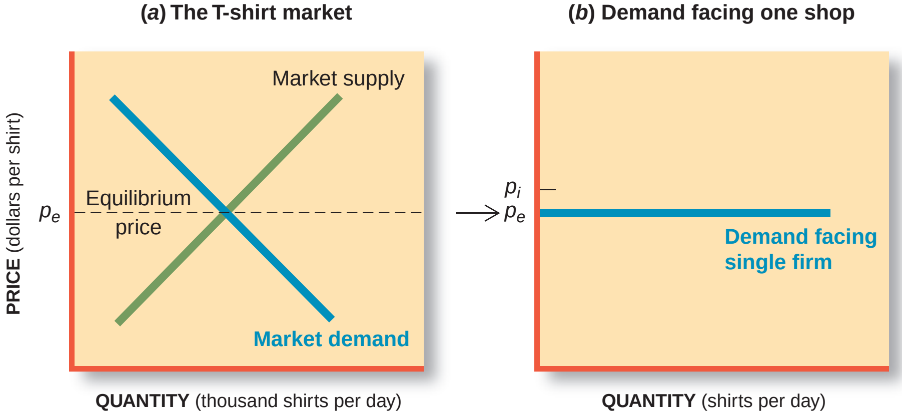


FIGURE 7.2
Market vs. Firm Demand

Consumer demand for any product is downward-sloping. The equilibrium price (p_e) of T-shirts is established by the intersection of *market* demand and *market* supply. This market-established price is the only one at which an individual shop can sell T-shirts. If the shop owner asks a higher price (e.g., p_i), no one will buy his shirts, since they can buy identical T-shirts from other shops at p_e. But he can sell all his shirts at the market-set equilibrium price. The shop owner thus confronts a horizontal demand curve for his own output. (Notice the difference in market and individual shop quantities on the horizontal axes of the two graphs.)

Figure 7.2 illustrates the distinction between the actions of a single producer and those of the market. Notice that

- ***The market demand curve for a product is always downward-sloping (law of demand).***
- ***The demand curve confronting a perfectly competitive firm is horizontal.***

THE PRODUCTION DECISION

Since a competitive firm can sell all its output at the market price, it has only one decision to make: how much to produce. Choosing a rate of output is a firm's **production decision.** Should it produce all the output it can? Or should it produce at less than capacity?

production decision: The selection of the short-run rate of output (with existing plant and equipment).

Output and Revenues

In searching for the most desirable rate of output, focus on the distinction between total *revenue* and total *profit*. **Total revenue** is the price of the good multiplied by the quantity sold:

total revenue: The price of a product multiplied by the quantity sold in a given time period: $p \times q$.

$$\text{Total revenue} = \text{price} \times \text{quantity}$$

Since a competitive firm can sell all its output at the market price (p_e), total revenue is a simple multiple of p_e. The total revenue of a T-shirt shop, for example, is the price of shirts (p_e) multiplied by the quantity sold. Figure 7.3 shows the total revenue curve that results from this multiplication. Note that ***the total revenue curve of a perfectly competitive firm is an upward-sloping straight line, with a slope equal to p_e.***

If a competitive firm wanted to maximize its total *revenue*, its production decision would be simple: It would always produce at capacity. Life isn't that simple, however; ***the firm's goal is to maximize profits, not revenues.***

Output and Costs

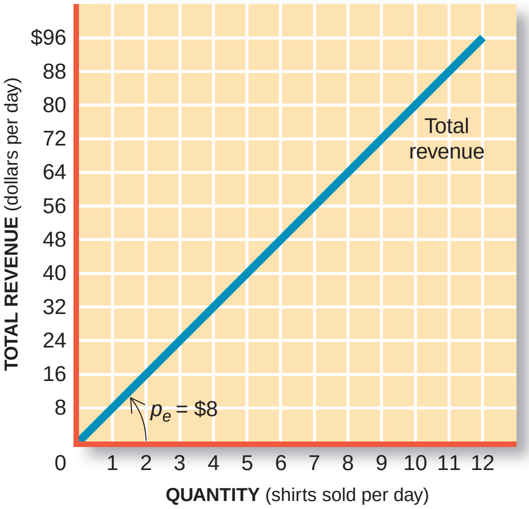
To maximize profits, a firm must consider how increased production will affect *costs* as well as *revenues*. How do costs vary with the rate of output?

As we observed in Chapter 6, producers are saddled with certain costs in the **short run.** A T-shirt shop has to pay the rent every month no matter how few shirts it sells. The Low-Rider Jeans Corporation in Chapter 6 had to pay the rent on its factory and lease payments

short run: The period in which the quantity (and quality) of some inputs can't be changed.

FIGURE 7.3
Total Revenue

Because a competitive firm can sell all its output at the prevailing price, its total revenue curve is linear. In this case, the market (equilibrium) price of T-shirts is assumed to be \$8. Hence, a shop's total revenue is equal to \$8 multiplied by quantity sold.



Price (per shirt)	×	Quantity (shirts per day)	=	Total revenue
\$8		1		\$ 8
8		2		16
8		3		24
8		4		32
8		5		40
8		6		48
8		7		56
8		8		64
8		9		72

fixed costs: Costs of production that don't change when the rate of output is altered, e.g., the cost of basic plant and equipment.

variable costs: Costs of production that change when the rate of output is altered, e.g., labor and material costs.

marginal cost (MC): The increase in total costs associated with a one-unit increase in production.

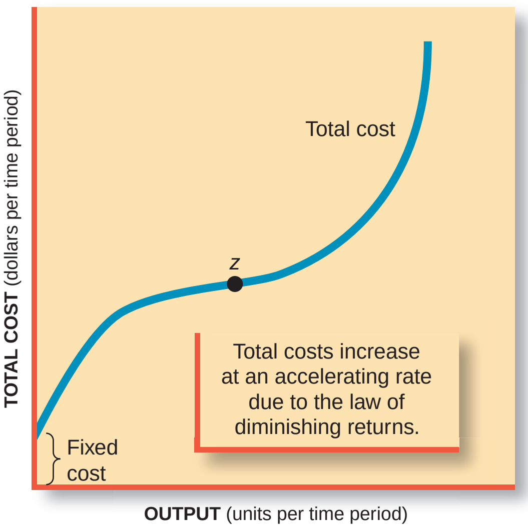
on its sewing machine. These **fixed costs** are incurred even if no output is produced. Once a firm starts producing output it incurs **variable costs** as well.

Since profits depend on the *difference* between revenues and costs, the costs of added output will determine how much profit a producer can make. Figure 7.4 illustrates a typical total cost curve. ***Total costs increase as output expands. But the rate of cost increase varies.*** Hence, the total cost curve is *not* linear. At first total costs rise slowly (notice the gradually declining slope until point *z*), then they increase more quickly (the rising slope after point *z*). This S-shaped curve reflects the *law of diminishing returns.* As we first observed in Chapter 6, **marginal costs (MC)** often decline in the early stages of production and then increase as the available plant and equipment are used more intensively. These changes in marginal cost cause *total* costs to rise slowly at first, then to pick up speed as output increases.

You may suspect by now that the road to profits is not an easy one. It entails comparing ever-changing revenues with ever-changing costs. Figure 7.5 helps simplify the problem by bringing together typical total revenue and total cost curves. Notice how total costs exceed total revenues at high rates of output (beyond point *g*). As production capacity is approached, costs tend to skyrocket, offsetting any gain in sales revenue.

FIGURE 7.4
Total Cost

Total cost increases with output. The rate of increase isn't steady, however. Typically, the rate of cost increase slows initially, then speeds up. After point *z,* diminishing returns (rising marginal costs) cause accelerating costs. These accelerating costs limit the profit potential of increased output.



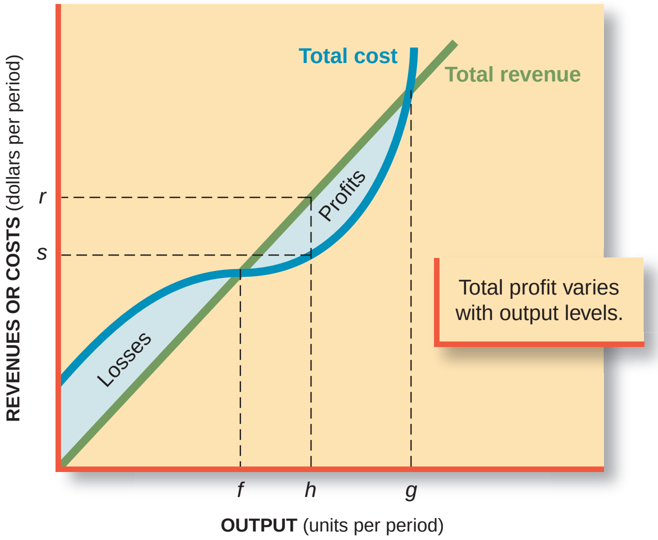


FIGURE 7.5
Total Profit

Profit is the *difference* between total revenue and total cost. It is represented as the vertical distance between the total revenue curve and the total cost curve. At output *h,* profit equals *r* minus *s*. The objective is to find that rate of output that *maximizes* profit.

Total profit in Figure 7.5 is represented by the vertical distance between the two curves. Total costs in this case exceed total revenue at low rates of output (below *f*) as well as at very high rates (above *g*). The firm is profitable only at output rates between *f* and *g*.

Although all rates of output between *f* and *g* are profitable, they aren't *equally* profitable. A quick glance at Figure 7.5 confirms that the vertical distance between total revenue and total cost varies considerably within that range. ***The primary objective of the producer is to find that one particular rate of output that maximizes total profits.*** With a ruler, one could find it in Figure 7.5 by measuring the distance between the revenue and cost curves at all rates of output. In the real world, most producers need more practical guides to profit maximization.

PROFIT-MAXIMIZING RULE

The best single rule for maximizing profits in the short run is straightforward: Never produce a unit of output that costs more than it brings in. By following this simple rule, a producer is likely to make the right production decision. We see how this rule works by looking first at the revenue side of production ("what it brings in"), then at the cost side ("what it costs").

Marginal Revenue = Price

In searching for the most profitable rate of output, we need to know what an additional unit of output will bring in—that is, how much it adds to the total revenue of the firm. In general, the contribution to total revenue of an additional unit of output is called **marginal revenue (MR).** Marginal revenue is the *change* in total revenue that occurs when output is increased by one unit; that is,

marginal revenue (MR): The change in total revenue that results from a one-unit increase in the quantity sold.

$$\text{Marginal revenue} = \frac{\text{change in total revenue}}{\text{change in output}}$$

To calculate marginal revenue, we compare the total revenues received before and after a one-unit increase in the rate of production; the *difference* between the two totals equals marginal revenue.

When the price of a product is constant, it's easy to compute marginal revenue. Suppose we're operating a catfish farm. Our product is catfish, sold at wholesale at the prevailing price of $13 per bushel. In this case, a one-unit increase in sales (one more bushel) increases total revenue by $13. As illustrated in Table 7.2, as long as the price of a product is constant, price and marginal revenue are one and the same thing. Hence, ***for perfectly competitive firms, price equals marginal revenue.***

TABLE 7.2
Total and Marginal Revenue

Marginal revenue (MR) is the *change* in total revenue associated with the sale of one more unit of output. A third bushel increases total revenue from $26 to $39; MR equals $13. If the price is constant (at $13 here), marginal revenue equals price.

Quantity Sold (bushels per day)	×	Price (per bushel)	=	Total Revenue (per day)	Marginal Revenue (per bushel)
0	×	$13	=	$ 0>	$13
1	×	13	=	13>	13
2	×	13	=	26>	13
3	×	13	=	39>	13
4	×	13	=	52>	13

Marginal Cost

Keep in mind why we're breeding and selling catfish. It's not to maximize *revenues* but to maximize *profits*. To gauge profits, we need to know not only the price of fish but also how much each bushel costs to produce. As we saw in Chapter 6, the added cost of producing one more unit of a good is its *marginal cost*. Figure 7.6 summarizes the marginal costs associated with the production of catfish.

The production process for catfish farming is wonderfully simple. The factory is a pond; the rate of production is the number of fish harvested from the pond per day. A farmer can alter the rate of production at will, up to the breeding capacity of the pond.

Assume that the *fixed* cost of the pond is $10 per day. The fixed costs include the rental value of the pond and the cost of electricity for keeping the pond oxygenated so the fish can breathe. These fixed costs must be paid no matter how many fish the farmer harvests.

To harvest catfish from the pond, the farmer must incur additional costs. Labor is needed to net and sort the fish. The cost of labor is *variable*, depending on how much output the farmer decides to produce. If no fish are harvested, no variable costs are incurred.

The *marginal costs* of harvesting are the additional costs incurred to harvest *one* more basket of fish. Generally, we expect marginal costs to rise as the rate of production increases.

Phillip Gould/Corbis

Analysis: Fish farmers want to maximize profits.

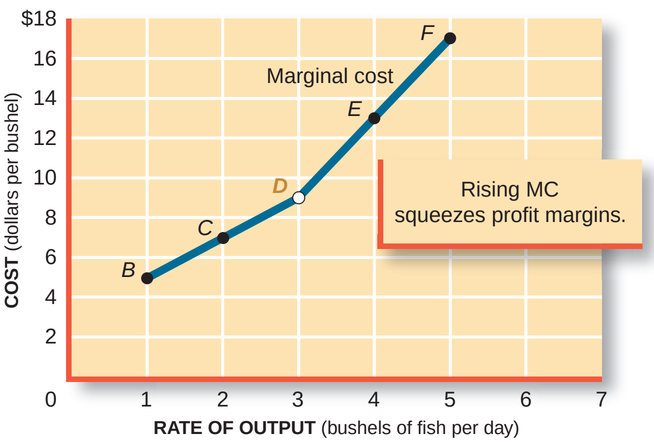


FIGURE 7.6
The Costs of Catfish Production

Marginal cost is the increase in total cost associated with a one-unit increase in production. When production expands from two to three units per day, total costs increase by $9 (from $22 to $31 per day). The marginal cost of the third bushel is therefore $9, as illustrated by point *D* in the graph.

	Rate of Output (bushels per day)	Total Cost (per day)	Marginal Cost (per day)	Average Cost (per day)
A	0	$10	—	—
B	1	15	$ 5	$15.00
C	2	22	7	11.00
D	3	31	9	10.33
E	4	44	13	11.00
F	5	61	17	12.20

The law of diminishing returns we encountered in Chapter 6 applies to catfish farming as well. As more labor is hired, each worker has less space (pond area) and capital (access to nets, sorting trays) to work with. Accordingly, it takes a little more labor time (marginal cost) to harvest each additional fish.

Figure 7.6 illustrates these marginal costs. Notice how the MC rises as the rate of output increases. At the output rate of 4 bushels per day (point *E*), marginal cost is $13. Hence, the fourth bushel *increases* total costs by $13. The fifth bushel is even more expensive, with a marginal cost of $17.

Profit-Maximizing Rate of Output

We're now in a position to make a production decision. The rule about never producing anything that adds more to cost than it brings in can now be stated in more technical terms. Since price equals marginal revenue for competitive firms, we can base the production decision on a comparison of *price* and marginal cost.

MC > *p*. We don't want to produce an additional unit of output if its MC exceeds its price. If MC exceeds price, we're spending more to produce that extra unit than we're getting back: Total profits will decline if we produce it.

***p* > MC.** The opposite is true when price exceeds MC. If an extra unit brings in more revenue than it costs to produce, it is *adding* to total profit. Total profits must increase in this case. Hence, a competitive firm wants to expand the rate of production whenever price exceeds MC.

p* = MC.** Since we want to expand output when price exceeds MC and contract output if price is less than MC, the profit-maximizing rate of output is easily found. ***For perfectly competitive firms, profits are maximized at the rate of output where price equals marginal cost. The implications of this **profit-maximization rule** are summarized in Table 7.3.

profit-maximization rule: Produce at that rate of output where marginal revenue equals marginal cost.

Figure 7.7 illustrates the application of our profit-maximization rule in catfish farming. The prevailing wholesale price of catfish is $13 a bushel. At this price we can sell all the catfish we can produce, up to our short-run capacity. The catfish can't be sold at a higher price because lots of farmers raise catfish and sell them for $13 (see News). If we try to charge a higher price, consumers will buy their fish from other vendors. Hence, we confront a horizontal demand curve at the price of $13.

The costs of producing catfish were examined in Figure 7.6. The key concept illustrated here is marginal cost. The MC curve slopes upward, in conventional fashion.

Figure 7.7 also depicts the total revenues, costs, and profits of alternative production rates. Study the table first. Notice that the firm loses $10 per day if it produces no fish (row A). At zero output, total revenue is zero ($p \times q = 0$). However, the firm must still contend with fixed costs of $10 per day. Total profit—total revenue minus total cost—is therefore *minus* $10; the firm incurs a loss.

Row B of the table shows how this loss is reduced when 1 bushel of fish is harvested per day. The production and sale of 1 bushel per day bring in $13 of total revenue (column 3). The total cost of producing 1 bushel per day is $15 (column 4). Hence, the total loss at an

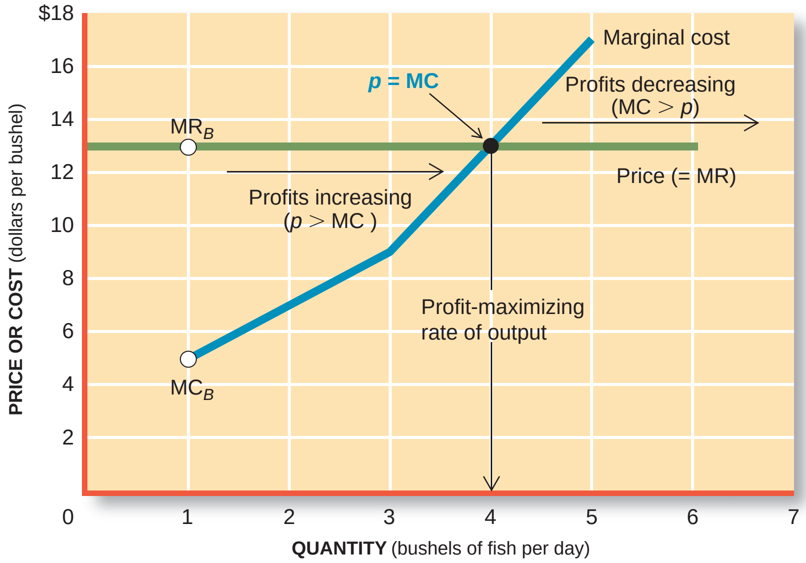
Price Level	Production Decision
price > MC	increase output
price = MC	maintain output (profits maximized)
price < MC	decrease output

TABLE 7.3
Short-Run Profit-Maximization Rules for Competitive Firm

The relationship between price and marginal cost dictates short-run production decisions. For competitive firms, profits are maximized at that rate of output where price = MC.

FIGURE 7.7
Maximization of Profits for a Competitive Firm

A competitive firm maximizes total profit at the output rate where MC = *p*. If MC is less than price, the firm can increase profits by producing more. If MC exceeds price, the firm should reduce output. In this case, profit maximization occurs at an output of 4 bushels per day.



	(1) Number of Bushels (per day)	(2) Price	(3) Total Revenue	−	(4) Total Cost	=	(5) Total Profit	(6) Marginal Revenue	(7) Marginal Cost
A	0	—	—		$10		−$10	—	—
B	1	$13	$13		15		− 2	$13	$ 5
C	2	13	26		22		+ 4	13	7
D	3	13	39		31		+ 8	13	9
E	4	13	52		44		+ 8	13	13
F	5	13	65		61		+ 4	13	17

webnote

Check out the real world of catfish farming at www.aces.edu/pubs/docs/A/ANR-0273/

output rate of 1 bushel per day is $2 (column 5). This may not be what we hoped for, but it's certainly better than the $10 loss incurred at zero output.

The superiority of harvesting 1 bushel per day rather than none is also evident in columns 6 and 7 of row B. The first bushel produced has a *marginal revenue* of $13. Its *marginal cost* is only $5. Hence, it brings in more added revenue than it adds to costs. Under these circumstances—whenever price exceeds MC—output should definitely be expanded. That is one of the decision rules summarized in Table 7.3.

The excess of price over MC for the first unit of output is also illustrated by the graph in Figure 7.7. Point MR_B ($13) lies above MC_B ($5); the *difference* between these two points measures the contribution that the first bushel makes to the total profits of the firm. In this case, that contribution equals $13 − $5 = $8, and production losses are reduced by that amount when the rate of output is increased from zero to 1 bushel per day.

As long as price exceeds MC, increases in the rate of output increase total profit. Notice what happens to profits when the rate of output is increased from 1 to 2 bushels per day (row C). The price (MR) of the second bushel is $13, its MC is $7. Therefore it *adds* $6 to total profits. Instead of losing $2 per day, the firm is now making a profit of $4 per day.

The firm can make even more profits by expanding the rate of output further. The marginal revenue of the third bushel is $13; its marginal cost is $9 (row D of the table). Therefore, the third bushel makes a $4 contribution to profits.

This firm will never make huge profits. For the fourth unit of output price and MC both equal $13. It doesn't contribute to total profits, and it doesn't subtract from them. The

IN THE NEWS

Southern Farmers Hooked on New Cash Crop

Catfish are replacing crops and dairy farming as a cash industry in much of the South, particularly in Mississippi's Delta region, where 80 percent of farm-bred catfish are grown.

Production has skyrocketed in the USA from 16 million pounds in 1975 to an expected 340 million pounds this year.

The business is growing among farmers in Alabama, Arkansas and Louisiana.

Catfish farming is similar to other agriculture, experts say. One thing is the same: It takes money to get started.

"If you have a good row-crop farmer, you have a good catfish farmer," says James Hoffman of Farm Fresh Catfish Co. in Hollandale, Miss. "But you can't take a poor row-crop farmer and make him a good catfish farmer."

Greensboro, Ala., catfish farmer Steve Hollingsworth says he spends $18,000 a week on feed for the 1 million catfish in his ponds.

"Each of the ponds has about 100,000 fish," he says. "You get about 60 cents per fish, so that's about $60,000."

The investment can be lost very quickly "if something's wrong in that pond," like an inadequate oxygen level, Hollingsworth says.

"You can be 15 minutes too late getting here, and all your fish are gone," he says.

—Mark Mayfield

Source: *USA Today*, December 5, 1989. www.usatoday.com

Analysis: People go into a competitive business like catfish farming to earn a profit. Once in business, they try to maximize total profits by equating price and marginal cost.

fourth unit of output represents the highest rate of output the firm desires. ***At the rate of output where price = MC, total profits of the firm are maximized.***[1]

Notice what happens if we expand output beyond 4 bushels per day. The price of the fifth bushel is still $13; its MC is $17. The fifth bushel adds more to costs than to revenue. If we produce that fifth bushel, total profit will decline by $4. In Figure 7.7 the MC curve lies above the price line at all output levels in excess of 4. The lesson here is clear: ***Output should not be increased if MC exceeds price.***

The correct production decision—the profit-maximizing decision—is shown in Figure 7.7 by the intersection of the price and MC curves. At this intersection, price equals MC and profits are maximized. If we produced less, we'd be giving up potential profits. If we produced more, total profits would also fall (review Table 7.3).

Adding Up Profits

To reach the right production decision, we've relied on *marginal* revenues and costs. Having found the desired rate of output, however, we may want to take a closer look at the profits we are accumulating. Figure 7.8 provides pictures of our success.

Total profits are represented in Figure 7.8*a* by the vertical distance between the total revenue and total cost curves. This is a straightforward interpretation of our definition of total profits—that is,

$$\text{Total profits} = \text{TR} - \text{TC}$$

The vertical distance between the TR and TC curves is maximized at the output of 4 bushels per day.

Our success in catfish farming can also be illustrated by *average* revenue and costs. Total profit is equal to *average* profit per unit multiplied by the number of units produced. Profit *per unit*, in turn, is equal to price *minus* average total cost—that is,

$$\text{Profit per unit} = p - \text{ATC}$$

[1]In this case, profits are the same at output levels of 3 and 4 bushels. Given the choice between the two levels, most firms will choose the higher level. By producing the extra unit of output, the firm increases its customer base. This not only denies rival firms an additional sale but also provides some additional cushion when the economy slumps. Also, corporate size may connote both prestige and power. In any case, the higher output level defines the *limit* to maximum-profit production.

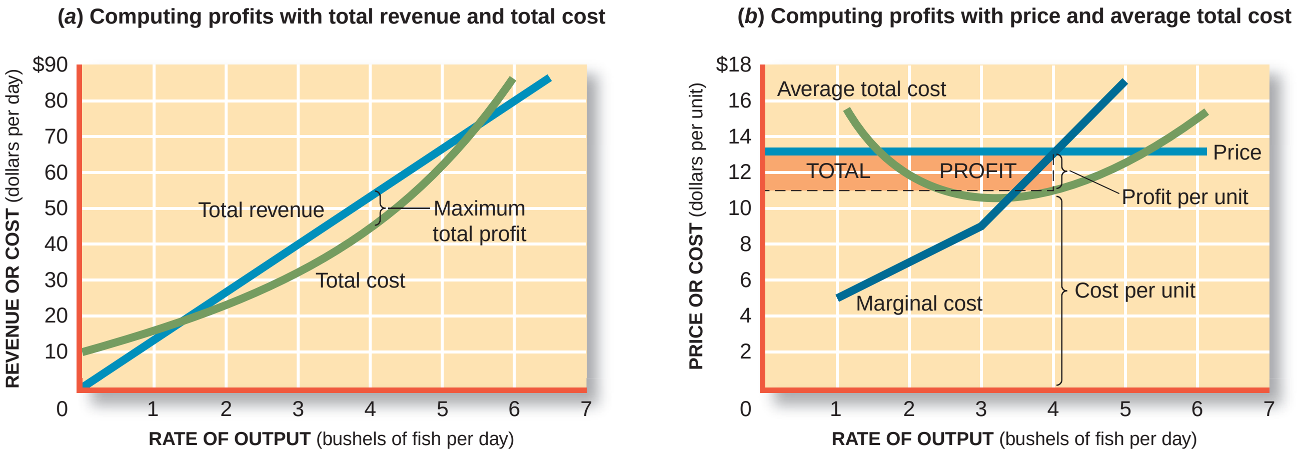


FIGURE 7.8
Alternative Views of Total Profit

Total profit can be computed as TR − TC, as in part *a*. Or it can be computed as profit *per unit* (p − ATC) multiplied by the quantity sold. This is illustrated in part *b* by the shaded rectangle. To find the profit-maximizing output, we could use either of these graphs or just the price and MC curves in Figure 7.7.

The price of catfish is illustrated in Figure 7.8*b* by the horizontal price line at $13. The average total cost of producing catfish is shown by the ATC curve. Like the ATC curve we encountered in Chapter 6, this one has a U shape. The *difference* between price and average cost—profit per unit—is illustrated by the vertical distance between the price and ATC curves. At 4 bushels per day, for example, profit per unit equals $13 − $11 = $2.

To compute *total* profits, we note that

$$\text{Total profits} = \text{profit per unit} \times \text{quantity}$$
$$= (p - \text{ATC}) \times q$$

In this case, the 4 bushels generate a profit of $2 each, for a *total* profit of $8 per day. *Total* profits are illustrated in Figure 7.8*b* by the shaded rectangle. (Recall that the area of a rectangle is equal to its height, the profit per unit, multiplied by its width, the quantity sold.)

Profit per unit is not only used to compute total profits but is often also of interest in its own right. Businesspeople like to cite statistics on "markups," which are a crude index to per-unit profits. However, ***the profit-maximizing producer never seeks to maximize per-unit profits. What counts is* total *profits, not the amount of profit per unit.*** This is the old $5 ice cream problem again. You might be able to maximize profit per unit if you could sell 1 cone for $5, but you would make a lot more money if you sold 100 cones at a per-unit profit of only 50 cents each.

Similarly, ***the profit-maximizing producer has no desire to produce at that rate of output where ATC is at a minimum.*** Minimum ATC does represent least-cost production. But additional units of output, even though they raise average costs, will increase total profits. This is evident in Figure 7.8; price exceeds MC for some output to the right of minimum ATC (the bottom of the U). Therefore, total profits are increasing as we increase the rate of output beyond the point of minimum average costs.

THE SHUTDOWN DECISION

The rule established for short-run profit maximization doesn't guarantee any profits. By equating price and marginal cost, the competitive producer is only assured of achieving the *optimal* output. This is the best possible rate of output for the firm, given the existing market price and the (short-run) costs of production.

But what if the best possible rate of output generates a loss? What should the producer do in this case? Keep producing output? Or shut down the factory and find something else to do?

The first instinct may be to shut down the factory to stop the flow of red ink. But this isn't necessarily the wisest course of action. It may be smarter to keep operating a money-losing operation than to shut it down.

The rationale for this seemingly ill-advised course of action resides in the fixed costs of production. ***Fixed costs must be paid even if all output ceases.*** The firm must still pay rent on the factory and equipment even if it doesn't use these inputs. That's why we call such costs "fixed."

The persistence of fixed costs casts an entirely different light on the shutdown decision. Since fixed costs will have to be paid in any case, the question becomes: Which option creates greater losses? Does the firm lose more money by continuing to operate (and incurring a loss) or by shutting down (and incurring a loss equal to fixed costs)? In these terms, the answer becomes clear: ***A firm should shut down only if the losses from continuing production exceed fixed costs.*** This happens when total revenue is less than total *variable* cost.

Price vs. AVC

The shutdown decision can be made without explicit reference to fixed costs. Figure 7.9 shows how. The relationship to focus on is between the price of a good and its average *variable* cost.

The curves in Figure 7.9 represent the short-run costs and potential demand curves for catfish. As long as the price of catfish is $13 per bushel, the typical firm will produce 4 a day, as determined by the intersection of the MC and MR (= price) curves (point *X*, in part *a*). In this case, price ($13) exceeds average *total* cost ($11) and catfish farming is profitable.

The situation wouldn't look so good, however, if the market price of catfish fell to $9. Following the rule for profit maximization, the firm would be led to point *Y* in part *b*, where MC intersects the new demand (price) curve. At this intersection, the firm would produce 3 bushels per day. But total revenues would no longer cover total costs, as can be seen from the fact that the ATC curve now lies *above* the price line. The ATC of producing 3 bushels is $10.33 (Figure 7.6); price is $9. Hence, the firm is incurring a loss of $4 per day (3 bushels at a loss of $1.33 each).

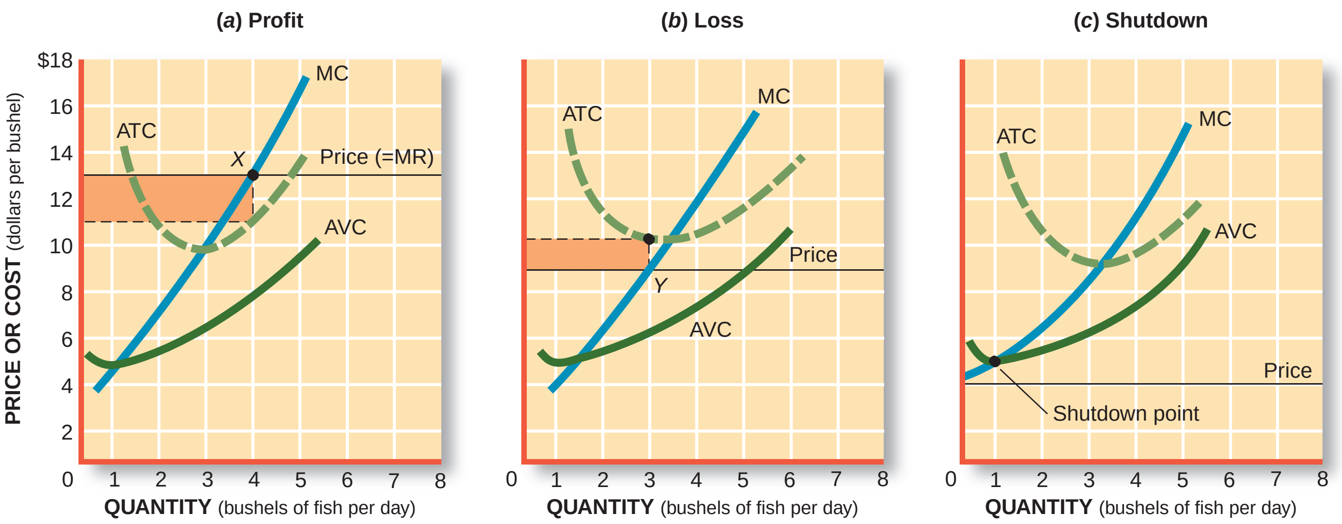


FIGURE 7.9
The Firm's Shutdown Point

A firm should cease production only if total revenue is lower than total *variable* cost. The shutdown decision may be based on a comparison of price and AVC. If the price of catfish per bushel was $13, a firm would earn a profit at point *X* in part *a.* At a price of $9, (point *Y* in part *b*), the firm is losing money (*p* is less than ATC) but is more than covering all variable costs (*p* is greater than AVC). If the price falls to $4 per bushel, as in part *c,* output should cease (*p* is less than AVC).

Should the firm stay in business under the circumstances? The answer is yes. Recall that the catfish farmer has already dug the pond and installed equipment at a (fixed) cost of $10 per day. The producer will have to pay these fixed costs whether or not the machinery is used. Stopping production would result in a loss amounting to $10 per day. Staying in business, even when catfish prices fall to $9 each, generates a loss of only $4 a day. In this case, ***where price exceeds average variable cost but not average total cost, the profit-maximization rule minimizes losses.***

The Shutdown Point

If the price of catfish falls far enough, the producer may be better off ceasing production altogether. Suppose the price of catfish fell to $4 per bushel (Figure 7.9*c*). A price this low doesn't even cover the variable cost of producing 1 bushel per day ($5). Continued production of even 1 bushel per day would imply a total loss of $11 per day ($10 of fixed costs plus $1 of variable costs). Higher rates of output would lead to still greater losses. Hence, the firm should shut down production, even though that action implies a loss of $10 per day. In all cases ***where price doesn't cover average variable costs at any rate of output, production should cease.*** Thus, the **shutdown point** occurs where price is equal to minimum average *variable* cost. Any lower price will result in losses larger than fixed costs. In Figure 7.9, the shutdown point occurs at a price of $5, where the MC and AVC curves intersect.

shutdown point: That rate of output where price equals minimum AVC.

THE INVESTMENT DECISION

When a firm shuts down, it doesn't necessarily leave (exit) the industry. General Motors still produces Cadillacs, for example, even though it idled one of its plants in 2001 (see News). ***The shutdown decision is a* short-run *response.*** It's based on the fixed costs of an established plant and the variable costs of operating it.

Ideally, a producer would never get into a money-losing business in the first place. Entry was based on an **investment decision** that the producer now regrets. ***Investment decisions are* long-run *decisions,*** however, and the firm now must pay for its bad luck or poor judgment. The investment decision entails the assumption of fixed costs (e.g., the lease of the factory); once the investment is made, the short-run production decision is designed to make the best possible use of those fixed inputs. The short-run profit-maximizing rule we've discussed applies only to this second decision; it assumes that a production unit exists. The accompanying News shows the contrast between production and investment decisions: GM *idled* its factory; Ford permanently closed its factory.

investment decision: The decision to build, buy, or lease plant and equipment; to enter or exit an industry.

long run: A period of time long enough for all inputs to be varied (no fixed costs).

The investment decision is of enormous importance to producers. The fixed costs that we've ignored in the production decision represent the producers' (or the stockholders') investment in the business. If they're going to avoid an economic loss, they have to generate at least enough revenue to recoup their investment—that is, the cost of (fixed) plant and equipment. Failure to do so will result in a net loss, despite allegiance to our profit-maximizing rule.

Whether fixed costs count, then, depends on the decision being made. For producers trying to decide how best to utilize the resources they've purchased or leased, fixed costs no longer enter the decision-making process. For producers deciding whether to enter business, sign a lease, or replace existing machinery and plant, fixed costs count very much. Businesspeople will proceed with an investment only if the *anticipated* profits are large enough to compensate for the effort and risk undertaken.

Long-Run Costs

When businesspeople make an investment decision, they confront not one set of cost figures but many. A plant not yet built can be designed for various rates of production and alternative technologies. In making long-run decisions, a producer isn't bound to one size of plant or to a particular mix of tools and machinery. In the long run, one can be flexible. In general, ***a producer will want to build, buy, or lease a plant that's the most efficient for the anticipated rate of output.*** This is the (dis)economy of scale phenomenon we discussed in the previous chapter. Once the right plant size is selected, the producer may proceed with the problem of short-run profit maximization. Once production is started, he can only hope that the investment decision was a good one and that a shutdown can be avoided.

IN THE NEWS

GM to Idle Cadillac Plant for Four Weeks

General Motors said Wednesday that it will idle the Lansing, Mich., Craft Center vehicle-assembly plant for four weeks beginning May 21 to cut inventories of unsold Cadillac Eldorado coupes. That will result in the temporary layoff of 300 workers, who will continue to receive 95 percent of their take-home pay.

Source: *Associated Press*, February 22, 2001. Reprinted with permission of The Associated Press.

Ford to Cut Jobs, Close Plants

Ford Motor announced a massive restructuring plan Monday . . . shedding up to 30,000 jobs and 14 factories by 2012. . . .

The automaker said Monday that it lost $1.6 billion pretax on North American auto operations last year.

The moves will reduce Ford's U.S. automaking capacity by 26%. The cuts represent 20% to 25% of Ford's North American workforce of 122,000 people.

—Chris Woodyard

Source: *USA Today*, January 24, 2006, p. 1. Reprinted with permission.

Analysis: GM's decision to idle a plant was a short-run *shutdown* decision; it is still in business. Ford, by contrast, made a long-run decision to cease operations and *exit* the industry in specific markets.

DETERMINANTS OF SUPPLY

Whether the time frame is the short run or the long run, the one central force in production decisions is the quest for profits. Producers will go into production—incur fixed costs—only if they see the potential for economic profits. Once in business, they'll expand the rate of output so long as profits are increasing. They'll shut down—cease production—when revenues don't at least cover variable costs (loss exceeds fixed costs).

Nearly anyone could make money with these principles if given complete information on costs and revenues. What renders the road to fortune less congested is the general absence of such complete information. In the real world, production decisions involve considerably more risk. People often don't know how much profit or loss they'll incur until it's too late to alter production decisions. Consequently, businesspeople are compelled to make a reasoned guess about prices and costs, then proceed. By way of summary, we can identify the major influences that will shape their short- and long-run decisions on how much output to supply to the market.

Short-Run Determinants

A competitive firm's short-run production decisions are dominated by marginal costs. Hence, the quantity of a good supplied will be affected by all forces that alter MC. Specifically, ***the determinants of a firm's supply include***

- ***The price of factor inputs.***
- ***Technology*** (the available production function).
- ***Expectations*** (for costs, sales, technology).
- ***Taxes and subsidies.***

Each determinant affects a producer's ability and willingness to supply output at any particular price.

The price of factor inputs determines how much the producer must pay for resources used in production. Technology determines how much output the producer will get from each unit of input. Expectations are critical because they express producers' perceptions of what future costs, prices, sales, and profits are likely to be. And finally, taxes and subsidies may alter costs or the amount of profit a firm gets to keep.

The Short-Run Supply Curve. By using the familiar *ceteris paribus* assumption, we can isolate the effect of price on supply decisions. In other words, we can draw a short-run **supply curve** the same way we earlier constructed consumer demand curves. In this case,

supply curve: A curve describing the quantities of a good a producer is willing and able to sell (produce) at alternative prices in a given time period, *ceteris paribus.*

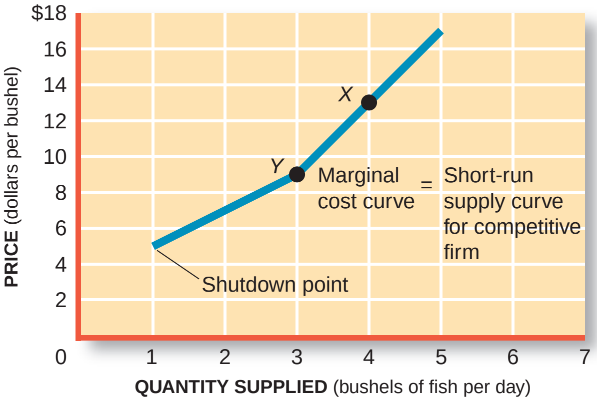


FIGURE 7.10
A Competitive Firm's Short-Run Supply Curve

For competitive firms, marginal cost defines the lowest price a firm will accept for a given quantity of output. In this sense, the marginal cost curve *is* the supply curve; it tells us how quantity supplied will respond to price. At p = $13, the quantity supplied is 4; at p = $9, the quantity supplied is 3.

Recall, however, that the firm will shut down if price falls below minimum average variable cost. The supply curve does not exist below minimum AVC ($5 in this case).

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the forces we assume constant are input prices, technology, expectations, and taxes. The only variable we allow to change is the price of the product itself.

Figure 7.10 illustrates the response of quantity supplied to a change in price. Notice the critical role of marginal costs: ***The marginal cost curve is the short-run supply curve for a competitive firm.*** Recall our basic profit-maximization rule. A competitive producer wants to supply a good only if its price exceeds its marginal cost. Hence, marginal cost defines the lower limit for an "acceptable" price. A catfish farmer is willing and able to produce 4 bushels per day only if the price of a bushel is $13 (point *X*). If the price of catfish dropped to $9, the *quantity* supplied would fall to 3 (point *Y*). The marginal cost curve tells us what the quantity supplied would be at all other prices as well. As long as price exceeds minimum AVC (the shutdown point), the MC curve summarizes the response of a producer to price changes: It *is* the short-run supply curve of a perfectly competitive firm.

The shape of the marginal cost curve provides a basic foundation for the *law of supply.* Because marginal costs tend to rise as output expands, an increase in output makes sense only if the price of that output rises. If the price does rise, it's profitable to increase the quantity supplied.

Supply Shifts

All the forces that shape the short-run supply curve are subject to change. Factor prices change; technology changes; expectations change; and tax laws get revised. ***If any determinant of supply changes, the supply curve shifts.***

An increase in wage rates, for example, would raise the marginal cost of producing catfish. This would shift the supply curve upward, making it more expensive for producers to supply larger quantities at any given price.

An improvement in technology would have the opposite effect. By increasing productivity, new technology would lower the marginal cost of producing a good. The supply curve would shift downward.

Tax Effects

Changes in taxes will also alter supply behavior. But not all taxes have the same effect; some alter short-run supply behavior, others affect only long-run supply decisions.

Property Taxes. Property taxes are levied by local governments on land and buildings. The tax rate is typically some small fraction (e.g., 1 percent) of total value. Hence, the owner of a $10 million factory might have to pay $100,000 per year in property taxes.

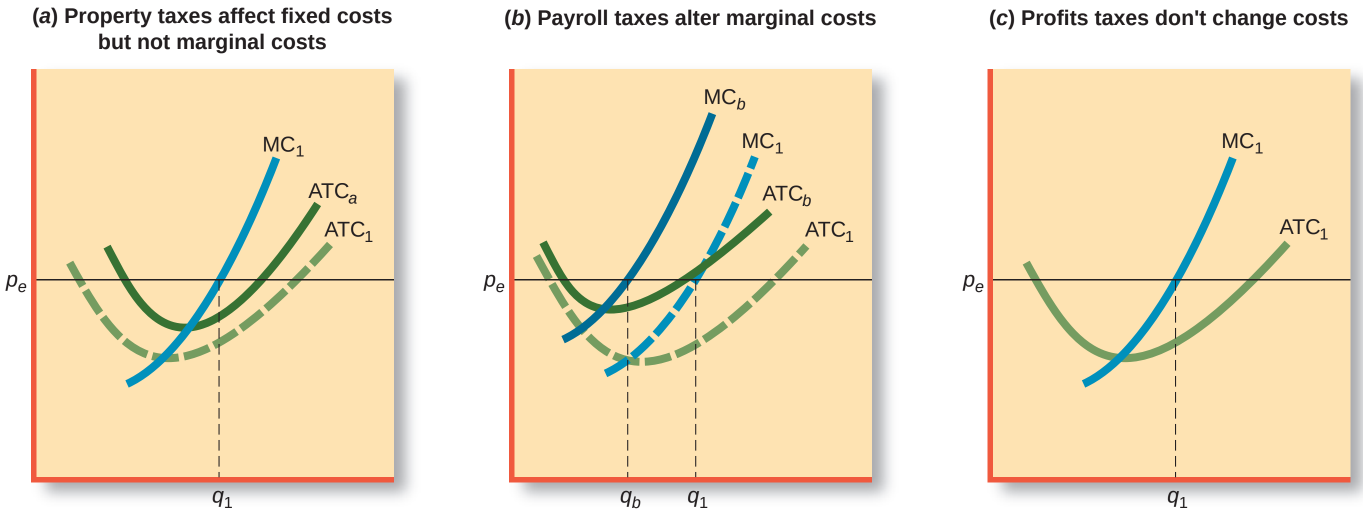

FIGURE 7.11
Impact of Taxes on Business Decisions

(*a*) Property taxes are a fixed cost for the firm. Since they don't affect marginal costs, they leave the optimal rate of output (q_1) unchanged. Property taxes raise average costs, however, and so reduce profits. Lower profits may alter investment decisions.

(*b*) Payroll taxes add directly to marginal costs and so reduce the optimal rate of output (to q_b). Payroll taxes also increase average costs and lower total and per-unit profits.

(*c*) Taxes on profits are neither a fixed cost nor a variable cost since they depend on the existence of profits. They don't affect marginal costs or price and so leave the optimal rate of output (q_1) unchanged. By reducing after-tax profits, however, such taxes lessen incentives to invest.

Property taxes have to be paid regardless of whether the factory is used. Hence, ***property taxes are a fixed cost*** for the firm. These additional fixed costs increase total costs and thus shift the average total cost (ATC) upward, as in Figure 7.11*a*.

Notice that the MC curve doesn't move when property taxes are imposed. Property taxes aren't based on the quantity of output produced. Accordingly, the production decision of the firm isn't affected by property taxes. The quantity q_1 in Figure 7.11*a* remains the optimal rate of output even after a property tax is introduced.

Although the optimal output remains at q_1, the profitability of the firm is reduced by the property tax. Profit per unit has been reduced by the upward shift of the ATC curve. If property taxes reduce profits too much, firms may move to a low-tax jurisdiction or another industry (investment decisions).

Payroll Taxes. Payroll taxes have very different effects on business decisions. Payroll taxes are levied on the wages paid by the firm. Employers must pay, for example, a 7.65 percent Social Security tax on the wages they pay (employees pay an identical amount). This tax is used to finance Social Security retirement benefits. Other payroll taxes are levied by federal and state governments to finance unemployment and disability benefits.

All payroll taxes add to the cost of hiring labor. In the absence of a tax, a worker might cost the firm $8 per hour. Once Social Security and other taxes are levied, the cost of labor increases to $8 plus the amount of tax. Hence, $8-per-hour labor might end up costing the firm $9 or more. In other words, ***payroll taxes increase marginal costs.*** This is illustrated in Figure 7.11*b* by the upward shift of the MC curve.

Notice how payroll taxes change the production decision. The new MC curve (MC_b) intersects the price line at a lower rate of output (q_b). Thus payroll taxes tend to reduce output and employment.

Profit Taxes. Taxes are also levied on the profits of a business. Such taxes are very different from either property or payroll taxes since profit taxes are paid only when profits are made. Thus they are neither a fixed cost nor a variable cost! As Figure 7.11*c* indicates, neither the MC nor the ATC curve moves when a profits tax is imposed. The only difference is that the firm now gets to keep less of its profits, instead "sharing" its profits with the government.

Although a profits tax has no direct effect on marginal or average costs, it does reduce the take-home (after-tax) profits of a business. This may reduce investments in new businesses. For this reason, many people urge the government to *reduce* corporate tax rates and so encourage increased investment. This was the objective of President Bush's 2002–3 tax cuts.

THE ECONOMY TOMORROW

INTERNET-BASED PRICE COMPETITION

Ten years ago the T-shirt shop owners on South Padre Island (see News, page 147) had to worry only about the other 40 shops at that beach resort. They worried that other shops might offer T-shirts at lower prices, forcing all the shops to cut prices. Now the level of competition is much higher. Beachgoers can now buy T-shirts at virtual shops on the Internet. Indeed, consumers can click on the Internet to find out the price of almost anything. There are even electronic shopping services that will find the lowest price for a product. Want a better deal on a car? You don't have to visit a dozen dealerships. With a few clicks, you can find the lowest price for the car you want and get directions to the appropriate dealer. In fact, you don't have to go anywhere: More and more producers will sell you their products directly over the Internet.

E-commerce intensifies competition in many ways. By allowing a consumer to shop worldwide, the Net vastly increases the number of firms in a virtual market. Even your campus bookstore now has to worry about textbook prices available at Amazon.com, Barnes and Noble, and other online booksellers.

webnote

If you want to shop for T-shirts at a cybermall, check out www.tshirtmall.com

Electronic commerce also reduces transaction costs. Retailers don't need stores or catalogs to display their products, and they can greatly reduce inventories by producing to order. This is how Dell computer supplies the $20 million of computers it sells per day online.

Electronic retailers also get a tax break. Transactions on the Net aren't subject to sales taxes. Hence, electronic retailers can offer products at lower prices without cutting profit margins, especially in high-tax states.

The evident advantages of e-commerce have made it the virtual mall of choice for many consumers. In 2006, consumers spent over $100 billion on electronic purchases. That was less than 1 percent of total consumer spending. But the trend is what counts. With Net sales more than doubling every year, e-commerce is sure to intensify price competition in the economy tomorrow.

SUMMARY

- Economic profit is the difference between total revenue and total cost. Total economic cost includes the value (opportunity cost) of *all* inputs used in the production, not just those inputs for which an explicit payment is made. LO2
- Because it must contend with many competitors, a competitive firm has no control over the price of its output. It effectively confronts a horizontal demand for its output (even though the *market* demand for the product is downward-sloping). LO1
- The short-run objective of a firm is to maximize profits from the operation of its existing facilities (fixed costs). For a competitive firm, the profit-maximizing output

occurs at the point where marginal cost equals price (marginal revenue). LO2

- A firm may incur a loss even at the optimal rate of output. It shouldn't shut down, however, so long as price exceeds average *variable* cost. If revenues at least cover variable costs, the firm's loss from production is less than fixed cost. LO2
- In the long run a producer can be flexible. There are no fixed costs and the firm may choose any-sized plant it wants. The decision to incur fixed costs (i.e., build, buy, or lease a plant) or to enter or exit an industry is an investment decision. LO2
- A competitive firm's supply curve is identical to its marginal cost curve (above the shutdown point at minimum average variable cost). In the short run, the quantity supplied will rise or fall with price. LO3
- The determinants of supply include the price of inputs, technology, taxes, and expectations. Should any of these determinants change, the firm's supply curve will shift. LO3
- Business taxes alter business behavior. Property taxes raise fixed costs; payroll taxes increase marginal costs. Profit taxes raise neither fixed costs nor marginal costs but diminish the take-home (after-tax) profits of a business. LO3
- The Internet has created virtual stores that intensify price competition. LO1

Key Terms

profit	perfect competition	marginal cost (MC)
economic cost	market power	marginal revenue (MR)
explicit cost	competitive firm	profit-maximization rule
implicit cost	production decision	shutdown point
economic profit	total revenue	investment decision
normal profit	short run	long run
monopoly	fixed costs	supply curve
market structure	variable costs	

Questions for Discussion

1. What economic costs will a large corporation likely overlook when computing its "profits"? How about the owner of a family-run business or farm? LO2
2. How can the demand curve facing a firm be horizontal if the market demand curve is downward-sloping? LO1
3. How many fish should a commercial fisherman try to catch in a day? Should he catch as many as possible or return to dock before filling the boat with fish? Under what economic circumstances should he not even take the boat out? LO2
4. If a firm is incurring an economic loss, would society be better off if the firm shut down? Would the firm want to shut down? Explain. LO2
5. Why wouldn't a profit-maximizing firm want to produce at the rate of output that minimizes average total cost? LO2
6. What rate of output is appropriate for a "nonprofit" corporation (such as a hospital)? LO2
7. What costs did GM eliminate when it idled its Lansing plant (News, page 159.) How about Ford? LO3
8. What was the opportunity cost of Mr. Fujishige's farm? (See News, page 145.) Is society better off with another Disney theme park? Explain. LO2
9. Is Apple Computer a perfectly competitive firm? Explain your answer. LO1
10. If a perfectly competitive firm raises its price above the prevailing market rate, how much of its sales might it lose? Why? Can a competitive firm ever raise its prices? If so, when? LO1

problems The Student Problem Set at the back of this book contains numerical and graphing problems for this chapter.

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web activities to accompany this chapter can be found on the Online Learning Center:
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