

NINTH EDITION

Principles of
Microeconomics

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shapes of the long-run cost curves in those industries do a good job of explaining these differences in the industry structures.

We begin our discussion of the long run by looking at firms in three short-run circumstances: (1) firms that earn economic profits, (2) firms that suffer economic losses but continue to operate to reduce or minimize those losses, and (3) firms that decide to shut down and bear losses just equal to fixed costs. We then examine how these firms make their decisions in response to these short-run conditions.

Although we continue to focus on perfectly competitive firms, all firms are subject to the spectrum of short-run profit or loss situations regardless of market structure. Assuming perfect competition allows us to simplify our analysis and provides us with a strong background for understanding the discussions of imperfectly competitive behavior in later chapters.

Short-Run Conditions and Long-Run Directions

Before beginning our examination of firm behavior, let us review the concept of profit. Recall that a normal rate of return is included in the definition of total cost (Chapter 7). A normal rate of return is a rate that is just sufficient to keep current investors interested in the industry. Because we define profit as total revenue minus total cost and because total cost includes a normal rate of return, our concept of profit takes into account the opportunity cost of capital. When a firm is earning an above-normal rate of return, it has a positive profit level; otherwise, it does not. When there are positive profits in an industry, new investors are likely to be attracted to the industry.

When we say that a firm is suffering a loss, we mean that it is earning a rate of return that is below normal. Such a firm may be suffering a loss as an accountant would measure it; or it may be earning at a very low—that is, below normal—rate. Investors are not going to be attracted to an industry in which there are losses. A firm that is **breaking even**, or earning a zero level of profit, is one that is earning exactly a normal rate of return. New investors are not attracted, but current ones are not running away either.

With these distinctions in mind, we can say that for any firm, one of three conditions holds at any given moment: (1) The firm is making positive profits, (2) the firm is suffering losses, or (3) the firm is just breaking even. Profitable firms will want to maximize their profits in the short run, while firms suffering losses will want to minimize those losses in the short run.

breaking even The situation in which a firm is earning exactly a normal rate of return.

Maximizing Profits

The best way to understand the behavior of a firm that is currently earning profits is by way of example.

Example: The Blue Velvet Car Wash When a firm earns revenues in excess of costs (including a normal rate of return), it is earning positive profits. Let us consider as an example the Blue Velvet Car Wash. Suppose investors have put up \$500,000 to construct a building and purchase all equipment required to wash cars. Let us also suppose that investors expect to earn a minimum return of 10 percent on their investment. If the money to set up the business had been borrowed from the bank instead, the car wash owners would have paid a 10 percent interest rate. In either case, total cost must include \$50,000 per year (10 percent of \$500,000).

The car wash is open 50 weeks per year and washes 800 cars per week. Whether or not it is open and operating, the car wash has fixed costs. Those costs include \$1,000 per week to investors—that is, the \$50,000 per year normal return to investors—and \$1,000 per week in other fixed costs—a basic maintenance contract on the equipment, insurance, and so on.

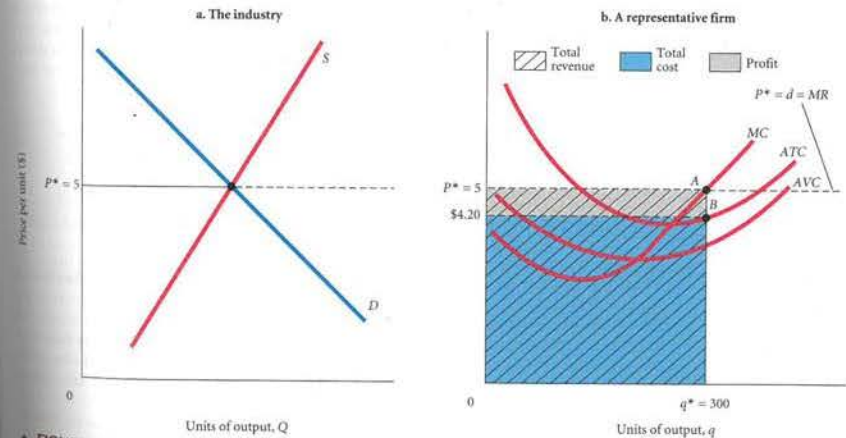
When the car wash is operating, there are also variable costs. Workers must be paid, and materials such as soap and wax must be purchased. For 800 weekly washes, the wage bill is \$1,000 per week. Materials, electricity, and so on run \$600 at this capacity. If the car wash is not in operation, there are no variable costs. Table 9.1 summarizes the costs of the Blue Velvet Car Wash.

TABLE 9.1 Blue Velvet Car Wash Weekly Costs

TFC Total Fixed Cost	TVC Total Variable Cost (800 Washes)	TC Total Cost	TR Total Revenue (P = \$5)
1. Normal return to investors	1. Labor \$1,000 2. Materials 600	TC = TFC + TVC = \$2,000 + \$1,600 = \$3,600	TR = \$5 × 800 = \$4,000
2. Other fixed costs (maintenance contract, insurance, etc.)	\$1,600		Profit = TR - TC = \$400
	1,000		
	\$2,000		

This car wash business is quite competitive. There are many car washes of equal quality in the area, and they offer their service at \$5. If Blue Velvet wants customers, it cannot charge a price above \$5. (Recall the perfectly elastic demand curve facing perfectly competitive firms; review Chapter 8 if necessary.) If we assume that Blue Velvet washes 800 cars each week, it takes in revenue of \$4,000 from operating (800 cars × \$5). Is this total revenue enough to make a positive profit? The answer is yes. Total revenues of \$4,000 is sufficient to cover total fixed cost of \$2,000 and total variable cost of \$1,600, leaving a positive profit of \$400 per week.

Graphic Presentation of the General Case Figure 9.1 graphs the performance of a firm (not the Blue Velvet Car Wash) that is earning a positive profit in the short run. Figure 9.1a illustrates the industry, or the market; and Figure 9.1b illustrates a representative firm. At present, the market is clearing at a price of \$5. Thus, we assume that the individual firm can sell all it wants at a price of $P^* = \$5$, but that it is constrained by its capacity. Its marginal cost curve rises in the short run because of a fixed factor. You already know that a perfectly competitive profit-maximizing firm produces up to the point where price equals marginal cost. As long as price (marginal revenue) exceeds marginal cost, firms can push up profits by increasing short-run output. The firm in the diagram, then, will supply $q^* = 300$ units of output (point A, where $P = MC$).



▲ FIGURE 9.1 Firm Earning a Positive Profit in the Short Run

A profit-maximizing perfectly competitive firm will produce up to the point where $P^* = MC$. Profit is the difference between total revenue and total cost. At $q^* = 300$, total revenue is $\$5 \times 300 = \$1,500$, total cost is $\$4.20 \times 300 = \$1,260$, and profit = $\$1,500 - \$1,260 = \$240$.

- In the short run, firms suffering losses are stuck in the industry. They can shut down operations ($q = 0$), but they must still bear fixed costs. In the long run, firms suffering losses can exit the industry.
- A firm's decision about whether to shut down in the short run depends solely on whether its total revenue from operating is sufficient to cover its total variable cost. If total revenue exceeds total variable cost, the excess can be used to pay some fixed costs and thus reduce losses.
- Anytime that price is below the minimum point on the average variable cost curve, total revenue will be less than total variable cost, and the firm will shut down. The minimum point on the average variable cost curve (which is also the point where marginal cost and average variable cost intersect) is called the *shut-down point*. At all prices above the shut-down point, the MC curve shows the profit-maximizing level of output. At all prices below it, optimal short-run output is zero.
- The *short-run supply curve* of a firm in a perfectly competitive industry is the portion of its marginal cost curve that lies above its average variable cost curve.
- Two things can cause the industry supply curve to shift: (1) in the short run, anything that causes marginal costs to change across the industry, such as an increase in the price of a particular input and (2) in the long run, entry or exit of firms.

LONG-RUN COSTS: ECONOMIES AND DISECONOMIES OF SCALE p. 184

- When an increase in a firm's scale of production leads to lower average costs, the firm exhibits *increasing returns to scale*, or *economies of scale*. When average costs do not change with the scale of production, the firm exhibits *constant returns to scale*. When an increase in a firm's scale of production leads to higher average costs, the firm exhibits *decreasing returns to scale*, or *diseconomies of scale*.
- A firm's *long-run average cost curve (LRAC)* shows the costs associated with different scales on which it can choose to operate in the long run.

LONG-RUN ADJUSTMENTS TO SHORT-RUN CONDITIONS p. 189

- When short-run profits exist in an industry, firms enter and existing firms expand. These events shift the industry supply curve to the right. When this happens, price falls and ultimately profits are eliminated.
- When short-run losses are suffered in an industry, some firms exit and some firms reduce scale. These events shift the industry supply curve to the left, raising price and eliminating losses.
- Long-run competitive equilibrium* is reached when $P = SRMC = SRAC = LRAC$ and profits are zero.
- In efficient markets, investment capital flows toward profit opportunities.

REVIEW TERMS AND CONCEPTS

breaking even, p. 178
 constant returns to scale, p. 185
 decreasing returns to scale or diseconomies of scale, p. 185
 increasing returns to scale or economies of scale, p. 185

long-run average cost curve (LRAC), p. 186
 long-run competitive equilibrium, p. 195
 minimum efficient scale (mes), p. 186
 optimal scale of plant, p. 189

short-run industry supply curve, p. 183
 shut-down point, p. 182
 long-run competitive equilibrium,
 $P = SRMC = SRAC = LRAC$

PROBLEMS

Visit www.myeconlab.com to complete the problems marked in orange online. You will receive instant feedback on your answers, tutorial help, and access to additional practice problems.



- For each of the following, decide whether you agree or disagree and explain your answer:
 - Firms that exhibit constant returns to scale have U-shaped long-run average cost curves.
 - A firm suffering losses in the short run will continue to operate as long as total revenue at least covers fixed cost.
- Ajax is a competitive firm operating under the following conditions: Price of output is \$5, the profit-maximizing level of output is 20,000 units of output, and the total cost (full economic cost) of producing 20,000 units is \$120,000. The firm's only fixed factor of production is a \$300,000 stock of capital (a building). If the interest rate available on comparable risks is

- 10 percent, should this firm shut down immediately in the short run? Explain your answer.
- Explain why it is possible that a firm with a production function that exhibits increasing returns to scale can run into diminishing returns at the same time.
 - Which of the following industries do you think are likely to exhibit large economies of scale? Explain why in each case.
 - Home building
 - Electric power generation
 - Vegetable farming
 - Software development
 - Aircraft manufacturing

- For cases A through F in the following table, would you (1) operate or shut down in the short run and (2) expand your plant or exit the industry in the long run?

	A	B	C	D	E	F
Total revenue	1,500	2,000	2,000	5,000	5,000	5,000
Total cost	1,500	1,500	2,500	6,000	7,000	4,000
Total fixed cost	500	500	200	1,500	1,500	1,500

- [Related to the *Economics in Practice* on p. 190] Do you agree or disagree with the following statements? Explain in a sentence or two.
 - A firm will never sell its product for less than it costs to produce it.
 - If the short-run marginal cost curve is U-shaped, the long-run average cost curve is likely to be U-shaped as well.
- The Smythe chicken farm outside Little Rock, Arkansas, produces 25,000 chickens per month. Total cost of production at Smythe Farm is \$28,000. Down the road are two other farms. Faubus Farm produces 55,000 chickens a month, and total cost is \$50,050. Mega Farm produces 100,000 chickens per month, at a total cost of \$91,000. These data suggest that there are significant economies of scale in chicken production. Do you agree or disagree with this statement? Explain your answer.
- Indicate whether you agree or disagree with the following statements. Briefly explain your answers.
 - Increasing returns to scale refers to a situation where an increase in a firm's scale of production leads to higher costs per unit produced.
 - Constant returns to scale refers to a situation where an increase in a firm's scale of production has no effect on costs per unit produced.
 - Decreasing returns to scale refers to a situation where an increase in a firm's scale of production leads to lower costs per unit produced.
- You are given the following cost data:

q	TFC	TVC
0	12	0
1	12	5
2	12	9
3	12	14
4	12	20
5	12	28
6	12	38

If the price of output is \$7, how many units of output will this firm produce? What is the total revenue? What is the total cost? Will the firm operate or shut down in the short run? in the long run? Briefly explain your answers.

- The concept of economies of scale refers to lower per-unit production costs at higher levels of output. The easiest way to understand this is to look at whether long-run average cost decreases with output (economies of scale) or whether long-run average cost increases with output (diseconomies of scale). If average cost is constant as output rises, there is constant returns to scale. But the concept of falling unit costs is all around us. Explain how the concept of economies of scale helps shed light on each of the following:
 - car pooling

- doubling up to reduce rent
 - farming
 - a single-family car versus public transit
 - a huge refinery
- According to its Web site, Netflix is the world's largest online entertainment subscription service. It owns 90,000 DVD titles that it rents out to its more than 9 million subscribers. On its Web site, Netflix indicates that its growth strategy is to "focus on subscription growth in order to realize economies of scale." In this business, where do you think scale economies come from?
 - From 2000 to 2005, the home building sector was expanding and new housing construction as measured by housing starts was approaching an all-time high. (At www.census.gov, click "Housing," then click "Construction data.") Big builders such as Lennar Corporation were making exceptional profits. The industry was expanding. Existing home building firms invested in more capacity and raised output. New home building firms entered the industry. During 2006 and 2007, demand for new and existing homes dropped. The inventory of unsold homes grew sharply. Home prices began to fall. Home builders suffered losses, and the industry contracted. Many firms went out of business, and many workers in the construction industry went bankrupt. Use the Web to verify that all of these events happened. Access www.bls.gov for employment data and www.bea.gov for information on residential construction as part of gross domestic product. What has happened since the beginning of 2008? Has the housing market recovered? Have housing starts stopped falling? If so, at what level? Write a short essay about whether the housing sector is about to expand or contract.
 - [Related to the *Economics in Practice* on p. 194] St. Mark's Square is a beautiful plaza in Venice that is often frequented by both tourists and pigeons. Ringing the piazza are many small, privately owned cafes. In these cafes, a cappuccino costs 7 euros despite the fact that an equally good cappuccino costs only 3 euros a block away. What is going on here?
 - The following problem traces the relationship between firm decisions, market supply, and market equilibrium in a perfectly competitive market.
 - Complete the following table for a single firm in the short run.

OUTPUT	TFC	TVC	TC	AVC	ATC	MC
0	\$300	\$ 0	—	—	—	—
1	—	100	—	—	—	—
2	—	150	—	—	—	—
3	—	210	—	—	—	—
4	—	290	—	—	—	—
5	—	400	—	—	—	—
6	—	540	—	—	—	—
7	—	720	—	—	—	—
8	—	950	—	—	—	—
9	—	1,240	—	—	—	—
10	—	1,600	—	—	—	—

- Using the information in the table, fill in the following supply schedule for this individual firm under perfect competition and indicate profit (positive or negative) at each output level. (Hint: At each hypothetical price, what is the MR of producing 1 more unit of output? Combine this with the MC of another unit to figure out the quantity supplied.)