SUMMARY

- Because a competitive firm is a price taker, its revenue is proportional to the amount of output it produces. The price of the good equals both the firm's average revenue and its marginal revenue.
- To maximize profit, a firm chooses a quantity of output such that marginal revenue equals marginal cost. Because marginal revenue for a competitive firm equals the market price, the firm chooses quantity so that price equals marginal cost. Thus, the firm's marginal-cost curve is its supply curve.
- In the short run when a firm cannot recover its fixed costs, the firm will choose to shut down temporarily if the price of the good is less than average variable cost. In the long run when the firm can recover both fixed and variable costs, it will choose to exit if the price is less than average total cost.
- In a market with free entry and exit, profits are driven to zero in the long run. In this long-run equilibrium, all firms produce at the efficient scale, price equals the minimum of average total cost, and the number of firms adjusts to satisfy the quantity demanded at this price.
- Changes in demand have different effects over different time horizons. In the short run, an increase in demand raises prices and leads to profits, and a decrease in demand lowers prices and leads to losses. But if firms can freely enter and exit the market, then in the long run, the number of firms adjusts to drive the market back to the zero-profit equilibrium.

KEY CONCEPTS

competitive market, *p. 280*
average revenue, *p. 281*
marginal revenue, *p. 282*
sunk cost, *p. 286*

QUESTION FOR REVIEW

1. Explain the difference between a firm's revenue and its profit. Which do firms maximize?
2. What is meant by a competitive firm?
3. Under what conditions will a firm shut down temporarily? Explain.
4. Draw the cost curves for a typical firm. For a given price, explain how the firm chooses the level of output that maximizes profit. At that level of output, show on your graph the firm's total revenue and total costs.
5. Does a firm's price equal marginal cost in the short run, in the long run, or both? Explain.
6. Under what conditions will a firm exit a market? Explain.
7. Are market supply curves typically more elastic in the short run or in the long run? Explain.
8. Does a firm's price equal the minimum of average total cost in the short run, in the long run, or both? Explain.

PROBLEMS AND APPLICATIONS

1. You go out to the best restaurant in town and order a lobster dinner for $40. After eating half of the lobster, you realize that you are quite full. Your date wants you to finish your dinner because you can't take it home and because "you've already paid for it." What should you do? Relate your answer to the material in this chapter.
2. Many small boats are made of fiberglass, which is derived from crude oil. Suppose that the price of oil rises.
   a. Using diagrams, show what happens to the cost curves of an individual boat-making firm and to the market supply curve.
   b. What happens to the profits of boat makers in the short run? What happens to the number of boat makers in the long run?
3. Bob's lawn-mowing service is a profit-maximizing, competitive firm. Bob mows lawns for $27 each. His total cost each day is $280, of which $30 is a fixed cost. He mows 10 lawns a day. What can you

say about Bob's short-run decision regarding shutdown and his long-run decision regarding exit?

4. Ball Bearings, Inc. faces costs of production as follows:

Quantity	Total Fixed Costs	Total Variable Costs
0	$100	$ 0
1	100	50
2	100	70
3	100	90
4	100	140
5	100	200
6	100	360

   a. Calculate the company's average fixed costs, average variable costs, average total costs, and marginal costs at each level of production.
   b. The price of a case of ball bearings is $50. Seeing that she can't make a profit, the Chief Executive Officer (CEO) decides to shut down operations. What are the firm's profits/losses? Was this a wise decision? Explain.
   c. Vaguely remembering his introductory economics course, the Chief Financial Officer tells the CEO it is better to produce 1 case of ball bearings, because marginal revenue equals marginal cost at that quantity. What are the firm's profits/losses at that level of production? Was this the best decision? Explain.

5. Consider total cost and total revenue given in the following table:

Quantity	0	1	2	3	4	5	6	7
Total cost	$8	9	10	11	13	19	27	37
Total revenue	$0	8	16	24	32	40	48	56

   a. Calculate profit for each quantity. How much should the firm produce to maximize profit?
   b. Calculate marginal revenue and marginal cost for each quantity. Graph them. (Hint: Put the points between whole numbers. For example, the marginal cost between 2 and 3 should be graphed at 2½.) At what quantity do these curves cross? How does this relate to your answer to part (a)?
   c. Can you tell whether this firm is in a competitive industry? If so, can you tell whether the industry is in a long-run equilibrium?

6. A firm in a competitive market receives $500 in total revenue and has marginal revenue of $10. What is the average revenue, and how many units were sold?
7. Suppose the book-printing industry is competitive and begins in a long-run equilibrium.
   a. Draw a diagram describing the typical firm in the industry.
   b. Hi-Tech Printing Company invents a new process that sharply reduces the cost of printing books. What happens to Hi-Tech's profits and the price of books in the short run when Hi-Tech's patent prevents other firms from using the new technology?
   c. What happens in the long run when the patent expires and other firms are free to use the technology?
8. The market for fertilizer is perfectly competitive. Firms in the market are producing output, but are currently making economic losses.
   a. How does the price of fertilizer compare to the average total cost, the average variable cost, and the marginal cost of producing fertilizer?
   b. Draw two graphs, side by side, illustrating the present situation for the typical firm and in the market.
   c. Assuming there is no change in either demand or the firms' cost curves, explain what will happen in the long run to the price of fertilizer, marginal cost, average total cost, the quantity supplied by each firm, and the total quantity supplied to the market.
9. A profit-maximizing firm in a competitive market is currently producing 100 units of output. It has average revenue of $10, average total cost of $8, and fixed costs of $200.
   a. What is its profit?
   b. What is its marginal cost?
   c. What is its average variable cost?
   d. Is the efficient scale of the firm more than, less than, or exactly 100 units?
10. Suppose that the U.S. textile industry is competitive, and there is no international trade in textiles. In long-run equilibrium, the price per unit of cloth is $30.
    a. Describe the equilibrium using graphs for the entire market and for an individual producer.

    Now suppose that textile producers in other countries are willing to sell large quantities of cloth in the United States for only $25 per unit.
    b. Assuming that U.S. textile producers have large fixed costs, what is the short-run effect of these imports on the quantity produced by an individual producer? What is the short-run effect on profits? Illustrate your answer with a graph.
    c. What is the long-run effect on the number of U.S. firms in the industry?

11. The market for apple pies in the city of Ectenia is competitive and has the following demand schedule:

Price	Quantity Demanded
$ 1	1,200 pies
2	1,100
3	1,000
4	900
5	800
6	700
7	600
8	500
9	400
10	300
11	200
12	100
13	0

Each producer in the market has fixed costs of $9 and the following marginal cost:

Quantity	Marginal Cost
1 pie	$ 2
2	4
3	6
4	8
5	10
6	12

a. Compute each producer's total cost and average total cost for 1 to 6 pies.
b. The price of a pie is now $11. How many pies are sold? How many pies does each producer make? How many producers are there? How much profit does each producer earn?
c. Is the situation described in part (b) a long-run equilibrium? Why or why not?
d. Suppose that in the long run there is free entry and exit. How much profit does each producer earn in the long-run equilibrium? What is the market price and number of pies each producer makes? How many pies are sold? How many pie producers are operating?

12. Suppose there are 1,000 hot pretzel stands operating in New York City. Each stand has the usual U-shaped average-total-cost curve. The market demand curve for pretzels slopes downward, and the market for pretzels is in long-run competitive equilibrium.
a. Draw the current equilibrium, using graphs for the entire market and for an individual pretzel stand.
b. The city decides to restrict the number of pretzel-stand licenses, reducing the number of stands to only 800. What effect will this action have on the market and on an individual stand that is still operating? Draw graphs to illustrate your answer.
c. Suppose that the city decides to charge a fee for the 800 licenses, all of which are quickly sold. How will the size of the fee affect the number of pretzels sold by an individual stand? How will it affect the price of pretzels in the city?
d. The city wants to raise as much revenue as possible, while ensuring that all 800 licenses are sold. How high should the city set the license fee? Show the answer on your graph.

13. An industry currently has 100 firms, all of which have fixed costs of $16 and average variable cost as follows:

Quantity	Average Variable Cost
1	$1
2	2
3	3
4	4
5	5
6	6

a. Compute marginal cost and average total cost.
b. The price is currently $10. What is the total quantity supplied in the market?
c. As this market makes the transition to its long-run equilibrium, will the price rise or fall? Will the quantity demanded rise or fall? Will the quantity supplied by each firm rise or fall?
d. Graph the long-run supply curve for this market.

For further information on topics in this chapter, additional problems, applications, examples, online quizzes, and more, please visit our website at www.cengage.com/international.