Key Concepts

Monopolistic Competition

The market structure of most industries lies between the extremes of perfect competition and monopoly. Monopolistic competition is one such “intermediate” industry structure. Monopolistic competition is a market structure in which:

- A large number of firms compete.
- Each firm produces a differentiated product (product differentiation is when a firm makes a good that is slightly different from the products of competing firms).
- Firms compete on product quality, price, and marketing. Brand-name products advertise their superiority to generics and generics advertise their low price.
- Firms are free to enter or exit the industry.

A monopolistically competitive firm faces a downward sloping demand curve because it produces a differentiated product. As a result, a monopolistically competitive firm’s marginal revenue curve lies below its demand curve.

Output and Price in Monopolistic Competition

In the short run:

- The firm maximizes its profit by producing the level of output such that $MR = MC$.
- The firm might earn an economic profit. If it does, free entry means that competitors eventually enter the industry. Alternatively, the firm might incur an economic loss. If it does, it (or other firms) eventually exit the industry.

In the long run:

- The firm maximizes its profit by producing the amount of output that sets $MR = MC$.
- The firm does not earn an economic profit or incur an economic loss, so $P = ATC$.

Figure 13.1 shows the long-run equilibrium for a monopolistically competitive firm.

Figure 13.1
The Long Run in Monopolistic Competition
Capacity output is the output at which average total cost is at its minimum. A monopolistically competitive firm has excess capacity because, as Figure 13.1 shows, in the long run it does not produce at the minimum ATC. From a social standpoint, monopolistically competitive firms are not efficient. However monopolistically competitive firms produce a large variety of differentiated products and consumers value variety.

Product Development and Marketing
Monopolistically competitive firms constantly strive to differentiate their products and (temporarily) earn an economic profit. The extent of innovation and product development is determined by the marginal cost and marginal revenue of innovation and development. Monopolistically competitive firms spend huge amounts on marketing. Such selling costs are fixed costs, which shift the firm’s ATC curve upward. Because all firms advertise, the effect of advertising on the demand for any particular firm’s product is ambiguous. The efficiency of monopolistic competition is unclear:
- On the plus side, consumers value variety and advertising might provide valuable information.
- On the minus side, advertising is costly and monopolistically competitive firms have higher costs because of their excess capacity.

Oligopoly
Oligopoly is a market structure in which a few firms compete. Each firm considers the effects of its actions on the behavior of the others and the actions of the others on its own profit. The kinked demand curve model:
- The firm believes that, if it raises its price, no competitors will follow but that, if it lowers its price, all its competitors will follow. The firm faces a kinked demand curve, with the kink at the current price and quantity, as illustrated in Figure 13.2.
- The kink causes a break in the MR curve. As long as the MC curve remains within this break, the firm’s price and quantity do not vary.
- The model fails to tell what happens if firms discover that their beliefs are incorrect.

The dominant firm oligopoly model:
- One large firm has a substantial cost advantage over its many small competitors.

The Kinked Demand Curve Oligopoly
- The large firm acts like a monopoly and sets its profit-maximizing price. The small firms take this price as given and act like perfect competitors.

Oligopoly Games
Game theory is a tool for studying strategic behavior. Games have rules, strategies, payoffs, and an outcome:
- Rules specify permissible actions by players.
- Strategies are actions, such as raising or lowering price, output, advertising, or product quality.
- Payoffs are the profits and losses of the players. A payoff matrix is a table that shows the payoffs for every possible action by each player.
- The outcome is determined by the players’ choices. In a Nash equilibrium, Player A takes the best possible action given the action of Player B, and B takes the best possible action given the action of A.
- Duopoly is a market with two competitors. In a duopoly, the firm’s might have a collusive agreement to decrease output and raise price. A cartel is a group of firms that have engaged in a collusive agreement. In this game, each firm can comply with the agreement or can cheat by lowering its price and in-
creasing its output. In a one-time game, a prisoners’ dilemma Nash equilibrium emerges, in which each firm has the dominant strategy of cheating. Each firm earns zero economic profit. Other decisions of a firm — how much to spend in research and development, how much to spend on advertising, and so on — can often be analyzed using game theory.

**Repeated Games and Sequential Games**

In a repeated game, other strategies can create a cooperative equilibrium, an equilibrium in which the players make and share the monopoly profit.

- A “tit-for-tat” strategy consists of taking the same action (cheating or not cheating) the other player took last period.
- A trigger strategy cooperates until the other player cheats and then plays the Nash equilibrium strategy (cheating) forever after.

In a repeated game the players might be able to attain the cooperative equilibrium because the long-run profit from colluding is greater than the short-run profit from cheating. But price wars can occur when new firms enter an industry, and the industry finds itself in a prisoners’ dilemma game.

A game tree, which shows the decisions made at the first stage and second stage of a game, can be used to analyze a sequential game, such as a contestable market.

A contestable market is a market in which one firm (or a small number operate) but in which entry and exit are free, so the existing firm(s) face competition from potential entrants. The company (or companies) in the market can play an entry-deterrence game:

- In an entry-deterrence game the firm in the market sets a competitive price (rather than a monopoly price) and earns a normal profit to order to keep potential competitors from entering the market.
- Limit pricing refers to the situation in which a firm charges a price lower than the monopoly price (and earns less than the monopoly profit) to keep potential competitors out of the market.

**Helpful Hints**

1. **Marginal Analysis in Different Industry Structures**: Firms in any type of market structure follow the same rule to maximize profit: Produce the level of output that sets $MC = MR$. This rule applies in perfect competition, monopoly, monopolistic competition, and kinked demand curve and dominant firm oligopolies. The essential reason for its widespread applicability is that the rule does not depend on industry structure. The framework of the $MR = MC$ rule is marginal analysis: As long as another unit of output adds more to the firm’s revenue than to its cost ($MR > MC$), producing more output adds its total profit. The fact that $MR = MC$ applies to all industry structures reflects the importance of marginal analysis. (More pragmatically, it also means that you do not have to remember a separate profit-maximizing rule for each type of industry structure!)

2. **Barriers to Entry and Long-Run Economic Profit**: Free entry leads to zero long-run economic profits both in perfect competition and monopolistic competition. If a monopoly is earning an economic profit, other firms would like to enter the monopoly’s industry, but barriers to entry keep them out. Whether a business can earn an economic profit in the long run revolves around the presence or absence of barriers to entry.

3. **How to Determine the Equilibrium in a Prisoners’ Dilemma Game**: Learning how to find the equilibrium of a prisoners’ dilemma-type game is important. Take the example of Chris and Loren in a prisoner’s dilemma. Each player has to choose between two strategies, confess or deny. First, set up the payoff matrix. Then look at the payoff matrix from Chris’s point of view. Chris does not know whether Loren is going to confess or deny, so Chris asks two questions: (1) Assuming that Loren confesses, do I get a better payoff if I confess or deny? (2) Assuming that Loren denies, do I get a better payoff if I confess or deny? If Chris’s best strategy is to confess, regardless of whether Loren confesses or denies, confessing is Chris’s dominant strategy. Next, look at the payoff matrix from Loren’s point of view. Let Loren ask the equivalent two questions, and determine whether Loren has a dominant strategy. The combination of Chris’s strategy and Loren’s strategy comprises the equilibrium outcome of the game.

4. **The Prisoners’ Dilemma Game and the Real World**: The key insight of the prisoners’ di-
CHAPTER 13

lemma game is the tension between the equilibrium outcome (in which both players’ best strategy is to confess because they can’t trust each other) and the fact that both players could make themselves better off if only they would cooperate. This tension helps explain complex events in the real world. The Organization of Petroleum Exporting Countries (OPEC) provides a classic example of this tension. OPEC is a cartel that controls a large fraction of the world’s oil. Looking at OPEC as a whole, restricting the supply of petroleum and keeping the price of petroleum high is in OPEC’s interest. Keeping the price of petroleum high, perhaps near $40 a barrel, which was the price about 20 years ago, would maximize the total revenues and profits of the OPEC nations. But when the price is this high, the individual interest of each nation lies in pumping more oil than the amount allocated to it under the OPEC agreement. Each nation figures that if it — and it alone — cheats on the output restriction imposed by the cartel agreement, the effect on the world price of oil would be small but the positive impact on its profit from selling more oil would be large. So each nation is tempted to cheat on the cartel.

Questions

True/False and Explain

Monopolistic Competition
1. Product differentiation gives each monopolistically competitive firm a downward sloping demand curve.
2. Monopolistically competitive firms compete only on price.
3. Similar to a monopoly, a monopolistically competitive industry has large barriers to entry.

Output and Price in Monopolistic Competition
4. In the short run, to maximize its profit, a monopolistically competitive firm produces the level of output that sets \( P = ATC \).
5. Monopolistically competitive firms can earn an economic profit in the long run.
6. Free entry is the basic reason that monopolistically competitive firms have excess capacity.
7. Monopolistically competitive firms have excess capacity in the long run.

Product Development and Marketing
8. A monopolistically competitive firm can earn an economic profit if it develops new products.
9. Monopolistically competitive firms have large marketing and selling costs.

Oligopoly
10. An oligopolist will consider the reactions of other firms before it decides to cut its price.
11. The kinked demand curve model of oligopoly predicts that the firm will change its price only infrequently.

Oligopoly Games
12. Game theory is used to analyze the behavior of monopolistically competitive firms.
13. In a one-time only prisoners’ dilemma game, the best strategy for a prisoner is to confess only if the prisoner believes that the other player will confess.
14. If oligopolistic firms are able to sustain an output-restricting, price-increasing collusive agreement, they will produce the efficient level of output.

Repeated Games and Sequential Games
15. Repeated games are more likely to have a cooperative equilibrium than one-time only games.
16. Price wars can break out when a small number of new firms enter an industry.
17. A single firm in a contestable market might be unable to earn an economic profit.
18. Limit pricing refers to attempts by firms to set their price at the highest possible limit.
Multiple Choice

Monopolistic Competition

1. A monopolistically competitive firm is like a monopoly firm insofar as
   a. both face perfectly elastic demand.
   b. both earn an economic profit in the long run.
   c. both have MR curves that lie below their demand curves.
   d. neither is protected by high barriers to entry.

2. A monopolistically competitive firm is like a perfectly competitive firm insofar as
   a. both face perfectly elastic demand.
   b. both earn an economic profit in the long run.
   c. both have MR curves that lie below their demand curves.
   d. neither is protected by high barriers to entry.

3. Product differentiation
   a. means that monopolistically competitive firms can compete on quality and marketing.
   b. occurs when a firm makes a product that is slightly different from that of its competitors.
   c. makes the firm’s demand curve downward sloping.
   d. All of the above answers are correct.

Output and Price in Monopolistic Competition

Figure 13.3 represents a monopolistically competitive firm in the short run. Use it for the next four questions.

14. How much output does the firm produce?
   a. \( Q_a \)
   b. \( Q_b \)
   c. \( Q_c \)
   d. None of the above

15. What price does the firm charge?
   a. \( P_a \)
   b. \( P_b \)
   c. \( P_c \)
   d. None of the above

16. What type of profit or loss is the firm earning?
   a. An economic profit
   b. A normal profit
   c. An economic loss
   d. An accounting loss

17. In the long run,
   a. new firms will enter, and each existing firm’s demand decreases.
   b. new firms will enter, and each existing firm’s demand increases.
   c. existing firms will leave, and each remaining firm’s demand decreases.
   d. existing firms will leave, and each remaining firm’s demand increases.

18. A monopolistically competitive firm has excess capacity because in the
   a. short run \( MR = MC \).
   b. short run the firm’s average total cost does not equal the minimum average total cost.
   c. long run the firm’s average total cost does not equal the minimum average total cost.
   d. long run the firm earns an economic profit.

19. In the long run, a monopolistically competitive firm’s economic profits are zero because of
   a. product differentiation.
   b. the lack of barriers to entry.
   c. excess capacity.
   d. the downward-sloping demand curve of each firm.
10. Monopolistically competitive firms constantly develop new products in an effort to
   a. make the demand for their product more elastic.
   b. increase the demand for their product.
   c. increase the marginal cost of their product.
   d. None of the above answers is correct.

11. When deciding upon how much to spend on product development, a firm will consider
   a. only the marginal revenue from product development.
   b. only the marginal cost of product development.
   c. both the marginal revenue and marginal cost of product development.
   d. the price and average total cost of product development.

12. Which of the following statements about monopolistically competitive firms is correct?
   a. They produce more than the capacity amount of output.
   b. They have high selling costs.
   c. They produce the efficient amount of output.
   d. They rarely advertise.

13. A firm that has a kinked demand curve assumes that, if it raises its price, ____ of its
    competitors will raise their prices and that, if it lowers its price, ____ of its competitors will lower
    their prices.
   a. all; all
   b. none; all
   c. all; none
   d. none; none

14. In the dominant firm model of oligopoly, the large firm acts like
   a. an oligopolist.
   b. a monopolist.
   c. a monopolistic competitor.
   d. a perfect competitor.

15. In the dominant firm model of oligopoly, the smaller firms act like
   a. oligopolists.
   b. monopolists.
   c. monopolistic competitors.
   d. perfect competitors.

16. A game always contains all of the following EXCEPT
   a. rules.
   b. a dominant strategy.
   c. strategies.
   d. payoffs.

17. In the prisoners’ dilemma game with a Nash equilibrium,
   a. only one prisoner confesses.
   b. neither prisoner confesses.
   c. both prisoners confess.
   d. any confession is thrown out of court.

18. If a collusive agreement in a duopoly maximizes the industry’s profit,
   a. each firm must produce the same amount.
   b. the industry level of output is efficient.
   c. industry marginal revenue must equal industry marginal cost at the level of total output.
   d. total output will be greater than without collusion.

Firms A and B are in a duopoly game, so they can either comply with a cartel agreement or cheat on
the agreement. The cartel agreement calls for each firm to boost its price and restrict the amount it
produces. For the next 5 questions, use the following payoff matrix that shows the firms’ economic
profits.

<table>
<thead>
<tr>
<th>A’s strategies</th>
<th>Comply</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cheat</td>
<td></td>
</tr>
<tr>
<td>$0</td>
<td>–$1 million</td>
</tr>
<tr>
<td>B’s strategies</td>
<td></td>
</tr>
<tr>
<td>Cheat</td>
<td></td>
</tr>
<tr>
<td>$0</td>
<td>$3 million</td>
</tr>
<tr>
<td>Comply</td>
<td></td>
</tr>
<tr>
<td>$3 million</td>
<td>$2 million</td>
</tr>
<tr>
<td>–$1 million</td>
<td>$2 million</td>
</tr>
</tbody>
</table>

19. If firm A cheats on the cartel and firm B complies with the agreement, firm A’s profit is
   a. $3 million.
   b. $2 million.
   c. zero.
   d. –$1 million.
20. If firm A cheats on the cartel and firm B complies with the agreement, firm B’s profit is
   a. $3 million.
   b. $2 million.
   c. zero.
   d. –$1 million
21. If this game is played only once,
   a. both firms A and B will cheat.
   b. firm A will cheat and firm B will not cheat.
   c. firm A will not cheat and firm B will cheat.
   d. neither firm A nor firm B will cheat.
22. The equilibrium in question 21 is called a
   a. credible strategy equilibrium.
   b. Nash equilibrium.
   c. duopoly equilibrium.
   d. cooperative equilibrium.
23. If this game is played repeatedly and both firms adopt trigger strategies so that the cooperative equilibrium emerges,
   a. both firms A and B will cheat.
   b. firm A will cheat and firm B will not cheat.
   c. firm A will not cheat and firm B will cheat.
   d. neither firm A nor firm B will cheat.
24. In a duopoly with a collusive agreement, when is the industry-wide profit as large as possible?
   a. When both firms comply with the collusive agreement.
   b. When one firm cheats on the cartel and the other firm does not.
   c. When both firms cheat on the collusive agreement.
   d. The answer is indeterminate because it depends on the industry’s MR curve.
25. In a duopoly with a collusive agreement, when can one firm have the maximum possible profit?
   a. When both firms comply with the collusive agreement.
   b. When one firm cheats on the agreement and the other firm does not.
   c. When both firms cheat on the agreement.
   d. The answer is indeterminate because it depends on the firm’s MR curve.
26. A prisoners’ dilemma equilibrium is most likely to emerge when
   a. a monopolistically competitive industry is dominated by a dominant firm.
   b. an oligopolistic industry faces a repeated game.
   c. a monopoly is forced to compete repeatedly with an oligopolistic industry.
   d. an oligopolistic industry plays a game once.

Repeated Games and Sequential Games
27. A strategy in which a firm takes the same action that the other firm did in the last period is a
   a. dominant strategy.
   b. trigger strategy.
   c. tit-for-tat strategy.
   d. wimp’s strategy.
28. Price wars can be the result of
   a. a cooperative equilibrium.
   b. a firm playing a tit-for-tat strategy in which last period the competitors complied with a collusive agreement.
   c. new firms entering the industry and immediately agreeing to abide by a collusive agreement.
   d. new firms entering an industry and all firms then finding themselves in a prisoners’ dilemma.
29. In a contestable market,
   a. the HHI is usually quite low.
   b. the firm in the market usually earns a large economic profit.
   c. the firm in the market might play an entry-deterrence game.
   d. two of the above answers are correct.
30. Limit pricing refers to
   a. the fact that a monopoly firm always sets the highest price possible.
   b. a situation in which a firm might lower its price to keep potential competitors from entering its market.
   c. how the price is determined in a kinked demand curve model of oligopoly.
   d. none of the above.

Short Answer Problems
1. In Figure 13.4 (on the next page) draw a diagram illustrating a monopolistically competitive firm that
is earning an economic profit in the short run. Identify the area that equals the economic profit.

2. In Figure 13.5 (on the next page) draw the long-run equilibrium for a monopolistically competitive firm. What conditions must be satisfied for long-run equilibrium?

3. Suppose that a monopolistically competitive firm is initially in long-run equilibrium and it succeeds in further differentiating its product. As a result, the demand for its product increases. In Figure 13.6 show what happens to this firm in the short run.

Without drawing a diagram, describe what happens in the long run.

4. Compare the advantages and disadvantages of perfect competition and monopolistic competition in terms of how they benefit society.

5. In Figure 13.7 draw a diagram showing a kinked demand curve oligopoly. Indicate the range between which the marginal cost can vary and still leave the firm’s output and price the same.

6. How can a price war that eliminates profits be explained with game theory?
7. Two firms — Tom’s Taxis and Chet’s Cabs — are the only two taxicab companies in a small college town. These firms are engaged in a duopoly game. If they both adhere to a collusive cartel agreement to restrict the number of their cabs and raise their price, each can earn an economic profit of $2 million. However, if one company cheats on the agreement — by shading its price a bit and perhaps quietly acquiring some more taxis — and the other complies with the agreement, the cheater earns an economic profit of $2.5 million and the compiler suffers an economic loss of $1 million. If both cheat, both earn $0 economic profit; that is, both earn a normal profit.

<table>
<thead>
<tr>
<th>Payoff Matrix for Short Answer Problem 7</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Tom’s strategies</strong></td>
</tr>
<tr>
<td>Cheat</td>
</tr>
<tr>
<td>Chet’s strategies</td>
</tr>
<tr>
<td>Comply</td>
</tr>
</tbody>
</table>

a. Use the description of the situation to complete the payoff matrix above. Put Tom’s payoffs in the darker triangles and Chet’s in the other triangles.
b. If this game is played only once, what is Tom’s best strategy? What is Chet’s best strategy? What will be the equilibrium outcome?
c. When is the joint total profit the largest? When is Tom’s profit the largest? Chet’s profit?

8. Suppose that the taxi firm duopoly game played in problem 7 changes: The payoffs are the same as before except when one player cheats and the other does not. Now the cheating player earns an economic profit of $2.5 million, and the player complying with the agreement earns an economic profit of $0.5 million.

a. Complete the second payoff matrix above for the new taxi firm duopoly game.

b. Does Tom have a clear-cut best strategy? Does Chet? Is there a clear equilibrium outcome in this game?

9. The taxi market changes again so that the payoff matrix is as shown in the matrix for problem 9 below. Chet and Tom now see that they will be playing a repeated game. Chet knows that Tom has adopted a tit-for-tat strategy. Last period Chet did not cheat on the cartel agreement.

<table>
<thead>
<tr>
<th>Payoff Matrix for Short Answer Problem 8</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Tom’s strategies</strong></td>
</tr>
<tr>
<td>Cheat</td>
</tr>
<tr>
<td>Chet’s strategies</td>
</tr>
<tr>
<td>Comply</td>
</tr>
</tbody>
</table>

a. If Chet cheats this period, what is his profit? If he cheats this period, what is the maximum profit he can earn next period? What is his maximum two-period profit if he cheats?
b. If Chet complies with the agreement, what is the maximum profit he earns this period? If he complies next period, what will be his profit? If he does not cheat in either period, what is the two-period total profit he earns?
c. Is Chet likely to cheat this period? Why?
You’re the Teacher

1. “You know, I’ve really been studying the book and this study guide and now a lot of this stuff is making sense. I liked the helpful hint that pointed out that firms in all types of industries actually had only one profit-maximization rule, what it called the \( MR = MC \) rule. It sure makes it easy if we don’t have to memorize different rules for different industries! Can you think of any other rules that are the same across all industries?” This student is correct: Common rules ease your work. Perhaps more importantly, common rules also show you that there are factors in common to all firms regardless of their industry structure. There is another rule that is common across all types of industries; it deals with when a firm earns an economic profit. With this hint, explain the other rule to the eager student.
Answers

True/False Answers

Monopolistic Competition
1. T By making its product different from those of its competitors, each monopolistically competitive firm has a unique product and hence a downward-sloping demand curve.
2. F Because its product is differentiated, monopolistically competitive firms compete on product quality and marketing, as well as on price.
3. F Similar to a perfectly competitive industry, a monopolistically competitive industry has many firms in it because there are no barriers to entry.

Output and Price in Monopolistic Competition
4. F Monopolistically competitive firms use the same rule as all firms: to maximize their profit, produce so that \( MR = MC \).
5. F The firms cannot earn an economic profit in the long run because of the absence of barriers to entry.
6. F Monopolistically competitive firms have excess capacity because they produce differentiated goods.
7. T Because they do not produce at the minimum ATC, monopolistically competitive firms have excess capacity, that is, if they boosted their production, their average total costs would fall.

Product Development and Marketing
8. T Monopolistically competitive firms constantly try to further differentiate their products, and developing new products is one method they use.
9. T Marketing and advertising play key roles in monopolistically competitive firms’ efforts to differentiate their products.

Oligopoly
10. T This mutual interdependence makes oligopoly a difficult industry structure to analyze.
11. T Shifts in the MC curve that do not move it beyond the vertical section of the MR curve have no effect on the price that the firm charges nor on the quantity it produces.

Oligopoly Games
12. F Game theory is used to analyze the behavior of oligopolistic firms.
13. F In a prisoners’ dilemma game, the dominant strategy is to confess; that is, regardless of the other players’ action, each player will confess.
14. F The collusive agreement described in the problem decreases output below its efficient level.

Repeated Games and Sequential Games
15. T Repeated games have strategies absent from games played only once, such as the tit-for-tat strategy, that can support the cooperative equilibrium. So, repeated games are more likely to have a cooperative equilibrium.
16. T When a small number of new firms enter a market, the firms might find themselves in a prisoners’ dilemma in which competition forces the price of the product down.
17. T In a contestable market, if the firm sets its price so that it earns an economic profit, competitors enter the market.
18. F Limit pricing refers to the situation in which an established firm sets a low price in order to keep new competitors out of the market.

Multiple Choice Answers

Monopolistic Competition
11. c Both have downward-sloping demand curves, so both have \( MR \) curves that lie below their demand curves.
12. d The absence of high barriers to entry accounts for the large number of firms in each industry.
13. d Answer b is the definition of product differentiation and answers a and c are results of product differentiation.

Output and Price in Monopolistic Competition
4. a The monopolistically competitive firm maximizes its profit by producing so that \( MR = MC \).
5. c With the firm producing \( Q_d \) output, the demand curve shows that a price of \( P_s \) is the highest price that can be charged and still sell all that is produced.
6. a The firm earns an economic profit because, at output of \( Q_d \), \( P > ATC \).
7. a New firms enter because they, too, want to earn an economic profit. As these firms enter, they decrease the demand for the existing firms’ products, which reduces the economic profit.

8. c The firm produces less output than that which minimizes its long-run ATC.

9. b If firms in the industry are earning an economic profit, the absence of barriers to entry means that new firms enter the industry and compete away the economic profit.

**Product Development and Marketing**

10. b If the firm can increase the demand for its product, it can temporarily earn an economic profit.

11. c For virtually all business decisions, a firm compares the marginal revenue and marginal cost resulting from the decision.

12. b Monopolistically competitive firms incur large selling costs trying to differentiate their products.

**Oligopoly**

13. b With this set of assumptions, the business believes that it will lose a large amount of sales if raises its price, but pick up only a small amount if it lowers its price.

14. b When setting its price and quantity, the dominant firm acts as if it were a monopoly.

15. d The smaller firms are unable to affect the price charged by the large firm.

**Oligopoly Games**

16. b A game might or might not have a dominant strategy.

17. c Both players confess even though it is in their joint interest for neither to confess.

18. c To maximize its profit, the industry behaves as a monopoly, which means that it produces the level of output needed for \( MR = MC \).

19. a Firm A’s profits are in the darkened triangle in the square at the lower left.

20. d Firm B’s profits are in the white triangle in the square at the lower left.

21. a Both firms adopt the strategy of cheating.

22. b A Nash equilibrium occurs when each player takes the best action possible, given the action of the other player.

23. d The cooperative equilibrium maximizes each firm’s profit over the long haul.

24. a The interest of the industry as a whole is to maintain the cartel.

25. b Each firm’s individual interest is to be the lone cheater on the cartel agreement. Compare this answer to the previous answer.

26. d In one-time only games, a dominant strategy for each firm likely is to cheat, so this strategy emerges as the Nash equilibrium.

**Repeated Games and Sequential Games**

27. c Tit-for-tat implies that “I’ll do to you what you did to me.”

28. d Neither the new firms nor the old ones want a price war, but a prisoners’ dilemma game might make a price war inevitable.

29. c By playing an entry-deterrence game, the firm in the market sets a low price to keep competitors from entering the market.

30. b Limit pricing can occur in contestable markets when the firm plays an entry deterrence game.

**Answers to Short Answer Problems**

**Figure 13.8**

**Short Answer Problem 1**

1. Figure 13.8 shows the short-run equilibrium of a monopolistically competitive firm. To maximize its profit, the firm produces so that \( MR = MC \). At this level of output, \( P > ATC \), so the firm earns an economic profit, as illustrated by the darkened rectangle. This diagram is identical to that of a monopoly firm earning an economic profit. Both monopoly
and monopolistically competitive firms face downward-sloping demand curves, both produce so that $MR = MC$, and, as long as $P > ATC$, both firms earn an economic profit.

**FIGURE 13.9**  
**Short Answer Problem 2**

2. Figure 13.9 shows the long-run equilibrium for a monopolistically competitive firm. Two conditions must be satisfied for this diagram to show the long-run equilibrium. Think of these requirements as a firm condition and a market condition. For the firm to be satisfied, it must maximize its profit, which requires that it be producing the amount of output so that $MR = MC$. Then, for there to be long-run equilibrium in the market, firms must have no incentive either to enter or exit the industry. As a result, there can be no economic profit, so $P = ATC$. (This second condition is not a choice of the firm; the firm would rather earn an economic profit. But for the market to be in long-run equilibrium, it is required.) Both conditions — production at $MR = MC$ and $P = ATC$ — are met in Figure 13.9 so Figure 13.9 illustrates the long-run equilibrium.

3. Figure 13.10 shows the effect when a monopolistically competitive firm succeeds in further differentiating its product. The demand for the firm’s good increases, thereby shifting the demand curve and the $MR$ curve rightward. As a result, the firm increases its output from $Q_1$ to $Q_2$ and raises its price from $P_1$ to $P_2$. The firm earns an economic profit. In the long run, other firms copy its product. As they copy, the demand for the initial firm’s good decreases; that is, the demand curve and $MR$ curve shift leftward. Ultimately, demand decreases enough that the pioneering firm — and all other “copier” firms — no longer earn an economic profit. At this point, other firms do not have an incentive to copy the good and the market is in long-run equilibrium.

4. An advantage of perfect competition is that it produces at minimum average total cost, whereas monopolistic competition produces at a higher average total cost because of its excess capacity. Another advantage is that a perfectly competitive industry is efficient; it produces the level of output that sets the marginal social benefit equal to the marginal social cost. A monopolistically competitive industry, however, is not efficient because the price of the product (which equals the marginal social benefit) exceeds the marginal social cost (which equals the marginal cost).

The advantage of monopolistic competition is that product differentiation leads to greater product variety, which consumers value. In addition, monopolistically competitive firms have a greater incentive to innovate new and improved products and methods of production. Monopolistically competitive firms must do more advertising and sales promotion than perfectly competitive firms. To the extent that these activities provide valued services to consumers, they benefit society.

So, the loss in efficiency and the higher $ATC$ that occurs in monopolistic competition must be
weighed against the gain of greater product variety, greater incentives to innovate, and potentially valuable promotional activity.

**FIGURE 13.11**

Short Answer Problem 5

5. Figure 13.11 illustrates a kinked demand curve oligopoly and the range over which the $MC$ can change and not affect the price, $P$, or quantity, $Q$.

6. Game theory explains price wars as the consequence of firms in a colluding industry responding to the cheating of a firm or as the response to new firms entering the industry. If one firm cheats by cutting its price, all other firms will cut their prices, and a price war ensues. After the price has fallen sufficiently (perhaps so the firms earn zero economic profit), they have an incentive to rebuild their collusion. Alternatively, if new firms (or even just one) enter an industry, the old and new players might find themselves playing a prisoners’ dilemma game. Neither set of firms wants the price to fall and profits to shrink, but they might be unable to collude successfully to keep the price and profit high.

7. a. The payoff matrix is given above.
   
   b. Tom’s best strategy is to cheat without regard to what Chet does. If Chet adheres to the agreement and does not cheat, Tom will cheat because his profit when cheating ($2.5$ million) exceeds his profit when he does not cheat ($2$ million). And, if Chet cheats, Tom also will cheat because his profit ($0$) is higher than the loss he would incur by not cheating ($−$1 million). Tom has a dominant strategy: cheat. In exactly the same way, Chet’s profits are higher if he cheats regardless of what Tom does. So, Chet also has a dominant strategy of cheating. The equilibrium outcome is for both Tom and Chet to cheat on the cartel agreement.
   
   c. The industry’s total profits are highest ($4$ million) when neither Tom nor Chet cheat. Tom’s profit is largest if he cheats and Chet does not. Similarly, Chet’s profit is greatest if he alone cheats. Though each player’s individual interest is to cheat, their joint interest is to comply.

8. a. The new payoff matrix is given above.
   
   b. Tom and Chet no longer have a dominant strategy. In particular, if Chet complies with the agreement, Tom wants to cheat because in this
case his profit by cheating ($2.5 million) exceeds his profit by complying ($2 million). But, if Chet cheats on the agreement, Tom will want to comply. If Chet is cheating, Tom earns a profit of $0.5 million by complying but $0 by cheating. Hence Tom’s best strategy depends on what Chet does. Chet is in the same situation: His best strategy depends on what Tom does. Unlike the situation in problem 7, the outcome is not clear-cut. The equilibrium depends on which strategy Chet and Tom decide to pursue.

9. a. Last period Chet did not cheat, so Tom’s tit-for-tat strategy means that Tom will not cheat this period. Because Tom will comply with the cartel agreement, Chet’s profit this period by cheating is $2.5 million. Next period Tom will cheat because Chet cheated this period. Therefore next period the most profit that Chet can earn is $0 by also cheating. (If Chet complied with agreement and Tom cheated, Chet loses –$2 million.) Over the two periods, Chet’s total profit if he cheats in the first period is $2.5 million.

b. If Chet does not cheat this period, this period he will earn $2 million. Because Chet complied with the agreement this period, Tom’s tit-for-tat strategy means that next period Tom will comply with the agreement. Then, if Chet also complies next period, he will earn $2 million. By complying each period Chet earns a total of $4 million over the two periods.

c. Chet is not likely to cheat. If he does, his total profits over the two periods are significantly less than if he complies over the two periods. So players in a repeated game are more likely to reach the cooperative equilibrium than players in a one-time game.

You’re the Teacher

1. “One other rule works for a firm in any type of industry structure. In particular, if \( P > ATC \), the firm earns an economic profit; if \( P = ATC \), the firm earns a normal profit; and if \( P < ATC \), the firm suffers an economic loss. Let’s take the case of \( P > ATC \) and find out why it means that the firm earns an economic profit. If we multiply both sides of the inequality by \( q \), the amount of output the firm produces, we get \( Pq > (ATC)q \). Now, \( Pq \) (the price times the amount produced) equals the firm’s total revenue. And \( ATC = TC/q \), so multiplying \( ATC \) times \( q \) gives \( TC \), the firm’s total cost. Hence when \( P > ATC \), total revenue exceeds total cost. Because the firm’s normal profit is already included in its total cost, the fact that the firm’s total revenue exceeds its total cost means that the ‘extra’ profit is an economic profit.

“But look, the main point of what I am saying is that we do have it easy. Here’s another case where we don’t have to memorize a bunch of different rules. If any firm finds that \( P \) exceeds \( ATC \), it’s earning an economic profit.”
Chapter Quiz

1. In a duopoly game that is repeated many times, each player tries to
   a. maximize the industry’s total profit.
   b. minimize the other player’s profit.
   c. maximize its market share.
   d. maximize its profit.

2. If \( P > MR \) for each firm in an industry, the industry is NOT
   a. perfectly competitive.
   b. monopolistically competitive.
   c. an oligopoly.
   d. a monopoly.

3. An industry with one large firm with a large cost advantage over its many smaller competitors is called
   a. a dominant firm oligopoly.
   b. a kinked demand curve oligopoly.
   c. a monopolistically competitive market.
   d. a near-monopoly oligopoly.

4. The major distinction between a monopolistically competitive industry and a perfectly competitive industry is that firms in a monopolistically competitive industry
   a. produce identical products.
   b. are protected by high barriers to entry.
   c. produce at the minimum \( ATC \) in the long run.
   d. produce a product that is different from those produced by its competitors.

5. If firms in a monopolistically competitive industry earn an economic profit,
   a. other firms will enter the industry.
   b. some firms will leave the industry.
   c. firms will neither enter nor exit.
   d. The premise of the question is wrong because monopolistically competitive firms cannot earn an economic profit.

6. A firm in which type of industry always has excess capacity in the long run?
   a. Perfect competition
   b. Monopolistic competition
   c. Oligopoly
   d. Monopoly

7. According to the kinked demand curve theory of oligopoly, each firm believes that if it lowers its price
   a. its competitors will not lower their prices.
   b. its competitors will lower their prices.
   c. its profit will rise.
   d. its marginal revenue will exceed its marginal cost.

8. In the long run, a monopolistically competitive firm
   ___ earn an economic profit and a monopoly ___
   earn an economic profit.
   a. can; can
   b. can; cannot
   c. cannot; can
   d. cannot; cannot

9. When each player selects his or her best strategy taking as given what the other player will do, the resulting equilibrium is called a
   a. cooperative equilibrium.
   b. tit-for-tat equilibrium.
   c. Nash equilibrium.
   d. trigger strategy equilibrium.

10. A strategy in which a player cooperates in the current period if the other player cooperated in the previous period, but cheats in the current period if the other player cheated in the previous period is called a
    a. tit-for-tat strategy.
    b. trigger strategy.
    c. duopoly strategy.
    d. dominant firm strategy.

The answers for this Chapter Quiz are on page 368