

Module 64 Introduction to Oligopoly

Module 65 Game Theory

Module 66 Oligopoly in Practice

Module 67 Introduction to Monopolistic Competition

Module 68 Product Differentiation and Advertising

Economics by Example:

“What’s Behind the Music Industry’s Woes?”

Market Structures: Imperfect Competition

The agricultural products company Archer Daniels Midland (also known as ADM) has often described itself as “supermarket to the world.” In 1993, executives from ADM and its Japanese competitor Ajinomoto met to discuss the market for lysine, an additive used in animal feed. In this and subsequent meetings, the two companies joined with several other producers to set targets for the price of lysine, behavior known as *price-fixing*. Each company agreed to limit its production to achieve the price targets, with the goal of raising industry profits. But what the companies were doing was illegal, and the FBI had bugged the meeting room with a camera hidden in a lamp. Over the past few years, there have been numerous investigations and some convictions for price-fixing in a variety of industries, from insurance to college education to computer chips. Despite its illegality, some firms continue to attempt to fix the price of their products.

In the fast food market, it is the legal practice of *product differentiation* that occupies the minds of marketing executives. Fast-food producers go to great lengths to convince

you they have something special to offer beyond the ordinary burger: it’s flame broiled or 100% beef or super-thick or lathered with special sauce. Or maybe they offer chicken or fish or roast beef. And the differentiation dance goes on in the pizza industry as well. Pizza Hut offers cheese in the crust. Papa John’s claims “better ingredients.” Dominoes has a “new recipe,” and if you don’t want thin crust, the alternative isn’t “regular,” it’s “hand tossed”! The slogans and logos for fast-food restaurants often seem to differ more than the food itself.

To understand why ADM engaged in illegal price-fixing and why fast-food joints go to great lengths to differentiate their patties and pizzas, we need to understand the two market structures in between perfect competition and monopoly in the spectrum of market power—oligopoly and monopolistic competition. The models of these two market structures are at the same time more complicated and more realistic than those we studied in the previous section. Indeed, they describe the behavior of most of the firms in the real world.





What you will learn in this Module:

- Why oligopolists have an incentive to act in ways that reduce their combined profit
- Why oligopolies can benefit from collusion

Module 64

Introduction to Oligopoly

In Module 57 we learned that an oligopoly is an industry with only a few sellers. But what number constitutes a “few”? There is no universal answer, and it is not always easy to determine an industry’s market structure just by looking at the number of sellers. Economists use various measures to gain a better picture of market structure, including concentration ratios and the Herfindahl-Hirschman Index, as explained in Module 57.

In addition to having a small number of sellers in the industry, an oligopoly is characterized by **interdependence**, a relationship in which the outcome (profit) of each firm depends on the actions of the other firms in the market. This is not true for monopolies because, by definition, they have no other firms to consider. On the other hand, competitive markets contain so many firms that no one firm has a significant effect on the outcome of the others. However, in an oligopoly, an industry with few sellers, the outcome for each seller depends on the behavior of the others. Interdependence makes studying a market much more interesting because firms must observe and predict the behavior of other firms. But it is also more complicated. To understand the strategies of oligopolists, we must do more than find the point where the *MC* and *MR* curves intersect!

Understanding Oligopoly

How much will a firm produce? Up to this point, we have always answered: the quantity that maximizes its profit. When a firm is a perfect competitor or a monopolist, we can assume that the firm will use its cost curves to determine its profit-maximizing output. When it comes to oligopoly, however, we run into some difficulties.

A Duopoly Example

Let’s begin looking at the puzzle of oligopoly with the simplest version, an industry in which there are only two firms—a **duopoly**—and each is known as a **duopolist**.

Firms are **interdependent** when the outcome (profit) of each firm depends on the actions of the other firms in the market.

An oligopoly consisting of only two firms is a **duopoly**. Each firm is known as a **duopolist**.

Imagine that there are only two producers of lysine (the animal feed additive mentioned in the section opener). To make things even simpler, suppose that once a company has incurred the fixed cost needed to produce lysine, the marginal cost of producing another pound is zero. So the companies are concerned only with the revenue they receive from sales.

Table 64.1 shows a hypothetical demand schedule for lysine and the total revenue of the industry at each price–quantity combination.

table 64.1

Demand Schedule for Lysine

Price of lysine (per pound)	Quantity of lysine demanded (millions of pounds)	Total revenue (millions)
\$12	0	\$0
11	10	110
10	20	200
9	30	270
8	40	320
7	50	350
6	60	360
5	70	350
4	80	320
3	90	270
2	100	200
1	110	110
0	120	0

If this were a perfectly competitive industry, each firm would have an incentive to produce more as long as the market price was above marginal cost. Since the marginal cost is assumed to be zero, this would mean that at equilibrium, lysine would be provided for free. Firms would produce until price equals zero, yielding a total output of 120 million pounds and zero revenue for both firms.

However, with only two firms in the industry, it would seem foolish to allow price and revenue to plummet to zero. Each would realize that with more production comes a lower market price. So each firm would, like a monopolist, see that profits would be higher if it and its rival limited their production.

So how much will the two firms produce?

One possibility is that the two companies will engage in **collusion**—they will cooperate to raise their joint profits. The strongest form of collusion is a **cartel**, a group of producers with an agreement to work together to limit output and increase price, and therefore profit. The world’s most famous cartel is the Organization of Petroleum Exporting Countries (OPEC).

As its name indicates, OPEC is actually a cartel made up of governments rather than firms. There’s a reason for this: cartels among firms are illegal in the United States and many other jurisdictions. But let’s ignore the law for a moment. Suppose the firms producing lysine were to form a cartel and that this cartel decided to act

Sellers engage in **collusion** when they cooperate to raise their joint profits. A **cartel** is a group of producers that agree to restrict output in order to increase prices and their joint profits.



OPEC representatives discuss the cartel’s policies of cooperation.

as if it were a monopolist, maximizing total industry profits. It's obvious from Table 64.1 that in order to maximize the combined profits of the firms, this cartel should set total industry output at 60 million pounds of lysine, which would sell at a price of \$6 per pound, leading to revenue of \$360 million, the maximum possible. Then the only question would be how much of that 60 million pounds each firm gets to produce. A "fair" solution might be for each firm to produce 30 million pounds and receive revenues of \$180 million.

But even if the two firms agreed on such a deal, they might have a problem: each of the firms would have an incentive to break its word and produce more than the agreed-upon quantity.

Collusion and Competition

Suppose that the presidents of the two lysine producers were to agree that each would produce 30 million pounds of lysine over the next year. Both would understand that this plan maximizes their combined profits. And both would have an incentive to cheat.

To see why, consider what would happen if one firm honored its agreement, producing only 30 million pounds, but the other ignored its promise and produced 40 million pounds. This increase in total output would drive the price down from \$6 to \$5 per pound, the price at which 70 million pounds are demanded. The industry's total revenue would fall from \$360 million ($\6×60 million pounds) to \$350 million ($\5×70 million pounds). However, the cheating firm's revenue would *rise*, from \$180 million to \$200 million. Since we are assuming a marginal cost of zero, this would mean a \$20 million increase in profits.

But both firms' presidents might make exactly the same calculation. And if *both* firms were to produce 40 million pounds of lysine, the price would drop to \$4 per pound. So each firm's profits would fall, from \$180 million to \$160 million.

The incentive to cheat motivates the firms to produce more than the quantity that maximizes their joint profits rather than limiting output as a true monopolist would. We know that a profit-maximizing monopolist sets marginal cost (which in this case is zero) equal to marginal revenue. But what is marginal revenue? Recall that producing an additional unit of a good has two effects:

1. A positive *quantity* effect: one more unit is sold, increasing total revenue by the price at which that unit is sold.
2. A negative *price* effect: in order to sell one more unit, the monopolist must cut the market price on *all* units sold.

The negative price effect is the reason marginal revenue for a monopolist is less than the market price. But when considering the effect of increasing production, a firm is concerned only with the price effect on its *own* units of output, not on those of its fellow oligopolists. In the lysine example, both duopolists suffer a negative price effect if one firm decides to produce extra lysine and so drives down the price. But each firm cares only about the portion of the negative price effect that falls on the lysine it produces.

This tells us that an individual firm in an oligopolistic industry faces a smaller price effect from an additional unit of output than a monopolist; therefore, the marginal revenue that such a firm calculates is higher. So it will seem to be profitable for any one firm in an oligopoly to increase production, even if that increase reduces the profits of the industry as a whole. But if everyone thinks that way, the result is that everyone earns a lower profit!

Until now, we have been able to analyze producer behavior by asking what a producer should do to maximize profits. But even if the duopolists are both trying to maximize profits, what does this predict about their behavior? Will they engage in collusion, reaching and holding to an agreement that maximizes their combined profits? Or will they engage in **noncooperative behavior**, with each firm acting in its own self-interest, even though this has the effect of driving down everyone's profits? Both strategies can be carried out with a goal of profit maximization. Which will actually describe their behavior?

When firms ignore the effects of their actions on each other's profits, they engage in **noncooperative behavior**.

Now you see why oligopoly presents a puzzle: there are only a small number of players, making collusion a real possibility. If there were dozens or hundreds of firms, it would be safe to assume they would behave noncooperatively. Yet, when there are only a handful of firms in an industry, it's hard to determine whether collusion will actually occur.

Since collusion is ultimately more profitable than noncooperative behavior, firms have an incentive to collude if they can. One way to do so is to formalize it—sign an agreement (maybe even make a legal contract) or establish some financial incentives for the companies to set their prices high. But in the United States and many other nations, firms can't do that—at least not legally. A contract among firms to keep prices high would be unenforceable, and it could be a one-way ticket to jail. The same goes for an informal agreement. In fact, executives from rival firms rarely meet without lawyers present, who make sure that the conversation does not stray into inappropriate territory. Even hinting at how nice it would be if prices were higher can bring an unwelcome interview with the Justice Department or the Federal Trade Commission. For example, in 2003 the Justice Department launched a price-fixing case against Monsanto and other large producers of genetically modified seed. The Justice Department was alerted by a series of meetings held between Monsanto and Pioneer Hi-Bred International, two companies that account for 60% of the U.S. market in maize and soybean seed. These companies, parties to a licensing agreement involving genetically modified seed, claimed that no illegal discussions of price-fixing occurred in those meetings. But the fact that the two firms discussed prices as part of the licensing agreement was enough to trigger action by the Justice Department.



Bryan Smith/Zuma Press

Competing with Prices versus Competing with Quantities

Sometimes, as we've seen, oligopolistic firms just ignore the rules. But more often they develop strategies for making the best of the situation depending on what they know, or assume, about the other firms' behavior. The uncertainties of oligopoly behavior make it harder to model than the behavior of monopolists or perfectly competitive firms, but models do exist. One such model is an example of *price competition* developed by French economist Joseph Bertrand. According to the *Bertrand model*, oligopolists repeatedly undercut each others' prices—charging a bit less than the others to steal their customers—until price reaches the level of marginal cost, as under perfect competition. Another French economist, Augustin Cournot, focused instead on *quantity competition*, which had oligopolists choosing quantities and charging as much as possible for those quantities, rather than choosing prices and selling as much as possible at those prices. According to the *Cournot model*, each oligopolist treats the output of its competitors as fixed, and restricts output to that quantity that will maximize profit given the fixed output of others. The firms' restriction of output in the Cournot model results in lower overall output levels, and higher prices, than under perfect competition, and each firm earns a positive economic profit.

Consider American Airlines and British Airways, which we will assume are duopolists with exclusive rights to fly the Chicago–London route. When the economy is strong and lots of people want to fly between Chicago and London, American Airlines and British Airways might assume the number of passengers the other can carry is constrained, for example by the number of landing slots or terminal gates available. In this environment they are likely to behave according to the Cournot model and price above marginal cost—say, charging \$800 per round trip. But when the business climate is poor, the two airlines are likely to find that they have lots of empty seats at a fare of \$800 and that capacity constraints are no longer an issue. What will they do?



Sean Callinan/Rob Homer

In the absence of collusion, price competition among oligopolists can be intense, as with the airfare war between Jetstar and Virgin Blue that has led to \$300 fares to Bali.

Recent history tells us they will engage in a price war by slashing ticket prices. If American Airlines were to try to maintain a price of \$800, it would soon find itself undercut by British Airways, which would charge \$750 and steal its customers. In turn, American Airlines would undercut British Airways by charging \$700—and so on. As long as each firm finds that it can capture the customers by cutting price, each will continue cutting until price is equal to marginal cost. (Going any lower would cause them to incur an avoidable loss.) This is the outcome Bertrand predicted.

Oligopolists would, understandably, prefer to avoid Bertrand behavior because it earns them zero profits. Lacking an environment that imposes constraints on their output capacity, firms try other means of avoiding direct price competition—such as producing products that are not perfect substitutes but are instead differentiated. We'll examine this strategy in more detail in Module 68. For now, we note that producing differentiated products allows oligopolists to cultivate a loyal set of customers and to charge prices higher than marginal cost.

Collusion is another approach to dodging the profit-suppressing effects of competition. In the next module, we'll see why informal collusion often works but sometimes fails.

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The Great Vitamin Conspiracy

It was a bitter pill to swallow. In the late 1990s, some of the world's largest drug companies (mainly European and Japanese) agreed to pay billions of dollars in damages to customers after being convicted of a huge conspiracy to rig the world vitamin market.

The conspiracy began in 1989 when the Swiss company Roche and the German company BASF began secret talks about raising prices for vitamins. Soon a French company, Rhone-Poulenc, joined in, followed by several Japanese companies and other companies around the world. The members of the group, which referred to itself as "Vitamins, Inc.," met regularly—sometimes at hotels, sometimes at

the private homes of executives—to set prices and divide up markets for "bulk" vitamins (like vitamin A, vitamin C, and so on). These bulk vitamins are sold mainly to other companies, such as animal feed makers, food producers, and so on, which include them in their products. Indeed, it was the animal feed companies that grew suspicious about the prices they were being charged, which led to a series of investigations. The case eventually broke open when Rhone-Poulenc made a deal with U.S. officials to provide evidence of the conspiracy. The French company was concerned that rumors about price-fixing would lead U.S. officials to block its planned merger with another company.

How could it have happened?

The main answer probably lies in different national traditions about how to treat oligopolists. The United States has a long tradition of taking tough legal action against price-fixing. European governments, however, have historically been much less stringent. Indeed, in the past some European governments have actually encouraged major companies to form cartels. But European antitrust law has changed recently to become more like U.S. antitrust law. Despite this change, however, the cultural tradition of forming cartels as normal business practice lingers within the boardrooms of some European companies.

Module 64 AP Review

Solutions appear at the back of the book.

Check Your Understanding

1. Explain whether each of the following characteristics will increase or decrease the likelihood that a firm will collude with other firms in an oligopoly to restrict output.
 - a. The firm's initial market share is small. (Hint: Think about the price effect.)
 - b. The firm has a cost advantage over its rivals.
 - c. The firm's customers face additional costs when they switch from one firm's product to another firm's product.
 - d. The firm and its rivals are currently operating at maximum production capacity, which cannot be altered in the short run.

Tackle the Test: Multiple-Choice Questions

- When firms cooperate to raise their joint profits, they are necessarily
 - colluding.
 - in a cartel.
 - a monopoly.
 - in a duopoly.
 - in a competitive industry.
- Use the information in the table below on market shares in the search engine industry and measures of market power (defined in Section 10) to determine which of the following statements are correct.

Search Engine	Market share
Google	44%
Yahoo	29
MSN	13
AOL	6
Ask	5
Other	3

 - The 4-firm concentration ratio is 92.
 - The Herfindahl-Hirschman index is 3,016.
 - The industry is likely to be an oligopoly.
 - I only
 - II only
 - III only
 - I and II only
 - I, II, and III
- An agreement among several producers to restrict output and increase profit is necessary for
 - cooperation.
 - collusion.
 - monopolization.
 - a cartel.
 - competition.
- Oligopolists engage in which of the following types of behavior?
 - quantity competition
 - price competition
 - cooperative behavior
 - I only
 - II only
 - III only
 - I and II only
 - I, II, and III
- Which of the following will make it easier for firms in an industry to maintain positive economic profit?
 - a ban on cartels
 - a small number of firms in the industry
 - a lack of product differentiation
 - low start-up costs for new firms
 - the assumption by firms that other firms have variable output levels

Tackle the Test: Free-Response Questions

- Refer to the table provided to answer the following questions. Assume that marginal cost is zero.

Demand Schedule

Price	Quantity
\$24	0
22	1
20	2
18	3
16	4
14	5
12	6
10	7
8	8
6	9
4	10
2	11
0	12

- If the market is perfectly competitive, what will the market equilibrium price and quantity be in the long run? Explain.
- If the market is a duopoly and the firms collude to maximize joint profits, what will market price and quantity be? Explain.
- If the market is a duopoly and the firms collude to maximize joint profits, what is each firm's total revenue if the firms split the market equally?

Answer (7 points)

1 point: If the market is perfectly competitive, price will be zero.

1 point: If the market is perfectly competitive, quantity will be 12.

1 point: Price equals marginal cost in the long-run equilibrium of a perfectly competitive market, so price will be zero, at which price the quantity is 12.

1 point: If the market is a duopoly, price will be \$12.

1 point: If the market is a duopoly, quantity will be 6.

1 point: In order to maximize joint profits, the two firms would act as a monopoly, setting marginal revenue equal to marginal cost and finding price on the demand curve above the profit-maximizing quantity. Marginal revenue passes through zero (going from 2 to -2) after the 6th unit, making 6 the profit-maximizing quantity. The most consumers would pay for 6 units is \$12, so that is the profit-maximizing price.

1 point: Total revenue is $\$12 \times 6 = \72 . By dividing this equally, each firm receives \$36.

- What are the two major reasons we don't see cartels among oligopolistic industries in the United States?
 - Explain the difference between behavior under the Cournot model and behavior under the Bertrand model.



What you will learn in this Module:

- How our understanding of oligopoly can be enhanced by using game theory
- The concept of the prisoners' dilemma
- How repeated interactions among oligopolists can result in collusion in the absence of any formal agreement

Module 65 Game Theory

Games Oligopolists Play

In our duopoly example and in real life, each oligopolistic firm realizes both that its profit depends on what its competitor does and that its competitor's profit depends on what it does. That is, the two firms are in a situation of interdependence, whereby each firm's decision significantly affects the profit of the other firm (or firms, in the case of more than two).

In effect, the two firms are playing a “game” in which the profit of each player depends not only on its own actions but on those of the other player (or players). In order to understand more fully how oligopolists behave, economists, along with mathematicians, developed the area of study of such games, known as **game theory**. It has many applications, not just to economics but also to military strategy, politics, and other social sciences.

Let's see how game theory helps us understand oligopoly.

The Prisoners' Dilemma

Game theory deals with any situation in which the reward to any one player—the **payoff**—depends not only on his or her own actions but also on those of other players in the game. In the case of oligopolistic firms, the payoff is simply the firm's profit.

When there are only two players, as in a lysine duopoly, the interdependence between the players can be represented with a **payoff matrix** like that shown in Figure 65.1. Each row corresponds to an action by one player; each column corresponds to an action by the other. For simplicity, let's assume that each firm can pick only one of two alternatives: produce 30 million pounds of lysine or produce 40 million pounds.

The matrix contains four boxes, each divided by a diagonal line. Each box shows the payoff to the two firms that results from a pair of choices; the number below the diagonal shows Firm 1's profits, the number above the diagonal shows Firm 2's profits.

These payoffs show what we concluded from our earlier analysis: the combined profit of the two firms is maximized if they each produce 30 million pounds. Either firm can, however, increase its own profits by producing 40 million pounds if the other produces only 30 million pounds. But if both produce the larger quantity, both will have lower profits than if they had both held their output down.

The study of behavior in situations of interdependence is known as **game theory**.

The reward received by a player in a game, such as the profit earned by an oligopolist, is that player's **payoff**.

A **payoff matrix** shows how the payoff to each of the participants in a two-player game depends on the actions of both. Such a matrix helps us analyze situations of interdependence.

figure 65.1

A Payoff Matrix

Two firms must decide how much lysine to produce. The profits of the two firms are *interdependent*: each firm's profit depends not only on its own decision but also on the other's decision. Each row represents an action by Firm 1, each column one by Firm 2. Both firms will be better off if they both choose the lower output; but it is in each firm's individual interest to choose the higher output.

		Firm 2	
		Produce 30 million pounds	Produce 40 million pounds
Firm 1	Produce 30 million pounds	Firm 1 makes \$180 million profit. Firm 2 makes \$180 million profit.	Firm 1 makes \$150 million profit. Firm 2 makes \$200 million profit.
	Produce 40 million pounds	Firm 1 makes \$200 million profit. Firm 2 makes \$150 million profit.	Firm 1 makes \$160 million profit. Firm 2 makes \$160 million profit.

The particular situation shown here is a version of a famous—and seemingly paradoxical—case of interdependence that appears in many contexts. Known as the **prisoners' dilemma**, it is a type of game in which the payoff matrix implies the following:

- Each player has an incentive, regardless of what the other player does, to cheat—to take an action that benefits it at the other's expense.
- When both players cheat, both are worse off than they would have been if neither had cheated.

The original illustration of the prisoners' dilemma occurred in a fictional story about two accomplices in crime—let's call them Thelma and Louise—who have been caught by the police. The police have enough evidence to put them behind bars for 5 years. They also know that the pair have committed a more serious crime, one that carries a 20-year sentence; unfortunately, they don't have enough evidence to convict the women on that charge. To do so, they would need each of the prisoners to implicate the other in the second crime.

So the police put the miscreants in separate cells and say the following to each: "Here's the deal: if neither of you confesses, you know that we'll send you to jail for 5 years. If you confess and implicate your partner, and she doesn't do the same, we reduce your sentence from 5 years to 2. But if your partner confesses and you don't, you'll get the maximum 20 years. And if both of you confess, we'll give you both 15 years."

Figure 65.2 on the next page shows the payoffs that face the prisoners, depending on the decision of each to remain silent or to confess. (Usually the payoff matrix reflects the players' payoffs, and higher payoffs are better than lower payoffs. This case is an exception: a higher number of years in prison is bad, not good!) Let's assume that the prisoners have no way to communicate and that they have not sworn an oath not to harm each other or anything of that sort. So each acts in her own self-interest. What will they do?

The **prisoners' dilemma** is a game based on two premises: (1) Each player has an incentive to choose an action that benefits itself at the other player's expense; and (2) When both players act in this way, both are worse off than if they had acted cooperatively.



The critically acclaimed 1991 movie *Thelma and Louise* was innovative in depicting two female characters running from the law.

figure 65.2

The Prisoners' Dilemma

Each of two prisoners, held in separate cells, is offered a deal by the police—a light sentence if she confesses and implicates her accomplice but her accomplice does not do the same, a heavy sentence if she does not confess but her accomplice does, and so on. It is in the joint interest of both prisoners not to confess; it is in each one's individual interest to confess.

		Louise	
		Don't confess	Confess
Thelma	Don't confess	Louise gets 5-year sentence. Thelma gets 5-year sentence.	Louise gets 2-year sentence. Thelma gets 20-year sentence.
	Confess	Louise gets 20-year sentence. Thelma gets 2-year sentence.	Louise gets 15-year sentence. Thelma gets 15-year sentence.

An action is a **dominant strategy** when it is a player's best action regardless of the action taken by the other player.

A **Nash equilibrium**, also known as a **noncooperative equilibrium**, is the result when each player in a game chooses the action that maximizes his or her payoff, given the actions of other players.



Mathematician and Nobel Laureate John Forbes Nash proposed one of the key ideas in game theory.

The answer is clear: both will confess. Look at it first from Thelma's point of view: she is better off confessing, regardless of what Louise does. If Louise doesn't confess, Thelma's confession reduces her own sentence from 5 years to 2. If Louise *does* confess, Thelma's confession reduces her sentence from 20 to 15 years. Either way, it's clearly in Thelma's interest to confess. And because she faces the same incentives, it's clearly in Louise's interest to confess, too. To confess in this situation is a type of action that economists call a **dominant strategy**. An action is a **dominant strategy** when it is the player's best action regardless of the action taken by the other player. It's important to note that not all games have a dominant strategy—it depends on the structure of payoffs in the game. But in the case of Thelma and Louise, it is clearly in the interest of the police to structure the payoffs so that confessing is a dominant strategy for each person. As long as the two prisoners have no way to make an enforceable agreement that neither will confess (something they can't do if they can't communicate, and the police certainly won't allow them to do so because the police want to compel each one to confess), the dominant strategy exists as the best alternative.

So if each prisoner acts rationally in her own interest, both will confess. Yet if neither of them had confessed, both would have received a much lighter sentence! In a prisoners' dilemma, each player has a clear incentive to act in a way that hurts the other player—but when both make that choice, it leaves both of them worse off.

When Thelma and Louise both confess, they reach an **equilibrium** of the game. We have used the concept of equilibrium many times in this book; it is an outcome in which no individual or firm has any incentive to change his or her action. In game theory, this kind of equilibrium, in which each player takes the action that is best for her, given the actions taken by other players, is known as a **Nash equilibrium**, after the mathematician and Nobel Laureate John Nash. (Nash's life was chronicled in the best-selling biography *A Beautiful Mind*, which was made into a movie.) Because the players in a Nash equilibrium do not take into account the effect of their actions on others, this is also known as a **noncooperative equilibrium**.

In the prisoners' dilemma, the Nash equilibrium happens to be an equilibrium of two dominant strategies—a **dominant strategy equilibrium**—but Nash equilibria can exist

when there is no dominant strategy at all. For example, suppose that after serving time in jail, Thelma and Louise are disheartened by the mutual distrust that led them to confess, and each wants nothing more than to avoid seeing the other. On a Saturday night, they might each have to choose between going to the nightclub and going to the movie theater. Neither has a dominant strategy because the best strategy for each depends on what the other is doing. However, Thelma going to the nightclub and Louise going to the movie theater is a Nash equilibrium because each player takes the action that is best given the action of the other. Thelma going to the movie theater and Louise going to the nightclub is also a Nash equilibrium, because again, neither wants to change her behavior given what the other is doing.

Now look back at Figure 65.1: the two firms face a prisoners' dilemma just like Thelma and Louise did after the crimes. Each firm is better off producing the higher output, regardless of what the other firm does. Yet if both produce 40 million pounds, both are worse off than if they had followed their agreement and produced only 30 million pounds. In both cases, then, the pursuit of individual self-interest—the effort to maximize profits or to minimize jail time—has the perverse effect of hurting both players.

Prisoners' dilemmas appear in many situations. The upcoming FYI describes an example from the days of the Cold War. Clearly, the players in any prisoners' dilemma would be better off if they had some way of enforcing cooperative behavior: if Thelma and Louise had both sworn to a code of silence, or if the two firms had signed an enforceable agreement not to produce more than 30 million pounds of lysine.

But we know that in the United States an agreement setting the output levels of two oligopolists isn't just unenforceable, it's illegal. So it seems that a noncooperative equilibrium is the only possible outcome. Or is it?

Overcoming the Prisoners' Dilemma: Repeated Interaction and Tacit Collusion

Thelma and Louise are playing what is known as a *one-shot* game—they play the game with each other only once. They get to choose once and for all whether to confess or deny, and that's it. However, most of the games that oligopolists play aren't one-shot games; instead, the players expect to play the game repeatedly with the same rivals. An oligopolist usually expects to be in business for many years, and knows that a decision today about whether to cheat is likely to affect the decisions of other firms in the future. So a smart oligopolist doesn't just decide what to do based on the effect on profit in the short run. Instead, it engages in **strategic behavior**, taking into account the effects of its action on the future actions of other players. And under some conditions oligopolists that behave strategically can manage to behave as if they had a formal agreement to collude.

Suppose that our two firms expect to be in the lysine business for many years and therefore expect to play the game of cheat versus collude shown in Figure 65.1 many times. Would they really betray each other time and again?

Probably not. Suppose that each firm considers two strategies. In one strategy it always cheats, producing 40 million pounds of lysine each year, regardless of what the other firm does. In the other strategy, it starts with good behavior, producing only 30 million pounds in the first year, and watches to see what its rival does. If the other firm also keeps its production down, each firm will stay cooperative, producing 30 million pounds again for the next year. But if one firm produces 40 million pounds, the other firm will take the gloves off and also produce 40 million pounds next year. This latter strategy—start by behaving cooperatively, but thereafter do whatever the other player did in the previous period—is generally known as **tit for tat**.

Playing “tit for tat” is a form of strategic behavior because it is intended to influence the future actions of other players. The “tit for tat” strategy offers a reward to

A firm engages in **strategic behavior** when it attempts to influence the future behavior of other firms.

A strategy of **tit for tat** involves playing cooperatively at first, then doing whatever the other player did in the previous period.

the other player for cooperative behavior—if you behave cooperatively, so will I. It also provides a punishment for cheating—if you cheat, don’t expect me to be nice in the future.

The payoff to each firm of each of these strategies would depend on which strategy the other chooses. Consider the four possibilities, shown in Figure 65.3:

1. If one firm plays “tit for tat” and so does the other, both firms will make a profit of \$180 million each year.
2. If one firm plays “always cheat” but the other plays “tit for tat,” one makes a profit of \$200 million the first year but only \$160 million per year thereafter.
3. If one firm plays “tit for tat” but the other plays “always cheat,” one makes a profit of only \$150 million in the first year but \$160 million per year thereafter.
4. If one firm plays “always cheat” and the other does the same, both firms will make a profit of \$160 million each year.

figure 65.3

How Repeated Interaction Can Support Collusion

A strategy of “tit for tat” involves playing cooperatively at first, then following the other player’s move. This rewards good behavior and punishes bad behavior. If the other player cheats, playing “tit for tat” will lead to only a short-term loss in comparison to playing “always cheat.” But if the other player plays “tit for tat,” also playing “tit for tat” leads to a long-term gain. So a firm that expects other firms to play “tit for tat” may well choose to do the same, leading to successful tacit collusion.

		Firm 2	
		Tit for tat	Always cheat
Firm 1	Tit for tat	<p>Firm 2 makes \$180 million profit each year.</p> <p>Firm 1 makes \$180 million profit each year.</p>	<p>Firm 2 makes \$200 million profit 1st year, \$160 million profit each later year.</p> <p>Firm 1 makes \$150 million profit 1st year, \$160 million profit each later year.</p>
	Always cheat	<p>Firm 2 makes \$150 million profit 1st year, \$160 million profit each later year.</p> <p>Firm 1 makes \$200 million profit 1st year, \$160 million profit each later year.</p>	<p>Firm 2 makes \$160 million profit each year.</p> <p>Firm 1 makes \$160 million profit each year.</p>

Which strategy is better? In the first year, one firm does better playing “always cheat,” whatever its rival’s strategy: it assures itself that it will get either \$200 million or \$160 million. (Which of the two payoffs it actually receives depends on whether the other plays “tit for tat” or “always cheat.”) This is better than what it would get in the first year if it played “tit for tat”: either \$180 million or \$150 million. But by the second year, a strategy of “always cheat” gains the firm only \$160 million per year for the second and all subsequent years, regardless of the other firm’s actions. Over time, the total amount gained by playing “always cheat” is less than the amount gained by playing “tit for tat”: for the second and all subsequent years, it would never get any less than \$160 million and would get as much as \$180 million if the other firm played “tit for tat” as well. Which strategy, “always cheat” or “tit for tat,” is more

profitable depends on two things: how many years each firm expects to play the game and what strategy its rival follows.

If the firm expects the lysine business to end in the near future, it is in effect playing a one-shot game. So it might as well cheat and grab what it can. Even if the firm expects to remain in the lysine business for many years (therefore to find itself repeatedly playing this game) and, for some reason, expects the other firm will always cheat, it should also always cheat. That is, the firm should follow the old rule, “Do unto others before they do unto you.”

But if the firm expects to be in the business for a long time and thinks the other firm is likely to play “tit for tat,” it will make more profits over the long run by playing “tit for tat,” too. It could have made some extra short-term profit by cheating at the beginning, but this would provoke the other firm into cheating, too, and would, in the end, mean less profit.

The lesson of this story is that when oligopolists expect to compete with each other over an extended period of time, each individual firm will often conclude that it is in its own best interest to be helpful to the other firms in the industry. So it will restrict its output in a way that raises the profit of the other firms, expecting them to return the favor. Despite the fact that firms have no way of making an enforceable agreement to limit output and raise prices (and are in legal jeopardy if they even discuss prices), they manage to act “as if” they had such an agreement. When this type of unspoken agreement comes about, we say that the firms are engaging in **tacit collusion**.

When firms limit production and raise prices in a way that raises each other's profits, even though they have not made any formal agreement, they are engaged in **tacit collusion**.

fyi

Prisoners of the Arms Race

Between World War II and the late 1980s, the United States and the Soviet Union were locked in a seemingly endless struggle that never broke out into open war. During this Cold War, both countries spent huge sums on arms, sums that were a significant drain on the U.S. economy and eventually proved a crippling burden for the Soviet Union, whose underlying economic base was much weaker. Yet neither country was ever able to achieve a decisive military advantage.

As many people pointed out, both nations would have been better off if they had both spent less on arms. Yet the arms race continued for 40 years.

Why? As political scientists were quick to notice, one way to explain the arms race was to suppose that the two countries were locked in a classic prisoners' dilemma. Each government would have liked to achieve decisive mil-

itary superiority, and each feared military inferiority. But both would have preferred a stalemate with low military spending to one with high spending. However, each government rationally chose to engage in high spending. If its rival did not spend heavily, this would lead to military superiority; not spending heavily would lead to inferiority if the other government continued its arms buildup. So the countries were trapped.

The answer to this trap could have been an agreement not to spend as much; indeed, the two sides tried repeatedly to negotiate limits on some kinds of weapons. But these agreements weren't very effective. In the end the issue was resolved as heavy military spending hastened the collapse of the Soviet Union in 1991.

Unfortunately, the logic of an arms race has not disappeared. A nuclear arms race has devel-



TASS/Soufoto

oped between Pakistan and India, neighboring countries with a history of mutual antagonism. In 1998 the two countries confirmed the unrelenting logic of the prisoners' dilemma: both publicly tested their nuclear weapons in a tit-for-tat sequence, each seeking to prove to the other that it could inflict just as much damage as its rival.

Check Your Understanding

- Suppose world leaders Nikita and Margaret are engaged in an arms race and face the decision of whether to build a missile. Answer the following questions using the information in the payoff matrix below, which shows how each set of actions will affect the utility of the players (the numbers represent utils gained or lost).

		Nikita	
		Build missile	Don't build missile
Margaret	Build missile	-10 / -10	-20 / 8
	Don't build missile	8 / -20	0 / 0

- Identify any Nash equilibria that exist in this game, and explain why they do or do not exist.
 - Which set of actions maximizes the total payoff for Nikita and Margaret?
 - Why is it unlikely that they will choose the payoff-maximizing set of actions without some communication?
- For each of the following characteristics of an industry, explain whether the characteristic makes it more likely that oligopolists will play noncooperatively rather than engaging in tacit collusion.
 - Each oligopolist expects several new firms to enter the market in the future.
 - It is very difficult for a firm to detect whether another firm has raised output.
 - The firms have coexisted while maintaining high prices for a long time.

Tackle the Test: Multiple-Choice Questions

- Each player has an incentive to choose an action that, when both players choose it, makes them both worse off. This situation describes
 - a dominant strategy.
 - the prisoners' dilemma.
 - interdependence.
 - Nash equilibrium.
 - tit for tat.
- Which of the following types of oligopoly behavior is/are illegal?
 - tacit collusion
 - cartel formation
 - tit for tat
 - I only
 - II only
 - III only
 - I and II only
 - I, II, and III
- A situation in which each player in a game chooses the action that maximizes his or her payoff, given the actions of the other players, ignoring the effects of his or her action on the payoffs received by others, is known as a:
 - dominant strategy.
 - cooperative equilibrium.
 - Nash equilibrium.
 - strategic situation.
 - prisoners' dilemma.

- In the context of the Thelma and Louise story in the module, suppose that Louise discovers Thelma's action (confess or don't confess) before choosing her own action.

		Louise	
		Don't confess	Confess
Thelma	Don't confess	Louise gets 5-year sentence. Thelma gets 5-year sentence.	Louise gets 2-year sentence. Thelma gets 20-year sentence.
	Confess	Louise gets 20-year sentence. Thelma gets 2-year sentence.	Louise gets 15-year sentence. Thelma gets 15-year sentence.

Based on the payoff matrix provided, Louise will

- confess whether or not Thelma confessed.
- not confess only if Thelma confessed.
- not confess only if Thelma didn't confess.
- not confess regardless of whether or not Thelma confessed.
- confess only if Thelma did not confess.

5. Which of the following is true on the basis of the payoff matrix provided in Question 4?
- Louise has no dominant strategy, but Thelma does.
 - Thelma has no dominant strategy, but Louise does.
 - Both Thelma and Louise have a dominant strategy.
 - Neither Thelma nor Louise has a dominant strategy.
 - Louise has a dominant strategy only if Thelma confesses.

Tackle the Test: Free-Response Questions

1. Refer to the payoff matrix provided. You and your competitor must decide whether or not to market a new product.

		You	
		Market	Don't market
Your competitor	Market	\$100 / \$100	\$0 / \$400
	Don't market	\$400 / \$0	\$0 / \$0

- If you market the new product and your competitor does not, how much profit will you earn?
- If you market the new product, what should your competitor do?
- Do you have a dominant strategy? Explain.
- Does this situation have a Nash equilibrium? Explain.

Answer (6 points)

1 point: \$400

1 point: Market the new product.

1 point: Yes

1 point: Profits are greater (either \$100 or \$400 versus \$0) if I market the new product, regardless of what my competitor does.

1 point: Yes

1 point: Both players marketing the product is a Nash equilibrium because neither side wants to change to not marketing, given what the other side is doing. (In fact, in this case both sides want to market the product regardless of what the other side is doing, so it is a dominant strategy equilibrium as well as a Nash equilibrium.)

2. Draw a clearly labeled payoff matrix illustrating the following situation. There are two firms, "Firm A" and "Firm B." Each firm must decide whether to charge a high price or a low price. If one firm charges a high price and the other a low price, the firm charging the high price will earn low profits while the firm charging the low price will earn high profits. If both firms charge a high price, both earn high profits and if both firms charge low prices, both earn low profits.



What you will learn in this Module:

- The legal constraints of antitrust policy
- The factors that limit tacit collusion
- The cause and effect of price wars, product differentiation, price leadership, and nonprice competition
- The importance of oligopoly in the real world

Module 66

Oligopoly in Practice

Previously, we described the cartel known as “Vitamins, Inc.,” which effectively sustained collusion for many years. The conspiratorial dealings of the vitamin makers were not, fortunately, the norm. But how do oligopolies usually work in practice? The answer depends both on the legal framework that limits what firms can do and on the underlying ability of firms in a given industry to cooperate without formal agreements. In this module we will explore a variety of oligopoly behaviors and how antitrust laws limit oligopolists’ attempts to maximize their profits.

The Legal Framework

To understand oligopoly pricing in practice, we must be familiar with the legal constraints under which oligopolistic firms operate. In the United States, oligopoly first became an issue during the second half of the nineteenth century, when the growth of railroads—themselves an oligopolistic industry—created a national market for many goods. Large firms producing oil, steel, and many other products soon emerged. The industrialists quickly realized that profits would be higher if they could limit price competition. So many industries formed cartels—that is, they signed formal agreements to limit production and raise prices. Until 1890, when the first federal legislation against such cartels was passed, this was perfectly legal.

However, although these cartels were legal, their agreements weren’t legally *enforceable*—members of a cartel couldn’t ask the courts to force a firm that was violating its agreement to reduce its production. And firms often did violate their agreements, for the reason already suggested by our duopoly example in Module 65: there is always a temptation for each firm in a cartel to produce more than it is supposed to.

In 1881 clever lawyers at John D. Rockefeller’s Standard Oil Company came up with a solution—the so-called *trust*. In a trust, shareholders of all the major companies in an industry placed their shares in the hands of a board of trustees who controlled the companies. This, in effect, merged the companies into a single firm that could then engage in monopoly pricing. In this way, the Standard Oil Trust established what was essentially a monopoly of the oil industry, and it was soon followed by trusts in sugar, whiskey, lead, cottonseed oil, and linseed oil.

Eventually, there was a public backlash, driven partly by concern about the economic effects of the trust movement and partly by fear that the owners of the trusts

were simply becoming too powerful. The result was the Sherman Antitrust Act of 1890, which was intended both to prevent the creation of more monopolies and to break up existing ones. At first this law went largely unenforced. But over the decades that followed, the federal government became increasingly committed to making it difficult for oligopolistic industries either to become monopolies or to behave like them. Such efforts are known to this day as **antitrust policy**.

One of the most striking early actions of antitrust policy was the breakup of Standard Oil in 1911. Its components formed the nuclei of many of today's large oil companies—Standard Oil of New Jersey became Exxon, Standard Oil of New York became Mobil, and so on. In the 1980s a long-running case led to the breakup of Bell Telephone, which once had a monopoly on both local and long-distance phone service in the United States. As we mentioned earlier, the Justice Department reviews proposed mergers between companies in the same industry and will bar mergers that it believes will reduce competition.

Among advanced countries, the United States is unique in its long tradition of antitrust policy. Until recently, other advanced countries did not have policies against price-fixing, and some even supported the creation of cartels, believing that it would help their own firms compete against foreign rivals. But the situation has changed radically over the past 20 years, as the European Union (EU)—an international body with the duty of enforcing antitrust policy for its member countries—has converged toward U.S. practices. Today, EU and U.S. regulators often target the same firms because price-fixing has “gone global” as international trade has expanded. During the early 1990s, the United States instituted an amnesty program in which a price-fixer receives a much-reduced penalty if it provides information on its co-conspirators. (Remember that the Great Vitamin Conspiracy was busted when a French company, Rhone-Poulenc, revealed the cartel in order to get favorable treatment from U.S. regulators.) In addition, Congress substantially increased maximum fines levied upon conviction. These two new policies clearly made informing on cartel partners a dominant strategy, and it has paid off: in recent years, executives from Belgium, Britain, Canada, France, Germany, Italy, Mexico, the Netherlands, South Korea, and Switzerland, as well as from the United States, have been convicted in U.S. courts of cartel crimes. As one lawyer commented, “You get a race to the courthouse” as each conspirator seeks to be the first to come clean.

Life has gotten much tougher over the past few years if you want to operate a cartel. So what's an oligopolist to do?

Tacit Collusion and Price Wars

If real life were as simple as our lysine story, it probably wouldn't be necessary for the company presidents to meet or do anything that could land them in jail. Both firms would realize that it was in their mutual interest to restrict output to 30 million pounds each and that any short-term gains to either firm from producing more would be much less than the later losses as the other firm retaliated. So even without any explicit agreement, the firms would probably have achieved the tacit collusion needed to maximize their combined profits.

Real industries are nowhere near that simple; nonetheless, in most oligopolistic industries, most of the time, the sellers do appear to succeed in keeping prices above their noncooperative level. Tacit collusion, in other words, is the normal state of oligopoly.

Although tacit collusion is common, it rarely allows an industry to push prices all the way up to their monopoly level; collusion is usually far from perfect. A variety of factors make it hard for an industry to coordinate on high prices.

Large Numbers

Suppose that there were three instead of two firms in the lysine industry and that each was currently producing only 20 million pounds. In that case any one firm that decided to produce an extra 10 million pounds would gain more in short-term profits—and lose less once another firm responded in kind—than in our original example because it has fewer units on which to feel the price effect. The general point is that the

Antitrust policy involves efforts by the government to prevent oligopolistic industries from becoming or behaving like monopolies.



In 1911, Standard Oil was broken up into 34 separate companies, 3 of which later became Chevron, Conoco, and Exxon.

more firms there are in an oligopoly, the less is the incentive of any one firm to behave cooperatively, taking into account the impact of its actions on the profits of the other firms. Large numbers of firms in an industry also make the monitoring of price and output levels more difficult, and typically indicate low barriers to entry.

Complex Products and Pricing Schemes

In our simplified lysine example the two firms produce only one product. In reality, however, oligopolists often sell thousands or even tens of thousands of different products. A Walmart Supercenter sells over 100,000 items! Under these circumstances, as when there are a large number of firms, keeping track of what other firms are producing and what prices they are charging is difficult. This makes it hard to determine whether a firm is cheating on the tacit agreement.

Differences in Interests

In the lysine example, a tacit agreement for the firms to split the market equally is a natural outcome, probably acceptable to both firms. In other situations, however, firms often differ both in their perceptions about what is fair and in their real interests.

For example, suppose that one firm in a duopoly was a long-established producer and the other a more recent entrant into the industry. The long-established firm might feel that it deserved to continue producing more than the newer firm, but the newer firm might feel that it was entitled to 50% of the business.

Alternatively, suppose that the newer firm's marginal costs were lower than the long-established firm's. Even if they could agree on market shares, they would then disagree about the profit-maximizing level of output.

Bargaining Power of Buyers

Often oligopolists sell not to individual consumers but to large buyers—other industrial enterprises, nationwide chains of stores, and so on. These large buyers are in a position to bargain for lower prices from the oligopolists: they can ask for a discount from an oligopolist, and warn that they will go to a competitor if they don't get it. An important reason large retailers like Target are able to offer lower prices to customers than small retailers is precisely their ability to use their size to extract lower prices from their suppliers.

These difficulties in enforcing tacit collusion have sometimes led companies to defy the law and create illegal cartels. We've already examined the cases of the lysine industry and the bulk vitamin industry. An older, classic example was the U.S. electrical equipment conspiracy of the 1950s, which led to the indictment of and jail sentences for some executives. The industry was one in which tacit collusion was especially difficult because of all the reasons just mentioned. There were many firms—40 companies were indicted. They produced a very complex array of products, often more or less custom-built for particular clients. They differed greatly in size, from giants like General Electric to family firms with only a few dozen employees. And the customers in many cases were large buyers like electrical utilities, which would normally try to force suppliers to compete for their business. Tacit collusion just didn't seem practical—so executives met secretly and illegally to decide who would bid what price for which contract.

The FYI describes yet another price-fixing conspiracy: the one between the very posh auction houses Sotheby's and Christie's.

Because tacit collusion is often hard to achieve, most oligopolies charge prices that are well below what the same industry would charge if it were controlled by a monopolist—or what they would charge if they were able to collude explicitly. In addition, sometimes tacit collusion breaks down and aggressive price competition amounts to a **price war**. A price war sometimes precipitates a collapse of prices to their noncooperative level, or even lower, as sellers try to put each other out of business or at least punish what they regard as cheating.

A **price war** occurs when tacit collusion breaks down and aggressive price competition causes prices to collapse.

The Art of Conspiracy

If you want to sell a valuable work of art, there are really only two places to go: Christie's, the London-based auction house, or Sotheby's, its New York counterpart and competitor. Both are classy operations—literally: many of the employees of Christie's come from Britain's aristocracy, and many of Sotheby's come from blue-blooded American families that might as well have titles. They're not the sort of people you would expect to be seeking plea bargains from prosecutors.

But on October 6, 2000, Diana D. Brooks, the very upper-class former president of Sotheby's, pleaded guilty to a conspiracy. With her counterpart at Christie's, she had engaged in the illegal practice of price-fixing—agreeing on the fees

they would charge people who sold artwork through either house. As part of her guilty plea, and in an effort to avoid going to jail, she agreed to help in the investigation of her boss, the former chairman of Sotheby's.

Why would such upper-crust types engage in illegal practices? For the same reasons that respectable electrical equipment industry executives did. By definition, no two works of art are alike; it wasn't easy for the two houses to collude tacitly because it was too hard to determine what commissions they were charging on any given transaction. To increase profits, then, the companies felt that they needed to reach a detailed agreement. They did, and they got caught.



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Product Differentiation and Price Leadership

In many oligopolies, however, firms produce products that consumers regard as similar but not identical. A \$10 difference in the price won't make many customers switch from a Ford to a Chrysler, or vice versa. Sometimes the differences between products are real, like differences between Froot Loops and Wheaties; sometimes, they exist mainly in the minds of consumers, like differences between brands of vodka (which is *supposed* to be tasteless). Either way, the effect is to reduce the intensity of competition among the firms: consumers will not all rush to buy whichever product is cheapest.

As you might imagine, oligopolists welcome the extra market power that comes when consumers think that their product is different from that of competitors. So in many oligopolistic industries, firms make considerable efforts to create the perception that their product is different—that is, they engage in **product differentiation**.

A firm that tries to differentiate its product may do so by altering what it actually produces, adding “extras,” or choosing a different design. It may also use advertising and marketing campaigns to create a differentiation in the minds of consumers, even though its product is more or less identical to the products of rivals.

A classic case of how products may be perceived as different even when they are really pretty much the same is over-the-counter medication. For many years there were only three widely sold pain relievers—aspirin, ibuprofen, and acetaminophen. Yet each of these generic pain relievers were marketed under a number of brand names. And each brand used a marketing campaign implying some special superiority.

Whatever the nature of product differentiation, oligopolists producing differentiated products often reach a tacit understanding not to compete on price. For example, during the years when the great majority of cars sold in the United States were produced by the Big Three auto companies (General Motors, Ford, and Chrysler), there was an unwritten rule that none of the three companies would try to gain market share by making its cars noticeably cheaper than those of the other two.

But then who would decide on the overall price of cars? The answer was normally General Motors: as the biggest of the three, it would announce its prices for the year

Product differentiation is an attempt by a firm to convince buyers that its product is different from the products of other firms in the industry.

In **price leadership**, one firm sets its price first, and other firms then follow.

Firms that have a tacit understanding not to compete on price often engage in intense **nonprice competition**, using advertising and other means to try to increase their sales.

first; and the other companies would adopt similar prices. This pattern of behavior, in which one company tacitly sets prices for the industry as a whole, is known as **price leadership**.

Interestingly, firms that have a tacit agreement not to compete on price often engage in vigorous **nonprice competition**—adding new features to their products, spending large sums on ads that proclaim the inferiority of their rivals’ offerings, and so on.

Perhaps the best way to understand the mix of cooperation and competition in such industries is with a political analogy. During the long Cold War between the United States and the Soviet Union, the two countries engaged in intense rivalry for global influence. They not only provided financial and military aid to their allies; they sometimes supported forces trying to overthrow governments allied with their rival (as the Soviet Union did in Vietnam in the 1960s and early 1970s, and as the United States did in Afghanistan from 1979 until the collapse of the Soviet Union in 1991). They even sent their own soldiers to support allied governments against rebels (as the United States did in Vietnam and the Soviet Union did in Afghanistan). But they did not get into direct military confrontations with each other; open warfare between the two superpowers was regarded by both as too dangerous—and tacitly avoided.

Price wars aren’t as serious as shooting wars, but the principle is the same.

How Important Is Oligopoly?

We have seen that, across industries, oligopoly is far more common than either perfect competition or monopoly. When we try to analyze oligopoly, the economist’s usual way of thinking—asking how self-interested individuals would behave, then analyzing their interaction—does not work as well as we might hope because we do not know whether rival firms will engage in noncooperative behavior or manage to engage in some kind of collusion. Given the prevalence of oligopoly, then, is the analysis we developed in earlier modules, which was based on perfect competition, still useful?

The conclusion of the great majority of economists is yes. For one thing, important parts of the economy are fairly well described by perfect competition. And even though many industries are oligopolistic, in many cases the limits to collusion keep prices relatively close to marginal costs—in other words, the industry behaves “almost” as if it were perfectly competitive.

It is also true that predictions from supply and demand analysis are often valid for oligopolies. For example, we saw that price controls will produce shortages. Strictly speaking, this conclusion is certain only for perfectly competitive industries. But in the 1970s, when the U.S. government imposed price controls on the definitely oligopolistic oil industry, the result was indeed to produce shortages and lines at the gas pumps.

So how important is it to take account of oligopoly? Most economists adopt a pragmatic approach. As we have seen here, the analysis of oligopoly is far more difficult and messy than that of perfect competition; so in situations where they do not expect the complications associated with oligopoly to be crucial, economists prefer to adopt the working assumption of perfectly competitive markets. They always keep in mind the possibility that oligopoly might be important; they recognize that there are important issues, from antitrust policies to price wars, that make trying to understand oligopolistic behavior crucial.



Cars line up for gasoline in 1973 after the U.S. government imposed price controls.

Module 66 AP Review

Solutions appear at the back of the book.

Check Your Understanding

- For each of the following industry practices, explain whether the practice supports the conclusion that there is tacit collusion in this industry.
 - For many years the price in the industry has changed infrequently, and all the firms in the industry charge the same price. The largest firm publishes a catalog containing a “suggested” retail price. Changes in price coincide with changes in the catalog.
 - There has been considerable variation in the market shares of the firms in the industry over time.
 - Firms in the industry build into their products unnecessary features that make it hard for consumers to switch from one company’s products to another’s.
 - Firms meet yearly to discuss their annual sales forecasts.
 - Firms tend to adjust their prices upward at the same times.

Tackle the Test: Multiple-Choice Questions

- Having which of the following makes it easier for oligopolies to coordinate on raising prices?
 - a large number of firms
 - differentiated products
 - buyers with bargaining power
 - identical perceptions of fairness
 - complex pricing schemes
- Which of the following led to the passage of the first antitrust laws?
 - growth of the railroad industry
 - the emergence of the Standard Oil Company
 - increased competition in agricultural industries
 - I only
 - II only
 - III only
 - I and II only
 - I, II, and III
- When was the first federal legislation against cartels passed?
 - 1776
 - 1800
 - 1890
 - 1900
 - 1980
- Which of the following industries has been prosecuted for creating an illegal cartel?
 - the lysine industry
 - the art auction house industry
 - the U.S. electrical equipment industry
 - the bulk vitamin industry
 - all of the above
- Oligopolists engage in tacit collusion in order to
 - raise prices.
 - increase output.
 - share profits.
 - increase market share.
 - all of the above.

Tackle the Test: Free-Response Questions

- Like other firms, universities face temptations to collude in order to limit the effects of competition and avoid price wars. (In fact, the U.S. Department of Justice formally accused a group of universities of price-fixing in 1991.) Answer the following questions about behavior in the market for higher education.
 - Describe one factor of the market for higher education that invites tacit collusion.
 - Describe one factor of the market for higher education that works against tacit collusion.
 - Explain one way in which universities could engage in illegal collusion.
 - What are three ways in which universities engage in product differentiation?
 - Explain how price leadership might work in the university setting.
 - What forms of nonprice competition do you see universities engaged in?

Answer (6 points)

1 point: The fact that universities offer a small number of products—enrollment into a small number of programs—invites tacit collusion. They may also have similar perceptions of fairness.

1 point: Factors that work against tacit collusion in the market for higher education include the large number of universities and the bargaining power of the better applicants.

1 point: Universities could engage in illegal collusion by holding meetings to establish uniform tuition rates, divvying up applicants so that each is accepted by a limited number of schools (to avoid competition), or sharing information on scholarship offerings so that applicants will receive similar offers from the competing schools.

1 point: Universities seek product differentiation in regard to athletic programs, facilities, academic standards, location, overseas programs, faculty, graduation requirements, and class size, among other areas.

1 point: Price leadership could be achieved in the university setting if one school, perhaps a large or prestigious university, announced its tuition early and then other schools based their tuition on that announcement.

1 point: Universities can engage in nonprice competition by offering better food, bigger dorm rooms, more accomplished faculty members, plush student centers, and similar amenities.

2. List four factors that make it difficult for firms to form a cartel. Explain each.



Module 67

Introduction to Monopolistic Competition

What you will learn in this Module:

- How prices and profits are determined in monopolistic competition, both in the short run and in the long run
- How monopolistic competition can lead to inefficiency and excess capacity

Understanding Monopolistic Competition

Suppose an industry is monopolistically competitive: it consists of many producers, all competing for the same consumers but offering differentiated products. How does such an industry behave?

As the term *monopolistic competition* suggests, this market structure combines some features typical of monopoly with others typical of perfect competition. Because each firm is offering a distinct product, it is in a way like a monopolist: it faces a downward-sloping demand curve and has some market power—the ability within limits to determine the price of its product. However, unlike a pure monopolist, a monopolistically competitive firm does face competition: the amount of its product it can sell depends on the prices and products offered by other firms in the industry.

The same, of course, is true of an oligopoly. In a monopolistically competitive industry, however, there are *many* producers, as opposed to the small number that defines an oligopoly. This means that the “puzzle” of oligopoly—whether firms will collude or behave noncooperatively—does not arise in the case of monopolistically competitive industries. True, if all the gas stations or all the restaurants in a town could agree—explicitly or tacitly—to raise prices, it would be in their mutual interest to do so. But such collusion is virtually impossible when the number of firms is large and, by implication, there are no barriers to entry. So in situations of monopolistic competition, we can safely assume that firms behave noncooperatively and ignore the potential for collusion.

Monopolistic Competition in the Short Run

We introduced the distinction between short-run and long-run equilibrium when we studied perfect competition. The short-run equilibrium of an industry takes the number of firms as given. The long-run equilibrium, by contrast, is reached only after

enough time has elapsed for firms to enter or exit the industry. To analyze monopolistically competitive competition, we focus first on the short run and then on how an industry moves from the short run to the long run.

Panels (a) and (b) of Figure 67.1 show two possible situations that a typical firm in a monopolistically competitive industry might face in the short run. In each case, the firm looks like any monopolist: it faces a downward-sloping demand curve, which implies a downward-sloping marginal revenue curve.

We assume that every firm has an upward-sloping marginal cost curve but that it also faces some fixed costs, so that its average total cost curve is U-shaped. This assumption doesn't matter in the short run; but, as we'll see shortly, it is crucial to understanding the long-run equilibrium.

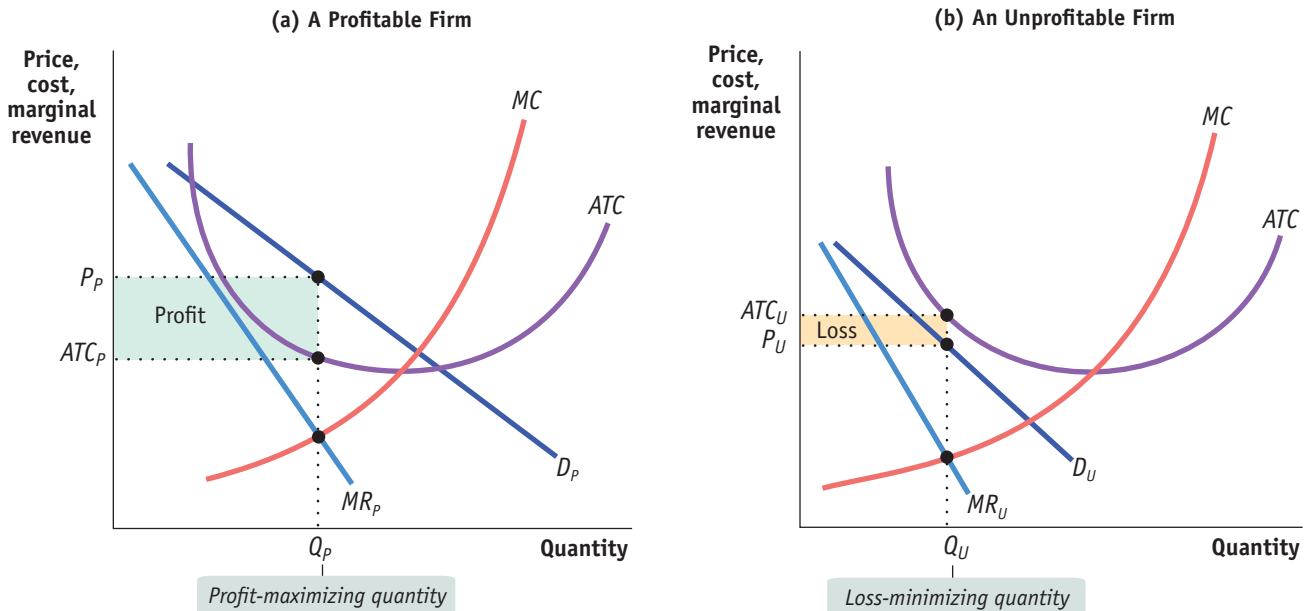
In each case the firm, in order to maximize profit, sets marginal revenue equal to marginal cost. So how do these two figures differ? In panel (a) the firm is profitable; in panel (b) it is unprofitable. (Recall that we are referring always to economic profit and not accounting profit—that is, a profit given that all factors of production are earning their opportunity costs.)

In panel (a) the firm faces the demand curve D_P and the marginal revenue curve MR_P . It produces the profit-maximizing output Q_P , the quantity at which marginal revenue is equal to marginal cost, and sells it at the price P_P . This price is above the average total cost at this output, ATC_P . The firm's profit is indicated by the area of the shaded rectangle.

In panel (b) the firm faces the demand curve D_U and the marginal revenue curve MR_U . It chooses the quantity Q_U at which marginal revenue is equal to marginal cost.

figure 67.1

The Monopolistically Competitive Firm in the Short Run



The firm in panel (a) can be profitable for some output quantities: the quantities for which its average total cost curve, ATC , lies below its demand curve, D_P . The profit-maximizing output quantity is Q_P , the output at which marginal revenue, MR_P , is equal to marginal cost, MC . The firm charges price P_P and earns a profit, represented by the area of the green shaded rectangle. The firm in panel (b),

however, can never be profitable because its average total cost curve lies above its demand curve, D_U , for every output quantity. The best that it can do if it produces at all is to produce quantity Q_U and charge price P_U . This generates a loss, indicated by the area of the yellow shaded rectangle. Any other output quantity results in a greater loss.

However, in this case the price P_U is *below* the average total cost ATC_U ; so at this quantity the firm loses money. Its loss is equal to the area of the shaded rectangle. Since Q_U is the profit-maximizing quantity—which means, in this case, the loss-minimizing quantity—there is no way for a firm in this situation to make a profit. We can confirm this by noting that at any quantity of output, the average total cost curve in panel (b) lies above the demand curve D_U . Because $ATC > P$ at all quantities of output, this firm always suffers a loss.

As this comparison suggests, the key to whether a firm with market power is profitable or unprofitable in the short run lies in the relationship between its demand curve and its average total cost curve. In panel (a) the demand curve D_P crosses the average total cost curve, meaning that some of the demand curve lies above the average total cost curve. So there are some price–quantity combinations available at which price is higher than average total cost, indicating that the firm can choose a quantity at which it makes positive profit.

In panel (b), by contrast, the demand curve D_U does not cross the average total cost curve—it always lies below it. So the price corresponding to each quantity demanded is always less than the average total cost of producing that quantity. There is no quantity at which the firm can avoid losing money.

These figures, showing firms facing downward-sloping demand curves and their associated marginal revenue curves, look just like ordinary monopoly graphs. The “competition” aspect of monopolistic competition comes into play, however, when we move from the short run to the long run.

Monopolistic Competition in the Long Run

Obviously, an industry in which existing firms are losing money, like the one in panel (b) of Figure 67.1, is not in long-run equilibrium. When existing firms are losing money, some firms will *exit* the industry. The industry will not be in long-run equilibrium until the persistent losses have been eliminated by the exit of some firms.

It may be less obvious that an industry in which existing firms are earning profits, like the one in panel (a) of Figure 67.1, is also not in long-run equilibrium. Given there is *free entry* into the industry, persistent profits earned by the existing firms will lead to the entry of additional producers. The industry will not be in long-run equilibrium until the persistent profits have been eliminated by the entry of new producers.

How will entry or exit by other firms affect the profit of a typical existing firm? Because the differentiated products offered by firms in a monopolistically competitive industry are available to the same set of customers, entry or exit by other firms will affect the demand curve facing every existing producer. If new gas stations open along a highway, each of the existing gas stations will no longer be able to sell as much gas as before at any given price. So, as illustrated in panel (a) of Figure 67.2 on the next page, entry of additional producers into a monopolistically competitive industry will lead to a *leftward* shift of the demand curve and the marginal revenue curve facing a typical existing producer.

Conversely, suppose that some of the gas stations along the highway close. Then each of the remaining stations will be able to sell more gasoline at any given price. So as illustrated in panel (b), exit of firms from an industry leads to a *rightward* shift of the demand curve and marginal revenue curve facing a typical remaining producer.

The industry will be in long-run equilibrium when there is neither entry nor exit. This will occur only when every firm earns zero profit. So in the long run, a monopolistically competitive industry will end up in **zero-profit equilibrium**, in which firms just manage to cover their costs at their profit-maximizing output quantities.

We have seen that a firm facing a downward-sloping demand curve will earn positive profit if any part of that demand curve lies above its average total cost curve; it

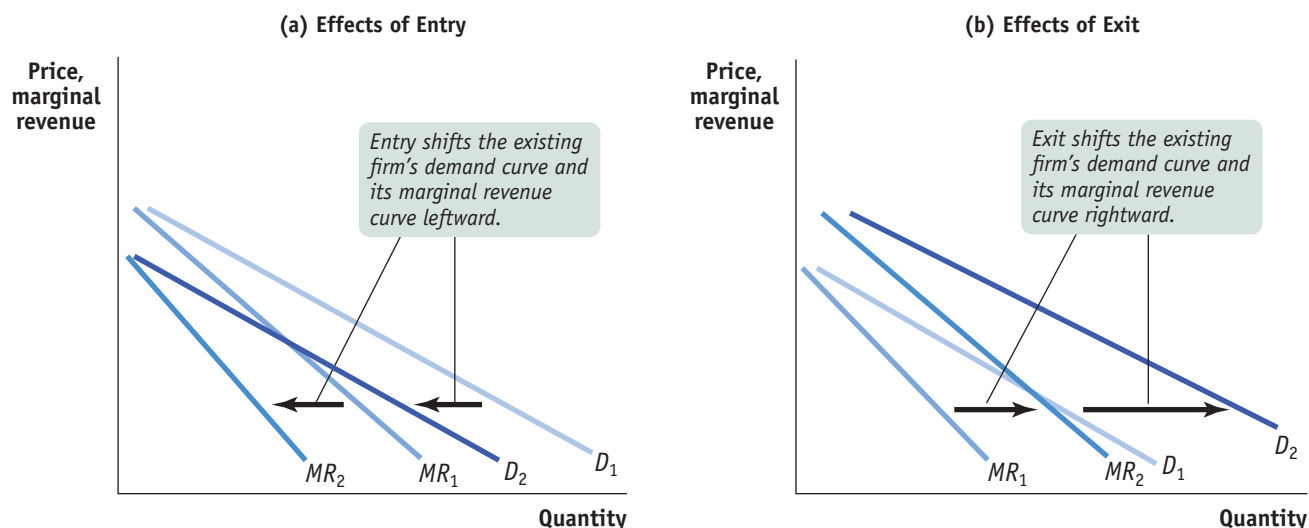


In the long-run, profit lures new firms to enter an industry.

In the long run, a monopolistically competitive industry ends up in **zero-profit equilibrium**: each firm makes zero profit at its profit-maximizing quantity.

figure 67.2

Entry and Exit Shift Existing Firms' Demand Curves and Marginal Revenue Curves



Entry will occur in the long run when existing firms are profitable. In panel (a), entry causes each existing firm's demand curve and marginal revenue curve to shift to the left. The firm receives a lower price for every unit it sells, and its profit falls. Entry will cease when firms make zero profit. Exit will occur in the long run when existing

firms are unprofitable. In panel (b), exit from the industry shifts each remaining firm's demand curve and marginal revenue curve to the right. The firm receives a higher price for every unit it sells, and profit rises. Exit will cease when the remaining firms make zero profit.

will incur a loss if its entire demand curve lies below its average total cost curve. So in zero-profit equilibrium, the firm must be in a borderline position between these two cases; its demand curve must just touch its average total cost curve. That is, the demand curve must be just *tangent* to the average total cost curve at the firm's profit-maximizing output quantity—the output quantity at which marginal revenue equals marginal cost.

If this is not the case, the firm operating at its profit-maximizing quantity will find itself making either a profit or loss, as illustrated in the panels of Figure 67.1. But we also know that free entry and exit means that this cannot be a long-run equilibrium. Why? In the case of a profit, new firms will enter the industry, shifting the demand curve of every existing firm leftward until all profit is eliminated. In the case of a loss, some existing firms exit and so shift the demand curve of every remaining firm to the right until all losses are eliminated. All entry and exit ceases only when every existing firm makes zero profit at its profit-maximizing quantity of output.

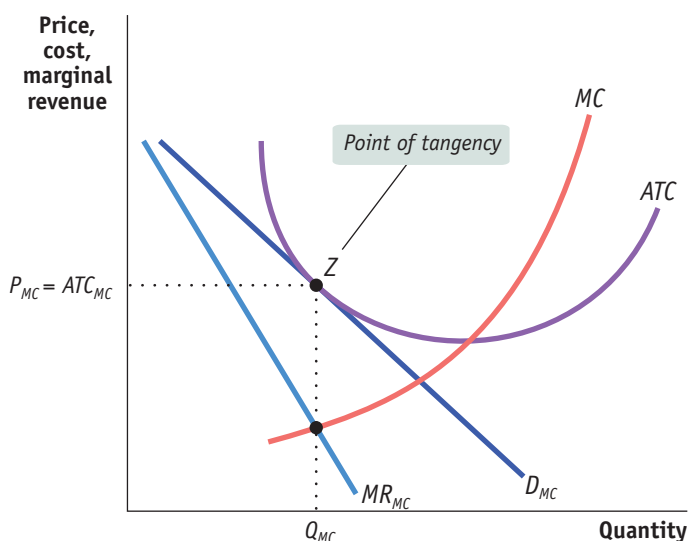
Figure 67.3 shows a typical monopolistically competitive firm in such a zero-profit equilibrium. The firm produces Q_{MC} , the output at which $MR_{MC} = MC$, and charges price P_{MC} . At this price and quantity, represented by point Z, the demand curve is just tangent to its average total cost curve. The firm earns zero profit because price, P_{MC} , is equal to average total cost, ATC_{MC} .

The normal long-run condition of a monopolistically competitive industry, then, is that each producer is in the situation shown in Figure 67.3. Each producer acts like a monopolist, facing a downward-sloping demand curve and setting marginal cost equal to marginal revenue so as to maximize profit. But this is just enough to achieve zero economic profit. The producers in the industry are like monopolists without monopoly profit.

figure 67.3

The Long-Run Zero-Profit Equilibrium

If existing firms are profitable, entry will occur and shift each existing firm's demand curve leftward. If existing firms are unprofitable, each remaining firm's demand curve shifts rightward as some firms exit the industry. Entry and exit will cease when every existing firm makes zero profit at its profit-maximizing quantity. So, in long-run zero-profit equilibrium, the demand curve of each firm is tangent to its average total cost curve at its profit-maximizing quantity: at the profit-maximizing quantity, Q_{MC} , price, P_{MC} , equals average total cost, ATC_{MC} . A monopolistically competitive firm is like a monopolist without monopoly profits.



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Hits and Flops

On the face of it, the movie business seems to meet the criteria for monopolistic competition. Movies compete for the same consumers; each movie is different from the others; new companies can and do enter the business. But where's the zero-profit equilibrium? After all, some movies are enormously profitable.

The key is to realize that for every successful blockbuster, there are several flops—and that the movie studios don't know in advance which will be which. (One observer of Hollywood summed up his conclusions as follows: "Nobody knows anything.") And by the time it becomes clear that a movie will be a flop, it's too late to cancel it.

The difference between movie-making and the type of monopolistic competition we model

in this section is that the fixed costs of making a movie are also *sunk costs*—once they've been incurred, they can't be recovered.

Yet there is still, in a way, a zero-profit equilibrium. If movies on average were highly profitable, more studios would enter the industry and more movies would be made. If movies on average lost money, fewer movies would be made. In fact, as you might expect, the movie industry on average earns just about enough to cover the cost of production—that is, it earns roughly zero economic profit.

This kind of situation—in which firms earn zero profit on average but have a mixture of highly profitable hits and money-losing



AP Photo/Nick Ut

flops—can be found in other industries characterized by high up-front sunk costs. A notable example is the pharmaceutical industry, in which many research projects lead nowhere but a few lead to highly profitable drugs.

Monopolistic Competition versus Perfect Competition

In a way, long-run equilibrium in a monopolistically competitive industry looks a lot like long-run equilibrium in a perfectly competitive industry. In both cases, there are many firms; in both cases, profits have been competed away; in both cases, the price received by every firm is equal to the average total cost of production.

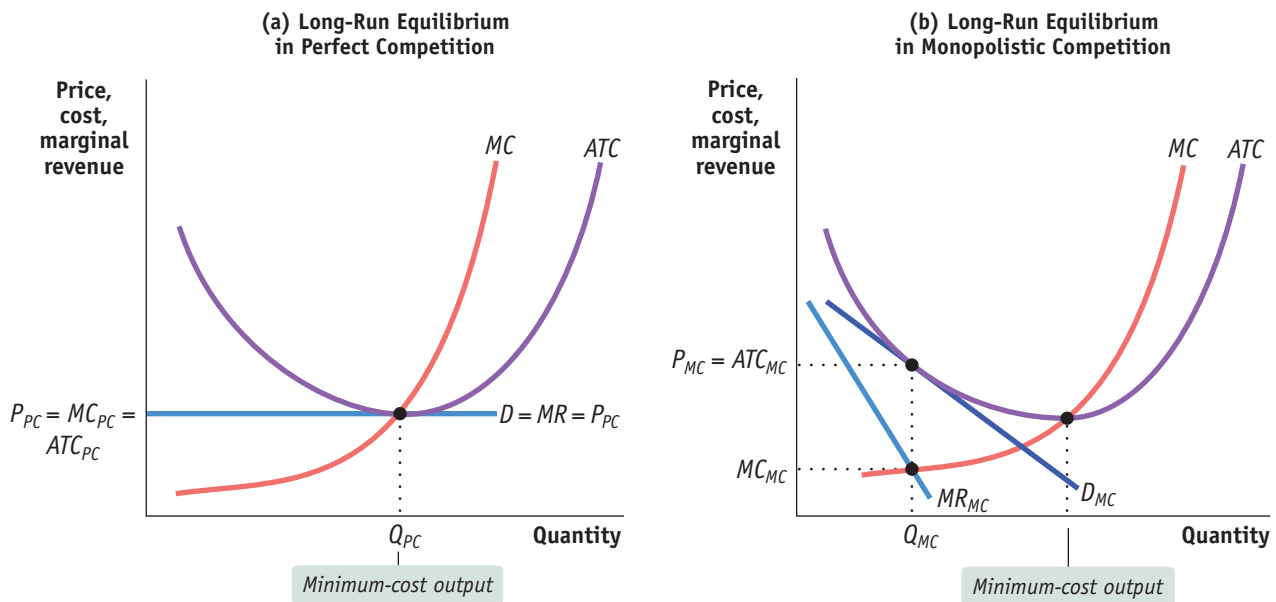
However, the two versions of long-run equilibrium are different—in ways that are economically significant.

Price, Marginal Cost, and Average Total Cost

Figure 67.4 compares the long-run equilibrium of a typical firm in a perfectly competitive industry with that of a typical firm in a monopolistically competitive industry. Panel (a) shows a perfectly competitive firm facing a market price equal to its minimum average total cost; panel (b) reproduces Figure 67.3. Comparing the panels, we see two important differences.

figure 67.4

Comparing Long-Run Equilibrium in Perfect Competition and Monopolistic Competition



Panel (a) shows the situation of the typical firm in long-run equilibrium in a perfectly competitive industry. The firm operates at the minimum-cost output Q_{PC} , sells at the competitive market price P_{PC} , and makes zero profit. It is indifferent to selling another unit of output because P_{PC} is equal to its marginal cost, MC_{PC} . Panel (b) shows the situation of the typical firm in long-run equilibrium in a monopolistically competitive industry. At Q_{MC} it makes zero profit because its price P_{MC} just equals average total cost, ATC_{MC} . At Q_{MC} the firm would like to sell another unit at price P_{MC} since P_{MC} exceeds marginal cost, MC_{MC} . But it is unwilling to lower price to make more sales. It therefore operates to the left of the minimum-cost output level and has excess capacity.

librium in a monopolistically competitive industry. At Q_{MC} it makes zero profit because its price P_{MC} just equals average total cost, ATC_{MC} . At Q_{MC} the firm would like to sell another unit at price P_{MC} since P_{MC} exceeds marginal cost, MC_{MC} . But it is unwilling to lower price to make more sales. It therefore operates to the left of the minimum-cost output level and has excess capacity.

First, in the case of the perfectly competitive firm shown in panel (a), the price, P_{PC} , received by the firm at the profit-maximizing quantity, Q_{PC} , is equal to the firm's marginal cost of production, MC_{PC} , at that quantity of output. By contrast, at the profit-maximizing quantity chosen by the monopolistically competitive firm in panel (b), Q_{MC} , the price, P_{MC} , is *higher* than the marginal cost of production, MC_{MC} .

This difference translates into a difference in the attitude of firms toward consumers. A wheat farmer, who can sell as much wheat as he likes at the going market price, would not get particularly excited if you offered to buy some more wheat at the market price. Since he has no desire to produce more at that price and can sell the wheat to someone else, you are not doing him a favor.

But if you decide to fill up your tank at Jamil's gas station rather than at Katy's, you are doing Jamil a favor. He is not willing to cut his price to get more customers—he's already made the best of that trade-off. But if he gets a few more customers than he expected at the posted price, that's good news: an additional sale at the *posted* price increases his revenue more than it increases his cost because the posted price exceeds marginal cost.

The fact that monopolistic competitors, unlike perfect competitors, want to sell more at the going price is crucial to understanding why they engage in activities like advertising that help increase sales.

The other difference between monopolistic competition and perfect competition that is visible in Figure 67.4 involves the position of each firm on its average total cost curve. In panel (a), the perfectly competitive firm produces at point Q_{PC} , at the bottom of the U-shaped ATC curve. That is, each firm produces the quantity at which average total cost is minimized—the *minimum-cost output*. As a consequence, the total cost of industry output is also minimized.

Under monopolistic competition, in panel (b), the firm produces at Q_{MC} , on the *downward-sloping* part of the U-shaped ATC curve: it produces less than the quantity that would minimize average total cost. This failure to produce enough to minimize average total cost is sometimes described as the **excess capacity** issue. The typical vendor in a food court or a gas station along a road is not big enough to take maximum advantage of available cost savings. So the total cost of industry output is not minimized in the case of a monopolistically competitive industry.

Some people have argued that, because every monopolistic competitor has excess capacity, monopolistically competitive industries are inefficient. But the issue of efficiency under monopolistic competition turns out to be a subtle one that does not have a clear answer.

Is Monopolistic Competition Inefficient?

A monopolistic competitor, like a monopolist, charges a price that is above marginal cost. As a result, some people who are willing to pay at least as much for an egg roll at Wonderful Wok as it costs to produce it are deterred from doing so. In monopolistic competition, some mutually beneficial transactions go unexploited.

Furthermore, it is often argued that monopolistic competition is subject to a further kind of inefficiency: that the excess capacity of every monopolistic competitor implies *wasteful duplication* because monopolistically competitive industries offer too many varieties. According to this argument, it would be better if there were only two or three vendors in the food court, not six or seven. If there were fewer vendors, they would each have lower average total costs and so could offer food more cheaply.

Is this argument against monopolistic competition right—that it lowers total surplus by causing inefficiency? Not necessarily. It's true that if there were fewer gas stations along a highway, each gas station would sell more gasoline and so would have a lower cost per gallon. But there is a drawback: motorists would be inconvenienced because gas stations would be farther apart. The point is that the diversity of products offered in a monopolistically competitive industry is beneficial to consumers. So the higher price consumers pay because of excess capacity is offset to some extent by the value they receive from greater diversity.

There is, in other words, a trade-off: more producers mean higher average total costs but also greater product diversity. Does a monopolistically competitive industry arrive at the socially optimal point in this trade-off? Probably not—but it is hard to say whether there are too many firms or too few! Most economists now believe that duplication of effort and excess capacity in monopolistically competitive industries are not large problems in practice.

Firms in a monopolistically competitive industry have **excess capacity**: they produce less than the output at which average total cost is minimized.

Module 67 AP Review

Solutions appear at the back of the book.

Check Your Understanding

1. Suppose a monopolistically competitive industry composed of firms with U-shaped average total cost curves is in long-run equilibrium. For each of the following changes, explain how the industry is affected in the short run and how it adjusts to a new long-run equilibrium.
 - a. a technological change that increases fixed cost for every firm in the industry
 - b. a technological change that decreases marginal cost for every firm in the industry
2. Why is it impossible for firms in a monopolistically competitive industry to join together to form a monopoly that is capable of maintaining positive economic profit in the long run?
3. Indicate whether the following statements are true or false, and explain your answers.
 - a. Like a firm in a perfectly competitive industry, a firm in a monopolistically competitive industry is willing to sell a good at any price that equals or exceeds marginal cost.
 - b. Suppose there is a monopolistically competitive industry in long-run equilibrium that possesses excess capacity. All the firms in the industry would be better off if they merged into a single firm and produced a single product, but whether consumers would be made better off by this is ambiguous.
 - c. Fads and fashions are more likely to arise in industries characterized by monopolistic competition or oligopoly than in those characterized by perfect competition or monopoly.

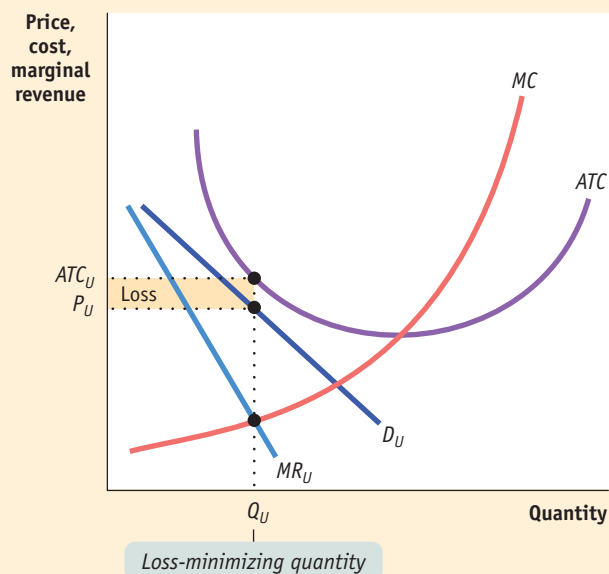
Tackle the Test: Multiple-Choice Questions

1. Which of the following is a characteristic of monopolistic competition?
 - a. a standardized product
 - b. many sellers
 - c. barriers to entry
 - d. positive long-run profits
 - e. a perfectly elastic demand curve
2. Which of the following results is possible for a monopolistic competitor in the short run?
 - I. positive economic profit
 - II. normal profit
 - III. loss
 - a. I only
 - b. II only
 - c. III only
 - d. I and II only
 - e. I, II, and III
3. Which of the following results is possible for a monopolistic competitor in the long run?
 - I. positive economic profit
 - II. normal profit
 - III. loss
 - a. I only
 - b. II only
 - c. III only
 - d. I and II only
 - e. I, II, and III
4. Which of the following best describes a monopolistic competitor's demand curve?
 - a. upward sloping
 - b. downward sloping
 - c. U-shaped
 - d. horizontal
 - e. vertical
5. The long-run outcome in a monopolistically competitive industry results in
 - a. inefficiency because firms earn positive economic profits.
 - b. efficiency due to excess capacity.
 - c. inefficiency due to product diversity.
 - d. efficiency because price exceeds marginal cost.
 - e. a trade-off between higher average total cost and more product diversity.

Tackle the Test: Free-Response Questions

1. Draw a correctly labeled graph for a monopolistically competitive firm that is unprofitable in the short run. Shade the area that represents the firm's losses.
2. Draw a correctly labeled graph for a monopolistically competitive firm in long-run equilibrium. Label the distance on the quantity axis that represents excess capacity.

Answer (7 points)



- 1 point: Correctly labeled axes
- 1 point: Downward-sloping demand curve
- 1 point: Marginal revenue curve below the demand curve
- 1 point: Loss-minimizing quantity where $MC = MR$
- 1 point: Loss-minimizing price on demand curve above where $MC = MR$
- 1 point: U-shaped average total cost curve above the demand curve at every quantity
- 1 point: Correct loss area shaded



What you will learn in this Module:

- Why oligopolists and monopolistic competitors differentiate their products
- The economic significance of advertising and brand names

Module 68

Product Differentiation and Advertising

In Module 66 we saw that product differentiation often plays an important role in oligopolistic industries. In such industries, product differentiation reduces the intensity of competition between firms when tacit collusion cannot be achieved. Product differentiation plays an even more crucial role in monopolistically competitive industries. Because tacit collusion is virtually impossible when there are many producers, product differentiation is the only way monopolistically competitive firms can acquire some market power. In this module, we look at how oligopolists and monopolistic competitors differentiate their products in order to maximize profits.

How Firms Differentiate Their Products

How do firms in the same industry—such as fast-food vendors, gas stations, or chocolate makers—differentiate their products? Sometimes the difference is mainly in the minds of consumers rather than in the products themselves. We'll discuss the role of advertising and the importance of brand names in achieving this kind of product differentiation later. But, in general, firms differentiate their products by—surprise!—actually making them different.

The key to product differentiation is that consumers have different preferences and are willing to pay somewhat more to satisfy those preferences. Each producer can carve out a market niche by producing something that caters to the particular preferences of some group of consumers better than the products of other firms. There are three important forms of product differentiation: differentiation by style or type, differentiation by location, and differentiation by quality.

Differentiation by Style or Type

The sellers in Leo's food court offer different types of fast food: hamburgers, pizza, Chinese food, Mexican food, and so on. Each consumer arrives at the food court with some preference for one or another of these offerings. This preference may depend on

the consumer's mood, her diet, or what she has already eaten that day. These preferences will not make consumers indifferent to price: if Wonderful Wok were to charge \$15 for an egg roll, everybody would go to Bodacious Burgers or Pizza Paradise instead. But some people will choose a more expensive meal if that type of food is closer to their preference. So the products of the different vendors are substitutes, but they aren't *perfect* substitutes—they are *imperfect substitutes*.

Vendors in a food court aren't the only sellers who differentiate their offerings by type. Clothing stores concentrate on women's or men's clothes, on business attire or sportswear, on trendy or classic styles, and so on. Auto manufacturers offer sedans, minivans, sport-utility vehicles, and sports cars, each type aimed at drivers with different needs and tastes.

Books offer yet another example of differentiation by type and style. Mysteries are differentiated from romances; among mysteries, we can differentiate among hard-boiled detective stories, whodunits, and police procedurals. And no two writers of hard-boiled detective stories are exactly alike: Raymond Chandler and Sue Grafton each have their devoted fans.

In fact, product differentiation is characteristic of most consumer goods. As long as people differ in their tastes, producers find it possible and profitable to offer variety.

Differentiation by Location

Gas stations along a road offer differentiated products. True, the gas may be exactly the same. But the location of the stations is different, and location matters to consumers: it's more convenient to stop for gas near your home, near your workplace, or near wherever you are when the gas gauge gets low.

In fact, many monopolistically competitive industries supply goods differentiated by location. This is especially true in service industries, from dry cleaners to hairdressers, where customers often choose the seller who is closest rather than cheapest.

Differentiation by Quality

Do you have a craving for chocolate? How much are you willing to spend on it? You see, there's chocolate and then there's chocolate: although ordinary chocolate may not be very expensive, gourmet chocolate can cost several dollars per bite.

With chocolate, as with many goods, there is a range of possible qualities. You can get a usable bicycle for less than \$100; you can get a much fancier bicycle for 10 times as much. It all depends on how much the additional quality matters to you and how much you will miss the other things you could have purchased with that money.

Because consumers vary in what they are willing to pay for higher quality, producers can differentiate their products by quality—some offering lower-quality, inexpensive products and others offering higher-quality products at a higher price.

Product differentiation, then, can take several forms. Whatever form it takes, however, there are two important features of industries with differentiated products: *competition among sellers* and *value in diversity*.

Competition among sellers means that even though sellers of differentiated products are not offering identical goods, they are to some extent competing for a limited market. If more businesses enter the market, each will find that it sells a lower quantity at any given price. For example, if a new gas station opens along a road, each of the existing gas stations will sell a bit less.

Value in diversity refers to the gain to consumers from the proliferation of differentiated products. A food court with eight vendors makes consumers happier than one with only six vendors, even if the prices are the same, because some customers will get a meal that is closer to what they had in mind. A road on which there is a gas station every two miles is more convenient for motorists than a road where gas stations are five miles apart. When a product is available in many different qualities, fewer people are forced to pay for more quality than they need or to settle for lower quality than they



Any Color, So Long as It's Black

The early history of the auto industry offers a classic illustration of the power of product differentiation.

The modern automobile industry was created by Henry Ford, who first introduced assembly-line production. This technique made it possible for him to offer the famous Model T at a far lower price than anyone else was charging for a car; by 1920, Ford dominated the automobile business.

Ford's strategy was to offer just one style of car, which maximized his economies of scale in production but made no concessions to differences in consumers' tastes. He supposedly declared that customers could get the Model T in "any color, so long as it's black."

This strategy was challenged by Alfred P. Sloan, who had merged a number of smaller automobile companies into General Motors. Sloan's strategy was to offer a range of car

types, differentiated by quality and price. Chevrolets were basic cars that directly challenged the Model T, Buicks were bigger and more expensive, and so on up to Cadillacs. And you could get each model in several different colors.

By the 1930s the verdict was clear: customers preferred a range of styles, and General Motors, not Ford, became the dominant auto manufacturer for the rest of the twentieth century.

want. There are, in other words, benefits to consumers from a greater diversity of available products.

As we'll see next, competition among the sellers of differentiated products is the key to understanding how monopolistic competition works.

Controversies About Product Differentiation

Up to this point, we have assumed that products are differentiated in a way that corresponds to some real desire of consumers. There is real convenience in having a gas station in your neighborhood; Chinese food and Mexican food are really different from each other.

In the real world, however, some instances of product differentiation can seem puzzling if you think about them. What is the real difference between Crest and Colgate toothpaste? Between Energizer and Duracell batteries? Or a Marriott and a Hilton hotel room? Most people would be hard-pressed to answer any of these questions. Yet the producers of these goods make considerable efforts to convince consumers that their products are different from and better than those of their competitors.

No discussion of product differentiation is complete without spending at least a bit of time on the two related issues—and puzzles—of *advertising* and *brand names*.

The Role of Advertising

Wheat farmers don't advertise their wares on TV, but car dealers do. That's not because farmers are shy and car dealers are outgoing; it's because advertising is worthwhile only in industries in which firms have at least some market power. The purpose of advertisements is to persuade people to buy more of a seller's product at the going price. A perfectly competitive firm, which can sell as much as it likes at the going market price, has no incentive to spend money persuading consumers to buy more. Only a firm that has some market power, and which therefore charges a price that is above marginal cost, can gain from advertising. (Industries that are more or less perfectly competitive, like the milk industry, do advertise—but these ads are sponsored by an association on behalf of the industry as a whole, not on behalf of a particular farm.)

Given that advertising "works," it's not hard to see why firms with market power would spend money on it. But the big question about advertising is, *why* does it work? A related question is whether advertising is, from society's point of view, a waste of resources.

Not all advertising poses a puzzle. Much of it is straightforward: it's a way for sellers to inform potential buyers about what they have to offer (or, occasionally, for buyers to inform potential sellers about what they want). Nor is there much controversy about the economic usefulness of ads that provide information: the real estate ad that declares “sunny, charming, 2 bedrooms, 1 bath, a/c” tells you things you need to know (even if a few euphemisms are involved—“charming,” of course, means “small”).

But what information is being conveyed when a TV actress proclaims the virtues of one or another toothpaste or a sports hero declares that some company's batteries are better than those inside that pink mechanical rabbit? Surely nobody believes that the sports star is an expert on batteries—or that he chose the company that he personally believes makes the best batteries, as opposed to the company that offered to pay him the most. Yet companies believe, with good reason, that money spent on such promotions increases their sales—and that they would be in big trouble if they stopped advertising but their competitors continued to do so.

Why are consumers influenced by ads that do not really provide any information about the product? One answer is that consumers are not as rational as economists typically assume. Perhaps consumers' judgments, or even their tastes, can be influenced by things that economists think ought to be irrelevant, such as which company has hired the most charismatic celebrity to endorse its product. And there is surely some truth to this. Consumer rationality is a useful working assumption; it is not an absolute truth.

However, another answer is that consumer response to advertising is not entirely irrational because ads can serve as indirect “signals” in a world where consumers don't have good information about products. Suppose, to take a common example, that you need to avail yourself of some local service that you don't use regularly—body work on your car, say, or furniture moving. You turn to the Yellow Pages, where you see a number of small listings and several large display ads. You know that those display ads are large because the firms paid extra for them; still, it may be quite rational to call one of the firms with a big display ad. After all, the big ad probably means that it's a relatively large, successful company—otherwise, the company wouldn't have found it worth spending the money for the larger ad.

The same principle may partly explain why ads feature celebrities. You don't really believe that the supermodel prefers that watch; but the fact that the watch manufacturer is willing and able to pay her fee tells you that it is a major company that is likely to stand behind its product. According to this reasoning, an expensive advertisement serves to establish the quality of a firm's products in the eyes of consumers.

The possibility that it is rational for consumers to respond to advertising also has some bearing on the question of whether advertising is a waste of resources. If ads work by manipulating only the weak-minded, the \$149 billion U.S. businesses spent on advertising in 2007 would have been an economic waste—except to the extent that ads sometimes provide entertainment. To the extent that advertising conveys important information, however, it is an economically productive activity after all.



Brand Names

You've been driving all day, and you decide that it's time to find a place to sleep. On your right, you see a sign for the Bates Motel; on your left, you see a sign for a Motel 6, or a Best Western, or some other national chain. Which one do you choose?

A **brand name** is a name owned by a particular firm that distinguishes its products from those of other firms.



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Unless they were familiar with the area, most people would head for the chain. In fact, most motels in the United States are members of major chains; the same is true of most fast-food restaurants and many, if not most, stores in shopping malls.

Motel chains and fast-food restaurants are only one aspect of a broader phenomenon: the role of **brand names**, names owned by particular companies that differentiate their products in the minds of consumers. In many cases, a company's brand name is the most important asset it possesses: clearly, McDonald's is worth far more than the sum of the deep-fat fryers and hamburger grills the company owns.

In fact, companies often go to considerable lengths to defend their brand names, suing anyone else who uses them without permission. You may talk about blowing your nose on a Kleenex or xeroxing a term paper, but unless the product in question comes from Kleenex or Xerox, legally the seller must describe it as a facial tissue or a photocopier.

As with advertising, with which they are closely linked, the social usefulness of brand names is a source of dispute. Does the preference of consumers for known brands reflect consumer irrationality? Or do brand names convey real information? That is, do brand names create unnecessary market power, or do they serve a real purpose?

As in the case of advertising, the answer is probably some of both. On the one hand, brand names often do create unjustified market power. Consumers often pay more for brand-name goods in the supermarket even though consumer experts assure us that the cheaper store brands are equally good. Similarly, many common medicines, like aspirin, are cheaper—with no loss of quality—in their generic form.

On the other hand, for many products the brand name does convey information. A traveler arriving in a strange town can be sure of what awaits in a Holiday Inn or a McDonald's; a tired and hungry traveler may find this preferable to trying an independent hotel or restaurant that might be better—but might be worse.

In addition, brand names offer some assurance that the seller is engaged in repeated interaction with its customers and so has a reputation to protect. If a traveler eats a bad meal at a restaurant in a tourist trap and vows never to eat there again, the restaurant owner may not care, since the chance is small that the traveler will be in the same area again in the future. But if that traveler eats a bad meal at McDonald's and vows never to eat at a McDonald's again, that matters to the company. This gives McDonald's an incentive to provide consistent quality, thereby assuring travelers that quality controls are in place.

Module 68 AP Review

Solutions appear at the back of the book.

Check Your Understanding

1. For each of the following types of advertising, explain whether it is likely to be useful or wasteful from the standpoint of consumers.
 - a. advertisements explaining the benefits of aspirin
 - b. advertisements for Bayer aspirin
 - c. advertisements that state how long a plumber or an electrician has been in business
2. Some industry analysts have stated that a successful brand name is like a barrier to entry. Explain why this might be true.

Tackle the Test: Multiple-Choice Questions

- Which of the following is a form of product differentiation?
 - style or type
 - location
 - quality
 - I only
 - II only
 - III only
 - I and II only
 - I, II, and III
- In which of the following market structures will individual firms advertise?
 - perfect competition
 - oligopoly
 - monopolistic competition
 - I only
 - II only
 - III only
 - II and III only
 - I, II, and III
- Advertising is an attempt to affect which of the following?
 - consumer tastes and preferences
 - consumer income
 - the price of complements
 - the price of substitutes
 - input prices
- Brand names generally serve to
 - waste resources.
 - decrease firm profits.
 - confuse consumers.
 - decrease information.
 - signal quality.
- Which of the following is true of advertising expenditures in monopolistic competition? Monopolistic competitors
 - will not advertise.
 - use only informational advertising.
 - waste resources on advertising.
 - attempt to create popular brand names.
 - earn long-run profits through advertising.

Tackle the Test: Free-Response Questions

- Refer to the table below showing the effects of running television commercials on a firm's total revenue. Assume that each commercial costs \$1,000 to run.

<i>Number of Commercials</i>	<i>Total revenue</i>
0	\$20,000
1	30,000
2	38,000
3	44,000
4	48,000
5	50,000
6	50,500

- What is the marginal revenue from running the second commercial?
- Should the firm run a third commercial? Explain.
- If the firm has no variable costs aside from the cost of commercials, how many commercials should the firm run to maximize profits? Explain.

Answer (5 points)

1 point: \$8,000

1 point: Yes.

1 point: Because the marginal revenue of \$6,000 exceeds the marginal cost of \$1,000.

1 point: 5

1 point: Marginal revenue exceeds marginal cost for the first 5 commercials. Marginal revenue is less than marginal cost for the 6th commercial.

- When is product differentiation socially efficient? Explain. When is it not socially efficient? Explain.

Section 12 Review

Summary

- Many industries are oligopolies, characterized by a small number of sellers. The smallest type of oligopoly, a **duopoly**, has only two sellers. Oligopolies exist for more or less the same reasons that monopolies exist, but in weaker form. They are characterized by imperfect competition: firms compete but possess market power.
- Predicting the behavior of oligopolists poses something of a puzzle. The firms in an oligopoly could maximize their combined profits by acting as a **cartel**, setting output levels for each firm as if they were a single monopolist; to the extent that firms manage to do this, they engage in **collusion**. But each individual

firm has an incentive to produce more than the agreed upon quantity of output—to engage in **noncooperative behavior**. Informal collusion is likely to be easier to achieve in industries in which firms face capacity constraints.

3. The situation of **interdependence**, in which each firm's profit depends noticeably on what other firms do, is the subject of **game theory**. In the case of a game with two players, the **payoff** of each player depends on both its own actions and on the actions of the other; this interdependence can be shown in a **payoff matrix**. Depending on the structure of payoffs in the payoff matrix, a player may have a **dominant strategy**—an action that is always the best regardless of the other player's actions.
4. Some **duopolists** face a particular type of game known as a **prisoners' dilemma**; if each acts independently on its own interest, the resulting **Nash equilibrium** or **noncooperative equilibrium** will be bad for both. However, firms that expect to play a game repeatedly tend to engage in **strategic behavior**, trying to influence each other's future actions. A particular strategy that seems to work well in such situations is **tit for tat**, which often leads to **tacit collusion**.
5. In order to limit the ability of oligopolists to collude and act like monopolists, most governments pursue **antitrust policy** designed to make collusion more difficult. In practice, however, tacit collusion is widespread.
6. A variety of factors make tacit collusion difficult: a large numbers of firms, complex products and pricing, differences in interests, and buyers with bargaining power. When tacit collusion breaks down, there can be a **price war**. Oligopolists try to avoid price wars in various ways, such as through **product differentiation** and through **price leader-**

ship, in which one firm sets prices for the industry. Another approach is **nonprice competition**, such as advertising.

7. Monopolistic competition is a market structure in which there are many competing producers, each producing a differentiated product, and there is free entry and exit in the long run.
8. Short-run profits will attract the entry of new firms in the long run. This reduces the quantity each existing producer sells at any given price and shifts its demand curve to the left. Short-run losses will induce exit by some firms in the long run. This shifts the demand curve of each remaining firm to the right.
9. In the long run, a monopolistically competitive industry is in **zero-profit equilibrium**: at its profit-maximizing quantity, the demand curve for each existing firm is tangent to its average total cost curve. There are zero profits in the industry and no entry or exit.
10. In long-run equilibrium, firms in a monopolistically competitive industry sell at a price greater than marginal cost. They also have **excess capacity** because they produce less than the minimum-cost output; as a result, they have higher costs than firms in a perfectly competitive industry. Whether or not monopolistic competition is inefficient is ambiguous because consumers value the product diversity that it creates.
11. Product differentiation takes three main forms: style or type, location, or quality. Firms will engage in advertising to increase demand for their products and enhance their market power. Advertising and **brand names** that provide useful information to consumers are valuable to society. Advertisements can be wasteful from a societal standpoint when their only purpose is to create market power.

Key Terms

Interdependence, p. 638

Duopoly, p. 638

Duopolist, p. 638

Collusion, p. 639

Cartel, p. 639

Noncooperative behavior, p. 640

Game theory, p. 644

Payoff, p. 644

Payoff matrix, p. 644

Prisoners' dilemma, p. 645

Dominant strategy, p. 646

Nash equilibrium, p. 646

Noncooperative equilibrium, p. 646

Strategic behavior, p. 647

Tit for tat, p. 647

Tacit collusion, p. 649

Antitrust policy, p. 653

Price war, p. 654

Product differentiation, p. 655

Price leadership, p. 656

Nonprice competition, p. 656

Zero-profit equilibrium, p. 661

Excess capacity, p. 665

Brand name, p. 672

Problems

1. The accompanying table presents market share data for the U.S. breakfast cereal market in 2006.

Company	Market Share
Kellogg	30%
General Mills	26
PepsiCo (Quaker Oats)	14
Kraft	13
Private Label	11
Other	6
<i>Source: Advertising Age</i>	

- a. Use the data provided to calculate the Herfindahl-Hirschman Index (HHI) for the market.
- b. Based on this HHI, what type of market structure is the U.S. breakfast cereal market?
2. The accompanying table shows the demand schedule for vitamin D. Suppose that the marginal cost of producing vitamin D is zero.

Price of vitamin D (per ton)	Quantity of vitamin D demanded (tons)
\$8	0
7	10
6	20
5	30
4	40
3	50
2	60
1	70

- a. Assume that BASF is the only producer of vitamin D and acts as a monopolist. It currently produces 40 tons of vitamin D at \$4 per ton. If BASF were to produce 10 more tons, what would be the price effect for BASF? What would be the quantity effect? Would BASF have an incentive to produce those 10 additional tons?
- b. Now assume that Roche enters the market by also producing vitamin D and the market is now a duopoly. BASF and Roche agree to produce 40 tons of vitamin D in total, 20 tons each. BASF cannot be punished for deviating from the agreement with Roche. If BASF, on its own, were to deviate from that agreement and produce 10 more tons, what would be the price effect for BASF? What would be the quantity effect for BASF? Would BASF have an incentive to produce those 10 additional tons?
3. The market for olive oil in New York City is controlled by two families, the Sopranos and the Contraltos. Both families will ruthlessly eliminate any other family that attempts to enter the New York City olive oil market. The marginal cost of producing olive oil is constant and equal to \$40 per gallon. There is

no fixed cost. The accompanying table gives the market demand schedule for olive oil.

Price of olive oil (per gallon)	Quantity of olive oil demanded (gallons)
\$100	1,000
90	1,500
80	2,000
70	2,500
60	3,000
50	3,500
40	4,000
30	4,500
20	5,000
10	5,500

- a. Suppose the Sopranos and the Contraltos form a cartel. For each of the quantities given in the table, calculate the total revenue for their cartel and the marginal revenue for each additional gallon. How many gallons of olive oil would the cartel sell in total and at what price? The two families share the market equally (each produces half of the total output of the cartel). How much profit does each family make?
- b. Uncle Junior, the head of the Soprano family, breaks the agreement and sells 500 more gallons of olive oil than under the cartel agreement. Assuming the Contraltos maintain the agreement, how does this affect the price for olive oil and the profits earned by each family?
- c. Anthony Contralto, the head of the Contralto family, decides to punish Uncle Junior by increasing his sales by 500 gallons as well. How much profit does each family earn now?
4. In France, the market for bottled water is controlled by two large firms, Perrier and Evian. Each firm has a fixed cost of €1 million and a constant marginal cost of €2 per liter of bottled water (€1 = 1 euro). The following table gives the market demand schedule for bottled water in France.

Price of bottled water (per liter)	Quantity of bottled water demanded (millions of liters)
€10	0
9	1
8	2
7	3
6	4
5	5
4	6
3	7
2	8
1	9

- a. Suppose the two firms form a cartel and act as a monopolist. Calculate marginal revenue for the cartel. What will the monopoly price and output be? Assuming the firms divided the output evenly, how much will each produce and what will each firm's profits be?
 - b. Now suppose Perrier decides to increase production by 1 million liters. Evian doesn't change its production. What will the new market price and output be? What is Perrier's profit? What is Evian's profit?
 - c. What if Perrier increases production by 3 million liters? Evian doesn't change its production. What would its output and profits be relative to those in part b?
 - d. What do your results tell you about the likelihood of cheating on such agreements?
5. To preserve the North Atlantic fish stocks, it is decided that only two fishing fleets, one from the United States and the other from the European Union (EU), can fish in those waters. The accompanying table shows the market demand schedule per week for fish from these waters. The only costs are fixed costs, so fishing fleets maximize profit by maximizing revenue.

Price of fish (per pound)	Quantity of fish demanded (pounds)
\$17	1,800
16	2,000
15	2,100
14	2,200
12	2,300

- a. If both fishing fleets collude, what is the revenue-maximizing output for the North Atlantic fishery? What price will a pound of fish sell for?
 - b. If both fishing fleets collude and share the output equally, what is the revenue to the EU fleet? To the U.S. fleet?
 - c. Suppose the EU fleet cheats by expanding its own catch by 100 pounds per week. The U.S. fleet doesn't change its catch. What is the revenue to the U.S. fleet? To the EU fleet?
 - d. In retaliation for the cheating by the EU fleet, the U.S. fleet also expands its catch by 100 pounds per week. What is the revenue to the U.S. fleet? To the EU fleet?
6. Suppose that the fisheries agreement in Problem 5 breaks down, so that the fleets behave noncooperatively. Assume that the United States and the EU each can send out either one or two fleets. The more fleets in the area, the more fish they catch in total but the lower the catch of each fleet. The accompany-

ing matrix shows the profit (in dollars) per week earned by the two sides.

		EU	
		1 fleet	2 fleets
U.S.	1 fleet	\$10,000 profit \$10,000 profit	\$12,000 profit \$4,000 profit
	2 fleets	\$4,000 profit \$12,000 profit	\$7,500 profit \$7,500 profit

- a. What is the noncooperative Nash equilibrium? Will each side choose to send out one or two fleets?
 - b. Suppose that the fish stocks are being depleted. Each region considers the future and comes to a "tit-for-tat" agreement whereby each side will send only one fleet out as long as the other does the same. If either of them breaks the agreement and sends out a second fleet, the other will also send out two and will continue to do so until its competitor sends out only one fleet. If both play this "tit-for-tat" strategy, how much profit will each make every week?
7. Untied and Air "R" Us are the only two airlines operating flights between Collegeville and Bigtown. That is, they operate in a duopoly. Each airline can charge either a high price or a low price for a ticket. The accompanying matrix shows their payoffs, in profits per seat (in dollars), for any choice that the two airlines can make.

		Air "R" Us	
		Low price	High price
Untied	Low price	\$20 profit \$20 profit	\$0 profit \$50 profit
	High price	\$50 profit \$0 profit	\$40 profit \$40 profit

- a. Suppose the two airlines play a one-shot game—that is, they interact only once and never again. What will be the Nash equilibrium in this one-shot game?

- b.** Now suppose the two airlines play this game twice. And suppose each airline can play one of two strategies: it can play either “always charge the low price” or “tit for tat”—that is, start off charging the high price in the first period, and then in the second period do whatever the other airline did in the previous period. Write down the payoffs to Untied from the following four possibilities:
- Untied plays “always charge the low price” when Air “R” Us also plays “always charge the low price.”
 - Untied plays “always charge the low price” when Air “R” Us plays “tit for tat.”
 - Untied plays “tit for tat” when Air “R” Us plays “always charge the low price.”
 - Untied plays “tit for tat” when Air “R” Us also plays “tit for tat.”
- 8.** Suppose that Coke and Pepsi are the only two producers of cola drinks, making them duopolists. Both companies have zero marginal cost and a fixed cost of \$100,000.
- Assume first that consumers regard Coke and Pepsi as perfect substitutes. Currently both are sold for \$0.20 per can, and at that price each company sells 4 million cans per day.
 - How large is Pepsi’s profit?
 - If Pepsi were to raise its price to \$0.30 cents per can, and Coke did not respond, what would happen to Pepsi’s profit?
 - Now suppose that each company advertises to differentiate its product from the other company’s. As a result of advertising, Pepsi realizes that if it raises or lowers its price, it will sell less or more of its product, as shown by the demand schedule in the accompanying table.

Price of Pepsi (per can)	Quantity of Pepsi demanded (millions of cans)
\$0.10	5
0.20	4
0.30	3
0.40	2
0.50	1

- If Pepsi now were to raise its price to \$0.30 per can, what would happen to its profit?
- Comparing your answer to part a(i) and to part b, what is the maximum amount Pepsi would be willing to spend on advertising?
- 9.** Philip Morris and R.J. Reynolds spend huge sums of money each year to advertise their tobacco products in an attempt to steal customers from each other. Suppose each year Philip Morris and R.J. Reynolds have to decide whether or not they want to spend money on advertising. If neither firm advertises,

each will earn a profit of \$2 million. If they both advertise, each will earn a profit of \$1.5 million. If one firm advertises and the other does not, the firm that advertises will earn a profit of \$2.8 million and the other firm will earn \$1 million.

- Use a payoff matrix to depict this problem.
 - Suppose Philip Morris and R.J. Reynolds can write an enforceable contract about what they will do. What is the cooperative solution to this game?
 - What is the Nash equilibrium without an enforceable contract? Explain why this is the likely outcome.
- 10.** Use the three conditions for monopolistic competition discussed in this section to decide which of the following firms are likely to be operating as monopolistic competitors. If they are not monopolistically competitive firms, are they monopolists, oligopolists, or perfectly competitive firms?
- a local band that plays for weddings, parties, and so on
 - Minute Maid, a producer of individual-serving juice boxes
 - your local dry cleaner
 - a farmer who produces soybeans
- 11.** You are thinking of setting up a coffee shop. The market structure for coffee shops is monopolistic competition. There are three Starbucks shops, and two other coffee shops very much like Starbucks, in your town already. In order for you to have some degree of market power, you may want to differentiate your coffee shop. Thinking about the three different ways in which products can be differentiated, explain how you would decide whether you should copy Starbucks or whether you should sell coffee in a completely different way.
- 12.** The restaurant business in town is a monopolistically competitive industry in long-run equilibrium. One restaurant owner asks for your advice. She tells you that, each night, not all tables in her restaurant are full. She also tells you that if she lowered the prices on her menu, she would attract more customers and that doing so would lower her average total cost. Should she lower her prices? Draw a diagram showing the demand curve, marginal revenue curve, marginal cost curve, and average total cost curve for this restaurant to explain your advice. Show in your diagram what would happen to the restaurant owner’s profit if she were to lower the price so that she sells the minimum-cost output.
- 13.** The market structure of the local gas station industry is monopolistic competition. Suppose that currently each gas station incurs a loss. Draw a diagram for a typical gas station to show this short-run situation. Then, in a separate diagram, show what will happen to the typical gas station in the long run. Explain your reasoning.
- 14.** The local hairdresser industry has the market structure of monopolistic competition. Your hairdresser boasts that he is making a profit and that if he continues to do so, he will be able to

- retire in five years. Use a diagram to illustrate your hairdresser's current situation. Do you expect this to last? In a separate diagram, draw what you expect to happen in the long run. Explain your reasoning.
15. Magnificent Blooms is a florist in a monopolistically competitive industry. It is a successful operation, producing the quantity that minimizes its average total cost and making a profit. The owner also says that at its current level of output, its marginal cost is above marginal revenue. Illustrate the current situation of Magnificent Blooms in a diagram. Answer the following questions by illustrating with a diagram.
- In the short run, could Magnificent Blooms increase its profit?
 - In the long run, could Magnificent Blooms increase its profit?
16. "In both the short run and in the long run, the typical firm in monopolistic competition and a monopolist each make a profit." Do you agree with this statement? Explain your reasoning.
17. The market for clothes has the structure of monopolistic competition. What impact will fewer firms in this industry have on you as a consumer? Address the following issues:
- variety of clothes
 - differences in quality of service
 - price
18. For each of the following situations, decide whether advertising is directly informative about the product or simply an indirect signal of its quality. Explain your reasoning.
- Golf champion Tiger Woods drives a Buick in a TV commercial and claims that he prefers it to any other car.
 - A newspaper ad states, "For sale: 1999 Honda Civic, 160,000 miles, new transmission."
 - McDonald's spends millions of dollars on an advertising campaign that proclaims: "I'm lovin' it."
 - Subway advertises one of its sandwiches by claiming that it contains 6 grams of fat and fewer than 300 calories.
19. In each of the following cases, explain how the advertisement functions as a signal to a potential buyer. Explain what information the buyer lacks that is being supplied by the advertisement and how the information supplied by the advertisement is likely to affect the buyer's willingness to buy the good.
- "Looking for work. Excellent references from previous employers available."
 - "Electronic equipment for sale. All merchandise carries a one-year, no-questions-asked warranty."
 - "Car for sale by original owner. All repair and maintenance records available."
20. The accompanying table shows the Herfindahl-Hirschman Index (HHI) for the restaurant, cereal, movie, and laundry detergent industries as well as the advertising expenditures of the top 10 firms in each industry in 2006. Use the information in the table to answer the following questions.

Industry	HHI	Advertising expenditures (millions)
Restaurants	179	\$1,784
Cereal	2,098	732
Movie studios	918	3,324
Laundry detergent	2,068	132

- Which market structure—oligopoly or monopolistic competition—best characterizes each of the industries?
- Based on your answer to part a, which type of market structure has higher advertising expenditures? Use the characteristics of each market structure to explain why this relationship might exist.