firms. It is called the model of monopolistic competition. Monopolistic competition occurs in an industry with many firms and free entry, where the product of each firm is slightly differentiated from the product of every other firm. We contrast the predictions of this model with those of the models of competition and monopoly developed in previous chapters.

We also study another type of industry whose structure seems to fall between the models of monopoly and competition. In an oligopoly, very few firms are in the industry. Because the industry has very few firms, each firm has market power—the actions of any one firm can significantly affect the market price. In an oligopoly, each firm needs to anticipate what the others will do and develop a strategy to respond. Neither the model of a competitive industry, in which case no one firm can affect the price, nor the model of monopoly, in which case one firm completely dominates the market, adequately describes such a situation. To develop a model of oligopoly, therefore, we need to extend our tools of economic analysis to deal with strategic behavior: how firms think about, anticipate, and react to other firms’ moves.

Figure 11-1 compares the models of monopolistic competition, oligopoly, monopoly, and competition. Over time, an industry can change from being a monopoly to monopolistic competition, to oligopoly, to competition, and back again, as a result of changes in the number of firms or the degree of product differentiation.

To emphasize the distinction between the models of competition and monopolistic competition or between the models of monopoly and monopolistic competition, the terms pure competition and pure monopoly sometimes are used. In this book, we simply use the terms competition and monopoly.

**Four Types of Industries**

Monopoly and competition are at the extreme ends. Monopolistic competition and oligopoly are in between.

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**Figure 11-1**

<table>
<thead>
<tr>
<th>Competition</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Many firms, free entry</td>
</tr>
<tr>
<td>• One product</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Monopolistic Competition</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Many firms, free entry</td>
</tr>
<tr>
<td>• Differentiated product</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Oligopoly</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Few firms, limited entry</td>
</tr>
<tr>
<td>• One or differentiated product</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Monopoly</th>
</tr>
</thead>
<tbody>
<tr>
<td>• One firm, no entry</td>
</tr>
<tr>
<td>• One product</td>
</tr>
</tbody>
</table>

**monopolistic competition**

a market structure characterized by many firms selling differentiated products in an industry that has free entry and exit.

**oligopoly**

an industry characterized by few firms selling the same product with limited entry of other firms.
Product Differentiation

The effort by firms to fashion products that are different from other firms’ products in ways that people value is called **product differentiation**. Product differentiation is pervasive in market economies. It leads to a great variety of consumer goods and capital goods. Goods that do not have product differentiation, such as aluminum ingots or gold bullion, are called **homogeneous products**, meaning that they are all exactly the same.

**Variety of Goods in a Market Economy**

Product differentiation is obvious from a casual examination of the wide variety of goods in a modern market economy. Table 11-1 gives an indication of this wide variety. If you like to run, you have a choice of 285 different types of running shoes. You can choose among 340 different types of cereals for breakfast and wear 70 different types of Levis’ jeans.

The wide variety of products in a market economy contrasts starkly with the absence of such variety that existed in the centrally planned economies of Eastern Europe and the Soviet Union. Stores in Moscow or Warsaw typically would have only one type of each product—one type of wrench, for example—produced according to the specifications of the central planners. Even food and clothing had relatively little variety. One of the first results of market economic reform in these countries has been an increase in the variety of goods available.

Product differentiation is a major activity of both existing firms and potential firms. Business schools teach managers that product differentiation ranks with cost cutting as one of the two basic ways in which a firm can improve its performance. An entrepreneur can enter an existing industry either by finding a cheaper way to produce an existing product or by introducing a product that is differentiated from existing products in a way that will appeal to consumers.

Product differentiation usually means something less than inventing an entirely new product. Aspirin was an entirely new product when it was invented; wrapping aspirin in a

<table>
<thead>
<tr>
<th>Table 11-1</th>
<th>Variety: An Illustration of Product Differentiation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Item</td>
<td>Number of Different Types</td>
</tr>
<tr>
<td>Automobile models</td>
<td>260</td>
</tr>
<tr>
<td>Automobile styles</td>
<td>1,212</td>
</tr>
<tr>
<td>SUV models</td>
<td>38</td>
</tr>
<tr>
<td>SUV styles</td>
<td>192</td>
</tr>
<tr>
<td>Personal computer models</td>
<td>400</td>
</tr>
<tr>
<td>Movie releases</td>
<td>458</td>
</tr>
<tr>
<td>Magazine titles</td>
<td>790</td>
</tr>
<tr>
<td>New book titles</td>
<td>77,446</td>
</tr>
<tr>
<td>Amusement parks</td>
<td>1,174</td>
</tr>
<tr>
<td>TV screen sizes</td>
<td>15</td>
</tr>
<tr>
<td>Frito-Lay chip varieties</td>
<td>78</td>
</tr>
<tr>
<td>Breakfast cereals</td>
<td>340</td>
</tr>
</tbody>
</table>

special coating to make it easier to swallow is product differentiation. Coke, when it was invented in 1886, was a new product, whereas Pepsi, RC Cola, Jolt Cola, Yes Cola, and Mr. Cola, which followed over the years, are differentiated products.

Product differentiation also exists for capital goods—the machines and equipment used by firms to produce their products. The large earthmoving equipment produced by Caterpillar is different from that produced by other firms, such as Komatsu of Japan. One difference is the extensive spare parts and repair service that go along with Caterpillar equipment. Bulldozers and road graders frequently break down and need quick repairs; by stationing parts distributorships and knowledgeable mechanics around the world, Caterpillar can offer quick repairs in the event of costly breakdowns. In other words, the products are differentiated on the basis of service and a worldwide network.

**Puzzles Explained by Product Differentiation**

Product differentiation explains certain facts about a market economy that could be puzzling if all goods were homogeneous.

**Intraindustry Trade** Differentiated products lead to trade between countries of goods from the same industry, called **intraindustry trade**. Trade between countries of goods from different industries, called **interindustry trade**, can be explained by comparative advantage. Bananas are traded for wheat because one of these goods is grown better in warm climates and the other is grown better in cooler climates. But why should intraindustry trade take place? Why should the United States both buy beer from Canada and sell beer to Canada? Beer is produced in many different countries, but a beer company in one country will differentiate its beer from that of a beer company in another country. For people to benefit from the variety of beer, we might see beer produced in the United States (for example, Budweiser) being exported to Canada and, at the same time, see beer produced in Canada (for example, Molson) being exported to the United States. If all beer were exactly the same (a homogeneous commodity), such trade within the beer industry would make little sense, but it is easily understood when products are differentiated.

**intraindustry trade** trade between countries in goods from the same or similar industries.

**interindustry trade** trade between countries in goods from different industries.
Advertising  Product differentiation also explains why firms use so much advertising—that is, the attempt by firms to tell consumers what is good about their products. If all products were homogeneous, then advertising would make little sense: A bar of gold bullion is a bar of gold bullion, no matter who sells it. But if a firm has a newly differentiated product in which it has invested millions of dollars, then it needs to advertise that product to prospective customers. You can have the greatest product in the world, but it will not sell if no one knows about it. Advertising is a way to provide information to consumers about how products differ.

Economists have debated the role of advertising in the economy for many years. Many have worried about the waste associated with advertising. For instance, the parent companies of Pepsi-Cola and Coca-Cola spend large sums of money on advertising for Aquafina and Dasani, their bottled water brands. It is hard to see how catchy phrases like “make your mouth water” and large advertising campaigns are providing useful information to consumers about a product that essentially is filtered tap water. One explanation is that the purpose of the advertising in these cases is to get people to try the product. If they like it, they will buy more; if they do not like it, they will not—but without the ad they might not ever try it. Whatever the reason, advertising will not sell an inferior product—at least, not for long. For example, despite heavy advertising, Federal Express failed miserably with Zapmail—a product that guaranteed delivery of high-quality faxes of documents around the country within hours—because of the superiority of inexpensive fax machines that even small businesses could buy. The Iridium satellite phone service was forced into bankruptcy in late 1999 because of the rapid spread of cell phone technology and networks all over the world.

Others say that advertising is wasteful partly because it is used to create a perception of product differentiation rather than genuine differences between products. For example, suppose Coke and Pepsi are homogeneous products (to some people’s tastes, they are identical). Then advertising simply has the purpose of creating a perception in people’s minds that the products are different. If this is the case, product differentiation may be providing a false benefit, and the advertising used to promote it is a waste of people’s time and effort.

Consumer Information Services  The existence of magazines such as Consumer Reports is explained by product differentiation. These magazines would be of little use to consumers if all products were alike.

Such services also may help consumers sort through exaggerated claims in advertising or help them get a better perception of what the real differences between products are. It is hard to sell an expensive product that ends up last on a consumer-rating list, even with the most creative advertising.

How Are Products Differentiated?

Altering a product’s physical characteristics—the sharpness of the knife, the calorie content of the sports drink, the mix of cotton and polyester in the shirt, and so on—is the most common method of product differentiation. JetBlue differentiated itself from other airlines by offering leather seats and satellite television on every seat on its airplanes. As the example of Caterpillar shows, products also can be differentiated on features other than the physical characteristics. Related features such as low installation costs, fast delivery, large inventory, and money-back guarantees also differentiate products.

Location is another important way in which products are differentiated. A CVS Pharmacy or a McDonald’s down the block is a very different product for you from a CVS Pharmacy or a McDonald’s 100 miles away. Yet only the location differentiates the product.
Time is yet another way to differentiate products. An airline service with only one daily departure from Chicago to Dallas is different from a service with 12 departures a day. Adding more flights of exactly the same type of air service is a way to differentiate the product. A 24-hour supermarket provides a different service from one that is open only during the day.

Convenience increasingly is being used by firms to differentiate products. How could peanut butter and jelly sandwiches, a standard for lunch, be more convenient? You can buy frozen peanut butter and jelly sandwiches on white bread. Prepackaged salads containing greens, dressing, and croutons; yogurt in a tube; single-serving microwaveable soup containers—these all are products that have become very popular in recent times as people’s lives have become busier and more hectic. Similarly, a firm like Netflix has eliminated the need to make a trip to the video store by making it possible for consumers to get movie rentals delivered to their homes.

The Optimal Amount of Product Differentiation at a Firm

Product differentiation is costly. Developing a new variety of spot remover that will remove mustard from wool (no existing product is any good at this) would require chemical research, marketing research, and sales effort. Opening another Lenscrafters (the United States already has hundreds of stores) requires constructing a new store and equipping it with eyeglass equipment, trained personnel, and inventory.

But product differentiation can bring in additional revenue for a firm. The new spot remover will be valued by football fans who want to keep warm with woolen blankets or scarves but who also like mustard on their hot dogs. The people who live in the neighborhood where the new Lenscrafters opens will value it because they do not have to drive or walk as far.

The assumption of profit maximization implies that firms will undertake an activity if it increases profits. Thus, firms will attempt to differentiate their products if the additional revenue from product differentiation is greater than the additional costs. This is exactly the advice given to managers in business school courses. “Create the largest gap between buyer value … and the cost of uniqueness” is the way Harvard Business School professor Michael Porter puts it in his book *Competitive Advantage*.¹ If the additional revenue is greater than the additional cost, then business firms will undertake a product-differentiation activity.

For a given firm, therefore, there is an optimal amount of product differentiation that balances out the additional revenue and the additional cost of the product differentiation. This is illustrated in Figure 11-2, which shows the amount of product differentiation chosen by a firm. For a company that owns and operates a haunted house, the horizontal axis is the amount of gore and scary features in the haunted house. The additional revenue from adding more gore and scary features to a haunted house is shown by the downward-sloping line. Although more gore and scary features attract additional customers, the additional revenue from increasing the amount of gore and scary features declines because only so many people would consider visiting a haunted house in a given area. It, therefore, is increasingly difficult to attract additional customers. The additional cost of adding more gore and scary features to a haunted house is shown by the upward-sloping line. This additional cost increases because the cheapest effects that could be included for differentiation would be added first. The optimal amount of gore and scary features for a haunted-house operator is the point at which the additional revenue from more gore and scary features is just equal to the additional cost. Beyond that point, more gore and scary features would reduce profits, because the additional cost would exceed the additional revenue.

This analysis for haunted-house owners is far from trivial. Theme parks increasingly are interested in attracting Halloween traffic, and more gore and scary features attract more customers. In some theme parks, Halloween is the largest event all year.

Using this analysis in practice is difficult because the revenue gains from product differentiation depend on what other firms do. The amount of additional revenue generated by additional gore and scary features in a haunted house depends on how much gore and how many scary features are included in other nearby haunted houses. In the next section, we will look at more formal models of industries with differentiated products.

**Monopolistic Competition**

The model of monopolistic competition, first developed by Edward Chamberlin of Harvard University in the 1930s, is designed to describe the behavior of firms operating in differentiated product markets. Monopolistic competition gets its name from the fact that it is a hybrid of monopoly and competition. Recall that monopoly has one seller facing a downward-sloping market demand curve with barriers to the entry of other firms.
Competition has many sellers, each facing a horizontal demand curve with no barriers to entry and exit. Monopolistic competition, like competition, has many firms with free entry and exit, but, as in monopoly, each firm faces a downward-sloping demand curve for its product.

What’s the Future of Product Differentiation?

How many types of running shoes do you think will be available for people to buy years from now? Now, about 285 different types are available, but the number has grown tremendously in the last 25 years—only five types were available in the 1970s. This large increase in product differentiation is not unique to running shoes; it has occurred in virtually all markets. Colgate now produces 17 different types of toothpaste, compared with only two types in the 1970s. But will this rapid increase in product differentiation continue?

To determine whether an economic trend will continue, we first need to explain the trend. According to the theory of the optimal amount of product differentiation at a firm (see Figure 11-2), a possible explanation for the increase in product differentiation is a reduction in its cost. Shifting the curve showing the “additional cost of product differentiation” down in Figure 11-2 would lead to more differentiated products. In fact, evidence indicates that the cost of product differentiation has been reduced; computerized machines used to produce shoes make it easier to change the settings and alter the shape, thickness, or treads of rubber soles.

So the model explains the recent trends very well, and if the costs of product differentiation continue to fall in the future, we can expect a greater variety of products.

Evidence already shows that computer technology is continuing to lower the cost of product differentiation. For example, a company called Footmaxx uses computers to determine a person’s individual foot shape and gait characteristics. As the customer walks on a sensitive pad, the foot shape and pressure are captured many times throughout the gait cycle, and the data are fed into a computer, which prescribes a custom orthotic insole, designed to fit the foot exactly and correct the individual’s gait. Nike’s iD division has been letting sneakerheads design their own shoes online for several years; in May 2005, it went one step further by inviting sneaker fans to use their cell phones to customize a pair of shoes that was displayed on a 22-story screen in the middle of Times Square in New York City. After a minute-long session designing their shoe, the consumer could then download the design as wallpaper for his or her mobile phone or go online and buy the newly designed sneakers. The interactive experience combined both design and technology innovations. Other companies are following suit. Converse recently launched its own “Design Your Own” service on its website.

In principle, it will be possible to choose a shoe that is unique to the individual—not only in style and color, but also in the shape of the foot and the characteristics of the gait. One can imagine more than a thousand types of running shoes—perhaps millions, one for every runner! Similar ideas are being developed for clothing—for example, a laser scans a person’s body and a shirt is made exactly in the person’s size.

Of course, these projections for the future require the ceteris paribus assumption that other things will remain the same. How important do you think that assumption is in this case? In particular, do you think consumers might change their behavior in response to such an explosion of product types?
The Deliciousness of Product Differentiation

In the last two decades, Americans stopped thinking about coffee as a homogeneous beverage and began to pay attention to whether the coffee they drank came from Starbucks or Peet’s, and whether it was brewed from beans grown in Sumatra or Kenya. In the past decade, a similar transformation has occurred in the chocolate industry. This article, from the Associated Press, talks about how American consumers now care about who made their chocolate, whether the cacao beans came from Guatemala or São Tomé and Príncipe, and how high the cacao count is.

Calif. Chocolatiers Boost Premium Boom

BY LISA LEFF

Americans’ love of chocolate has become a dark and bittersweet affair, and it took a former vintner to make it so. John Scharffenberger and Robert Steinberg launched the first U.S. chocolate manufacturing company in half a century, drawing heavily on Scharffenberger’s refined palate and his past as a maker of sparkling wines. Together, they set out to do for dark chocolate what fellow Californian Robert Mondavi had done for wine—demystify, democratize and domesticate it. Call it kismet, uncanny timing or creative chemistry, but in the 11 years since co-founding Scharffen Berger Chocolate Maker they have watched the public’s appetite for gourmet chocolate expand from a Valentine’s Day extravagance to an everyday indulgence.

“We’ve gone through a food revolution in this country,” said Scharffenberger. Just as Americans have become more sophisticated about wine, whole-bean coffee, artisan cheeses and other products that once were the luxury of certified foodies have been mainstreamed to the masses. “The one thing that remained to be done was chocolate, and that’s what we hit on,” Scharffenberger said. Like the label of a fine wine, the wrapper on a Scharffen Berger chocolate tells you exactly what’s inside. It was the first U.S. chocolatier to feature the cacao count prominently on its wrappers—the higher the number, the darker and more bitter the chocolate. And the source of the beans is also noted, for those who like knowing whether their chocolate got its start in Madagascar, Ecuador, Ghana or Peru. Scharffen Berger bars now are prominently displayed in the checkout lines of grocers like Trader Joe’s, Andronico’s and Whole Foods.

Yet venerable players like Reading, Pa.-based Godiva Chocolatier Inc., part of The Campbell Soup Co., and Ghirardelli Chocolate Co., now headquartered in San Leandro, Calif., jump-started the trend, said Marcia Mogelonsky, an analyst with the market research firm Mintel International. They popularized fancy chocolates with upscale, single-serving packaging, wider distribution and savvy marketing, she said. Even The Hershey Co., the name synonymous with American chocolate, has invested heavily in premium chocolate, showing it is more than a fad, she said. Besides buying Scharffen Berger 1 1/2 years ago, the company has introduced its own line of premium chocolate bars and late last year purchased Ashland, Ore.-based Dagoba Organic Chocolate.

Between 2003 and 2005, U.S. sales of premium chocolates went from $1.4 billion to $1.79
The monopolistically competitive firm’s demand curve slopes downward because of product differentiation. When a monopolistically competitive firm raises its price, the quantity demanded of its product goes down but does not plummet to zero, as in the case of a competitive firm. For example, if Nike raises the price of its running shoes, it will lose some sales to Reebok, but it will still sell a considerable number of running shoes because some people prefer Nike shoes to other brands. Nike running shoes and Reebok running shoes are differentiated products to many consumers. On the other hand, a competitive firm selling a product like wheat, which is a much more homogeneous product, can expect to lose virtually all its customers to another firm if it raises its price above the market price.

As we will see, free entry and exit is an important property of monopolistic competition. Because of it, firms can come into the market if they can make a profit or leave the market if they are running losses.

A Typical Monopolistic Competitor

Figure 11-3 illustrates the key features of the model of monopolistic competition. Each graph in Figure 11-3 shows a typical monopolistically competitive firm. At first glance, the graphs look exactly like the graph for a monopoly, introduced in Chapter 10. They should, because both monopolistic and monopolistically competitive firms face downward-sloping demand curves. The demand curve facing a monopolistically competitive firm, however, has a different interpretation because other firms are in the industry. The demand curve is not the market demand curve; rather, it is the demand curve that is specific to a particular firm. When new firms enter the industry—for example, when Converse enters with Nike and Reebok—the demand curves specific to both Nike and Reebok shift to the left. When firms leave, the demand curves of the remaining firms shift to the right. The reason is that new firms take some of the quantity demanded away from existing firms, and when some firms exit, a greater quantity is demanded for the remaining firms.
The difference between the graphs for a monopolist and a monopolistic competitor shows up when we move from the short run to the long run, that is, when firms enter and exit. This example is illustrated in Figure 11-3. Note that the three graphs in the

**Monopolistic Competition**

Each graph shows a typical firm in a monopolistically competitive industry. Firms enter the industry if they can earn profits, as in graph (a). This will shift the demand and marginal revenue curves to the left for the typical firm because some buyers will switch to the new firms. Firms leave if they face losses, as in graph (b). This will shift the demand and marginal revenue curves to the right because the firms that stay in the industry get more buyers. In the long run, profits are driven to zero, as in graph (c).

![Figure 11-3](image-url)
figure have exactly the same average total cost curve. The graphs differ from one another in that the location of the demand and marginal revenue curves relative to the average total cost curve is different in each. Graphs (a) and (b) represent the short run. Graph (c) represents the long run, after the entry and exit of firms in the industry.

Observe that the demand curve in graph (c) is drawn so that it just touches the average total cost curve. At this point, the profit-maximizing price equals average total cost. Thus, total revenue is equal to total costs, and profits are zero. On the other hand, in graphs (a) and (b), the demand curve is drawn to show either a positive profit or a negative profit (loss) because price is either greater than or less than average total cost.

**The Short Run: Just Like a Monopoly** Consider the short-run situation, before firms either enter or exit the industry. The monopolistic competitor’s profit-maximization decision is like that of the monopoly. To maximize profits, it sets its quantity to the point at which marginal revenue equals marginal cost. Because the monopolistically competitive firm faces a downward-sloping demand curve, its profit-maximizing price and quantity balance the increased revenue from a higher price with the lost customers brought on by the higher price. The marginal-revenue-equals-marginal-cost condition achieves this balance. The profit-maximizing quantity of production is shown by the dashed vertical lines in graphs (a) and (b) of Figure 11-3.

For example, For Eyes, Lenscrafters, and Pearle Vision are monopolistic competitors in many shopping areas in the United States. Each local eyeglass store has an optometrist, but each offers slightly different services. At a shopping area with several of these eyeglass stores, if one of them raises prices slightly, then fewer people will purchase glasses from that store. Some people will walk all the way to the other end of the mall to the store with the lower-priced glasses. Others, however, will be happy to stay with the store that raised its prices because they like the service and the location. These outlets are not monopolists, but the downward slope of their demand curves makes their pricing decision much like that of monopolists. The slope of the demand curve for a monopolistic competitor may be different from that for a monopolist, but the qualitative relationship between demand, revenue, and costs—and the firm’s decisions in setting quantity and price—is the same.

**Entry and Exit: Just Like Competition** Now consider entry and exit, which can take place over time. In the model of long-run competitive equilibrium in Chapter 9, we showed that if economic profits could be made, new firms would enter the industry. If firms were running losses, then firms would exit the industry. Only when economic profits were zero would the industry be in long-run equilibrium, with no tendency for firms either to enter or to exit.

In monopolistic competition, the entry and exit decisions are driven by the same considerations. If profits are positive, as in graph (a) of Figure 11-3, firms have an incentive to enter the industry. Consider the market for skin care products. Beginning in the 1980s, liquid soap products, especially soaps scented with natural oils, were introduced by a few manufacturers and quickly caught on with consumers. Soon, virtually every manufacturer of soap and shampoo products began to offer liquid soap products fortified with vitamins and flavored by aromatics. In contrast, if profits are negative, as shown in graph (b) of Figure 11-3, firms have an incentive to exit the industry. During the dot-com boom of the late 1990s, several companies entered the business of home delivery of groceries. Perhaps the best known of these firms, Webvan, tried to differentiate its product by offering to deliver groceries within a 30-minute delivery window requested by the consumer. Despite a promising start, most of these new entrants were unable to make profits and left the industry. Webvan, for example, foundered after the costs of building its own warehousing and distribution network turned out to be far greater than the revenue it could earn from grocery sales.
As we move from the short run to the long run, the entry and exit of competing firms will tend to shift the demand curve for each of the firms remaining in the industry to the point at which the demand curve and the average total cost curve are tangent—that is, the point at which the two curves just touch and have the same slope. Entry into the industry will shift the demand curve of each existing firm to the left because the existing firms will be sharing their sales with the new firms. If Suave sells a new brand of shampoo similar to Pantene shampoo, then some consumers who had been buying Pantene will instead buy Suave’s similar new shampoo. The demand for Pantene and other shampoos therefore will decline because of the availability of Suave’s new product. Thus, the existing firms will see their demand curves shift to the left—each one will find that it sells less at each price. The differences in the positions of the demand (and marginal revenue) curves in the short run and the long run illustrate this shift. The shift in the demand curve causes each firm’s profits to decline, and profits eventually decline to zero. (Recall that these are economic profits, not accounting profits, and therefore are a good measure of the incentive for firms to enter the industry.)

The case of negative profits and exit is similar. If demand is such that firms are running a loss, then some firms will exit the industry, leaving their share of sales to the surviving firms. This action causes the demand curve facing the remaining firms to shift to the right until the losses (negative economic profits) are driven to zero. When Caribou Coffee closed in Ann Arbor, University of Michigan students bought coffee at other nearby coffee shops instead, increasing the demand for coffee at these nearby shops. This is illustrated by comparing graph (b) of Figure 11-3, which shows losses in the short run, with graph (c), which shows zero profits.

The Long-Run Monopolistically Competitive Equilibrium

Two differences are notable between monopolistically competitive firms and competitive firms in the long run. To see these differences, consider Figure 11-4, which replicates graph (c) of Figure 11-3, showing the position of the typical monopolistic competitor in long-run equilibrium, after entry and exit have taken place.
First, observe that the price is greater than marginal cost for a monopolistically competitive firm. This was also true for the monopoly; it means that the market is not as efficient as a competitive market. Production is too low because the marginal benefit of additional production is greater than the marginal cost. Because each firm has some market power, it restricts output slightly and gets a higher price. The sum of producer plus consumer surplus is reduced relative to that in a competitive market. In other words, the result is a loss of efficiency—a deadweight loss.

Second, as shown in Figure 11-4, the quantity produced is not at the minimum point on the average total cost curve, as it was for the competitive industry. That is, the quantity that the monopolistic competitor produces is at a higher-cost point than the quantity that the perfectly competitive firm would produce. Thus, monopolistically competitive firms operate in a situation of excess costs. If each firm expanded production and lowered its price, average total cost would decline. Each firm operates with some excess capacity in the sense that it could increase output and reduce average total cost. The firms choose not to do so because they have some market power to keep their prices a little higher and their output a little lower than that. Their market power comes from the downward-sloping demand curve that they face. For example, each coffee shop charges a little more and sells slightly fewer cups of coffee than it would in a perfectly competitive market.

Comparing Monopoly, Competition, and Monopolistic Competition

Table 11-2 compares the different effects of competition, monopoly, and monopolistic competition.

A competitive firm will produce the quantity that equates price and marginal cost. A competitive market is efficient in that consumer surplus plus producer surplus is maximized and no deadweight loss results. Average total cost is minimized.

In a monopoly, price is greater than marginal cost. A monopoly is inefficient because consumer surplus plus producer surplus is not maximized, so a deadweight loss results. Moreover, average total cost is not minimized. Economic profits remain positive because firms cannot enter the market.

In monopolistic competition, price is also greater than marginal cost. Thus, consumer surplus plus producer surplus is not maximized, and deadweight loss results; average total cost is not minimized. Profits are zero in the long-run equilibrium, however, because of entry and exit. Monopolistic competition does not result in as efficient an outcome as competition. Monopolistic competition, as well as monopoly, is inefficient.

Product Variety versus Deadweight Loss

When comparing monopolistic competition with competition, we must recognize—as with the comparison of monopoly and competition in the last chapter—that replacing monopolistic competition with competition may be an impossibility or require a loss to society. Remember that product differentiation is the key reason for monopolistic competition. We showed in the previous section that consumers usually value the variety of products that comes from product differentiation. Some people like having both Pepsi and Coke. Roads and

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**Table 11-2**

<table>
<thead>
<tr>
<th>Type of Model</th>
<th>Price</th>
<th>Deadweight Loss?</th>
<th>Average Total Cost Minimized?</th>
<th>Profit in Long Run?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Competition</td>
<td>$P = MC$</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Monopolistic competition</td>
<td>$P &gt; MC$</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Monopoly</td>
<td>$P &gt; MC$</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
</tbody>
</table>
airports are better because of the different capabilities of earthmoving equipment sold by Caterpillar and Komatsu. Thus, eliminating monopolistic competition by having a single competitive product, whether Coksi or Catematsu, even if it were possible, probably would reduce consumer surplus by more than the gain that would come from competition over monopolistic competition.

More generally, product differentiation may be of sufficient value to consumers that it makes sense to have monopolistically competitive firms despite the deadweight loss. Or, to state it somewhat differently, the deadweight loss from monopolistic competition is part of the price consumers pay for the variety or the diversity of products.

**REVIEW**

- The model of monopolistic competition is a hybrid of competition and monopoly. Entry and exit are possible, as in competition, but firms see a downward-sloping demand curve, as in monopoly, although the market has many firms.
- The analysis of monopolistic competition in the short run is much like that of monopoly, but entry and exit lead to zero economic profits in the long run.
- Monopolistic competitors produce less than competitive firms and charge prices higher than marginal costs. Thus, a deadweight loss results from monopolistic competition. In the long run, monopolistic competition produces less than the quantity that would minimize average total cost.
- The deadweight loss and excess costs can be viewed as the price of product variety.

**Oligopoly**

Thus far, we have seen two situations in which firms have market power: monopoly and monopolistic competition. But those are not the only two. When an industry has *very few* producers—a situation termed *oligopoly*—each firm can have an influence on the market price even if the goods are homogeneous. For example, if Saudi Arabia—one of the major producers of crude oil in the world and a member of the Organization of Petroleum Exporting Countries (OPEC)—decides to cut its production of crude oil, a relatively homogeneous commodity, it can have a significant effect on the world price of oil. The effect on the price, however, will depend on what other producers do. If the other producing countries—Iran, Kuwait, and so on—increase their production to offset the Saudi cuts, then the price will not change by much. Thus, Saudi Arabia, either through formal discussion with other oil-producing countries in OPEC or by guessing, must take account of what the other producers will do.

Such situations are not unusual. The managers of a firm in an industry with only a few other firms know that their firm has market power. But they also know that the other firms in the industry have market power too. If the managers of a firm make the right assessment about how other firms will react to any course of action they take, then their firm will profit. This awareness and consideration of the market power and the reactions of other firms in the industry is called *strategic behavior*. Strategic behavior also may exist when product differentiation exists, as in monopolistically competitive industries, but to study and explain strategic behavior, it is simpler to focus on oligopolies producing homogeneous products.

A common approach to the study of strategic behavior of firms is the use of *game theory*, an area of applied mathematics that studies games of strategy like poker or chess. Game theory has many applications in economics and the other behavioral sciences. Because oligopoly behavior has many of the features of games of strategy, game theory provides a precise framework to better understand oligopolies.
An Overview of Game Theory

Game theory, like the basic economic theory of the firm and consumer (described in Chapters 5 and 6 of this book), makes the assumption that people make purposeful choices with limited resources. More precisely, game theory assumes that the players in a game try to maximize their payoffs—the amount they win or lose in the game. Depending on the application, a payoff might be measured by utility, if the player is a person, or by profits, if the player is a firm.

Game theory endeavors to go beyond basic economic theory in that each player takes explicit account of the actions of each and every other player. It asks questions like: “In a poker game, what should Mary do if Deborah sees her bet and raises her by $10?” The aims of game theory are to analyze the choices facing each player and to design utility-maximizing actions, or strategies, that respond to every action of the other players.

An important example in game theory is the game called the prisoner’s dilemma, illustrated in Figure 11-5. The game is between Bonnie and Clyde, two prisoners who have been arrested for a crime that they committed. The payoff matrix shown in Figure 11-5 has two rows and two columns. The two columns for Bonnie show her options, which are labeled at the top “confess” and “remain silent.” The two rows for Clyde show his options; these also are labeled “confess” and “remain silent.” Inside the boxes, we see what happens to Bonnie and Clyde for each option, confess or remain silent. The top right of each box shows what happens to Bonnie. The bottom left of each box shows what happens to Clyde. Each year of prison sentence is considered to have a payoff equal to negative one. Both Bonnie and Clyde would like to maximize their payoff, which means they would prefer a shorter sentence of one year (with a payoff equal to negative one) to longer sentences of five years (with a payoff equal to negative five) or seven years (with a payoff equal to negative seven).

The police already have enough information to get a conviction for a lesser crime, for which Bonnie and Clyde would each get a three-year jail sentence. Thus, if both Bonnie and Clyde remain silent, they are sent to jail for three years each, as shown in the lower right-hand corner of the table.

Two Prisoners Facing a Prisoner’s Dilemma

Clyde and Bonnie are in separate jail cells, held for a crime they did commit. The payoff for each—with each year of prison having a payoff of −1—is given in the appropriate box and depends on whether they both confess or they both remain silent or one confesses while the other remains silent. The top right of each box shows Bonnie’s payoff; the bottom left of each box shows Clyde’s payoff.
But Bonnie and Clyde each have the option of confessing to the more serious crime that they committed. If Bonnie confesses and Clyde does not, she gets a reward. If Clyde confesses and Bonnie does not, he gets a reward. The reward is a reduced penalty: The jail sentence is only one year—not as severe as the three years it would be if the prosecutor had no confession. The penalty for being convicted of the more serious crime in the absence of a confession is seven years. Thus, if Bonnie confesses and Clyde does not, he gets a seven-year sentence. If both confess, they each get a five-year sentence.

What should Clyde and Bonnie do? The answer depends on their judgment about what the other person will do. And this is the point of the example. Bonnie can either confess or remain silent. The consequences of her action depend on what Clyde does. If Bonnie confesses and Clyde confesses, she gets five years. If Bonnie confesses and Clyde remains silent, Bonnie gets one year. If Bonnie remains silent and Clyde remains silent, she gets three years. Finally, if Bonnie remains silent and Clyde confesses, she gets seven years. Clyde is in the same situation as Bonnie.

Think about a strategy for Bonnie. Bonnie is better off confessing, regardless of what Clyde does. If Clyde confesses, then by confessing herself, Bonnie gets five years rather than the seven years she would get by remaining silent. If, on the other hand, Clyde remains silent, then Bonnie is still better off by confessing because she gets only one year rather than the three years she would get by remaining silent. Hence, Bonnie has a great incentive to confess because she gets a reduced sentence in either case.

Clyde is in the same situation. He can compare what his sentence would be whether Bonnie confesses or remains silent. In this case, Clyde also is better off confessing regardless of whether Bonnie confesses or remains silent.

What this reasoning suggests is that both Bonnie and Clyde will confess. If they both had remained silent, they would have gone to jail for only three years, but the apparently sensible strategy is to confess and go to jail for five years. This is the prisoner’s dilemma. The case where both remain silent is called the cooperative outcome of the game because to achieve this, they would somehow have to agree in advance not to confess and then keep their word. The case in which both confess is called the noncooperative outcome of the game because Clyde and Bonnie follow an “everyone for himself or herself” strategy. Note that the cooperative outcome is preferred to the noncooperative outcome by both Clyde and Bonnie, yet both choose the option that results in the noncooperative outcome.

The mathematician and Nobel laureate in economics John Nash defined the noncooperative equilibrium—which economists call a Nash equilibrium—as a set of strategies from which no player would like to deviate unilaterally—that is, no player would see an increase in his or her payoff by changing his or her strategy while the other players keep their strategies constant.

**Applying Game Theory to Oligopolies**

How do we apply game theory to determine the strategy of firms in an oligopoly? The easiest case is in an industry with only two firms. This is a particular type of oligopoly called a duopoly. A prominent example of an industry characterized by a duopoly is the large commercial airplane manufacturing industry, where Boeing and Airbus have to plan their strategy taking the other’s strategy into account. The competition between FedEx and UPS in the overnight package delivery business is another example. In a duopoly, market supply is determined by the output of the two firms, so in deciding how much more to produce of a good, the firm has to consider its own additional costs of production, the change in the market price when it increases production, and how the other firm’s subsequent response in terms of increasing or decreasing its production will affect the market price. A numerical example is worked out for you in the accompanying
A Duopoly Game

On October 10, the town of Pumpkinville will hold a farmer’s market at which folks can buy giant pumpkins to carve in time for Halloween. Jack and Jill are the only two producers of giant pumpkins in Pumpkinville—Jack has a farm 50 miles east of town, while his competitor, Jill, has a farm 50 miles west of town. Jack and Jill each now have 60 giant pumpkins ready to harvest. The day before the market, Jack and Jill have to decide how many pumpkins they should harvest and transport to the market. Both are profit maximizers who take costs and revenues into account. All the costs until today (seeds, fertilizer, water, labor, and so on) cannot be altered and should not affect the decision of whether to send the pumpkins to market or let them rot on the ground.

Jack and Jill also know that while the townsfolk love their pumpkins, they are not willing to pay any price. The market demand for giant pumpkins is downward sloping, which means that the price each producer receives will depend on the total quantity of pumpkins supplied on the day of the market. So Jack’s decision about how many pumpkins to bring to the market will influence the price that Jill receives for her pumpkins, and vice versa. This situation is perfect for game theoretic analysis.

To simplify our analysis, let’s assume that Jack’s and Jill’s strategies are limited to three actions: They can bring either 30, 40, or 60 pumpkins to the market. The payoff matrix for Jack and Jill is shown in Figure 11-6. This is a three-by-three matrix with a total of nine blank boxes, one for each combination of Jack’s and Jill’s actions; the boxes are numbered for easy reference. Each of these boxes lists the profits that Jack and Jill obtain given their actions. For example, in box 1, both Jack and Jill choose to harvest and transport only 30 pumpkins to the market. In this case, Jack’s payoff is $3,600, which we write on the bottom left corner of the first box. The payoff for Jill is also $3,600 (top right corner of the first box). The rest of the payoff matrix in Figure 11-6 can be interpreted in a similar way.

Jack and Jill are aware of the nine possible outcomes, and the question is how each of them is going to

![Figure 11-6 Payoff Matrix for Jack and Jill](image)

The payoff matrix contains the profits for Jack and Jill for every possible combination of their actions. For example, in box 6, Jack sends 40 pumpkins to the market, while Jill delivers 60; Jack’s payoff is $1,600. Jill has a payoff of $2,400.
choose a quantity to deliver to the farmer's market. How many pumpkins each of them should harvest and bring to the market depends on how many the other person chooses to bring. So Jack and Jill engage in a mental exercise, each trying to figure out what the other will do.

Put yourself in Jill's shoes. She can easily see that her maximum payoff of $4,000 happens when she sends 40 pumpkins to the market while Jack sends only 30. If Jill sells 40 pumpkins, however, then Jack can increase his payoff from $3,000 to $3,200 by selling 40 instead of 30 pumpkins. So box 2 cannot be a solution to Jill's and Jack's problem. Similarly, Jack's maximum payoff of $4,000 happens when he sends 40 pumpkins to the market while Jill sends only 30. But were he to do so, then Jill would be able to increase her payoff by selling 40 pumpkins instead of 30. So box 4 cannot be a solution.

Jack and Jill may soon independently realize that box 1 provides the highest combined payoff ($7,200). If they were to collude, then they could achieve this outcome, where each farmer produces 30 pumpkins and makes $3,600. This outcome is equivalent to the monopoly solution; by colluding, Jack and Jill are effectively acting like a single producer to maximize collective profits.

But they are unlikely to be able to sustain this collusive outcome. If Jill chooses to sell 30 pumpkins, once again Jack will have the incentive to increase his production and sell 40 pumpkins, leaving Jill with a lower profit. The same is true if Jack chooses to sell 30 pumpkins because Jill has the same incentive to sell 40 pumpkins, so box 1 does not work either.

At this point you can guess that we are looking for a combination of strategies from which neither player would like to deviate unilaterally—that is, a Nash equilibrium. By carefully exploring all the boxes and checking to see whether either player has an incentive to deviate from that particular combination, we find that the only Nash equilibrium in this example is in box 5, where Jack and Jill sell 40 pumpkins each, for a payoff of $3,200 each. At that level, neither Jack nor Jill wants to produce more or less pumpkins, given the production of their competitor. That is the outcome of the duopoly situation.
$121 per pumpkin. The duopoly solution lies between the monopoly and competitive equilibria in terms of price, quantity, and profit.

**Collusion** Firms in an oligopoly know that their combined profits can be maximized if they act together as a monopolist. Firms might act together in three ways. The first is by **explicit collusion**, in which the managers communicate with each other and agree to fix prices or cut back on production. Although explicit collusion is illegal, it still happens. In the 1980s and 1990s, several firms in Florida and Texas were found guilty of agreeing to fix prices for milk sold to schools. In 1990, the Justice Department charged that several Ivy League universities colluded to offer similar financial aid packages to admitted students, thus depriving these students of the more generous aid packages that would have resulted from the schools competing with one another for the best students. The governments of many countries that produce oil routinely collude to cut back production and raise prices. A group of producers that coordinates its pricing and production decisions is called a **cartel**.

Second, in **tacit collusion** no explicit communication occurs between firms, but firms keep prices high by regularly following the behavior of one firm in the industry. The dominant firm is sometimes called a **price leader**. Third, the firms could merge and form a single entity.

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**Figure 11-7**

**Comparison of Monopoly, Duopoly, and Competitive Equilibria**

Prices and quantities for a Cournot duopoly lie between the equilibria for a monopoly and a competitive market.
Incentives to Defect In oligopoly, game theory predicts that unless there is a way to bind each firm to cooperation, there is a tendency to defect. Because the deflection results in a lower than monopoly price, consumers gain from the deflection, and deadweight loss is reduced.

Incentives to Cooperate: Repeated Games

Although the prisoner’s dilemma and the Cournot duopoly suggest a tendency toward the noncooperative outcome, a difference exists between the situation of the prisoners Bonnie and Clyde and the farmers Jack and Jill: Pumpkinville’s farmer’s market probably will be open for many years, allowing Jack and Jill to interact with each other in the future. Firms that interact with each other repeatedly may behave quite differently from firms that interact only once. If the same game is to be played year after year—a repeated game—then the firms might be able to build up a reputation for not defecting.

Experimental economists have conducted experiments in which two people play the same prisoner’s dilemma game over and over again. (The people in the experiments are given small monetary rewards rather than jail penalties.) These experiments indicate that people frequently end up using strategies that lead to a cooperative outcome. A typical strategy that people use is called “tit-for-tat.” Using a tit-for-tat strategy, one player regularly matches, in the next game, the actions of the other player in the current game. For example, Clyde’s tit-for-tat strategy would be to confess the next time the game is played if Bonnie confesses in the current game, and not to confess the next time the game is played if Bonnie does not confess in the current game. A tit-for-tat strategy gives the other player an incentive to follow the cooperative action—not confess—and thereby leads to a cooperative outcome. Players can use several other strategies to support a specific outcome in a repeated game.

Secret Defections Even though reputational consequences may help firms better sustain a cooperative outcome, firms still have incentives to defect. The incentives for a firm to defect from an agreement will be greater if it is difficult for other firms to detect the deflection. In the pumpkin example, it is impossible for Jack to increase his production without Jill’s knowing it. This makes defection less likely. If one firm can secretly increase production or cut prices, enforcing the agreement will be more difficult. But it may be possible for a member of OPEC to sell oil to China under a secret agreement, or for a member of the world coffee cartel to ship coffee without being detected, at least for a while. The impact of such secret defections is much like the situation in boxes 2 and 4 in Figure 11-6. Profits to the defector increase, and profits to the other producers decrease. Consumers are better off because the quantity supplied to the market increases, helping to lower the price.

For a long time, Japanese construction firms operated a now well-known collusion scheme called dango. Firms took turns offering a slightly lower bid, while all the other firms submitted high-priced bids to the government. This collusion ensured that each construction firm would get periodic contracts that were lucrative, without worrying about being undercut by its competitors. Ironically, and unfortunately for consumers, making the bids public made it harder for any firm to defect because firms in the agreement would know at once which firm had lowered its prices.
CONCLUSION

In this chapter, we have explored two different types of models—monopolistic competition and oligopoly—that lie in the complex terrain between competition and monopoly. The models were motivated by the need to explain how real-world firms—Johnson Publications, Liz Claiborne, Nike, and PepsiCo—and the members of OPEC operate in markets with differentiated products or with a small number of other firms or countries.

In the models introduced in this chapter, firms have market power in that they can affect the price of the good in their market. Market power enables a firm to charge a price higher than marginal cost. It is a source of deadweight loss. Observations of the behavior of actual firms show a wide variation in market power among firms.

Economists in government and businesses use the ideas about monopolistic competition and oligopoly discussed in this chapter. Economists working in the U.S. Department of Justice use them to determine whether the government should intervene in certain industries, as we will explore in Chapter 12. Consultants to business use them to help firms decide how to differentiate their products from those of other firms.

Having concluded our discussion of the four basic types of models of markets in this chapter, it is useful to remember the important distinction between models and the facts that the models endeavor to explain or predict. None of the assumptions of these models—such as homogeneous products or free entry—hold exactly in reality. For example, when contrasted with the monopolistic competition model of this chapter, the model of competition (with its assumption of homogeneous goods) might seem not to apply to many markets. Few goods are exactly homogeneous. But when economists apply their models, they realize that these models are approximations of reality. How close an approximation comes to reality heavily depends on the application. The model of competition can be helpful in explaining the behavior of firms in industries that are approximately competitive, just as the model of monopoly can be helpful in explaining the behavior of firms in industries that are approximately monopolistic. We now have a richer set of models that apply to situations far removed from competition or monopoly.

REVIEW

- Game theory provides a framework to study strategic behavior in an oligopoly. A game theory setting typically describes how the outcomes that a player can achieve by pursuing a particular strategy vary depending on the strategies pursued by the other players.
- A game theory setting can have a cooperative outcome, in which the players agree to cooperate, or a noncooperative outcome, which results when players follow their individual incentives.
- The concept of a Nash equilibrium—a set of strategies from which no player wishes to unilaterally deviate—is used to identify the noncooperative solution.
- The prisoner’s dilemma is a widely known example in which the two parties will not be able to achieve the superior cooperative equilibrium. Instead, they have to settle for the inferior noncooperative equilibrium.
- Firms can compete with one another on the basis of quantity (Cournot) or price (Bertrand). The examples we look at in this chapter are for Cournot competition.
- Game theoretic concepts can illustrate why firms in an oligopoly will be tempted to defect from any agreement and not act like a monopolist. Because a market has only a few producers, however, the outcome will not be the same as in the case of perfect competition. Prices and quantities for an oligopoly lie in between the solutions for a monopolist and for a competitive market.
- To the extent that a firm colludes, either explicitly or tacitly, it acts more like a monopolist and reduces economic efficiency by raising price above marginal cost.
- Repeated interactions among firms and the inability to defect secretly from an agreement make it more likely that collusive behavior among a group of firms is sustainable.