

**ANALYZING MANAGERIAL DECISIONS: *United Airlines***

The *WSJ* recently presented data suggesting that United Airlines was not covering its costs on flights from San Francisco to Washington, D.C. The article quoted analysts saying that United should discontinue this service. The costs per flight (presented in the article) included the costs of fuel, pilots, flight attendants, food, etc. used on the flight. They also

included a share of the costs associated with running the hubs at the two airports, such as ticket agents, building charges, baggage handlers, gate charges, etc. Suppose that the revenue collected on the typical United flight from San Francisco to Washington does not cover these costs. Does this fact imply that United should discontinue these flights? Explain.

increased the level of scrutiny they applied to internal investment proposals. In a competitive market, firms must strive for efficiency and cost control; inefficient firms lose money and are forced out of the market.

**Superior Firms**

Even in relatively competitive industries, there are firms that do exceptionally well over long time periods—for example, by being a low-cost producer or having some particular advantage, such as location, relative to competitors. The excess returns, however, often do not go to the owner of the enterprise but rather to the factor input responsible for the particular advantage. For example, land close to a highway interchange (and thus offering customers convenient access) often sells for higher prices than land farther from the interchange. Similarly, the salary of an exceptionally talented manager will be bid up by other firms. In many cases, the firms employing these superior factors of production earn only a normal rate of return ( $P^* = LRAC$ ). (These issues are discussed in more detail in Chapter 8.)

## Barriers to Entry<sup>5</sup>

Although the competitive model is a reasonable approximation in many markets, there are other industries where firms have notable market power—output decisions of individual firms have a noticeable impact on prices. A necessary condition for market power to exist is that there are effective *barriers to entry* into the industry.

To understand what constitutes an effective entry barrier, it is useful to consider the decisions of individual firms to enter an industry. Firms consider entering a new market when they observe extant firms reporting large profits. For instance, if Wen Ho observes a firm such as a cable TV company reporting large profits, his firm (like a number of other firms) is likely to consider entering the industry. Entry decisions depend on three important factors: First, Wen will be concerned about whether his entry will affect product prices. This depends, at least in part, on how existing firms are likely to respond to a new entrant. For example, are they likely to cut prices? Second, Wen will be concerned about incumbent advantages. Do existing firms have advantages that an entering firm will have difficulty duplicating—ones that make it unlikely that the new firm will enjoy similar profits? Third, Wen will be concerned about costs of exit. How much will it cost to leave the industry if this incursion fails? We discuss each of these factors in turn.

<sup>5</sup>This section provides a brief summary of the literature in economics on barriers to entry; it draws on S. M. Oster (1994), *Modern Competitive Analysis* (Oxford Press: New York).

## Incumbent Reactions

### Specific Assets

Specific assets are assets that have more value in their current use than in their next best alternative use. Consider the case of the Alaskan Pipeline. It has a high value in its current use. Yet it is completely specialized for transporting oil from the North Slope to Prudhoe Bay—it has virtually no other use. Moreover, it could be moved only at enormous expense. If existing firms in an industry have invested heavily in assets quite specialized to that market, they are likely to fight harder to maintain their positions than if their assets are less specific and can be shifted at low cost to alternative activities.

### Scale Economies

Industries with significant economies of scale have minimum efficient scales that occur at high output levels (see Chapter 5). In such industries, a new entrant must produce at high volume to be cost-effective. Large-scale production is more likely to have a material effect on price. For example, if the minimum efficient scale is 30 percent of total market demand, price certainly will decline if a new entrant tries to capture such a large share of the market—its entry undoubtedly would trigger vigorous price competition from incumbents. Note that the absolute size of the minimum efficient scale is not as important as is this scale relative to the size of the total market. Minimum efficient scale varies enormously across industries. In one study, estimates of minimum efficient scale, as a percentage of industry capacity, ranged from 0.5 percent (fruit/vegetable canning) to 33 percent (gypsum products).<sup>6</sup> Globalization of markets increases effective market size, thereby reducing this entry barrier—for example, consider the size of American versus global automobile markets.

### Reputation Effects

Potential entrants can be influenced by the reputations of existing firms in the industry for reactions to new entrants. In certain circumstances, it can pay for an existing firm to react more aggressively than would be implied by considering only its immediate interests. For example, facing a new rival, the firm might engage in extensive price cutting to establish a reputation as a formidable competitor. Note, however, that threats by firms to cut prices if entry occurs sometimes lack credibility. If new firms actually enter, existing firms might not follow through with their threats because they would be harmed by their own price cuts. Thus, it can be reasonable for a potential entrant to ignore threats—if the entrant believes that incumbents are bluffing. We examine these considerations in greater detail in Chapter 9.

## HISTORICAL APPLICATIONS

### Excess Capacity at Alcoa

In 1940, Alcoa Aluminum lost an important antitrust case involving its production strategy of maintaining excess capacity.

The judge ruled that he could think of no better “effective” deterrent to entry.

<sup>6</sup>K. Lancaster and R. Dulaney (1979), *Modern Economics: Principles and Policy* (Rand McNally: New York), 211.

## MANAGERIAL APPLICATIONS

### Entry in Consumer Electronics

Since its founding two decades ago, Xococo Inc. has evolved from producing low-cost color TVs for the Chinese market to producing flat-screen TVs. They plan to market in the United States by supplying companies like Dell or Hewlett-Packard. Rather than spending lavishly in chips and software to power their products, they buy the components, assemble the gadgets, and undercut the industry leaders' prices. Thus, consumer electronics leaders like Sony and Matsushita are threatened the way IBM was by the rise of the PC clone.

Source: E. Ramstad and P. Dvorak (2003), "Off-the-Shelf Parts Create New Order in TVs, Electronics," *The Wall Street Journal* (December 16), A1.

### Excess Capacity

If firms with excess capacity cut production, they can be confronted with much higher average costs (depending on the slopes of their average cost curves). Also, firms with excess capacity are better able to satisfy the demands of new customers should they lower price and force a rival out of business. Potential competitors, therefore, may be less likely to enter when there is excess capacity in the industry because they anticipate more aggressive reactions on the part of incumbents.<sup>7</sup> Excess capacity frequently exists for completely innocuous reasons. For example, a firm facing cyclical production or anticipating growth has excess capacity over some time spans because it has invested in additional capacity to satisfy peak demands better. In other cases, excess capacity may be chosen specifically to deter entry.

### Incumbent Advantages

#### Precommitment Contracts

Existing firms often have long-term contracts for raw materials, distribution outlets, shelf space, and delivery of the final product. These contracts can serve as a deterrent to entry, since they limit the opportunities for customers and suppliers to switch from incumbent firms to new entrants.

#### Licenses and Patents

Sometimes, entry is limited through government restrictions such as licensing requirements and patents. For instance, the number of doctors is limited effectively by state medical licensing requirements. This restriction allows doctors to charge higher prices than if entry were unrestricted. Regulators and licensed physicians justify such restrictions with arguments based on consumer protection. Yet, whether or not consumers benefit from stringent licensing is debatable—given that they pay higher prices.

Normal patent life is 17 years. Over this period, other firms are prohibited from copying the innovation; thus a patent provides a firm with potential market power. Patents also provide important incentives to innovate. From a practical standpoint, the effectiveness of a patent in blocking entry varies dramatically (some patents can be circumvented by clever design, for example).

<sup>7</sup>Excess capacity can occur because of significant declines in industry demand. In this case, profits are likely to be low and entry will not be attractive. Our current discussion focuses on cases where incumbents are making economic profits and have excess capacity. These economic profits might not induce entry because of the fear of price cutting by incumbents.

## MANAGERIAL APPLICATIONS

### Government Restrictions on Exit

Some regulators want to restrict companies from closing plants. These regulators appear motivated by concerns over people who lose their jobs when a company closes a plant. Restrictions on plant closings, however, are likely to reduce the desirability of entry into an industry—firms will be reluctant to enter an industry if they cannot exit easily when they are losing money. Thus, potential effects of government restrictions on exit are less vigorous competition in the affected industries, higher consumer prices, and lower levels of employment.

### Learning-Curve Effects

In Chapter 5, we discussed how average costs are reduced in some industries through production experience. As production experience accumulates, the firm learns how to lower unit costs. Learning-curve effects can result in new rivals having a cost disadvantage relative to existing firms. Whether these effects are important depends on whether the new entrants simply can copy the techniques learned by existing firms through their experience.

### Pioneering Brand Advantages

Sometimes, a firm benefits from being first in an industry. In some industries—over-the-counter drugs, for example—a satisfied customer might be reluctant to switch brands even if the price of a competing product is substantially lower. This tendency is likely to be strongest in *experience goods*, which have to be tried by the customer to ascertain quality. For instance, customers might hesitate to try a new pain reliever because they fear that it might not be as effective as their regular brand. Where quality can be judged by inspection prior to purchase, this advantage of incumbents is lower. Sometimes the incumbent's advantage with an experience good can be overcome by a new entrant through free samples, endorsements, or government certification. Each of these methods entails additional costs—these costs of overcoming incumbent advantages deter entry.

### Exit Costs

Another important entry consideration centers on the costs of exit. In some industries, it is possible to “hit and run.” For instance, forming a new company to seal asphalt driveways requires little investment in specialized equipment or training. A new firm can enter quickly when the profit potential is high and exit at low cost if profits decline. In other industries, especially those with specific assets, exit costs can be high. In such industries firms bear significant costs, such as moving employees to new locations and liquidating plants and other assets when they decide to exit. High exit costs deter initial entry.

## Monopoly

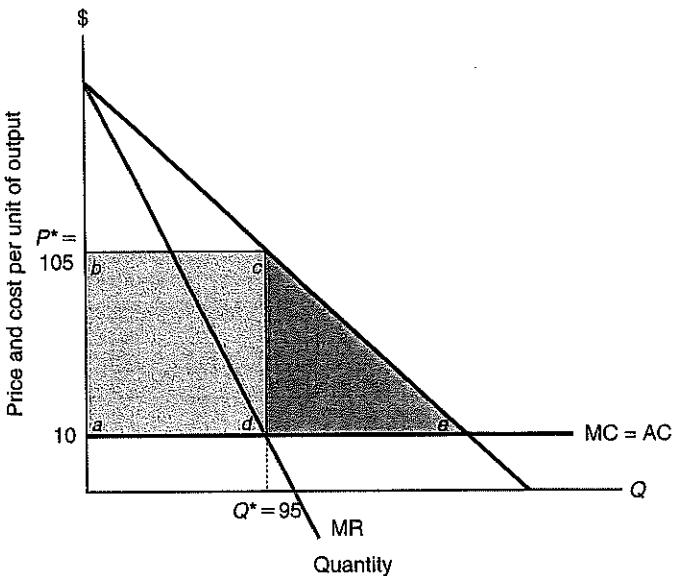
Effective barriers to entry limit the threat of competition and give incumbent firms market power. Although competitive markets are at one end of the spectrum, at the other end is *monopoly*—where there is but a single firm in the industry. Here, industry and firm demand curves are one and the same.

### Profit Maximization

Suppose that a monopolist charges the same price to all customers. (As discussed shortly, such a pricing policy might be motivated by either government regulation or the inability

**Figure 6.5 Monopoly**

This figure illustrates the price and output decisions of a monopolist. In the example, demand is  $P = 200 - Q$ . Marginal costs are \$10. The profit-maximizing output occurs at 95 units, where  $MR = MC$ . To sell this output, the firm charges a price of \$105. The firm makes \$95 per unit profit ( $\$105 - \$10$ ) for a total profit of \$9,025 ( $\$95 \times 95$ ), as indicated by the shaded rectangle  $abcd$ . Some consumers are willing to pay more than the marginal cost of production, yet do not receive the product. The associated loss in potential gains from trade is pictured by the shaded triangle  $cde$ . The firm does not lower the price to sell to these consumers because it does not want to lower the price for other customers.



to prevent resale among customers; in Chapter 7, we relax this restriction.) The firm's objective is to choose the price-quantity combination along the demand curve that maximizes profits. This combination occurs where marginal revenue equals marginal cost.

For purposes of illustration, consider the following linear demand curve:

$$P = 200 - Q \quad (6.4)$$

(Assume that marginal cost is constant at \$10.) Recall from Chapter 4 that the marginal revenue curve for a linear demand curve is a line with the same intercept and twice the negative slope. Figure 6.5 displays the demand curve, marginal revenue curve, and marginal cost curve in this example. Optimal output occurs at 95 units—where  $MR = MC$ . To sell this output, the firm charges a price of \$105. The firm makes \$95 profit per unit ( $\$105 - \$10$ ) for a total profit of \$9,025 ( $\$95 \times 95$ ); this is indicated by the shaded rectangle  $abcd$ .

As opposed to pure competition, monopolistic suppliers charge customers more than the marginal and average costs of production and distribution; the firm thus earns an economic profit. Monopolies restrict output compared to competitive industries. In our example, if the industry were competitive, the market price would be \$10 (marginal cost) and total quantity sold would be 190 units. (Pricing by firms with market power is discussed in additional detail in Chapter 7.)

#### Unexploited Gains from Trade

Given the monopolist's output and pricing choices, some consumers are willing to pay more than the marginal cost of production and distribution, yet do not purchase the product. Thus, not all gains from trade are exhausted. The associated loss in potential gains from trade is pictured by the shaded triangle  $cde$  in Figure 6.5. Consumers along this segment of the demand curve value the product at more than \$10 but

*Question 12*

### **ANALYZING MANAGERIAL DECISIONS: Pricing and Investment Decisions**

You work for a drug manufacturing company that holds a patent on Hair Grow, the world's most effective drug for restoring hair. Your job is to analyze the pricing and investment decisions facing the firm. Your marketing group estimates that Hair Grow has the following demand curve:

$$P = 101 - .00002Q$$

1. Your marginal cost for producing a Hair Grow pill is \$1. What is the profit-maximizing price and quantity? What is your profit?

2. Suppose that your production facility can only produce 1,000,000 pills. What is your optimal price and quantity given the production constraint? What are your profits?
3. Suppose that you could increase the capacity of your plant to 3,000,000 pills within a two-year period for a cost of \$30,000,000. Should you undertake the investment (for simplicity, assume you can borrow the funds for the expansion at a 0 percent interest rate)?

less than \$105. The firm does not lower the price to sell to these consumers because it does not want to lower the price for other customers (recall that in this chapter we presume the firm charges the same price to all customers). From the firm's standpoint, any gain from selling to additional customers would be more than offset by the loss from lowering its price to all its customers.<sup>8</sup>

## Monopolistic Competition

As the name implies, *monopolistic competition* is a market structure that is a hybrid between competition and monopoly. In this market structure, there are multiple firms that produce similar products. There is free exit from and entry into the industry. Yet competition does not eliminate market power because the firms sell differentiated products. Examples of such industries include toothpaste, golf balls, skis, tennis rackets, shampoo, and deodorant. For instance, although Colgate and Crest compete directly, many customers do not view these brands of toothpaste as perfect substitutes. These companies thus have some market power. New toothpaste firms are likely to enter the industry if the existing firms report large profits—there are no significant barriers to entry.

Monopolistic competition is similar to monopoly in that firms under both market structures face downward-sloping demand curves: A toothpaste company can raise its price without losing all sales. Given that the firms face downward-sloping demand curves, each strives to select the price-quantity combination that maximizes its profits. The output decision is based on the same analysis as for the pure monopolist—choose that output where  $MC = MR$ .

<sup>8</sup>Economists frequently refer to these lost gains from trade as a *dead-weight loss*. This inefficiency (or *social cost*) is one reason why governments might pass regulations like antitrust laws to restrict the formation of monopolies. But these regulations also can be motivated by concerns about the higher prices that consumers pay when they face monopolistic suppliers. Although government regulation has the potential to reduce inefficiencies and wealth transfers from consumers to firms, it is important to keep in mind that government regulation is not costless. There are salaries for regulators and court costs, for instance. From a societal viewpoint, the costs of government regulation should be weighed against the benefits. These issues are discussed in greater detail in Chapter 21.

# Pricing with Market Power

## CHAPTER OUTLINE

- Pricing Objective
- Benchmark Case: Single Price per Unit
  - Profit Maximization
  - Estimating the Profit-Maximizing Price
  - Potential for Higher Profits
- Homogeneous Consumer Demands
  - Block Pricing
  - Two-Part Tariffs
- Price Discrimination—Heterogeneous Consumer Demands
  - Exploiting Information about Individual Demands
  - Using Information about the Distribution of Demands
- Bundling
- Other Concerns
  - Multiperiod Considerations
  - Strategic Interaction
  - Legal Issues
- Implementing a Pricing Strategy
- Summary

**I**ntruit began as a small software company in 1983 with its new program *Quicken*—a personal finance program that addressed the common household problem of balancing the family's checkbook. By 2008, Intuit had grown to a company with over \$2.6 billion in annual revenue and publicly traded stock on the Nasdaq Stock Market. Its flagship products in 2008 included *Quicken*, *QuickBooks*, and *TurboTax*.

A visit to Intuit's cyberstore in 2008 would have revealed many interesting pricing decisions. Consider the following examples: (1) Intuit offered four versions of *Quicken* including its *Starter*, *Deluxe*, *Premier*, and *Home & Business* editions. The prices for these products ranged from the *Starter Edition* selling at \$29.99 to the *Home & Business Edition* selling at \$99.99. (2) The three higher priced editions could read computer files produced by older versions of *Quicken*, but the low-priced *Starter Edition* could not. Thus existing users who wanted to update their software, but use existing data files, had to purchase one of the higher priced alternatives. (3) Existing *Quicken* users were offered

\$20 off the retail price and a \$10 mail-in rebate (good until July 31, 2008) if they purchased *Quicken Deluxe 2008*. (4) Customers who purchased *Quicken* were given the option to purchase *TurboTax* (Intuit's popular tax preparation software) and *Quicken* as a bundle at a \$20 savings from the normal online prices. (5) Online customers could enter a "Special Offer Code" that gave discounts to customers with the code. (6) Intuit offered free trials on some of their products, such as *Quicken Bill Pay*. (7) Packages of 250 standard checks were priced at 26 cents per check, while packages of 2,000 checks were priced at only 9 cents per check.

Pricing is a key managerial decision. These examples illustrate some of the complexities associated with product pricing. For example, how should managers set their basic prices? Why do firms use coupons and rebates? Why are some customers charged higher prices for the same product than others? Why do firms bundle products? Why do firms offer a line of similar products at different price points? Why would a firm ever give its products away? Why do some firms offer volume discounts?

In this chapter we present a basic analysis of pricing with market power and provide answers to these and related questions. We organize the remainder of the chapter as follows: First, we discuss the underlying objective of pricing decisions. Next, we analyze the benchmark case where the firm charges the same price to all customers. Subsequently, we consider more complex pricing policies. The chapter ends with a brief discussion of several other issues, including multiperiod considerations, strategic interactions, legal and implementation issues.

## Pricing Objective

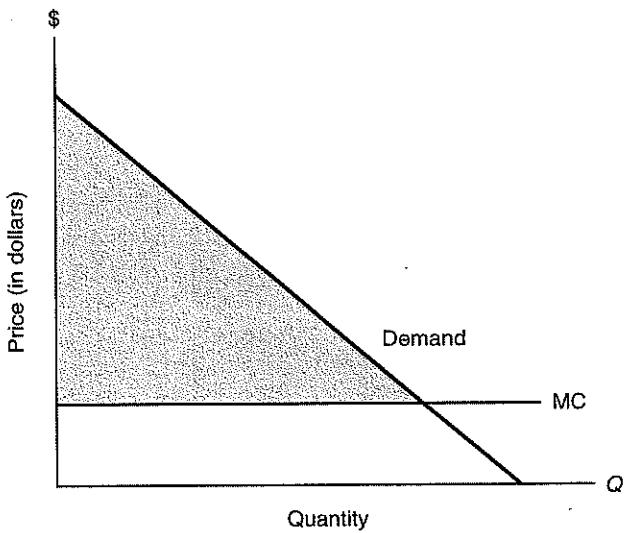
A firm has *market power* when it faces a downward-sloping demand curve. Firms with market power can raise price without losing all customers to competitors. The ultimate objective is to choose a pricing policy that maximizes the firm's value. We continue with the standard economic analysis in which managers seek to maximize profits over a single period. Although managers actually seek to maximize the present value of all future profits, if the business setting is expected to be stationary, these problems are equivalent. Later in this chapter, we discuss how concerns about future profits can affect the current pricing decision. Nonetheless, our single-period analysis provides useful insights into pricing decisions.

Figure 7.1 (page 208) depicts a firm's demand curve for and its marginal cost of producing the product. The demand curve reflects what consumers are willing to pay for the product. Only in quite special cases is it in the interests of the firm to sell the product at below marginal cost: It can do better by not producing the product. (Later in this chapter, we examine multiperiod considerations that might prompt firms to set current price below marginal cost.) Thus, the maximum potential gains from trade are given by the shaded triangle. If the firm were to sell the product at marginal cost, all the gains would go to consumers in the form of *consumer surplus*. Consumer surplus is defined as the difference between what the consumer is willing to pay for a product and what the consumer actually pays when buying it. Profit-maximizing managers try to devise pricing policies that capture as much of the available gains from trade as possible: The managerial ideal would be to capture all the potential consumer surplus as company profit.

We begin by reviewing the benchmark case where the firm charges all customers the same price. In this case (which was introduced in Chapters 4 and 6), the firm captures some, but not all, of the potential gains from trade. Subsequently, we consider more complex pricing policies.

**Figure 7.1 Pricing with Market Power**

The demand curve reflects what consumers are willing to pay for the product. It typically is not in the firm's interest to sell the product below marginal cost, since it can do better by not producing the product. Thus, the maximum potential gains from trade are given by the shaded triangle. The firm's objective is to select a pricing policy that maximizes its share of the gains from trade and thus firm profit.



## Benchmark Case: Single Price per Unit

### Profit Maximization

Suppose that Intuit sells a software product called *Checkware*. It purchases the product at \$10 from the manufacturer and selects a retail price to post on the Internet. All customers buy at this price regardless of the quantity purchased. Intuit has no other incremental costs and faces the following demand curve:

$$P = 85 - 0.5Q \quad (7.1)$$

where  $P$  is price and  $Q$  is quantity (in thousands of units).

What price should Intuit select to maximize profits?

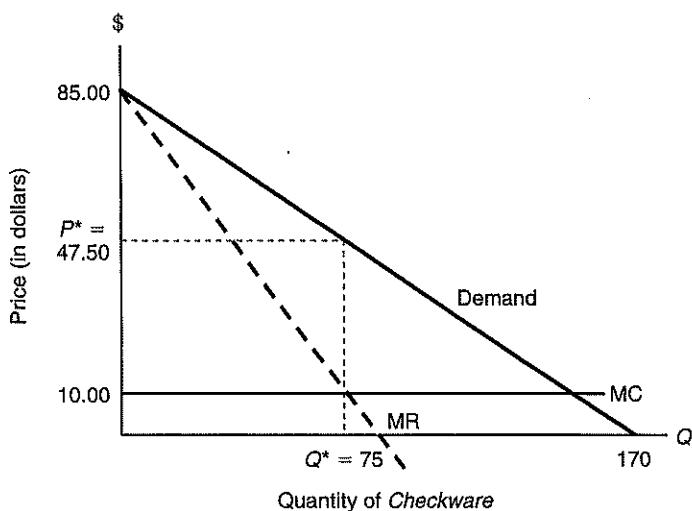
Chapter 6 shows that profits are maximized by selecting a price-output combination in which marginal revenue equals marginal cost. Marginal revenue is  $85 - Q$ , and marginal cost is \$10 in this example.<sup>1</sup> Thus the optimal quantity and price are 75 and \$47.50, respectively. Profits are \$2,812,500. Figure 7.2 illustrates the solution graphically.

We focus on this example to provide a number of basic insights. It is important to note, however, that this analysis simplifies the pricing problem in at least four important ways. First, all consumers are charged the same unit price, regardless of the quantity purchased. Thus more complicated pricing strategies are not considered. Second, the firm sells only one product; thus interactions among products are not considered. Third, the demand curve is for a single period. The analysis focuses on maximizing single-period profits and abstracts from longer-term considerations (for example, how pricing this period might affect either demand or costs in future periods). Fourth, the demand curve assumes that the prices of competing products are constant no matter what price

<sup>1</sup>For expositional simplicity, we assume marginal cost is constant; in the more general case, one also requires information about the marginal cost function.

**Figure 7.2 Single Price per Unit**

The marginal cost of the software is \$10. Demand is given by  $P = 85 - 0.5Q$ . If the firm charges a single unit price to all customers, profits are maximized by setting marginal revenue ( $MR = 85 - Q$ ) equal to marginal cost. The resulting optimal price and quantity are \$47.50 and 75, respectively.



Intuit charges. In some markets, there is likely to be interaction in the pricing decisions of firms within the industry. Later in this chapter, we consider the implications of relaxing these assumptions.

### Relevant Costs

Managers maximize profits by setting marginal cost equal to marginal revenue. As emphasized throughout this book, sunk costs are irrelevant for the pricing-output decision—only *incremental costs* matter. Suppose that Intuit previously had spent \$100,000 for developing its cyberstore and establishing and promoting its Web site. While Intuit hopes to generate enough profits to offset this initial investment, this expenditure is sunk and hence is irrelevant for its current pricing decisions.

Also as discussed earlier, it is important for managers to focus on *opportunity costs* not accounting costs. For instance, suppose that Intuit has some *Checkware* packages in inventory that it had previously purchased from the manufacturer at \$18. This historical cost is not relevant for the current pricing decision. Rather what is important is the current cost for replacing the inventory—\$10.<sup>2</sup>

### Price Sensitivity

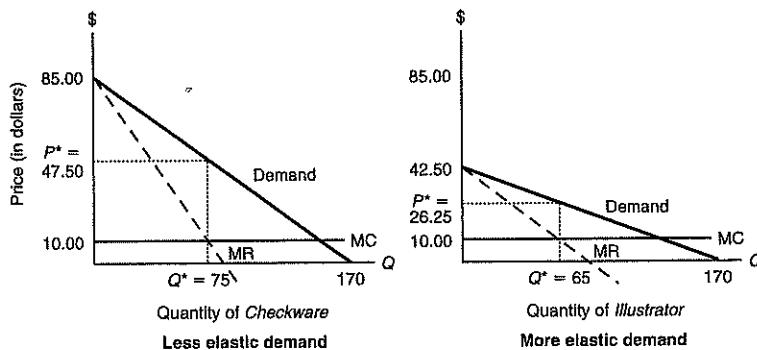
Additional insights into a monopolist's pricing decision can be developed using the concept of price elasticity introduced in Chapter 4. Recall that the price elasticity  $\eta$  is a measure of price sensitivity. The higher the price elasticity, the more sensitive is the quantity demanded to price changes. With some algebra, it is easy to show that the monopolist's optimal pricing policy of setting marginal revenue equal to marginal cost can be rewritten as

$$P^* = MC^*/[1 - 1/\eta^*] \quad (7.2)$$

<sup>2</sup>Suppose that a package was sold for \$16 that originally cost \$18. The company reports an accounting loss of \$2. However, if the company has to pay \$10 to replace the unit in inventory, it actually has an economic profit of \$6. (When the wholesale price fell from \$18 to \$10, Intuit lost \$8 for each unit in inventory.)

**Figure 7.3 Price Sensitivity and Optimal Markup**

The optimal price markup above marginal cost depends on the elasticity of demand. The optimal markup decreases with the elasticity of demand. The demand curve for *Checkware* on the left is less elastic than the demand curve for *Illustrator* on the right. Correspondingly, the optimal markup is higher for the demand curve on the left (\$37.50 above cost versus \$16.25 above cost). At the optimal price and quantities, the elasticity for the demand curve on the left is 1.27 versus 1.62 for the demand curve on the right.



where  $P^*$  is the profit-maximizing price,  $MC^*$  = marginal cost, and  $\eta^*$  is the elasticity of demand, both at the optimal output level.

Recall that the elasticity of demand ranges between 0 (totally inelastic) and  $\infty$  (infinitely elastic). Market power decreases as demand becomes more elastic.

No firm should operate on the inelastic portion of its demand curve ( $\eta < 1$ ). To understand why, assume this conclusion is false—suppose the profit-maximizing price is on the inelastic portion of the demand curve. Now consider a price above this profit-maximizing price. With inelastic demand, total revenue increases with an increase in price. As price is increased, fewer units are sold and production costs fall. With an increase in revenue and a reduction in costs, profits must increase with price: Hence the maximum profit cannot lie on the inelastic portion of the demand curve. Thus, we are assured that  $\eta^* > 1$ , and the optimal price is greater than marginal cost.<sup>3</sup>

If a firm has substantial market power, its demand will be less elastic and the markup over marginal cost will be high. In contrast, if the firm has limited market power (for example, there are many good substitutes), elasticity will be high and the markup low.

In our *Checkware* example, the markup is \$37.50 ( $\$47.50 - \$10$ ). The elasticity at the optimal price-quantity combination is 1.27 (using the technique from the appendix of Chapter 4). Figure 7.3 compares this case with that of a more elastic demand curve for another software product—*Illustrator*:<sup>3</sup>

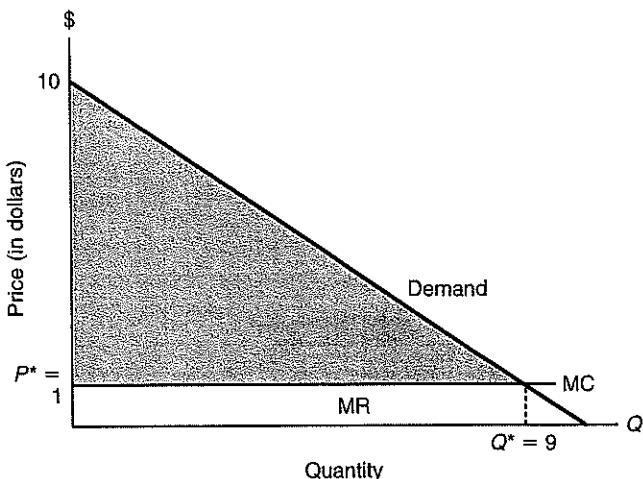
$$P = 42.50 - 0.25Q \quad (7.3)$$

With this demand curve, the optimal output and price are 65 and \$26.25, respectively. The elasticity at this combination is 1.62 compared to 1.27 in the first example. Correspondingly, the markup is lower (\$16.25 versus \$37.50).

<sup>3</sup>For both demand curves, the quantity sold is 170 when price is zero; however, quantity declines more rapidly with price increases in the second case.

**Figure 7.5 Two-Part Tariff**

In this example, all potential customers had identical demands. The figure displays a demand curve for a representative consumer,  $P = 10 - Q$ . The managerial cost of producing the product is \$1. The potential consumer surplus that the firm could capture is \$40.50, as shown by the shaded triangle. Maximum profits can be extracted by charging an up-front fee equal to all the consumer surplus (or slightly less) and then charging a price equal to marginal cost, \$1. Under such a scheme, the consumer purchases 9 units.



that the firm could capture are shown by the shaded triangle and are equal to \$40.50 ( $0.5 \times 9 \times 9$ ). Maximum profits can be extracted by charging an up-front fee equal to all the gains from trade (or slightly less) and then charging a price equal to marginal cost, \$1. With this pricing strategy, the consumer purchases 9 units. In contrast, if the firm charged a single unit price, the best it could do would be a profit of \$20.25 (by setting marginal revenue equal to marginal cost). In this case, the price is \$5.50 per unit and the consumer purchases 4.5 units.

Two-part tariffs also can be used profitably when customers' demands are not identical, but this pricing strategy tends to be less effective the more consumers vary in their demands for the product. From a practical or legal standpoint, a company might have to offer the same two-part tariff to all potential customers. Charging a high entry fee allows the firm to extract more surplus from customers who have high demands for the product, but potential customers with lower demands will choose not to purchase. When customers' demands vary widely, it often is best to charge a low entry fee (possibly zero) and then charge a price above marginal cost for use. In this case, given the costs of implementing a two-part tariff (devising the pricing strategy, collecting the fees, and so on), the firm frequently is better off just charging a single price. However, in the next section, we discuss other pricing policies that can increase profits facing more heterogeneous demand.

## Price Discrimination—Heterogeneous Consumer Demands

Potential customers often vary materially in their willingness to pay for a product. In our benchmark case, the firm charges the same price to all potential customers. With a heterogeneous customer base, the company can make higher profits if it is able to charge higher prices to those customers who are willing to pay more for the product.

*Price discrimination* occurs whenever a firm charges differential prices across customers that are not related to differences in production and distribution costs. With price discrimination, the markup or profit margin realized varies across customers. Two conditions are necessary for profitable price discrimination. First, different price elasticities of demand must exist among potential customers for the product (demand must be

## MANAGERIAL APPLICATIONS

### Two-Part Pricing for Capital Goods

Frequently a consumer buys a capital good from a firm and then purchases another good to obtain the services of the capital good. For example, Gillette sells razors and razor blades, Hidden Fence installs pet containment systems that require special batteries sold only by Hidden Fence. This situation is like a two-part tariff. With homogeneous consumers, profits are maximized by setting the price of the capital good to extract all consumer surplus and pricing the consumable at marginal cost. With heterogeneous consumers it is typically optimal to charge a lower price for the capital good and a price above marginal cost for the consumable.

heterogeneous). Otherwise, there is no point in segmenting the market. When different price elasticities do exist, it is generally more profitable to charge higher prices to those customers who are less sensitive to price. Second, the firm must be able to identify submarkets and restrict transfers among consumers across different submarkets. Otherwise, any attempt to charge differential prices to customers will be undercut by resale across the submarkets. One group of consumers can buy at the low price, then resell to the other groups at a price below the firm's prices to these groups.

Sometimes managers have quite good information about individuals' product demands (which specific customers are willing to pay more for the product). For instance, if Andrew Leone has sold automobiles to the same customers on repeated occasions, he is likely to have relatively good information about each customer's price sensitivity. In other cases, managers have poor information about individual product demands. For example, early in his career Andy had less experience and accumulated information to differentiate among customers who came to the dealership. But he still might be able to engage in certain kinds of price discrimination with information only about the range or distribution of customer demands. We begin our examination of price discrimination by considering the case where the manager has good information about individual demands. We then consider the case where the manager has information only about the distribution of demands.

## MANAGERIAL APPLICATIONS

### As Cigarette Prices Soar, a Gray Market Booms

To price-discriminate successfully, a firm must not only be able to identify submarkets with different price elasticities, but also be able to restrict trade among these submarkets.

Cigarette companies have historically charged much higher prices in the United States than in foreign markets for their premium brands. Due to the fact that United States cigarette prices increased by over 50 percent in the late 1990s, made-for-export cigarettes have appeared for sale in United States stores and on the Internet. These cigarettes were returned for sale in the United States "through a complex and shadowy distribution network."

For example, in 1999, Cigarettes Cheaper, a California-based discounter, sold 45,000 cartons of made-for-export cigarettes produced by R.J. Reynolds. A carton of diverted Winstons sold for \$24.89 compared to \$30.39 for regular Winstons. In addition, the Internet contains Web sites offering cheap export cigarettes. In Brasschaat, Belgium, merchant Tehoe Rooijakkers indicated that hits have increased to 150 a day on his Web site advertising low-cost Marlboros, Winstons, and Camels.

These activities reduce the ability of the tobacco companies to charge premium prices for their brand-name cigarettes in the United States.

Source: S. Hwang (1999), "As Cigarette Prices Soar, a Gray Market Booms," *The Wall Street Journal* (January 28), B1.

## MANAGERIAL APPLICATIONS

### Tuition Pricing

Firms engaging in personalized pricing strive to extract the maximum willingness to pay from each customer. While colleges and universities do not engage in perfect personalized pricing, they effectively charge different prices to students for tuition through the use of financial aid packages. Stated tuition is the maximum price that any student is charged. Low-income students, who are likely to be relatively price-sensitive, typically are offered more financial aid than high-income students. In addition, top students who are likely to have numerous scholarship offers, and thus more options, are offered significant discounts. An average student from a high-income family typically pays much higher effective tuition than other students.

## Exploiting Information about Individual Demands

### Personalized Pricing<sup>8</sup>

Suppose there are many potential customers. Each customer places a value on the product that signifies the maximum that that individual would pay for the product—their reservation price. For simplicity, suppose each customer purchases at most 1 unit. Personalized pricing (*first-degree price discrimination*) extracts the maximum amount each customer is willing to pay for the product. Each consumer is charged a price that makes that customer indifferent between purchasing and not purchasing the product. In this case, the firm extracts all the potential gains from trade. This extreme form of price discrimination is rare and typically is possible only when the number of customers is extremely small and resale is impossible. With personalized pricing, the firm sells to all customers who are willing to pay more than the marginal cost of production. All gains from trade are exhausted, and the outcome is efficient. All the gains from trade, however, go to the firm.

While perfect personalized pricing is rare, new technologies are making it easier for companies to customize quoted prices. For example, companies selling over the Internet can vary quoted prices based on past buying histories, demographic information obtained through electronic registration, clickstreams, and so on. Similarly, companies that sell through catalogs can—and often do—include personalized inserts, where the quoted prices vary depending on the customer's buying history and personal characteristics (for example, zip code). This type of personalized pricing was more difficult under older printing technologies and before the existence of computerized databases that store customer information.<sup>9</sup>

### Group Pricing

Managers sometimes can gauge an individual's price sensitivity by observing a characteristic of the individual such as age, income, or dress. In these cases, the manager can have a fairly good idea of a specific individual's demand for the product, even if the manager never has interacted with the customer in the past.

<sup>8</sup>Economists often categorize price discrimination as first-, second-, or third-degree. These terms were originated by A.C. Pigou (1950), *The Economics of Welfare* (Macmillan: London). Unfortunately, they are not very descriptive. Following C. Shapiro and H. Varian (1999), *Information Rules: A Strategic Guide to the Network Economy* (Harvard Business School Press: Boston), we use more descriptive terms like personalized pricing, menu pricing, and group pricing.

<sup>9</sup>Note, however, that the Internet also lowers information costs and that this makes market segmentation (a necessary aspect of effective price discrimination) more difficult (recall the earlier Managerial Application on made-for-export cigarettes).

## MANAGERIAL APPLICATIONS

### **Virtual Vineyards**

Virtual Vineyards offers premium wines and specialty foods—such as El Serpis Anchovy Stuffed Olives and Fox's Fine Foods Killer Corn Relish—over the Internet. The company also offers advice, monthly wine programs, and a variety of other services at its Web site. Virtual Vineyards tracks the clickstream of each user and instantaneously makes special offers based on the behavior. In a similar vein, Amazon.com tracks the purchases of each consumer and recommends additional related books the next time the user logs on. The Internet has made possible many marketing opportunities not available through other media.

Source: C. Shapiro and H. Varian (1999), *Information Rules: A Strategic Guide to the Network Economy* (Harvard Business School Press: Boston).

Group pricing (*third-degree price discrimination*) results when a firm separates its customers into several groups and sets a different price for each group. For example, utility companies charge different rates to individual versus commercial users, computer companies give educational discounts, and airlines charge different rates based on the amount of notice given for the reservation. Beyond.com charged government agencies and large companies lower prices than other customers. As illustrated in the following example, a firm that can segment its market maximizes profits by setting marginal revenue equal to marginal cost for each market segment.

Firms use a variety of characteristics to divide customers into groups. Three prominent examples are age, time of purchase, and income. For instance, movie theaters frequently give discounts to senior citizens and students, price lower for matinees than for evening performances, and vary prices across locations depending on the average income in the area. The objective is to charge a higher price to the groups who are less price-sensitive.

## MANAGERIAL APPLICATIONS

### **Pricing of Books**

Firms divide customers into groups based on various characteristics. Different prices are charged to each group, depending on their elasticity of demand.

One characteristic used by book publishers to segment the market is time. When a new book comes to market, it usually is offered only in a hardcover edition for a relatively high price. Subsequently, it is offered in paperback at a substantially reduced price. Individuals who have a high demand for the book (and thus a low price elasticity) do not want to wait for the paperback edition and thus pay a high price for the book. Those with lower demands wait for the cheaper edition. After the paperback edition comes to market, the publisher generally will continue to offer the hardcover edition. Hardcover books are likely to make better gifts than paperbacks. Also customers are likely to prefer hardcovers for their libraries. Thus there continues to be a market for both types of books. Continuing to offer multiple versions is an example of menu pricing (discussed below).

In late 2005, Amazon.com offered several versions of *Harry Potter and the Order of the Phoenix* by J. K. Rowling—Book 5 in the popular series. The hardcover version sold for \$19.20, whereas the paperback sold for \$9.99. In addition, there was a hardcover, large-print edition for \$29.95, an audio CD for \$47.25, and an audiocassette for \$29.70. The hardcover and paperback editions also could be purchased as part of specially boxed five book sets. Book 6, *Harry Potter and the Half-Blood Prince*, is available only in hardcover.