CHAPTER 12

Product Pricing with Monopoly Power

Price discrimination, such as is practiced by airlines, can increase the profit of a firm with some monopoly power.

Chapter Outline

Learning Objectives

- Explain price discrimination, the various degrees of price discrimination, and how price discrimination can increase a firm's profit.
- Spell out the three necessary conditions for a firm to be able to engage in price discrimination.
- Demonstrate how, under third-degree price discrimination, market segments that have less elastic demand end up being charged a higher price all else being equal.
- Explore how two-part tariffs, a form of second-degree price discrimination, can increase a firm's profit.
- Show how intertemporal price discrimination, a type of third-degree price discrimination, can increase a firm's profit.

PRICE DISCRIMINATION
the practice of charging different prices for the same product when there is no cost difference to the producer in supplying the product

Our analysis of monopoly has thus far been based on the assumption that the monopolist charges a single price to all customers, and we have identified the profit-maximizing price and output based on this assumption. In many cases, however, firms with monopoly power charge different prices to different customers or even to the same customers depending on the quantity purchased. The practice of charging different prices for the same product when there is no cost difference to the producer in supplying the product is called **price discrimination**.

Examples of price discrimination include amusement parks, such as Disneyland, that use season passes to offer the first day of admission at a relatively high price and any additional day of admission for the rest of the year at a price of zero; the sale of discounted airline seats, hotel rooms, and rental cars through online merchants such as Travelocity; hotel chains and metropolitan bus services that feature discount rates for senior citizens; laundry services that charge more to dry clean women's blouses than men's shirts; book publishers that charge more for the early printings of a title (the hardback edition) than later printings (the paperback edition); the frequent-flyer programs offered by airlines; and restaurants in Paris that list a higher price for a dish on the English version of their menu than they list for the same dish on the French version.

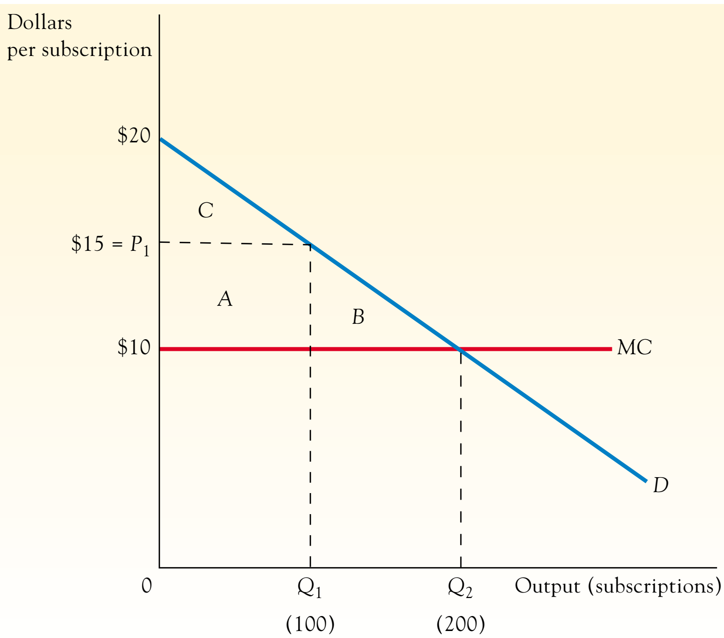
Why these more complicated pricing practices arise and what consequences they have are this chapter's subjects. As we will see, price discrimination can increase a firm's profit as well as the total surplus (consumer surplus plus producer surplus) generated by a market.

12.1 PRICE DISCRIMINATION

Let's begin our discussion of price discrimination with a simple example. Consider a monopoly that produces a product of which each consumer will purchase no more than one unit. An example might be a monthly fee to Internet access—few people would purchase two subscriptions to the same Internet access, even at a very low price. The demand curve confronting the monopoly, shown as *D* in Figure 12.1, slopes downward because consumers are willing to pay different prices for Internet access. At a lower price, a larger quantity of subscriptions can be sold as more consumers sign up for Internet access, but each consumer purchases only one subscription. Marginal cost is constant at $10 per subscription. If the monopoly must set one price for all consumers—the assumption we made in Chapter 11—price is $15, output is 100 units, and profit is given by the rectangular area A. (We have not drawn in the marginal revenue curve to keep the diagram simple.)

FIGURE 12.1

Price Discrimination Can Increase Profit
When a uniform price is charged, the maximum profit is shown by area *A*, assuming $MR = MC$ at Q_1. However, if a different price can be charged for each unit sold, it may be possible to realize areas *A* plus *B* plus *C* as monopoly profit.



Now let's see how the monopolist might be able to increase its profit by charging nonuniform prices. Note that there is a person willing to pay just below the $15 price, say $14.95, for Internet access. If the monopoly could charge her $14.95 she would purchase the product. Moreover, the monopoly's profit would rise by $4.95 from the transaction ($14.95 minus the $10 marginal cost of the 101st unit) as long as the monopoly does not have to reduce the $15 price to the first 100 customers. (Recall that it is the lost revenue from lowering the price on initial sales that makes marginal revenue lower than price. If you don't have to lower the price on the first 100 units, the price received for the 101st unit is its marginal revenue.) But the monopolist doesn't have to stop there. If the 102nd unit can be sold for $14.90, then profit will rise by another $4.90 as long as the prices charged for the first 101 units are not lowered. Indeed, additional profit can be realized in this way all the way out to an output of 200: each unit can be sold for more than it costs to produce. In this way, the monopolist can increase profit by area *B* (which is the sum of the excess of price paid over marginal cost of each unit beyond 100).

Note that this pricing procedure doesn't have to be restricted to units from 101 to 200; all units can be priced at the maximum price each consumer will pay. The very first unit can be sold for, say, $20, the second for $19.95, and so on. Under these conditions, the marginal revenue curve relevant for the monopoly's output decision coincides with the demand curve, so the $MR = MC$ rule for profit maximization leads to an output of Q_2, as already explained. Then the monopoly's profit is given by the sum of areas *A*, *B*, and *C*, substantially higher than when the single price of $15 is charged for all units.

This pricing policy, in which each unit of output is sold for the maximum price a consumer will pay, is called **first-degree** or **perfect price discrimination**. It is perfect from the monopolist's point of view because the monopolist makes the maximum profit given the demand curve. If any higher price is charged on any unit, then that unit would not be sold and profit would be smaller. In effect, the monopoly has been able to capture all of the consumer surplus (areas $A + B + C$) as its profit. A monopolist can do no better than that.

FIRST-DEGREE (PERFECT) PRICE DISCRIMINATION
a policy in which each unit of output is sold for the maximum price a consumer will pay

Perfect price discrimination, if a monopoly can practice it, has some notable consequences. In addition to increasing the monopolist's profit, the resulting output is efficient. This is in sharp contrast to the market outcome when a monopolist can charge only a single price and (at least from a static perspective) output ends up being less than the efficient output. With perfect price discrimination, even though consumers receive no net benefit (or just the tiniest amount necessary to induce them to buy), every unit with a marginal value to consumers greater than the marginal cost of producing it is, in fact, produced. All the potential net benefit from producing the good goes to the monopolist as profit, but it is just a transfer of income from consumers to the monopolist and not a net loss to society. All the potential benefit is realized by some member of society, which is what efficiency entails.

Implementing first-degree price discrimination is, as you might expect, not easy. It requires some mechanism by which a monopolist can determine the maximum amount each potential customer is willing to pay for the product. Asking potential customers is no good because customers have an incentive to understate what they are willing to pay if they will be charged accordingly. Furthermore, there tends to be no indirect means of securing such information from potential customers. For example, car dealers do not (yet!) have a device that automatically registers the maximum amount a prospective customer is willing to pay for a car when the customer walks into the showroom.

Although perfect price discrimination may be rare (if not nonexistent), there are cases in which different consumers are charged different prices, and the preceding analysis explains why they arise: producers are trying to increase their profits by approximating this type of pricing. For example, lawyers and doctors often charge wealthy customers more than poor customers. Many car dealers also strive to approximate first-degree price discrimination. Although they are unable to perfectly estimate what each potential customer is willing to pay for a car, most dealers employ certain tactics to elicit at least a rough guess. For instance, the salesperson may claim to share the customer's goal of getting the best possible deal and promise to bargain very hard with the dealership owner on the customer's behalf. However, the sales representative will first attempt to get the customer to make an initial bid without committing the dealership to any selling price—all the while sizing up how badly the customer would like to buy a new car, how stuck the customer is on a particular model and color, the customer's financial resources, and so on. Once the customer is committed to a bid, the representative disappears (supposedly to meet with the owner of the dealership on the customer's behalf) and then reappears, typically to report that the customer's bid isn't quite good enough. The owner wants at least *X* dollars more, at a bare minimum. Another round of negotiation is initiated through which the salesperson attempts to get a higher bid from the customer. Because of this tactic, various buyers may pay a wide variety of prices for the same make and model of car, and dealers' profits are higher than they otherwise would be.

Other Degrees of Price Discrimination

Price discrimination occurs when different prices are charged for the same good, with the per-unit price varying either across consumers or across separate units purchased by the same consumer, or both. In the case of first-degree price discrimination, each consumer is charged a different price equal to the maximum amount he or she is willing to pay. In the case where consumers are willing to buy more than one unit, they are charged a different price for each successive unit, with the schedule of prices set to extract their entire consumer surplus.

As discussed in the preceding section, first-degree price discrimination is rare to nonexistent, if for no other reason than the difficulty of knowing each consumer's demand curve. Some pricing practices, however, represent rough attempts to approximate perfect price discrimination.

Second-degree price discrimination or **block pricing** is the name given to a schedule of prices such that the price per unit declines with the quantity purchased by a particular customer. It is distinguished from first-degree price discrimination in that the same price schedule confronts all consumers; the price schedule is not perfectly individually tailored as in the first-degree case.

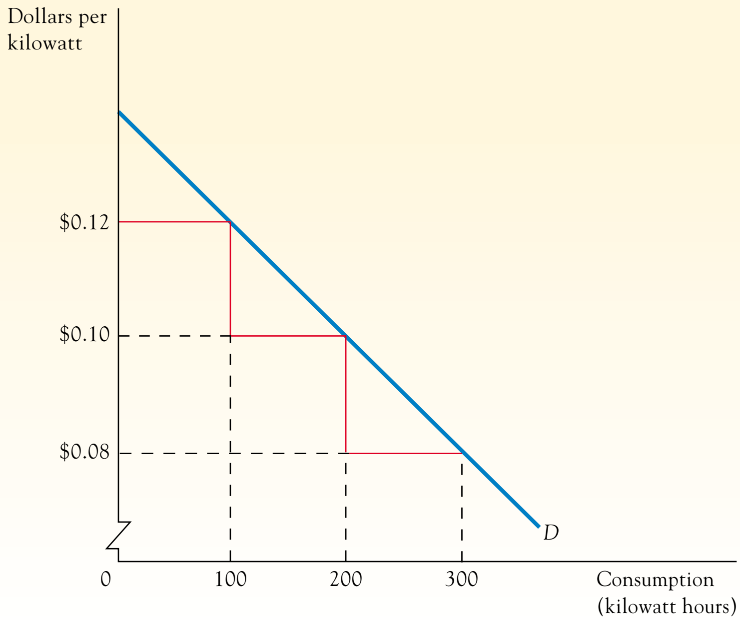
SECOND-DEGREE PRICE DISCRIMINATION (BLOCK PRICING)
the use of a schedule of prices such that the price per unit declines with the quantity purchased by a particular consumer

An example of second-degree price discrimination is depicted in Figure 12.2. Suppose that an electric utility prices the first 100 kilowatt hours per month at \$0.12 per kilowatt hour, the second 100 at \$0.10, the third at \$0.08, and so on. Just as in the first-degree case, block pricing can increase a firm's profit by extracting additional consumer surplus on initial units consumed. It also tends to result in greater (more efficient) output because heavy users pay prices closer or equal to marginal cost. It does not, however, convert all potential consumer surplus into monopoly profit—as perfect price discrimination does. To see this, note that based on the electricity consumer's demand curve depicted in Figure 12.2, the consumer is willing to pay more than \$0.12 per unit for each kilowatt hour less than 100 and thus realizes some surplus when the utility charges only \$0.12 per output unit. Likewise, the consumer is willing to pay more than \$0.10 per hour for each kilowatt hour in excess of 100 but less than 200 and so realizes some added consumer surplus when the utility charges \$0.10 per unit over this output range.

FIGURE 12.2

Second-Degree Price Discrimination: Block Pricing

An electric utility charges $0.12 per kilowatt hour per month for the first 100 units, $0.10 for the second 100 units, $0.08 for the third 100 units, and so on. The unit price (depicted by the step-like red curve) thus depends on the quantity purchased by a consumer.



APPLICATION 12.1 GIVING FREQUENT SHOPPERS THE SECOND DEGREE

Second-degree price discrimination is actively practiced by most major airlines. Frequent flyers pay less as they fly more. Frequent-buyer programs are also employed by hotels, fast-food chains, airport parking lots, supermarkets, and financial services firms. For example, Marriott's Honored Guest program gives participating consumers a free weekend night at any domestic Marriott hotel after they have accumulated a certain number of points in the program (each dollar the customer spends on a Marriott guest room earns 10 points). Park and Fly, a chain that operates off-terminal parking lots near major airports in several major U.S. cities, has a "frequent-parker" program that offers customers a week's free parking after they have paid for 35 days.

Most major fast-food chains offer value packages whereby consumers are offered a discount the more food they order at any one point in time. McDonald's, for example, offers a "Value Meal" whereby the price of a Big Mac, french fries, and soft drink is lower if the items are purchased as a package than if each item is purchased separately.

Supermarkets also are moving toward a tiered-pricing system by offering lower prices to shoppers with greater loyalty. As of 2002, more than 75 percent of U.S. households belonged to at least one supermarket frequent shopper club. Supermarkets relying on such programs employ computerized scanning systems that sort customers based on the volume of their purchases and dispense coupons at the checkout line accordingly.

In the financial services area, Merrill Lynch initiated a client-reward program in 1997 that bases the annual fee on the amount of money that investors maintain in Merrill accounts. "Bronze" investors who maintain at least $100,000 in accounts are charged an annual fee of 1.5 percent and are given 12 commission-free stock or bond trades per year. "Platinum" investors who maintain at least $5 million in Merrill accounts are charged an annual fee of 0.84 percent and receive 75 commission-free stock or bond trades per year.

THIRD-DEGREE PRICE DISCRIMINATION (MARKET SEGMENTATION) a situation in which each consumer faces a single price and can purchase as much as desired at that price, but the price differs among categories of consumers

Third-degree price discrimination or **market segmentation** occurs when each consumer faces a single price and can purchase as much as desired at that price, but the price differs among categories of consumers. Because this is probably the most common type of price discrimination, we will examine it more fully. There are many examples of this pricing practice. Your college bookstore quite possibly sells books to faculty members at a discount, charging them a lower price than it charges students for the same books. Telephone companies charge higher monthly rates for business phones than for home phones. Many drugstores offer senior citizens discounts on drug purchases. Movie theaters typically charge lower prices to children, senior citizens, and students. Grocery stores offer certain items at lower prices to customers with coupons. In all these cases the same product is sold to different groups for different prices.

APPLICATION 12.2 THE THIRD DEGREE BY CAR DEALERS

Professor Ian Ayres of Yale University employed a team of research assistants to explore whether car retailers priced their products differently on the basis of race or gender.[1] Apart from race and gender, the research assistants were selected for uniformity of age, education, economic class, occupation, address, and attractiveness. The research assistants were also all trained to use the same bargaining tactics.

Based on the study, Professor Ayres found that after multiple bargaining rounds, the lowest price offered by a dealer for a new car results in an average profit to the dealer of \$362 per white male customer, \$504 per white female customer, \$783 per black male customer, and \$1,237 per black female customer. The most likely explanation for this pattern is third-degree price discrimination, according to Ayres. To the extent that white men, on average, are believed by car dealers to have superior access to information about the car market and less aversion to bargaining, profit-maximizing behavior by car dealers would encourage precisely such a pricing pattern. Naturally, Ayres's conclusion presumes that information and competition in the market for new cars are sufficiently imperfect to allow an individual dealership some pricing power over individual customers.

[1] Ian Ayres, "Fair Driving: Gender and Race Discrimination in Retail Car Negotiations," *Harvard Law Review*, 104 No. 4 (February 1991), pp. 817–872.

12.2 THREE NECESSARY CONDITIONS FOR PRICE DISCRIMINATION

Although there are many examples of price discrimination, especially third-degree price discrimination, all of them are predicated on the satisfaction of certain conditions. First, the product seller must possess some degree of monopoly power, in the sense of confronting a downward-sloping demand curve. (It isn't necessary that the firm be a pure monopoly—that is, the only seller—just that the firm have some monopoly power.) In the absence of monopoly power a seller is not able to charge some customers higher prices than others.

Second, the seller must have some means of at least roughly approximating the maximum amount buyers are willing to pay for each unit of output. To practice third-degree price discrimination, for example, the seller must be able to separate customers into two or more identifiable market segments and the price elasticity of demand must differ among the segments. As we explain next in more detail, this condition makes it profitable for the seller to charge a higher price to the market segment with the more inelastic demand.

RESALE arbitrage of the product among market segments

Third, the seller must be able to prevent **resale** or arbitrage of the product among the market segments. If this condition is violated, the likelihood that a seller will be able to engage in price discrimination is significantly undermined. Suppose, for example, that General Motors tries to price discriminate by selling automobiles to senior citizens at a 20 percent discount. How many automobiles would it sell at the higher, normal price? Very few, we would predict. Senior citizens would simply buy cars at a discount and then resell them at a higher price (still below GM's normal price). A similar result would occur if people got their parents or grandparents to purchase cars for them. Resale of the product undermines the seller's ability to sell at the higher price.

If resale of the product is relatively easy, price discrimination can't be very effective. How, then, can resale be prevented? Sometimes, the nature of the product itself prevents resale. Electricity provided to a local business can't be resold to a nearby homeowner. If you receive a medical checkup, there is no way you can transfer it to a friend. Children who attend movies cannot reproduce the entertainment for their parents. In general, goods that are immediately consumed—a common characteristic of services—are not as susceptible to resale. In contrast, manufactured items, like automobiles, appliances, and clothes, can be purchased by one person and later turned over to someone else. As a result, price discrimination is less common in the sale of manufactured goods.

Application 12.3 Arbitrage in the International Phone Calling Market

The price for an international call to the United States is 30 to 150 percent higher than the cost of making a comparable outbound call.[2] For example, it costs up to twice as much to call from Tokyo to Los Angeles as it does to call from Los Angeles to Tokyo. The differential pricing imposes roughly a $5 billion annual deficit on the U.S. balance of trade and results from the fact that most overseas phone companies are state-owned and face less competitive pressure because they are both the regulator and the provider of phone service.

The relatively high international rates provide an incentive for firms to resell calls at the U.S. rate to customers wishing to make calls from another country. That is, firms such as New York-based International Discount Telecommunications (IDT) allow callers to place calls from Malaysia at the same rates as if the calls originated in the United States.

Reselling works as follows: Suppose that a caller from Malaysia wishes to dial a number in San Francisco. The caller dials an IDT machine located in the United States, hangs up, and waits for the machine to call back. Using a telephone key pad, the caller then instructs the IDT machine to place a call to San Francisco. In this way, the caller is linked up with the intended contact at a cost savings of up to 50 percent.

[2]This application is based on "Foreign Calls Add $4 Billion to Trade Gap," *Los Angeles Times*, December 31, 1992, pp. D1 and D3.

12.3 Price and Output Determination with Price Discrimination[3]

Imagine a monopoly that is initially selling 1,500 units of output at the uniform price of $10. Suppose that it can separate the customers into two identifiable market segments, segment A and segment B, and that resale of the product between the segments is not possible. Therefore, the monopolist may charge a different price to each segment. However, for price

[3]A mathematical treatment of some of the material in this section is given in the appendix at the back of the book (page 567).

discrimination to be worthwhile, the monopolist must be able to sell the 1,500 units for a higher total revenue by charging each segment a different price.

When the demand elasticities differ for the two market segments, the monopolist can increase total revenue from selling a given quantity by charging different prices. Suppose that when both segments are charged the $10 price, the elasticity of demand for segment A is 1.25 and for segment B it is 5.0. Recall from Chapter 11 that the formula for marginal revenue is $MR = P[1 - (1/\eta)]$.[4] A difference in elasticities means that the marginal revenue from selling in the two market segments differs. For segment A:

$$MR_A = \$10[1 - (1/1.25)] = \$2.$$

For segment B:

$$MR_B = \$10[1 - (1/5)] = \$8.$$

Thus, if one unit less is sold to segment A, the monopolist loses $2 in total revenue, but if that unit is sold to segment B, revenue from that segment will rise by $8. Consequently, transferring a unit of output from segment A to segment B increases total revenue by $6. Reducing sales to segment A raises the price to segment A, while segment B's price falls as sales increase there. This policy means that the segment with the more inelastic demand, segment A, pays a higher price.

Figure 12.3 illustrates the way to divide 1,500 units of output between the two segments to maximize total revenue. Segment A's demand curve is to the left of the origin, and segment B's is to the right. Initially, the monopolist charges a flat $10 price. At that price segment A purchases 500 units and segment B, 1,000 units. Total revenue is $15,000. Because segment A's demand curve is less elastic than segment B's, however, marginal revenue is lower for segment A ($2) than for segment B ($8). Shifting sales from the market segment where the marginal revenue is low to where it is high increases total revenue. As long as marginal revenue is higher for segment B, such reallocation will increase total revenue, so it should continue until the marginal revenues in the two market segments are equal.

When the monopolist transfers 200 units from segment A to segment B, marginal revenue in both market segments is equal at $7.50. The restriction of sales in segment A, where demand is less elastic, raises price sharply for this segment, to $12.75. But the increase in sales in market segment B, where demand is highly elastic, reduces price only slightly, to $9.75. The relative differences in the price changes explain why total revenue increases. Price rises sharply for the less elastic demand segment but falls only slightly for the highly elastic demand segment. With sales allocated so that the marginal revenues are equal, total revenue is now $15,525 [(300 × $12.75) + (1,200 × $9.75)], higher than the $15,000 in total revenue the monopolist earns when both market segments are charged the same price.

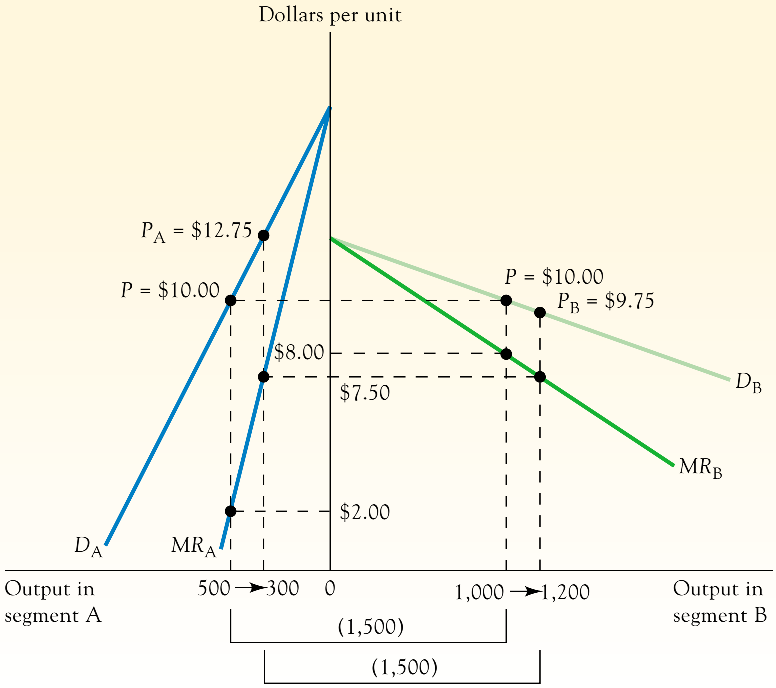
When the monopoly can charge different prices to the two segments, total revenue from the sale of any given output is highest when the marginal revenues are equal. This result always means a higher price for the segment with the less elastic demand. Note, however, that the rule of equating marginal revenues holds for any output, but it does not tell us what level of output is most profitable. Should the monopolist produce more than 1,500 units? The marginal revenue from an additional unit of output is now $7.50 in whichever market seg-

[4]See footnote 5 in Chapter 11. The formula implies that the more elastic the demand, the closer marginal revenue is to the price of the product. At the extreme, when the elasticity of demand is infinity (a horizontal demand curve), marginal revenue equals price: $MR = P[1 - (1/\infty)] = P(1 - 0) = P$. When demand is elastic ($\eta > 1$), marginal revenue is less than price but greater than zero. For example, when $\eta = 3$, marginal revenue is two-thirds the price: $MR = P[1 - (1/3)] = P(2/3) = (2/3)P$. When demand is unit-elastic, marginal revenue equals zero: $MR = P[1 - (1/1)] = P(0) = 0$. And when demand is inelastic ($\eta < 1$), marginal revenue is negative. For example, when $\eta = 1/2$, marginal revenue is equal to the negative of the price: $MR = P[1 - (1/0.5)] = P(1 - 2) = -P$.

FIGURE 12.3

Gains from Price Discrimination

If demand elasticities differ and if the seller can segment a market, then it pays the seller to charge a higher price in the market segment with the less elastic demand. To maximize total revenue from the sale of 1,500 units, the seller divides output between the market segments so that the marginal revenues are equal: 1,200 units in segment B and 300 units in segment A. The seller charges a higher price in segment A ($12.75) than in segment B ($9.75).



ment it is sold, so if marginal cost is less than $7.50, profit will be higher if output increases. When sales are divided between market segments in this way, the decision of how much output to produce is made by comparing the common value of marginal revenue (because it is equal in both market segments) with marginal cost.

Figure 12.4 shows how the monopolist determines the most profitable level of total output. As we just explained, the monopolist should compare the marginal cost with the common value of marginal revenue for the two separate market segments. The common value of marginal revenue is derived by horizontally summing the separate marginal revenue curves, and the result is the darker curve ΣMR. This curve shows one value of marginal revenue (since it is the same in both separate segments) for each level of total output. The output level where MC equals ΣMR is consequently the most profitable output.

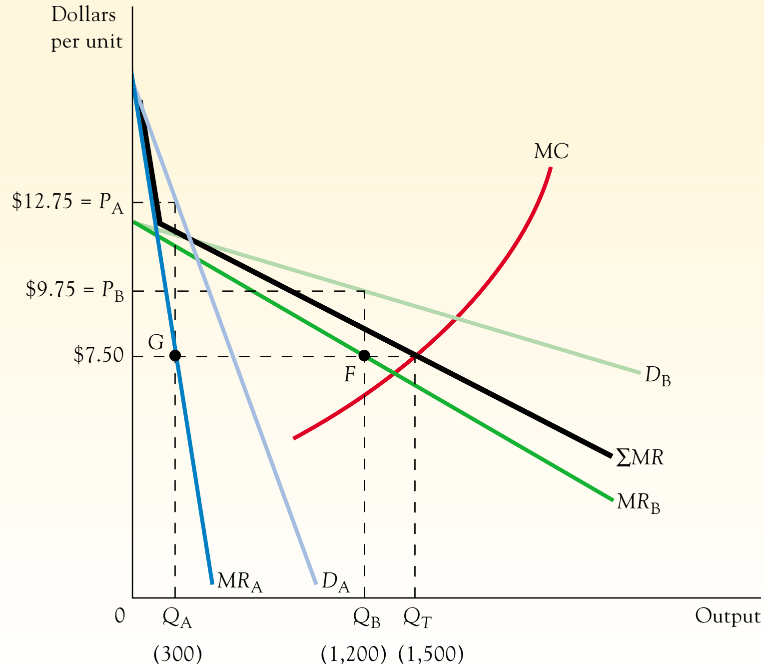
In the diagram the most profitable output is 1,500 units where marginal cost is $7.50 and equals the marginal revenue in both market segments. To determine how this total output is divided between segments A and B, we identify the output at which marginal revenue is equal to $7.50 in each segment. To do so, we move horizontally to the left from the intersection of MC and ΣMR until we reach each segment's separate marginal revenue curve. This occurs at points *F* and G, so sales to segment A are 300 units and sales to segment B are 1,200 units. Price is higher for A than for B.

Whether a monopolist who price discriminates is in any sense worse than one who charges a uniform price is not clear. Compared with a single-price monopoly, price discrimination benefits one group of consumers, those with the more elastic demand who are charged a lower price, and harms the other group of consumers. Frequently, those who benefit have lower incomes than those harmed because in some markets low-income persons are more sensitive to price (have higher demand elasticities), so perhaps this outcome is favorable. The monopoly also benefits from price discrimination by obtaining a higher profit (or else it wouldn't price discriminate), and that outcome is often regarded as undesirable in the

FIGURE 12.4

Price and Output Determination Under Price Discrimination

The most profitable output occurs where the sum of the separate *MR* curves, ΣMR, intersects *MC* at Q_T. Thus, the monopoly sells Q_B in market segment B at a price of P_B and Q_A in market segment A at a price of P_A.



public policy arena. Matters become more complicated when we recognize that total output may be greater (that is, more efficient) under price discrimination than under single-price monopoly. For these reasons no blanket condemnation of price discrimination seems appropriate, and each case should be separately judged.

The identities of the monopoly and its customers may also play a role in evaluating price discrimination, as a further example will suggest. Price discrimination is sometimes found in international markets when a firm charges a higher price in its domestic market than it charges abroad. This procedure is sometimes called *dumping*, and it occurs when the international demand for a product is more elastic than the demand in the domestic market. The difference in elasticities occurs because there is more competition in world markets. For instance, Japanese firms have been alleged to dump products in the United States by selling them at lower prices here than in Japan. In this case of price discrimination, U.S. consumers might applaud the practice because they are the ones who benefit. If we can get TVs, stereos, radios, steel, and cars from Japan more cheaply than we can produce them here, the average real income of U.S. consumers rises.

APPLICATION 12.4 Why Hotel and Apartment Building Owners Get Cable Television Service for a Lower Price

Local cable television distributors often charge a lower price for basic service to owners of hotels and multiple-dwelling-unit apartment buildings than they do to single-family residences. This situation occurs because, relative to single-family residences, hotel and apartment building owners find it more attractive to install satellite dishes to receive TV channels. That is, the per-residential-unit cost of a satellite dish is lower when the dish is employed to serve 50 apartment units versus just one home. Since hotel and apartment building owners' demand for cable service is more elastic, profit maximization by the franchised cable operator dictates a lower price for these more price-sensitive customers.

APPLICATION 12.5 The Cost of Being Earnest When It Comes to Applying to Colleges

Approximately 60 percent of the United States' 1,500 private four-year colleges use statistical analysis to determine how much financial aid to offer prospective students and thereby increase the schools' tuition revenue.[5] By offering less financial aid, a college in effect charges a higher tuition price to a prospective student. If the prospective student opts to attend, the college earns more revenue than it would have made by offering the student a more generous financial aid package.

Statistical models attempt to take into account the price sensitivity of various applicant groups. For example, eager applicants who apply for early admission tend to be less price sensitive and thus constitute a market segment that can be offered less financial aid (that is, charged a higher tuition price). Students who come for on-campus interviews are statistically more likely to enroll and so need less aid to entice them. Expressed pre-med majors also tend to be less price sensitive and thus can be offered less financial aid as well.

In contrast to basing financial aid offers overwhelmingly on a student's demonstrated financial need (as was the case in college admissions only a decade ago), taking into account a student's price sensitivity to college costs pays off for the colleges that take this route. Thomas E. Williams, the president of the National Center for Enrollment Management, one of the consulting groups that has sprouted up to develop the "financial-aid-leveraging" statistical models, states that his average client college increased its tuition revenue by nearly $500,000 by factoring in applicants' price sensitivity.

[5] This application is based on "Colleges Manipulate Financial-Aid Offers, Shortchanging Many," *Wall Street Journal*, April 1, 1996, pp. A1 and A4.

12.4 TWO-PART TARIFFS

A **two-part tariff** is a form of second-degree price discrimination. Under a two-part tariff a firm charges consumers a fixed fee (per time period) for the right to purchase the product at a uniform per-unit price. For example, consumers might have to pay $50 per month (regardless of how much of the product they purchase); having paid this **entry fee**, they can then purchase the product at $10 per unit. In this manner, consumers pay a lower average price per unit with the more units they purchase.

TWO-PART TARIFF
a form of second-degree price discrimination in which a firm charges consumers a fixed fee per time period for the right to purchase the product at a uniform per-unit price

ENTRY FEE
the fixed fee charged per time period in the case of a two-part tariff

An example of a two-part tariff is a tennis club, for which you must pay an annual membership fee plus a charge each time you use the tennis courts. Another example is telephone service, for which you pay a monthly fee plus a charge for calls placed. Mail-order book retailers and member-based discount warehouses employ two-part tariffs when they charge a customer a fee to join their shoppers' clubs and then offer discounts (20 to 50 percent off the list price) on any purchase made.

To employ two-part tariffs, a firm must have a degree of monopoly power and must be able to prevent resale of the product; in these respects the situation is analogous to price discrimination. Resale must be prevented because consumers have incentives to avoid the entry fee by having one consumer pay the entry fee and then resell the product to other consumers who have not.

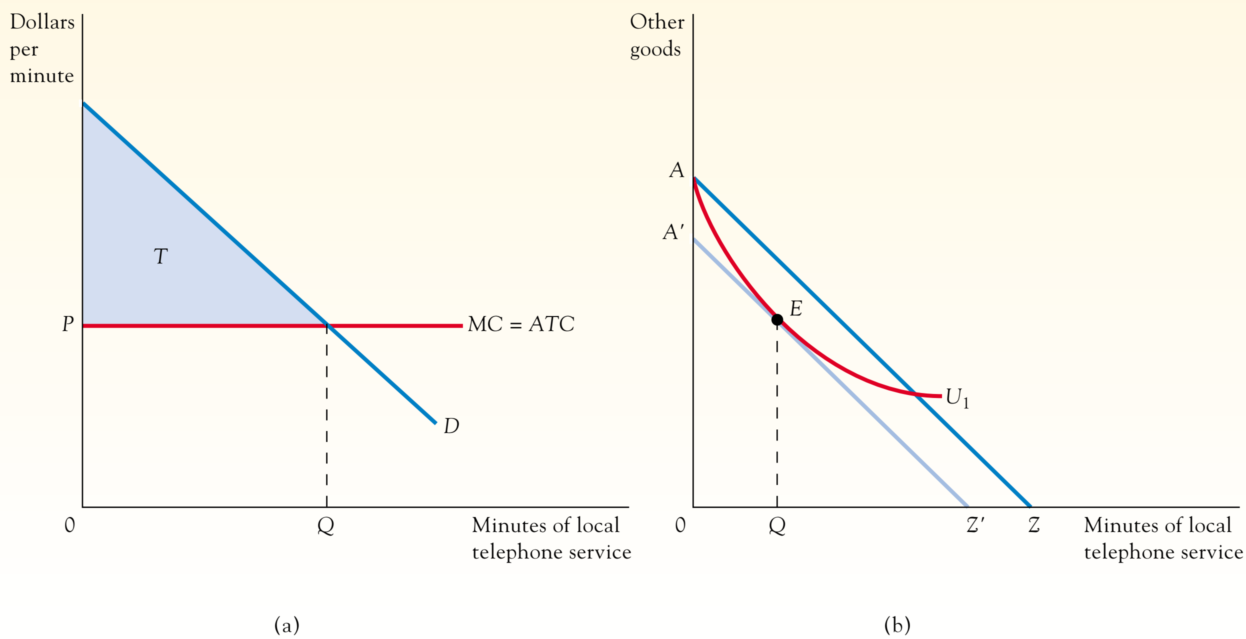
How does a firm that uses a two-part tariff decide how to set the entry fee and the per-unit price? Of course, the firm is guided by a desire to maximize its profit, but determining what combination of price and entry fee will maximize profit is often not an easy matter. In one case, however, it is simple: when all consumers have the same demand curve for the product, and the firm knows this demand curve. Figure 12.5 illustrates this case. In Figure 12.5a, a single consumer's demand curve for minutes of local telephone service (per month) is shown as D, and the marginal and average total costs to the firm providing local telephone service are assumed to be constant at $MC = ATC$. For the purpose of illustration we assume that the provider of local telephone service is not subject to any price regulation (as Chapter 15 will explain, this assumption is not valid in reality; public utility commissions limit the rates that local telephone suppliers can charge). To maximize profit, the firm charges an entry fee shown by the triangular shaded area T and a per-unit price of P. The consumer pays the entry fee and consumes Q minutes of local telephone service. The firm makes a profit (from this consumer) equal to the shaded area (the entry fee) because the revenue from selling at price P just covers the production cost.

How do we know that this combination of entry fee and price will maximize profit? In general, a monopolist cannot make a profit greater than the maximum consumer surplus that a consumer would attain if the product is priced at marginal cost. The maximum con-

FIGURE 12.5

Two-Part Tariff

(a) Using a two-part tariff pricing strategy, the firm charges an entry fee shown by area T and a per-unit price equal to P, extracting all potential consumer surplus as profit. (b) The entry fee is shown as AA'. The consumer selects point E, but is no better off than at point A.



sumer surplus is the shaded area, and in our example the firm realizes this amount as profit. In fact, the consumer receives no net gain at all from purchasing the product; all of the potential gain goes to the firm as profit. (Practically speaking, the firm might have to use a slightly lower entry fee to ensure that the consumer participates.) If the firm tried to raise the entry fee (with price fixed), the consumer would be better off not participating in this market at all. Similarly, if the firm tried to raise the price (with the entry fee fixed), the consumer would be better off exiting the market altogether.

The situation from the consumer's point of view can be clarified with the aid of Figure 12.5b. The consumer's income is given by *A*; line *AZ* has a slope equal to the price of the local telephone monopolist's product. *AZ* would be the consumer's budget line if the firm charged price *P* and no entry fee. Obviously, if the consumer could choose a point on *AZ*, he or she would be better off than if consuming none of the good at point *A*; there would be a net gain, or consumer surplus, in this case. The local telephone supplier, however, sets the entry fee to extract all this potential gain. In this case, the entry fee is given by AA'. After paying that entry fee the consumer can purchase the product along the $A'Z'$ budget line (which has a slope of *P*). Note that the entry fee is set so that the consumer's preferred point on $A'Z'$, point *E*, is on the same indifference curve the consumer realizes at point *A*: The consumer is indifferent between purchasing the product (and paying the entry fee) and not participating in this market at all (that is, staying at point *A*).

With many consumers who have identical demands, all would choose to participate and the local telephone provider would realize all the potential consumer surplus as its profit. In terms of the outcome, note that it is the same as when the firm can practice first-degree, or perfect, price discrimination. In both cases, the firm is able to capture all the consumer surplus as profit. In addition, the firm is producing the efficient rate of output, because it is producing where marginal cost equals the price (marginal benefit). All the potential gain from producing this product has been realized, but it has been realized by the firm as profit rather than by the consumers as consumer surplus.

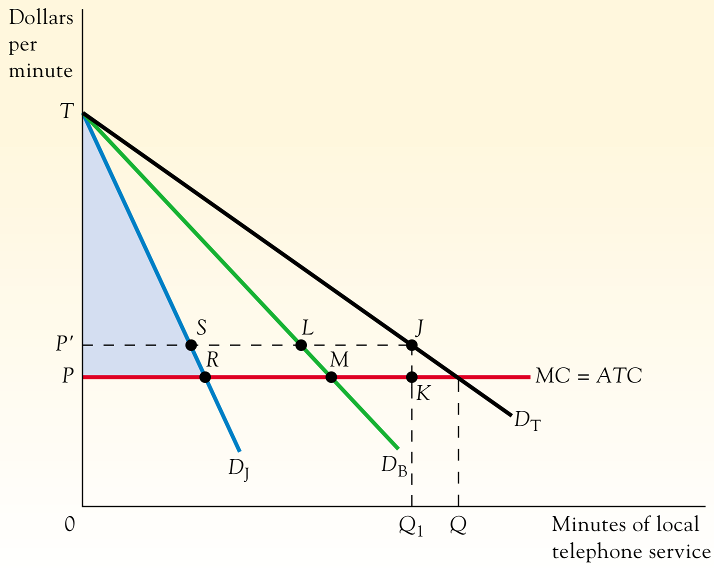
Many Consumers, Different Demands

The firm would like to charge each consumer an entry fee that extracts the entire potential consumer surplus. When consumers have different demand curves, however, a different entry fee must be charged to each consumer. If that can be done, the outcome is the same as we have just explained. Typically, however, a firm may find that it must charge the same entry fee to all consumers, perhaps because it does not have enough knowledge of each consumer's demand curve, and acquiring such knowledge would be prohibitively expensive. In this case, the joint determination of the entry fee and a price that maximizes profit is more difficult. In fact, there is no general rule that determines the most profitable policy. Instead, firms have to proceed on the basis of trial and error, first setting an entry fee and then varying price, and vice versa, until they find the combination that maximizes profit. Let's consider what this combination is likely to look like.

Assume there are two consumers of local telephone service, Jennifer and Brad, with demand curves D_J and D_B, respectively, in Figure 12.6. (The analysis also applies, of course, if there are a large number of consumers, with equal numbers having each demand curve.) To simplify the analysis, we have drawn Brad's demand curve such that he would consume exactly twice as much as Jennifer at each possible price. The total demand curve facing the local telephone supplier is then D_T, and the supplier's marginal cost of production is assumed to be constant, as before. (The supplier is assumed to be free of any regulatory rate controls.) Now suppose that the local telephone supplier is initially charging a price equal to marginal cost and sets the entry fee equal to the shaded area (thereby extracting all of Jennifer's consumer surplus). Profit is equal to twice the shaded area because the entry fee is col-

FIGURE 12.6

Two-Part Tariff with Different Demands
When consumers have different demand curves, the entry fee is set lower and the price of the product is set above marginal cost. Here, we see that the firm will make a larger profit by charging price *P′* with entry fee *TSP′* instead of price *P* with entry fee *TRP*.



lected from both consumers. Note that if the entry fee is increased a small amount, Jennifer would drop out of the market and so profit would fall; only Brad would pay the entry fee.[6]

This combination of price and entry fee is not, however, the one that maximizes profit. To see why, suppose that the firm raises price to *P′* and simultaneously reduces the entry fee to ensure that both consumers remain in the market. (If the price is increased and the entry fee remains unchanged, Jennifer would exit the market. In Figure 12.5b, this would have the effect of making the budget line steeper at point *A′*, and Jennifer would be better off at point A than at any point on the new budget line.) The maximum entry fee that can be charged and still keep Jennifer in the market is now the area *TSP′*, so the entry fee has been reduced by area *P′SRP*. Our problem is to see whether this combination of a higher price and lower entry fee produces a larger profit for the firm. To see that it does, note that profit is now equal to area *P′JKP* (from sales at a price above cost) plus twice the area *TSP′* (from the entry fee charged to each consumer). Compared with the initial situation, profit has increased by area *P′JKP* minus twice the area *P′SRP*. Because area *P′JKP* is larger than twice area *P′SRP*, profit has increased. (Because Brad's demand is exactly twice Jennifer's, twice the area *P′SRP* exactly equals area *P′LMP*, so profit has increased by area *P′JKP* minus *P′LMP*, or by area *LJKM*.)

Thus, the telephone supplier can increase its profit by reducing the entry fee and raising price above marginal cost. Note that this contrasts with our earlier analysis of the case where all consumers have the same demand curves. In that case, price was set equal to marginal cost. When demands differ, however, the firm has an incentive to alter both the entry fee and price. In Figure 12.6, for example, the firm has an incentive to continue reducing the entry fee and raising price as long as profit can be further increased. Where this process ends depends on the specific pattern of consumer demand curves confronting the firm, but we can show that the result will usually be a price lower than the simple monopoly price.

[6] If Brad's demand is more than twice as large as Jennifer's, it would pay the firm to raise the entry fee to extract all of Brad's consumer surplus and let Jennifer exit the market.

Consider Figure 12.7, in which the consumer demands and marginal cost are the same as in the previous graph. If the firm were a simple monopoly charging a uniform price and no entry fee, the price would be *P* and output, *Q*, would be half the competitive output (for linear demand curves and constant marginal cost). Profit would be shown by the rectangle *PJHN*. Now we can see that the firm can do better by using a two-part tariff, if that is feasible. If it charges an entry fee equal to the area *TSP* and continues to charge price *P*, profit will increase by twice the entry fee. Thus, a two-part tariff will result in larger profit than would a uniform price. However, it does not mean that this specific entry fee and price will maximize profit. In fact, we can show that an increase in the entry fee coupled with a price lower than *P* will increase profit.

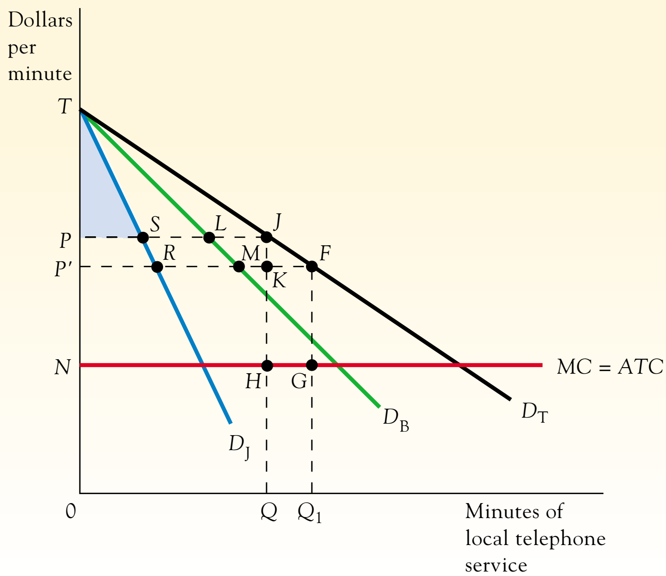
Let us evaluate how an increase in the entry fee to *TRP′*, coupled with a reduction in price to *P′*, will affect the firm's profit. Ignoring the entry fee for the moment, we see that the price reduction will affect profit in two opposing ways. Profit will be increased by area *KFGH* (additional output at a price above cost) and reduced by area *PJKP′* (reduced profit on initial output). If the initial price *P* is the simple monopoly profit-maximizing price, these two areas will be approximately equal. (In other words, a small change in price in the neighborhood of the profit-maximizing price will have a negligible effect on total profit.) Thus, the profit from sales at a price above marginal cost is approximately unchanged by the price reduction. Recalling now that the firm also collects higher entry fees, equal to twice area *PSRP′*, we can see that the combination of a lower price and higher entry fee will increase total profit. (Proceeding more slowly, profit increases by area *KFGH*, minus area *PJKP′*, and plus twice area *PSRP′* = area *PLMP′*. Thus, profit rises by area *KFGH* minus area *LJKM*.)

This analysis is obviously somewhat complicated, and would be even more so if we considered a case with more than two consumers. Nevertheless, we have been able to reach some interesting conclusions about two-part tariffs. First, a firm can realize more profit by using this pricing strategy than by simply using a uniform price. Second, the price charged will be lower than the simple monopoly profit-maximizing price but higher than marginal cost. Third, and an implication of the second point, output will be higher than under simple monopoly and therefore the deadweight loss will be smaller.

FIGURE 12.7

Effect of Two-Part Tariff on Price

Profit can be increased by charging a price lower than the simple monopoly price when a two-part tariff is used. Here, we see that the firm will make a greater profit by charging price *P′* with entry fee *TRP′* rather than price *P* with entry fee *TSP.*



APPLICATION 12.6 The Costs of Engaging in Price Discrimination

Employing a pricing strategy such as a two-part tariff is not without its costs. The Disney theme parks provide a case in point.[7] Prior to 1980, Disney required customers to purchase a "passport" that granted admission to its theme parks, Disneyland and Disney World, and included a set number of tickets to each of the parks' various rides. Additional ride tickets could be purchased, with the price varying depending on the ride. Disney set the highest prices for "E" rides such as Space Mountain, since customers favoring such rides tended to be more fanatical (that is, less price sensitive) in their preferences. These fanatical riders could not be identified at the admission gate, but they could be sorted out through the two-part pricing scheme, and so Disney could extract more of their consumer surplus.

Despite the effectiveness of the two-part pricing scheme for extracting consumer surplus, Disney adopted a simpler, single-price admission policy in the early 1980s; the company began charging a higher entry fee but eliminated the additional ride charge. The reason was that Disney found the cost of administering the more complicated two-part pricing scheme in terms of labor and paperwork (additional staff were needed to sell and collect tickets for the various rides) outweighed the benefit (the net revenue generated by the two-part pricing scheme). Although Disney's theme parks still employ other forms of price discrimination (multi-day and season passes, senior-citizen discounts, and so on), the two-part passport pricing strategy did not enhance company profit because of its administrative costs.

[7]This application draws on Walter Nicholson, *Intermediate Microeconomics*, 6th ed. (New York: Dryden Press, 1994).

12.5 Intertemporal Price Discrimination and Peak-Load Pricing

INTERTEMPORAL PRICE DISCRIMINATION a form of third-degree price discrimination in which different market segments are willing to pay different prices depending on the time at which they purchase the good

Intertemporal price discrimination is a form of third-degree price discrimination. When different market segments are willing to pay different prices depending on the time at which they purchase the good, a firm can increase its profit by tailoring its prices to the demands of the various market segments.

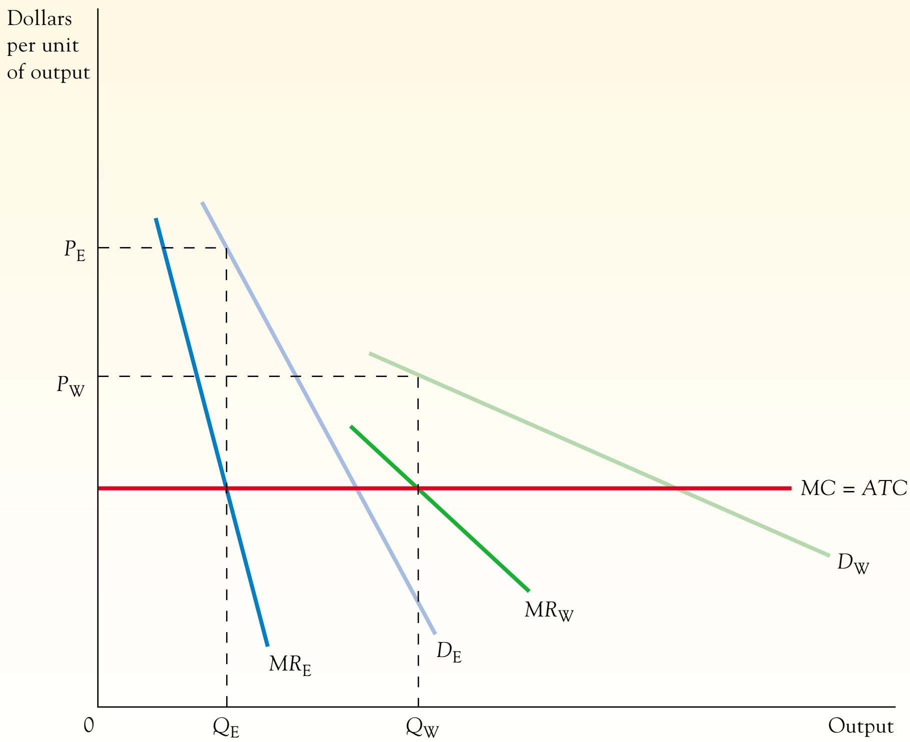
Take the case of video programming. Distributors of television programs and motion pictures discriminate among audiences by releasing their products at different times (known as *windows*) and through different channels. Historically, movies were released through a series of "runs," beginning with first-run theaters in big cities and working down to small community theaters. Over the past decade, the typical domestic release sequence for a successful U.S. feature film has changed to cinema, home video, first cable run, broadcast network, second cable run, and syndication to local television stations. Through this type of release sequence, distributors allow buyers to sort themselves according to how much they are willing to pay to view the product at different points in time after the initial release of a program.

Figure 12.8 illustrates how a motion picture distributor can increase profit by engaging in intertemporal price discrimination versus charging the same markup of price over marginal cost irrespective of the viewing window. Suppose that consumers eager to view a new film as soon as it is released to theaters are represented by the demand and marginal revenue curves D_E and MR_E. In contrast, consumers willing to wait to view the film, on broad-

FIGURE 12.8

Intertemporal Price Discrimination

When two different market segments are willing to pay different prices based on the time that a good is purchased, a supplier can increase profit by employing a pricing strategy that takes this into account. Compared to charging a common price to the two segments, profit is increased by charging P_E to the market segment more eager to purchase the good and P_W to the segment willing to wait to make the purchase.



cast television perhaps, are represented by the demand and marginal revenue curves D_W and MR_W. Assume, for simplicity's sake, that the cost of serving all consumers is constant and equal to MC.

If resale can be prevented, the film distributor can increase profit by charging different prices to the two market segments: P_E to customers eager to see the film at a cinema as soon as it is released and P_W to customers opting to wait to view the film at home. Such third-degree price discrimination results in profit being greater than if a common price is charged to both market segments. As can be easily verified, charging a common price such as P_E or P_W, or a price in between P_E and P_W, yields lower total profit than if the two segments are charged different prices based on the outputs where their respective marginal revenue curves intersect the marginal cost curve.

Another example of intertemporal price discrimination involves different fares for seats on the same flight depending on how far in advance an airline ticket is purchased. Some economists believe that computer hardware manufacturers engage in intertemporal price discrimination when they introduce a new product. IBM, for instance, charged approximately

$3,500 for a personal computer in the early 1980s when the product was first introduced. By 2002, however, the per-unit price had fallen below $2,000.[8] Book publishing provides another example. The paperback version of a book typically comes out six months to a year after the hardcover version and is priced much lower, not solely because of lower production cost but also in recognition of the fact that consumers willing to wait that long to read the book are more price sensitive than hardcover buyers.

APPLICATION 12.7 YIELD MANAGEMENT BY AIRLINES

To increase their profits, major airlines rely on "yield management": sophisticated computer programs to determine how many seats on a given flight they should make available at a particular fare. Through a fare structure based on past demand for a flight (for example, 30 seats might be earmarked for sale at the lowest discount fare) and restrictions to prevent resale (advanced purchase requirements, Saturday-night stay conditions, cancellation penalties, and so on), airlines strive to take advantage of the fact that air travelers differ in their sensitivity to prices and restrictions. For example, the lowest-price fare typically requires an advance purchase of 21 days, necessitates a Saturday-night stay, and is nonrefundable. Such deep-discount fares generally are unattractive to business travelers, who are willing to pay more for a ticket (because the tickets are charged to an expense account) and cannot finalize their travel plans that far in advance or stay over a Saturday night. Prior to spinning it off as a separate unit in 1996, American Airlines estimated that SABRE, its computer-reservation system, accounted for 75 percent of the company's net worth thanks to its effectiveness at promoting price discrimination.

To exploit the fact that airlines release more lower-price fares whenever demand for seats on a flight is lower than expected, travel agents have begun relying on software programs that continuously scan a reservation system, snagging low fares as they become available. Airlines have retaliated by imposing hefty fees, based on the number of computer keystrokes made by the agencies, to discourage extensive fare searches.

Airlines' efforts to limit resale through their computer-reservation systems and travel restrictions have not proved entirely successful. For example, suppose that a business customer needs to travel twice from Atlanta to Chicago for meetings on two successive Wednesdays, on April 7 and 14. Rather than buying a ticket for each round-trip that originates in Atlanta on Tuesday afternoon and returns from Chicago on Wednesday night (fares that retail for $500 to $800), the traveler can buy two back-to-back Super-Saver tickets that require a Saturday night stay (each costing only $200 to $400): The first originates out of Atlanta on Tuesday, April 6, and returns from Chicago on Wednesday, April 14; and the second originates out of Chicago on Wednesday, April 7, and returns from Atlanta on Tuesday, April 13. In this manner, business travelers can circumvent the restrictions imposed by airlines while accessing the deepest-discount fares.

Individual airlines have recently begun cracking down on back-to-back ticketing ploys by refusing to let travelers board a flight if they do not plan to stay over on Saturday night at the destination city on a Super-Saver fare[9]—that is, when the carrier knows that the traveler has an overlapping ticket issued on the same airline. Whether the airlines ultimately will be able to prevent such arbitrage by business travelers is questionable, given that a business traveler can buy one back-to-back ticket from one airline and the other ticket from a competing airline.

[9] "Airlines Crack Down on Agents Over Fare Plays," *Wall Street Journal*, September 12, 1997, pp. B1 and B2.

[8] Increased competition in the personal computer market as well as falling production cost, however, might also explain the historical decline in prices.

Application 12.8 Priceline, Project Purple Demon, and Online Intertemporal Price Discrimination

Notwithstanding the sophisticated yield management techniques practiced by airlines and detailed in the preceding application, about 30 percent of seats still go empty on any given day.[10] Rather than get nothing for them, airlines are increasingly turning to online distribution channels in an effort to entice bargain-minded travelers with special fares, referred to as *distressed inventory*, which aren't published in industrywide computer systems. For example, since the late 1990s, most major U.S. airlines have released, in the early hours of each Wednesday morning, e-mail or Web site lists of bargain fares on flights that remain largely unfilled. Passengers must leave on the coming Saturday and return on Monday or Tuesday. The savings can be substantial. For example, in 2002 American offered last-minute round-trip tickets from Chicago to Boston for $130 each online versus $1,000 for an unrestricted coach ticket available through more traditional distribution channels.

Selling distressed inventory in the airline business, of course, is also the focus of companies such as Priceline, Travelocity, and Orbitz, which offer deeply discounted fares on-line for travel on a variety of different airlines. Priceline, one of the most successful of such companies, requires customers to name their price and masks the identity of the airline, the routing, and the precise time of day of the flights until the customers' offers are accepted. Priceline's annual revenue has grown from $35 million in 1998 to $1.2 billion by 2002.

Priceline's growth has, as one might expect, not gone unnoticed by the major carriers. In 1999, United, American, Northwest, Continental, US Airways, and America West, initiated a joint venture dubbed "Purple Demon" to compete with Priceline. Launched in late 2000 as Hotwire, the joint venture differs from Priceline in one key way: consumers don't have to name their own price to get cheap tickets. Rather, Hotwire allows consumers to select actual discount fares that are posted online for various routes.

[10]This application is based on "Surf and Fly: Navigating Net Fares," *Business Week,* January 26, 1998, p. 102; and "Airlines to Offer Cheap Tickets on the Internet," *Wall Street Journal,* June 29, 2000, pp. B1 and B4.

Peak-Load Pricing

In Figure 12.8 we assumed that the marginal cost associated with selling output at various points in time is constant. Such an assumption is not always valid. Sometimes producers charge different prices at different points in time because, in addition to demand, the cost of producing the "same" product varies with the time it is produced. In such instances different prices reflect not only different demands (that is, price discrimination), but also different costs. An important case of this type involves the provision of telephone service.

Telephone usage varies greatly over a 24-hour period. Typically, total use is greatest in the daytime, during normal business hours. Residential use tends to be greater in the evening than during the day, but total use is lower in the evening than in the daytime. Late-evening use is lowest of all. (There are also often systematic variations in use over the year; telephone usage is lowest during vacation months such as August and skyrockets on specific days such as Mother's Day.) Thus, a different demand curve exists for telephone service at different times of the day. Economists refer to the period when demand is highest as the "peak" period and when it is the lowest as the "off-peak" period.

Just as the demand for telephone service differs, so does the cost of producing it. If telephone switching capacity (the ability to connect one caller to another) could be stored at negligible cost, the marginal cost of providing telephone calls during peak and off-peak periods would not differ; that is, the telephone company could operate at a constant rate of production over the day, store the surplus switching capacity during the off-peak period, and sell it during the peak period. Unfortunately, however, switching capacity can't be stored; it has to be used when it is produced. Because production must be greater during the peak period than during the off-peak period, telephone companies must have the switching capacity to meet the peak demand. As a consequence, much of the switching capacity needed during periods of peak demand sits idle in off-peak periods. Moreover, the marginal cost of providing telephone service is higher during peak periods when capacity is strained and lower during off-peak periods when only the most efficient switching capacity is employed.

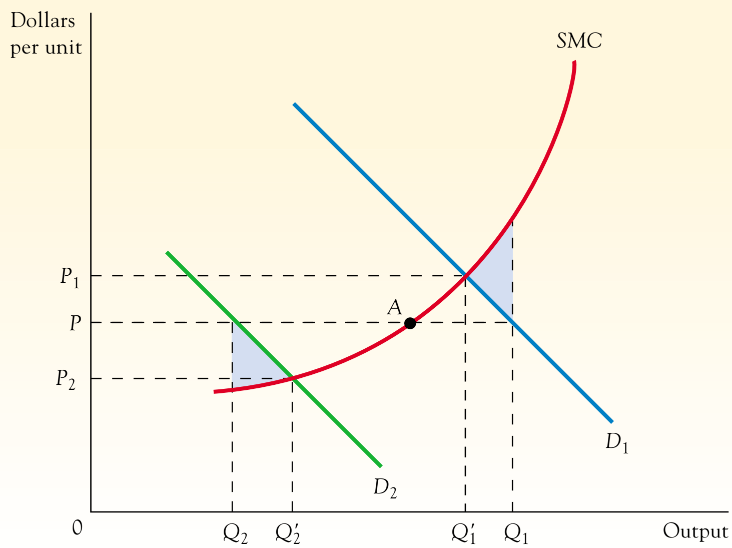
As we will see, charging a higher price for telephone service during the peak period than during the off-peak period serves to promote efficiency. We can compare the consequences of a uniform price for telephone service with prices set to reflect different demands and marginal costs of service over the day, with the aid of Figure 12.9. We assume a short-run setting in which the scale of operation has been selected; the switching capacity, buildings, and telephone lines are already built. The short-run marginal cost of telephone service is shown as *SMC*, and it slopes upward for reasons already explained in Chapter 8. We further assume that demand varies between two periods, with the demand curve for the peak period shown as D_1 and the demand curve for the off-peak period shown as D_2.

Now suppose that a public utility commission requires the provider of telephone service, a regulated monopoly, to sell output at the price *P*, which just covers the average cost of producing telephone service in peak and off-peak periods. At *P*, the monopoly will provide an output of Q_2 during the off-peak period, but what will be the most profitable output for the peak period? During the peak period the telephone company would like to produce an amount equal to *PA*, where $MC = MR$ $(= P)$. Note, however, that if the telephone company produced *PA*, a shortage would result during the peak period. To avoid such a shortage, the public utility commission may require that the telephone company be able to meet the demand at the regulated rate. Thus, we assume that the monopoly will produce Q_1 during the peak period. However, because marginal revenue $(= P)$ is less than marginal cost at Q_1, the interests of the telephone company and the public utility commission, as well as the

FIGURE 12.9

Peak-Load Pricing

With demand of D_1 in the peak period and D_2 in the off-peak period, peak-load pricing involves charging a price of P_1 in the peak period and P_2 in the off-peak period.



public, would be at odds. (In the case of electric utilities, where uniform pricing is much more common than for telephone service, some have argued that the occasional blackouts and brownouts during periods of heavy use are manifestations of suppliers' reluctance to provide adequate capacity to meet peak demand at regulated rates.)

PEAK-LOAD PRICING a pricing policy in which different prices are charged for peak and off-peak periods

In contrast to the uniform-price policy, **peak-load pricing** calls for a different price in peak and off-peak periods. If regulators wish to promote efficiency, the price in each period would be set where *SMC* intersects the relevant demand curve. Thus, price would be P_2 in the off-peak period and P_1 in the peak period. Faced with these prices, consumers would purchase Q_2' in the off-peak period and Q_1' in the peak period. With this price structure consumers have an incentive to be more economical in their use of telephone service at the time when the cost of providing it is highest. This situation may include shifting their telephone usage from the peak to the off-peak period.[11]

Peak-load pricing has two advantages relative to uniform pricing. First, a more efficient distribution of telephone usage between the peak and off-peak periods results. Note that people curtail their telephone usage when it is more costly and increase their usage when it is less expensive, so the total cost of producing a given amount of telephone service is reduced. More formally, when use in the peak period falls from Q_1 to Q_1', total cost falls by the area under the *SMC* curve over this range, and total benefit falls by the area under the demand curve. Total cost falls by more than total benefit, however, so there is a net gain, as shown by the shaded area. Similarly, total benefit rises by more than total cost when consumption is increased in the off-peak period; the net gain is shown by the shaded area between D_2 and *SMC*. If the monopoly is regulated so that it makes zero economic profit, this efficiency gain will be realized by the consumers of telephone service. The gain to consumers is easiest to see if we assume that the total output of telephone service remains unchanged ($Q_2' - Q_2 = Q_1 - Q_1'$). Then, the total cost of producing this telephone service is reduced. If total revenue just covers total cost, total revenue from consumers also falls: The average price of telephone service is reduced by using peak-load pricing.

A second advantage of peak-load pricing becomes apparent when we turn from a short-run to a long-run setting. In choosing a scale of operation, the telephone company must have the capacity to meet the peak-period demand. Under uniform pricing, handling the peak demand means being able to produce Q_1. With peak-load pricing the quantity demanded in the peak period is less, so a smaller scale of operation is feasible. In terms of building adequate capacity, peak-load pricing means that the telephone company has to build and maintain less switching capacity. This cost saving also represents an efficiency gain from peak-load pricing.

To a significant extent, the efficiency gains from peak-load pricing depend on the ability of users to curtail their consumption when confronted with a higher price during the peak period. The options here are greater than might be imagined. Some adjustments are quite simple. In the case of electricity production in Vermont, for example, a system of peak-load pricing has been used since 1974. Vermont families commonly fill dishwashers after dinner but do not turn them on until late at night, when rates fall.

Businesses are also capable of adjusting their demand in response to a system of peak-load pricing. A case in point is provided by the Kohler Corporation, in Kohler, Wisconsin. When the daytime electricity price was raised to 2.03 cents per kilowatt hour and the night-

[11]The extent to which people shift telephone usage from the peak to the off-peak period will be greater than shown in the diagram because the demand curves themselves will shift. Demand curve D_1 is drawn for a given price of telephone service in the off-peak period—in this case, a price of *P*. When the price is P_2 in the off-peak period, the demand curve in the peak period will shift to the left since consumption in the two periods are substitutes. Similarly, demand in the off-peak period will rise. The interdependence between the demand curves is ignored in the text; taking it into account strengthens the case for peak-load pricing.

time price was lowered to 1.01 cents in 1977, Kohler responded by shifting 250 of its workers to the night-time shift. To compensate its workers for a less desirable work schedule, Kohler paid an extra $50,000 in wages, but cut its annual electric bill by about $464,000.

Although we have examined peak-load pricing in the context of regulated monopolies, it is also relevant for other forms of market organization. When the conditions are appropriate, it tends to arise naturally in unregulated markets. For example, hotels and motels in resort areas charge more during vacation periods when demand is high, restaurants charge more at dinner than at lunch, and movie theaters charge more in the evening than in the afternoon. In these and similar cases, the different prices charged result from the fact that demand and cost vary systematically over time and that cost varies over time because the product cannot be stored.

SUMMARY

- Monopolies can engage in pricing tactics not available to competitive firms. One example is price discrimination, the charging of nonuniform prices.
- A firm with monopoly power has an incentive to engage in price discrimination because it can increase profit, provided it is not too costly to identify what different potential customers are willing to pay and that resale can be prevented.
- Perfect or first-degree price discrimination means selling each unit of output for the maximum price a consumer will pay. It is perfect from the monopolist's point of view because it produces the maximum amount of profit and reduces consumer surplus to zero.
- Second-degree price discrimination or block pricing occurs when the per-unit price declines as a function of the quantity purchased. Provided that such a declining per-unit pricing schedule does not reflect only cost considerations (for example, economies of scale), it can increase a monopoly's profit by allowing the firm to take advantage of the fact that it faces a downward-sloping demand curve.
- Third-degree pricing or market segmentation occurs when the price differs among categories of consumers. The same item may be sold to different market segments at different prices depending on such factors as a segment's demographic features and sensitivity to the time of purchase, as well as the extent to which the market segment is informed about the prices charged by competing firms.

REVIEW QUESTIONS AND PROBLEMS

Questions and problems marked with an asterisk have solutions given in Answers to Selected Problems at the back of the book (page 577).

***12.1.** Apply the theory of price discrimination to a monopoly that faces a downward-sloping demand curve for its domestic sales but a horizontal demand curve for sales in international markets. (Do you see how tariffs and trade restrictions could produce this situation?)

12.2. Assume that all consumers have identical demand curves for local telephone service, and the producer of such service is a monopoly. Compare price, output, profit, and consumer surplus when (a) the monopoly sets a uniform price for the product; and (b) the monopoly uses a two-part tariff.

12.3. How can the supplier of local telephone service determine the optimal two-part tariff if its customers have different (but known to the supplier) demand curves?

12.4. In Figure 12.6, how will the profit realized by raising the price and reducing the entry fee be affected if Brad's demand curve is only slightly greater than Jennifer's (instead of twice as large, as shown in the graph)? In Figure 12.7, how will the profit realized by reducing the price and increasing the entry fee be affected if Brad's demand curve is only slightly greater than Jennifer's? What do these results suggest about how the profit-maximizing price and entry fee will vary in the two cases?

***12.5.** Car rental firms often charge a daily rental fee for cars plus an additional cost per mile driven. Is this an example of a two-part tariff?

12.6. What is peak-load pricing? How is it similar to price discrimination? How is it distinguished from price discrimination?

***12.7.** Food consumption peaks at dinnertime and is very small between midnight and 6:00 A.M. In view of this systematic variation in consumption over the day, why is peak-load pricing not used more extensively for food?

12.8. The text states that if conditions are appropriate, peak-load pricing arises naturally under competitive conditions. Explain why peak-load pricing will emerge, starting from a point where all firms are charging a uniform price.

12.9. "Suppose that Cornell University faces a downward-sloping, linear demand curve for the undergraduate education that it provides. If Cornell is able to engage in perfect, first-degree price discrimination (through obtaining detailed financial information from each prospective student and offering different levels of financial aid), then Cornell's marginal and average revenue curves will be identical." Explain why this statement is true, false, or uncertain.

12.10. The year is 2020 and the U.S. airline industry has been radically transformed through a recent wave of mergers. Only one company, MONO Airlines, has managed to survive the succession of price wars, labor–management disputes, and government policy reversals that plagued the industry in previous years. MONO now seeks to make the most of its exclusive hold on the market. To that end, it adopts a new slogan, "Fly MONO—or Walk," and then hires you as a consultant to offer advice on its pricing policy. Specifically, MONO asks you for advice on how much to charge for its one-way flight from Boston to New York City. You are informed that the one-way marginal cost for each passenger is $40. You are also told that there are two types of customers: well-paid business executives, and less-advantaged students and tourists. The demand by each of these types of customers is shown in the table.

	One-Way Trips Demanded Per Year (in Thousands)	
Price of One-Way Ticket	Executives	Students/Tourists
$140	0	0
$130	8	0
$120	9	1
$110	10	2
$100	11	3
$90	12	4
$80	13	5
$70	14	6

You recommend that MONO charge different prices to the two different customer groups. If MONO charges different fares, what fare would maximize the profit earned from each customer group?

12.11. Consider your answer to the preceding problem. Relative to the case where MONO charges a single price to all its passengers, would the price discrimination scheme you recommended raise or lower MONO's total profit? By how much?

12.12. Hard Bodies is a new entrant to the local health club scene. The owners of Hard Bodies realize that profit can be increased through price discrimination. Accordingly, the firm employs several different pricing schemes. For each of the following schemes explain whether it is price discrimination and, if so, what degree of price discrimination it is.

a. An annual membership to the club sells at a 50 percent discount of the total rate charged customers who choose to pay on a month-by-month basis (for example, the annual fee is $300 while the regular monthly rate is $50).

b. Obese customers weighing at least 300 pounds get a 20 percent discount on all regular rates.

c. Spouses of members belonging to the club qualify for a 30 percent discount on all regular rates.

d. Hard Bodies offers to beat (through a 20 percent discount) any rate that a customer is offered by a rival health club.

12.13. Besides price discrimination, can you think of any other reason to explain why dry cleaners typically charge more to dry clean a woman's blouse than a man's shirt?

12.14. Apart from shipping costs, would you expect the price of an item to be lower or higher if bought through a mail-order company versus through a store? Explain your answer.

12.15. A private golf club has two types of members. Serious golfers each have the demand curve $Q = 350 - 10P$, where Q represents the number of rounds played per year and P is the per-round price. Casual golfers have the demand curve $Q = 100 - 10P$. The club has 10 serious and 100 casual golfing members and faces a constant marginal cost of $5 per round played by either type of member. If the club can engage in third-degree price discrimination, what prices should it charge to the two types of members?

12.16. In the preceding problem, suppose that the club can employ a two-part pricing scheme but must charge all members the same annual membership (entry) fee. What entry fee and per-round price should the club charge?

12.17. Suppose that the golf club described in Problem 12.15 can employ a two-part pricing scheme and can charge different entry fees to different members. What entry fee and per-round price should the club charge to each member type?

12.18. Assume that the marginal cost to a grocery of selling a bottle of salad dressing to customers who use coupons versus those who don't is identical and equal to $1.50. If the elasticity of demand of coupon users is 5 versus 1.25 for noncoupon users, how much of a per-unit discount should the store make available through coupons? What if coupon users have a demand elasticity equal to 2 versus 1.25 for noncoupon users?

12.19. A video game producer has costs of $25,000 per month that are fixed with regard to output. The firm's marginal cost is $5 per unit of output for output between 1 and 15,000 units.

Information available from the market research group indicates that 15,000 units could be sold each month in the firm's primary market if the price was set at $6.80 per unit and that 14,000 units could be sold at $7 per unit. The market research group also suggests that it is reasonable to assume that price and quantity demanded have a linear relationship in this market not only between those two points, but also well beyond them.

a. One officer of the firm feels that price should be set at the level that would maximize revenue. At what price would this objective be accomplished? What would price elasticity and marginal revenue be at this price? Is this the price the firm should establish? Why or why not?

b. Other officers are concerned with profit. What price should be set to maximize profit? What output will prevail in the market at this price? What would price elasticity and marginal revenue be at this price? What is the profit?

The firm has the opportunity to sell in a second market that is separated from the first in such a way that buyers in one market cannot resell to buyers in the other market. For the second market, the market research group has estimated the demand relationship to be:

$$P_2 = 7 - 0.00001Q_2;$$

where P_2 is the price in the second market and Q_2 is the quantity of the firm's product sold in that market each month.

c. Some officers of the firm believe this second market offers an opportunity for additional profit. They argue that if production is constrained to 15,000 units, the limit within which marginal cost is $5, it is worthwhile to sell some of these units in the second market. Should the firm sell any units in this market? Should it sell only units that would not be absorbed in the primary market at the profit-maximizing price? Should it divert some units from the primary to the secondary market? What price would you set in each market? What are the elasticity and marginal revenue in each market? What is the profit if your policy suggestion is followed? How much profit do you attribute to each market? Explain why your suggestion is the best policy.

d. One of the firm's production managers has pointed out that 15,000 units of output per month is not the absolute limit on production. The physical limit, he points out, may be closer to 30,000 units. The problem is that for each unit of output above the 15,000-unit level, marginal cost will rise by $0.001, so that unit 15,001 will increase total cost by $5.001, unit 15,002 will increase it by $5.002, and so on. He wonders if the two markets together could not advantageously absorb more than 15,000 units considering this production situation. What total output do you recommend? How much should go into each market? Is it worthwhile to push beyond 15,000 units of output per month? Why or why not?

12.20. You run a rather plush ride concession at an amusement park. It costs you $500 per day to have the ride available to patrons of the park. For each rider you have, the incremental cost is $1.

The patrons of the park appear to fall into one of two groups. Members of the first group are not concerned with taking a variety of rides but are quite responsive to ride price and will take the same ride many times. Members of the second group like variety in their rides and will pay a good deal to have at least one turn on a particular ride.

The daily demand for rides on your concession by a patron of the park in each of the two groups is shown in the table:

Price	Patron in Group 1	Patron in Group 2
$5.00	0	1
4.00	0	1
3.00	0	1
2.75	1	1
2.50	2	1
2.25	3	1
2.00	4	2
1.75	5	2
1.50	6	2
1.25	7	2
1.00	8	2
0.75	9	2
0.50	10	2

Each day each group includes about 100 patrons.

a. If the amusement park limits you to a one-part pricing structure consisting of a price per ride that is the same for every ride taken, what price will you charge?

b. If you could charge a two-part tariff consisting of a fee for access to your concession plus a charge for each ride taken, then what access fee and ride charge would you set? How much would you be willing to pay to the amusement park's owners to permit you to use this pricing structure?

c. If you could charge each patron a declining amount for each ride the patron took—that is, $3 for the first ride, $2.50 for the second, and so on—could you do better for yourself and for the amusement park than you could with either a single price or a two-part tariff? Explain why or why not.

12.21. Explain why magazine publishers sometimes offer a lower per-unit price to consumers who take a longer time to renew their subscription. Also explain why this is a profit-enhancing strategy as long as not too many customers realize that they can get a better deal by holding out.

12.22. Most cellular phone service providers offer prospective consumers several different plans from which to choose. For example, AT&T's Digital One Rate recently offered plans consisting of an access charge of $59.99 for 450 minutes per month plus 35 cents for each additional minute beyond 450; $119.99 for 1,100 minutes plus 30 cents per each additional minute; and

$199.99 for 2,000 minutes plus 25 cents for each additional minute. What degrees of price discrimination are being practiced by AT&T through such a menu of plans? Intuitively explain why AT&T finds it profitable to offer such a variety of plans.

12.23. In 1996, the State University of New York's various colleges began setting lower tuition rates for courses offered at night, on weekends, during the summer, and at sites with vacant seats. From an economic perspective does such a policy make sense? Explain why or why not.

12.24. Provide an intuitive explanation for why a restaurant in Paris might list a higher price for a dish on the English version of its menu than on the French version.