After months of investigation, police from Interpol swooped down on an international drug syndicate operating out of Antwerp, Belgium. The syndicate had been smuggling drugs from Kenya, Uganda, and Tanzania into the port of Antwerp for distribution throughout Europe. Smuggling had netted the syndicate millions of dollars in profit. The drug being smuggled? Heroin? Cocaine? No, something more valuable, Combivir. Why was Combivir, the anti-AIDS drug we introduced in Chapter 13, being illegally smuggled from Africa to Europe when Combivir was manufactured in Europe and could be bought there legally?1

The answer is that Combivir was priced at $12.50 per pill in Europe and, much closer to cost, about 50 cents per pill in Africa. Smugglers who bought Combivir in Africa and sold it in Europe could make approximately $12 per pill, and they were smuggling millions of pills. But this raises another question. Why was GlaxoSmithKline (GSK) selling Combivir at a much lower price in Africa than in Europe? Remember from Chapter 13 that GSK owns the patent on Combivir and thus has some market power over pricing. In part, GSK reduced the price of Combivir in Africa for humanitarian reasons, but lowering prices in poor countries can also increase profit. In this chapter, we explain how a firm with market power can use price discrimination—selling the same product at different prices to different customers—to increase profit.

Price Discrimination

Figure 14.1 shows how price discrimination can increase profit. In the left panel we show the market for Combivir in Europe and in the right panel the market in Africa. The demand curve in Africa is much lower and more elastic (price sensitive) than in Europe because, on average, Africans are poorer than Europeans.

Now let’s suppose for the moment that Europe is the only market. What price should GSK set? We know from Chapter 13 that the profit-maximizing quantity is found where marginal revenue equals marginal cost. From $MR = MC$ in the left panel, we find that the profit-maximizing quantity is $Q_{Europe}$. The profit-maximizing price is the highest price that consumers will pay to purchase $Q_{Europe}$ units, which we label $P_{Europe}$. Profit is given by the green area labeled $\text{Profit}_{Europe}$.
Similarly, if Africa were the only market, GSK would choose the profit-maximizing quantity $Q_{\text{Africa}}$ and the profit-maximizing price $P_{\text{Africa}}$, which would generate profit in the amount $\text{Profit}_{\text{Africa}}$.

But what price should GSK set if it wants to have a single “world price” for both Europe and Africa? If GSK wants a single world price, it should lower the price in Europe and raise the price in Africa, setting a price somewhere between $P_{\text{Europe}}$ and $P_{\text{Africa}}$, say, at $P_{\text{World}}$. (In a more advanced class, we would solve for the exact profit-maximizing world price, but that level of detail is not necessary here.)

But remember that $P_{\text{Europe}}$ is the profit-maximizing price in Europe and $P_{\text{Africa}}$ is the profit-maximizing price in Africa, so by lowering the price in Europe, GSK must be reducing profit in Europe. Similarly, by raising the price in Africa, GSK must be reducing profit in Africa. Thus, profit at the single price $P_{\text{World}}$ must be less than when GSK sets two different prices earning the combined profit: $\text{Profit}_{\text{Europe}} + \text{Profit}_{\text{Africa}}$.

We have now arrived at the first principle of price discrimination: (1a) If the demand curves are different, it is more profitable to set different prices in different markets than a single price that covers all markets.

We also know from Chapter 13 and from Figure 14.1 how a monopolist should set prices. Recall that the more inelastic the demand curve, the higher the profit-maximizing price. In this case, the demand for Combivir is more inelastic (less sensitive to price) in the European market than in the African market, so the price is higher in Europe. This really isn’t an independent principle; it’s an implication of profit maximization, as we showed in Chapter 13. But it’s a useful reminder, so we will add to our first principle: (1b) To maximize profit, the monopolist should set a higher price in markets with more inelastic demand.
The first principle of price discrimination tells us that GSK wants to set a higher price for Combivir in Europe than in Africa. But we also know from the introduction that setting two different prices for Combivir encourages drug smuggling. Smugglers buy Combivir at $P_{Africa}$ and sell at $P_{Europe}$, which leaves fewer sales for GSK. A smuggler’s profit comes out of GSK’s pocket.

If smuggling is extensive, GSK will end up selling most of its output at $P_{Africa}$, which is less profitable than if GSK set a single world price. Thus, if GSK can’t stop the drug smugglers, it will abandon its attempt at price discrimination and will instead set a single price—perhaps a single world price such as $P_{World}$ or, if the African market is small, GSK may abandon Africa altogether and set a single price of $P_{Europe}$.

Smuggling is a special example of a more general (and legal) process that economists call arbitrage—buying low in one market and selling high in another market. Thus, we arrive at the second principle of price discrimination: (2) *Arbitrage makes it difficult for a firm to set different prices in different markets, thereby reducing the profit from price discrimination.*

We summarize the principles of price discrimination.

### The Principles of Price Discrimination

1a. If the demand curves are different, it is more profitable to set different prices in different markets than a single price that covers all markets.

1b. To maximize profit, the firm should set a higher price in markets with more inelastic demand.

2. Arbitrage makes it difficult for a firm to set different prices in different markets, thereby reducing the profit from price discrimination.

The first principle tells us that a firm wants to set different prices in different markets. The second principle tells us that a firm may not be able to set different prices in different markets. To succeed at price discrimination, the monopolist must prevent arbitrage.

### Preventing Arbitrage

If it wants to profit from price discrimination, GSK must prevent the Combivir that it sends to Africa from being resold in Europe. GSK has a number of tools to discourage smuggling. GSK, for example, sends red Combivir pills to Africa and sells white Combivir in Europe. If GSK detectives find red Combivir in Europe, they know that a GSK distributor has broken its agreement. Using special bar codes on each package, GSK can then track the smuggled pills back to the distributor who was supposed to distribute them in Africa. Interpol is called in to make arrests.

Markets can differ in more ways than geographically. Rohm and Haas is a producer of plastics. One of its plastics, methyl methacrylate (MM), was used in industry and also in dentistry as a material for dentures. MM had lots of substitutes as an industrial plastic but few as a denture material, so Rohm and Haas sold MM for industrial uses at 85 cents per pound and sold a slightly different version designed for dentures at $22 per pound. At these prices, arbitrage is taking advantage of price differences for the same good in different markets by buying low in one market and selling high in another market.
it wasn’t long before enterprising individuals started buying industrial MM and converting it to denture MM. Just like GSK, Rohm and Haas needed a way to prevent arbitrage between the two markets.

One bold thinker came up with what Rohm and Haas internal documents called “a very fine method of controlling the bootleg situation.” The innovator suggested that Rohm and Haas should mix industrial MM with arsenic. This wouldn’t reduce the value of MM in industry, but it would surely deter people from making it into dentures! Rohm and Haas’s legal department rejected this plan, but the company came up with an idea nearly as good: They planted a rumor that industrial MM was mixed with arsenic.

Although Rohm and Haas never implemented the poisoning idea, the U.S. government has. The government taxes alcohol but subsidizes ethanol fuel. To prevent arbitrage, that is, to prevent entrepreneurs from buying ethanol fuel and converting it to drinkable alcohol, the government requires that ethanol fuel be poisoned!

It’s easier to prevent arbitrage of some products than of others. A masseuse, for example, may easily set different prices for different customers because it’s difficult for a customer who buys a massage at the low price to resell it to another customer at the higher price. Services, in general, are difficult to arbitrage.

**Price Discrimination Is Common**

Once you know the signs, price discrimination is easy to see. Movie theaters, for example, often charge less for seniors than for younger adults. Is this because theater owners have a special respect for the elderly? Probably not. More likely it’s that theater owners realize that young people have a more inelastic demand for movies than seniors. Thus, theater owners charge a high price to young people and a low price to seniors. It would probably be even more profitable if theater owners could charge people who are on a date more than married people (no one likes to look cheap on a date). But it’s easy for theater owners to judge age and not so easy for them to figure out who is on a date and who is married.

Students don’t always pay higher prices, however. Stata is a well-known statistical software package. It costs a business $1,295 to buy Stata, but registered students pay only $145. Thus, it’s not about age—the young sometimes pay more and sometimes pay less—it’s about how age correlates with what businesses really care about, which is how much the customer is willing to pay.

Here’s another example. Airlines know that businesspeople are typically less sensitive to the price of an airline ticket than are vacationers (i.e., businesspeople have more inelastic demand curves). An airline would like, therefore, to set a high price for businesspeople and a low price for vacationers, as illustrated in Figure 14.2.

But airlines can’t very well say to their customers, “Are you flying on business? Okay, the price is $600. Going on a vacation? The price is $200.” So how can airlines segment the market?

Airlines set different prices according to characteristics that are correlated with the willingness to pay. Vacationers, for example, can easily plan their trips weeks or months in advance. Businesspeople, however, may discover that they need to fly tomorrow. Thus, if a customer wants to fly to Tampa, Florida, in two weeks’ time he or she is probably a vacationer and the airline will charge that person a low price, but if the customer wants to fly tomorrow, the price will be
higher. On the day these words were written, U.S. Airways was charging $113 to fly from Washington, D.C., to Tampa with two weeks’ notice but more than three times as much, $395, to fly tomorrow. Except for the dates, the flights were identical. Figure 14.3 illustrates how one airline charged many different prices for the same flight.

Similarly, publishers know that hard-core fans are willing to pay a high price for the latest Harry Potter book, while others will buy only if the price is low. Publishers would like to charge the hard-core fans a high price and the less devoted a low price. How can they do this? One way is to start with a high price and then lower it once the hard-core fans have bought their fill. Thus, when *Harry Potter and the Half-Blood Prince* hit the shelves, it retailed at $34.99 in hardback, but when the paperback was released about a year later, it sold for just $9.99. Does it cost more to produce a hardback? Yes, but not much more, maybe a dollar or two. The hard-core fans pay a higher price not because costs are higher, but because the publisher knows that they are willing to pay a higher price.

A more subtle form of price discrimination occurs when firms offer different versions of a product for the purpose of segmenting customers into different markets. IBM, for example, offered one of its laser printers in two models: the regular version and the Series E (E for economy). The regular version printed at 10 pages per minute, the Series E printed at 5 pages per minute. The regular version was much more expensive than the Series E. What’s surprising is that the Series E cost more to produce. In fact, the only
difference between the regular and the Series E was that the Series E printer contained an extra chip that slowed the printer down! IBM wasn’t charging more for the regular printer because that printer cost more to produce; it was charging more because it knew that the demand for speed was correlated with willingness to pay.

**Universities and Perfect Price Discrimination**

Universities are one of the biggest practitioners of price discrimination, although they hide this practice under the blanket of “student aid.” Student aid is a way of charging different students different prices for the same good. Consider Williams College, a small, prestigious liberal arts college. In 2016, some students at Williams paid the sticker price of $64,090, while others paid just $3,127 for exactly the same education. Why the big difference in price?

Part of the story is that Williams College was doing good by offering financial aid to students from poorer families. But Williams College was also doing well. To see why, notice that Williams College is a lot like an airline. If U.S. Airways is going to fly an airplane from New York to Los Angeles anyway, then U.S. Airways can increase its profits by filling extra seats so long as its customers are willing to pay the marginal costs of flying (say, the extra fuel costs). Of course, if a customer is willing to pay $800 to fly to L.A., then U.S. Airways wants to charge that customer $800 and not less. But if the marginal cost of flying is $100, then U.S. Airways can increase its profits by filling an empty seat so long as the customer is willing to pay at least $101.

Williams College is a lot like an airline because if Ancient Greek History 101 is going to be taught anyway, then Williams can increase its profits by filling extra seats so long as its students are willing to pay the marginal costs of teaching. Of course, if a student is willing to pay $64,090 for a year of education at Williams, then Williams wants to charge that student $64,090 and not less. But if the marginal costs of teaching are $3,127 a year, then Williams can increase its profits by filling an empty seat so long as the student is willing to pay at least $3,127.

About half the students at Williams paid the full sticker price of $64,090, but half did not. Table 14.1 shows the average price paid by students in five different income classes, low to high, after taking into account “financial aid.”

**TABLE 14.1** PRICE DISCRIMINATION AT WILLIAMS COLLEGE, 2016

<table>
<thead>
<tr>
<th>Income Quintile</th>
<th>Family Income</th>
<th>Average Net Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td>$0–$30,000</td>
<td>$3,127</td>
</tr>
<tr>
<td>Lower Middle</td>
<td>$30,001–$48,000</td>
<td>$4,971</td>
</tr>
<tr>
<td>Middle</td>
<td>$48,001–$75,000</td>
<td>$7,419</td>
</tr>
<tr>
<td>Upper Middle</td>
<td>$75,001–$110,000</td>
<td>$16,899</td>
</tr>
<tr>
<td>High</td>
<td>$110,001+</td>
<td>$38,936</td>
</tr>
</tbody>
</table>

Note: Students who did not apply for financial aid, about half the student body, paid $64,090.

Data from: CollegeCalc.org, using data from the United States Department of Education.
The difference in price is extreme. Even the airlines, masters of price discrimination, can rarely charge some customers 20 times what they charge other customers. Williams has a big advantage over the airlines, however. Williams has an extraordinary amount of information about its customers.

To receive financial aid, Williams demands that students and their parents submit their tax returns to Williams. Williams, therefore, has very detailed information about the income of its customers, and it uses that information to set many different prices. Table 14.1 shows average prices within each income class, but, in fact, Williams divided prices even more finely, setting a different price, for example, to a student with family income of $30,000 than one with family income of $35,000. In theory, Williams could offer a different price to each one of its students, charging each student his or her maximum willingness to pay. This is what economists call **perfect price discrimination**.

Figure 14.4 shows how perfect price discrimination works in a market like education, where each customer buys one unit of the good. Alex values education the highest, Tyler the second highest, Robin the third highest, all the way down to Bryan who thinks that education has very little value. A firm that has a lot of information about Alex, Tyler, Robin, and Bryan can set four different prices, charging each of them their maximum willingness to pay (or, if you like, a penny less than their maximum willingness to pay). Thus, Alex is charged the most and Bryan the least.

Since a perfectly price-discriminating (PPD) monopolist charges each consumer his or her maximum willingness to pay, consumers end up with zero

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**FIGURE 14.4**

A Perfect Price Discriminator Marches Down the Demand Curve, Charging Each Customer Their Maximum Willingness to Pay

![Diagram](image)

The PPD monopolist on the right (b) charges each customer their maximum willingness to pay. Compared to the single-price monopolist on the left (a) the PPD monopolist earns all the consumer surplus and deadweight loss as profit. Since there is no deadweight loss, the output under the PPD monopolist is at the efficient level.
consumer surplus. All of the gains from trade go to the monopolist. This is bad for consumers but does have a beneficial side effect: Since the PPD monopolist gets all the gains from trade, the PPD monopolist has an incentive to maximize the gains from trade, and maximizing the gains from trade means no deadweight loss.

In Chapter 13, we showed that a single-price monopoly creates a deadweight loss, but this is not true for a perfectly price-discriminating monopoly. In Figure 14.4, notice that whenever a consumer’s willingness to pay is higher than marginal cost, then that consumer is sold a unit of the good—but this means that the PPD monopoly produces the efficient quantity! In fact, the perfectly price-discriminating monopolist produces until $P = MC$ (i.e., $Q^*$ units), exactly as does a competitive firm!

Another way of seeing why the perfectly price-discriminating monopolist produces the efficient quantity is to remember that all firms want to produce until $MR = MC$. For a competitive firm, $MR = P$, so the competitive firm produces until $P = MC$. For a single-price monopolist, $MR < P$, so the single-price monopolist produces less than the competitive firm. But what is $MR$ for a PPD monopolist? It’s $P$ and thus the PPD monopolist also sets $P = MC$. Can you explain why as a PPD monopolist moves down the demand curve selling to additional customers, its $MR$ is always equal to price?

Detailed information about its customers helps Williams College set each student’s price close to that student’s maximum willingness to pay, thus maximizing Williams’s revenue. Ever wonder why many retailers ask for your zip code when they ring up your purchase? More information means more profit. Ever wonder why used car salespeople are so friendly? Sure, friendliness helps to sell cars, but what you think of as friendly talk is really a clever strategy to learn as much about you as possible so the salesperson can price accordingly. When buying a new car, one of the authors of this book always tells the salesperson he is a student. Alas, the ruse is becoming less believable as the years wear on.

**Is Price Discrimination Bad?**

Price discrimination certainly sounds bad, but we just showed that a perfectly price-discriminating monopolist produces more output than a single-price monopolist, and this is good so price discrimination can’t always be bad. What about if price discrimination is imperfect? Does a monopolist that sets two (or a handful of) prices raise or lower total surplus? The answer is subtle, but there is a similar intuition to the case of the perfectly price-discriminating monopolist. Price discrimination is bad if the total output with price discrimination falls or stays the same, but if output increases under price discrimination, then total surplus will usually increase.

To see this, let’s return to the case of Combivir in Europe and Africa. Suppose that GSK was forbidden from price discriminating so it had to set one world price. What world price would GSK set, and would this increase or decrease total surplus?

One possibility is that if forced to set a single price, GSK would lower the price enough so that some Africans could buy Combivir—for example, a price like $P_{World}$ in Figure 14.1. A single price of $P_{World}$ is better for Europeans since $P_{World} < P_{Europe}$, but it is worse for Africans since $P_{World} > P_{Africa}$. Thus, depending on exactly how much better off Europeans are and how much
worse off Africans are at \( P_{\text{World}} \), price discrimination could be better or worse than single pricing.

How likely is it, however, that GSK would lower the price to \( P_{\text{World}} \)? Two-thirds of the 630 million people living in Africa live on less than a dollar a day. Thus, even when GSK sells Combivir at close to its cost of 50 cents a pill, most Africans with AIDS cannot afford Combivir. GSK, therefore, cannot make up for a low price by selling large volumes of Combivir to Africans. Thus, if GSK cannot set two different prices, it will probably abandon the African market altogether and sell to the world at \( P_{\text{Europe}} \). At \( P_{\text{Europe}} \), only Europeans can afford to buy Combivir.

At the single price of \( P_{\text{Europe}} \), are Europeans better off than with price discrimination? No, the price to Europeans hasn’t changed and thus the quantity of Combivir consumed by Europeans is the same under both pricing systems. What about Africans? At the single price of \( P_{\text{Europe}} \), Africans pay more for Combivir than with price discrimination and they consume less. Thus, in the most plausible case, forcing GSK to set a single price doesn’t help Europeans but does hurt Africans. Alternatively stated, price discrimination in this case increases total surplus because price discrimination increases output—with price discrimination, Europeans consume as much Combivir as with a single price, but Africans increase their consumption from what it would be with a high single price.

**Why Misery Loves Company and How Price Discrimination Helps to Cover Fixed Costs**

In industries with high fixed costs, price discrimination has another benefit. To explain why, we ask a strange question. Imagine that there are two diseases that if left untreated are equally deadly. One of the diseases is rare, the other is common. If you had to choose, would you rather be afflicted with the rare disease or the common disease? Take a moment to think about this question because there is a definite answer.

It’s much better to have the common disease because there are more drugs to treat common diseases than to treat rare diseases, and more drugs means greater life expectancy. Patients diagnosed with a rare disease are 45% more likely to die before the age of 55 than patients diagnosed with a more common disease.\(^*\)

The reason there are more drugs to treat common diseases is the market is larger. Simply put, it costs about the same to develop a drug for a rare or a common disease but the revenues are much greater for a drug that treats a common disease. Thus, the larger the market, the more profitable it is to develop a drug for that market.

The fact that profits increase with market size explains why price discrimination can benefit *Europeans*, as well as Africans. We have already shown that Africans benefit from price discrimination because of lower prices. Europeans benefit because price discrimination increases the profit from producing pharmaceuticals, and more profit means more research and development, more new drugs, and greater life expectancy.

Pharmaceuticals are not the only industry with high fixed costs—airlines, chemicals, universities, software, and movies all have a similar cost structure. Low prices for vacationers, for example, can benefit business travelers because the extra profit that airlines earn from selling to vacationers encourages airlines to offer more flights to more places at more times. The synthetic fabric Kevlar is five times stronger by weight than steel and is used to make bulletproof vests as well as auto tires. As a bulletproof vest, Kevlar has few substitutes, but as tire belting, it has many. As a result, DuPont charges more for Kevlar used in vests than for Kevlar used in belting. If DuPont had to charge the same price in all markets, Kevlar might not be used for belting at all, and DuPont would have lower profits and less incentive to innovate.

**Tying and Bundling**

Everyone knows that airlines charge different prices to different customers for the same flight. Senior citizen and student discounts are obvious. Universities advertise their scholarship policies—even if they don’t always advertise that this is a way of increasing profit! But other types of price discrimination are more subtle and difficult to see. Let’s take a look at tying and bundling, two types of price discrimination that are hidden to the untrained observer.

**Tying**

Why are printers so cheap and ink so expensive? As we write this chapter, one remarkable Hewlett-Packard (HP) photo printer/scanner/copier sells for just $69. A full set of color ink cartridges, however, will set you back $44. At that price, it almost pays to buy a new printer (which comes with a cartridge) every time you run out of ink! Clearly, HP is pricing its printers low and making its profit from selling ink. HP is not alone in pursuing this strategy. Xbox game consoles are priced below cost, and Xbox games are priced above cost. Cell phones are priced below cost and phone calls are priced above cost. Why?

Think of HP as selling not printers and ink, but the package good, “ability to print color photos.” HP wants to charge a high price to consumers with a high willingness to pay and a low price to consumers with a low willingness to pay. Consumers with a high willingness to pay for the “ability to print color photos” probably want to print a lot of color photos. Consumers with a low willingness to pay probably want to print only the occasional color photo. By charging a high price for ink, HP is charging high-willingness-to-pay consumers a high price. Yet, because the price of printers is low, consumers who have only a low willingness to pay are charged a low price.

HP’s pricing scheme is especially brilliant because the price is so flexible. Instead of two prices, there are many: one for a consumer who prints 10 photos a month, another for a consumer who prints 15 photos a month, and yet another for a consumer who prints 100 photos a month.

For HP’s scheme to work, it’s critical that no one else but HP be allowed to sell ink for HP printers—HP must tie its printers to HP ink cartridges, which is why this form of price discrimination is called tying. If competitors could easily enter the market for ink, the price of ink would fall to marginal cost and HP’s pricing scheme would fall apart. HP manages to keep competitors out of the market for ink in a clever way—the HP ink cartridge contains not just ink, but also a crucial and patented component of the printer head. Since other
firms are forbidden by law from manufacturing the printer head, and since the head and the ink must be packaged together, HP manages to keep competitors out of the market for ink. Well, almost. There is an active market in refilling HP printer heads, which is much cheaper than buying them new.

HP’s strategy illustrates both the benefits and costs of price discrimination. Price discrimination, as usual, may increase output by lowering the price to users who only want to print the occasional photo. Price discrimination also spreads the fixed costs of research and development—which are extensive for color photo printers—over more users, thus encouraging more innovation. But putting printer heads in the ink cartridge rather than in the printer probably raises the total cost of printing. Although there are some advantages to disposable printer heads, HP is spending the extra money not to benefit consumers but to keep competitors out of the ink business. Since the extra costs of production don’t benefit consumers, they are a cost of price discrimination.

By the way, in addition to price discrimination, HP is probably also taking advantage of a bit of consumer irrationality. When comparing printers, consumers should look at the total price, printer plus ink, over the entire lifetime of the printer. But it takes some work to estimate the total price, and consumers who are shortsighted may focus on amazingly cheap printers rather than astonishingly expensive ink.

**Bundling**

Goods are bundled when they must be bought in a package. Nike doesn’t sell right and left shoes individually; Nike sells shoes only in a right-and-left bundle.* Toyota doesn’t sell engines, steering columns, and wheels. It sells a bundle called a car. As the examples suggest, most bundling is easily explained as a way to reduce costs. But why does Microsoft sell Word, Excel, Outlook, Access, and PowerPoint in a bundle called Microsoft Office?

Unlike buying a car piece by piece, it would not be difficult for consumers to buy the Office products individually and assemble them as they wanted. Almost every car buyer wants an engine and four wheels, but not every Office buyer wants Microsoft Access. So why does Microsoft bundle? Note that Microsoft does sell most Office products individually, but the sum of the individual prices far exceeds the price of the bundle, so most consumers buy Office.

Bundling is a type of price discrimination. Suppose that we have two consumers, Amanda and Yvonne, whose maximum willingness to pay for Word and Excel is as given in Table 14.2.

Microsoft can sell each product individually or it can sell Word and Excel together as a bundle. Let’s calculate profit for each possibility. To make our lives simple, we will assume that the marginal costs of production are zero (which is approximately true—it costs very little to download Word).

If Microsoft sets prices individually, there are two sensible choices for the price of Word: $40 or $100. If Microsoft sets a price of $40 for Word, both Amanda and Yvonne will buy, and profit will be $80. If Microsoft sets a price of $100, Amanda alone will buy but profit will be higher, $100. Similarly, Microsoft can sensibly sell Excel for $20 or $90. Profit is higher at

<table>
<thead>
<tr>
<th>TABLE 14.2 MAXIMUM WILLINGNESS TO PAY FOR WORD AND EXCEL</th>
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<tbody>
<tr>
<td></td>
</tr>
<tr>
<td>Word</td>
</tr>
<tr>
<td>Excel</td>
</tr>
</tbody>
</table>

* The difference between tying and bundling is that bundled goods are sold one to one. Every right shoe comes with a left shoe. Tied goods are sold one to many. Every HP printer is tied to a variable number of ink cartridges, depending on consumer demand.
a price of $90 because $20 + $70 = $90. If Microsoft sets prices individually, therefore, it will charge $100 for Word and $90 for Excel for a total profit of $190 = $100 + $90.

Now consider bundling Word and Excel and selling them as Office. What price to set? To calculate this, we need to know the maximum amount that Amanda and Yvonne will pay for Word plus Excel. We calculate this in Table 14.3.

Amanda is willing to pay up to $120 for the Office bundle and Yvonne is willing to pay up to $130. What is the profit-maximizing price for the Office bundle? Microsoft will set the bundle price at $120 and sell two Office bundles for a total profit of $240. What has happened to Microsoft’s profit compared with when it set prices individually? When Microsoft priced Word and Excel individually, its profit was just $190. When Microsoft sells Word and Excel in a bundle called Office, its profits increase by $50, or 26%. Why?

Notice that in this example bundling is equivalent to a sophisticated scheme of (almost) perfect price discrimination. At a bundle price of $120, we can think of Amanda as being charged $100 for Word and $20 for Excel, and Yvonne as being charged $40 for Word and $80 for Excel. But in order to implement this price discrimination scheme directly, Microsoft would have to know a lot about Amanda’s and Yvonne’s willingness to pay for Word and Excel and Microsoft would have to prevent Yvonne from buying Word at $40 and reselling it to Amanda (and similarly keep Amanda from reselling Excel to Yvonne). When Microsoft bundles, however, it’s easier to price-discriminate because although Amanda and Yvonne place very different values on Word and Excel, they have similar values for Office. Microsoft, therefore, knows more about the demand for Office than about the demand for Word or Excel, and the more Microsoft knows about demand, the easier it is for Microsoft to price-discriminate.

As with other forms of price discrimination, bundling can increase efficiency, especially when fixed costs are high and marginal costs are low. In our example, when Microsoft set prices individually, only Amanda bought Word and only Yvonne bought Excel. This is inefficient because Amanda values Excel at $20 and the costs of providing Excel is zero (and similarly for Yvonne and Word). When Microsoft bundles, Amanda and Yvonne buy both Word and Excel, which increases total surplus.

Total surplus without bundling is $190. What is total surplus with bundling? It’s $250. Check that you understand where this number came from.

Furthermore, the costs of producing software are primarily the fixed costs of research and development. Bundling means that these fixed costs are spread across more consumers, which raises the incentive to innovate.

### Bundling and Cable TV

Bundling is quite common. LexisNexis sells online access to a bundle of thousands of newspapers, journals, and references. Disneyland bundles many attractions and sells them for a single entrance fee. The buffet at China Garden is a bundle of food. Bundling, however, can be controversial. Cable TV operators sell television channels in a bundle. Recently, this practice has come under attack, with many politicians arguing for “à la carte” pricing, that is, pricing

**TABLE 14.3  MAXIMUM WILLINGNESS TO PAY FOR OFFICE**

<table>
<thead>
<tr>
<th></th>
<th>Amanda</th>
<th>Yvonne</th>
</tr>
</thead>
<tbody>
<tr>
<td>Word</td>
<td>$100</td>
<td>$40</td>
</tr>
<tr>
<td>Excel</td>
<td>$20</td>
<td>$90</td>
</tr>
<tr>
<td>Office = Word + Excel</td>
<td>$120</td>
<td>$130</td>
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</tbody>
</table>
Critics of bundling complain that consumers should not be forced to pay for channels that they don’t watch. The claim seems sensible at first, but does it add up? Would the critics also say that the buffet at China Garden forces consumers of kung pao chicken to pay for unwanted egg foo young?

Bundle pricing makes sense for cable operators because customers have a high willingness to pay for some channels and a low willingness to pay for other channels, but the high- and low-value channels differ by customer. The demand for the bundle, however, is more similar across customers. Since it costs the cable company very little to offer every channel to every customer, bundling can increase profit and efficiency. The idea is exactly the same as we showed with the Microsoft Office example. In Table 14.3, change Word to the Food Network and Excel to Lifetime (and see also end-of-chapter Challenges question 21).

As usual, bundling is most likely to be beneficial in a high-fixed-cost, low-marginal-cost industry. Cable TV is a high-fixed cost, low-marginal cost industry. Over the last decade, for example, one cable operator, Comcast, spent $40 billion laying new cable. Once the cable is laid, the marginal cost of carrying another channel is low, especially with high bandwidth fiber optic cable. In cases like this, bundling doesn’t cost the firm very much (and may even be cheaper than individual pricing), and by increasing profit, it increases the incentive to spend resources on the fixed costs of development.

**Takeaway**

Price discrimination—selling the same good to different customers at different prices—is a common feature of many markets. The most obvious form of price discrimination is when a firm sets different prices in different markets—as, for example, when GSK sells Combivir for a high price in Europe and a low price in Africa. Firms also price goods based on characteristics that are correlated with willingness to pay so student and senior discounts are a form of price discrimination, as are the different prices that airlines set for the same flight depending on how far in advance the flight is booked.

Price discrimination isn’t always easy. To price-discriminate, the firm must prevent consumers who are charged a low price from reselling to consumers who would be charged a high price, that is, prevent arbitrage. Price discrimination also requires that the firm know a lot about its customers. The more the firm knows, the better it can price-discriminate. If the firm knew exactly how much each of its customers valued its product and it could prevent arbitrage, the firm could charge each customer that customer’s maximum willingness to pay—this is called perfect price discrimination. Universities come closest to practicing perfect price discrimination because to provide scholarships, the university can demand a lot of information about the income of its students and their families and it’s hard to resell an education.

Tying and bundling are less obvious forms of price discrimination. By setting a low price for printers and a high price for ink, HP is setting different prices for the “ability to print color photos”—a low price for those who print only occasionally and a high price for those who print often. Cell phones are priced below cost and cell phone calls are priced above cost for the same reason.

Bundling goods in a package can also be a form of price discrimination. When consumers place very different values on package components but similar values on the package, bundling can increase profits.
Firms want to price-discriminate because price discrimination increases profits. Price discrimination may also increase total surplus. Price discrimination is most likely to increase total surplus when it increases output and when there are large fixed costs of development. Price discrimination for pharmaceuticals, for example, lowers the price for consumers in poor countries (thus, increasing output) and, by increasing profits, price discrimination increases the incentive to research and develop new drugs.

CHAPTER REVIEW

**Interactive activity** Go online to practice with more examples of these types of problems, including live links to videos, data sources, and feedback.

**Problems in green relate to MRU videos. See the MRU table at the end of the exercises.**

**KEY CONCEPTS**

price discrimination, p. 269
arbitrage, p. 271
perfect price discrimination, p. 275
tyi ng, p. 278
bundling, p. 279

**FACTS AND TOOLS**

1. True or false? A business that price-discriminates will generally charge some customers more than marginal cost, and it will generally charge other customers less than marginal cost.

2. Two customers, Fred and Lamont, walk into Grady’s Used Pickups. Who probably has a more inelastic demand for one of Grady’s pickups: people like Lamont, who are good at shopping around, or people like Fred, who know what they like and just buy it?

3. Who probably has more elastic demand for a Hertz rental car: someone who reserves a car online weeks before a trip, or someone who walks up to a Hertz counter after he walks off an airplane following a 4-hour flight? Who probably gets charged more?

4. When arbitrage is easy in a market of would-be price discriminators, who is more likely to get priced out of the market: those with elastic demand or those with inelastic demand?

5. There are people who absolutely must have the latest fashions. Can you classify them as probably having elastic or inelastic demand?

6. Why would a firm hand out coupons for its products rather than just lowering the price? (Hint: At your school, what kind of students use coupons to buy their pizza? What kind of students never use coupons to buy their pizza?)

7. Where will you see more price discrimination: in monopoly-type markets with just a few firms or in competitive markets with many firms? Why?

8. When will a monopoly create more output: when it is allowed to and can perfectly price-discriminate or when the government bans price discrimination?

9. Some razors, like Gillette’s Fusion and Venus razors, have disposable heads. The razor comes with an initial pack with a razor handle plus three or four heads; after that, you need to buy refills separately.
   a. Where do you think Gillette gets more revenue: by selling the initial pack or by selling the refills?
   b. The next time you buy a new razor, are you going to spend more time looking at the price of the razor or at the price of the refills?

**THINKING AND PROBLEM SOLVING**

10. Subway, the fast-food chain, sells foot-long sandwiches for $5 each. However, Subway still sells 6-inch sandwiches for considerably more than $2.50 each, that is, at a higher price per inch of sub.
a. Can you think of a way that in theory you could make money from Subway's pricing practices? Would this method work in practice? What does this tell you about the limits of arbitrage?

b. In many of our price discrimination examples, we think that businesses try to break customers into two groups: more price-sensitive and less price-sensitive. What kinds of Subway customers fit into the first group? Into the second?

Busy lawyers with 20-minute lunches
College students
Health-conscious soccer moms
Long-haul truck drivers

11. A dry cleaner has a sign in its window: “Free Internet Coupons.” The dry cleaner lists its Web site, and indeed there are good discounts available with the coupons. Most customers don’t use the coupons.

a. What probably would be the main difference between customers who use the coupons and those who don’t?

b. Some people might think “The dry cleaner offers the coupons to get people in the door to try the place out, but then the customers will pay the normal high price afterward.” But the coupons are always there, so even repeat customers can keep using the coupons. Is this a mistake on the business owner’s part? (Hint: Think about marginal cost.)

12. a. When will a firm find it easier to price-discriminate: before the existence of eBay or afterward?

b. Which of the two “principles of price discrimination” does this invoke?

13. As we saw in this chapter, drug companies often charge much more for the same drug in the United States than in other countries. Congress often considers passing laws to make it easier to import drugs from these low-price countries (it also considers passing laws to make it illegal to import these drugs, but that’s another story).

If one of these laws passes, and it becomes effortless to buy AIDS drugs from Africa or antibiotics from Latin America—drugs that are made by the same companies and have essentially the same quality controls as the drugs here in the United States—how will drug companies change the prices they charge in Latin America and Africa? Why?

14. Some people think that businesses create monopolies by destroying their competition, and there is certainly some truth to that. But as we learned from Obi-Wan Kenobi, “[Y]ou will find that many of the truths we cling to depend greatly on our own point of view.” For instance, some people (Convenience Shoppers) love shopping at one particular store and will switch stores only when a product is outrageously expensive, while other people (Bargain Shoppers) will gladly spend hours looking through newspaper advertisements searching for the best deal.

a. When both kinds of people, the Convenience Shoppers and the Bargain Shoppers, are shopping at the same Walmart, who is more likely to stick to their prearranged shopping list, and who is more likely to splurge on a little something?

b. Which group does Walmart have monopoly power over? Which group does Walmart have no monopoly power over?

c. Does this mean that the same shop can simultaneously be a “monopolist” to some customers and a “competitive firm” to other customers? Why or why not?

d. Does this mean that Darth Vader really did kill Anakin Skywalker?

15. Where are you more likely to see businesses “bundling” a lot of goods into one package: in industries with high fixed costs and low marginal costs (like computer games or moviemaking), or in industries with low fixed costs and high marginal costs (like doctor visits, where the doctor’s time is expensive)?

16. Isn’t it surprising that movies, with tickets that cost around $10, often use vastly more economic resources than stage plays, where tickets can easily cost $100?

Compare, for example, a live stage performance of Shakespeare’s Hamlet with a movie of Hamlet.

a. In which field is the marginal cost of one more showing lower: on stage or on screen?

b. “Bundling” in a movie or stage performance might show up in the form of adding special effects, expensive actors, or fancy costumes: Some customers might not be too interested in an Elizabethan revenge drama, but
they show up to see Liam Neeson waving an authentic medieval dagger. Is it better to think of these extra expenses as “fixed costs” or “marginal costs”?

c. In which setting will it be easier for a business to cover its total costs: in a “bundled” stage production or in a “bundled” movie production?

17. When is a pharmaceutical company more likely to spend $100 million to research a new drug when it knows it will be able to charge different prices in different countries or when it knows that it will be required to charge the same price in different countries? Why?

18. True or false? A price-discriminating business will sometimes be willing to spend money to make a product worse.

19. Let’s calculate the profit from price discrimination. The average daily demand for dinners at Paradise Grille, an upscale casual restaurant, is as follows:

Demand for dinners by senior citizens:

\[ P = 50 - 0.5Q \quad \text{MR} = 50 - Q \]

Demand for dinners by others:

\[ P = 100 - Q \quad \text{MR} = 100 - 2Q \]

Marginal cost = 10 in both cases

a. What is the profit-maximizing price for each group?

b. Translate this into real-world jargon: If you owned this restaurant, what “senior citizen discount” would you offer, in percent?

c. Ignoring fixed costs, how much profit would Paradise Grille make if it did this?

d. If it became illegal to discriminate on the basis of age, you would face only one demand curve. Adding these two demand curves turns out to yield

\[ P = 67 - \left(\frac{1}{3}\right)Q \quad \text{MR} = 67 - \left(\frac{2}{3}\right)Q \]

What are the optimal price and quantity in this unified market? Are the total meals sold in this discrimination-free market higher or lower than in part a?

e. What is the profit in this discrimination-free market?

20. At the Kennedy Center for the Performing Arts in Washington, D.C., if you make a $120 donation per year, you are allowed to go to a small room before the concert and drink free coffee and eat free cookies. If you make a donation of $1,200 per year, you are allowed to go to a different small room before the concert and drink the same free coffee and eat the same free cookies. There are always a lot of people in both rooms before the concert: Why doesn’t everybody just pay the $120 instead of the higher price?

21. In the following table, we consider how Alex, Tyler, and Monique would fare under à la carte pricing and under bundling for cable TV when there are two channels: Lifetime and the Food Network.

<table>
<thead>
<tr>
<th>Channel</th>
<th>Alex</th>
<th>Tyler</th>
<th>Monique</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lifetime</td>
<td>10</td>
<td>15</td>
<td>3</td>
</tr>
<tr>
<td>The Food Network</td>
<td>7</td>
<td>4</td>
<td>9</td>
</tr>
<tr>
<td>The Bundle</td>
<td>15</td>
<td>19</td>
<td>12</td>
</tr>
</tbody>
</table>

a. If the channels are priced individually, the most profitable prices for the cable operator turn out to be 10 for Lifetime and 7 for the Food Network. At these prices, who buys what channel and how much profit is there?

b. Let’s just check to see if these prices really are profit-maximizing. What would profit be if the cable company raised Lifetime to a price of 11 and Food Network to a price of 8?

c. At the profit-maximizing prices, how much total consumer surplus would there be for the three of them? (Recall that consumer surplus is just each customer’s willingness to pay minus the amount each person actually paid.)

d. Now consider what happens under bundling: Customers get a take-it-or-leave-it offer of both channels or nothing at all. The profit-maximizing bundle price turns out
to be 12, and at that price, Alex, Tyler, and Monique all subscribe. How much consumer surplus is there at this price? How much profit? And, most important, what would profit equal if the cable company raised the price to 13 instead?

22. Consider the following seating arrangement for a concert hall:

```
  Stage

Front row:  

Rows B–H, about 50 feet back from the front row, seat 20 people per row.
```

a. Would these front-row seats sell for more or for less than the front-row seats at a typical concert hall? Why?

b. Why don’t we see concert halls set up like this?

23. a. In competitive markets in the long run, if there are two kinds of steaks, “regular” and “high-quality Angus beef,” and the regular beef sells at a lower price, is this an example of price discrimination?

b. Why is this different from the HP printer story in this chapter?

24. Amanda and Yvonne are thinking of going out to the movies. Amanda likes action flicks more, but Yvonne likes a little bit of romance. Warner Bros. is trying to decide what kind of movies to make this year. Should it make one movie for release this summer, an action flick with a romantic subplot, or should it make two movies for release this summer: an action flick and a romantic drama?

Here’s the two friends’ willingness to pay for the separate kinds of movies. As you can see, both Amanda and Yvonne are annoyed by the idea of a hybrid movie: Each would rather see her favorite kind of movie.

<table>
<thead>
<tr>
<th>Maximum Willingness to Pay for a Movie Ticket</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amanda</td>
</tr>
<tr>
<td>Pure action</td>
</tr>
<tr>
<td>Pure romance</td>
</tr>
<tr>
<td>Action + romance</td>
</tr>
</tbody>
</table>

Now, let’s look at this from Warner Bros.’ point of view. You’re the midlevel executive who has to decide which project to green light. Your marketing people have figured out that there are 5 million people like Amanda and 5 million people like Yvonne in the United States, and they’ll only see one film per summer. To make things simple, assume that the marginal cost of showing the movie one more time is zero, and that ticket prices are fixed at $8.

a. If the cost of producing any of the three films is $30 million, what should the studio do: make the two films or just the one hybrid film? Of course, the right way to find the answer is to figure out which choice would generate the most profit for Warner Bros.

b. Of course, the hybrid might cost a bit more to make. What if the hybrid costs $40 million to make, the pure action flick $30 million, and the romance a mere $15 million? What’s the best choice now: one hybrid or two pure films?

c. Let’s see how much prices would have to change for the answer to this question to change. Holding all else equal, how low would the cost of the pure romance film have to fall before the two-movie deal would get the green light?

d. (Hard) There’s an underlying principle here: The “unbundled” two-movie deal won’t get the green light unless its total cost is less than what? The answer is not a number—it’s an idea. Is this likely to happen in the real world? Why or why not?

25. Think about the kind of 40-year-old who pulls out a faded, obviously expired student ID to get a discount ticket at a movie theater: What can you predict about his or her willingness to pay for a full-price movie? Is the movie theater making a mistake when it lets him or her pay the student price?
26. We mentioned that airlines charge much more for flights booked at the last minute than for flights booked well in advance, even for exactly the same flight. This is because people who tend to book at the last minute tend to have inelastic demand. Think of other characteristics that airlines use to vary their pricing: Do you think these characteristics are correlated with business travel or any other sort of inelastic demand? (If you don’t fly too often, just ask someone who does: “What’s the key to getting the lowest possible airfare?”)

27. Apple’s iTunes music service sells music by the song. Other services, such as Spotify and Pandora, sell subscriptions to a library of music. Using the material in this chapter, which type of service do you think is most likely to succeed in the marketplace and why?

WORK IT OUT
For interactive, step-by-step help in solving the following problem, go online.
If Congress passed a privacy law making it illegal for colleges to ask for parents’ tax returns, would that tend to help students from high-income families or students from low-income families?
## CHAPTER 14 APPENDIX

### Solving Price Discrimination Problems with Excel (Advanced Section)

Excel’s Solver tool can be used to solve difficult price discrimination problems. Imagine that there are two groups of customers with the following demand curves:

\[
\begin{align*}
Q^D_1 &= 330 - 2 \times P_1 \\
Q^D_2 &= 510 - 4 \times P_2
\end{align*}
\]

where \(Q^D_1\) is the quantity demanded by Group 1 when it faces price \(P_1\) and \(Q^D_2\) is the quantity demanded by Group 2 when it faces price \(P_2\). We could think of these markets as Europe and Africa or as business travelers and vacationers, similar to the way we did in the text. The monopolist has the following costs:

\[
\text{Costs} = 1,000 + Q
\]

where \(Q\) is the quantity produced by the monopolist.

The monopolist’s goal is simple: It wants to choose prices \(P_1\) and \(P_2\) in order to maximize its profits. We will assume that the two markets are distinct, so arbitrage is not possible. Although the goal is simple, the solution is difficult. In fact, this problem is considerably more difficult than any of the problems we dealt with in the text. In the text, we assumed that marginal cost was constant (a flat \(MC\) curve). Assuming constant marginal costs simplified the problem because it meant that when the monopolist produced more in Market 1, the costs of producing another unit in Market 2 didn’t change. In our problem here, marginal cost is increasing—which means that when the monopolist produces more in Market 1, its cost of producing an additional unit in Market 2 also increases. In an intermediate or graduate economics class, you would use calculus to solve a problem like this.

In the real world, business managers and entrepreneurs must solve problems like this every day and they don’t all know calculus, so we will show you how to solve the problem using Excel. First, let’s write down what we know. In Figure A14.1, we highlight the equation for \(Q^D_1\), which we enter as “=330-2*B2”. We put the price for Group 1 in cell B2. We want to find the profit-maximizing price for Group 1 but we don’t know what it is, so for now we just put a zero in cell B2. The equation and price for Group 2 are entered similarly.

### FIGURE A14.1

<table>
<thead>
<tr>
<th></th>
<th>Group 1</th>
<th>Group 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Price</td>
<td>$0.00</td>
</tr>
<tr>
<td>2</td>
<td>Quantity Demanded</td>
<td>330.00</td>
</tr>
</tbody>
</table>
Now we enter the formula for the monopolist's cost. The total quantity produced by the monopolist is simply the quantity produced for Group 1 plus the quantity produced for Group 2. Thus, we can rewrite the monopolist's costs as

\[
\text{Costs} = 1,000 + (Q_1^0 + Q_2^0)^2
\]

In Figure A14.2, we have entered the monopolist's costs in cell B5 as “=1000+(B3+C3)^2”.

It is important to see that what matters here is the formula for costs; the number in the picture, $706,600.00, is simply the monopolist’s costs if the monopolist set \( P_1 \) and \( P_2 \) at zero and produced everything its customers demanded at those prices!

Finally, we enter the formula for profits, as shown in Figure A14.3.

Profits are revenues minus costs so we enter into Excel “=B2*B3+C2*C3-B5”, which is price times the quantity demanded for Group 1 plus price times quantity demanded for Group 2 minus total costs. Excel now has enough information to solve this problem. In Excel 2011, the Solver function is found under the Data tab (but you may first have to add-in the Solver.
application—see Excel help for instructions on how to do this). Clicking on the Solver button produces Figure A14.4.

Our target is profits so in the Solver box next to “Set Target Cell”, we enter B6. We want a maximum of profits, so make sure the “Equal to” button is filled in on Max. Finally, we are going to maximize profits by changing prices, so in the box for “By Changing Cells”, we enter “B2:C2”. Now we click Solve and Excel finds the answer shown in Figure A14.5.
Excel tells us that the profit-maximizing prices are $142.50 for Group 1 and $123.75 for Group 2. At these prices, Group 1 customers buy 45 units, Group 2 customers buy 15 units, and monopoly profits are $3,668.75.

Once you understand the basic ideas, it’s easy to make these models even more realistic by adding bells and whistles such as more groups. Notice that we have solved this problem with a combination of economic principles and practical skills (in this case, a bit of Excel know-how). An important lesson to learn is that this combination of principles and practical skills is very powerful and eagerly sought out by employers in a variety of fields.