A monopoly decides what price to charge its customers and what quantity to sell. We also use the model to explain some puzzling pricing behavior, such as why some airlines charge a lower fare to travelers who stay over a Saturday night. Monopolies and the reasons for their existence raise important public policy questions about the role of government in the economy. The model we develop shows that monopolies cause a loss to society when compared with firms providing goods in competitive markets; the model also provides a way to measure that loss. This loss that monopolies cause to society creates a potential role for government to step in to try and reduce this loss.

Deciding when to, or whether to, intervene to break up a monopoly is an extremely complex task, however. As in the iTunes case or the Microsoft case, the Department of Justice often is faced with convincing arguments on both sides of the issue. Companies that are accused of being monopolists will argue that their products are simply superior to the competition and provide a service to consumers. Companies and governments will disagree on what the appropriate definition of the “market” is. For instance, Apple could argue that consumers buy music from a variety of sources and play it on a variety of different devices; hence, the iTunes-iPod combination, as popular as it is, hardly could be considered to be one that restricts consumer choice. In fact, even governments have a hard time agreeing with that notion. Shortly after the European action was announced, Thomas Barnett, a senior official in the Department of Justice’s Antitrust Division, said in a speech that “consumers buy the expensive iPod device first, then have the option—not the obligation—to use the free iTunes software and buy the cheap iTunes songs.”

Finally, it is important to keep in mind that in the twenty-first-century economy, monopolies frequently do not last long. The increased use of the Internet and the decreased use of software that resides on one’s own computer greatly reduced concerns about Microsoft’s monopoly; the rise of cellular phones made us less concerned about local phone monopolies; satellite television provided competition to your cable television company’s local monopoly; the technological advances made by chipmaker AMD eroded concerns about Intel’s powerful role in the market for microprocessors. Similarly, as more music players and different music sales formats are introduced to the market, concerns about Apple may start to fade. Nevertheless, some monopolies do last a long time. De Beers is one of the most famous examples of a monopoly. It maintained its monopoly position from 1929 well into the 1980s, and even into the 2010s it controls about half of the diamond market.

**A Model of Monopoly**

A **monopoly** occurs when only one firm in an industry is selling a product for which there are no close substitutes. Thus, implicit in the definition of monopoly are **barriers to entry**—other firms are not free to enter the industry. For example, De Beers created barriers to entry by maintaining exclusive rights to the diamonds in most of the world’s diamond mines. Microsoft was accused of creating a barrier to entry in software.
production by bundling together its software with the Windows operating system that came preinstalled on computers. Sometimes the barriers to entry are artificially created by the government through systems of copyrights and patents that prevent other firms from duplicating a company’s products. These patents and copyrights allow a company to earn revenue by licensing the right to produce the particular good that resulted from the company’s innovation and creativity.

The economist’s model of a monopoly assumes that the monopoly will choose a level of output that maximizes profits. In this respect, the model of a monopoly is like that of a competitive firm. If increasing production will increase a monopoly’s profits, then the monopoly will raise production, just as a competitive firm would. If cutting production will increase a monopoly’s profits, then the monopoly will cut its production, just as a competitive firm would.

The difference between a monopoly and a competitive firm is not what motivates the firm but rather how its actions affect the market price. The most important difference is that a monopoly has market power. That is, a monopoly has the power to set the price in the market, whereas a competitor does not. This is why a monopoly is called a price-maker rather than a price-taker, the term used to refer to a competitive firm.

Getting an Intuitive Feel for the Market Power of a Monopoly

We can demonstrate the monopoly’s power to affect the price in the market by looking at either what happens when the monopoly changes its price or what happens when the monopoly changes the quantity it produces. We consider the price decision first.

No One Can Undercut the Monopolist’s Price

When several sellers are competing with one another in a competitive market, one seller can try to sell at a higher price, but no one will buy at that price because another seller is always nearby who will undercut that price. If a seller charges a higher price, everyone will ignore that seller; there is no effect on the market price.

The monopoly’s situation is quite different. Instead of several sellers, the market has only one seller. If the single seller sets a high price, it has no need to worry about being undercut by other sellers. There are no other sellers. Thus, the single seller—the monopoly—has the power to set a high price. True, the buyers probably will buy less at the higher price—that is, as the price rises, the quantity demanded declines—but because no other sellers offer that product or service, they probably will buy something from the lone seller.

The Impact of Quantity Decisions on the Price

Another way to see this important difference between a monopoly and a competitor is to examine what happens to the price when a firm changes the quantity it produces. Suppose that 100 firms are competing in the bagel-baking market in a large city, each producing about the same quantity of bagels each day. Suppose that one of the firms—Bageloaf—decides to cut its production in half. Although this is a huge cut for one firm, it is a small cut compared with the whole market—only 0.5 percent. Thus, the market price will rise very little. Moreover, if this little price increase affects the behavior of the other 99 firms at all, it will motivate them to increase their production slightly. As they increase the quantity they supply, they partially offset the cut in supply by Bageloaf, and so the change in market price will be even smaller. Thus, by any measure, the overall impact on the price from the change in Bageloaf’s production is negligible. Bageloaf essentially has no power to affect the price of bagels in the city.

market power
a firm’s power to set its price without losing its entire share of the market.

price-maker
a firm that has the power to set its price, rather than taking the price set by the market.
But now suppose that Bageloaf and the 99 other firms are taken over by Bagelopoly, which then becomes the only bagel bakery in the city. Now, if Bagelopoly cuts production in half, the total quantity of bagels supplied to the whole market is cut in half, and this will have a big effect on the price in the market.

If Bagelopoly cut its production even further, the price would rise further. If Bagelopoly increased the quantity it produced, however, the price of bagels would fall. Thus, Bagelopoly has immense power to affect the price. Even if Bagelopoly does not know exactly what the price elasticity of demand for bagels is, it can adjust the quantity it will produce either up or down to change the price.

**Showing Market Power with a Graph** Figure 10-1 contrasts the market power of a monopoly with that of a competitive firm. The right-hand graph shows that the competitive firm views the market price as essentially out of its control. The market price is shown by the flat line and is thus the same regardless of how much the firm produces. If the competitive firm tried to charge a higher price, nobody would buy because many competitors would be charging a lower price; so, effectively, the competitive firm cannot charge a higher price.

To a monopoly, on the other hand, things look quite different. Because the monopoly is the sole producer of the product, it represents the entire market. The monopoly—shown in the left-hand graph—sees a downward-sloping market demand curve.
curve for its product. The downward-sloping demand curve seen by the monopoly is the same as the market demand curve. If the monopoly charges a higher price, the quantity demanded declines along the demand curve. With a higher price, fewer people buy the item, but with no competitors to undercut that higher price, some demand still exists for the product. The difference in the market power of a monopoly and a competitive firm—illustrated by the slope of the demand curve each faces—causes the difference in the behavior of the two types of firms.

**The Effects of a Monopoly’s Decision on Revenues**

Now that we have seen how the monopoly can affect the price in its market by changing the quantity it produces, let’s see how its revenues are affected by the quantity it produces.

Table 10-1 gives a specific numerical example of a monopoly. Depending on the units for measuring the quantity $Q$, the monopoly could be producing software, computer chips, or diamonds. The two columns on the left represent the market demand curve, showing a negative relationship between the price and the quantity sold: As the price falls from $130 to $120 per unit, for example, the quantity sold rises from three to four.

**Total Revenue and Marginal Revenue** The third column of Table 10-1 shows what happens to the monopoly’s *total revenue*, or price times quantity, as the quantity of output increases. Observe that at the beginning, when the monopoly increases the quantity produced, total revenue rises: When zero units are sold, total revenue is clearly zero; when one unit is sold, total revenue is $1 \times $150, or $150; when two units are sold, total revenue is $2 \times $140, or $280; and so on. As the quantity sold increases, however, total revenue rises by smaller and smaller amounts and eventually

### Table 10-1

<table>
<thead>
<tr>
<th>Quantity Produced and Sold (Q)</th>
<th>Price (P)</th>
<th>Total Revenue (TR)</th>
<th>Marginal Revenue (MR)</th>
<th>Total Costs (TC)</th>
<th>Marginal Cost (MC)</th>
<th>Profits</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>160</td>
<td>0</td>
<td>—</td>
<td>70</td>
<td>—</td>
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<td>150</td>
<td>150</td>
<td>150</td>
<td>79</td>
<td>9</td>
<td>71</td>
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<tr>
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<td>140</td>
<td>280</td>
<td>130</td>
<td>84</td>
<td>5</td>
<td>196</td>
</tr>
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<td>130</td>
<td>390</td>
<td>110</td>
<td>94</td>
<td>10</td>
<td>296</td>
</tr>
<tr>
<td>4</td>
<td>120</td>
<td>480</td>
<td>90</td>
<td>114</td>
<td>20</td>
<td>366</td>
</tr>
<tr>
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<td>110</td>
<td>550</td>
<td>70</td>
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<td>34</td>
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<td>100</td>
<td>600</td>
<td>50</td>
<td>196</td>
<td>48</td>
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</tr>
<tr>
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<td>90</td>
<td>630</td>
<td>30</td>
<td>261</td>
<td>65</td>
<td>369</td>
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<td>80</td>
<td>640</td>
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<tr>
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<td>70</td>
<td>630</td>
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<td>130</td>
<td>149</td>
</tr>
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<td>60</td>
<td>600</td>
<td>-30</td>
<td>656</td>
<td>175</td>
<td>-56</td>
</tr>
</tbody>
</table>

$TR = P \times Q$

Change in $TR$ = Change in $Q$

Change in $TC$ = Change in $Q$

$TR - TC$
starts to fall. In Table 10-1, total revenue reaches a peak of $640 at eight units sold and then starts to decline.

Marginal revenue, introduced in Chapter 6, is the change in total revenue from one more unit of output sold. For example, if total revenue increases from $480 to $550 as output rises by one unit, marginal revenue is $70 ($550 − $480 = $70). Marginal revenue for the monopolist in Table 10-1 is shown in the fourth column, next to total revenue. In addition, marginal revenue is plotted in the right-hand graph of Figure 10-2, where it is labeled $MR$.

The left-hand graph in Figure 10-2 shows how total revenue changes with the quantity of output for the example in Table 10-1. It shows that total revenue increases by a smaller and smaller amount, reaches a maximum, and then begins to decline. In other words, marginal revenue declines as the quantity of output rises and eventually becomes negative. So, although a monopolist has the power to influence the price, this does not mean that it can get as high a level of total revenue as it wants.

Why does total revenue increase by smaller and smaller amounts and then decline as production increases? To sell more output, the monopolist must lower the price to get people to buy the increased output. As it raises output, it must lower the price more and more, and this causes the increase in total revenue to get smaller. As the price falls to very low levels, revenue actually declines.

**Figure 10-2**

Total Revenue, Marginal Revenue, and Demand
The graph on the left plots total revenue for each level of output in Table 10-1. Total revenue first rises and then declines as the quantity of output increases. Marginal revenue is the change in total revenue for each additional increase in the quantity of output and is shown by the orange curve at the right. Observe that the marginal revenue curve lies below the demand curve at each level of output except $Q = 1$. 
Marginal Revenue Is Less Than the Price}

Another important relationship between marginal revenue and price is that for every level of output, marginal revenue is less than the price (except at the first unit of output, where it equals the price). To observe this, compare the price \( P \) and marginal revenue \( MR \) in Table 10-1 or in the right-hand panel of Figure 10-2.

Note that the green line in Figure 10-2 showing the price and the quantity of output demanded is simply the demand curve facing the monopolist. Thus, another way to say that marginal revenue is less than the price at a given level of output is to say that the marginal revenue curve lies below the demand curve.

Why is the marginal revenue curve below the demand curve? When the monopolist increases output by one unit, there are two effects on total revenue: (1) a positive effect, which equals the price \( P \) times the additional unit sold, and (2) a negative effect, which equals the reduction in the price on all items previously sold times the number of such items sold. For example, as the monopolist in Table 10-1 increases production from four to five units and the price falls from $120 to $110, marginal revenue is $70. This $70 is equal to the increased revenue from the extra unit produced, or $110, less the decreased revenue from the reduction in the price, or $40 ($10 times the four units previously produced). Marginal revenue \( MR = $70 \) is thus less than the price \( P = $110 \). The two effects on marginal revenue are shown in the graph in the margin when quantity increases from 3 to 4. Because the second effect—the reduction in revenue due to the lower price on the items previously produced—is subtracted from the first, the price is always greater than the marginal revenue.

Marginal Revenue and Elasticity

Marginal revenue is negative when the price elasticity of demand is less than one. To see this, some algebra is helpful. Note from the examples in the table below that the following equation holds:

\[
MR = (P \times \Delta Q) - (\Delta P \times Q)
\]

If \( MR < 0 \), then

\[
P \times \Delta Q < \Delta P \times Q
\]

which implies that

\[
\frac{\Delta Q}{Q} < \frac{\Delta P}{P}
\]

or, in words, that the price elasticity of demand is less than one. Because it would be crazy for a monopolist to produce so much that its marginal revenue was negative, we
conclude that a monopoly would never produce a level of output for which the price
elasticity of demand would be less than one.

**Average Revenue** We also can use average revenue to show that marginal revenue
is less than the price. **Average revenue** is defined as total revenue divided by the quan-
tity of output; that is, \( AR = TR / Q \). Because total revenue \( (TR) \) equals price times
quantity \( (P \times Q) \), we can write average revenue \( (AR) \) as \( (P \times Q) / Q \) or, simply, the price
\( P \). In other words, the demand curve—which shows price at each level of output—also
shows average revenue for each level of output.

Now recall from Chapter 8 that when the average of anything (costs, grades,
heights, or revenues) declines, the marginal must be less than the average. Thus, because
average revenues (prices) decline (that is, the demand curve slopes down), the marginal
revenue curve must lie below the demand curve.

**Finding Output to Maximize Profits at the Monopoly**

Now that we have seen how a monopoly’s revenues depend on the quantity it produces,
let’s see how its profits depend on the quantity it produces. Once we identify the rela-
tionship between profit and the quantity the monopoly will produce, we can determine
the level of output that maximizes the monopoly’s profits. Revenues alone cannot deter-
mine how much a firm produces. For instance, we know that a monopolist will never
produce a quantity for which marginal revenue is negative. But that does not mean that
it will produce until marginal revenue is zero. Even if each additional unit brings in extra
revenue, the firm will have to look at the costs of producing that extra unit as well.

The last three columns of Table 10-1 show the costs and profits for the example
monopoly. There are no new concepts to introduce about costs for a monopoly, so we
can continue to use the cost measures we developed in Chapters 7 to 9. The most im-
portant features to note are that total costs increase as more is produced and that mar-
ginal cost also increases, at least for high levels of output.

**Comparing Total Revenue and Total Costs** The difference between total
revenue and total costs is profits. Observe in Table 10-1 that as the quantity produced
increases, both the total revenue from selling the product and the total costs of produc-
ing the product increase. At some level of production, however, total costs start to
increase more than revenue increases, so that eventually profits must reach a maximum.

A quick glance at the profits column in Table 10-1 shows that this maximum level
of profits is $404 and is reached when the monopoly produces six units of output. The
price the monopoly must charge so that people will buy six units of output is $100,
according to the second column of Table 10-1. To help you visualize how profits change
with quantity produced and to find the maximum level of profits, Figure 10-3 plots total
costs, total revenue, and profits from Table 10-1. Profits are shown as the gap between
total costs and total revenue. The gap reaches a maximum when output \( Q \) equals six.

**Equate Marginal Cost and Marginal Revenue** Economists use an alter-
native, more intuitive approach to finding the level of production that maximizes a
monopolist’s profits. This approach looks at marginal revenue and marginal cost and
employs a rule that economists use extensively.

Consider producing different levels of output, starting with one unit and then rising
unit by unit. Compare the marginal revenue from selling each additional unit of output
with the marginal cost of producing it. If the marginal revenue is greater than the mar-
ginal cost of the additional unit, then profits will increase if the unit is produced. Thus,
the unit should be produced, because total revenue rises by more than total costs. For
example, in Table 10-1, the marginal revenue from producing one unit of output is...
$150 and the marginal cost is $9, so producing that unit increases profits by $141. Thus, at least one unit should be produced. What about two units? Then marginal revenue equals $130 and marginal cost equals $5, so that second unit adds $125 to profits, meaning that it makes sense to produce two units.

Continuing this way, the monopolist should increase its output as long as marginal revenue is greater than marginal cost. But because marginal revenue is decreasing, at some level of output, marginal revenue will drop below marginal cost. The monopolist should not produce at that level. For example, in Table 10-1, the marginal revenue from selling seven units of output is less than the marginal cost of producing it. Thus, the monopolist should not produce seven units; instead, six units of production, with $MR = 50$ and $MC = 48$, is the profit-maximization level. This is the highest level of output for which marginal revenue is greater than marginal cost. Note that this level of output is exactly what we obtain by looking at the gap between total revenue and total costs.

Thus, the monopolist should produce up to the level of production at which marginal cost equals marginal revenue ($MC = MR$). If the level of production cannot be adjusted so exactly that marginal revenue is precisely equal to marginal cost, then the firm should produce at the highest level of output for which marginal revenue exceeds marginal cost, as in Table 10-1. In most cases, the monopoly will be able to adjust its output by smaller fractional amounts (for example, pounds of diamonds rather than tons of diamonds), and therefore marginal revenue will equal marginal cost.

A picture of how this marginal revenue equals marginal cost rule works is shown in Figure 10-4. The marginal revenue curve is plotted, along with the marginal cost curve. As the quantity produced increases above very low levels, the marginal cost curve slopes up and the marginal revenue curve slopes down. Marginal revenue equals marginal cost at the level of output at which the two curves intersect.

### Finding a Quantity of Output to Maximize Profits

Profits are shown as the gap between total revenue and total costs in the graph on the left and are plotted on the graph on the right. Profits are at a maximum when the quantity of output is six.
It is useful to compare the \( MC = MR \) rule for the monopolist with the \( MC = P \) rule for the competitive firm that we derived in Chapter 6.

Marginal Revenue Equals the Price for a Price-Taker For a competitive firm, total revenue is equal to the quantity sold (\( Q \)) multiplied by the market price (\( P \)), but the competitive firm cannot affect the price. Thus, when the quantity sold is increased by one unit, revenue is increased by the price. In other words, for a competitive firm, marginal revenue equals the price; to say that a competitive firm sets its marginal cost equal to marginal revenue is to say that it sets its marginal cost equal to the price. Thus, the \( MC = MR \) rule applies to both monopolies and competitive firms that maximize profits.

A Visual Comparison Figure 10-5 is a visual comparison of the two rules. A monopoly is shown on the right graph of Figure 10-5. We drew this kind of graph in Figure 10-3 except that it applies to any firm, so we do not show the units. A competitive firm is shown in the left graph of Figure 10-5. The scale on these two figures might be quite different; only the shapes are important for this comparison.

Look carefully at the shape of the total revenue curve for the monopoly and contrast it with the total revenue curve for the competitive firm. The total revenue curve for the monopoly starts to turn down at higher levels of output, whereas the total revenue curve for the competitive firm keeps rising in a straight line.

To illustrate the maximization of profits, we have put the same total costs curve on both graphs in Figure 10-5. Both types of firms maximize profits by setting production so that the gap between the total revenue curve and the total costs curve is as large as possible. That level of output, the profit-maximizing level, is shown for both firms.
Higher or lower levels of output will reduce profits, as shown by the gaps between total revenue and total costs in the diagrams.

Observe that at the profit-maximizing level of output, the slope of the total costs curve is equal to the slope of the total revenue curve. Those of you who are mathematically inclined will notice that the slope of the total costs curve is how much total costs change when quantity is increased by one unit—that is, the marginal cost. Similarly, the slope of the total revenue curve is the marginal revenue—the increase in total revenue when output increases by one unit. Thus, we have another way of seeing that marginal revenue equals marginal cost for profit maximization.

For the competitive firm, marginal revenue is the price, which implies the condition of profit maximization at a competitive firm derived in Chapter 6: Marginal cost equals price. For the monopolist, however, marginal revenue and price are not the same thing.

### Profit Maximization for a Monopoly and a Competitive Firm

Total revenue for a competitive firm rises steadily with the amount sold; total revenue for a monopoly first rises and then falls. However, both the monopolist and the competitor maximize profits by making the gap between the total costs curve and the total revenue curve as large as possible or by setting the slope of the total revenue curve equal to the slope of the total costs curve. Thus, marginal revenue equals marginal cost. For the competitive firm, marginal revenue equals the price.

#### REVIEW

- When one firm is the sole producer of a product with no close substitutes, it is a monopoly. Most monopolies do not last forever. They come and go as technology changes. Barriers to the entry of new firms are needed to maintain a monopoly.

- A monopoly is like a competitive firm in that it tries to maximize profits. But unlike a competitive firm, a monopoly has market power; it can affect the market price. The demand curve that the monopoly faces is the same as the market demand curve.
The Generic Diagram of a Monopoly and Its Profits

Look at Figure 10-6, which combines the monopoly’s demand and marginal revenue curves with its average total cost curve and marginal cost curve. This diagram is the workhorse of the model of a monopoly, just as Figure 8-6 in Chapter 8 is the workhorse of the model of a competitive firm. As with the diagram for a competitive firm, you should be able to draw it in your sleep. It is a generic diagram that applies to any monopolist, not just the one in Table 10-1, so we do not put scales on the axes.

Observe that Figure 10-6 shows four curves: a downward-sloping demand curve \((D)\), a marginal revenue curve \((MR)\), an average total cost curve \((ATC)\), and a marginal cost curve \((MC)\). The position of these curves is important. First, the marginal cost curve cuts through the average total cost curve at the lowest point on the average total cost curve. Second, the marginal revenue curve is below the demand curve over the entire range of production (except at the vertical axis near one, where they are equal).

We already have given the reasons for these two relationships (in Chapter 8 and in the previous section of this chapter), but it would be a good idea for you to practice sketching your own diagram like Figure 10-6 to ensure that the positions of your curves meet these requirements.1

### Determining Monopoly Output and Price on the Diagram

In Figure 10-6 we show how to calculate the monopoly output and price. First, find the point of intersection of the marginal revenue curve and the marginal cost curve. Second, draw a dashed vertical line through this point and look down the dashed line at the horizontal axis to figure out the quantity produced. Producing a larger quantity would lower marginal revenue below marginal cost. Producing a smaller quantity would raise

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1 When sketching diagrams, it is useful to know that when the demand curve is a straight line, the marginal revenue curve is always twice as steep as the demand curve and, if extended, would cut the horizontal axis exactly halfway between zero and the point at which the demand curve would cut the horizontal axis.
marginal revenue above marginal cost. The quantity shown is the profit-maximizing level. It is the amount the monopolist produces.

What price will the monopolist charge? We again use Figure 10-6, but be careful: Unlike the quantity, the monopolist’s price is not determined by the intersection of the marginal revenue curve and the marginal cost curve. The price has to be such that the quantity demanded is equal to the quantity that the monopolist decides to produce. To find the price, we need to look at the demand curve in Figure 10-6. The demand curve gives the relationship between price and quantity demanded. It tells how much the monopolist will charge for its product to sell the amount produced. To calculate the price, extend the dashed vertical line upward from the point of intersection of the marginal cost curve and the marginal revenue curve until it intersects the demand curve. At the intersection of the demand curve and the vertical line, we find the price that will generate a quantity demanded equal to the quantity produced. Now draw a horizontal line over to the left from the point of intersection to mark the price on the vertical axis. This is the monopoly’s price, about which we will have more to say later.

**Determining the Monopoly’s Profits**

Profits also can be shown on the diagram in Figure 10-6. Profits are given by the difference between the area of two rectangles, a total revenue rectangle and a total costs rectangle. Total revenue is price times quantity and thus is equal to the area of the rectangle with height equal to the monopoly price and length equal to the quantity produced. Total costs are average total cost times quantity and thus are equal to the area of the rectangle with height equal to \( ATC \) and length equal to the quantity produced. Profits are then equal to the blue-shaded area that is the difference between these two rectangles.
It is possible for a monopoly to have negative profits, or losses, as shown in Figure 10-7. In this case, the price is below average total cost, and therefore total revenue is less than total costs. Like a competitive firm, a monopolist with negative profits will shut down if the price is less than average variable cost. It eventually will exit the market if negative profits persist.

**Review**

- A monopolist’s profit-maximizing output and price can be determined graphically. The diagram shows four curves: the marginal revenue curve, the demand curve, the marginal cost curve, and the average total cost curve.
- The monopoly’s production is determined at the point at which marginal revenue equals marginal cost.
- The monopoly’s price is determined from the demand curve at the point at which the quantity produced equals the quantity demanded.
- The monopoly’s profits are determined by subtracting the total costs rectangle from the total revenue rectangle. The total revenue rectangle is given by the price times the quantity produced. The total costs rectangle is given by the average total cost times the quantity produced.

**Competition, Monopoly, and Deadweight Loss**

Are monopolies harmful to society? Do they reduce consumer surplus? Can we measure these effects? To answer these questions, economists compare the price and output of a monopoly with those of a competitive industry. First, observe in Figure 10-6 and
Figure 10-7 that the monopoly does not operate at the minimum point on the average total cost curve even in the long run. Recall that firms in a competitive industry do operate at the lowest point on the average total cost curve in the long run. To go further in our comparison, we use Figure 10-8, which is a repeat of Figure 10-6, except that the average total cost curve is removed to reduce the clutter. All the other curves are the same.

**Comparison with Competition**

Suppose that instead of only one firm being in the market, it now includes many competitive firms. For example, suppose Bagelopoly—a single firm producing bagels in a large city—is broken down into 100 different bagel bakeries like Bageloaf. The production point for the monopolistic firm and its price before the breakup are marked as “monopoly quantity” and “monopoly price” in Figure 10-8. What are production and price after the breakup?

The market supply curve for the new competitive industry would be Bagelopoly’s old marginal cost curve, because this is the sum of the marginal cost curves of all the newly created firms in the industry. Equilibrium in the competitive industry is the point at which this market supply curve crosses the market demand curve. The amount of production at that point is marked by “competitive quantity” in Figure 10-8. The price at that equilibrium is marked by “competitive price” on the vertical axis.

Compare the quantity and price for the monopolist and the competitive industry. It is clear that the quantity produced by the monopolist is less than the quantity produced by the competitive industry. It also is clear that the monopoly will charge a higher price than will emerge from a competitive industry. In sum, the monopoly produces less and charges a higher price than the competitive industry would.

**Figure 10-8**

**Deadweight Loss from Monopoly**

The monopolist’s output and price are determined as in Figure 10-6. To get the competitive price, we imagine that competitive firms make up an industry supply curve that is the same as the monopolist’s marginal cost curve. The competitive price and quantity are given by the intersection of the supply curve and the demand curve. The monopoly quantity is lower than the competitive quantity. The monopoly price is higher than the competitive price. The deadweight loss is the reduction in consumer plus producer surplus because of the lower level of production by the monopolist.
This is an important result. The monopoly exploits its market power by holding back on the quantity produced and causing the price to rise compared with the competitive equilibrium. This is always the case. Convince yourself by drawing different diagrams. For example, when De Beers exercises its market power, it holds back production of diamonds, thereby raising the price and earning economic profits.

Even though the monopoly has the power to do so, it does not increase its price without limit. When the price is set very high, marginal cost rises above marginal revenue. That behavior is not profit maximizing.

### Deadweight Loss from Monopoly

The economic harm caused by a monopoly occurs because it produces less than a competitive industry would. How harmful, then, is a monopoly?

**Consumer Surplus and Producer Surplus Again** Economists measure the harm caused by monopolies by the decline in the sum of consumer surplus plus producer surplus. Recall that *consumer surplus* is the area above the market price line and below the demand curve, the demand curve being a measure of consumers’ marginal benefit from consuming the good. The *producer surplus* is the area above the marginal cost curve and below the market price line. Consumer surplus plus producer surplus is thus the area between the demand curve and the marginal cost curve. It measures the sum of the marginal benefits to consumers of the good less the sum of the marginal costs to the producers of the good. A competitive market will maximize the sum of consumer plus producer surplus.

With a lower quantity produced by a monopoly, however, the sum of consumer surplus and producer surplus is reduced, as shown in Figure 10-8. This reduction in consumer plus producer surplus is called the *deadweight loss due to monopoly*. It is a quantitative measure of the harm a monopoly causes the economy. A numerical example is given in the margin.

How large is the deadweight loss in the U.S. economy? Using the method illustrated in Figure 10-8, empirical economists estimate that the loss is between 0.5 and 2 percent of gross domestic product (GDP), or between $60 billion and $240 billion, per year. Of course, the deadweight loss is a larger percentage of production in industries in which monopolies have a greater presence.

Figure 10-8 also shows that the monopoly takes, in the form of producer surplus, some of the consumer surplus that would have gone to the consumers in competitive markets. Consumer surplus is now the area below the demand curve and above the monopoly price, which is higher than the competitive price. This transfer of consumer surplus to the monopoly is not a deadweight loss, however, because what the consumers lose, the monopoly gains. This transfer affects the distribution of income, but it is not a net loss to society.

**Meaningful Comparisons** In any given application, we need to be careful that the comparison of monopoly and competition makes sense. Some industries cannot be broken up into many competitive firms without changing the cost structure of the industry. For instance, having 100 sewer companies laying down pipes to serve one local area would be costly. Therefore, transforming a monopolistic sewer industry into a competitive sewer industry is unlikely to lead to greater societal benefits. Instead, we should try to affect the monopoly’s decisions by government actions.

We also should be careful about concluding that a competitive industry of one type is preferable to a monopolistic industry of another type. History provides many such examples. Western settlers in the United States during the nineteenth century had a
larger consumer surplus from railroads—in spite of the railroad monopolists’ profits—than they did from competitive wagon trains. Modern-day users of the information highway—computers and telecommunications—reap a larger consumer surplus from Microsoft’s software and Intel’s computer chips, even if they are produced monopolistically, than they would from a competitive pocket calculator industry.

**The Monopoly Price Is Greater Than Marginal Cost**

Another way to think about the loss to society from monopoly is to observe the difference between price and marginal cost. Figure 10-8, for example, shows that the monopoly price is well above the marginal cost at the quantity at which the monopoly produces.

**Marginal Benefit Is More Than Marginal Cost**

Because consumers will consume up to the point at which the marginal benefit of a good equals its price, the excessive price means that the marginal benefit of a good is greater than the marginal cost. This is inefficient because producing more of the good would increase benefits to consumers by more than the cost of producing it.

The size of the difference between price and marginal cost depends on the elasticity of the monopoly’s demand curve. If the demand curve is highly elastic (close to a competitive firm’s view as shown in Figure 10-1), then the difference between price and marginal cost is small.

**The Price-Cost Margin**

A common measure of the difference between price and marginal cost is the **price-cost margin**. It is defined as

\[
\text{Price-cost margin} = \frac{\text{Price} - \text{marginal cost}}{\text{Price}}
\]

For example, if the price is $4 and the marginal cost is $2, the price-cost margin is \(\frac{4 - 2}{4} = 0.5\). The price-cost margin for a competitive firm is zero because price equals marginal cost. Economists use a rule of thumb to show how the price-cost margin depends on the price elasticity of demand. The rule of thumb is shown in the equation below.

\[
\text{Price-cost margin} = \frac{1}{\text{price elasticity of demand}}
\]

For example, when the elasticity of demand is two, the price-cost margin is 0.5. The flat demand curve has an infinite elasticity, in which case the price-cost margin is zero; in other words, price equals marginal cost.

**REVIEW**

- A monopoly creates a deadweight loss because it restricts output below what the competitive market would produce. The cost is measured by the deadweight loss, which is the reduction in the sum of consumer plus producer surplus.
- Sometimes the comparison between monopoly and competition is only hypothetical because it would either be impossible or make no sense to break up the monopoly into competitive firms.
- Another way to measure the impact of a monopoly is by the difference between price and marginal cost. Monopolies always charge a price higher than marginal cost. The difference—summarized in the price-cost margin—depends inversely on the elasticity of demand.