On May 18, 1998, the U.S. Department of Justice, with the attorneys general of 20 states and the District of Columbia, filed an antitrust suit against the Microsoft Corporation, claiming it was a monopolist in the market for PC operating systems. For the next two and a half years, the case was front-page news in countries around the world. Was Microsoft really a monopolist? Had it used illegal tactics to strengthen and extend its market position? Lawyers on both sides of the case turned to economists to answer these questions.

Why would government officials be concerned about the existence of a monopoly? In this chapter we’ll address this and other questions about monopoly markets. How, for example, does the market outcome under monopoly differ from the market outcome under perfect competition? How can the government tell if a group of firms is colluding and acting just like a monopolist instead of competing vigorously? What can government do to improve on the outcomes of monopoly?
“I Like a Little Competition”—J. P. Morgan
Guess who's comin' to town...

Just another natural disaster.
CHAPTER 10 OUTLINE

10.1 Monopoly
10.2 Monopoly Power
10.3 Sources of Monopoly Power
10.4 The Social Costs of Monopoly Power
10.5 Monopsony
10.6 Monopsony Power
10.7 Limiting Market Power: The Antitrust Laws
Market Power: Monopoly and Monopsony

- **monopoly**  Market with only one seller.
- **monopsony**  Market with only one buyer.
- **market power**  Ability of a seller or buyer to affect the price of a good.
10.1 MONOPOLY

Average Revenue and Marginal Revenue

- **marginal revenue** Change in revenue resulting from a one-unit increase in output.

To see the relationship among total, average, and marginal revenue, consider a firm facing the following demand curve:

\[ P = 6 - Q \]

<table>
<thead>
<tr>
<th>Price (P)</th>
<th>Quantity (Q)</th>
<th>Total Revenue (R)</th>
<th>Marginal Revenue (MR)</th>
<th>Average Revenue (AR)</th>
</tr>
</thead>
<tbody>
<tr>
<td>$6</td>
<td>0</td>
<td>$0</td>
<td>---</td>
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<tr>
<td>5</td>
<td>1</td>
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<td>4</td>
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<tr>
<td>3</td>
<td>3</td>
<td>9</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>2</td>
<td>4</td>
<td>8</td>
<td>-1</td>
<td>2</td>
</tr>
<tr>
<td>1</td>
<td>5</td>
<td>5</td>
<td>-3</td>
<td>1</td>
</tr>
</tbody>
</table>
Average and marginal revenue are shown for the demand curve $P = 6 - Q$. 

Figure 10.1

Average and Marginal Revenue

Average and marginal revenue are shown for the demand curve $P = 6 - Q$. 

Dollars per unit of output

Output
We can also see algebraically that $Q^*$ maximizes profit. Profit $\pi$ is the difference between revenue and cost, both of which depend on $Q$:

$$\pi(Q) = R(Q) - C(Q)$$

As $Q$ is increased from zero, profit will increase until it reaches a maximum and then begin to decrease. Thus the profit-maximizing $Q$ is such that the incremental profit resulting from a small increase in $Q$ is just zero (i.e., $\Delta \pi / \Delta Q = 0$). Then

$$\frac{\Delta \pi}{\Delta Q} = \frac{\Delta R}{\Delta Q} - \frac{\Delta C}{\Delta Q} = 0$$

But $\Delta R/\Delta Q$ is marginal revenue and $\Delta C/\Delta Q$ is marginal cost. Thus the profit-maximizing condition is that

$$MR - MC = 0, \text{ or } MR = MC$$
10.1 MONOPOLY

An Example

Figure 10.3

Example of Profit Maximization

Part (a) shows total revenue $R$, total cost $C$, and profit, the difference between the two.

Part (b) shows average and marginal revenue and average and marginal cost.

Marginal revenue is the slope of the total revenue curve, and marginal cost is the slope of the total cost curve.

The profit-maximizing output is $Q^* = 10$, the point where marginal revenue equals marginal cost.

At this output level, the slope of the profit curve is zero, and the slopes of the total revenue and total cost curves are equal.

The profit per unit is $15$, the difference between average revenue and average cost. Because 10 units are produced, total profit is $150.$
10.1 MONOPOLY

A Rule of Thumb for Pricing

\((Q/P)(\Delta P/\Delta Q)\) is the reciprocal of the elasticity of demand, \(1/E_d\), measured at the profit-maximizing output, and

\[ MR = P + P(1/E_d) \]

Now, because the firm’s objective is to maximize profit, we can set marginal revenue equal to marginal cost:

\[ P + P(1/E_d) = MC \]

which can be rearranged to give us

\[ \frac{P - MC}{P} = -\frac{1}{E_d} \] (10.1)

Equivalently, we can rearrange this equation to express price directly as a markup over marginal cost:

\[ P = \frac{MC}{1 + (1/E_d)} \] (10.2)
In 1995, Prilosec, represented a new generation of antiulcer medication. Prilosec was based on a very different biochemical mechanism and was much more effective than earlier drugs.

By 1996, it had become the best-selling drug in the world and faced no major competitor.

Astra-Merck was pricing Prilosec at about $3.50 per daily dose.

The marginal cost of producing and packaging Prilosec is only about 30 to 40 cents per daily dose.

The price elasticity of demand, $E_D$, should be in the range of roughly $-1.0$ to $-1.2$.

Setting the price at a markup exceeding 400 percent over marginal cost is consistent with our rule of thumb for pricing.
10.1 MONOPOLY

The Effect of a Tax

Suppose a specific tax of \( t \) dollars per unit is levied, so that the monopolist must remit \( t \) dollars to the government for every unit it sells. If \( MC \) was the firm’s original marginal cost, its optimal production decision is now given by

\[
MR = MC + t
\]

Figure 10.5

Effect of Excise Tax on Monopolist

With a tax \( t \) per unit, the firm’s effective marginal cost is increased by the amount \( t \) to \( MC + t \).

In this example, the increase in price \( \Delta P \) is larger than the tax \( t \).
Suppose a firm has two plants. What should its total output be, and how much of that output should each plant produce? We can find the answer intuitively in two steps.

- **Step 1.** Whatever the total output, it should be divided between the two plants so that *marginal cost is the same in each plant*. Otherwise, the firm could reduce its costs and increase its profit by reallocating production.

- **Step 2.** We know that total output must be such that *marginal revenue equals marginal cost*. Otherwise, the firm could increase its profit by raising or lowering total output.
10.1 MONOPOLY

*The Multiplant Firm

We can also derive this result algebraically. Let \( Q_1 \) and \( C_1 \) be the output and cost of production for Plant 1, \( Q_2 \) and \( C_2 \) be the output and cost of production for Plant 2, and \( Q_T = Q_1 + Q_2 \) be total output. Then profit is

\[
\pi = PQ_T - C_1(Q_1) - C_2(Q_2)
\]

The firm should increase output from each plant until the incremental profit from the last unit produced is zero. Start by setting incremental profit from output at Plant 1 to zero:

\[
\frac{\Delta \pi}{\Delta Q_1} = \frac{\Delta (PQ_T)}{\Delta Q_1} - \frac{\Delta C_1}{\Delta Q_1} = 0
\]

Here \( \Delta (PQ_T)/\Delta Q_1 \) is the revenue from producing and selling one more unit—i.e., marginal revenue, MR, for all of the firm’s output.
The next term, $\Delta C_1/\Delta Q_1$, is marginal cost at Plant 1, $MC_1$. We thus have $MR - MC_1 = 0$, or

$$MR = MC_1$$

Similarly, we can set incremental profit from output at Plant 2 to zero,

$$MR = MC_2$$

Putting these relations together, we see that the firm should produce so that

$$MR = MC_1 = MC_2$$  \hspace{1cm} (10.3)
10.2 MONOPOLY POWER

Figure 10.7

The Demand for Toothbrushes

Part (a) shows the market demand for toothbrushes.

Part (b) shows the demand for toothbrushes as seen by Firm A.

At a market price of $1.50, elasticity of market demand is $1.5$.

Firm A, however, sees a much more elastic demand curve $D_A$ because of competition from other firms.

At a price of $1.50$, Firm A's demand elasticity is $-6$.

Still, Firm A has some monopoly power: Its profit-maximizing price is $1.50\text{, which exceeds marginal cost.}$
10.2 MONOPOLY POWER

Measuring Monopoly Power

Remember the important distinction between a perfectly competitive firm and a firm with monopoly power: *For the competitive firm, price equals marginal cost; for the firm with monopoly power, price exceeds marginal cost.*

- **Lerner Index of Monopoly Power**
  Measure of monopoly power calculated as excess of price over marginal cost as a fraction of price.

Mathematically:

\[ L = \frac{P - MC}{P} \]

This index of monopoly power can also be expressed in terms of the elasticity of demand facing the firm.

\[ L = \frac{P - MC}{P} = -\frac{1}{E_d} \quad (10.4) \]
The markup \((P - MC)/P\) is equal to minus the inverse of the elasticity of demand facing the firm. If the firm’s demand is elastic, as in (a), the markup is small and the firm has little monopoly power. The opposite is true if demand is relatively inelastic, as in (b).
Although the elasticity of market demand for food is small (about $-1$), no single supermarket can raise its prices very much without losing customers to other stores.

The elasticity of demand for any one supermarket is often as large as $-10$. We find $P = MC/(1 - 0.1) = MC/(0.9) = (1.11)MC$.

The manager of a typical supermarket should set prices about 11 percent above marginal cost.

Small convenience stores typically charge higher prices because its customers are generally less price sensitive.

Because the elasticity of demand for a convenience store is about $-5$, the markup equation implies that its prices should be about 25 percent above marginal cost.

With designer jeans, demand elasticities in the range of $-2$ to $-3$ are typical. This means that price should be 50 to 100 percent higher than marginal cost.
10.3 SOURCES OF MONOPOLY POWER

The Elasticity of Market Demand

If there is only one firm—a pure monopolist—its demand curve is the market demand curve.

Because the demand for oil is fairly inelastic (at least in the short run), OPEC could raise oil prices far above marginal production cost during the 1970s and early 1980s.

Because the demands for such commodities as coffee, cocoa, tin, and copper are much more elastic, attempts by producers to cartelize these markets and raise prices have largely failed.

In each case, the elasticity of market demand limits the potential monopoly power of individual producers.
10.4 THE SOCIAL COSTS OF MONOPOLY POWER

Deadweight Loss from Monopoly Power

The shaded rectangle and triangles show changes in consumer and producer surplus when moving from competitive price and quantity, $P_c$ and $Q_c$, to a monopolist’s price and quantity, $P_m$ and $Q_m$.

Because of the higher price, consumers lose $A + B$ and producer gains $A - C$. The deadweight loss is $B + C$. 
Price Regulation

If left alone, a monopolist produces $Q_m$ and charges $P_m$.

When the government imposes a price ceiling of $P_1$, the firm’s average and marginal revenue are constant and equal to $P_1$ for output levels up to $Q_1$.

For larger output levels, the original average and marginal revenue curves apply.

The new marginal revenue curve is, therefore, the dark purple line, which intersects the marginal cost curve at $Q_1$. 
10.4 THE SOCIAL COSTS OF MONOPOLY POWER

Price Regulation

Figure 10.11

Price Regulation

When price is lowered to $P_c$, at the point where marginal cost intersects average revenue, output increases to its maximum $Q_c$. This is the output that would be produced by a competitive industry.

Lowering price further, to $P_3$ reduces output to $Q_3$ and causes a shortage, $Q'_3 - Q_3$. 

Marginal revenue curve when price is regulated to be no higher than $P_1$. 

The diagram shows the relationship between marginal revenue (MR) and marginal cost (MC) with price and output. The point where $P_2 = P_c$ indicates the regulated price level $P_c$. The output $Q_1$ at this price is the maximum output before a shortage occurs. Further lowering of price to $P_3$ reduces output to $Q_3$ and causes a shortage of $Q'_3 - Q_3$. 

The diagram includes the AC and AR curves, showing the average cost and average revenue at different levels of output. The MR curve intersects the MC curve at the optimal output level, which is $Q_1$ at $P_2 = P_c$. Below this point, the price is regulated to $P_1$, and above this point, the price is not allowed to exceed $P_1$. 

The figure illustrates the economic inefficiencies of monopoly power, particularly the deadweight loss caused by the shortage of output at the regulated price.
10.7 LIMITING MARKET POWER: THE ANTITRUST LAWS

- **antitrust laws**
  Rules and regulations prohibiting actions that restrain, or are likely to restrain, competition.

There have been numerous instances of illegal combinations. For example:

- In 1996, Archer Daniels Midland Company (ADM) and two other major producers of lysine (an animal feed additive) pleaded guilty to criminal charges of price fixing.

- In 1999, four of the world’s largest drug and chemical companies—Roche A.G. of Switzerland, BASF A.G. of Germany, Rhone-Poulenc of France, and Takeda Chemical Industries of Japan—were charged by the U.S. Department of Justice with taking part in a global conspiracy to fix the prices of vitamins sold in the United States.

- In 2002, the U.S. Department of Justice began an investigation of price fixing by DRAM (dynamic access random memory) producers. By 2006, five manufacturers—Hynix, Infineon, Micron Technology, Samsung, and Elpida—had pled guilty for participating in an international price-fixing scheme.
10.7 LIMITING MARKET POWER: THE ANTITRUST LAWS

Antitrust in Europe

The responsibility for the enforcement of antitrust concerns that involve two or more member states resides in a single entity, the Competition Directorate.

Separate and distinct antitrust authorities within individual member states are responsible for those issues whose effects are felt within particular countries.

The antitrust laws of the European Union are quite similar to those of the United States. Nevertheless, there remain a number of differences between antitrust laws in Europe and the United States.

Merger evaluations typically are conducted more quickly in Europe.

It is easier in practice to prove that a European firm is dominant than it is to show that a U.S. firm has monopoly power.
Robert Crandall, president and CEO of American, made a phone call to Howard Putnam, president and chief executive of Braniff. It went like this:

_Crandall:_ I think it’s dumb as hell for Christ’s sake, all right, to sit here and pound the $%^&! out of each other and neither one of us making a $%^&! dime.

_Putnam:_ Well . . .

_Crandall:_ I mean, you know, $%^&!, what the hell is the point of it?

_Putnam:_ But if you’re going to overlay every route of American’s on top of every route that Braniff has—I just can’t sit here and allow you to bury us without giving our best effort.

_Crandall:_ Oh sure, but Eastern and Delta do the same thing in Atlanta and have for years.

_Putnam:_ Do you have a suggestion for me?
10.7 LIMITING MARKET POWER: THE ANTITRUST LAWS

EXAMPLE 10.5 A Phone Call About Prices (continued)

Crandall: Yes, I have a suggestion for you. Raise your %@#$%%&! fares 20 percent. I'll raise mine the next morning.

Putnam: Robert, we . . .

Crandall: You'll make more money and I will, too.

Putnam: We can't talk about pricing!

Crandall: Oh %@#$%%&!, Howard. We can talk about any %@#$%%&! thing we want to talk about.

Crandall was wrong. Talking about prices and agreeing to fix them is a clear violation of Section 1 of the Sherman Act.

However, proposing to fix prices is not enough to violate Section 1 of the Sherman Act: For the law to be violated, the two parties must agree to collude.

Therefore, because Putnam had rejected Crandall’s proposal, Section 1 was not violated.
Did Microsoft engage in illegal practices?

The U.S. Government said yes; Microsoft disagreed. Here is a brief road map of some of the U.S. Department of Justice’s major claims and Microsoft’s responses.

**DOJ claim:** Microsoft has a great deal of market power in the market for PC operating systems—enough to meet the legal definition of monopoly power.

**MS response:** Microsoft does not meet the legal test for monopoly power because it faces significant threats from potential competitors that offer or will offer platforms to compete with Windows.

**DOJ claim:** Microsoft viewed Netscape’s Internet browser as a threat to its monopoly over the PC operating system market. In violation of Section 1 of the Sherman Act, Microsoft entered into exclusionary agreements with computer manufacturers and Internet service providers with the objective of raising the cost to Netscape of making its browser available to consumers.

**MS response:** The contracts were not unduly restrictive. In any case, Microsoft unilaterally agreed to stop most of them.
10.7 LIMITING MARKET POWER: THE ANTITRUST LAWS

EXAMPLE 10.6  The United States versus Microsoft (continued)

DOJ claim: In violation of Section 2 of the Sherman Act, Microsoft engaged in practices designed to maintain its monopoly in the market for desktop PC operating systems. It tied its browser to the Windows 98 operating system, even though doing so was technically unnecessary. This action was predatory because it made it difficult or impossible for Netscape and other firms to successfully offer competing products.

MS response: There are benefits to incorporating the browser functionality into the operating system. Not being allowed to integrate new functionality into an operating system will discourage innovation. Offering consumers a choice between separate or integrated browsers would cause confusion in the marketplace.

DOJ claim: In violation of Section 2 of the Sherman Act, Microsoft attempted to divide the browser business with Netscape and engaged in similar conduct with both Apple Computer and Intel.

MS response: Microsoft’s meetings with Netscape, Apple, and Intel were for valid business reasons. Indeed, it is useful for consumers and firms to agree on common standards and protocols in developing computer software.
"It just so happens that robbing the rich and giving to the poor is a Government monopoly!"
Thank You