

Market Power and Monopoly

Introduction (1/1)

In the real world, there are very few examples of perfectly competitive industries.

Firms often have **market power**, or an ability to influence the market price of a product.

The most extreme example is a **monopoly**, or a market served by only one firm.

Chapter Outline

- 9.1 Sources of Market Power: Barriers to Entry
- 9.2 Market Power and Marginal Revenue
- 9.3 Profit Maximization for a Firm with Market Power
- 9.4 How a Firm with Market Power Reacts to Market Changes
- 9.5 The Winners and Losers from Market Power
- 9.6 Governments and Market Power: Regulation, Antitrust, and Innovation
- 9.7 Conclusion

Sources of Market Power (1/6)

The key difference between perfect competition and a market structure in which firms have pricing power is the presence of **barriers to entry**, or factors that prevent entry into the market with large producer surplus.

- Normally, positive producer surplus in the long run will induce additional firms to enter the market until it is driven to zero.
- The presence of barriers to entry means that firms in the market may be able to maintain positive producer surplus indefinitely.

Sources of Market Power (2/6)

Extreme Scale Economies: Natural Monopoly

One common barrier to entry results from a production process that exhibits economies of scale at every quantity level.

- Long-run average total cost curve is downward sloping; diseconomies never emerge.

Results in a **natural monopoly**:

- It's more efficient for a single firm to produce the entire industry output.
- Splitting output across multiple firms raises the average cost of production.
 - An example is a production process with the following total cost structure:

$$TC = 100 + 10Q \rightarrow ATC = \frac{100}{Q} + 10$$

Sources of Market Power (3/6)

Switching Costs

Another barrier to entry results from the presence of consumers' switching costs, which can result from:

- brand-related opportunity costs (e.g., preferred status on an airline).
- technology constraints (e.g., once you buy a DIRECTV satellite dish and install it, the only way to switch to DISH Network is to get a new satellite dish and converter box installed).
- search costs (e.g., health insurance plans).

Some goods have characteristics that make them **network goods**.

- A good whose value to each consumer increases with the number of other consumers of the product (Instagram)

Sources of Market Power (4/6)

Product Differentiation

For most non-commodity markets, consumers may not treat products from different firms as perfect substitutes.

- Example: Bicycle makers operate in what could be thought of as the same market, but not every potential bike buyer will see a Trek bicycle as exactly the same thing as a Cannondale.

Product differentiation refers to imperfect substitutability across varieties of a product.

Sources of Market Power (5/6)

Absolute Cost Advantages or Control of Key Inputs

Many production processes rely on scarce inputs (e.g., natural resource products).

A firm can have an absolute cost advantage over other firms in obtaining the key input.

Controlling this input allows a firm to keep its costs lower than those of any other competitor.

Sources of Market Power (6/6)

Government Regulation

A final important barrier is government regulation that limits entry to a market.

- Examples:
 - Patents and copyrights
 - Licensing requirements (e.g., medical board certification)
 - Prohibition of competition (e.g., U.S. Postal Service)

Market Power and Marginal Revenue (1/10)

A true monopolist faces the market demand curve:

- There are no competing firms in this market.
- Price is not fixed; the only way to sell more of a product is to lower the price.

How does this differ from perfect competition?

Perfectly competitive firms can sell as much as they want at the market price.

Other market structures associated with downward-sloping demand:

- **Oligopoly** is a market structure in which a few competitors operate.
- **Monopolistic competition** is a type of imperfect competition where a large number of firms have some market power, but each makes zero economic profit in the long run.

Market Power and Marginal Revenue (2/10)

Marginal Revenue

In perfect competition, the demand curve facing an individual firm is horizontal, and marginal revenue is equal to price.

If a firm has market power, the demand curve for its product(s) will have a downward slope.

What does this imply for the shape of the marginal revenue curve?

- It must also be downward sloping.

Consider the production decisions of Durkee-Mower, Inc., a Massachusetts firm that makes Marshmallow Fluff.

- Has had a dominant market position since the 1920s
- Table 9.1 shows how price and marginal revenue are related to the quantity of Fluff produced.

Market Power and Marginal Revenue (3/10)

Table 9.2: Marginal Revenue for Marshmallow Fluff

Quantity (millions of pounds) (Q)	Price (\$ / pound) (P)	Total Revenue (\$ millions) (TR = P × Q)	Marginal Revenue (\$ millions) $\left(MR = \frac{\Delta TR}{\Delta Q} \right)$
0	6	0	-
1	5	5	5
2	4	8	3
3	3	9	1
4	2	8	-1
5	1	5	-3

Market Power and Marginal Revenue (4/10)

Marginal revenue is *not* equivalent to price for a firm facing a downward-sloping demand curve.

Why is this the case?

- When a firm produces more of a product, the price for *all* of its products in the marketplace falls.
- This occurs because we are considering a specific market (time and place) -- decisions are not sequential.

Market Power and Marginal Revenue (5/10)

Marginal revenue is *not* equivalent to price for a firm facing a downward-sloping demand curve.

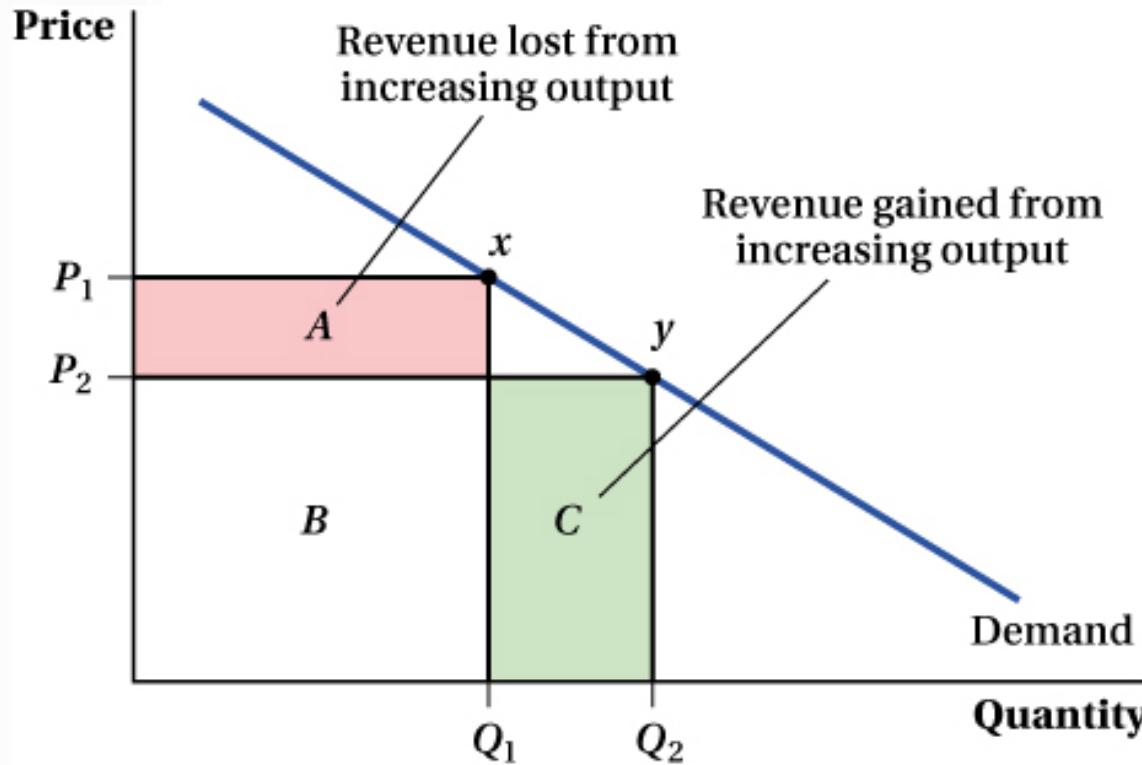
Marginal revenue is the change in total revenue associated with an increase in output, which is composed of two parts.

Two components for a firm with market power:

1. Increase in total revenue associated with an increase in sales
2. Decrease in total revenue associated with the fall in market price for all previously produced units of output

Market Power and Marginal Revenue (6/10)

Figure 9.1 Understanding Marginal Revenue



Market Power and Marginal Revenue (7/10)

The two opposing effects on marginal revenue of an increase in production by a monopolist can be examined mathematically:

1. The additional revenue from selling one more unit at market price:

$$\Delta\text{Revenue} = P$$

2. The fall in revenue associated with a decline in market price for all units produced:

$$\Delta\text{Revenue} = \frac{\Delta P}{\Delta Q} \times Q$$

Combining these effects gives the equation for marginal revenue:

$$MR = P + \frac{\Delta P}{\Delta Q} \times Q$$

Market Power and Marginal Revenue (8/10)

Consider what the equation for marginal revenue means

$$MR = P + \frac{\Delta P}{\Delta Q} \times Q$$

Consider a linear demand curve ($\frac{\Delta P}{\Delta Q}$ is constant).

The inverse demand curve is given by $P = a - bQ$
therefore:

$$MR = P + \frac{\Delta P}{\Delta Q} Q = (a - bQ) + \frac{\Delta P}{\Delta Q} Q = (a - bQ) + (-b)Q = a - 2bQ$$

$$MR = a - bQ$$

Market Power and Marginal Revenue (9/10): Question 1

A firm's demand curve is $Q = 200 - P$. Which is the marginal revenue that corresponds to this demand curve?

- A. $MR = 200 - 2P$
- B. $MR = 400 - 2Q$
- C. $MR = 200 - 2Q$
- D. $MR = 400 - 2P$

Market Power and Marginal Revenue (9/10): Question 1 – Correct Answer

A firm's demand curve is $Q = 200 - P$. Which is the marginal revenue that corresponds to this demand curve?

- A. $MR = 200 - 2P$
- B. $MR = 400 - 2Q$
- C. **$MR = 200 - 2Q$ (correct answer)**
- D. $MR = 400 - 2P$

Market Power and Marginal Revenue (10/10): Question 2

A firm's demand curve is $Q = 100 - 2P$. What is the marginal revenue when $Q = 10$?

- A. 10
- B. 20
- C. 40
- D. 80

Market Power and Marginal Revenue (10/10): Question 2 – Correct Answer

A firm's demand curve is $Q = 100 - 2P$. What is the marginal revenue when $Q = 10$?

- A. 10
- B. 20
- C. **40 (correct answer)**
- D. 80

Profit Maximization for a Firm with Market Power (1/10)

How to Maximize Profit

Firms with market power are still assumed to maximize profits.

- However, unlike in perfect competition, production decisions influence price.

$$MR \neq P$$

How much will firms choose to produce?

- They will engage in production until $MR = MC$

Profit Maximization for a Firm with Market Power (2/10)

Profit Maximization: A Graphical Approach

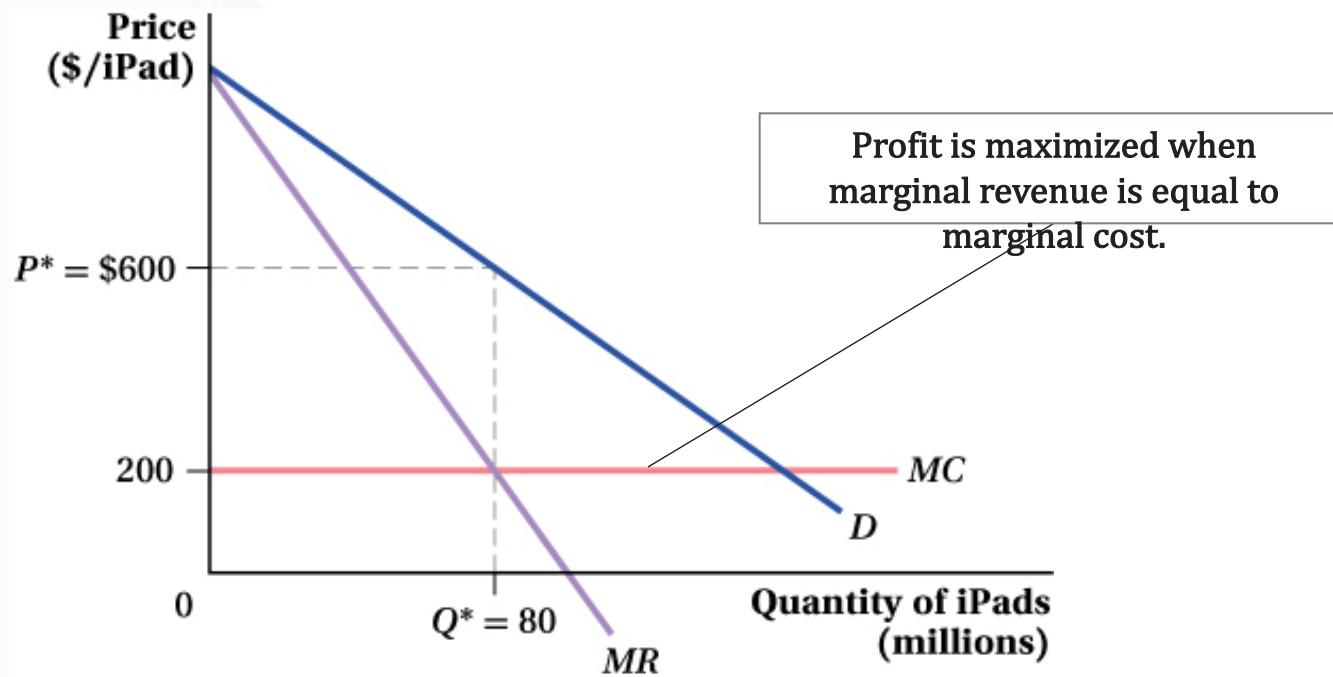
Consider the market for iPads; assume that the marginal cost of production for Apple is constant at \$200 per unit.

There are three steps to determining the profit-maximizing quantity of production:

1. Derive the marginal revenue curve from the demand curve.
2. Find the output quantity at which marginal revenue equals marginal cost.
3. Determine the profit-maximizing price by locating the point on the demand curve at the optimal quantity level.

Profit Maximization for a Firm with Market Power (3/10)

Figure 9.3 How provide an explanation as Per a Firm with Market Power Maximizes Profit



Profit Maximization for a Firm with Market Power (4/10)

Profit Maximization: A Mathematical Approach

Consider, again, the market for iPads. The marginal cost of production for Apple is constant at \$200 per unit. Now suppose demand is given by

$$Q = 200 - 0.2P$$

where quantity is measured in millions and price in dollars.

How do we determine the profit-maximizing price–quantity combination that Apple should choose?

1. Derive the marginal revenue curve from the demand curve.
2. Find the output quantity for which marginal revenue is equal to marginal cost.
3. Determine the profit-maximizing price by locating the point on the demand curve at the optimal quantity level.

Profit Maximization for a Firm with Market Power (5/10)

Profit Maximization: A Mathematical Approach

1. Derive the marginal revenue curve from the demand curve.

$$Q = 200 - 0.2P$$

$$0.2P = 200 - Q \rightarrow P = 1,000 - 5Q$$

This is a linear demand curve, so marginal revenue takes the form

$$MR = a - 2bQ = 1,000 - 10Q$$

Profit Maximization for a Firm with Market Power (6/10)

- Find the output quantity for which marginal revenue is equal to marginal cost.

For this step, simply set the equation for marginal revenue equal to \$200 and solve for quantity.

$$MR = MC \rightarrow 2bQ - 1,000 = 200 \rightarrow Q^* = 80 \text{ million}$$

- The profit-maximizing price can be found by substituting the profit-maximizing quantity into the inverse demand curve.

$$P^* = 1,000 - 5(80) \rightarrow P^* = \$600$$

Profit Maximization for a Firm with Market Power (7/10)

A Markup Formula for Companies with Market Power: The Lerner Index

It is useful to have a general approach to determining the rate of markup for firms with market power.

- **Markup** is the percentage of a firm's price that is greater than its marginal cost.
- The **Lerner Index** is a measure of a firm's markup, which indicates the degree of market power the firm enjoys.

Profit Maximization for a Firm with Market Power (8/10)

A Markup Formula for Companies with Market Power: The Lerner Index

Starting with the definition of marginal revenue and setting it equal to marginal cost,

$$MR = P + \frac{\Delta P}{\Delta Q} \times Q = MC$$

Multiply the left-hand side by P/P (doesn't change anything):

$$P + \frac{\Delta P}{\Delta Q} \times \frac{P}{P} \times Q = P + \underbrace{\left(\frac{\Delta P}{\Delta Q} \times \frac{Q}{P} \right)}_{1/E^d} \times P = MC$$

And finally, $\frac{P - MC}{P} = -\frac{1}{E^d}$

or, as demand becomes more elastic, the optimal markup falls.

Profit Maximization for a Firm with Market Power (9/10)

A Markup Formula for Companies with Market Power: The Lerner Index

Markup Rule:
$$\frac{P - MC}{P} = -\frac{1}{E^d}$$

- Left-hand side is firm's profit-maximizing markup, or the percentage of the firm's price that is greater than (or marked up from) its marginal cost
- Indicates that as demand becomes more elastic, the optimal markup falls
Why does this make sense?
 - The more sensitive consumers are to price changes (more elastic) the less the firm can take advantage of them.

Profit Maximization for a Firm with Market Power (10/10): Question 1

At their respective profit maximizing price and quantity combinations, Firm A's good has a price elasticity of -1.5 and Firm B's good has a price elasticity of -2.0. Which of the following statements is true?

- A. Firm A's Lerner Index is -0.67.
- B. Firm B's Lerner Index is 0.50.
- C. Firm B has more markup power than Firm A.
- D. Firm B's Lerner Index is -0.50.

Profit Maximization for a Firm with Market Power (10/10):

Question 1 – Correct Answer

9.3

At their respective profit maximizing price and quantity combinations, Firm A's good has a price elasticity of -1.5 and Firm B's good has a price elasticity of -2.0. Which of the following statements is true?

- A. Firm A's Lerner Index is -0.67.
- B. Firm B's Lerner Index is 0.50. **(correct answer)**
- C. Firm B has more markup power than Firm A.
- D. Firm B's Lerner Index is -0.50.

How a Firm with Market Power Reacts to Market Changes (1/7)

Response to a Change in Marginal Cost

Just as in the case of a firm in a perfectly competitive industry, firms with market power will alter output decisions in response to changing marginal costs of production.

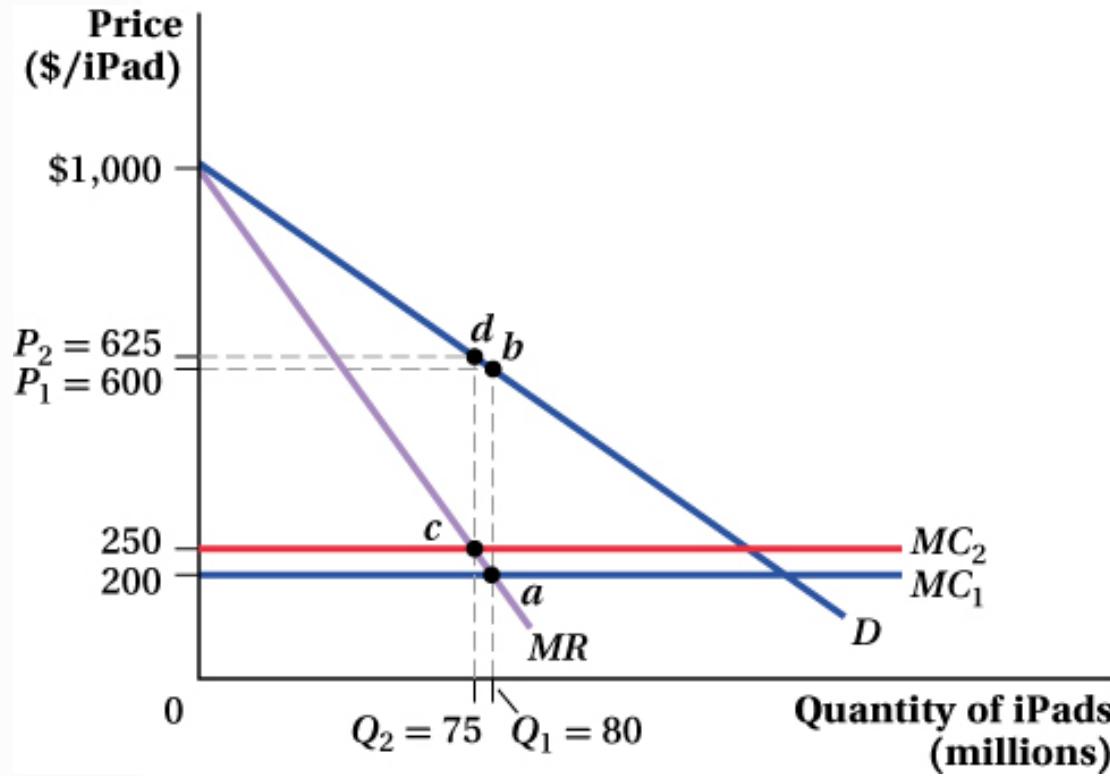
Suppose an accident at the factory of an Apple parts supplier leads to an increase in the marginal cost of iPad production from \$200 to \$250 per unit.

How will this affect Apple's production decisions?

- Marginal cost will increase, and because of the downward-sloping marginal revenue curve, the new optimal production should decrease.
- Price will also decrease as a result.

How a Firm with Market Power Reacts to Market Changes (2/7)

Figure 9.4 How a Firm with Market Power Reacts to an Increase in Marginal Cost



How a Firm with Market Power Reacts to Market Changes (3/7)

Response to a Change in Demand

Now suppose there is a parallel shift in the demand for iPads due to a doubling of the iPad's battery life. The new demand curve is given by

$$Q = 280 - 0.2P$$

The new inverse demand curve is given by

$$P = 1,400 - 5Q$$

To find the new profit-maximizing price–quantity combination, follow the same three-step procedure.

How a Firm with Market Power Reacts to Market Changes (4/7)

Response to a Change in Demand

- Derive the marginal revenue curve from the inverse demand curve.

$$P = 1,400 - 5Q$$

Marginal revenue takes the form

$$MR = a - 2bQ \rightarrow MR = 1,400 - 10Q$$

- Find the output quantity for which marginal revenue is equal to marginal cost.

$$MR = MC \rightarrow 1,400 - 10Q = 200 \rightarrow Q^* = 1.2 \text{ million}$$

How a Firm with Market Power Reacts to Market Changes (5/7)

Response to a Change in Demand

3. The profit-maximizing price can be found by substituting the profit-maximizing quantity into the inverse demand curve.

$$P = 1,400 - 5(120) = \$800$$

So, an outward shift in demand *increases* both the quantity of iPads produced and the price at which each is sold.

How a Firm with Market Power Reacts to Market Changes (6/7)

Changing the Price Sensitivity of Consumers

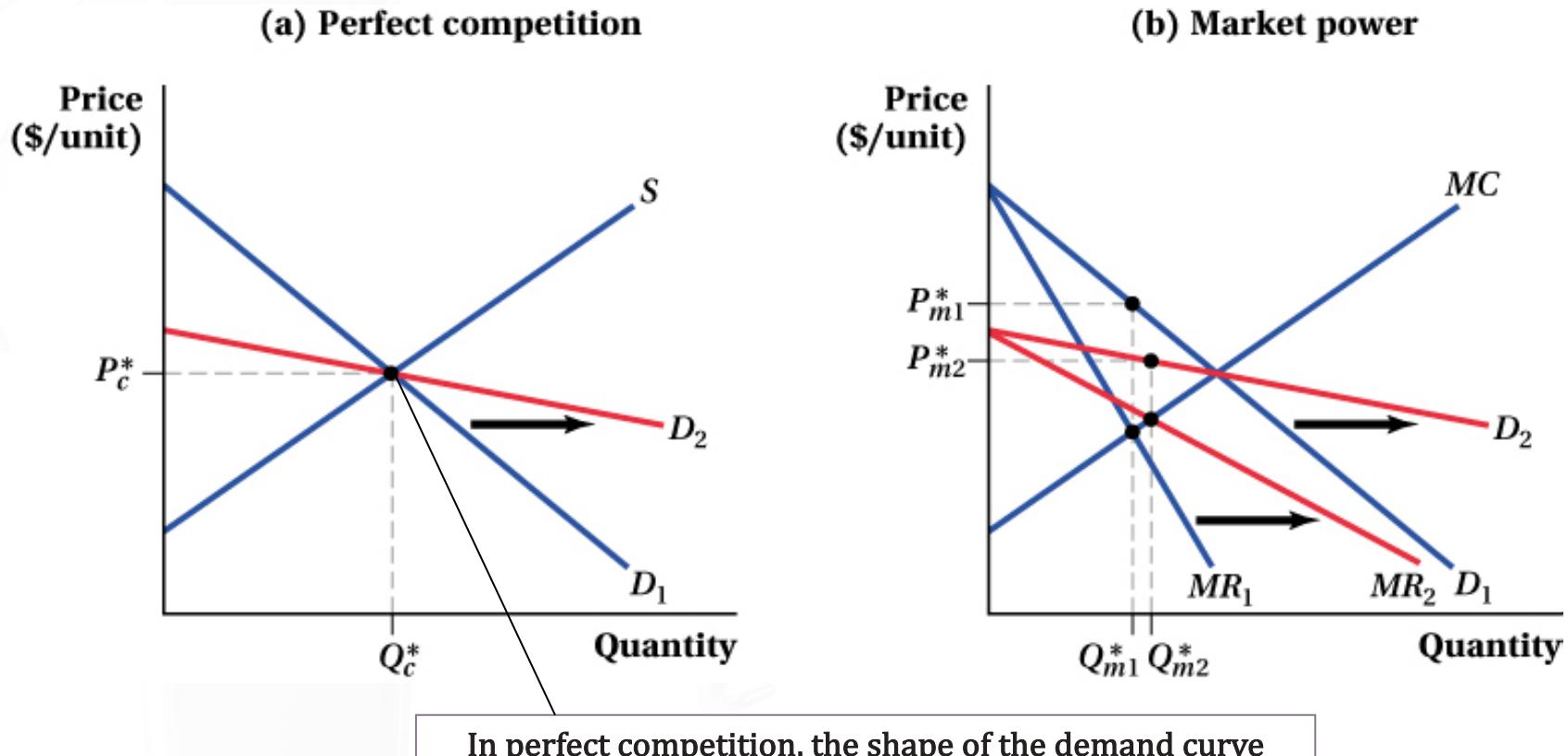
A major way in which firms with market power react differently from those subject to perfect competition is in response to changes in the price sensitivity of demand.

For instance, consider what would happen to the demand for iPads if a new competing tablet is introduced to the market that makes consumers' demand for iPads more price-sensitive without changing the quantity demanded at the current price.

- Demand for iPads should have become more price-elastic.
- The demand curve for iPads should have had a shallower slope.

How a Firm with Market Power Reacts to Market Changes (7/7)

Figure 9.5 Responses to a Rotation in the Demand Curve



In perfect competition, the shape of the demand curve does not matter—only the intersection with the supply curve.

The Winners and Losers of Market Power (1/7)

9.5

If firms with market power find it profitable to choose a level of output that is different from what would occur in perfect competition, there must be some additional benefit.

How much better off are firms when they have market power, and what does this imply for consumers' well-being?

- Examine Producer and Consumer Surplus to see!

The Winners and Losers of Market Power (2/7)

Consumer and Producer Surplus under Market Power

Returning to the example of Apple and the iPad, recall that Apple has a marginal cost of production of \$200 per unit and faces inverse demand:

$$P = 1,000 - 5Q$$

where quantity is measured in millions.

Producer surplus is the difference between the monopoly price of iPads and the constant marginal cost, multiplied by the quantity sold.

$$PS = (P_m - MC) \times Q_m = (\$600 - \$200) \times 80 \text{ million} = \$32 \text{ billion}$$

The Winners and Losers of Market Power (3/7)

9.5

Consumer and Producer Surplus under Market Power

Consumer surplus is calculated as the area under the inverse demand curve and *above* the sales price.

First, calculate the demand choke price, which is the price at which quantity demanded is equal to zero.

$$P = 1,000 - 5(0) = \$1,000$$

With linear demand, consumer surplus is a right triangle with height equal to the demand choke price net of the sales price and length equal to quantity sold.

$$CS = \frac{1}{2}(P_{\text{choke}} - P_m) \times Q_m = \frac{1}{2}(\$1,000 - \$600) \times 80 \text{ million} = \$16 \text{ million}$$

The Winners and Losers of Market Power (4/7)

9.5

Consumer and Producer Surplus under Perfect Competition

How would the outcome of the market for iPads change under perfect competition?

In perfect competition, marginal cost is equal to industry supply, and equilibrium occurs when industry supply is equal to demand.

$$P = MC \rightarrow 1,000 - 5Q = 200 \rightarrow Q = 160 \text{ million}$$

and price is equal to \$200.

What happens to Apple's producer surplus?

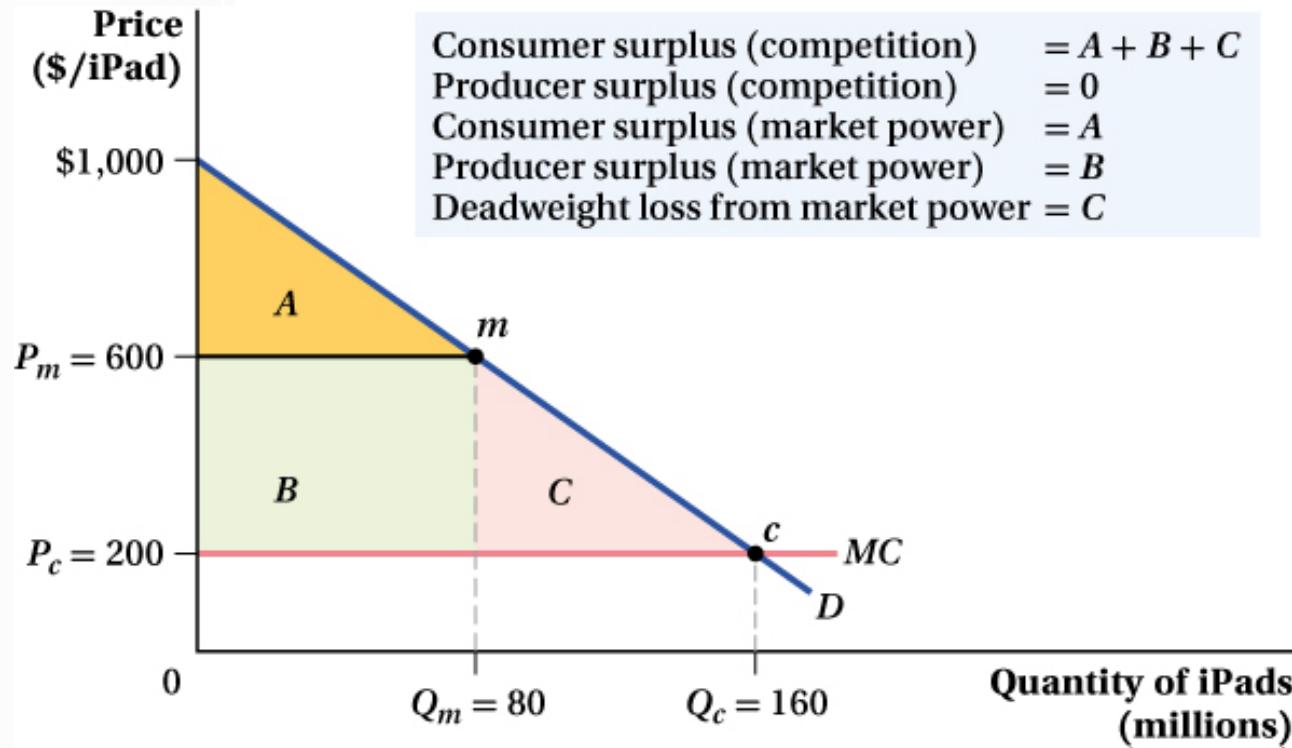
- It equals zero in perfect competition because $P = MC$.

Consumer surplus becomes

$$CS = \frac{1}{2}(P_{\text{choke}} - P_C) \times Q_C = \frac{1}{2}(\$1,000 - \$200) \times 160 \text{ million} = \$64 \text{ million}$$

The Winners and Losers of Market Power (5/7)

Figure 9.6 Surplus from the Apple iPad



The Winners and Losers of Market Power (6/7)

9.5

The Deadweight Loss of Market Power

Producer surplus is eliminated under perfect competition, but consumer surplus increases.

Also, net surplus improves under perfect competition, from \$48 billion to \$64 billion.

This illustrates the loss in efficiency in markets that are not perfectly competitive.

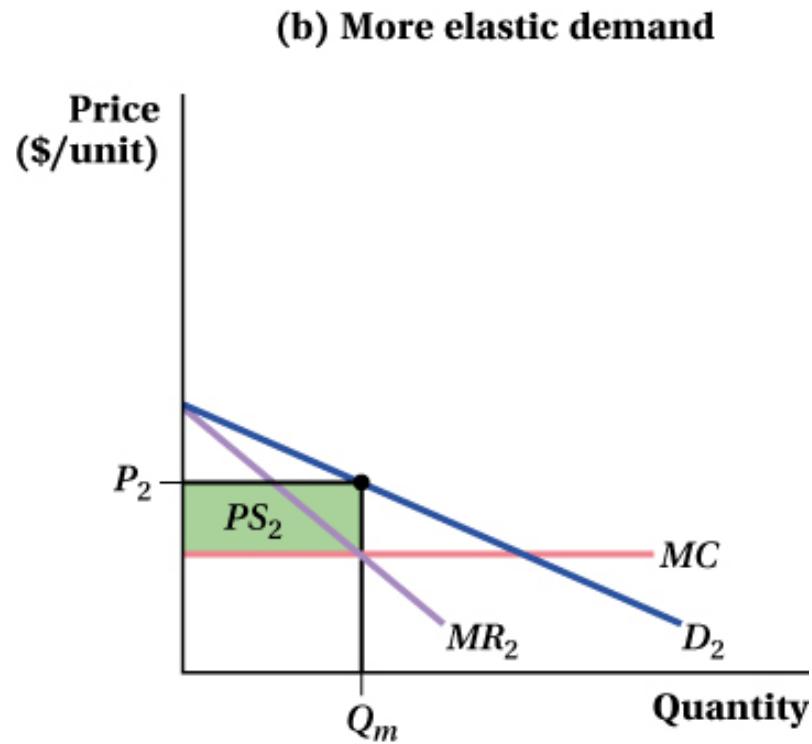
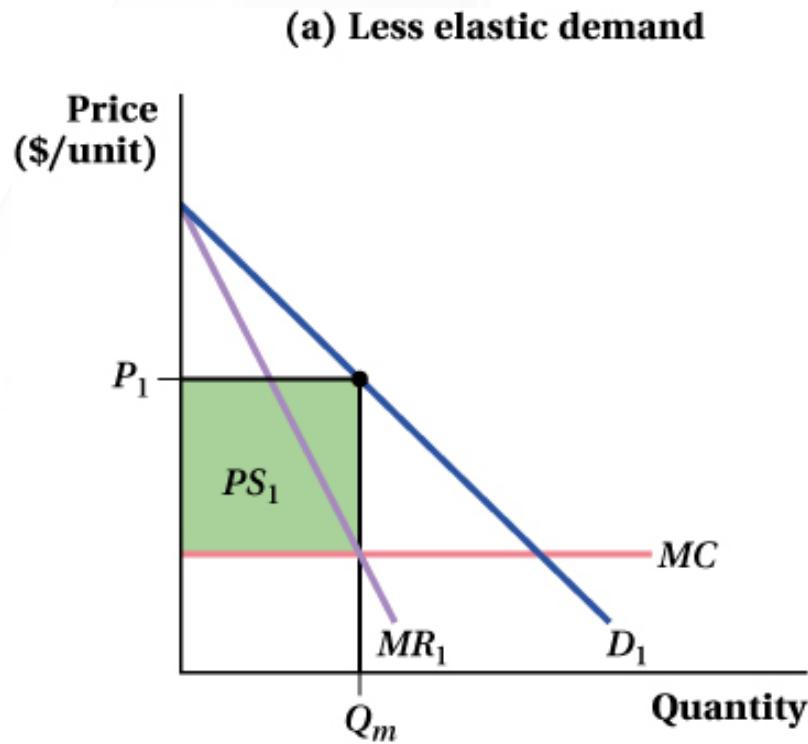
- When producers have market power, they can improve overall outcomes.
- However, if producers reduce output to a level below the perfectly competitive level, total surplus falls.

This loss of efficiency is a **deadweight loss** and, in this case, it is equal to \$16 billion.

The Winners and Losers of Market Power (7/7)

9.5

Figure 9.7 Gains from Market Power under Different Demand Curves



Governments and Market Power: Regulation, Antitrust, and Innovation (1/4)

9.6

The deadweight loss associated with market power can justify government intervention if regulations help achieve a more competitive or efficient outcome.

Direct Price Regulation

In some cases, the government will regulate price rather than attempting to dismantle a monopoly or encourage new participants.

- This is often the case for **natural monopolies**, or industries in which a firm's long-run average total cost falls continuously as output increases.

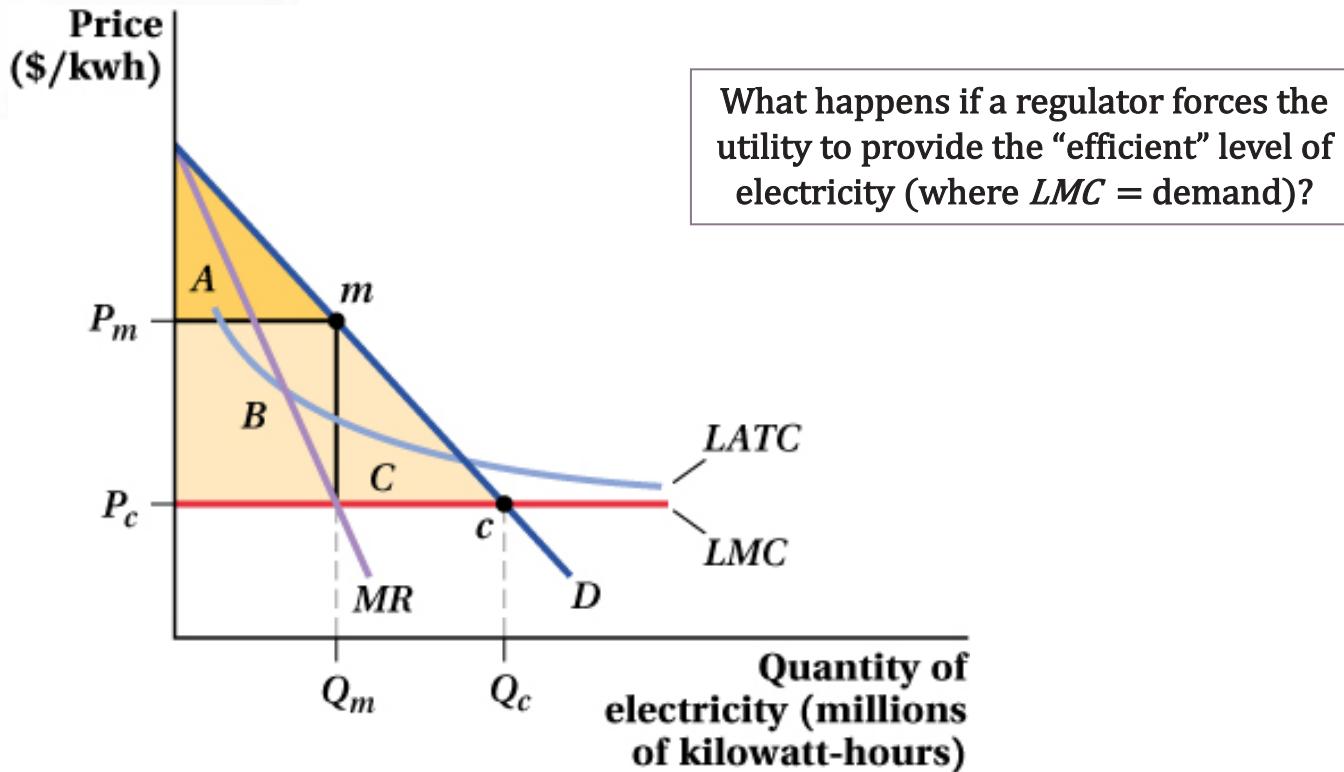
Consider a utility that provides electricity to a town.

- Significant fixed costs (generation and transmission)
- Low marginal costs

Governments and Market Power: Regulation, Antitrust, and Innovation (2/4)

9.6

Figure 9.8 Government Regulation of a Natural Monopoly



Governments and Market Power: Regulation, Antitrust, and Innovation (3/4)

9.6

Antitrust laws are designed to promote competitive markets by restricting behaviors that limit competition.

- Mergers and acquisitions
- Price fixing and other forms of collusion
- Predatory pricing

Can be difficult to determine if concentration is bad for consumers

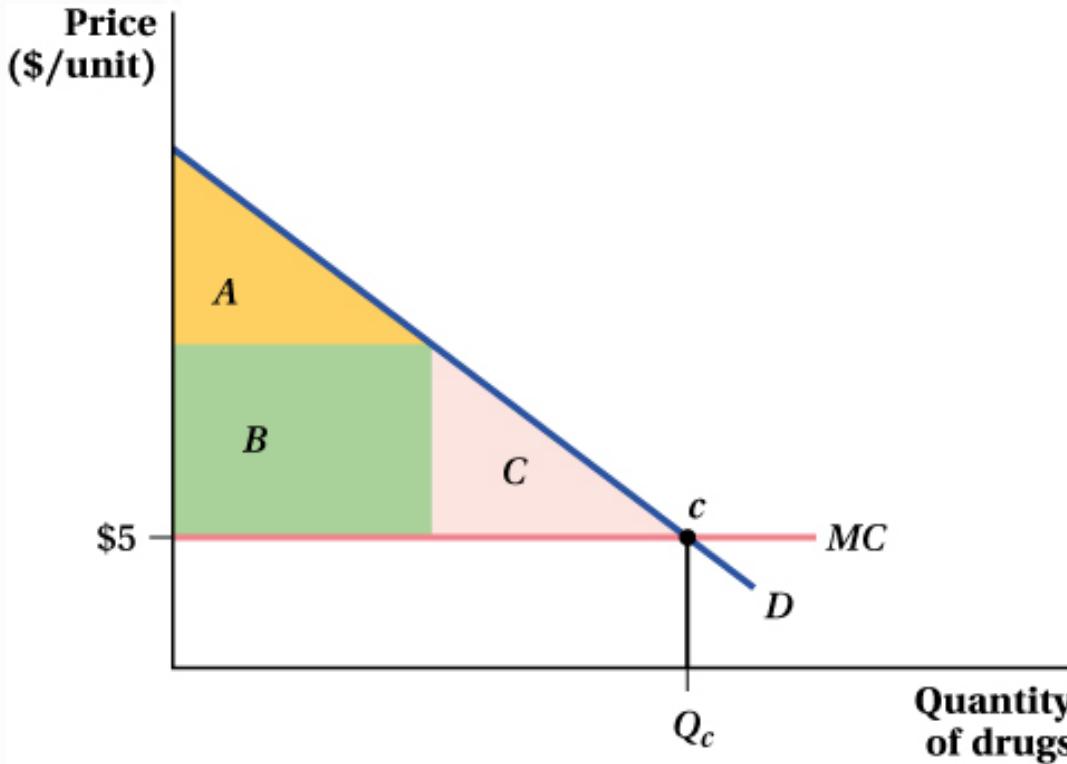
In other cases, the government may actually promote monopolies.

- Patents, licenses, copyrights
 - Designed to spur innovation
 - In setting length of patents, must balance the incentive for innovation with the reduction in consumer welfare that comes with granting a monopoly.

Governments and Market Power: Regulation, Antitrust, and Innovation (4/4)

9.6

Figure 9.9 Monopoly Power and Innovation



Conclusion (1/1)

In this chapter, we have shown how firms with market power don't treat output price as fixed but instead recognize that price depends on the quantity produced.

- Firms produce where marginal cost is equal to marginal revenue.
- Equilibrium output is lower than under perfect competition.
- Market power leads to a deadweight loss.

However, we have so far assumed that to sell more of a product, a firm must lower the price on all previously produced units.

In Chapter 10, we examine how firms may be able to charge different prices to different consumers, a practice called **price discrimination**.