

Lecture 9. Monopoly and Monopsony

BTM210, KAIST

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Topics Covered in This Lecture

Monopoly

Monopoly Power

Sources of Monopoly Power

The Social Costs of Monopoly Power

Monopsony

Monopsony Power

Limiting Market Power: The Antitrust Laws

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Deviation from a Perfectly Competitive Market

- In a perfectly competitive market,
 - Many sellers and buyers who are price takers

$$\max_q Pq - C(q) \Rightarrow P = MC(q)$$

- The market forces, a.k.a. invisible hands, determine price.
- Monopoly and monopsony are the extreme opposites of perfect competition
 - Monopoly is a market that has only "one seller" but many buyers.
 - Monopsony is a market that has only "one buyer" but many sellers.
 - Monopolists and monopsonists are price setters.
 - In general, goods are supplied less with higher price in a monopoly market.
 - Antitrust laws can limit the market power of a monopolist.
 - Monopoly explained, St.Louis Fed

Monopoly

- A unique position of a monopolist
 - The monopolist is a sole producer and need not worry about competitors.
 - The monopolist sets a price it wants.
 - However, the higher price it sets, the lower demand it has.
 - Because the market demand curve is the monopolist's demand curve.
- The monopolist's problem

$$\max_{P, Q} \Pi(P, Q) = PQ - C(Q) \Rightarrow \max_Q \Pi(Q) = P(Q)Q - C(Q)$$

$$\frac{d\Pi}{dQ} = \underbrace{\frac{dP}{dQ}Q + P(Q)}_{\text{Marginal revenue (MR)}} - \underbrace{\frac{dC}{dQ}}_{\text{Marginal cost (MC)}} = 0$$

- Note that $P(Q^*) > MC(Q^*)$.

Average Revenue and Marginal Revenue

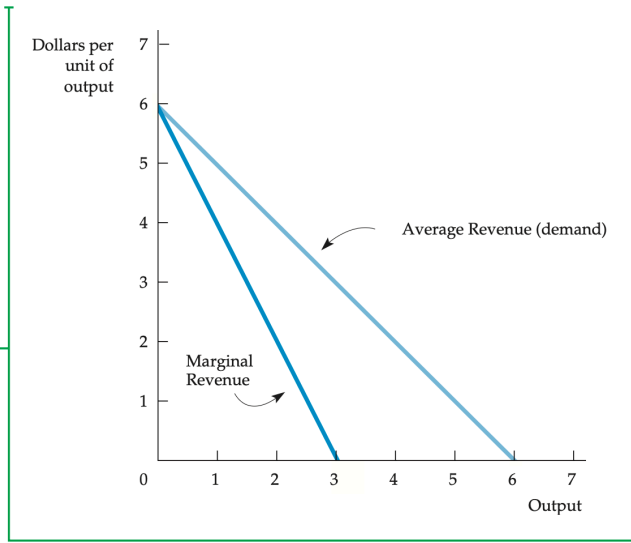
- The monopolist's average revenue—the price it receives per unit sold—is precisely the market demand curve.
- When the demand curve is downward sloping, the price (average revenue) is greater than marginal revenue because all units are sold at the same price.

TABLE 10.1		TOTAL, MARGINAL, AND AVERAGE REVENUE		
PRICE (P)	QUANTITY (Q)	TOTAL REVENUE (R)	MARGINAL REVENUE (MR)	AVERAGE REVENUE (AR)
\$6	0	\$0	—	—
5	1	5	\$5	\$5
4	2	8	3	4
3	3	9	1	3
2	4	8	−1	2
1	5	5	−3	1

Source: *Microeconomics*, 9th ed. (Pindyck and Rubinfeld, 2018), Table 10.1

FIGURE 10.1 AVERAGE AND MARGINAL REVENUE

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



Source: *Microeconomics*, 9th ed. (Pindyck and Rubinfeld, 2018), Figure 10.1

The Monopolist's Output Decision

- What quantity should the monopolist produce?
- To maximize profit, a firm must set output so that marginal revenue is equal to marginal cost.

$$MR(Q) = MC(Q)$$

- If $MR > MC$,
 - Increase the quantity supplied and lower the price: $MR \downarrow$ & $MC \uparrow$
 - More profits can be added up.
- If $MR < MC$,
 - Decrease the quantity supplied and push up the price: $MR \uparrow$ & $MC \downarrow$
 - Loss can be reduced.

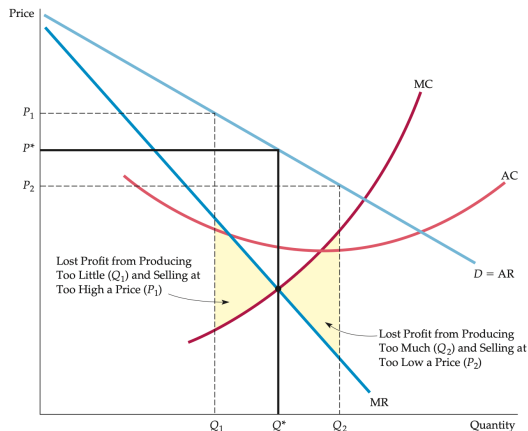


FIGURE 10.2
PROFIT IS MAXIMIZED WHEN MARGINAL REVENUE EQUALS MARGINAL COST

Q^* is the output level at which $MR = MC$. If the firm produces a smaller output—say, Q_1 —it sacrifices some profit because the extra revenue that could be earned from producing and selling the units between Q_1 and Q^* exceeds the cost of producing them. Similarly, expanding output from Q^* to Q_2 would reduce profit because the additional cost would exceed the additional revenue.

Source: *Microeconomics, 9th ed.* (Pindyck and Rubinfeld, 2018), Figure 10.2

An Example

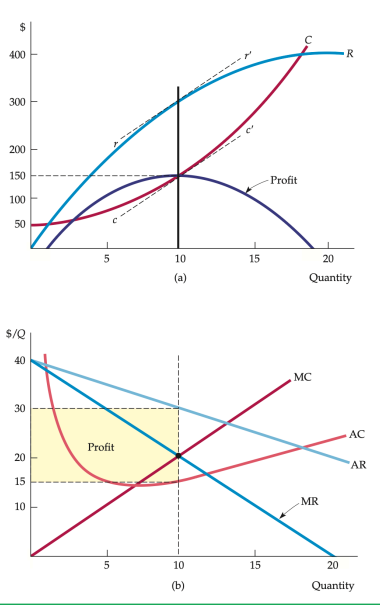
- The cost of production and demand curve are as follows.

$$C(Q) = 50 + Q^2, \quad P(Q) = 40 - Q$$

- What is the quantity and price that maximize the monopolist's profits?

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.



Source: *Microeconomics, 9th ed.* (Pindyck and Rubinfeld, 2018), Figure 10.3

A Rule of Thumb for Pricing

$$MR(Q) = MC(Q)$$

$$\begin{aligned} MR(Q) &= \frac{d}{dQ}(P(Q)Q) = \frac{dP}{dQ}Q + P = \frac{dP(Q)}{dQ} \frac{Q}{P} P + P \\ &= (1/E_d)P + P \end{aligned}$$

$$\frac{P - MC}{P} = -\frac{1}{E_d} \Leftrightarrow P = \frac{MC}{1 + (1/E_d)} > MC$$

- The LHS is the markup over marginal cost as a percentage of price.
- The firm can check whether a particular output level and price are optimal.
- A monopolist charges a price that exceeds marginal cost, but by an amount that depends inversely on the elasticity of demand.

Remarks

$$\frac{P - MC}{P} = -\frac{1}{E_d} \Leftrightarrow P = \frac{MC}{1 + (1/E_d)} > MC$$

- A monopolist will never produce a quantity of output that is on the inelastic portion of the demand curve — i.e., where the elasticity of demand is less than 1 in absolute value.
- If $MC = 0$, the firm will produce at the point where the elasticity of demand is exactly -1. Maximizing profit is equivalent to maximizing revenue, and revenue is maximized when $E_d = -1$.

Shifts in Demand

- In a perfectly competitive market,
 - The supply curve tells us how much will be produced at every price.
 - The supply curve represents the marginal cost of production for the industry as a whole.
- In a monopolistic market,
 - There is no supply curve: There is no one-to-one relationship between price and the quantity produced.
 - The monopolist's output decision depends not only on marginal cost but also on the shape of the demand curve.
- Thus, shifts in demand in a monopolistic market
 - Do not trace out the series of prices and quantities that correspond to a competitive supply curve.

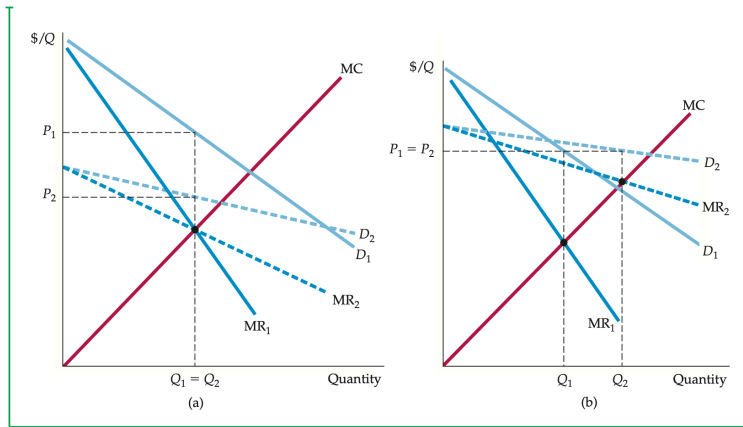


FIGURE 10.4 SHIFTS IN DEMAND

Shifting the demand curve shows that a monopolistic market has no supply curve—i.e., there is no one-to-one relationship between price and quantity produced. In **(a)**, the demand curve D_1 shifts to new demand curve D_2 . But the new marginal revenue curve MR_2 intersects marginal cost at the same point as the old marginal revenue curve MR_1 . The profit-maximizing output therefore remains the same, although price falls from P_1 to P_2 . In **(b)**, the new marginal revenue curve MR_2 intersects marginal cost at a higher output level Q_2 . But because demand is now more elastic, price remains the same.

Source: *Microeconomics*, 9th ed. (Pindyck and Rubinfeld, 2018), Figure 10.4

The Effect of a Tax

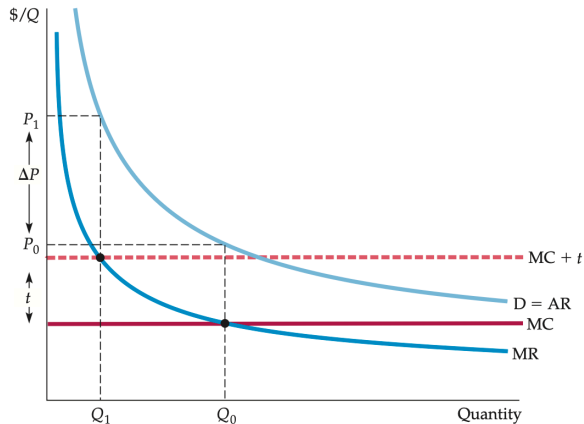


FIGURE 10.5
EFFECT OF EXCISE TAX ON
MONOPOLIST

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 ΔP is larger than the tax t .

Source: *Microeconomics, 9th ed.* (Pindyck and Rubinfeld, 2018), Figure 10.5

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Pure Monopoly Is Rare, but a Firm Can Have Monopoly Power.

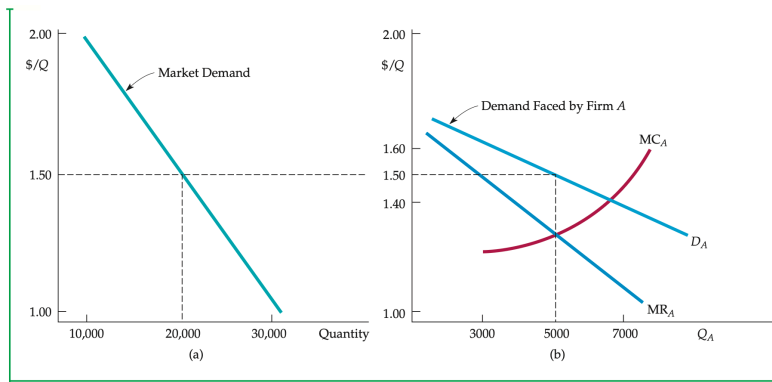


FIGURE 10.7
THE DEMAND FOR TOOTHBRUSHES

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, which exceeds marginal cost.

Source: *Microeconomics, 9th ed.* (Pindyck and Rubinfeld, 2018), Figure 10.7

Measuring Monopoly Power

- How can we measure monopoly power in order to compare one firm with another?
 - For the competitive firm, price equals marginal cost.
 - For the firm with monopoly power, price exceeds marginal cost.
 - Thus, a natural way to measure monopoly power is to examine the extent to which the profit maximizing price exceeds marginal cost.
- **Lerner Index of Monopoly Power**
 - The difference between price and marginal cost, divided by price

$$L = (P - MC)/P$$

- Note that the monopolist firm's optimal pricing rule is

$$(P - MC)/P = -1/E_d.$$

Elasticity of Demand, Monopoly Power, and Price Markup

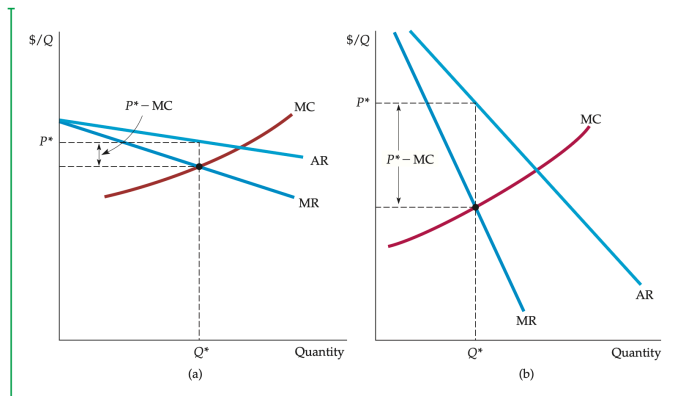


FIGURE 10.8
ELASTICITY OF DEMAND AND PRICE MARKUP

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).

Source: *Microeconomics, 9th ed.* (Pindyck and Rubinfeld, 2018), Figure 10.8

Markup Pricing: Supermarkets vs. Convenience Stores

- **Supermarkets**

- The elasticity of demand for a supermarket is often large as -10.

$$P = \frac{MC}{1 + 1/E_d} = \frac{MC}{1 - 1/10} = 1.11MC$$

- For most supermarkets, the markup is indeed about 10 percent.

- **Convenience stores**

- Its customers are generally less price sensitive. They might need a quart of milk or a loaf of bread late at night or may find it inconvenient to drive to the supermarket.
- The elasticity of demand for a convenience store is about -5.

$$P = \frac{MC}{1 + 1/E_d} = \frac{MC}{1 - 1/5} = 1.25MC$$

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Sources of Monopoly Power

- Why do some firms have considerable monopoly power while other firms have little or none?
 - The less elastic its demand curve, the more monopoly power a firm has.
 - The ultimate determinant of monopoly power is therefore the firm's elasticity of demand.
- Rephrase the question: Why do some firms (e.g., a supermarket) face demand curves that are more elastic than those faced by others (e.g., a convenience store)?
 - The elasticity of market demand
 - The number of firms in the market
 - The interaction among firms

Sources of Monopoly Power: The Elasticity of Market Demand

- The elasticity of market demand limits the potential for monopoly power. The firm's own demand will be at least as elastic as market demand.

$$|E_{\text{firm}}| \geq |E_{\text{market}}|$$

- A pure monopolist
 - If there is only one firm, its demand curve is the market demand curve.
 - The firm's degree of monopoly power depends completely on the elasticity of market demand.
- Several firms competing with one another
 - The elasticity of market demand sets a lower limit on the magnitude of the elasticity of demand for each firm.

Sources of Monopoly Power: The Number of Firms

- The monopoly power of each firm will fall as the number of firms increases.
 - As more and more firms compete, each firm will find it harder to raise prices and avoid losing sales to other firms.
- Creating barriers to entry can deter entry by new competitors.
 - A patent makes it impossible for other firms to enter the market.
 - A copyright can limit the sale of a book, music or a software to a single company.
 - A license can prevent new firms from entering the market.
 - Economies of scale may make it too costly for more than a few firms to supply the entire market.

Sources of Monopoly Power: The Interaction Among Firms

- A few firms competing aggressively can drive prices down to nearly competitive levels, by undercutting one another's prices to capture more market share.
- Firms could collude (in violation of the antitrust laws), agree to limit output and raise prices, and generate substantial monopoly power.
- A firm's monopoly power often changes over time.
 - Monopoly power must be thought of in a dynamic context.
 - Real or potential monopoly power in the short run can make an industry more competitive in the long run.
 - Large short-run profits can induce new firms to enter an industry, thereby reducing monopoly power over the longer term.

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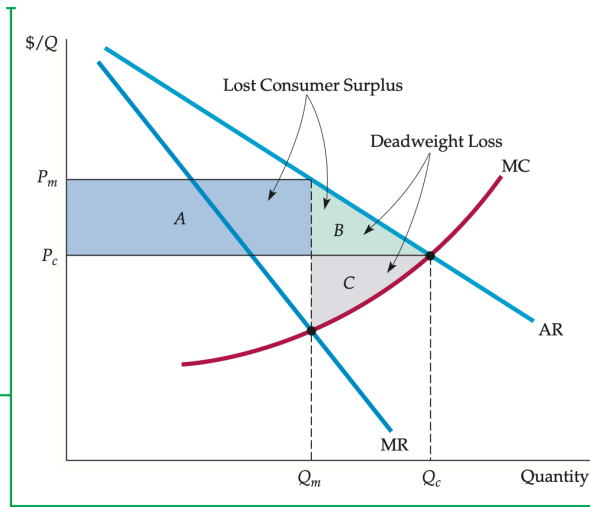
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Limiting Market Power: The Antitrust Laws

Deadweight Loss from Monopoly Power

FIGURE 10.10
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 $B + C$.



Source: *Microeconomics*, 9th ed. (Pindyck and Rubinfeld, 2018), Figure 10.10

Rent Seeking

- The social cost of monopoly power is likely to exceed the deadweight loss.
- The firm may engage in **rent seeking**: spending large amounts of money in socially unproductive efforts to acquire, maintain, or exercise its monopoly power.
 - Lobbying activities to obtain government regulations that make entry by potential competitors more difficult
 - Advertising and legal efforts to avoid antitrust scrutiny
 - Installing but not utilizing extra production capacity to convince potential competitors that they cannot sell enough to make entry worthwhile
- The economic incentive to incur rent-seeking costs = the gains from monopoly power = $A - C$

Price Regulation and Natural Monopoly

- Price regulation
 - In a competitive market, price regulation always results in a deadweight loss.
 - When a firm has monopoly power, on the contrary, price regulation can eliminate the deadweight loss that results from monopoly power.
- Natural monopoly
 - A natural monopoly is a firm that can produce the entire output of the market at a cost that is lower than what it would be if there were several firms.
 - A natural monopoly usually arises when there are strong economies of scale.
 - Price regulation is most often used for natural monopolies.

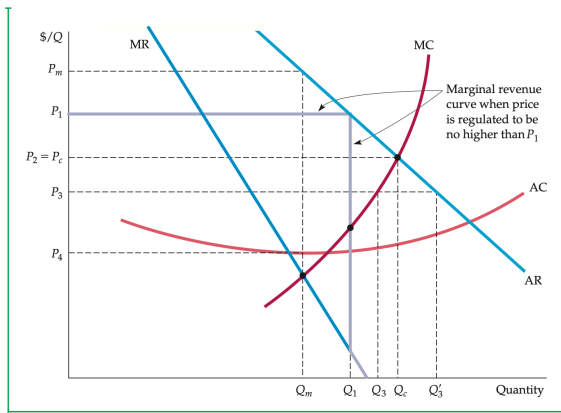


FIGURE 10.11
PRICE REGULATION

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 . 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, $Q'_3 - Q_3$.

Source: *Microeconomics*, 9th ed. (Pindyck and Rubinfeld, 2018), Figure 10.11

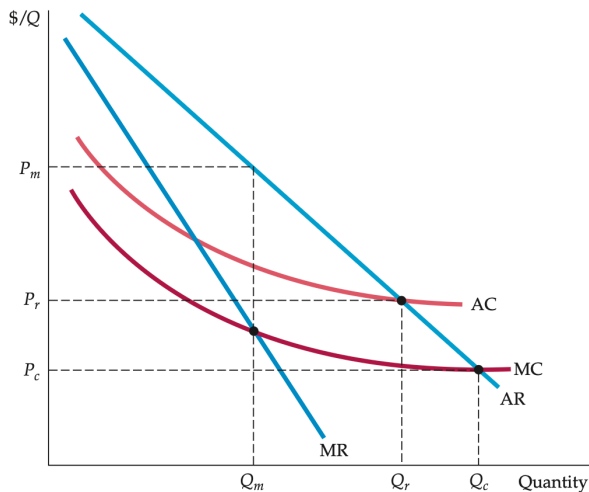


FIGURE 10.12 REGULATING THE PRICE OF A NATURAL MONOPOLY

A firm is a natural monopoly because it has economies of scale (declining average and marginal costs) over its entire output range. If price were regulated to be P_c the firm would lose money and go out of business. Setting the price at P_r yields the largest possible output consistent with the firm's remaining in business; excess profit is zero.

Source: *Microeconomics, 9th ed.* (Pindyck and Rubinfeld, 2018), Figure 10.12

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The Buyer Side of Market Power

- **Monopsony** refers to a market in which there is a single buyer.
- An **oligopsony** is a market with only a few buyers.
- With one or only a few buyers, some buyers may have **monopsony power**: a buyer's ability to affect the price of a good.
- Monopsony power enables the buyer to purchase a good for less than the price that would prevail in a competitive market: $P(Q^*) < MV(Q^*)$

$$\begin{aligned} \max_{P, Q} NB(P, Q) = V(Q) - E(P, Q) &\Rightarrow \max_Q NB(Q) = V(Q) - P(Q)Q \\ \frac{dNB}{dQ} = \underbrace{\frac{dV}{dQ}}_{\text{Marginal value (MV)}} - \underbrace{\left(\frac{dP}{dQ}Q + P \right)}_{\text{Marginal expenditure (ME)}} &= 0 \end{aligned}$$

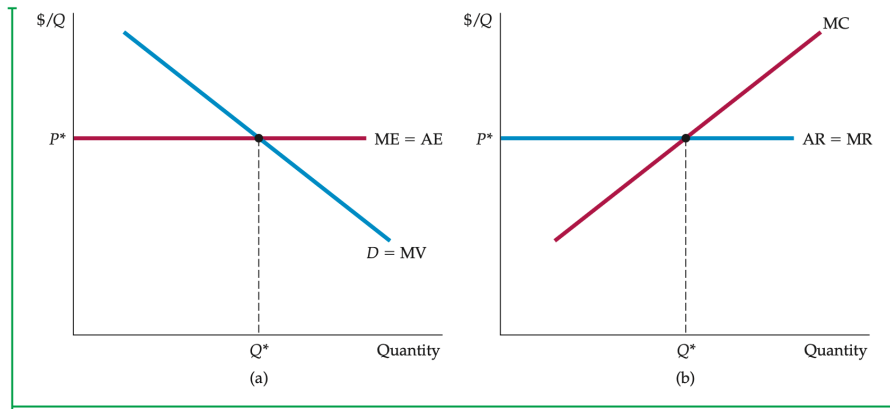


FIGURE 10.13
COMPETITIVE BUYER COMPARED TO COMPETITIVE SELLER

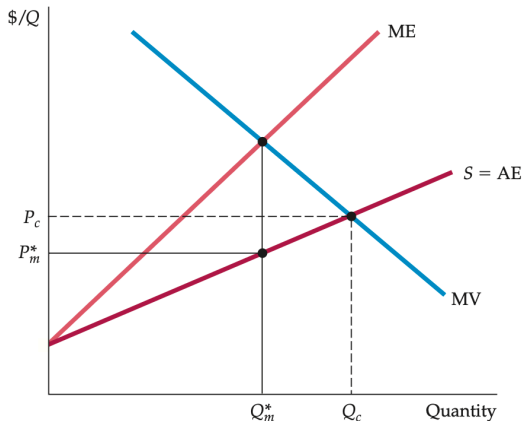
In **(a)**, the competitive buyer takes market price P^* as given. Therefore, marginal expenditure and average expenditure are constant and equal; quantity purchased is found by equating price to marginal value (demand). In **(b)**, the competitive seller also takes price as given. Marginal revenue and average revenue are constant and equal; quantity sold is found by equating price to marginal cost.

Source: *Microeconomics, 9th ed.* (Pindyck and Rubinfeld, 2018), Figure 10.13

FIGURE 10.14

MONOPSONIST BUYER

The market supply curve is monopsonist's average expenditure curve AE. Because average expenditure is rising, marginal expenditure lies above it. The monopsonist purchases quantity Q_m^* , where marginal expenditure and marginal value (demand) intersect. The price paid per unit P_m^* is then found from the average expenditure (supply) curve. In a competitive market, price and quantity, P_c and Q_c , are both higher. They are found at the point where average expenditure (supply) and marginal value (demand) intersect.



Source: *Microeconomics, 9th ed.* (Pindyck and Rubinfeld, 2018), Figure 10.14

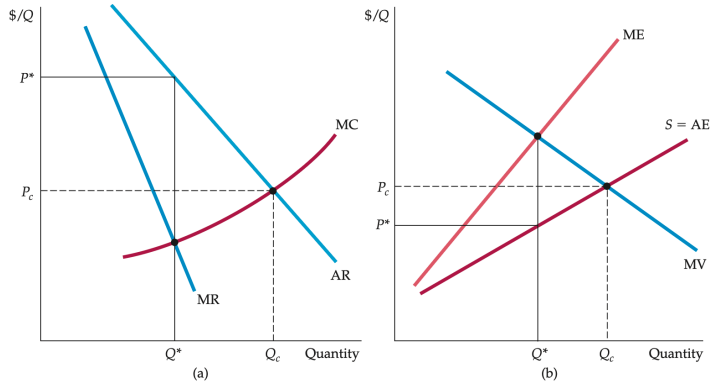


FIGURE 10.15 MONOPOLY AND MONOPSONY

These diagrams show the close analogy between monopoly and monopsony. **(a)** The monopolist produces where marginal revenue intersects marginal cost. Average revenue exceeds marginal revenue, so that price exceeds marginal cost. **(b)** The monopsonist purchases up to the point where marginal expenditure intersects marginal value. Marginal expenditure exceeds average expenditure, so that marginal value exceeds price.

Source: *Microeconomics, 9th ed.* (Pindyck and Rubinfeld, 2018), Figure 10.15

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Elasticity of Supply, Monopsony Power, and Price Markdown

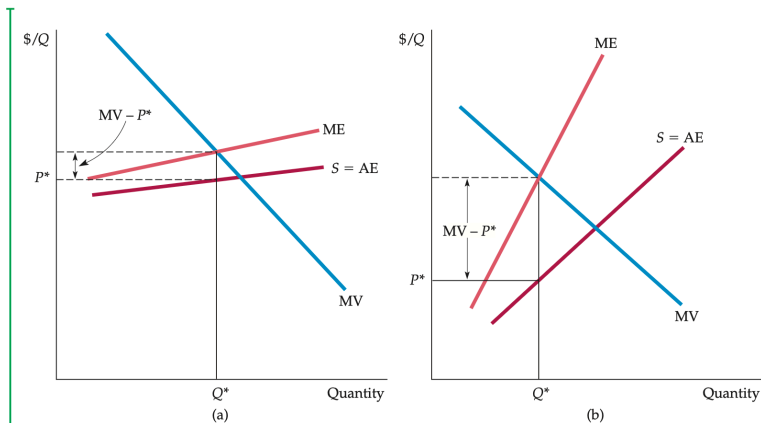


FIGURE 10.16

MONOPSONY POWER: ELASTIC VERSUS INELASTIC SUPPLY

Monopsony power depends on the elasticity of supply. When supply is elastic, as in **(a)**, marginal expenditure and average expenditure do not differ by much, so price is close to what it would be in a competitive market. The opposite is true when supply is inelastic, as in **(b)**.

Sources of Monopsony Power

- **Elasticity of market supply**

- The less elastic the supply curve, the greater the difference between marginal expenditure and average expenditure and the more monopsony power the buyer enjoys.

- **Number of buyers**

- When the number of buyers is very large, no single buyer can have much influence over price.

- **Interaction among buyers**

- If buyers compete aggressively, they will bid up the price close to their marginal value of the product, and will thus have little monopsony power.

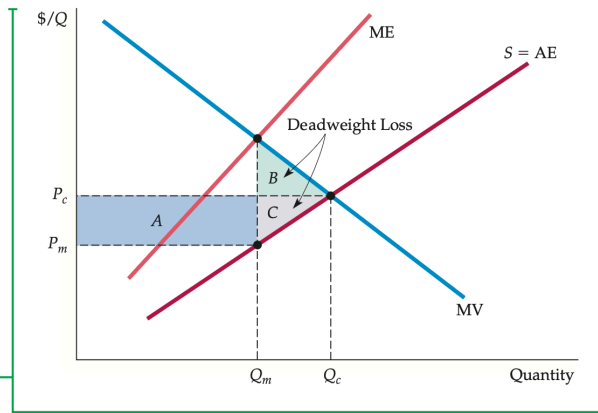
The Social Costs of Monopsony Power

- With monopsony, the price is lower and less is sold.

FIGURE 10.17

DEADWEIGHT LOSS FROM MONOPSONY POWER

The shaded rectangle and triangles show changes in buyer and seller surplus when moving from competitive price and quantity, P_c and Q_c , to the monopsonist's price and quantity, P_m and Q_m . Because both price and quantity are lower, there is an increase in buyer (consumer) surplus given by $A - B$. Producer surplus falls by $A + C$, so there is a deadweight loss given by triangles B and C .



Source: *Microeconomics, 9th ed.* (Pindyck and Rubinfeld, 2018), Figure 10.17

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Limiting Market Power: The Antitrust Laws

- Market power distorts prices, reduces outputs, and leads to a deadweight loss.
- How can limit market power and prevent it from being used anticompetitively?
- For a natural monopoly,
 - Direct price regulation is the answer.
- More generally,
 - Prevent firms from obtaining excessive market power through mergers and acquisitions.
 - Prevent firms that already have market power from using it to restrict competition.
 - This is done via antitrust laws.
- Note that it is not illegal to be a monopolist or to have market power.
 - A company can gain market power through innovation, which drives economic growth and enhances consumer welfare,
 - The Key Issue of Platform Regulation, KDI