

After Midterm Monopoly (Chapter 11: 11.1-11.6)

1

Monopoly

Definition: A **Monopoly Market** consists of a single seller facing many buyers.

The monopolist's profit maximization problem:

$$\text{Max } \pi(Q) = TR(Q) - TC(Q)$$

where: $TR(Q) = QP(Q)$ and
 $P(Q)$ is the (*inverse*) market demand curve.

The monopolist's profit maximization condition:

$$\Delta TR(Q)/\Delta Q = \Delta TC(Q)/\Delta Q \quad \text{OR} \quad MR(Q) = MC(Q)$$

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Monopoly vs Perfect Competition

In perfect competition, there are infinitely many buyers and sellers, selling homogeneous products.

As a result, **perfectly competitive firms are price takers**: they take price as given, and face a perfectly elastic demand curve.

In contrast, a **monopolist is a price maker**. It sets the market price to maximize its profit.

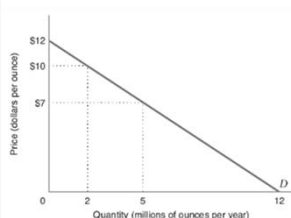
However, we often state the monopolist's profit maximization problem in terms of setting quantity rather than price.

This is because $TR(Q)$ and $TC(Q)$ are functions of Quantity.

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Profit Maximization by a Monopolist

The Monopolist's Demand Curve is downward-sloping: the higher P , the lower Q , and vice versa.



- Along the demand curve, different revenues for different quantities
- Profit maximization problem is **the optimal trade-off between volume** (number of units sold) **and margin** (the differential between price).

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Profit Maximization by a Monopolist

- Demand Curve: $P(Q) = 12 - Q$
- Total Revenue: $TR(Q) = Q \times P(Q) = 12Q - Q^2$
- Total Cost: $TC(Q) = \frac{1}{2}Q^2$
- Profit-Maximization: $MR(Q^*) = MC(Q^*)$

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Profit Maximization by a Monopolist

Given the inverse demand and MC, what is the profit maximizing Q and P for the monopolist?

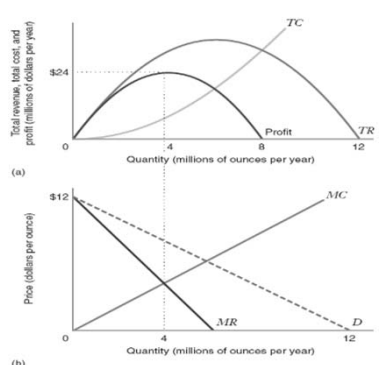
$$P = 12 - Q \quad MC = Q \quad MR = 12 - 2Q$$

$$\text{Setting } MC = MR ; 12 - 2Q = Q$$

$$Q^* = 4 \quad P^* = 12 - 4 = 8$$

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Profit Maximization by a Monopolist



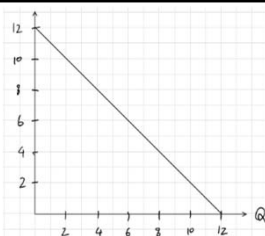
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Profit Maximization by a Monopolist

- If $MR > MC$,
- If $MR < MC$,
- $MR = MC$,

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A Closer Look at MR



The extra 3m ounces is called **Marginal Units**.
The prior 2m ounces is called **Inframarginal Units**.

- To sell more units, a monopolist has to lower the price.
- At the lower P, the increase in TR is Area.....
- The TR sacrificed is Area.....
- $\Delta TR = \dots\dots\dots$

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Marginal Revenue

- Area C = price x change in quantity = $P \cdot \Delta Q$
- Area B = - quantity x change in price = $-\Delta P \cdot Q$
- Change in TR = $\Delta TR = P \cdot \Delta Q - (-\Delta P \cdot Q)$

- So MR =

where $\Delta P / \Delta Q$ = slope of the inverse demand curve.

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Marginal Revenue

Marginal revenue has two parts:

- P: increase in TR due to higher Q, i.e., the marginal units.
- $(\Delta P / \Delta Q) \cdot Q$: decrease in TR due to lower P of the inframarginal units.

Since $(\Delta P / \Delta Q) \cdot Q < 0$, then **MR is less than the price** for any Q greater than 0, i.e., $MR(Q)$ lies below $P(Q)$.

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Average Revenue

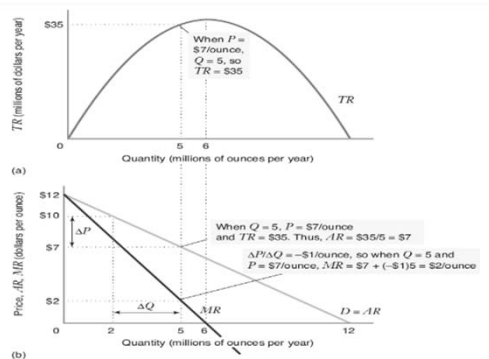
Since $AR = \frac{TR}{Q} = \frac{P \cdot Q}{Q} = P$

the monopolist's AR curve coincides with the market inverse demand curve:

$$AR(Q) = P(Q)$$

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Total, Average, and Marginal Revenue



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MR and AR

When P decreases by \$3 per ounce (from \$10 to \$7), Q increases by 3 million ounces (from 2 million to 5 million).

$$\frac{\Delta P}{\Delta Q} =$$

$$TR = P \times Q = 7 \times 5 = \text{___ million per year}$$

$$AR = \frac{TR}{Q} = \text{___ per ounce}$$

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

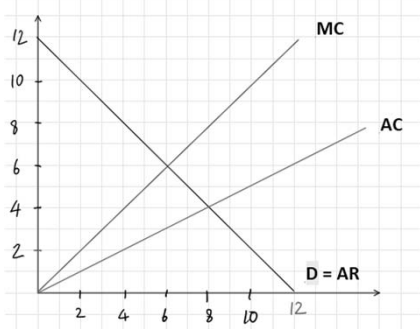
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Suppose that the equation of the market demand curve is $P = a - bQ$.

Problem What are the expressions for the average and marginal revenues curves?

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The Monopolist's Profit Maximization Condition



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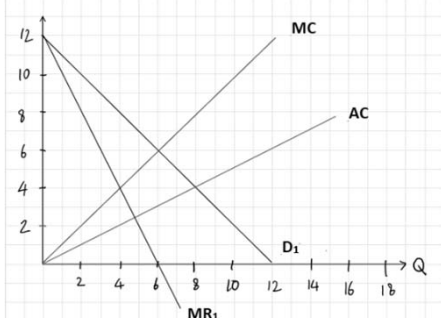
A monopolist does not have a supply curve

A monopolist does not have a supply curve (i.e., an optimal output for any exogenously-given price) because price is endogenously-determined by demand: the monopolist picks a preferred point on the demand curve.

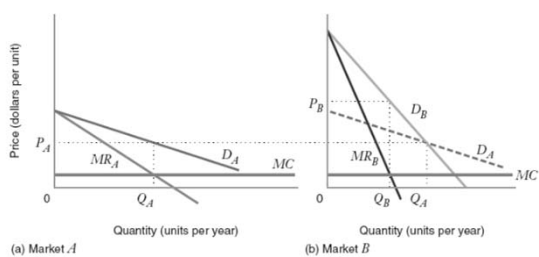
One could also think of the monopolist choosing output to maximize profits subject to the constraint that price be determined by the demand curve.

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A monopolist does not have a supply curve



Price Elasticity of Demand and the Profit-Maximizing Price

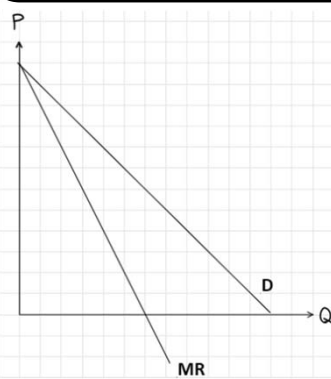


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Marginal Revenue and Price Elasticity of Demand

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Marginal Revenue and Price Elasticity of Demand



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Marginal Revenue and Price Elasticity of Demand

Region of Demand Curve	Relationship between	
	Marginal Revenue and $\epsilon_{Q,P}$	Total Revenue and Price
		The monopolist can increase total revenue by decreasing price (and thereby increasing quantity) by a small amount. The monopolist's total revenue will not change when price (or quantity) is changed by a small amount. The monopolist can increase total revenue by increasing price (and thereby decreasing quantity) by a small amount.

Inverse Elasticity Pricing Rule (IEPR)

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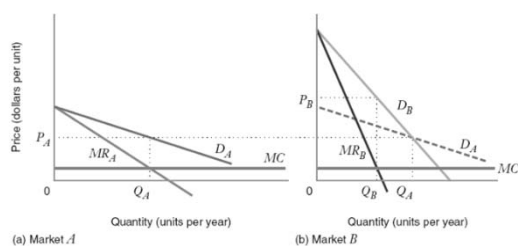
- Monopolist's optimal markup of price above marginal cost expressed as a percentage of price is equal to minus the inverse of the price elasticity of demand.

$$\frac{P^* - MC^*}{P^*} = -\frac{1}{\epsilon_{Q,P}}$$

- IEPR tells us about how much P^* the monopolist should charge to maximize profits, given the PED.
- The more price elasticity of demand, the smaller will be the optimal markup.**

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Inverse Elasticity Pricing Rule (IEPR)



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Learning-by-Doing Exercise: Computing the Optimal Monopoly Price for a Constant Elasticity Demand Curve

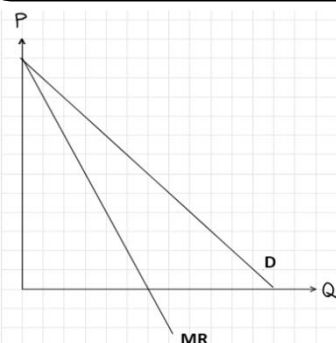
The general form of a constant elasticity demand curve is $Q = aP^{-b}$. At every point on such a curve, the price elasticity of demand equals $-b$.⁶ Suppose a monopolist has a constant marginal cost $MC = \$50$.

Problem

- What is the monopolist's optimal price if its constant elasticity demand curve is $Q = 100P^{-2}$?
- What is the monopolist's optimal price if its constant elasticity demand curve is $Q = 100P^{-5}$?

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The Monopolist will only operate on the elastic region of the demand curve.



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The Lerner Index of Market Power

Definition: An agent has **Market Power** if he can affect the market price.

Sometimes, this is thought of as the degree to which a firm can raise price above marginal cost.

Definition: The **Lerner Index of market power** is the price-cost margin, $(P^* - MC)/P^*$.

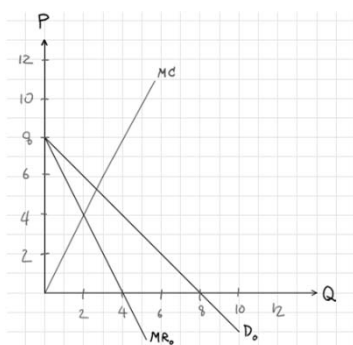
This index ranges between 0 (for competitive firms) and 1 (for a monopolist facing a unit-elastic demand).

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Price Elasticity of Demand, Price, and Marginal Cost

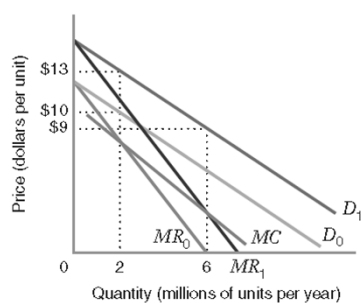
	Elasticity of Demand, ϵ	Price/Marginal Cost Ratio, $p/MC = 1/[1 + (1/\epsilon)]$	Lerner Index, $(p - MC)/p = -1/\epsilon$
← more elastic → ↑	-1.01	101	0.99
	-1.1	11	0.91
	-2	2	0.5
	-3	1.5	0.33
	-5	1.25	0.2
	-10	1.11	0.1
	-100	1.01	0.01
	← more elastic →		
← more elastic →	→ more elastic →	1	0

Comparative Statics – Shifts in Demand



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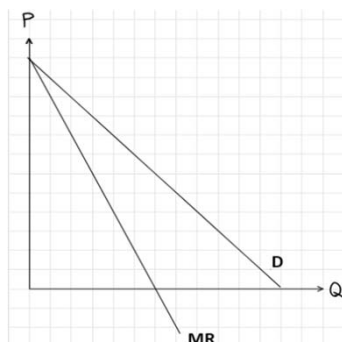
Comparative Statics – Shifts in Demand



(b)

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The Monopoly Midpoint Rule



For a constant MC,
 P^* is found using
the midpoint rule:
 P^* is halfway
between the
vertical intercept of
the demand curve
 a (choke price) and
vertical intercept of
the MC curve c .

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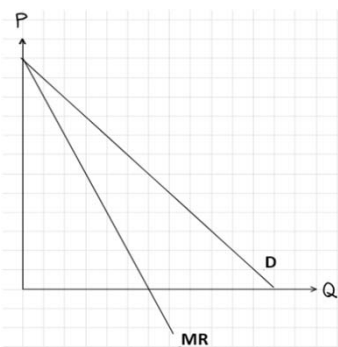
Learning-by-Doing Exercise: Computing the Optimal Price Using the Monopoly Midpoint Rule

Suppose a monopolist faces a linear market demand curve $P = a - bQ$ and has a constant marginal cost $MC = c$ (as illustrated in Figure 11.11).

Problem What is the monopolist's profit-maximizing quantity and price?

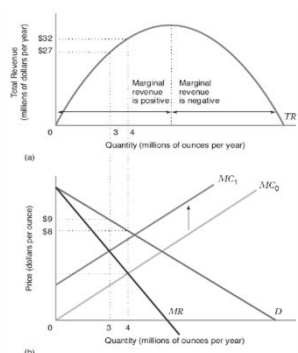
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Comparative Statics – Shifts in MC



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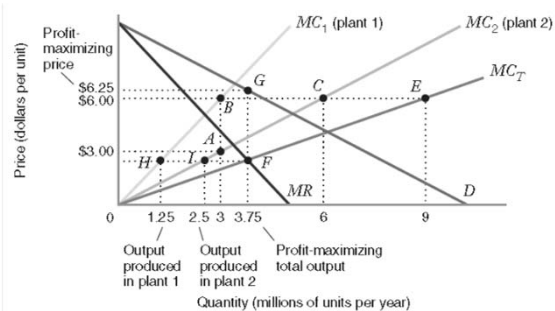
Comparative Statics – Shifts in MC



- Upward shift of MC decreases the profit maximizing monopolist's total revenue.
- Downward shift of MC increases the profit maximizing monopolist's total revenue.

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Monopoly with Multiple Plants

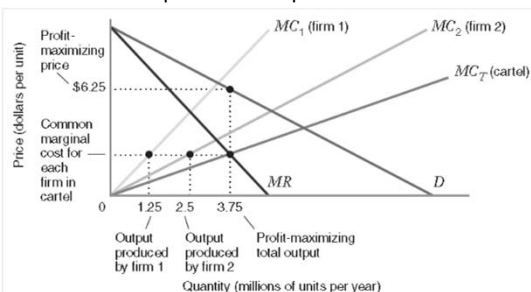


Output choices with 2 plants

Monopoly with Two Markets

Profit Maximization by Cartel

Cartel A group of producers that collusively determines the price and output in a market.

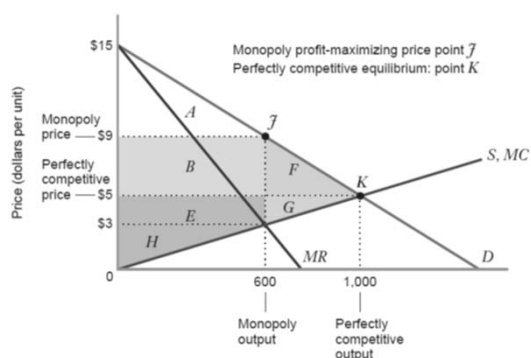


The Welfare Economies of Monopoly

Since the monopoly equilibrium output does not, in general, correspond to the perfectly competitive equilibrium, it entails a **dead-weight loss**.

Suppose that we compare a monopolist to a competitive market, where the supply curve of the competitors is equal to the marginal cost curve of the monopolist.

The Welfare Economies of Monopoly



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The Welfare Economies of Monopoly

	Perfect Competition	Monopoly	Impact of Monopoly
Consumer surplus			
Producer surplus			
Net economic benefit			

Why does Monopoly exist?

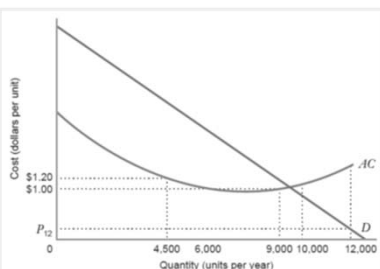
Definition: A market is a **natural monopoly** if the total cost incurred by a single firm producing output is less than the combined total cost of two or more firms producing this same level of output among them.

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Why does Monopoly exist?

FIGURE 11.17 Natural Monopoly Market

Any output level less than 10,000 units per year can be produced most cheaply by a single firm. For example, a single firm can produce an output of 9,000 units for an average cost of \$1 per unit. Two firms, each producing 4,500 units, would incur an average cost of \$1.20 per unit. Two firms could produce 12,000 units at a lower total cost than one firm could. However, this level of output would not be profitable because the price P_{12} at which 12,000 units would be demanded is less than the minimum level of average cost.



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Why does Monopoly exist?

Definition: **Barriers to Entry** are factors that allow an incumbent firm to earn positive economic profits while making it unprofitable for newcomers to enter the industry.

1. **Structural Barriers to Entry** – occur when incumbent firms have cost or demand advantages that would make it unattractive for a new firm to enter the industry
2. **Legal Barriers to Entry** – exist when an incumbent firm is legally protected against competition
3. **Strategic Barriers to Entry** – result when an incumbent firm takes explicit steps to deter entry

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