

# Monopoly

EE311

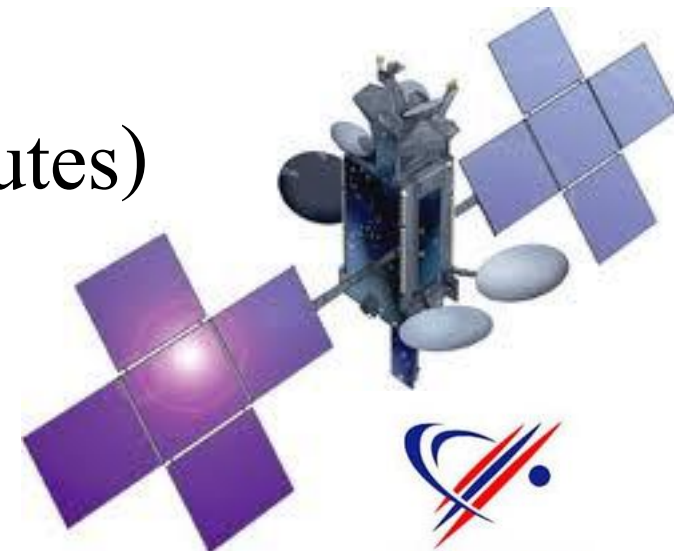
Chayun Tantivasadakarn

Faculty of Economics, Thammasat University

# Monopoly



- Monopoly
  1. One seller - many buyers
  2. One product (no good substitutes)
  3. Barriers to entry
  4. Price Maker



# Sources of Monopoly Power: Barriers to entry

- Technical barriers to entry
  - Economies of scale --> Natural monopoly
  - Example: Satellites, Trains, Electric Power Networks



# Sources of Monopoly Power: Barriers to entry

- Legal barriers:

- Patents, Copy rights to protect innovation

- Medicines, Movies

- Concessions or licenses

- Sin Products: Alcohol

- Sources of income: TV or radio broadcasting

- Environment protection: forest, mineral

- Consumer protection: Medical services



บริษัท ผาแดงอินดัสทรี  
(มหาชน)



nip tuck

# Sources of Monopoly Power: Barriers to entry

- Creation of barriers to entry:
  - Owner of a vital resource
  - Trade secrets
  - Strategies to deter entry
  - Collusion (IBC+UTV ->UBC)
  - Lobby or State capture  
(Investment Banks and the FED)



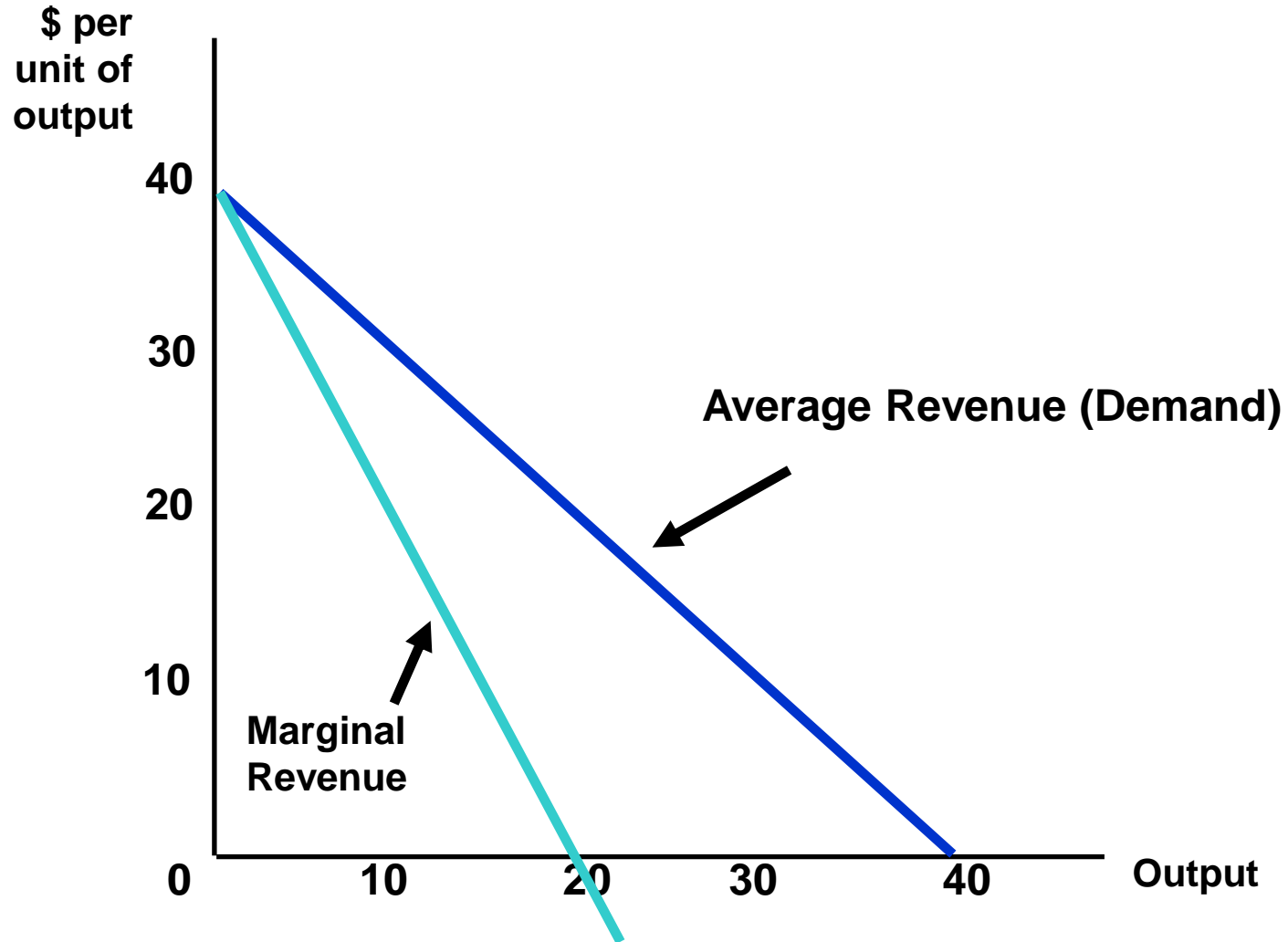
# Single Price Policy

- Assume profit maximization behavior.
- It needs to choose the quantity that maximizes profits.
- Since there is only one firm in the market, the monopolist faces the market demand curve.
- With the downward sloping demand curve, the monopolist is a price maker.

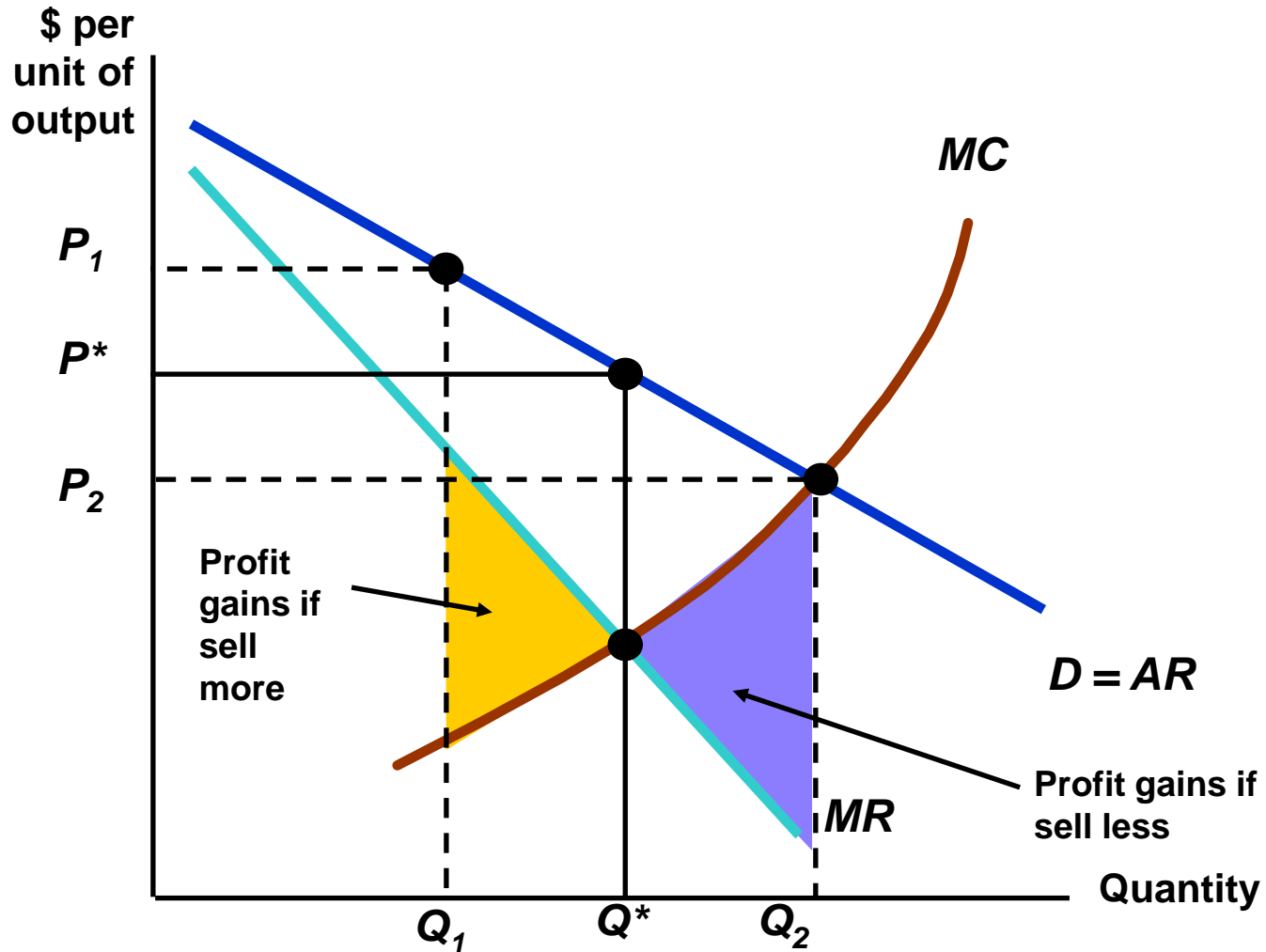
## Average & Marginal Revenue

- The monopolist's **average revenue**, price received per unit sold, is the market demand curve. Example:  
 $P = 40 - Q$
- Monopolist also needs to find **marginal revenue**, change in revenue resulting from a unit change in output.
- $TR = PQ = 40Q - Q^2$
- $AR = 40 - Q$
- $MR = dTR/dQ = 40 - 2Q$ 
  - Same intercept but the slope is twice as steep.

# Average and Marginal Revenue



# Monopolist's Output Decision



# Monopolist's Output Decision

- At  $Q_1$ ,  $MR > MC$ . TR increases faster than TC, profit will be increased if sell more.
- At  $Q_2$ ,  $MR < MC$ . TR increases slower than TC, profit will be increased if sell less.
- At  $Q^*$ ,  $MR = MC$ . There is no gain from changing sell.

# Monopoly: An Example

$$\text{Cost} = C(Q) = 50 + Q^2$$

$$\text{MC} = \frac{dC}{dQ} = 2Q$$

$$\text{Demand : } P(Q) = 40 - Q$$

$$\text{TR}(Q) = P(Q)Q = 40Q - Q^2$$

$$\text{MR} = \frac{dR}{dQ} = 40 - 2Q$$

# Monopoly: An Example

$$MC = MR$$

$$2Q = 40 - 2Q$$

$$4Q = 40$$

$$Q = 10$$

$$P(Q) = 40 - Q$$

$$P(Q) = 40 - 10 = 30$$

$$\pi = (30)(10) - 50 - (10)^2$$

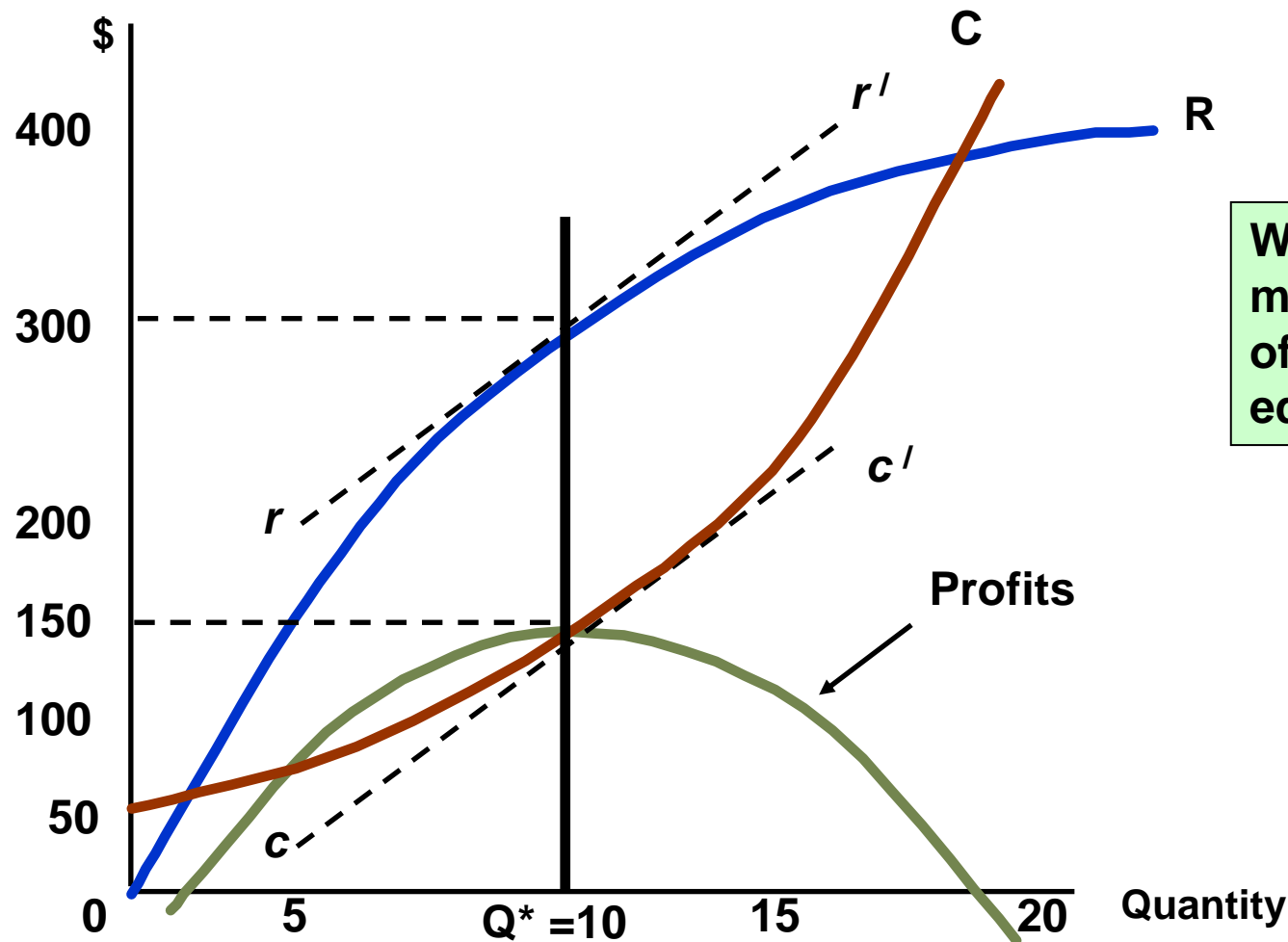
$$= 300 - 50 - 100$$

$$= 150$$

## Monopoly: An Example

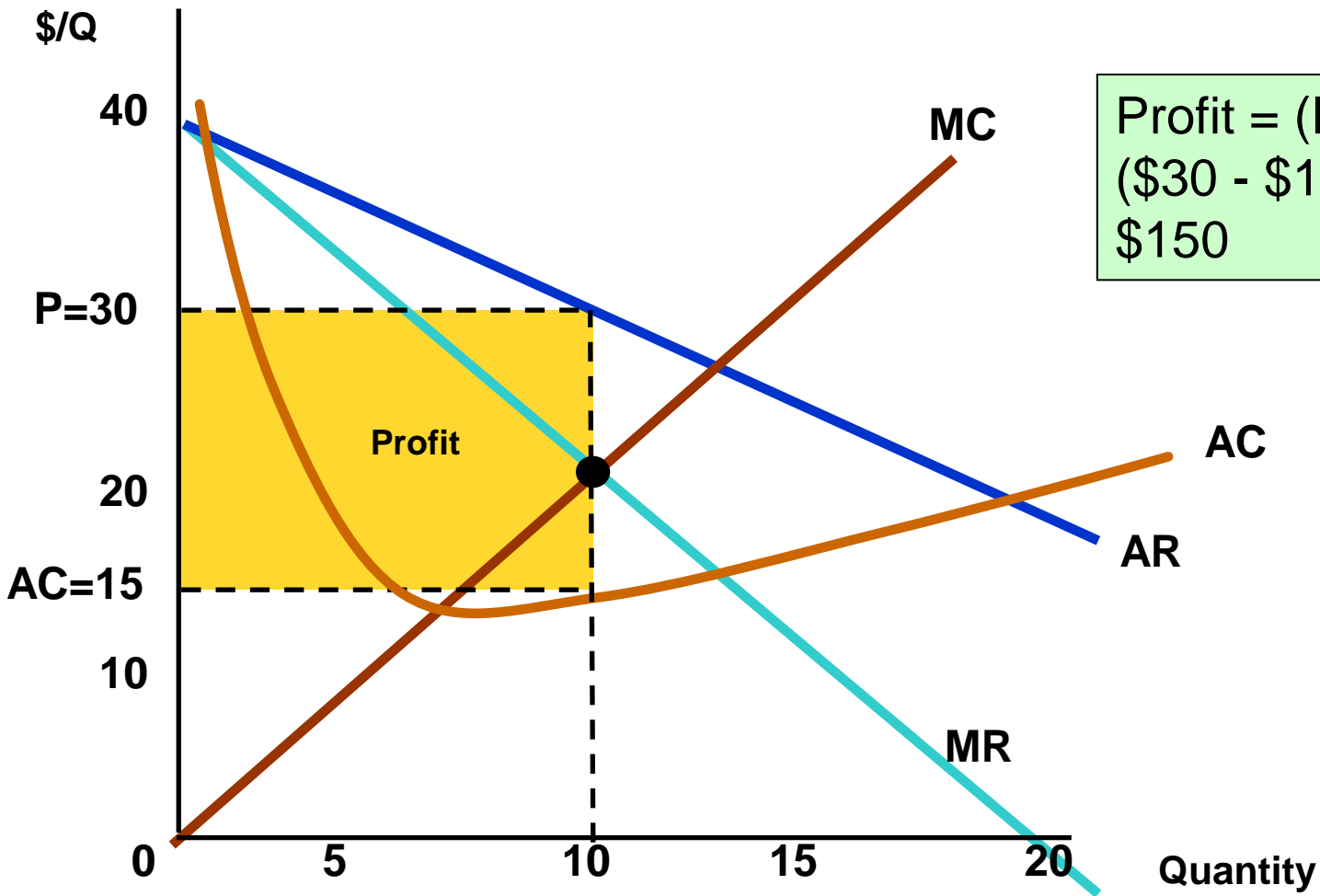
- By setting marginal revenue equal to marginal cost, we verified that profit is maximized at  $P = \$30$  and  $Q = 10$ .
- This can be seen graphically by plotting cost, revenue and profit
  - Profit is initially negative when produce little or no output
  - Profit increase and  $q$  increase, maximized at  $Q^*=10$

# Example of Profit Maximization



When profits are maximized, slope of  $rr'$  and  $cc'$  are equal:  $MR=MC$

# Example of Profit Maximization



$$\text{Profit} = (P - AC) \times Q = (\$30 - \$15)(10) = \$150$$

## Exercise

“If a monopolist suffers a loss, it only needs to increase the price to cover the loss. A monopolist can choose both price and quantity it wishes since there is no other competitor”

Comment.



# A Rule of Thumb for Pricing

$$1. \quad MR = \frac{\Delta TR}{\Delta Q} = \frac{\Delta(PQ)}{\Delta Q}$$

- Produce one more unit brings in revenue  $(1)(P) = P$
- With downward sloping demand, producing and selling one more unit results in small drop in price  $\Delta P/\Delta Q$ .
  - Reduces revenue from all units sold, change in revenue:  $Q(\Delta P/\Delta Q)$

# A Rule of Thumb for Pricing

$$\begin{aligned} 2. \text{ MR} &= P + Q \frac{\Delta P}{\Delta Q} \\ &= P + P \left( \frac{Q}{P} \right) \left( \frac{\Delta P}{\Delta Q} \right) \\ 3. \text{ E}_d &= \left( \frac{P}{Q} \right) \left( \frac{\Delta Q}{\Delta P} \right) \end{aligned}$$

# A Rule of Thumb for Pricing

$$4. \left( \frac{Q}{P} \right) \left( \frac{\Delta P}{\Delta Q} \right) = \frac{1}{E_d}$$

$$5. MR = P + P \left( \frac{1}{E_d} \right)$$

# A Rule of Thumb for Pricing

**p is maximized where  $MR = MC$**

$$P + P\left(\frac{1}{E_D}\right) = MC$$

$$P = \frac{MC}{1 + (1/E_D)}$$
$$\frac{P - MC}{P} = -\frac{1}{E_D}$$

- A monopolist never produce in the range where  $|E_D| < 1$ 
  - If  $|E_D| = 1$ , P is infinity.
  - When  $|E_D| < 1$ , total revenue can be increased by increasing the price.

# Markup Pricing

$$P = \frac{MC}{1 + (1/E_D)}$$

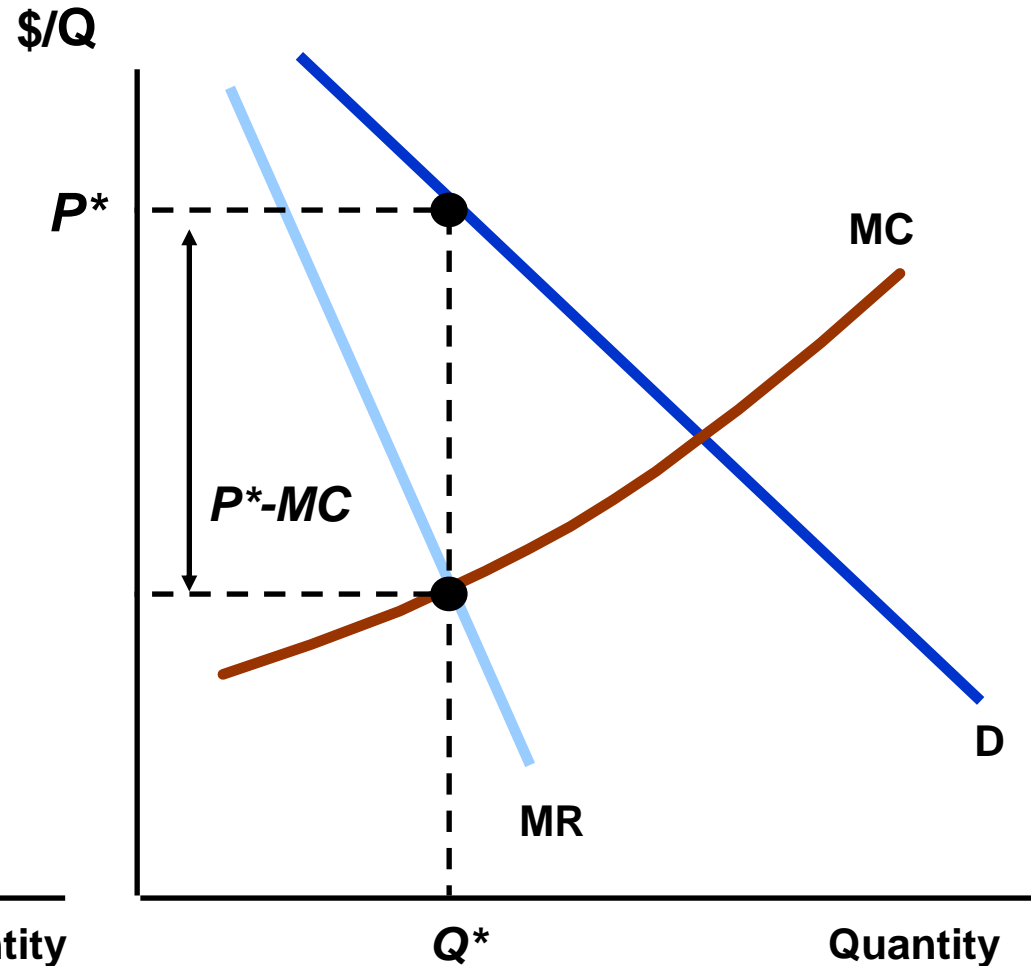
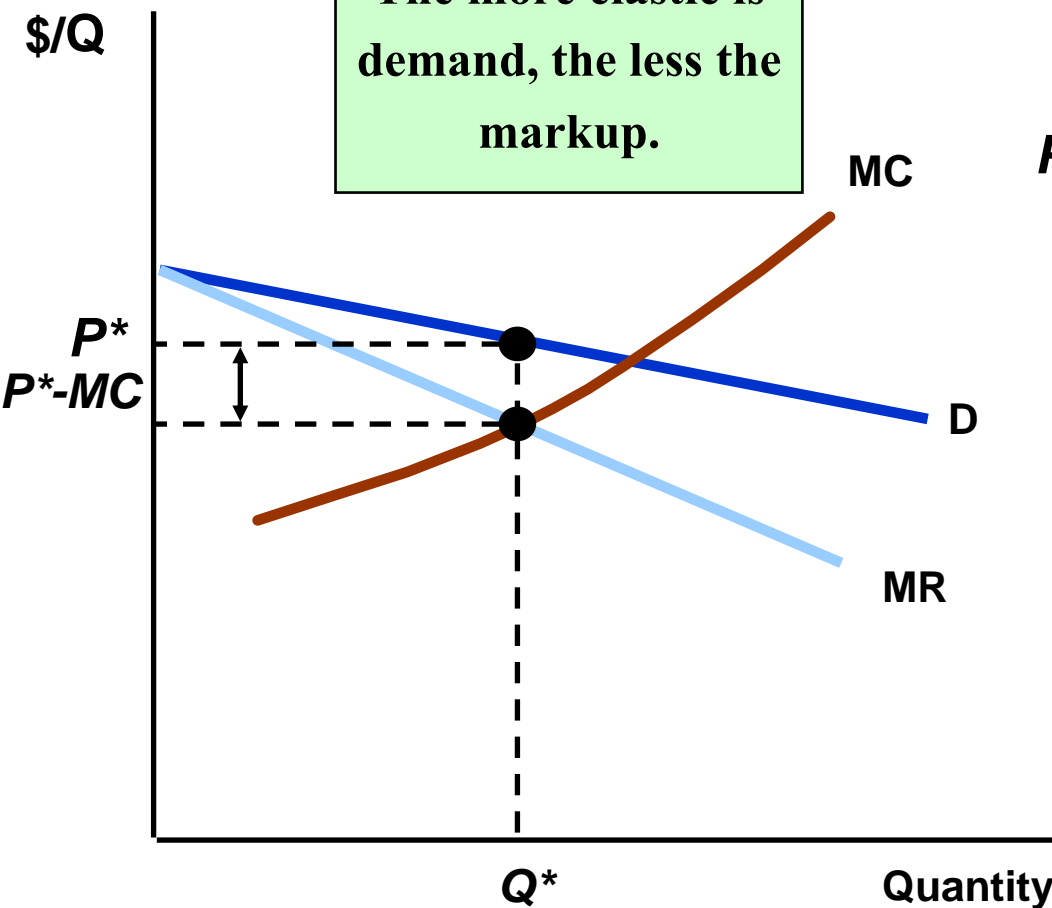
$$E_D = -3, \quad MC = 20$$

$$P = \frac{20}{1 - (1/3)} = \frac{20}{2/3} = 30$$

What if  $E_D = -6$ ? Why?

# Elasticity of Demand and Markup Pricing

The more elastic is demand, the less the markup.



# Markup Pricing: Supermarkets & Convenience Stores

- Supermarkets:
  - there are several firms with similar products
  - Often buy in large quantities

$E_d = -10$  for individual stores



$$P = \frac{MC}{1 + \left(1 / -10\right)} = \frac{MC}{0.9} = 1.11(MC)$$

Prices set about 10-11% above MC.

# Markup Pricing: Supermarkets & Convenience Stores

- Convenience Stores
  - Often buy when goods are ran out in small quantities

$$E_d = -5$$



$$P = MC / (1 + (1 / -5)) = MC / 0.8 = 1.25 MC$$

Prices set about 25% above MC.

# Markup Pricing: Supermarkets & Convenience Stores

- Convenience stores have more monopoly power.
- Convenience stores do have higher profit margins than supermarkets however
  - Volume is far smaller and average fixed costs are larger
- Supermarkets have larger sale volumes and has higher negotiation power over suppliers

## Remarks

- $(P - MC)/P$  is the profit markup over the MC as a percentage of the selling price
- To maximize profits by producing at  $MR = MC$  is actually consistent with the above markup
- The formula is also used for measuring monopoly power

## Measuring Monopoly Power

- Could measure monopoly power by the extent to which price is greater than MC for each firm
- Lerner's Index of Monopoly Power
  - $L = (P - MC)/P$ 
    - The larger the value of L (between 0 and 1) the greater the monopoly power.
  - L is expressed in terms of  $E_D$ 
    - $L = (P - MC)/P = -1/E_D$
    - $E_D$  is elasticity of demand for a firm, not the market

# Measuring Monopoly Power

- $(P - MC)/P$  is the markup over MC as a percentage of price. It measures monopoly power.
- The markup should equal the inverse of the elasticity of demand.
- Price is expressed directly as the markup over marginal cost

## Measuring Monopoly Power

- Monopoly power, however, does not guarantee profits.
- Profit depends on average cost relative to price.
- One firm may have more monopoly power, but lower profits due to high average costs

## Determinants of Monopoly Power

- Note that the term monopoly power used here referred to the ability of a firm to dominate the market. So an oligopolistic firm can have monopoly power more than others.
- This is determined by:
  - 1) Elasticity of market demand
  - 2) Number of firms in market
  - 3) The interaction among firms

# Elasticity of Market Demand

- The less elastic the demand curve, the more monopoly power a firm has.
- With one firm their demand curve is market demand curve
  - Degree of monopoly power determined completely by elasticity of market demand
- With more firms, individual demand may differ from market demand
  - Demand for a firm's product is more elastic than the market elasticity

## Number of Firms

- The monopoly power of a firm falls as the number of firms increases all else equal
  - More important are the number of firms with significant market share
  - Market is highly concentrated if only a few firms account for most of the sales
- Firms would like to create barriers to entry to keep new firms out of market

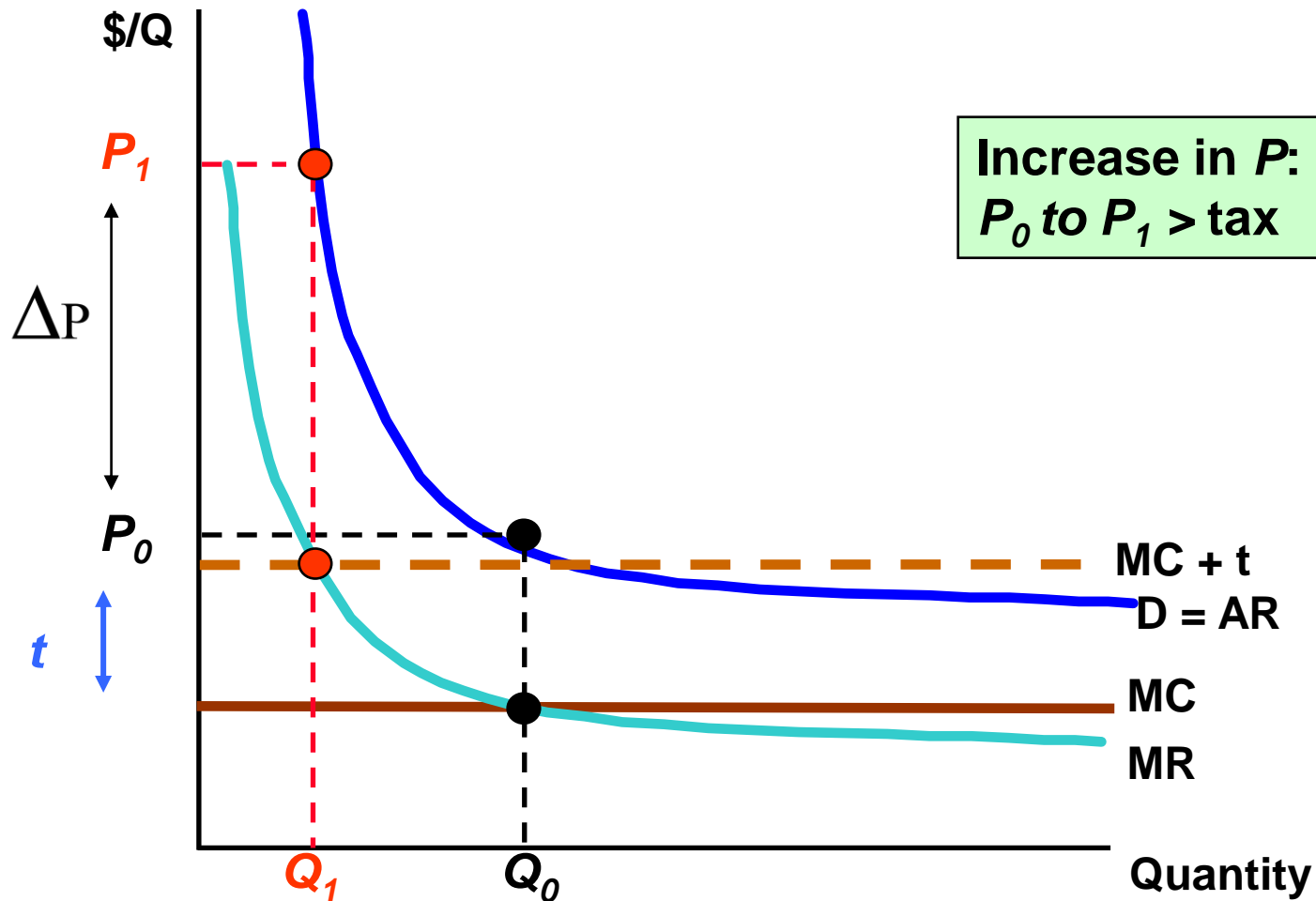
## Interaction Among Firms

- If firms are aggressive in gaining market share by, for example, undercutting the other firms, prices may reach close to competitive levels.
- If firms collude (violation of antitrust rules), could generate substantial monopoly power
- Markets are dynamic and therefore, so is the concept of monopoly power

## The Effect of a Tax

- In competitive market, a per-unit tax causes price to rise by less than tax: burden shared by producers and consumers
- Under monopoly, price can sometimes rise by more than the amount of the tax.
- To determine the impact of a tax:
  - $t = \text{specific tax}$
  - $MC' = MC + t$
  - Assume a constant MC for simplicity

# Effect of Excise Tax on Monopolist



## Effect of Excise Tax on Monopolist

- The amount the price increases with implementation of a tax depends on elasticity of demand
- Price may or may not increase by more than the tax
- In a competitive market, the price cannot increase by more than tax
- Profits for monopolist will fall with a tax

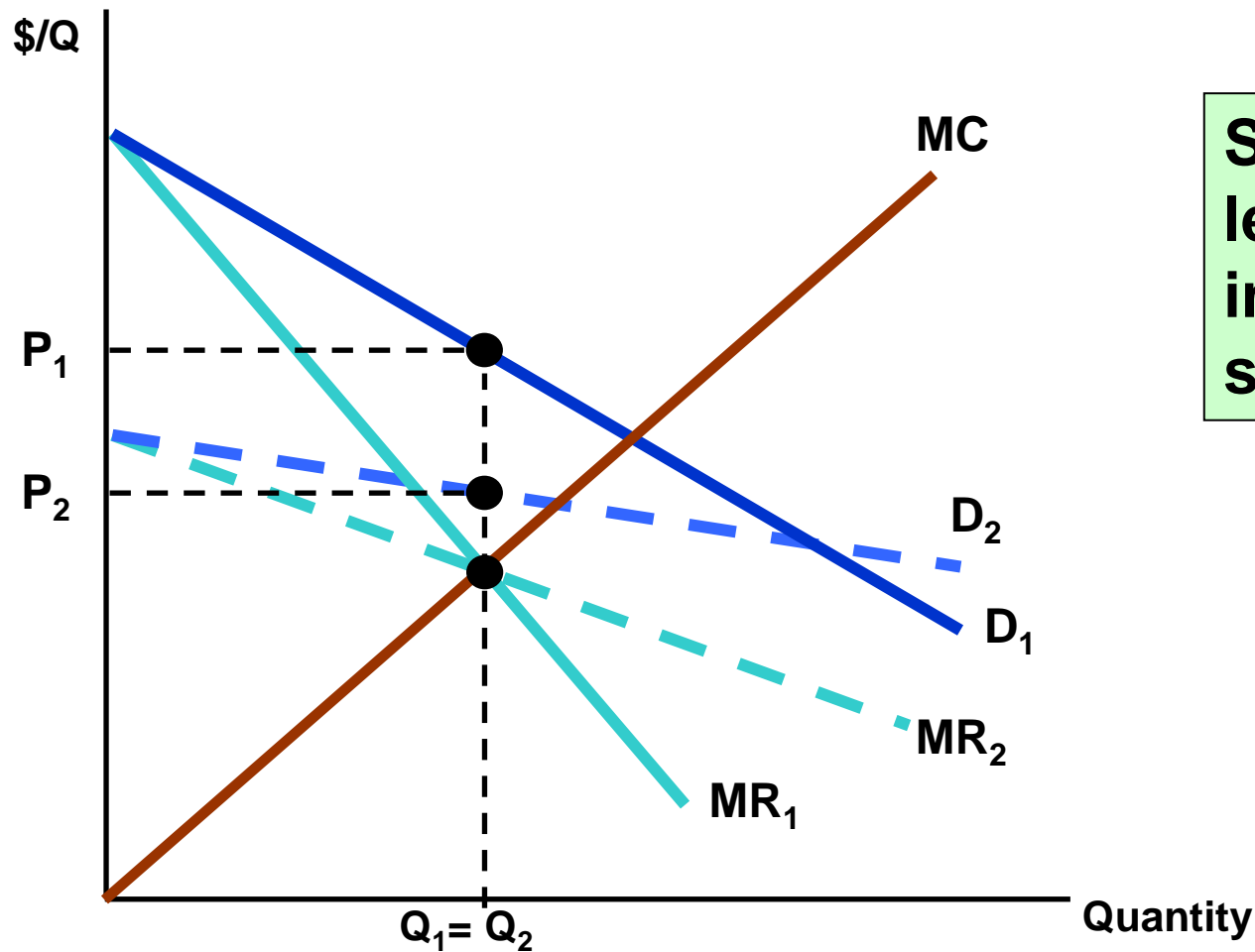
## Is there any supply curve for a monopolist?

- In perfect competition, the market supply curve is determined by marginal cost.
- For a monopoly, output is determined by marginal cost and the shape of the demand curve.

## Is there any supply curve for a monopolist?

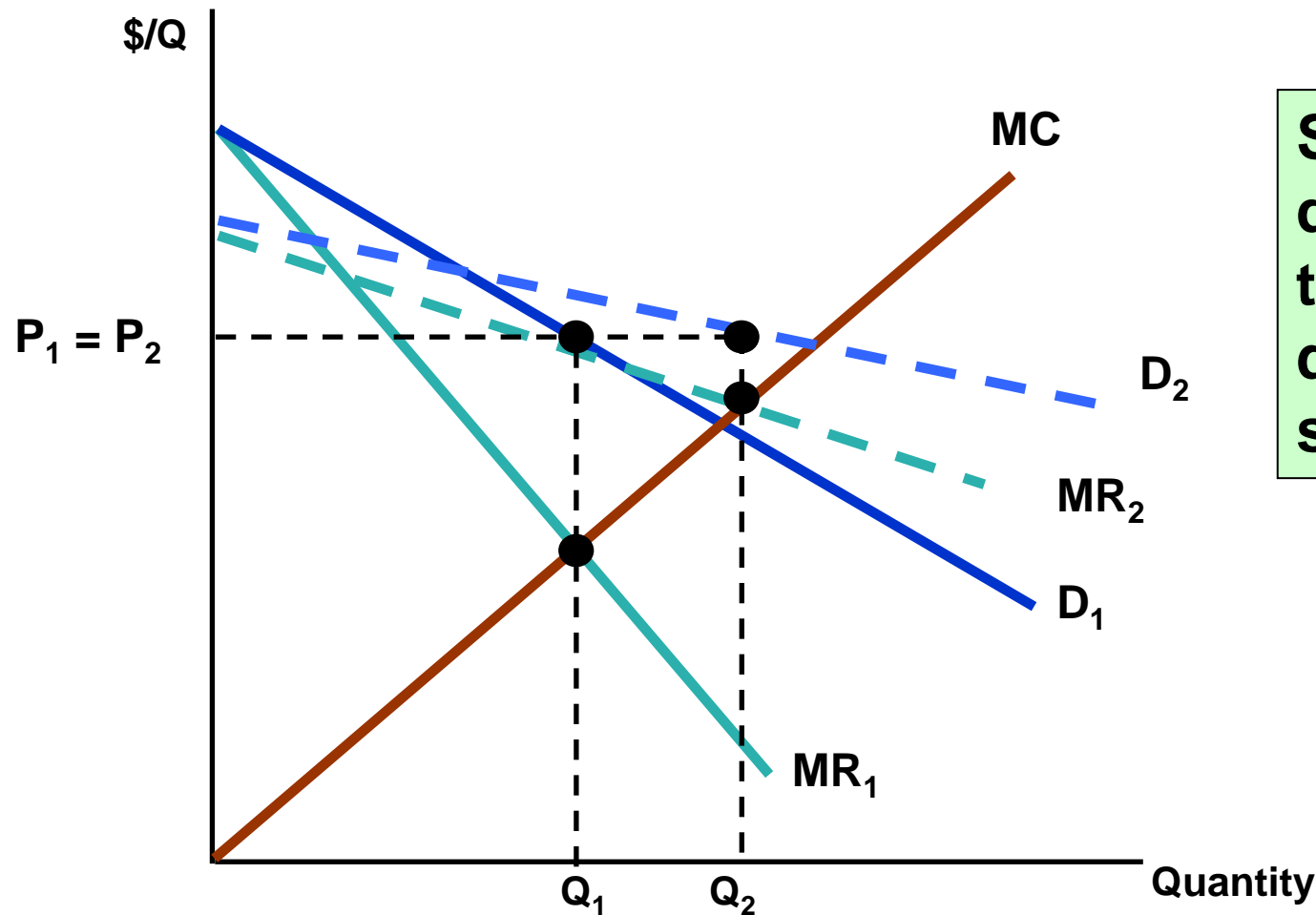
- Shifts in demand do not trace out price and quantity changes corresponding to a supply curve
- Shifts in demand lead to
  - Changes in price with no change in output
  - Changes in output with no change in price
  - Changes in both price and quantity

# Is there any supply curve for a monopolist?



Shift in demand leads to change in price but same quantity

# Is there any supply curve for a monopolist?



Shift in demand leads to change in quantity but same price

## There is no monopoly supply curve

- Shifts in demand usually cause a change in both price and quantity.
- Competitive market supplies specific quantity at every price
  - This relationship does not exist for a monopolistic market
- **There is no supply curve for monopolistic market**

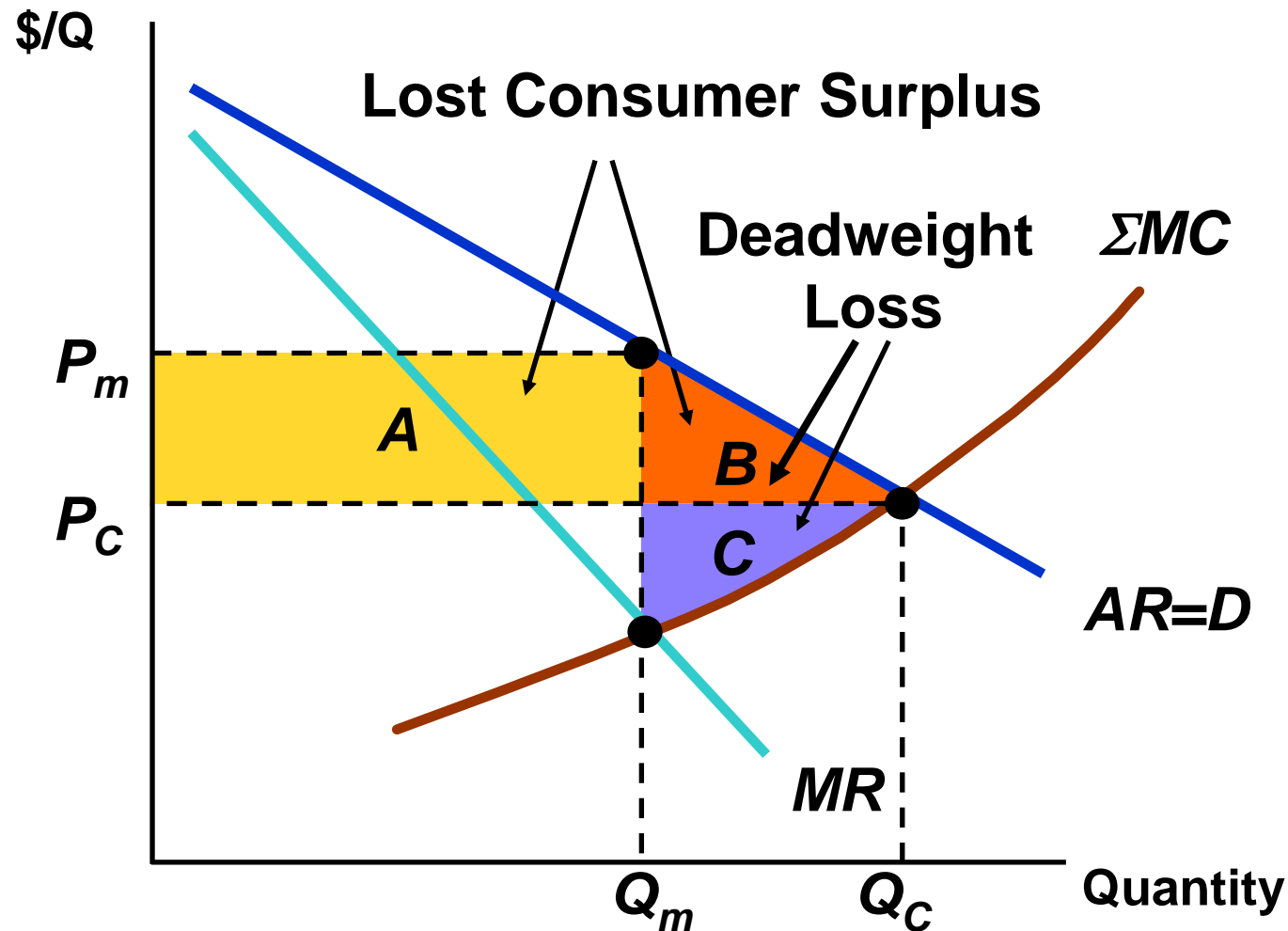
# The Social Costs of Monopoly Power

- Monopoly power results in higher prices and lower quantities.
- However, does monopoly power make consumers and producers in the aggregate better or worse off?
- We can compare producer and consumer surplus when in a competitive market and in a monopolistic market

## The Social Costs of Monopoly

- Perfectly competitive firm will produce where  $MC = D \rightarrow P_C$  and  $Q_C$
- Monopoly produces where  $MR = MC$ , getting their price from the demand curve  $\rightarrow P_M$  and  $Q_M$
- There is a loss in consumer surplus when going from perfect competition to monopoly
- A deadweight loss is also created with monopoly

# Deadweight Loss from Monopoly Power



$$\Delta CS = -A - B$$
$$\Delta PS = A - C$$
$$\text{Net} = -[B + C]$$

About  
0.5 – 1%  
of GDP

## The Social Costs of Monopoly

- Social cost of monopoly is likely to exceed the deadweight loss
- Worsening income distribution
- May conceal new innovation that compete with the existing product
- Building excess capacity to prevent entry
- Rent Seeking or Directly Unproductive Profit Seeking (DUPS): Lobbying, State capture



# The Social Costs of Monopoly

- Government can regulate monopoly power through **price regulation**
  - Recall that in competitive markets, price regulation created a deadweight loss.
  - Price regulation can eliminate deadweight loss with a monopoly
  - **Marginal cost pricing**: regulate the price where  $MC = D$

# Price Regulation: Marginal cost pricing

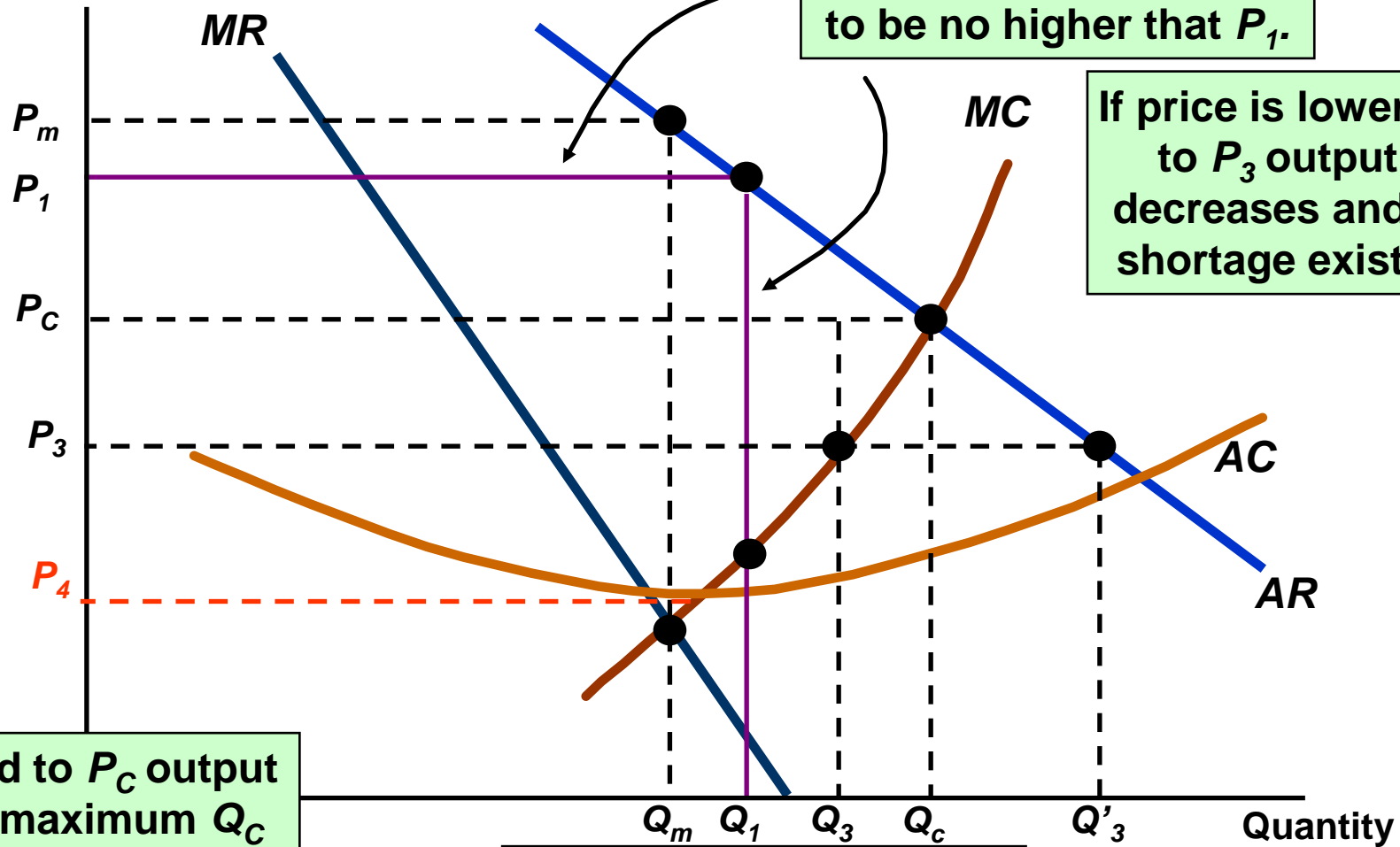
If left alone, a monopolist produces  $Q_m$  and charges  $P_m$ .

For output levels above  $Q_1$  the original average and marginal revenue curves apply.

If price is lowered to  $P_C$  output increases to its maximum  $Q_C$  and there is no deadweight loss.

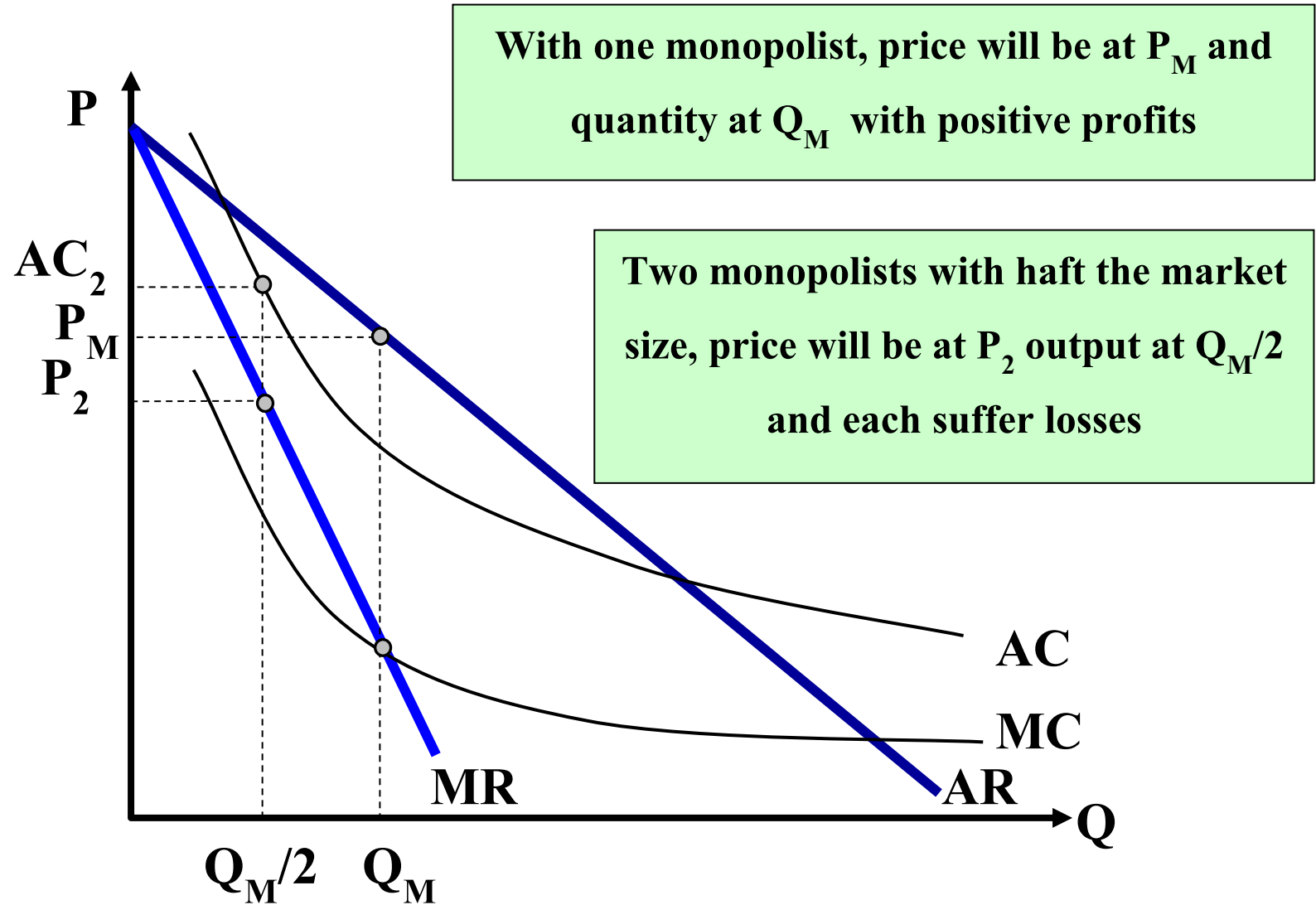
Marginal revenue curve when price is regulated to be no higher than  $P_1$ .

If price is lowered to  $P_3$  output decreases and a shortage exists.



Any price below  $P_4$  results in the firm incurring a loss.

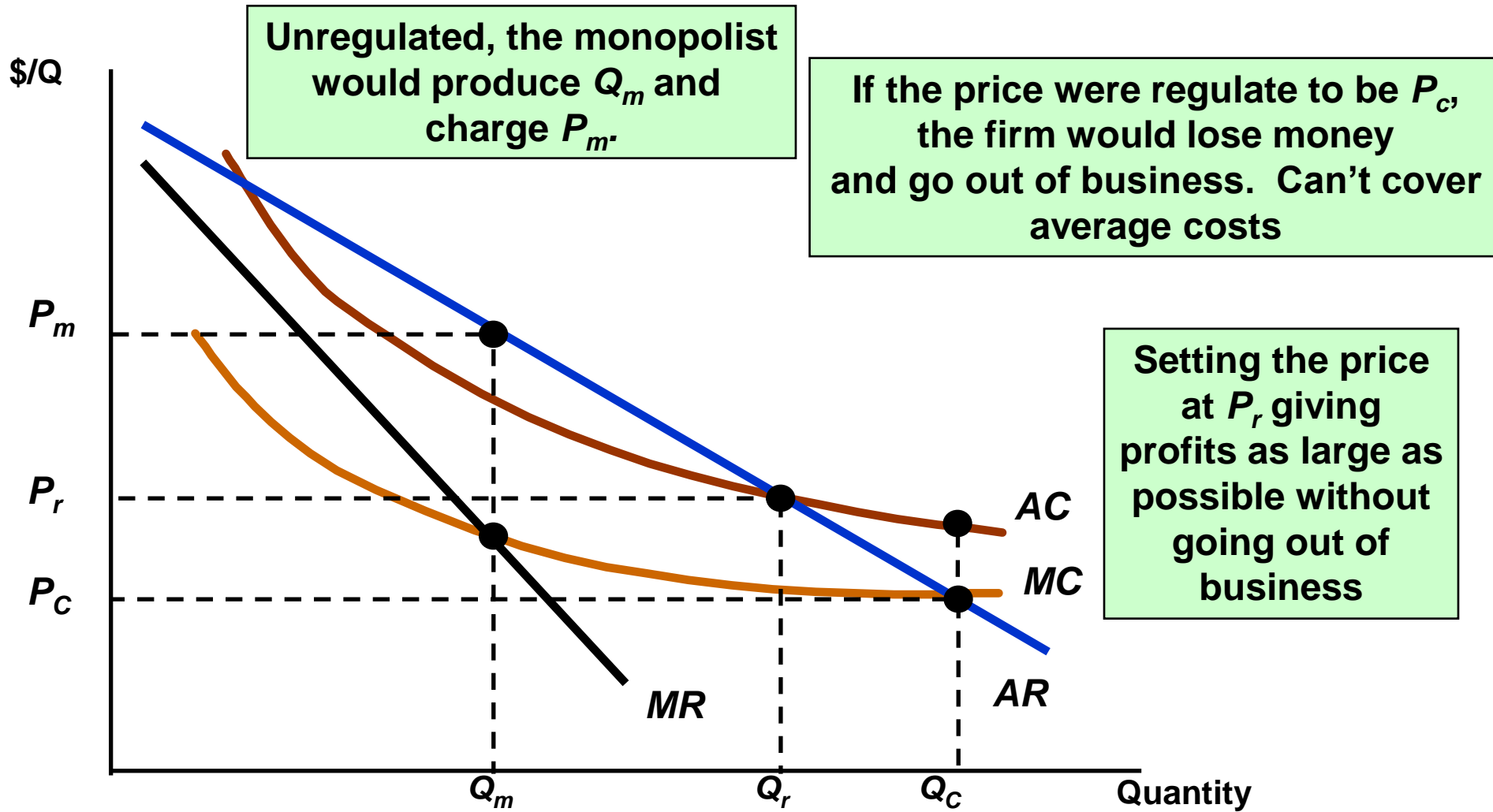
# Natural monopoly



# Regulating Natural Monopoly

- Natural Monopoly
  - A firm that can produce the entire output of an industry at a cost lower than what it would be if there were several firms.
  - Usually arises when there are large economies of scale
- The firm would lose money and can't cover average costs if marginal cost pricing is used.
- Compromise by using **Average cost pricing**
  - Regulate the price where  $AC = D$ .

# Regulating the Price of a Natural Monopoly



## Other Regulations

- Government may also set price caps based on firms variable costs, past prices, and possibly inflation and productivity growth
- A firm is typically allowed to raise its price each year without approval from regulatory agency by amount equal to inflation minus expected productivity growth

## The Multi-plant Firm

- For some firms, production takes place in more than one plant each with different costs
- Firm must determine how to distribute production between both plants
  - Production should be split so that the MC in the plants is the same
  - Output is chosen where  $MR=MC$ . Profits is therefore maximized when  $MR=MC$  at each plant

# The Multi-plant Firm

- We can show this algebraically:
  - $Q_1$  and  $C_1$  is output and cost of production for Plant 1
  - $Q_2$  and  $C_2$  is output and cost of production for Plant 2
  - $Q_T = Q_1 + Q_2$  is total output
  - Profit is then:

$$\pi = PQ_T - C_1(Q_1) - C_2(Q_2)$$

## The Multi-plant Firm

- Firm should increase output from each plant until the additional profit from last unit produced at Plant 1 equals 0

$$\frac{\Delta\pi_1}{\Delta Q_1} = \frac{\Delta(PQ_T)}{\Delta Q_1} - \frac{\Delta C_1}{\Delta Q_1} = 0$$

$$MR - MC_1 = 0$$

$$MR = MC_1$$

## The Multi-plant Firm

- We can show the same for Plant 2
- Therefore we can see that the firm should choose to produce where

$$MR = MC_1 = MC_2$$

- We can show this graphically
  - $MR = MC_T$  gives total output
  - This point shows the MR for each firm
  - Where MR crosses  $MC_1$  and  $MC_2$  shows the output for each firm

# Production with Two Plants

