Monopoly

EE311

Kittichai Saelee

This handout is adapted from the original material prepared by Prof. Chayun Tantivasadakarn.

Topics to be Discussed

- Monopoly
- Single price policy
- Sources of Monopoly Power
- The Social Costs of Monopoly Power
- Limiting Market Power
- The Multiplant Firm

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

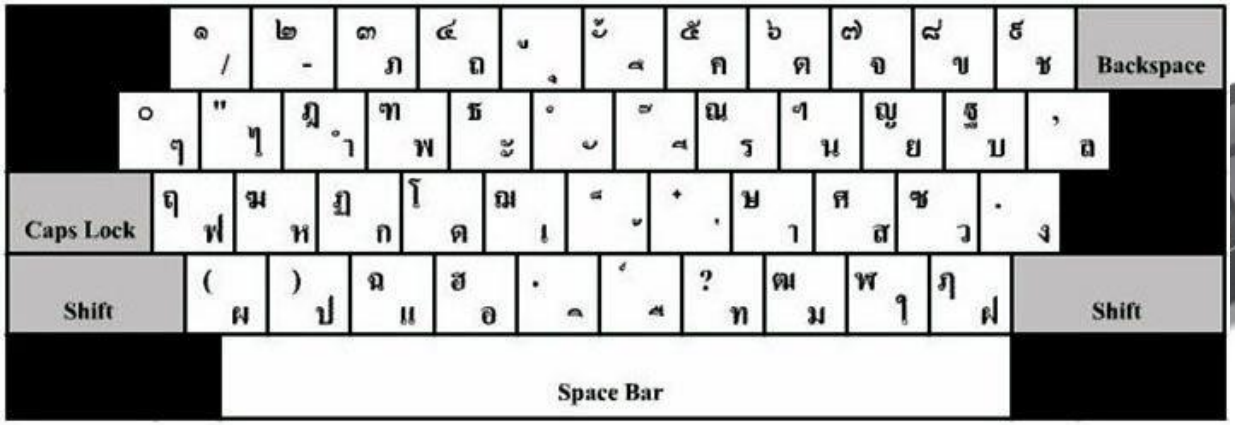
- Legal barriers:
  - Patents, Copy rights to protect innovation
    - Medicines, Movies
  - Concessions or licenses
    - Sin Products: Alcohol
    - Sources of income: TV or radio broadcasting
    - Environment protection: forest, mineral
    - Consumer protection: Medical services

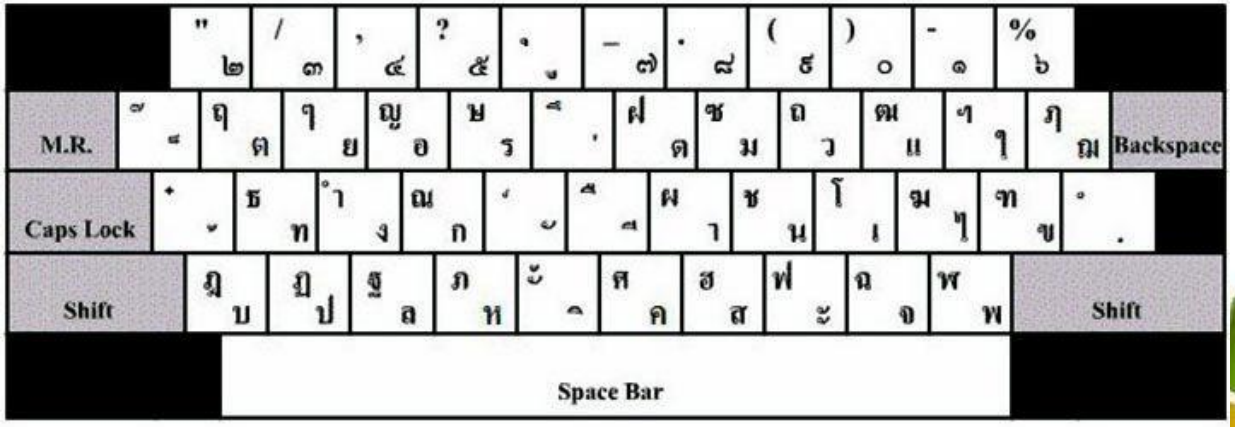
Sources of Monopoly Power: Barriers to entry

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

Sources of Monopoly Power: Barriers to entry

- Network sizes





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windows

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

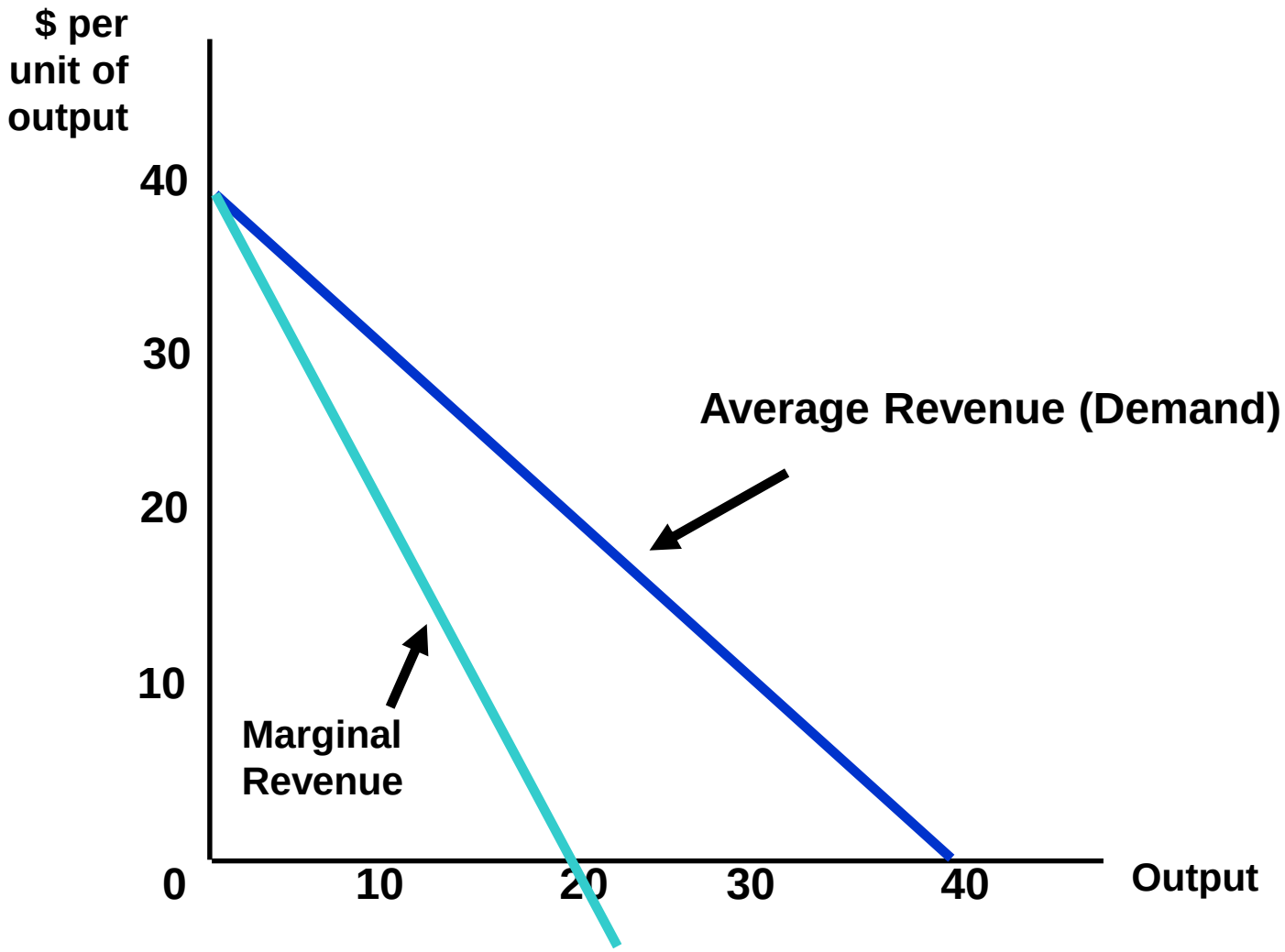
- The monopolist's average revenue, price received per unit sold, is the market demand curve. Example: $P = 40 - Q$
- Monopolist also needs to find marginal revenue, change in revenue resulting from a unit change in output.
- $TR = PQ = 40Q - Q^2$
- $AR = 40 - Q$
- $MR = dTR/dQ = 40 - 2Q$
  - Same intercept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

Total, Marginal, and Average Revenue

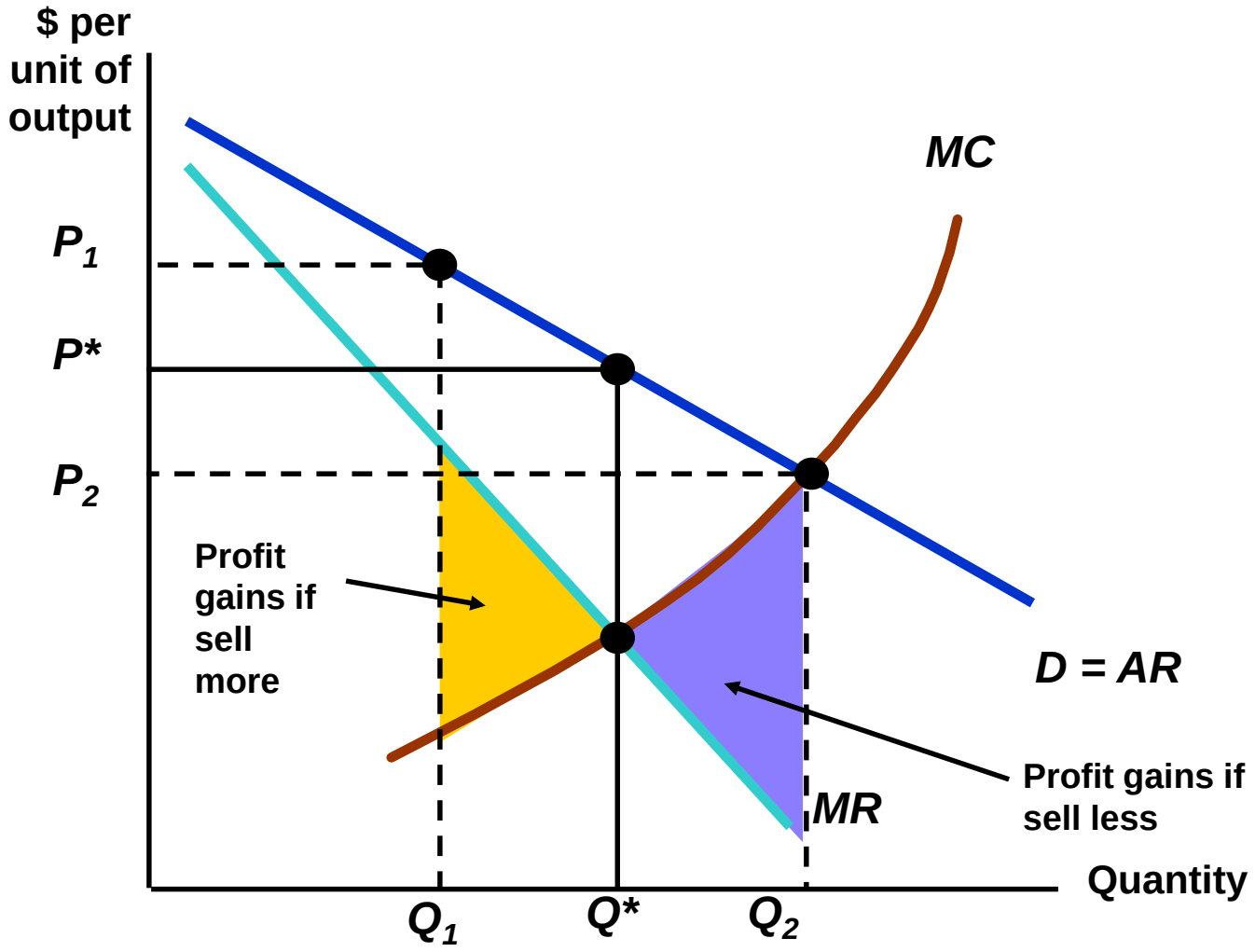
P	Q	TR	AR	MR
40	0	0	40	40
30	10	300	30	20
20	20	400	20	0
10	30	300	10	-20
0	40	0	0	-40

Note:P = 40 - Q = AR, MR = 40 - 2Q

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.

Monopolist's Output Decision

Profits maximized at the output level where

$$MR = MC$$

$$\pi(Q) = TR(Q) - TC(Q)$$

$$\frac{\Delta\pi}{\Delta Q} = \frac{\Delta TR}{\Delta Q} - \frac{\Delta TC}{\Delta Q} = 0$$

or $MC = MR$

Monopoly: An Example

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

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

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

$$TR(Q) = P(Q)Q = 40Q - Q^2$$

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

Monopoly: An Example

$$MC = MR$$

$$2Q = 40 - 2Q$$

$$4Q = 40$$

$$Q = 10$$

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

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

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

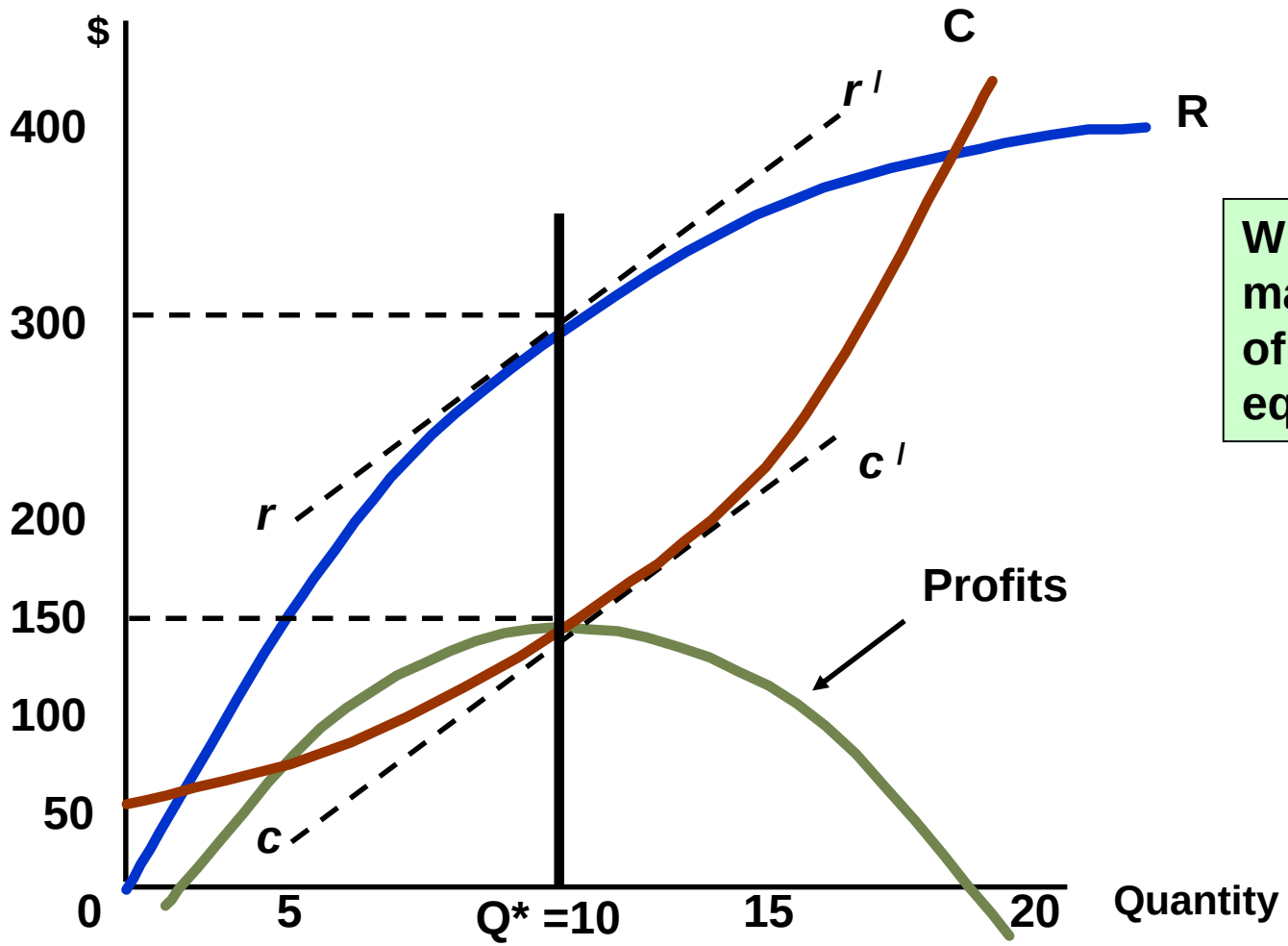
$$= 300 - 50 - 100$$

$$= 150$$

Monopoly: An Example

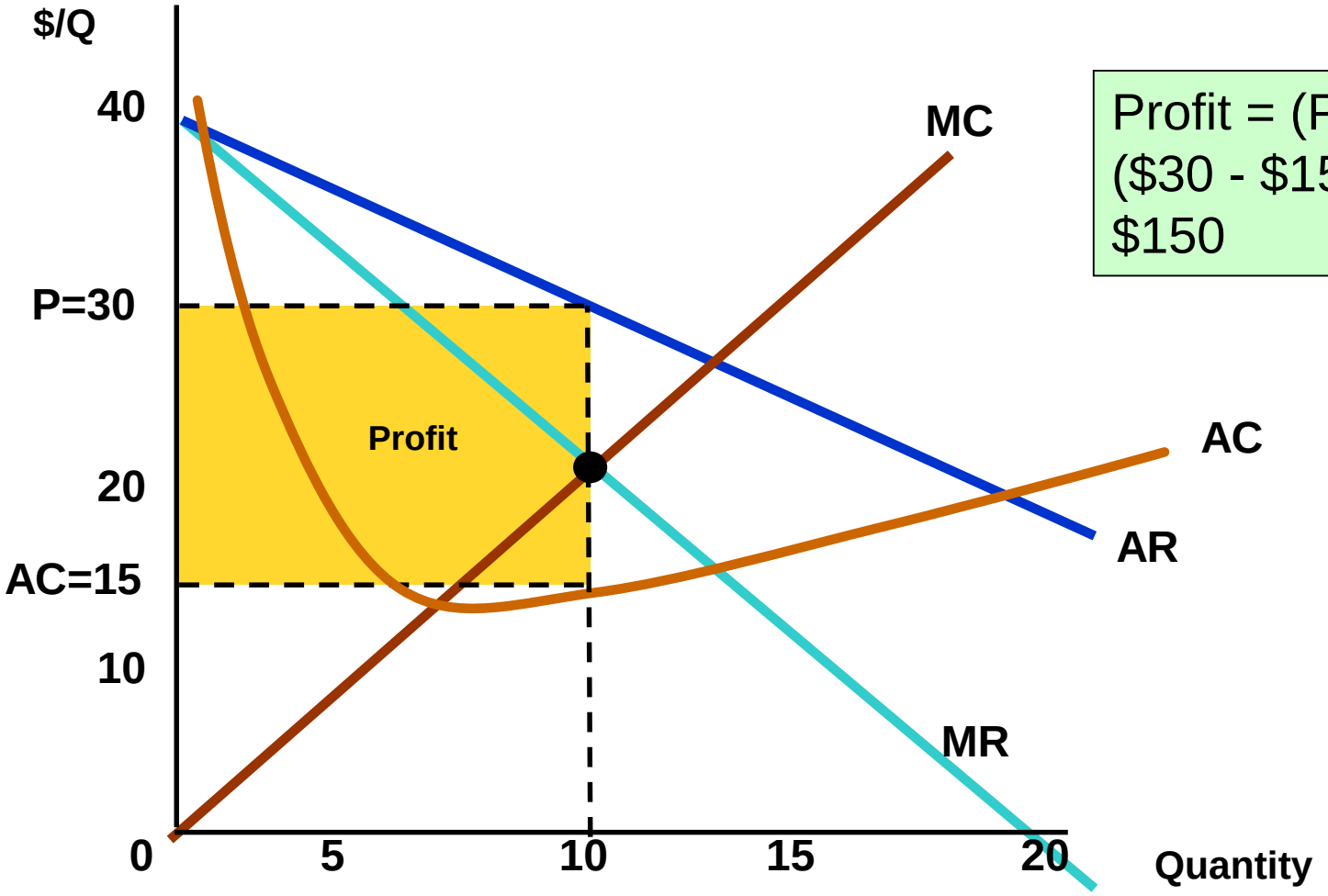
- By setting marginal revenue equal to marginal cost, we verified that profit is maximized at P = $30 and Q = 10.
- This can be seen graphically by plotting cost, revenue and profit
  - Profit is initially negative when produce little or no output
  - Profit increase and q increase, maximized at Q*=10

Example of Profit Maximization



When profits are maximized, slope of $rr^{/}$ and $cc^{/}$ are equal: MR=MC

Example of Profit Maximization



Profit = (P - AC) x 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

$$2.\ MR = P + Q\frac{\Delta P}{\Delta Q}$$

$$= P + P\left(\frac{Q}{P}\right)\left(\frac{\Delta P}{\Delta Q}\right)$$

$$3.\ E_d = \left(\frac{P}{Q}\right)\left(\frac{\Delta Q}{\Delta P}\right)$$

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

$$\text{p is maximized where } MR = MC$$

$$P + P\left(1/E_D\right) = MC$$

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

$$\frac{P - MC}{P} = -\frac{1}{E_D}$$

- 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

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

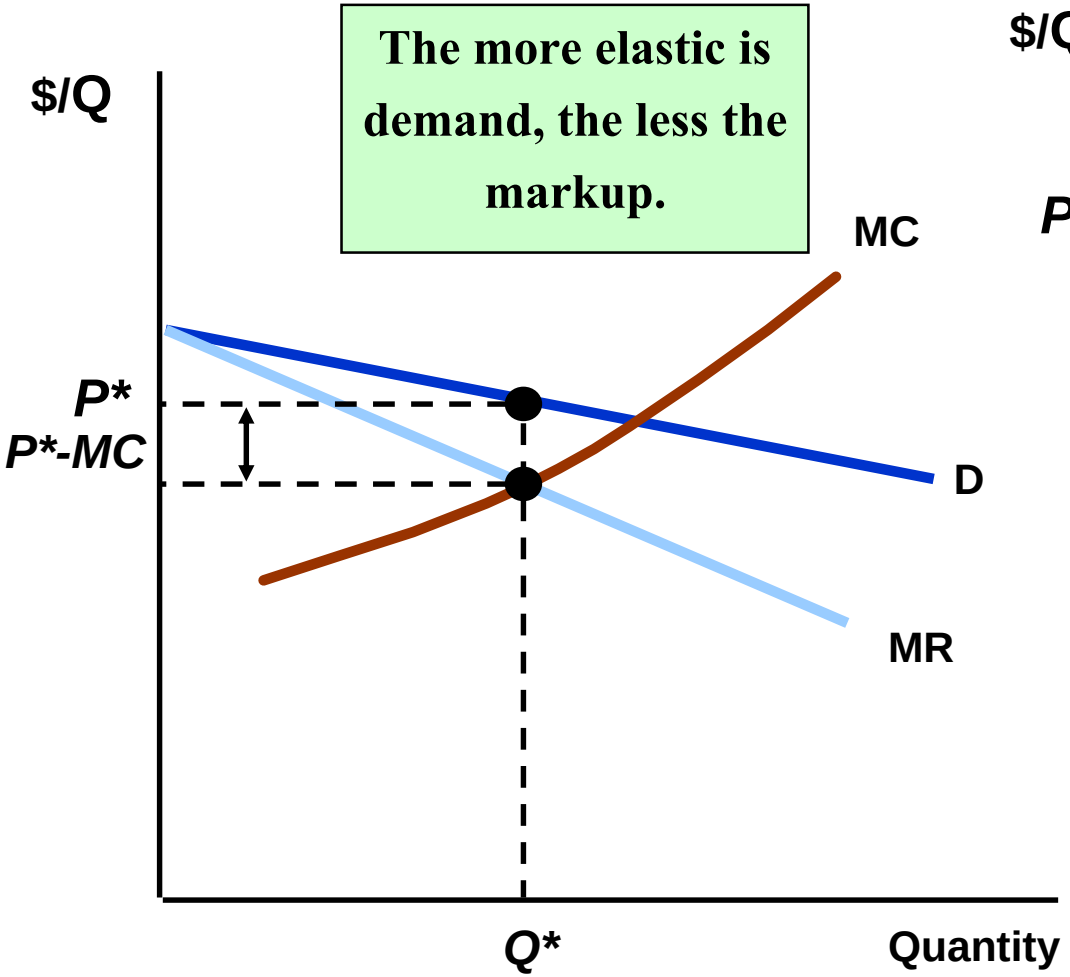
$$E_D = -3, \quad MC = 20$$

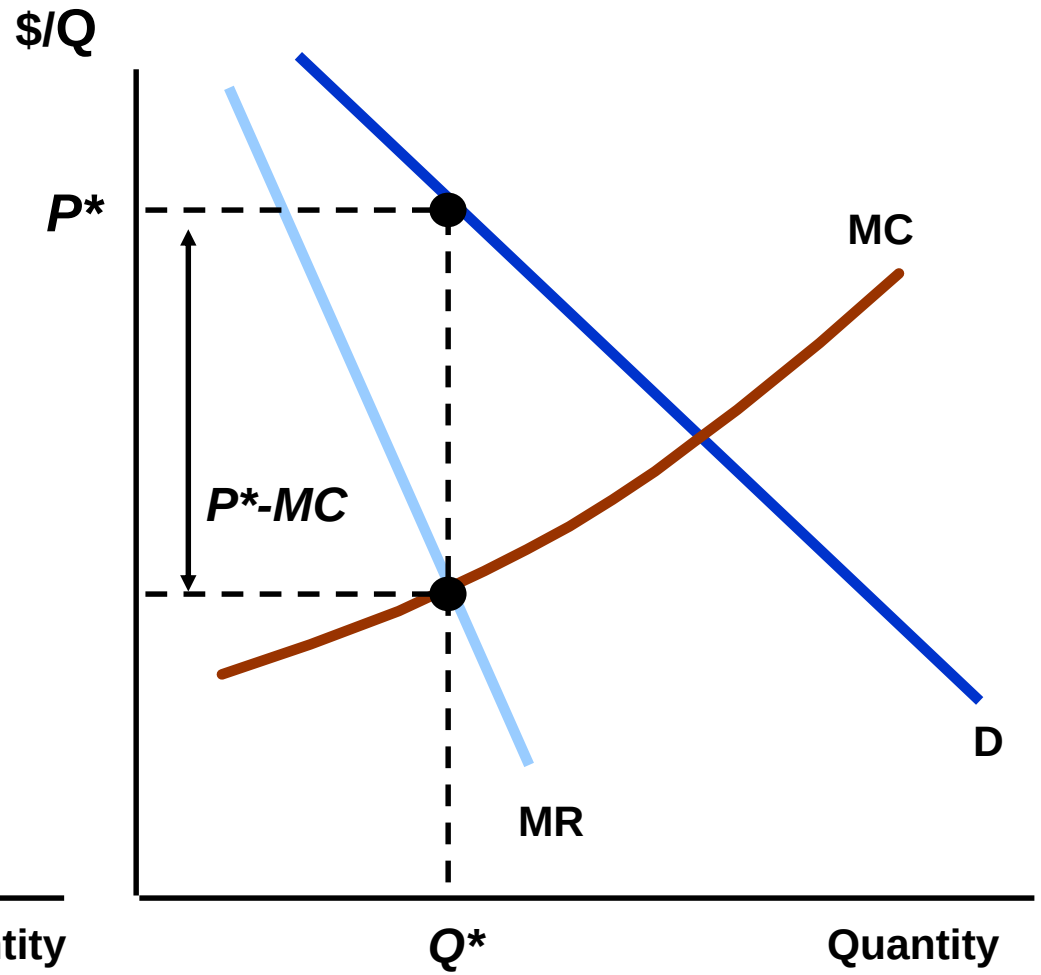
$$P = \frac{20}{1 - (1/3)} = \frac{20}{2/3} = 30$$

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

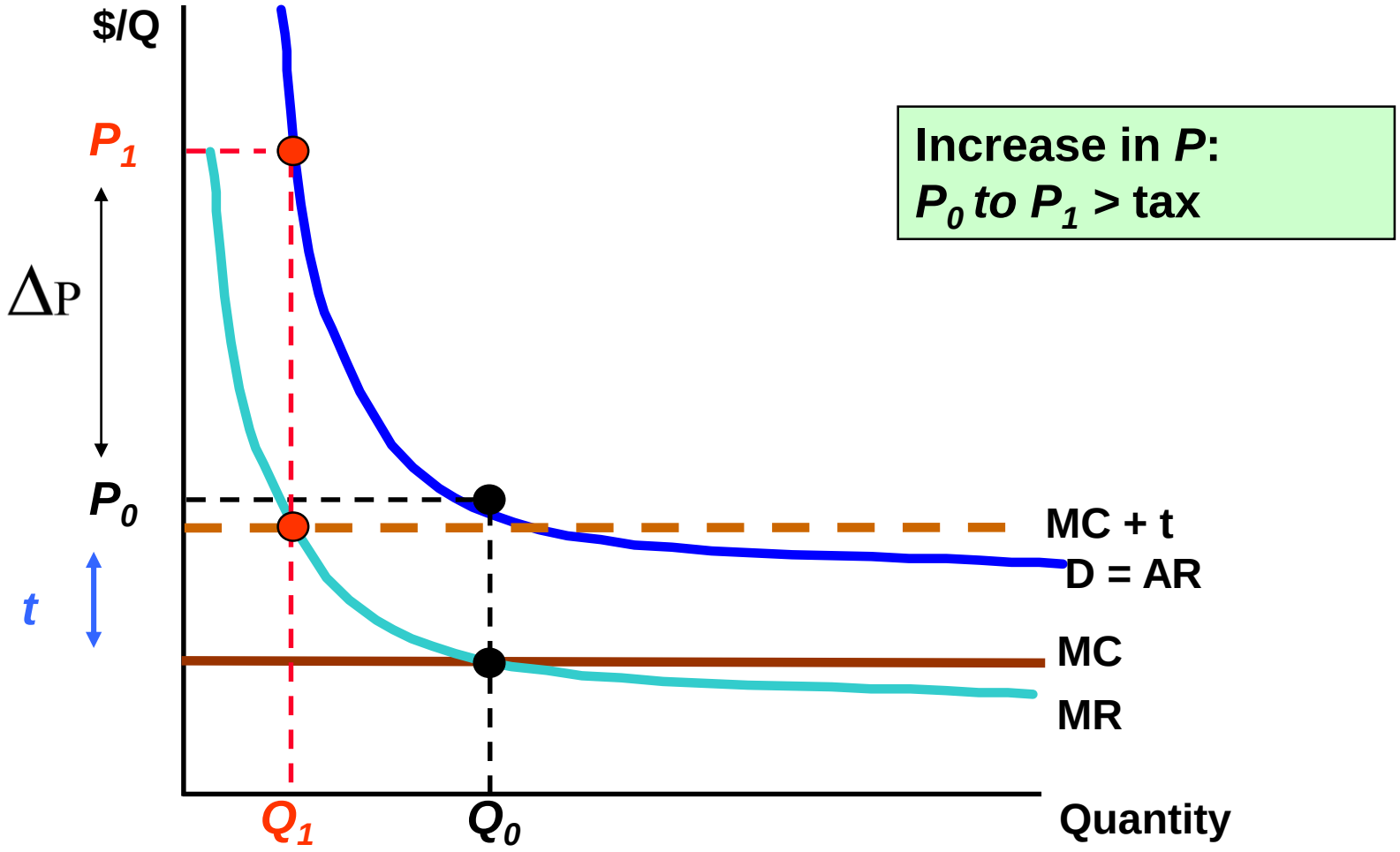
Interaction Among Firms

- 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 = 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

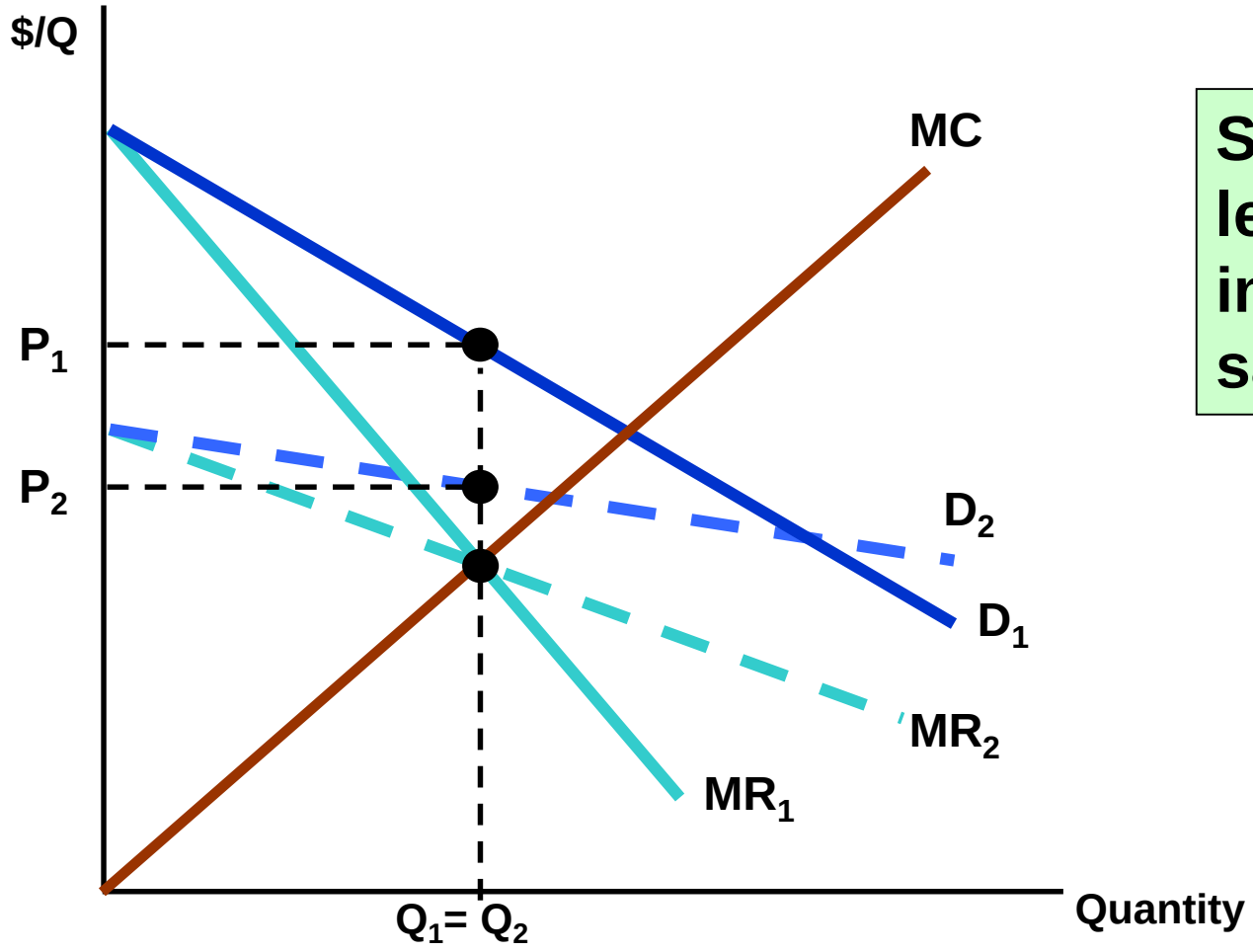
Is there any supply curve for a monopolist?

- 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?

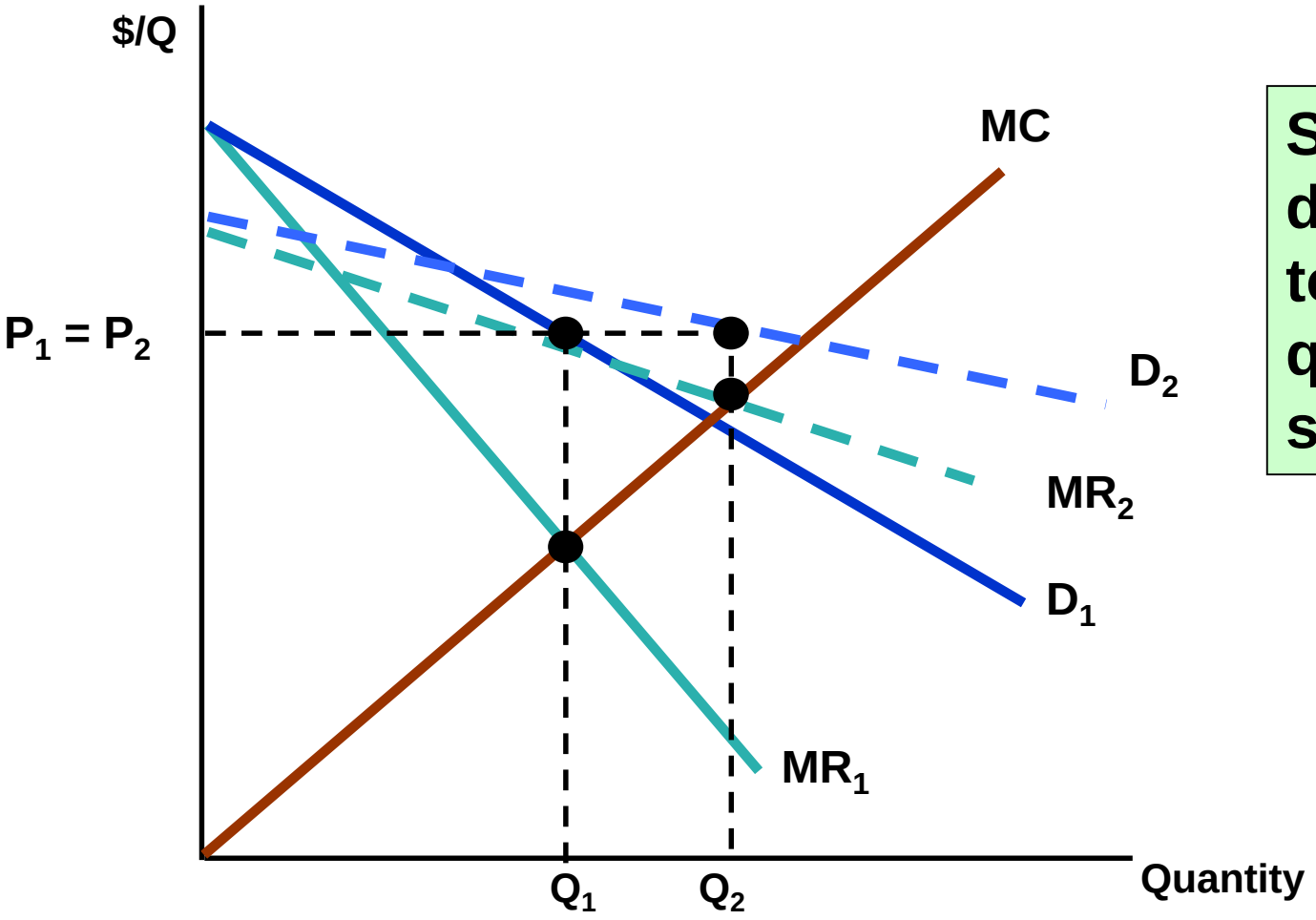
- Shifts in demand do not trace out price and quantity changes corresponding to a supply curve
- Shifts in demand lead to
  - Changes in price with no change in output
  - Changes in output with no change in price
  - Changes in both price and quantity

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

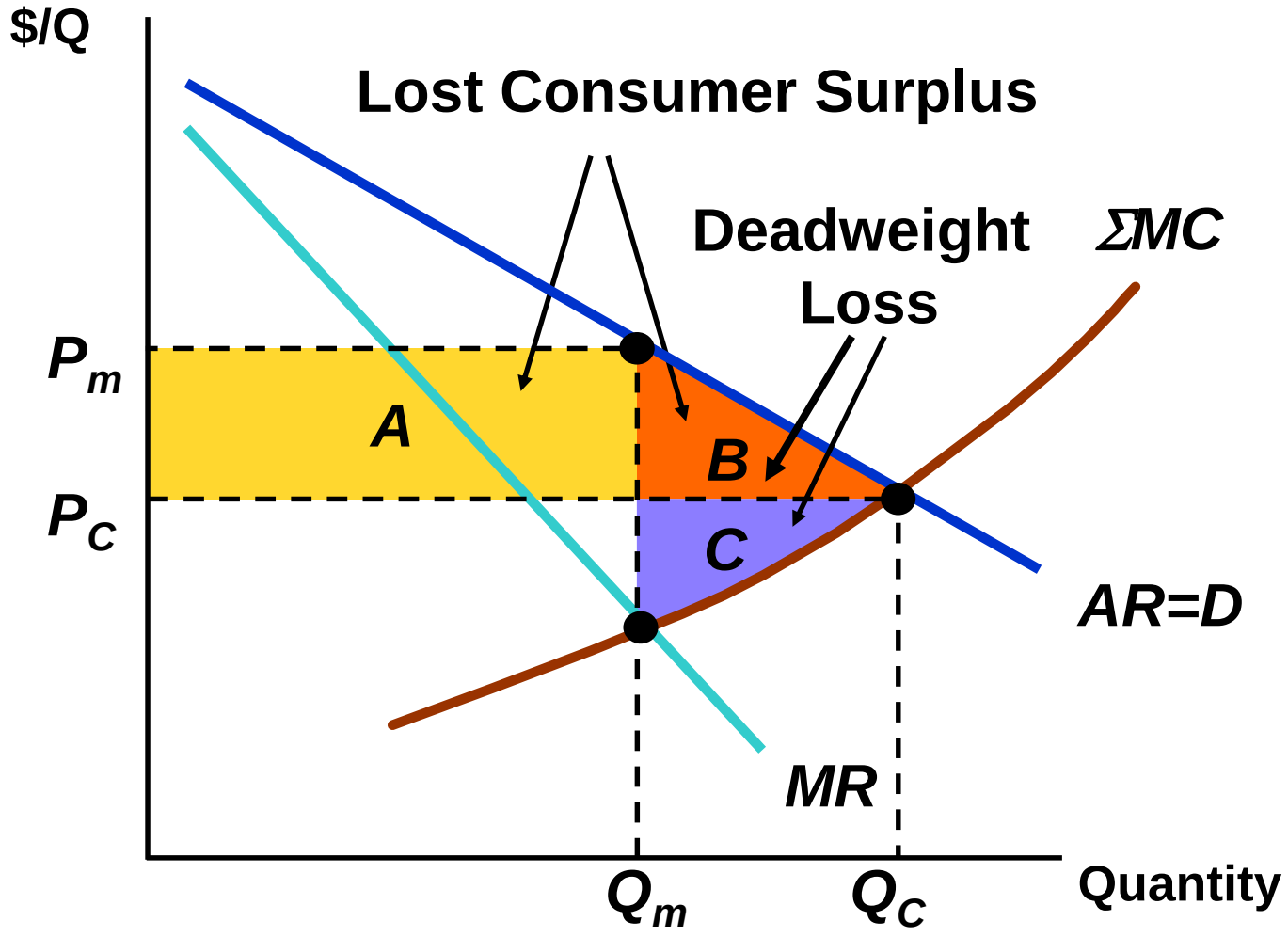
The Social Costs of Monopoly Power

- 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 -> P_C and Q_C
- Monopoly produces where MR = MC, getting their price from the demand curve ->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



$\Delta CS = -A - B$

$\Delta PS = A - C$

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

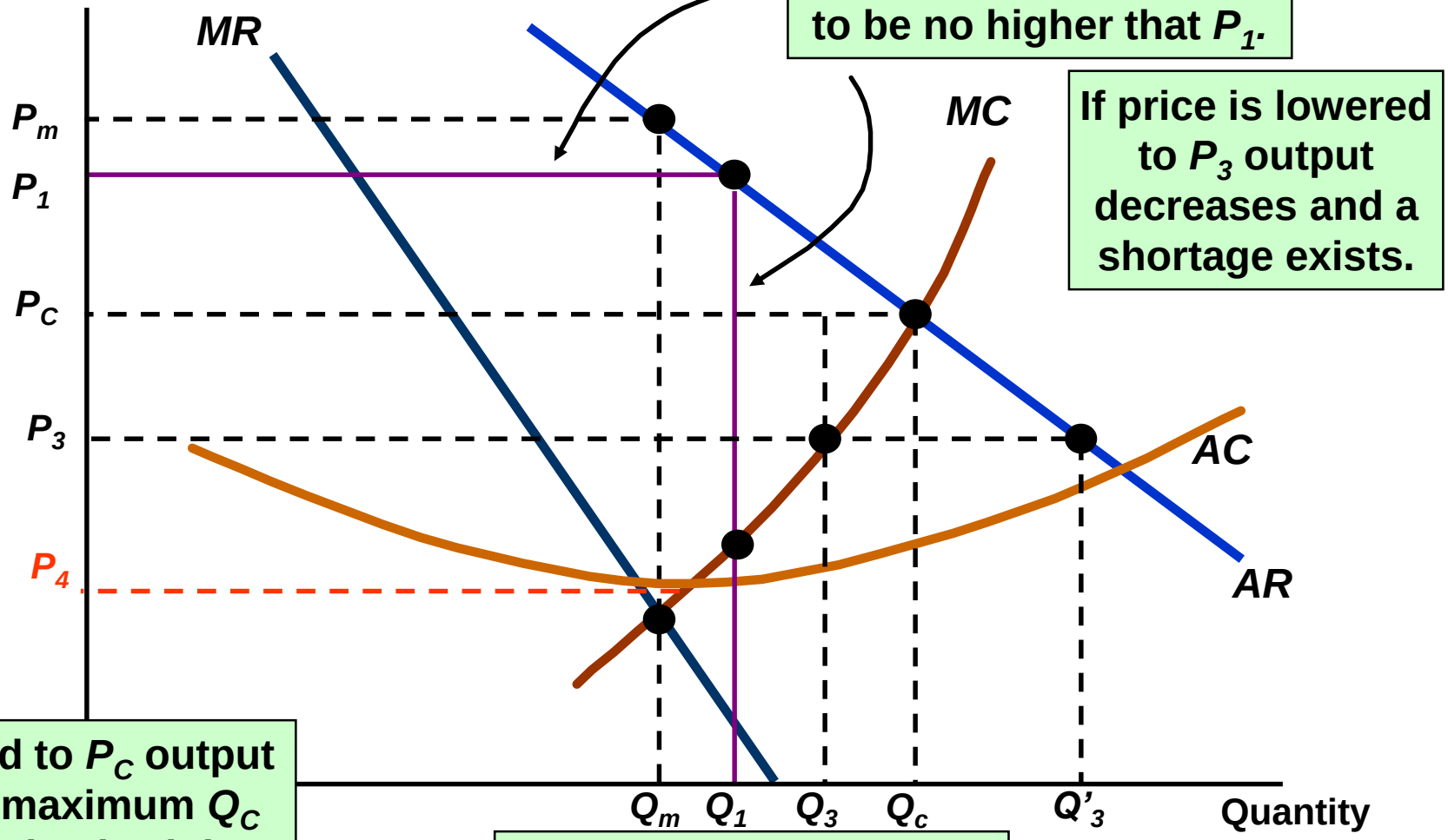
The Social Costs of Monopoly

- 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.



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

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

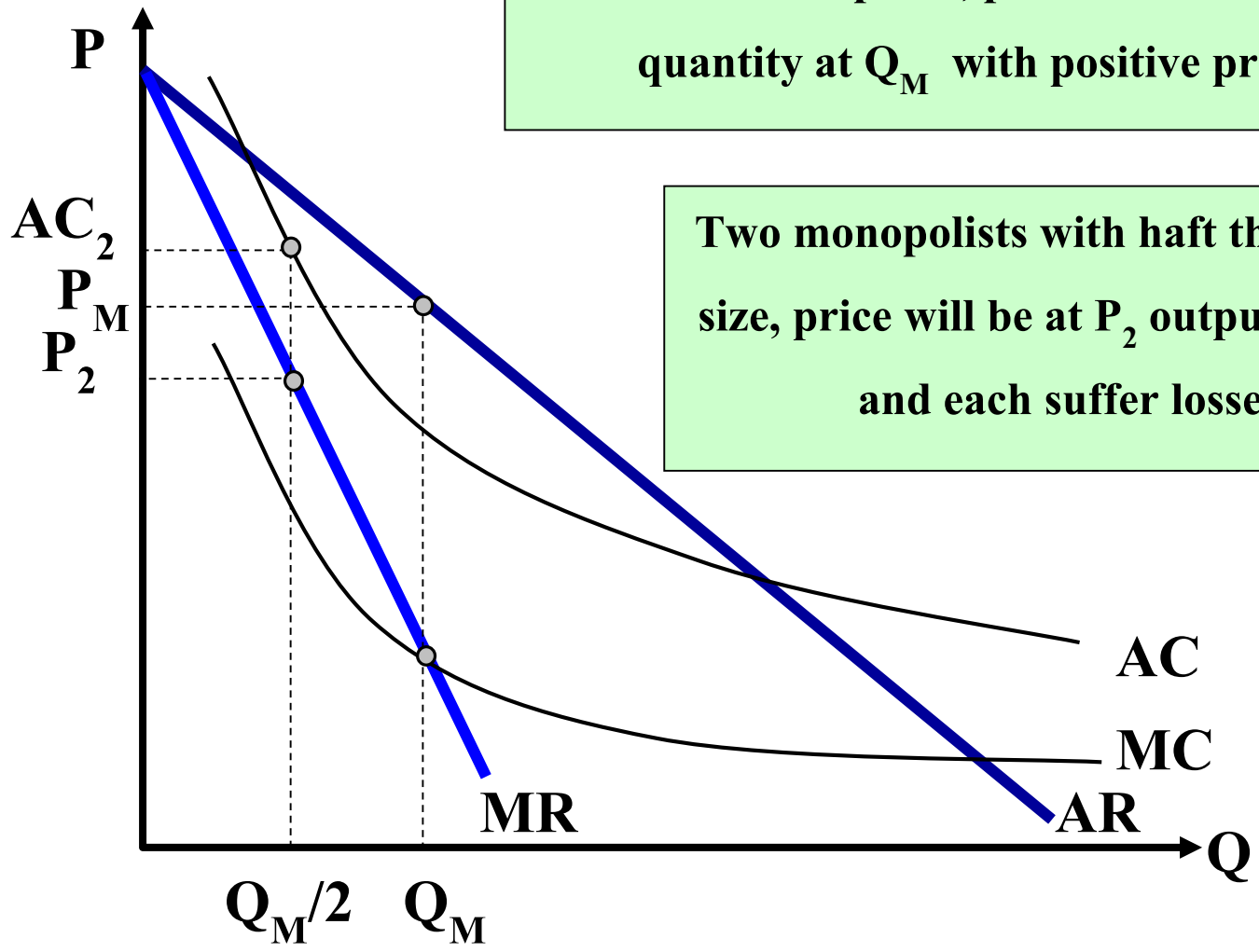
If price is lowered to P_C output increases to its maximum Q_C and there is no deadweight loss.

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

Natural monopoly

With one monopolist, price will be at P_M and quantity at Q_M with positive profits

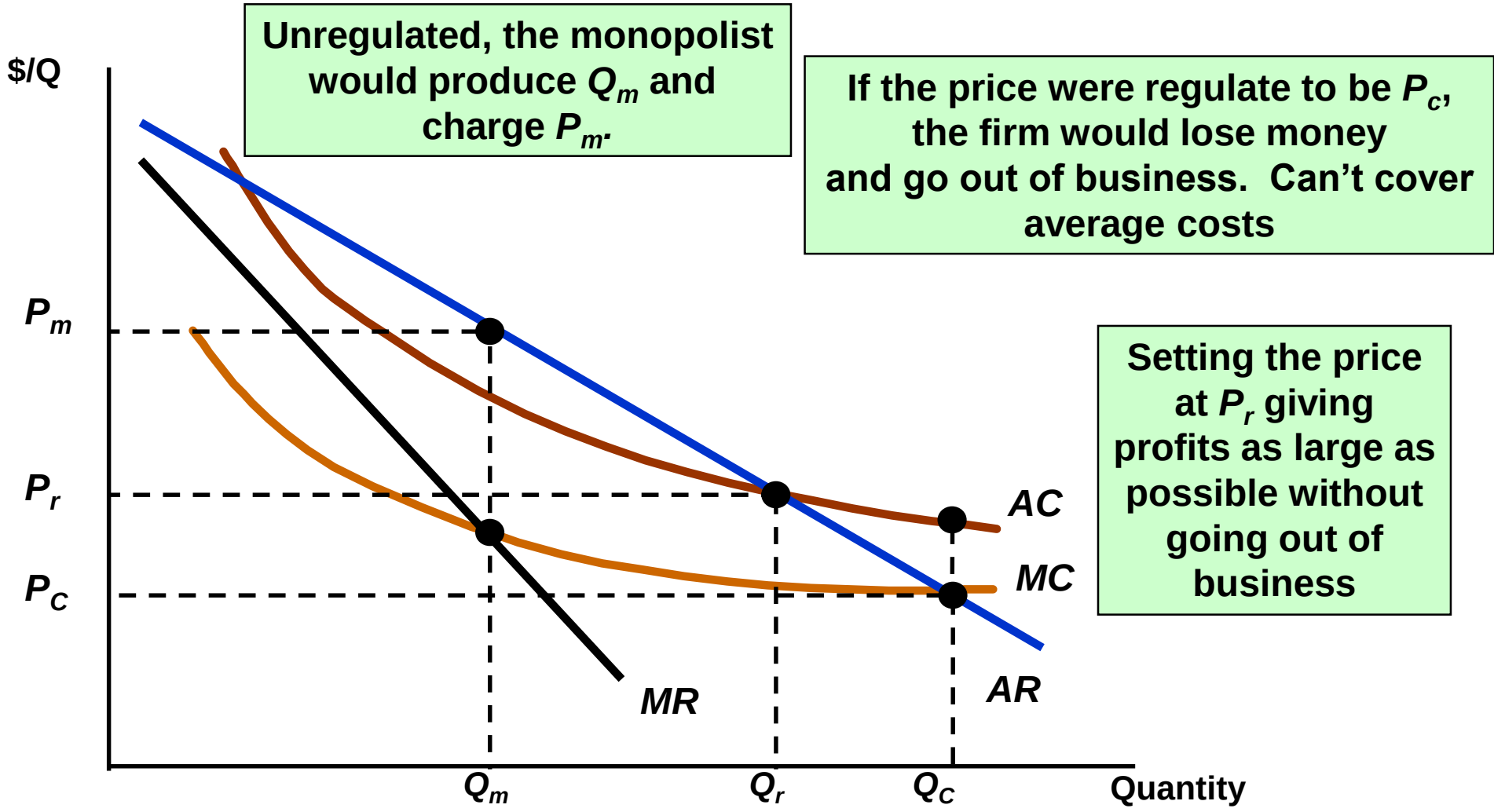
Two monopolists with haft the market size, price will be at P_2 output at $Q_M/2$ and each suffer losses



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

Competition Act

- Enacted in B.E. 2542 (1999) to replace Price Control and Anti-monopoly Acts
- Being a monopolist does not violate the law. But abusing monopoly power does (A. 25) Regulate merging (A. 26) Prohibit cartel or collusion (A. 27) Exclusive distribution (A. 28) and unfair competition (A. 29)
- Apply to all firms except public enterprises, farmer groups and co-operatives and business exempted by ministerial orders

Definition of market dominant firm (9 Jan 2007)

- Any business with market share of 50% or more and total sales revenue of Baht 1,000 million or more in the previous year; or Any one of the top three business operators with an aggregate market share of 75% or more and total sales revenue of Baht 1,000 million or more, excluding business operators who have market share of less than 10% or total sales revenue of less than Baht 1,000 million in the previous year.
- 3 year jail imprison or Baht 6 million fine or both

หลักเกณฑ์การเป็นผู้ประกอบธุรกิจซึ่งมีอำนาจเหนือตลาด พ.ศ. 2561

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Cases

- Merging between UTV and IBC to UBC cable TV
  - Could not be accused since the cabinet had not yet given definition for dominant firm
- Beer-Whisky Tying (Surathip's Chang Beer Case)
  - No definition for dominant firm and was done by distributors
- Honda Case (motorcycles) forcing its dealers to market Honda's motorcycles exclusively
  - the Commission found Honda guilty in 2003 pending for the Public Prosecutor's decision which refused to prosecute until the case is expired.

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