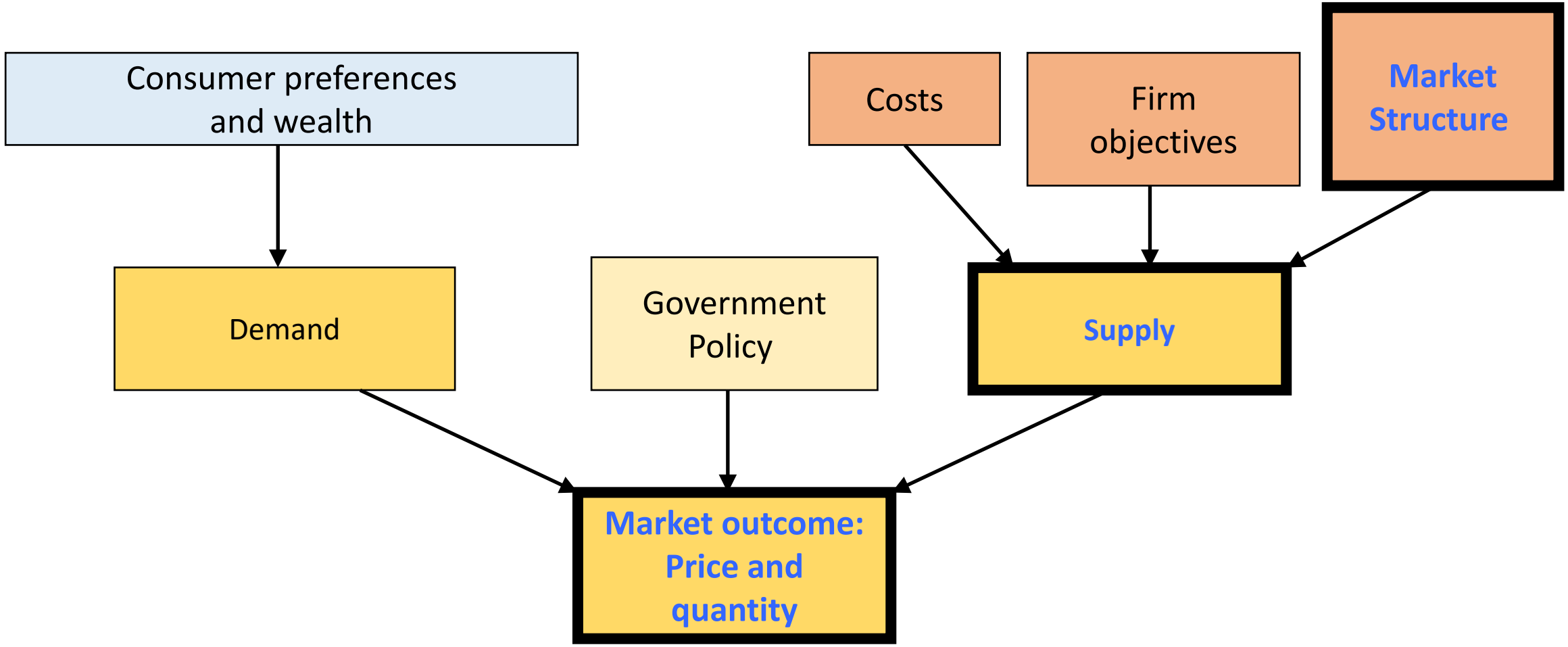
Lecture 6
Monopoly and market power I

Reading: NW ch.13

The story so far…



Learning Objectives

1. Explain **what** a monopoly market is and what conditions might cause a market to be a monopoly

2. What is market power?

3. Discuss relationship between price and revenue for monopolist: derive the monopolist's **marginal revenue** (MR) curve

4. Understand what is supply by a monopolist: show how a monopolist **maximises its profit** (MR = MC) – and use graphs to show a firm's profit (or loss)

4. Explain why a monopolist causes **a loss in surplus** (a deadweight loss) in the market

5. Explain possible option to **regulate** a monopolist, and outline their strengths and weaknesses

Characteristics of a Monopoly

- **A market with a single seller**
  - is a *monopoly*, and that seller is a *monopolist*.
  - One seller but many buyers
  - Because the monopolist is the only firm in the market, it has **market power** to determine the price in the market – that is, it is a ***price maker***.

- **Barriers to entry to potential entrants**
  - Think of it as a cost that must be incurred by a new entrant in the market that incumbents do not bear
  - Barriers to entry are ***legal*** or `***natural*** constraints' that protect a firm from potential competitors.

Why are there monopolies?

There must be some barriers to entry

competition and entry is restricted by various mechanisms including:

- **Legal** Barriers to Entry
  - exclusive right over a goods production (patent, copyright)
  - public franchise (Australia Post); government licences (taxis, practice of medicine)

Why are there monopolies?

- **Natural** Barriers to Entry
  - Control over an essential input not available to other firms
    - E.g. Esso/BHP and natural gas fields in Victoria; know-how, distribution network
  - The monopolist might simply have a lower cost of production that effectively allows them to prevent other firms from entering the market.
    - E.g. favourable access to raw materials, favourable geographic location, learning curve advantages
  - Technology/level of demand make one producer more efficient than a number of producers:

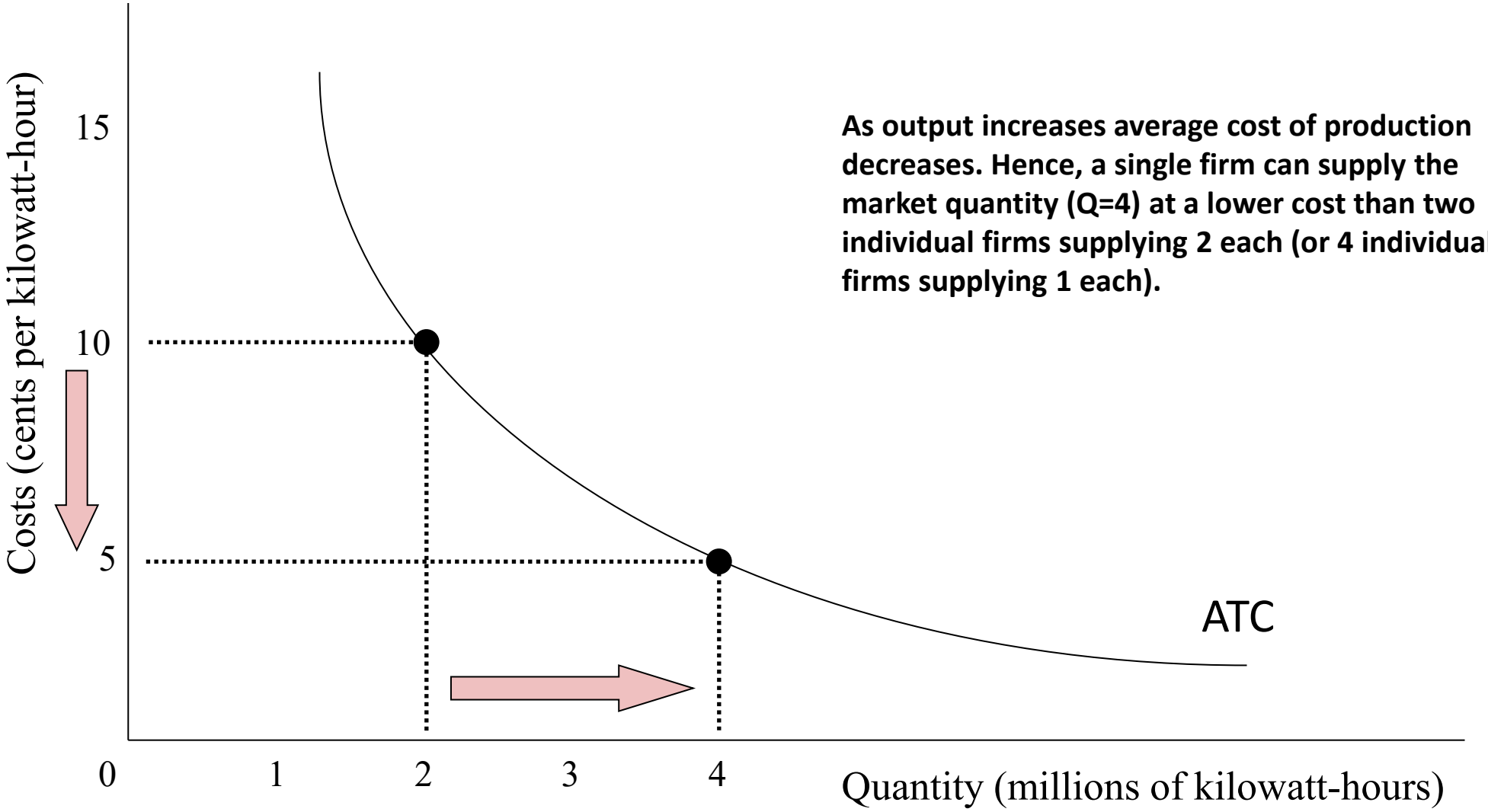
Natural monopoly

A **natural monopoly** results from a situation where a single firm can supply an entire market at lower cost than two or more firms could supply that market.

- Examples?
  - Telecommunications network, electricity transmission, (tap) water provision

- Declining (long run) average total cost implies natural monopoly
  - i.e. substantial economies of scale (a `natural' barrier to entry)
  - Often large capital costs (infrastructure), but low marginal cost of supply

Declining average costs



As output increases average cost of production decreases. Hence, a single firm can supply the market quantity (Q=4) at a lower cost than two individual firms supplying 2 each (or 4 individual firms supplying 1 each).

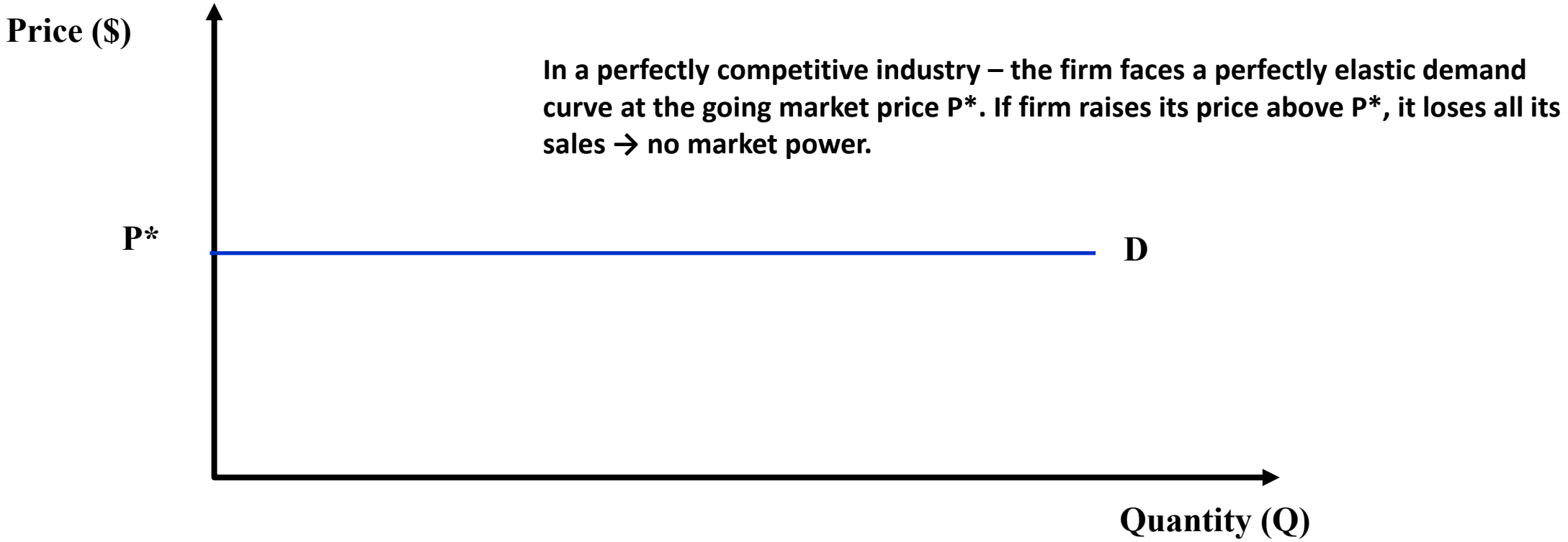
What is market power?

- A **monopoly** is an industry comprised of a single firm
  - *No close substitutes* for the firm's product
  - The firm is protected from competition by some *barrier to entry* which prevents and or inhibits entry of other firms

- In the absence of close competition …
  - A monopolist has **market power** – **the ability to affect price**

What is market power?

- What does having market power mean?
  - Recall the perfectly competitive **firm** is a price taker



In a perfectly competitive industry – the firm faces a perfectly elastic demand curve at the going market price P*. If firm raises its price above P*, it loses all its sales → no market power.

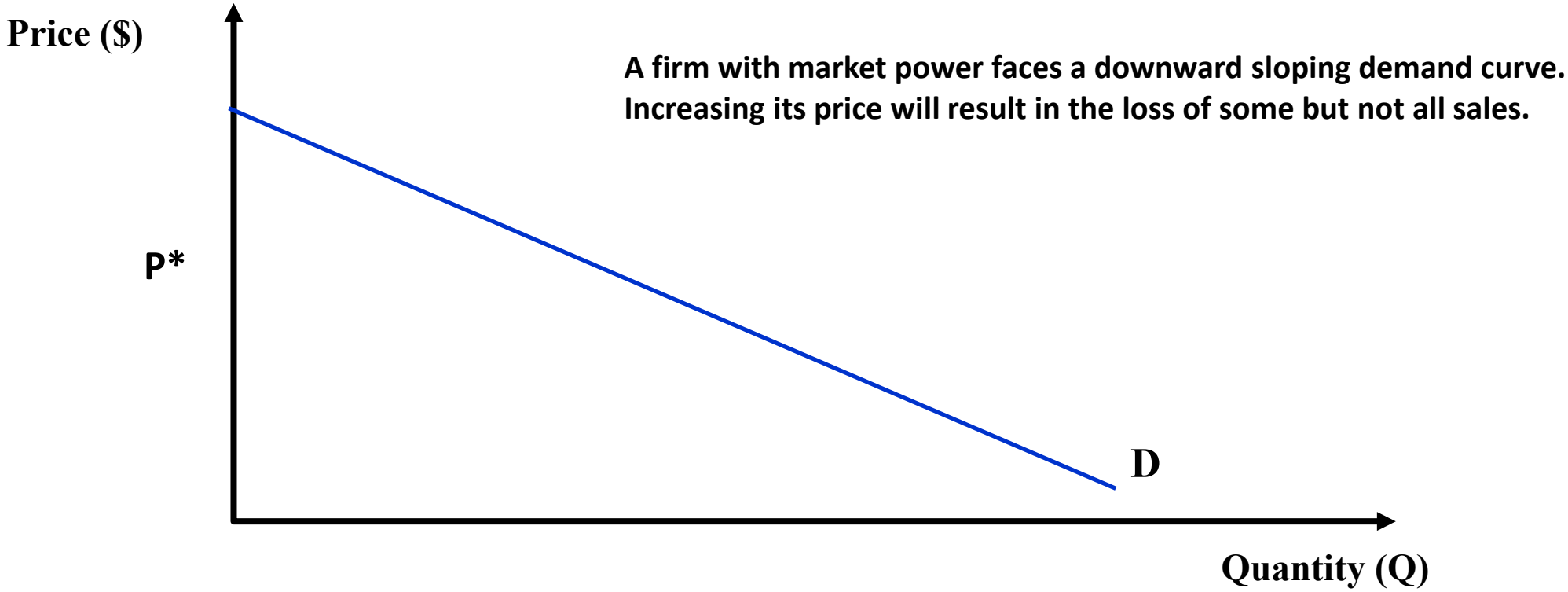
What is market power?

- What does having market power mean?
  - Whereas, a firm that has a **LOW price elasticity of demand for its output** can raise price and not lose all its customers.

- ***Market power*** *captures the idea that a firm can raise its prices above the level that would exist in a perfectly competitive industry and not lose all its customers*

What is market power?

- What does having market power mean?



What is market power?

- A competitive firm has to take the price as determined in the market *(**price taker**)*
  - no market power
  - faces a perfectly elastic demand curve for its good

- A monopolist instead is a ***price maker***
  - has market power
  - faces a downward-sloping D-curve for its good
  - Not only a monopolist has market power, but whenever imperfect competition in market: e.g. a monopolist, firm in a monopolistically competitive market, oligopoly

Monopoly Pricing Strategies

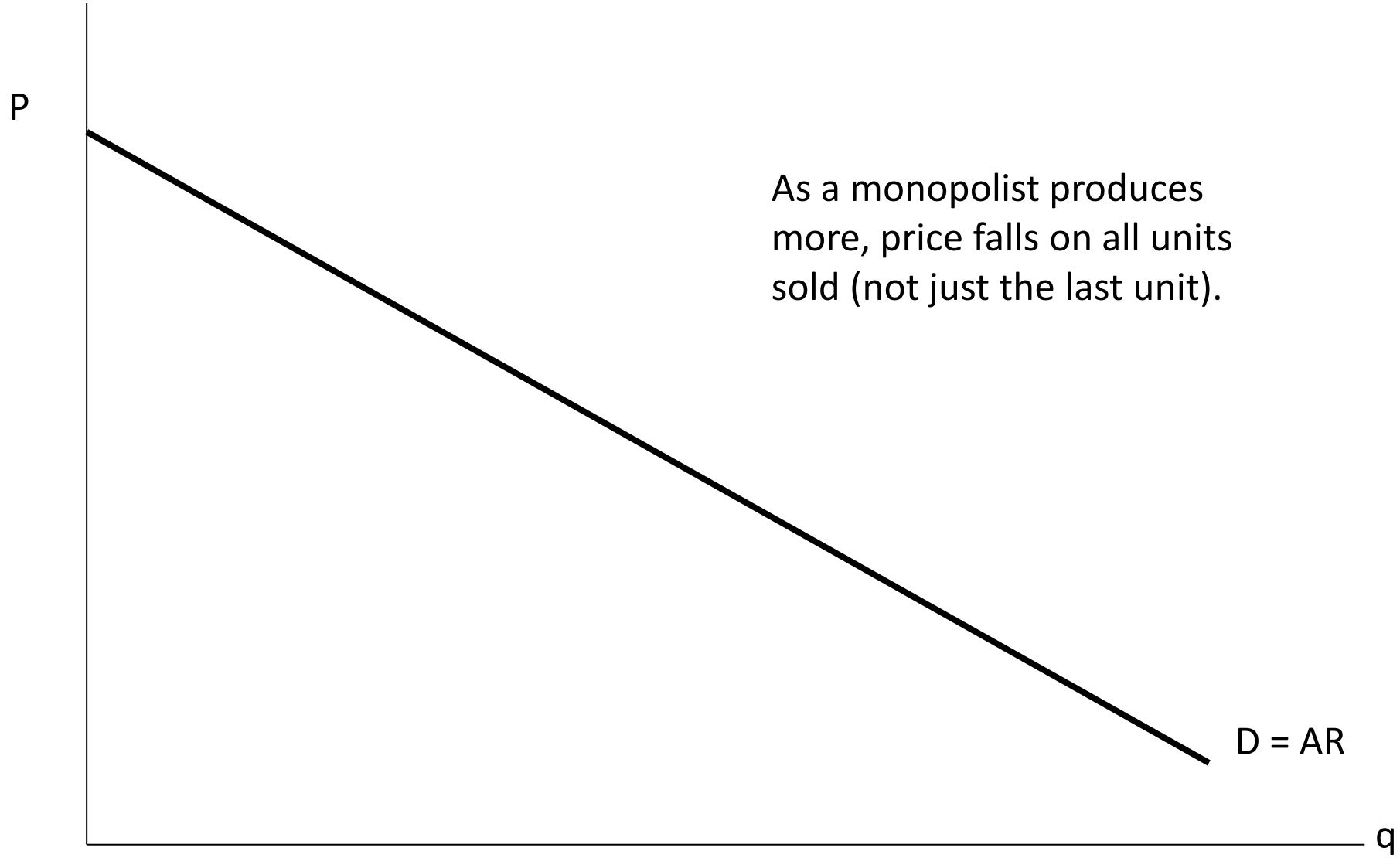
- A **single-price monopolist** is a firm that must sell each unit of output for the same price.
  - Monopolist chooses quantity (and thus price) to maximise profits

- **Price discrimination** is the practice of selling different units of a good or service for different prices.
  - E.g., Haircuts, Movies, Utility bills
  - Monopolist sets a variety of prices to maximise profits

Single-price monopolist

- Here we examine a monopolist who charges the **same price to all of its consumers**, also known as a single-price monopolist.
- As the monopolist is the sole producer, it faces all the demand in the market.
  - faces the downward-sloping ***market demand*** *curve*.
  - firm has **market power** (or monopoly power) – it can raise price and not have the quantity demanded drop to zero
  - Monopolist has to ***choose the price*** *(or the quantity it wants to sell*).
- A monopolist can alter the **price** in the market by changing q
  - faces a downward-sloping (market) demand curve
  - if it increases output by one unit the price will fall by some amount.
    - if produces more, price falls
    - if produce less, price rises
  - This causes a **trade off** for the monopolist: sell less q for higher price or sell more q for lower price

Monopolist: output and price effect



Monopolist and Marginal revenue

- **Marginal revenue (MR)** is the additional revenue that the firm received from selling one extra unit of a good.

- For a monopolist, the **marginal** revenue incorporates **two effects**:

  (i) ***Output effect***: as you sell more units, you obtain extra revenue from the additional units sold; and

  (ii) ***price effect***: as you sell more units, price falls and you lose revenue on the existing units sold

- Hence MR is not the same as the market price: **MR is always below P**

- Note, there is no price effect for a competitive firm, only an output effect
  - price is invariant to the quantity it sells: MR=P=AR is constant for any q supplied

A monopolist's marginal revenue – an example

- **Single price monopolist**'s Total, Average and Marginal Revenue

Quantity	Price	Total revenue	Average revenue	Marginal revenue
Q	*P*	*TR=PxQ*	*AR=TR/Q*	*MR=ΔTR/ΔQ*
0	$11			
1	10			
2	9			
3	8			
4	7			
5	6			
6	5			
7	4			
8	3			

demand curve!

A monopolist's marginal revenue – an example

- **Single price monopolist**'s Total, Average and Marginal Revenue

Quantity	Price	Total revenue	Average revenue	Marginal revenue
Q	*P*	*TR=PxQ*	*AR=TR/Q*	*MR=ΔTR/ΔQ*
0	$11	$ 0		
1	10	10		
2	9	18		
3	8	24		
4	7	28		
5	6	30		
6	5	30		
7	4	28		
8	3	24		

↓

demand curve!

A monopolist's marginal revenue – an example

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1	10	10	$10	
2	9	18	9	
3	8	24	8	
4	7	28	7	
5	6	30	6	
6	5	30	5	
7	4	28	4	
8	3	24		

demand curve!

average revenue is just the price!

A monopolist's marginal revenue – an example

- **Single price monopolist**'s Total, Average and Marginal Revenue

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2	9	18	9	8
3	8	24	8	6
4	7	28	7	4
5	6	30	6	2
6	5	30	5	0
7	4	28	4	-2
8	3	24		

demand curve!

average revenue is just the price!

Note that MR is decreasing.

And MR< P=AR

Deriving MR from monopolist's Demand curve

- MR is the change in total revenue when the firm sells one more unit
  - Can obtain the MR by differentiating TR ***with respect to q***:

$$MR = \frac{dTR}{dq}$$

- Example: consider when the demand curve is linear and given by

$P = a - bq$ (*inverse* D-curve; where a and b are constants)

hence $AR = a - bq$

$TR = P(q)*q = (a - bq)*q$

$= (aq - bq^2)$

Deriving MR from monopolist's Demand curve

- From TR = $(aq - bq^2)$

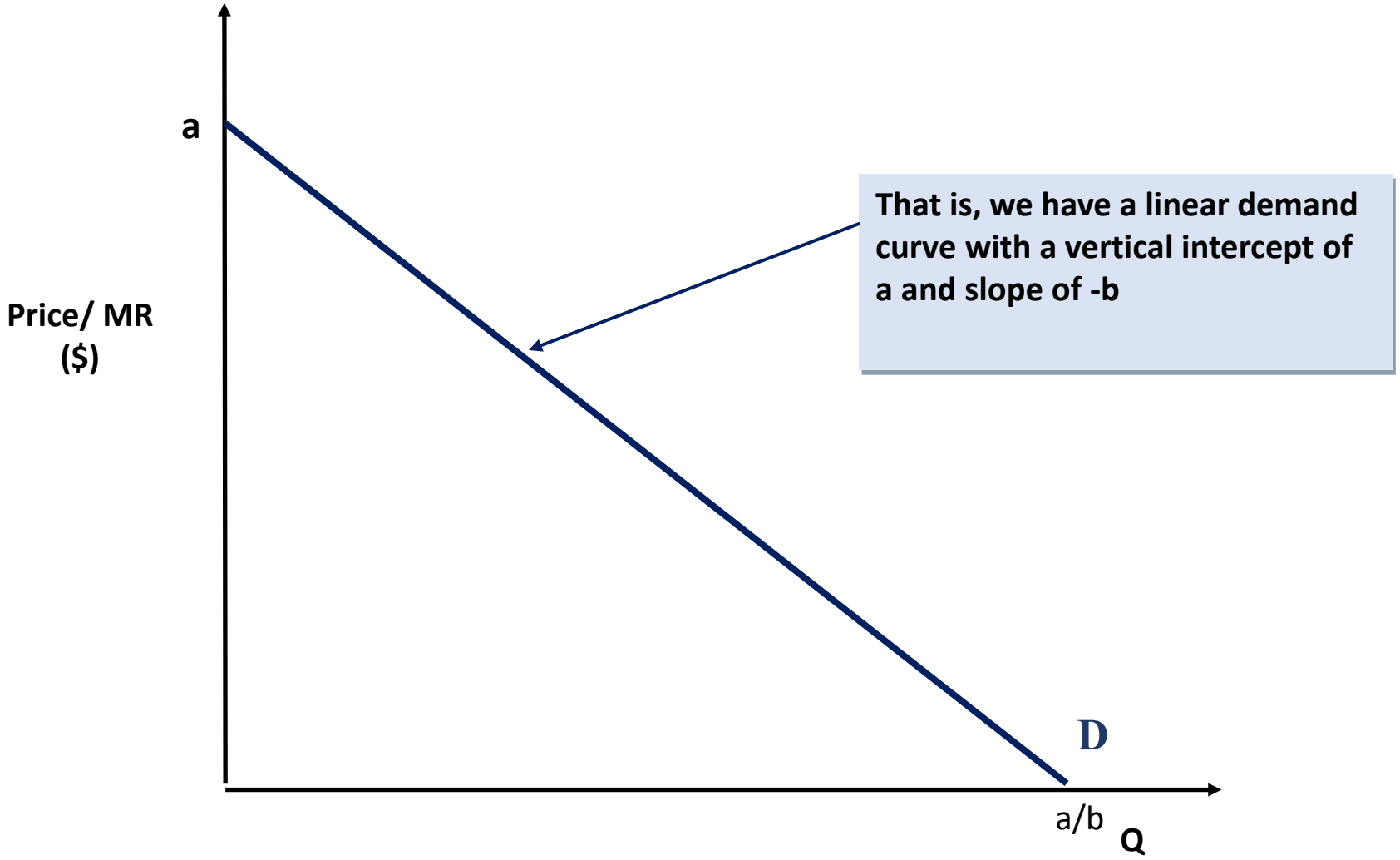
$$MR = \frac{dTR}{dq} = a - 2bq$$

- For example, if P = 100 – 2q, then MR = 100 – 4q

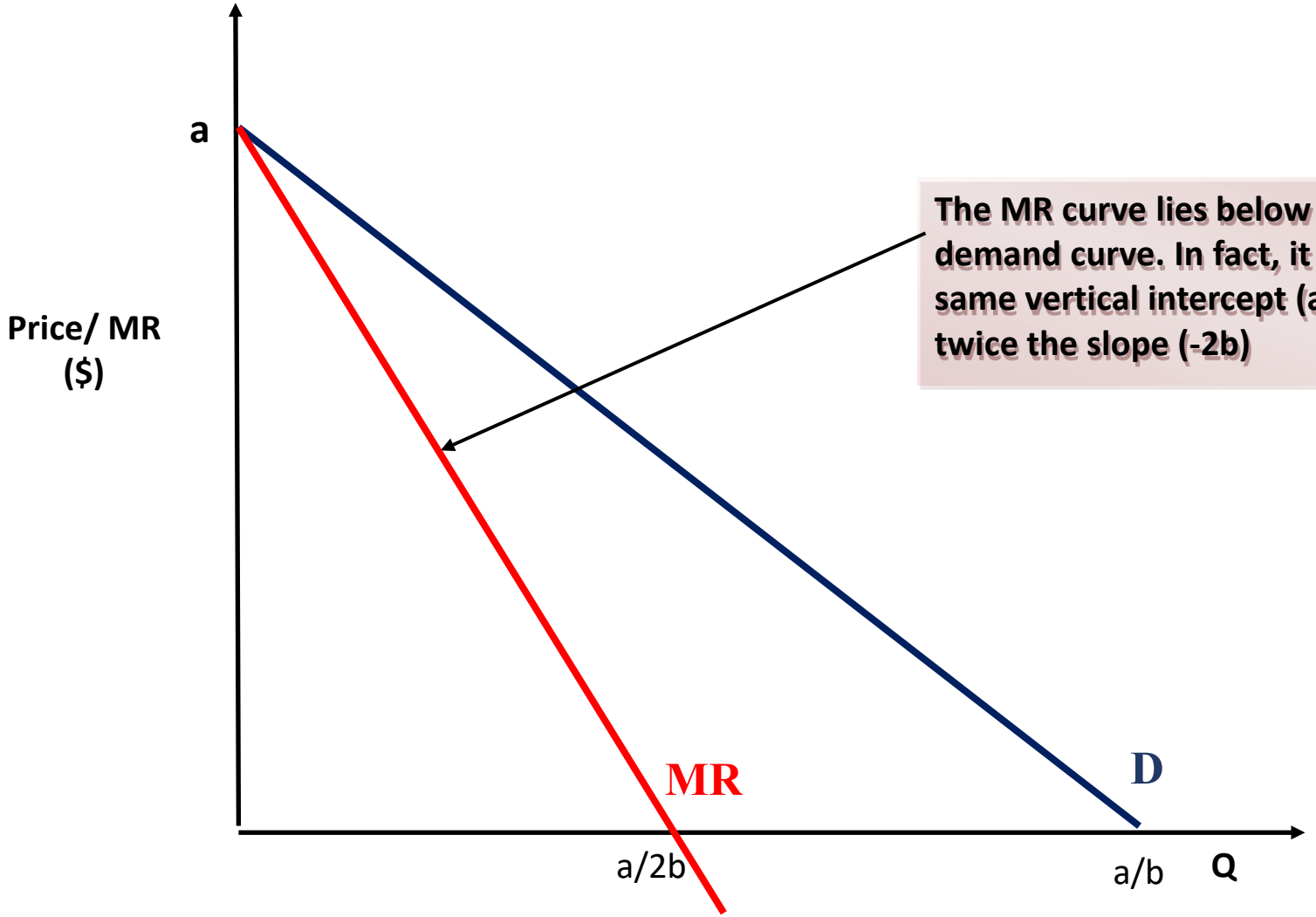
- Note two things about MR when demand is a straight line:
  - MR has the same vertical intercept as the demand curve (at a); and
  - MR is linear and has twice the slope of the demand curve: the MR curve has a slope of -2b whereas the demand curve has a slope of –b.

- This is a rule you can choose to remember (or you can derive it as above)

Monopolist's marginal and average revenue

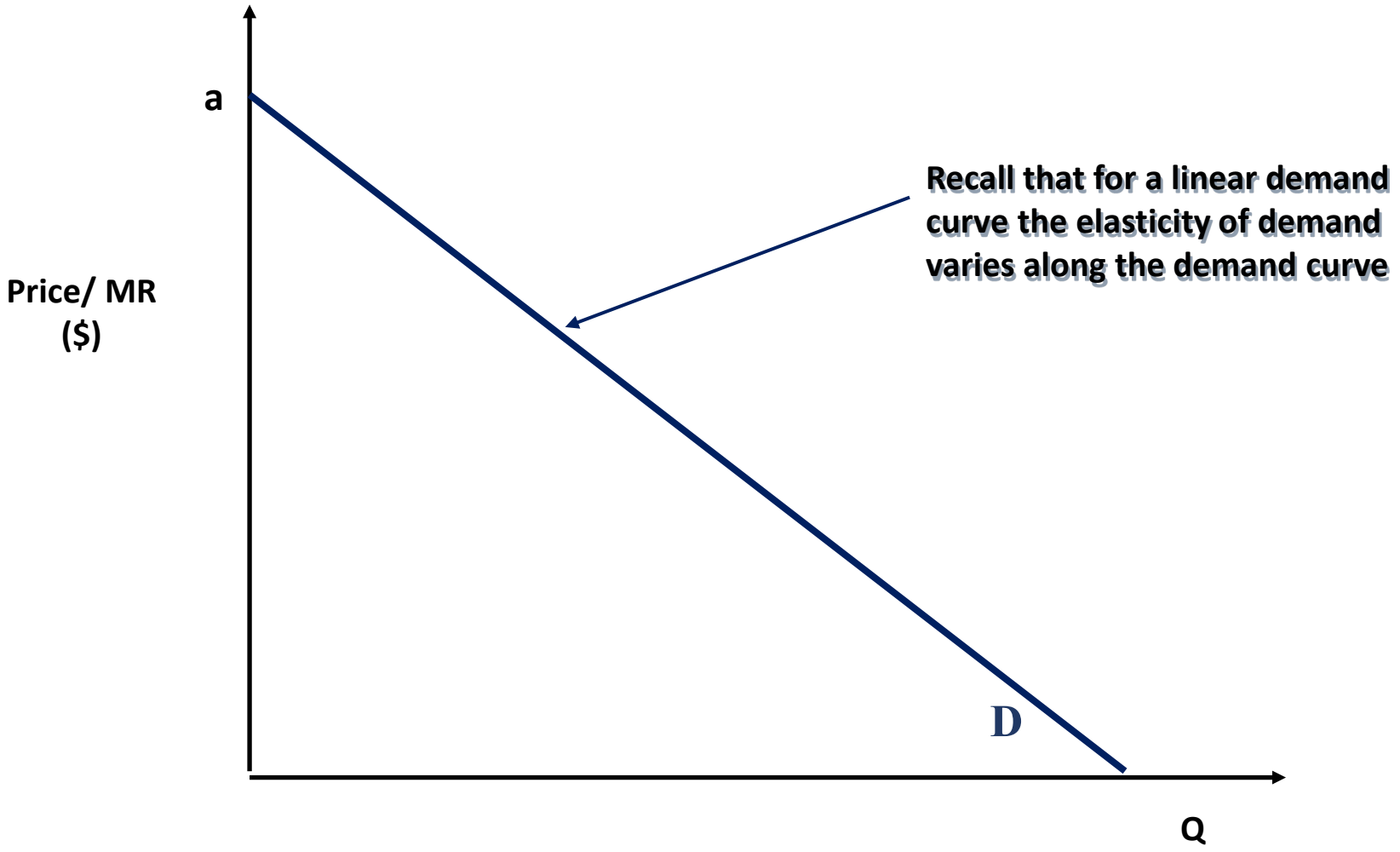


Monopolist's marginal and average revenue



MR cuts the
q axis at ½ the distance
from where demand cuts
the q axis

Reminder: Marginal revenue and elasticity



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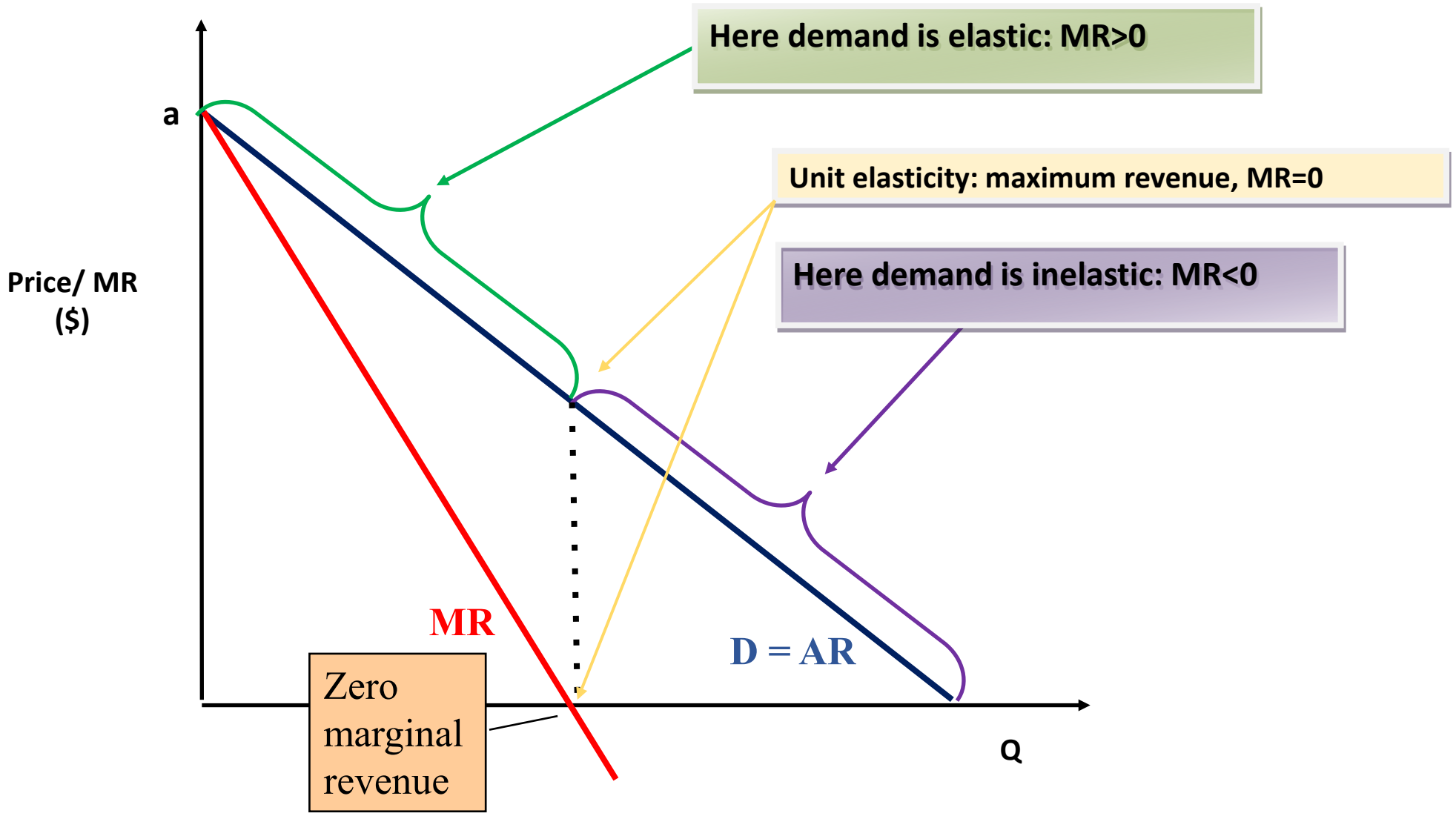
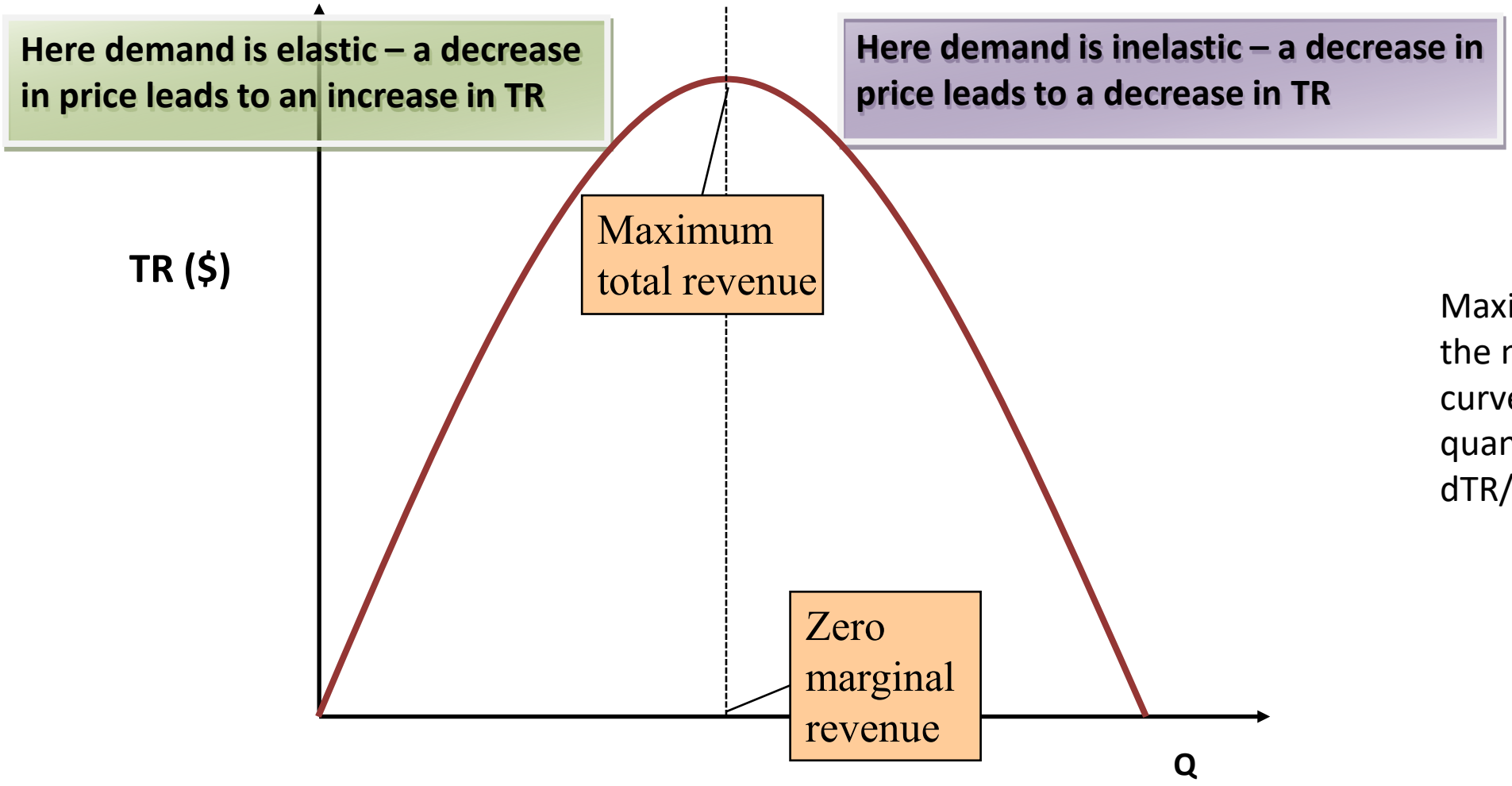


Reminder: Total Revenue & elasticity



Maximum TR is reached at the midpoint of the D-curve (unit elasticity), at a quantity where:
dTR/dq = MR = 0.

Monopoly and profit maximization

- **Profits will be maximized** when a monopolist sets marginal revenue equal to marginal cost:

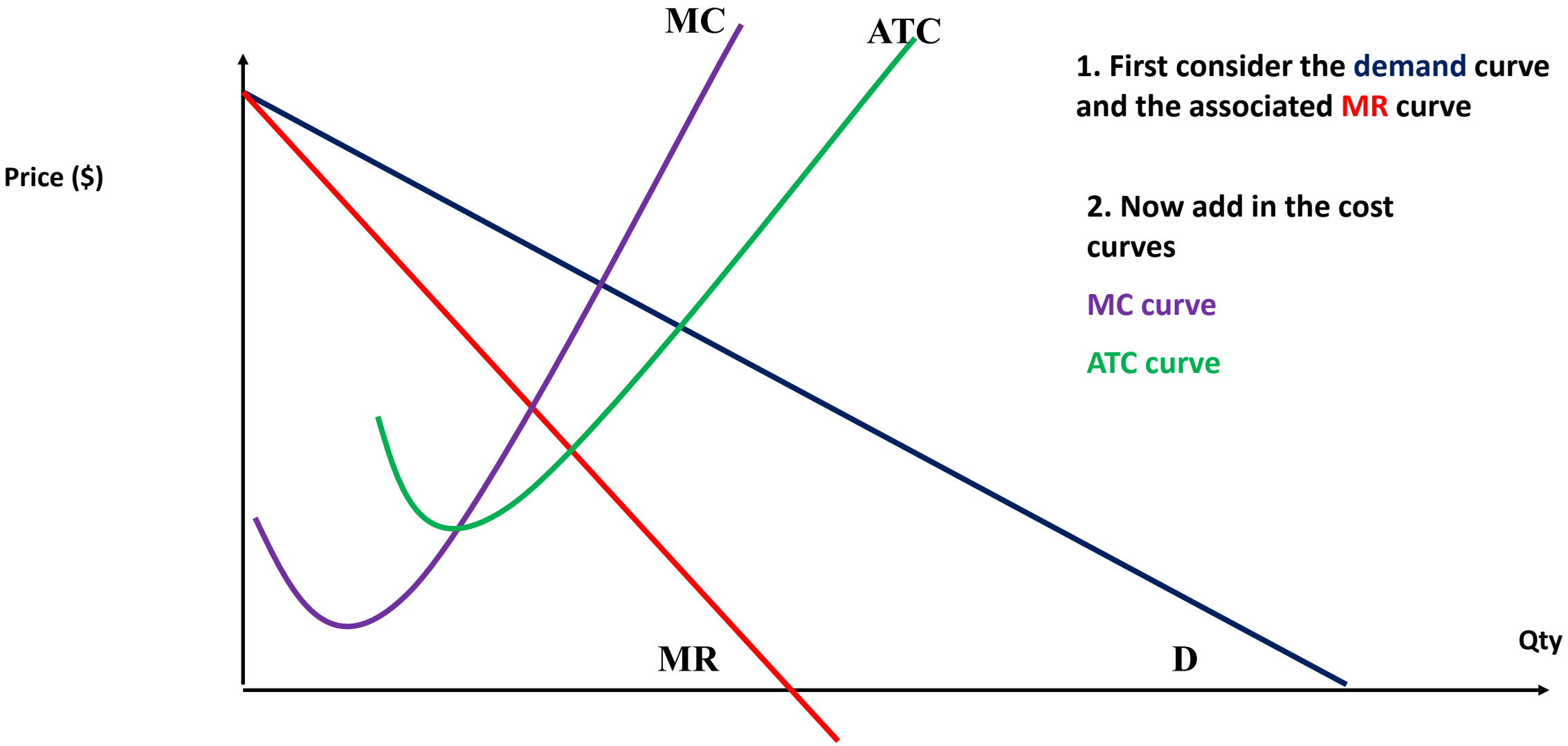
$$MR = MC$$

  - If MR > MC, the monopolist can increase its profit by selling one extra unit.
  - If MR < MC, profit falls from selling the last unit, so it would be better off from not selling that unit.

- For a competitive firm – **P =** MR = **MC**
- For a monopolist – P > **MR = MC**

- Note – this means that for a (single-price) monopoly **P > MC** at the optimal quantity supplied (while competitive firms produce until P = MC)

Profit maximization: MR = MC



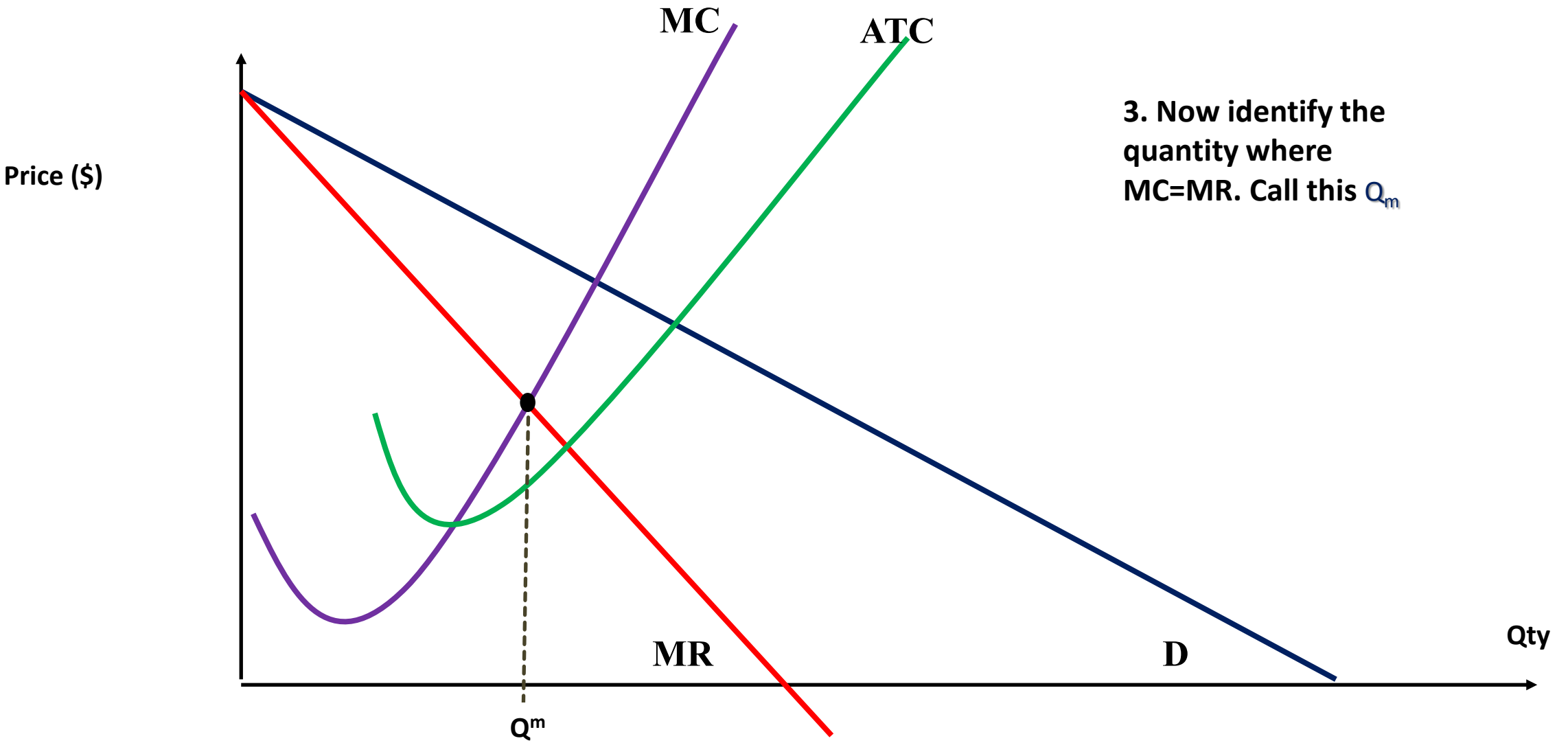
1. First consider the demand curve and the associated MR curve

2. Now add in the cost curves

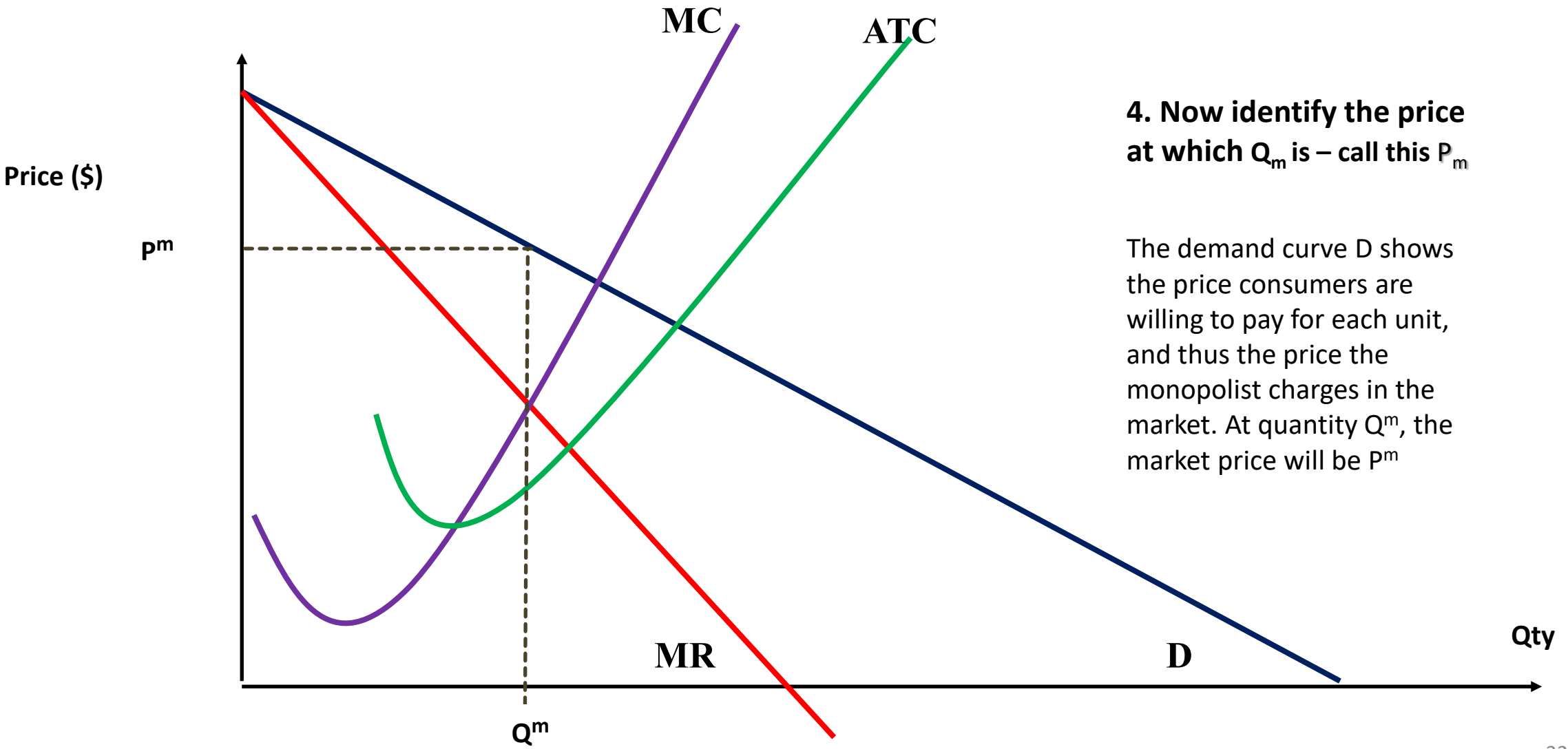
MC curve

ATC curve

Profit maximization: MR = MC



Monopoly output and price



4. Now identify the price at which Q_m is – call this P_m

The demand curve D shows the price consumers are willing to pay for each unit, and thus the price the monopolist charges in the market. At quantity Q^m, the market price will be P^m

Monopoly profits

- The monopolist's profit is

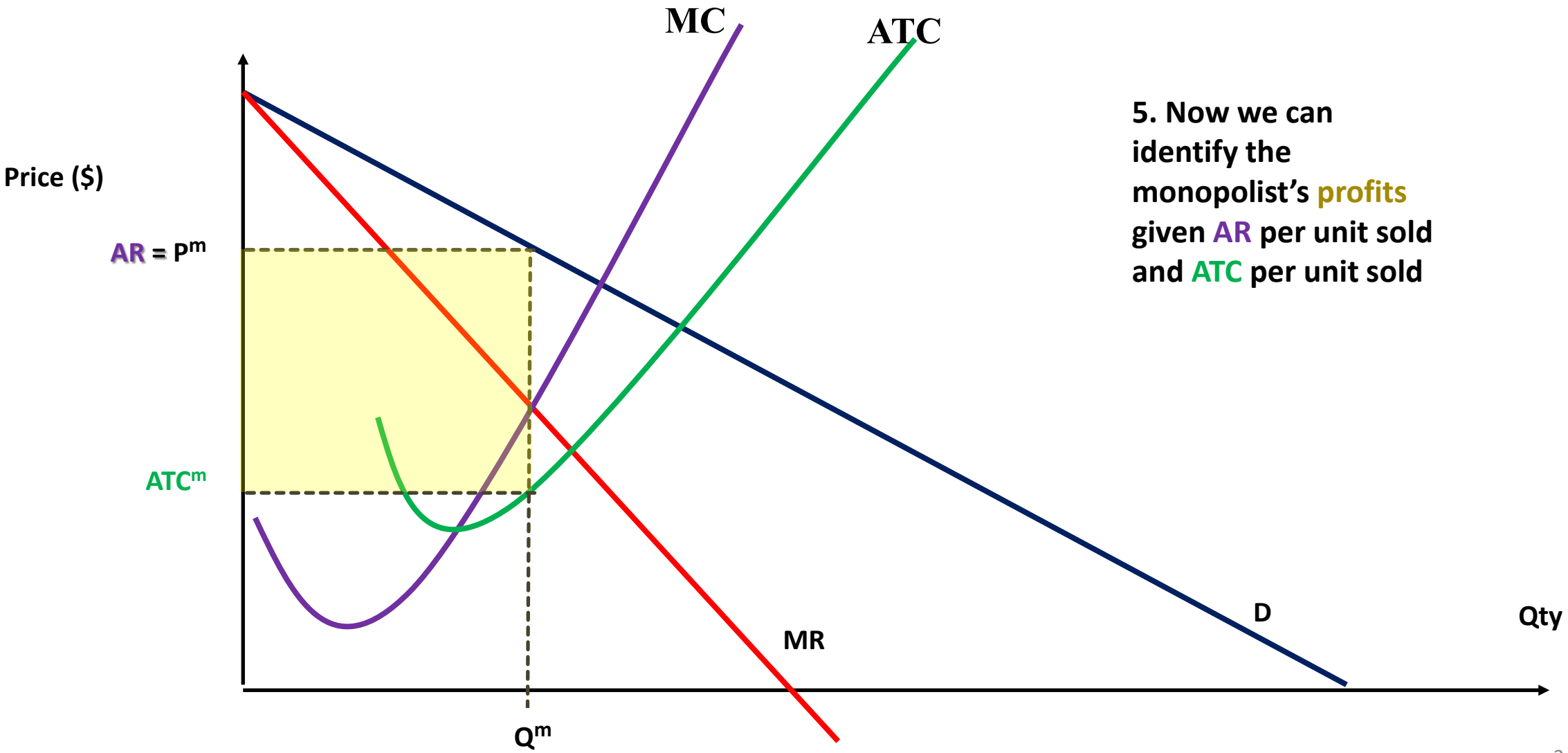
$$\pi = TR - TC$$
$$\pi = (TR/q - TC/q)*q$$

- As before TR/q = AR = P; TC/q = ATC, so

$$\pi = (AR - ATC)*q$$
$$= (P - ATC)*q$$

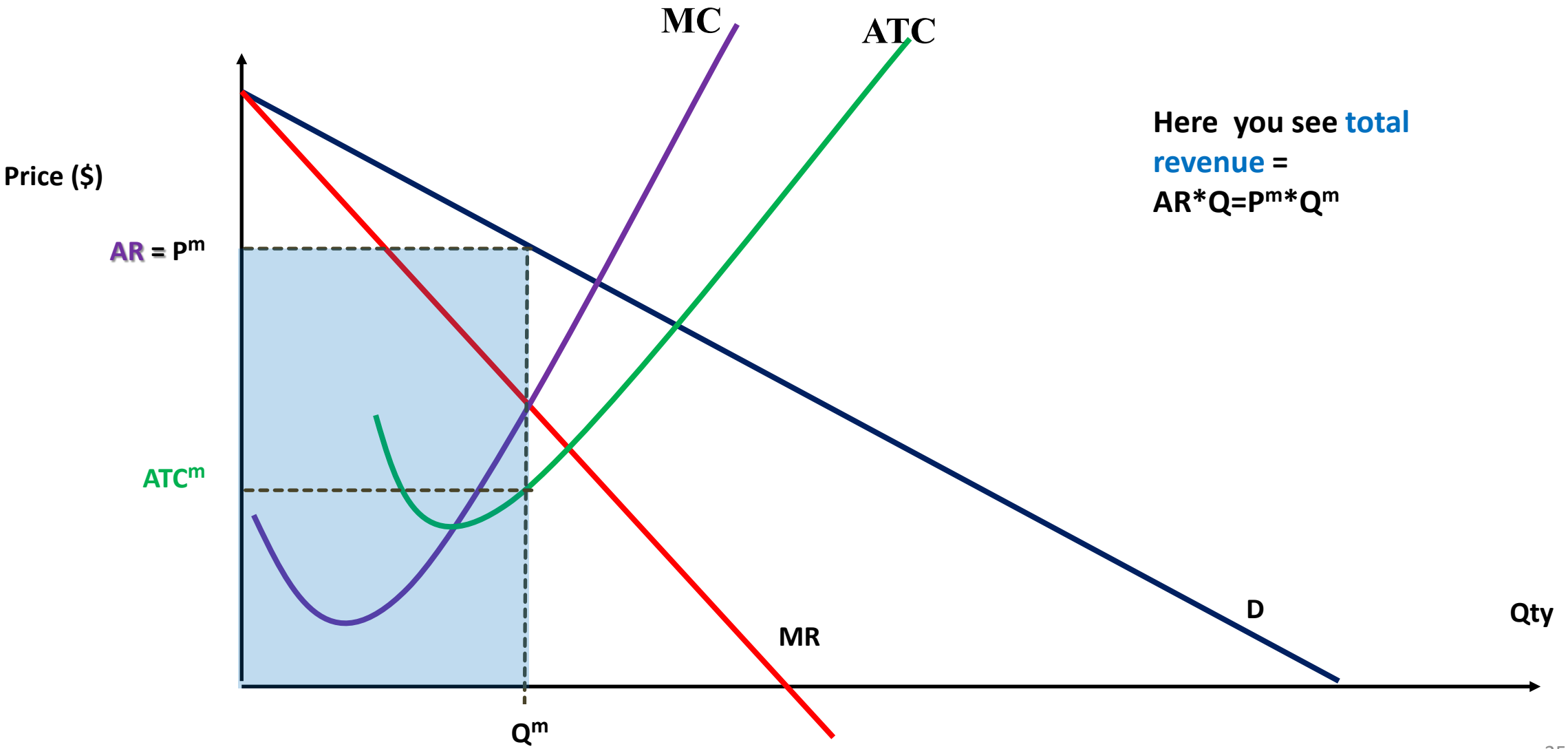
- (P – ATC) is the profit per unit sold, q is the quantity sold; profit is then the average profit per unit output times by the quantity sold

Monopoly profits



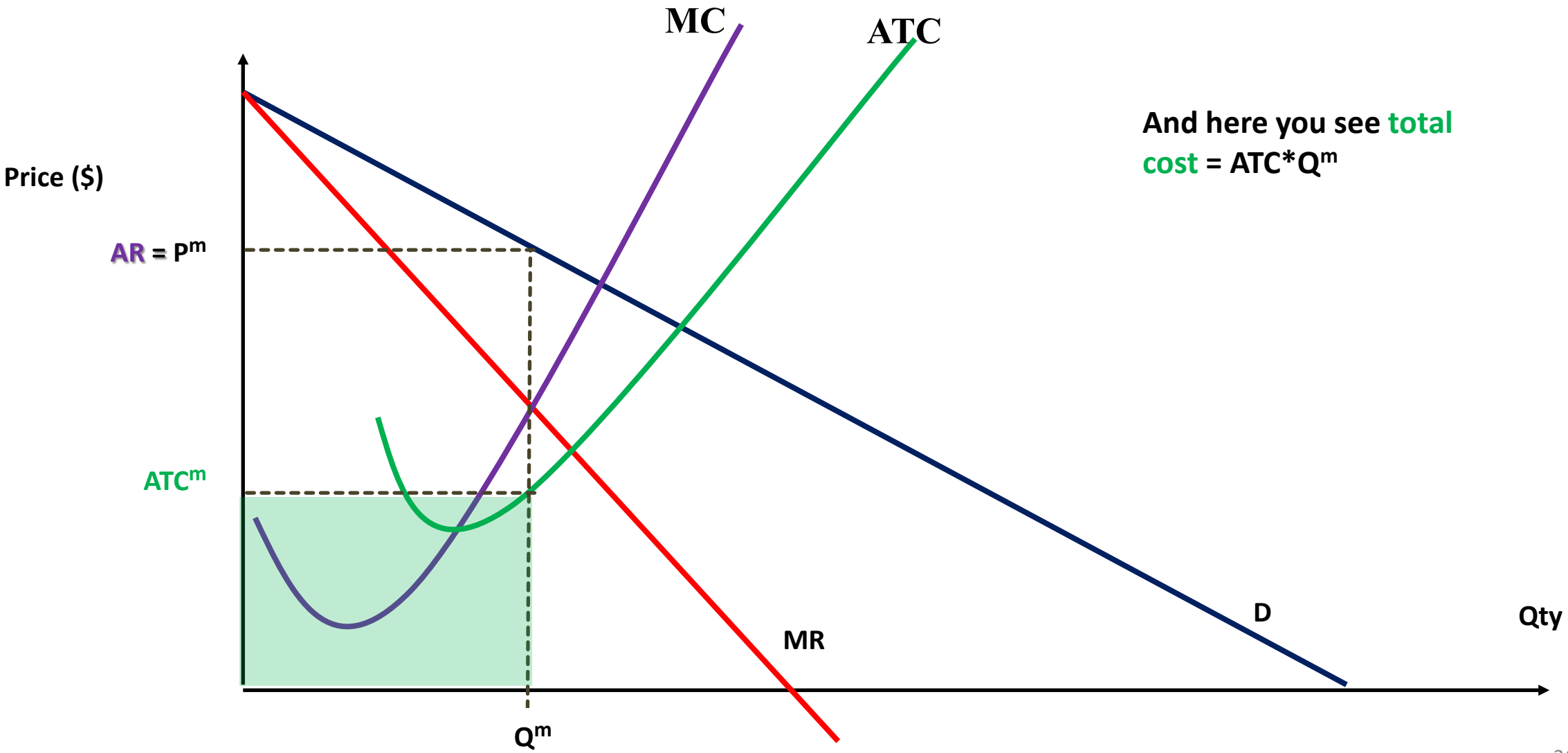
5. Now we can identify the monopolist's profits given AR per unit sold and ATC per unit sold

Monopoly profits



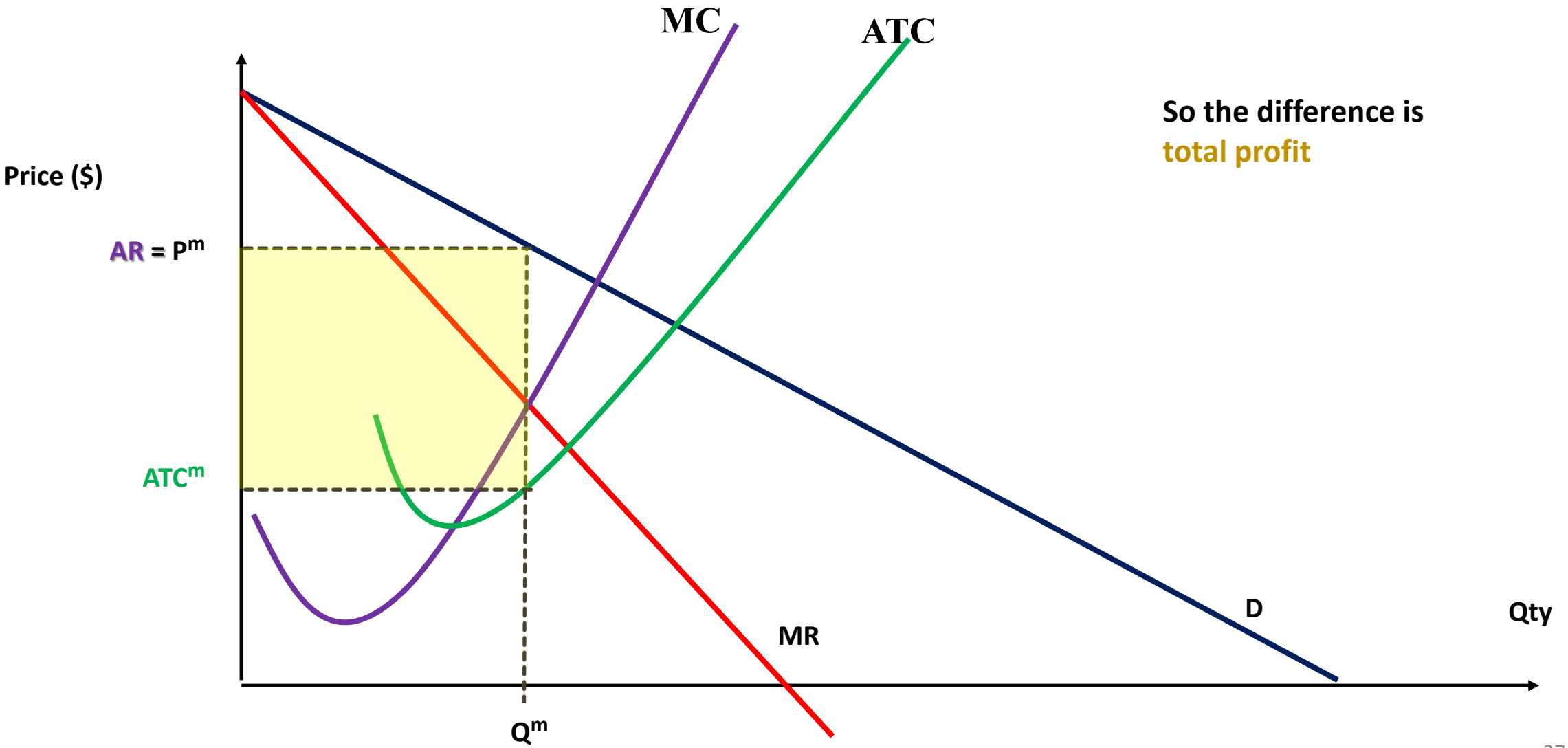
Here you see **total revenue** = $AR*Q=P^m*Q^m$

Monopoly profits



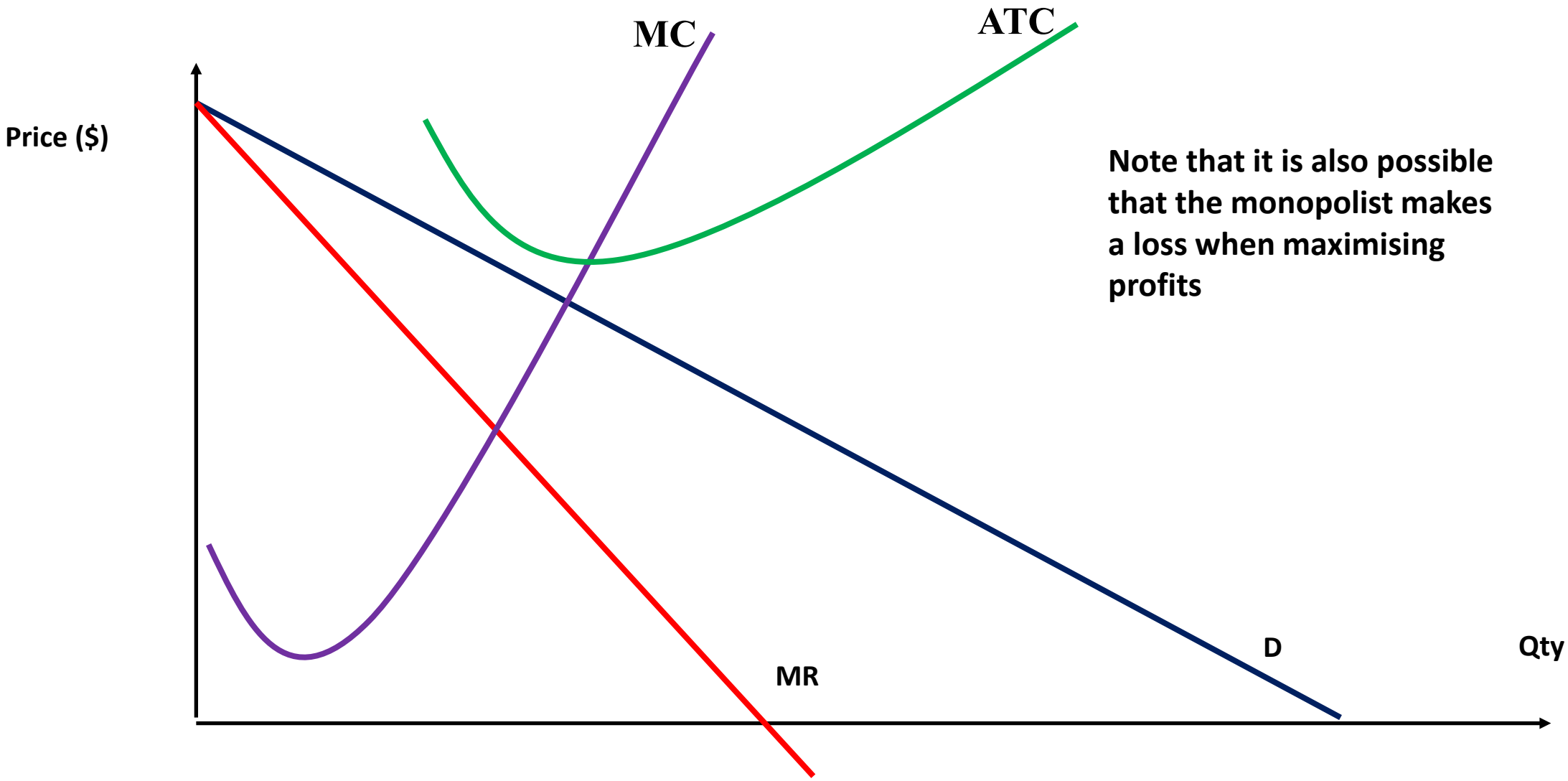
And here you see total cost = ATC*Q^m

Monopoly profits



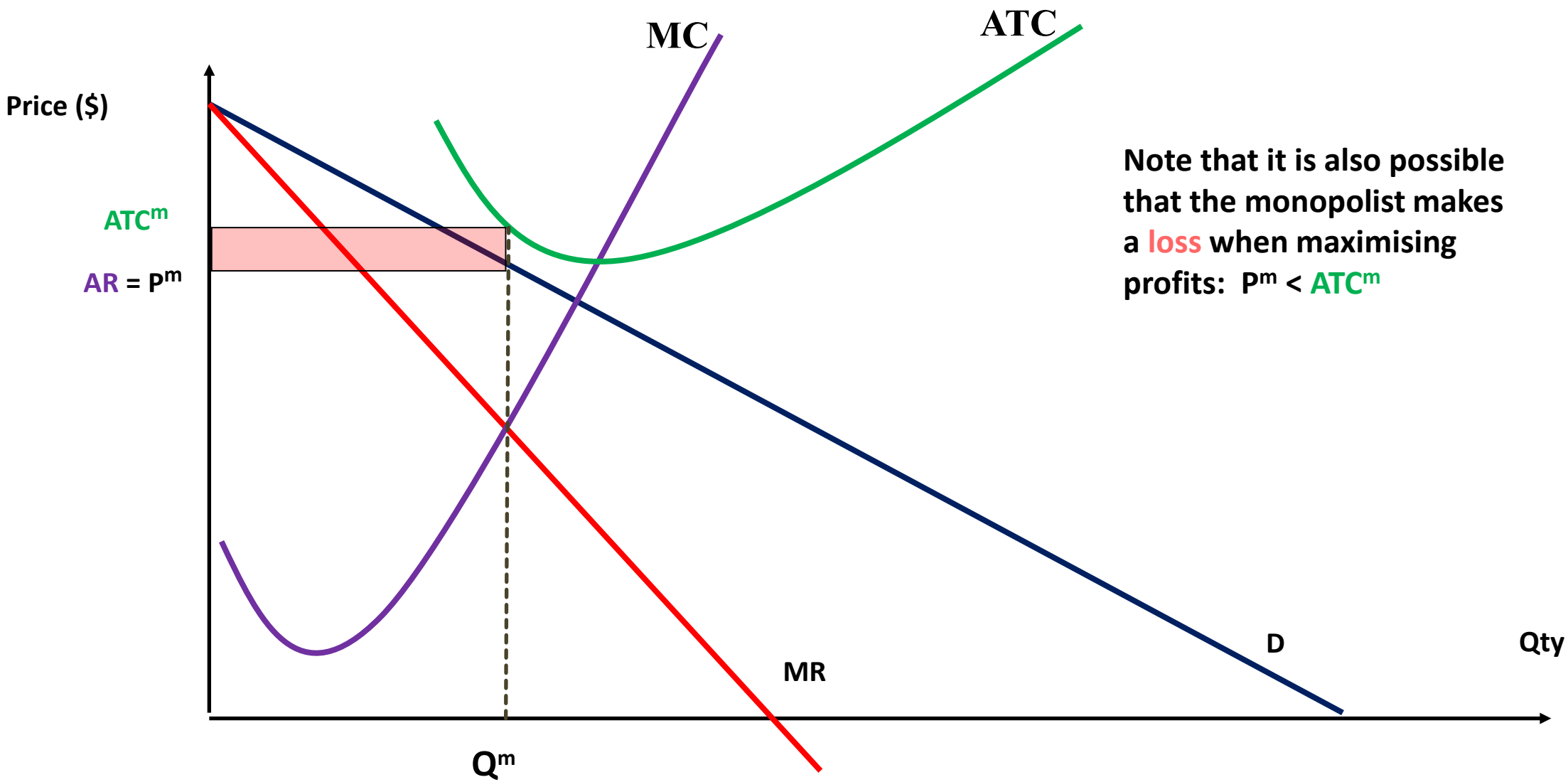
So the difference is
total profit

Monopoly profits



Note that it is also possible that the monopolist makes a loss when maximising profits

Monopoly profits



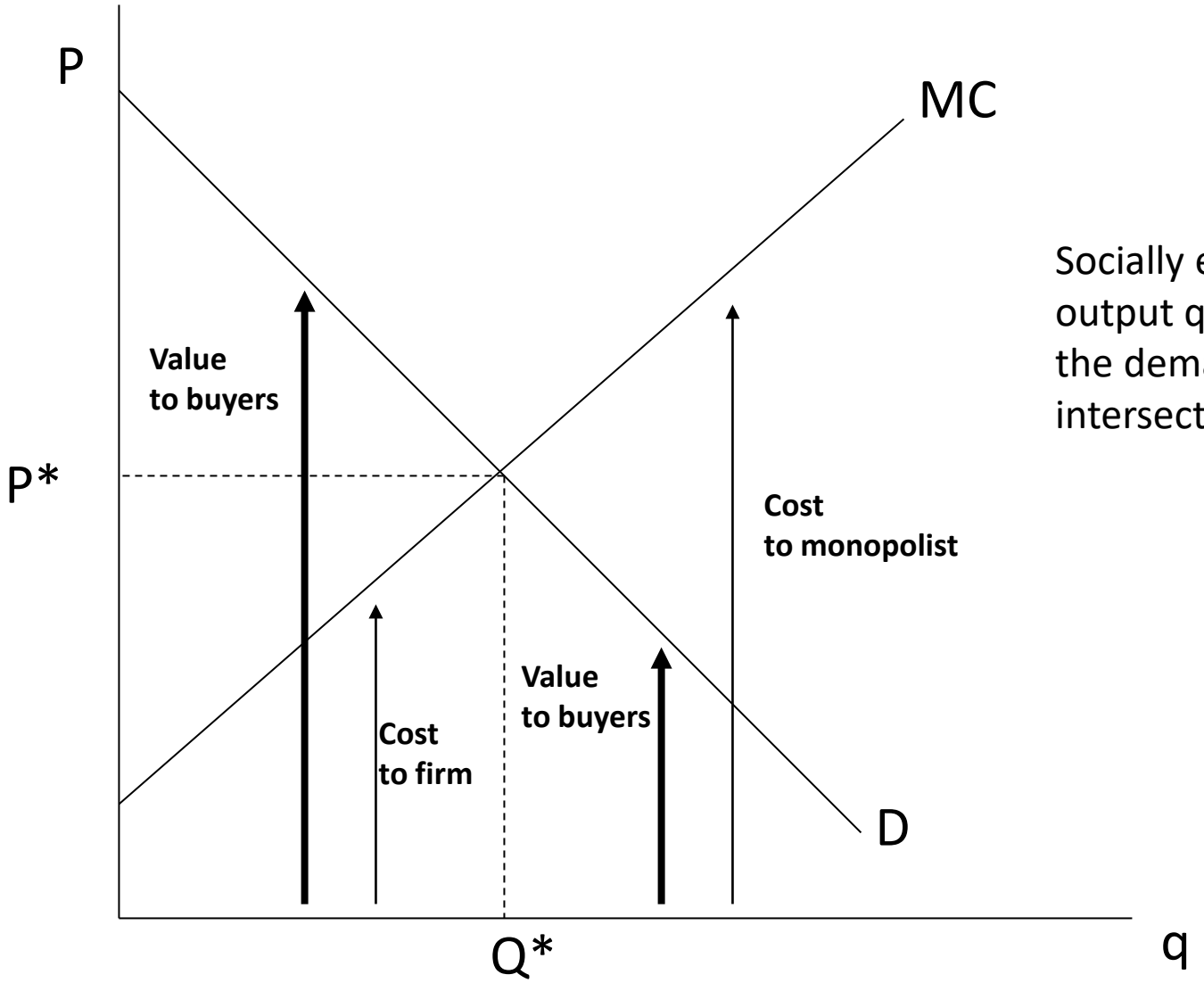
Note that it is also possible that the monopolist makes a loss when maximising profits: $P^m < ATC^m$

Welfare / efficiency with a monopoly

- **Socially efficient level of output** is where the marginal value to consumers (MB) equals the marginal cost of production (MC)
  - MB = MC: all gains from trade are exhausted
  - welfare (total surplus) maximum, competitive market output **Q***

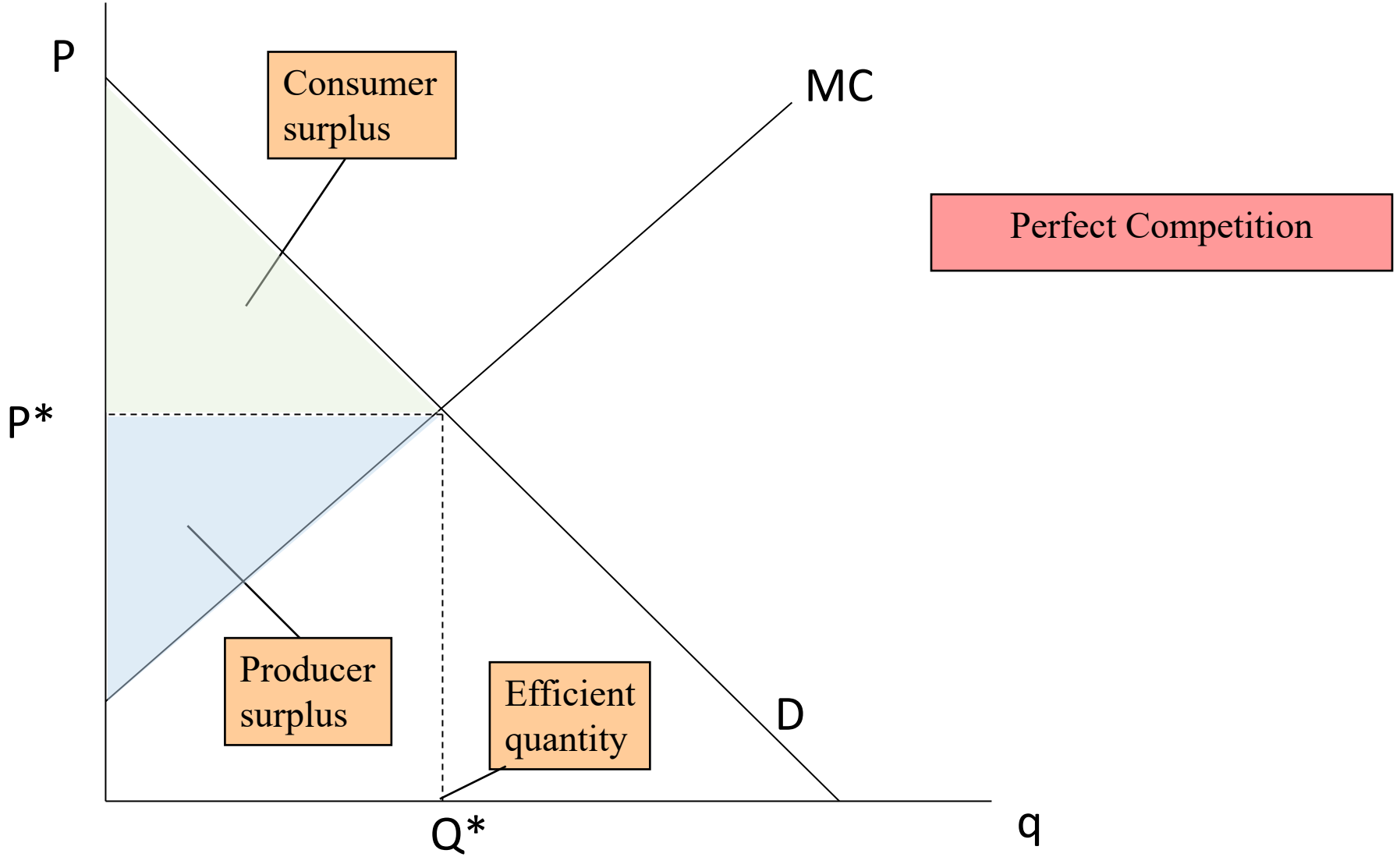
- **Monopolist** produces where MR = MC
  - We know that for every level of output (except the every first unit sold): MR < MB (=P)
  - thus the monopolist restricts output to $\mathbf{Q^m < Q^*}$
  - As a result surplus is not maximised
  - Another way to think of it – a monopolist's **price is too high**, reducing quantity demanded.
  - using its market power, a monopolist can create a wedge (like a tax) between consumers' WTP and the producer's costs.
  - A **deadweight loss** (DWL) results

Welfare in a market

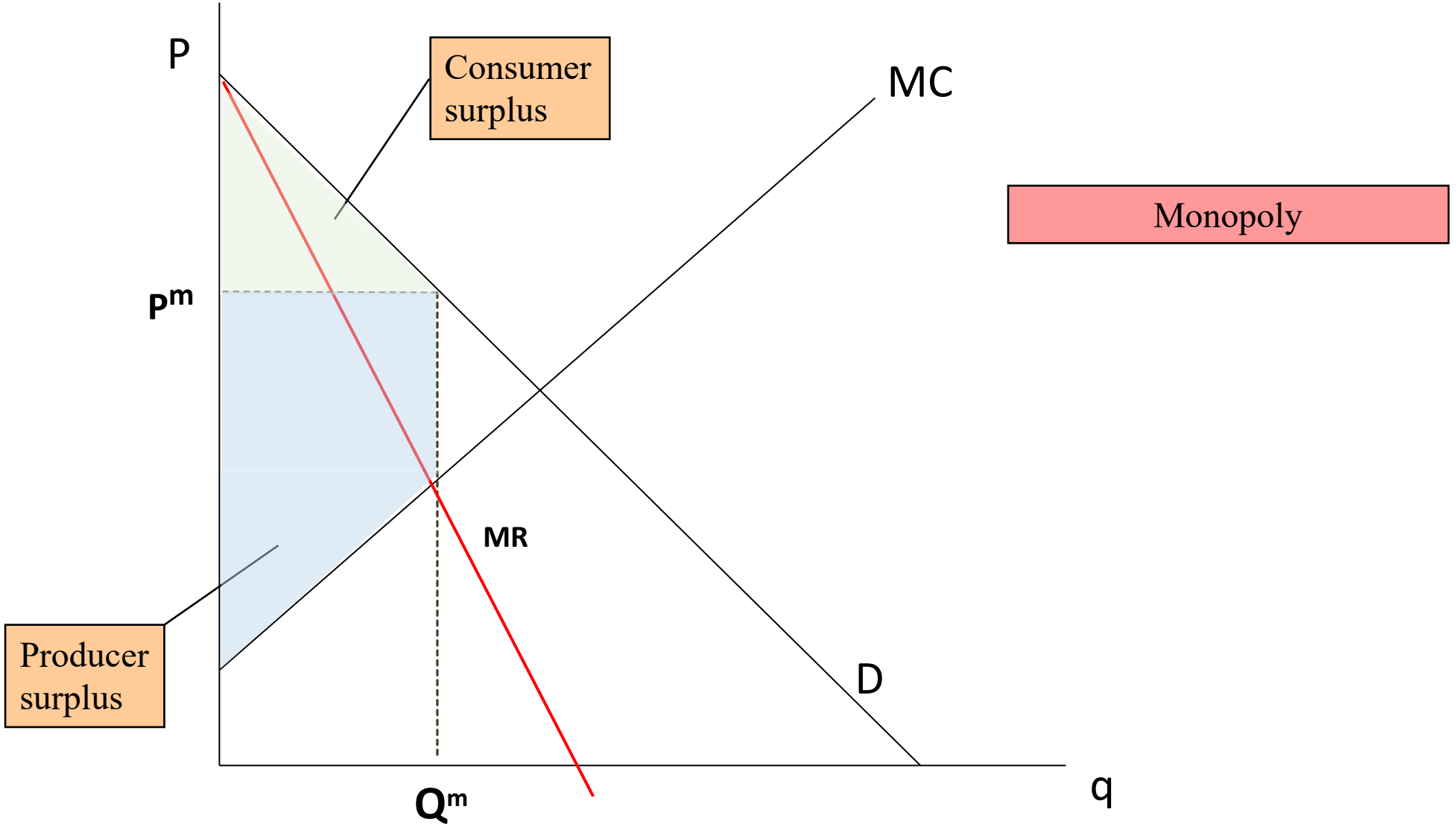


Socially efficient level of output q is found where the demand curve intersects MC curve

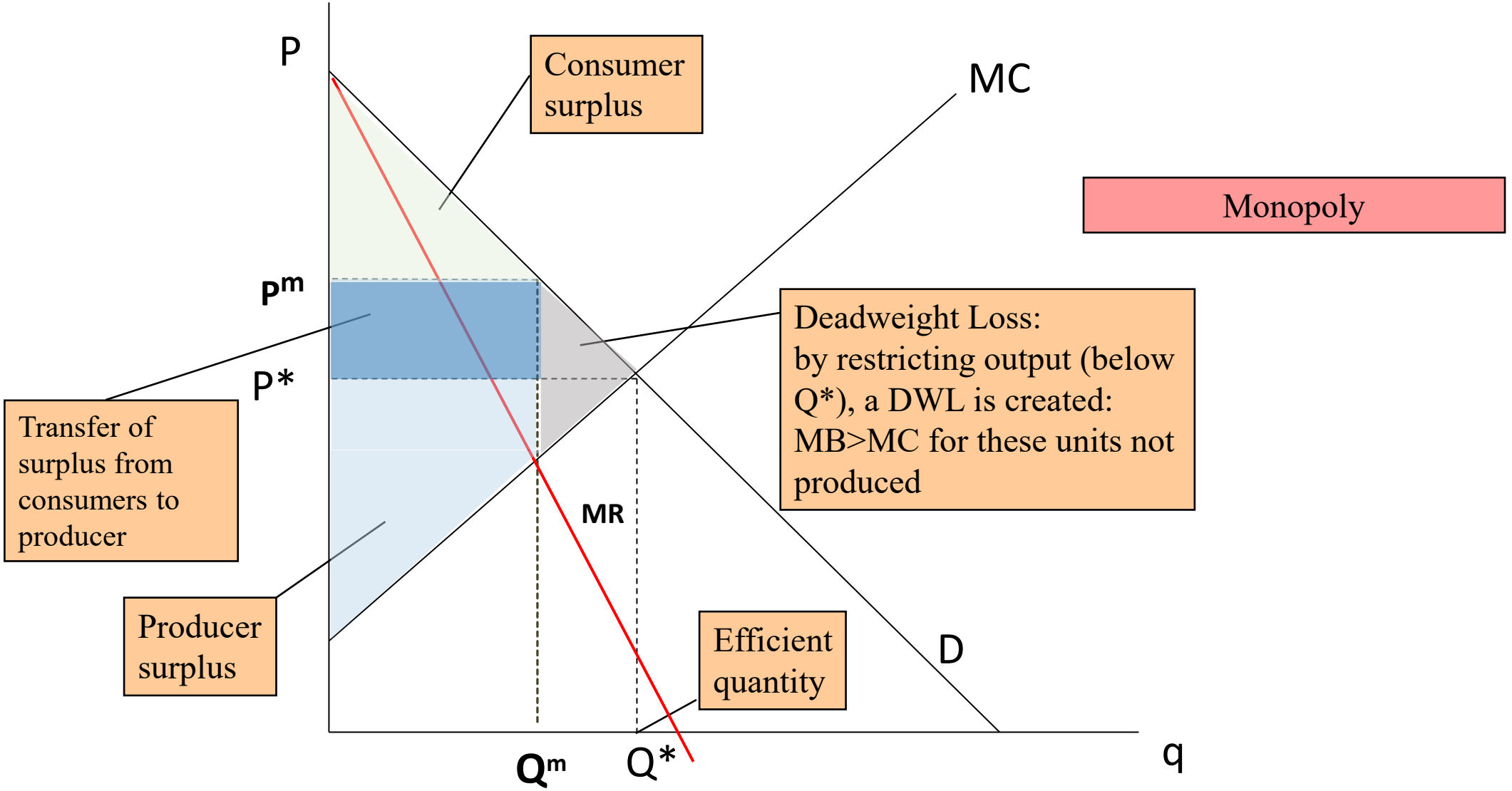
Maximum welfare in perfect competition



Welfare with a monopoly



Welfare loss of monopoly



Deadweight loss (DWL)

- Monopoly causes a deadweight loss because it **reduces output** from socially efficient level (not because it earns profits per se)
  - higher prices transfer surplus from consumers to producers
  - higher prices reduce output: this causes DWL
- A possible additional loss of a monopoly is rent seeking behaviour
  - e.g., bribing politicians to maintain government monopoly

Monopoly and Perfect Competition Compared

Perfect Competition

- a price taker
- produce where P = MC
- P = MR = MC
- no barriers to entry
- no economic profits (in LR)

Monopoly

- influences price (price maker)
- produces where MR = MC
- P > MC; P > MR
- barriers to entry
- restricts output, charges a higher price and can earn economic profits

Example of a monopoly problem

- Consider a monopolist whose demand curve and marginal cost are given by the below. Calculate the monopolist's price, quantity, profit and DWL.

$$Demand: \quad Q = 10 - \frac{P}{2}$$

$$Costs: \quad MC = 5 + Q$$

- How do you go about this problem?
  1. Draw the demand and MC curves
  2. In monopoly: monopolist produces Q^m to satisfy MR = MC (profit-maximisation)
     - Rewrite demand: P = f(Q), derive MR from this Demand curve + draw MR
     - Set MR = MC to find Q^m, P^m determined by demand curve + indicate on your figure
  3. DWL of monopoly?
     - = loss in welfare because of under- or overproduction relative to competitive market outcome
     - Indicate DWL in figure + calculate area

Example of a monopoly problem

- Consider a monopolist whose demand curve and marginal cost are given by the below. Calculate the monopolist's price, quantity, profit and DWL.

$$Demand: \quad Q = 10 - \frac{P}{2}$$

$$Costs: \quad MC = 5 + Q$$

1. Draw the demand and MC curves
2. **In monopoly: monopolist produces Q^m to satisfy MR = MC (profit-maximisation)**
   - P = 20 – 2Q, thus MR = 20 – 4Q
   - Profit-maximisaton: MR=MC, thus Q^m=3, P^m=14 + indicate on your figure
3. **DWL of monopoly?**
   - = loss in welfare because of under- or overproduction relative to competitive market outcome
   - Indicate DWL in figure: DWL = ½ * (P^m-MC) * (Q^*-Q^m)= 6. Loss in welfare because monopoly (market power) restricts output below efficient output (Q^*).

Alternative method profit maximisation

- Profit maximisation occurs when MC = MR

$$\pi(q) = q*P(q) - c(q)$$

where P(q) is the demand curve and c(q) is the cost curve

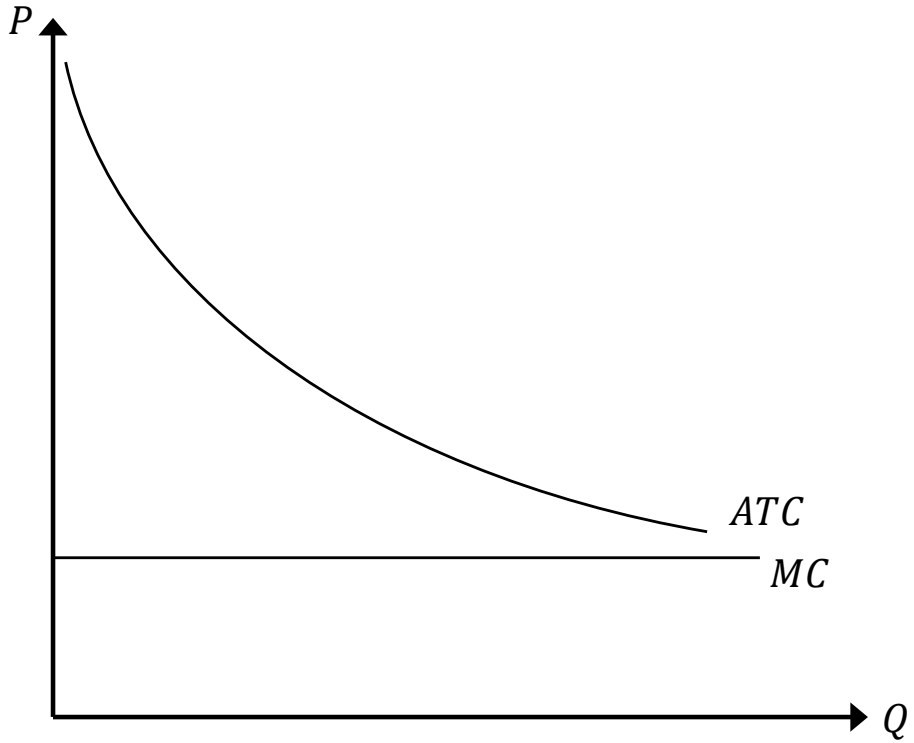
$$d\pi\ (q)/dq = 0$$

(also check the second-order condition)

Public policies towards monopolies

- Given it creates a DWL, governments might try to regulate a monopoly.
- Goal: Increase competition in monopolised industries
- Australian Competition and Consumer Commission (ACCC)
  - Cartels (price-fixing agreements) illegal
  - oppose mergers
  - misuse of market power
- Price regulation
  - Regulate price of a monopolist (typically monopolist with declining ATC – a 'natural monopoly')
  - Two basic forms: MC-price regulation; ATC-price regulation

An example of a natural monopoly



When a firm has a large fixed cost and a constant marginal cost, the average total cost curve will be downward sloping for all values of Q; this industry will be a natural monopoly.

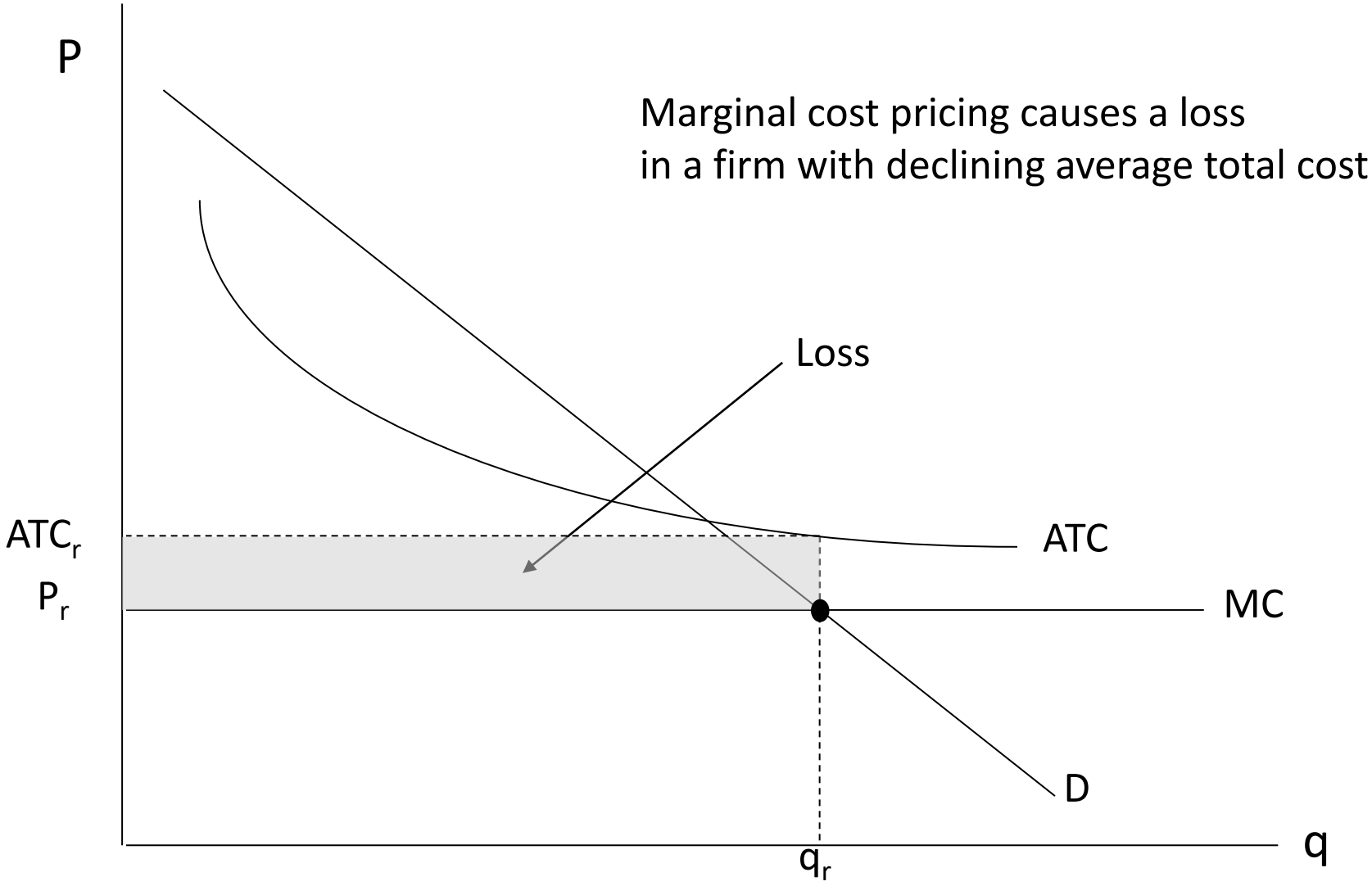
Marginal-cost price regulation

- Under marginal-cost price regulation, the government sets the monopoly price at **P=MC** (assuming constant MC for simplicity).
- This means that the DWL = 0.

- However, this means that the monopolist makes a **loss** equal to the grey-shaded area (that is, its fixed costs), and will exit the market when it can.

- To prevent this, the government will need to **subsidize** the monopolist that amount to prevent them from leaving the market,
  - These funds will typically have a DWL associated with them (from taxation).
  - Such a subsidy could also be politically unpopular.

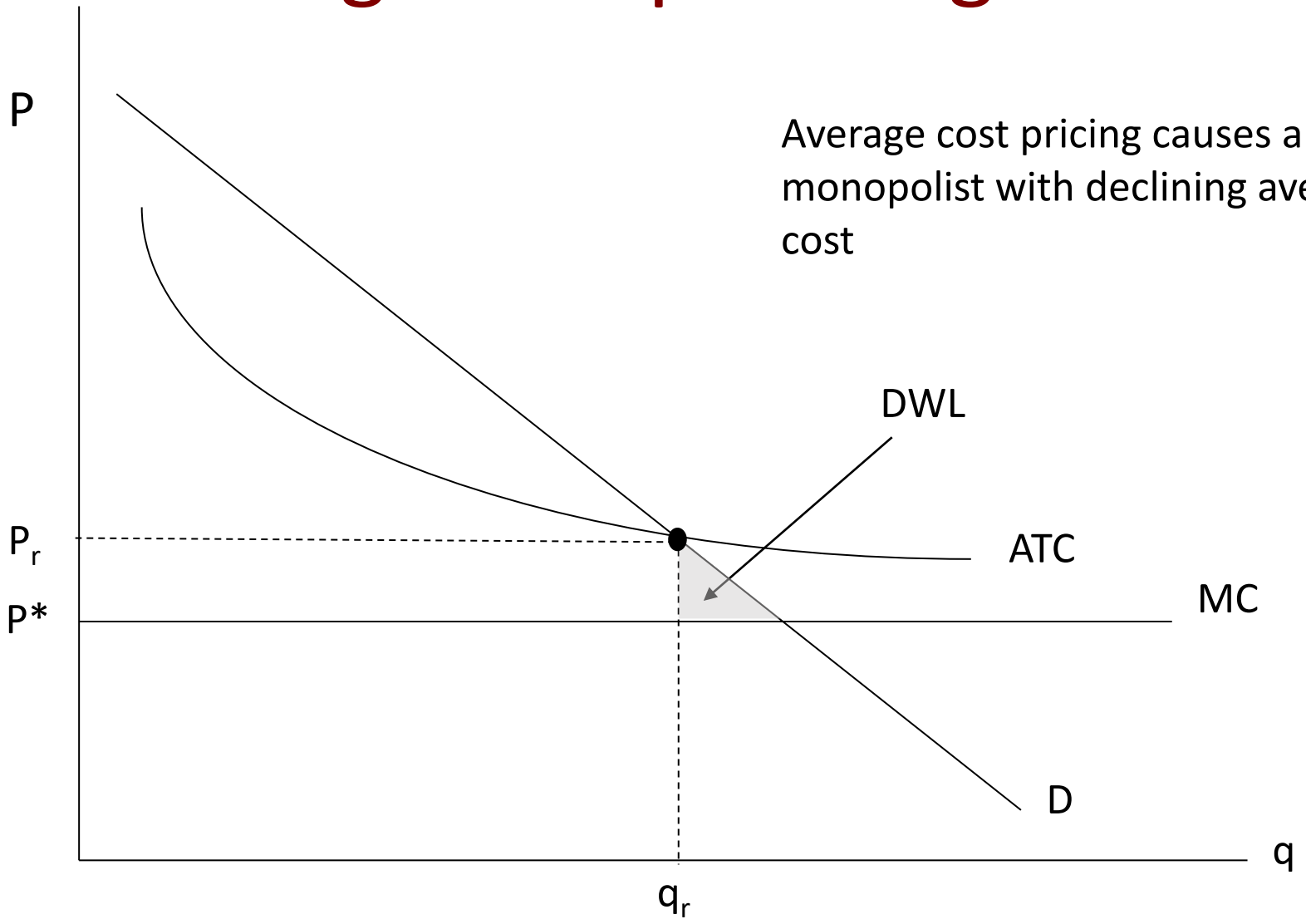
Marginal-cost price regulation



Average-cost price regulation

- Under average-cost price regulation, the government sets the monopoly price at **P= ATC**.
- However, the monopolist will produce less than the efficient quantity (the monopolist does not produce where MB = MC), so there is still **some DWL**.
- However, regulation typically **decreases DWL** relative to the situation with no regulation at all.

Average-cost price regulation



Public policies

- Problems with price regulations
  - MC pricing: if enforce marginal cost pricing monopolist makes a loss, monopolist requires a subsidy (DWL of tax)
  - ATC pricing, monopolist earns zero profit but there is a DWL in the market

- Public ownership
  - Can be difficult to implement
  - public ownership alters incentives for managers
    - motivation of private managers may differ from public managers (why?)
    - assess relative success of regulation vs. ownership

- Do nothing

Monopoly: key ideas

- A market with **a single seller** is a *monopoly*, and that seller is a *monopolist*.
- A monopolist will use its **market power** to charge higher prices in order to increase its profits
  - Downward sloping D-curve, profit-max (MR = MC) implies **restricting the quantity** traded below the efficient level: P > MC
  - As well as increasing profits, this has implications of overall welfare; there is potential for a market failure (a **deadweight loss**)
- **Regulations** are possible, but are unlikely to eliminate any DWL and can raise their own problems
  - Preventative regulation – trying to limit scope of monopolies/banning cartels; or ex post regulation, such a price regulation
- A monopolist might be able to increase profits further by tailoring prices to specific consumers based on their valuations for the product; this is called **price discrimination**.

Price discrimination

- Consider how a monopolist tries to **avoid the 'price effect'** of reducing prices to all consumers to sell extra output
- **What?** Charging a different price for different units of output *(unrelated to cost of production)*
- **Goal**: to convert consumer surplus into economic profit for the firm.
- **How?** The key intuition behind price discrimination is sell to consumers with a lower valuation for the product, while still charging a higher price to customers with a higher willingness to pay. If a monopolist can do this it can increase profits.
- **More on this next week!**