Perfect Competition
EE311

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Perfectly Competitive Markets

- The model of perfect competition can be used to study a variety of markets (Agricultural products, stock market, exchange rate)
- Basic assumptions of Perfectly Competitive Markets
  - Many small firms -->Price taking
  - Product homogeneity
  - Free entry and exit
  - Perfect information

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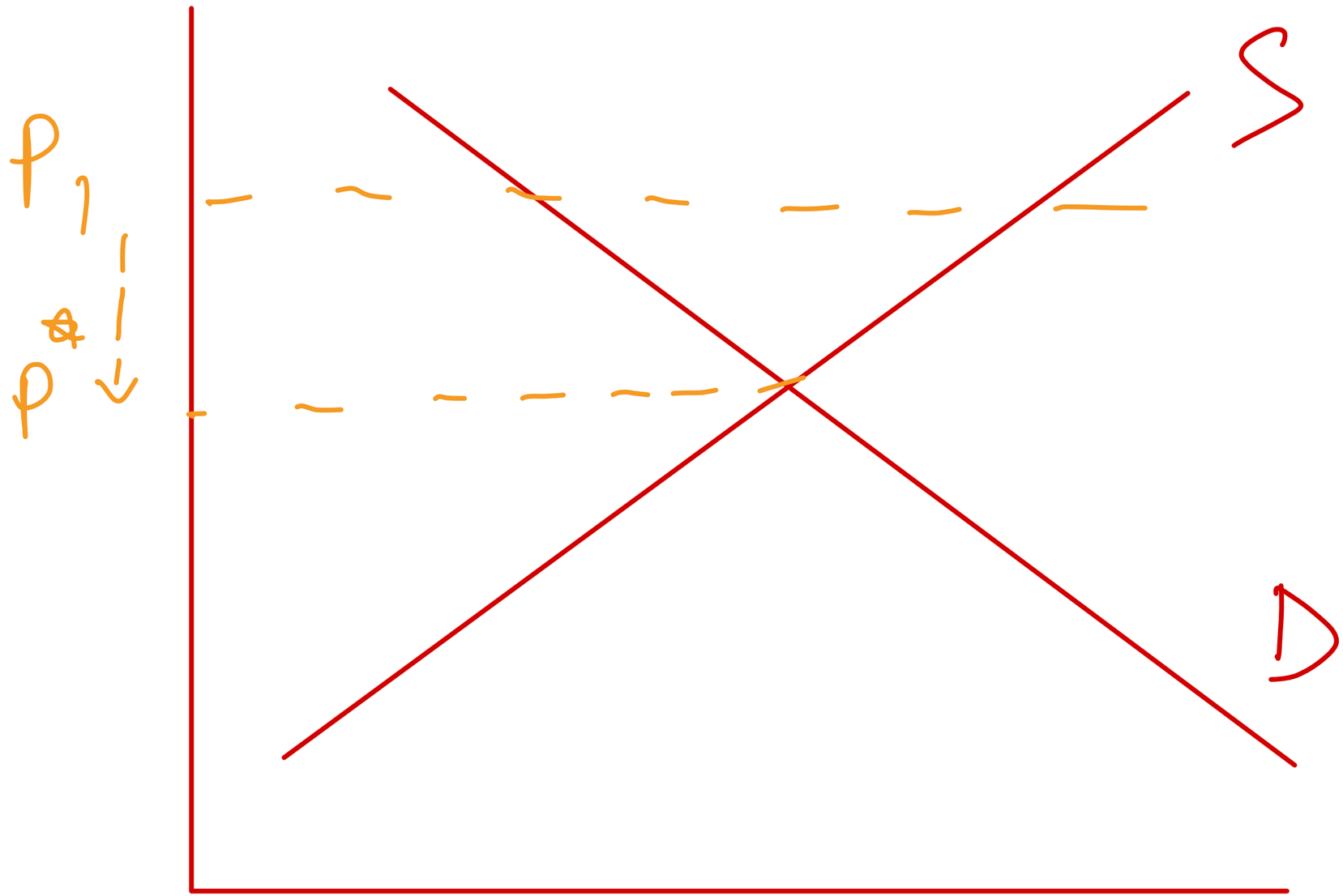
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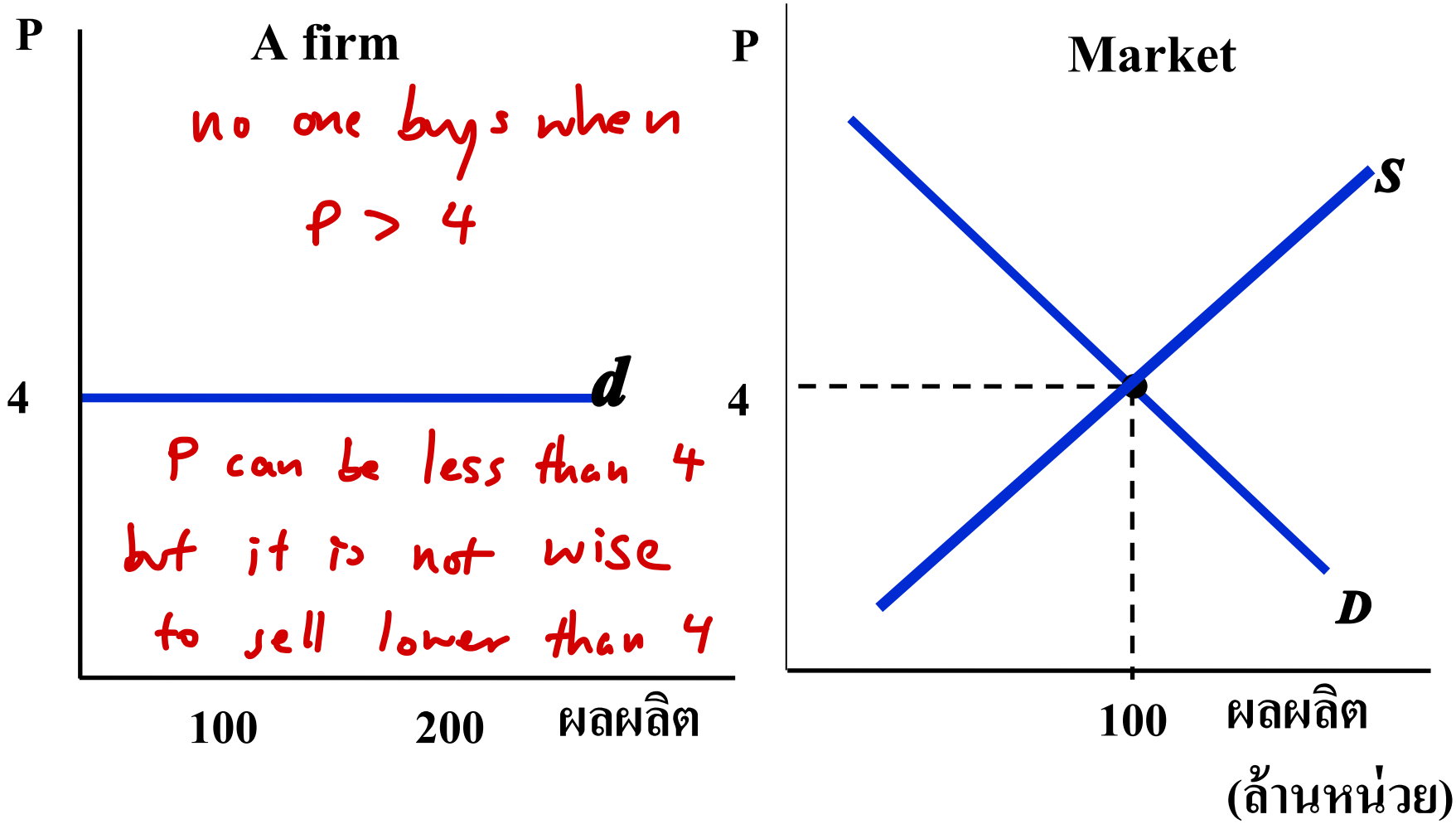
Perfectly Competitive Markets

1. Price Taking
   - The individual firm sells a very small share of the total market output and, therefore, cannot influence market price.
   - Each firm takes market price as given – price taker
   - The facing demand curve of each firm is horizontal.

Facing demand curve for a competitive firm



Perfectly Competitive Markets

2. Product Homogeneity

- The products of all firms are perfect substitutes.
- Product quality is relatively similar as well as other product characteristics including location
- Example: Agricultural products, copper ore, lumber
- Heterogeneous products, such as brand names, can charge higher prices because they are perceived as better

A

B

Shrine

Perfectly Competitive Markets

3. Free Entry and Exit

- When there are no special costs that make it difficult for a firm to enter (or exit) an industry (no laws or regulations, free factor mobility)
  - Buyers can easily switch from one supplier to another.
  - Suppliers can easily enter or exit a market.
    - Pharmaceutical companies not perfectly competitive because of the large costs of R&D required

Perfectly Competitive Markets

4. Perfect Information

- No information cost for buyers and sellers
- Perfect information and homogenous products imply one market price.
- Perfect information and free entry and exit imply zero profit in the long run.
  - Excess profits attract new entry which increases market supply. Price is then decreased until profit is zero.
  - Losses force firms to exit which decreases market supply. Price is then increased until profit is zero.

Profit Maximization

- We can study profit maximizing output for any firm whether perfectly competitive or not
  - Profit (π) = Total Revenue - Total Cost
  - If q is output of the firm, then total revenue is price of the good times quantity
  - Total Revenue (TR) = TR(q)

Profit Maximization

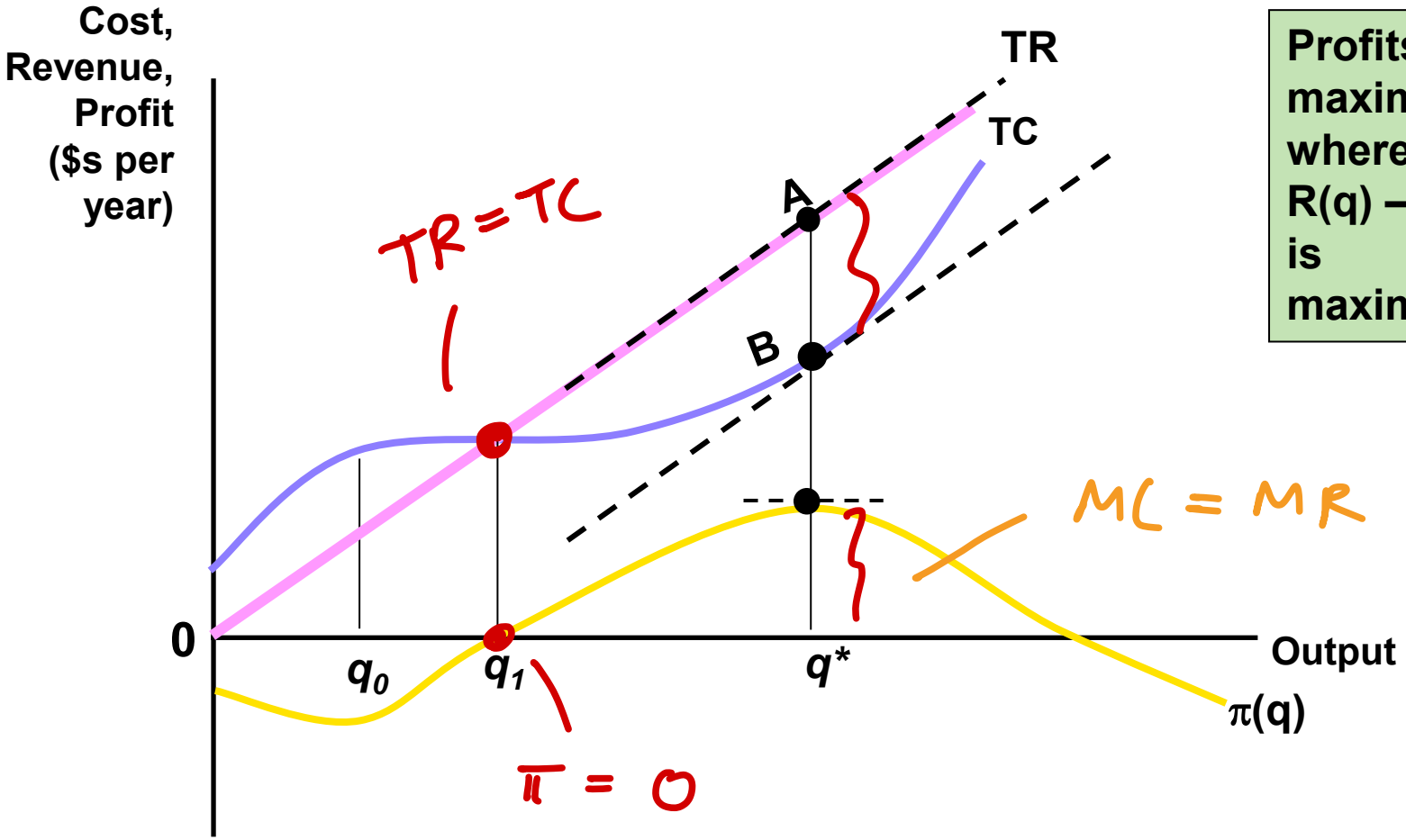
- Costs of production depends on output
  - Total Cost (TC) = TC(q)
- Profit for the firm, π, is difference between revenue and costs

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

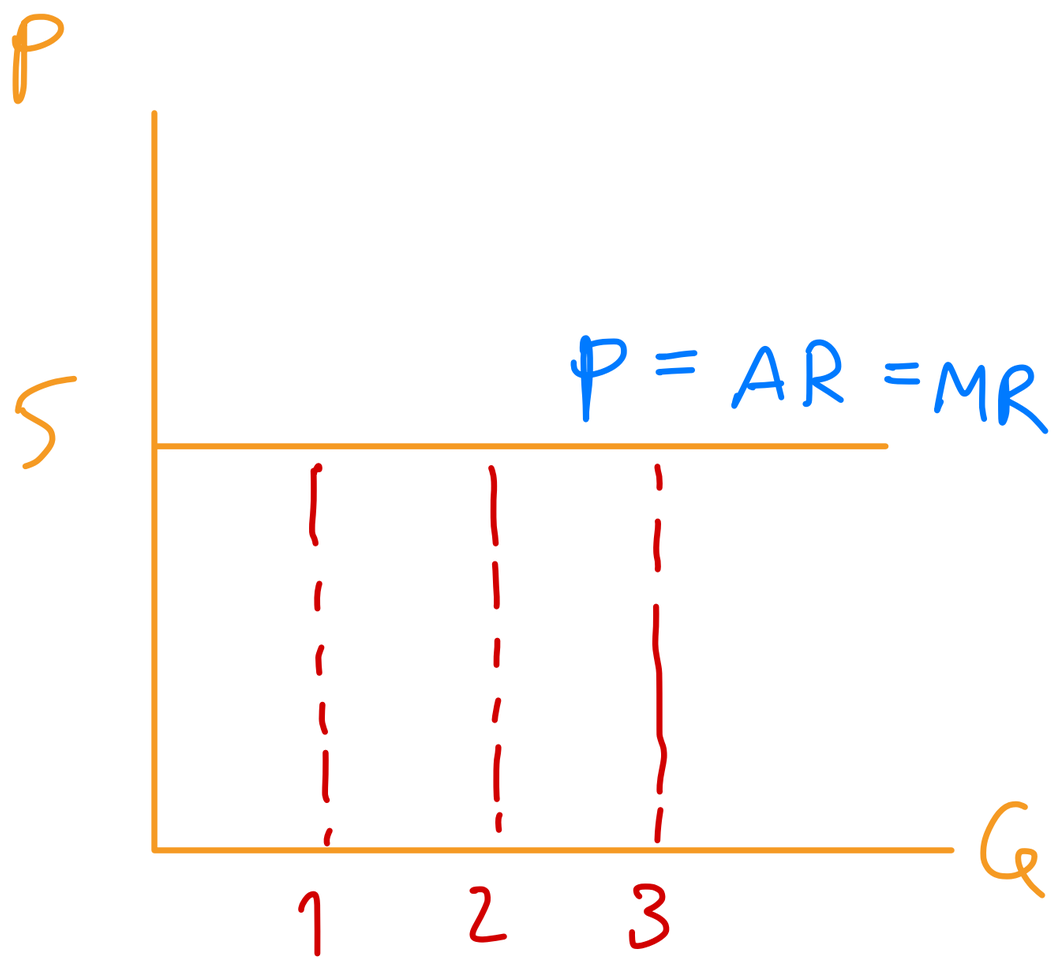
- Firm selects output to maximize the difference between revenue and cost

Profit Maximization – Short Run

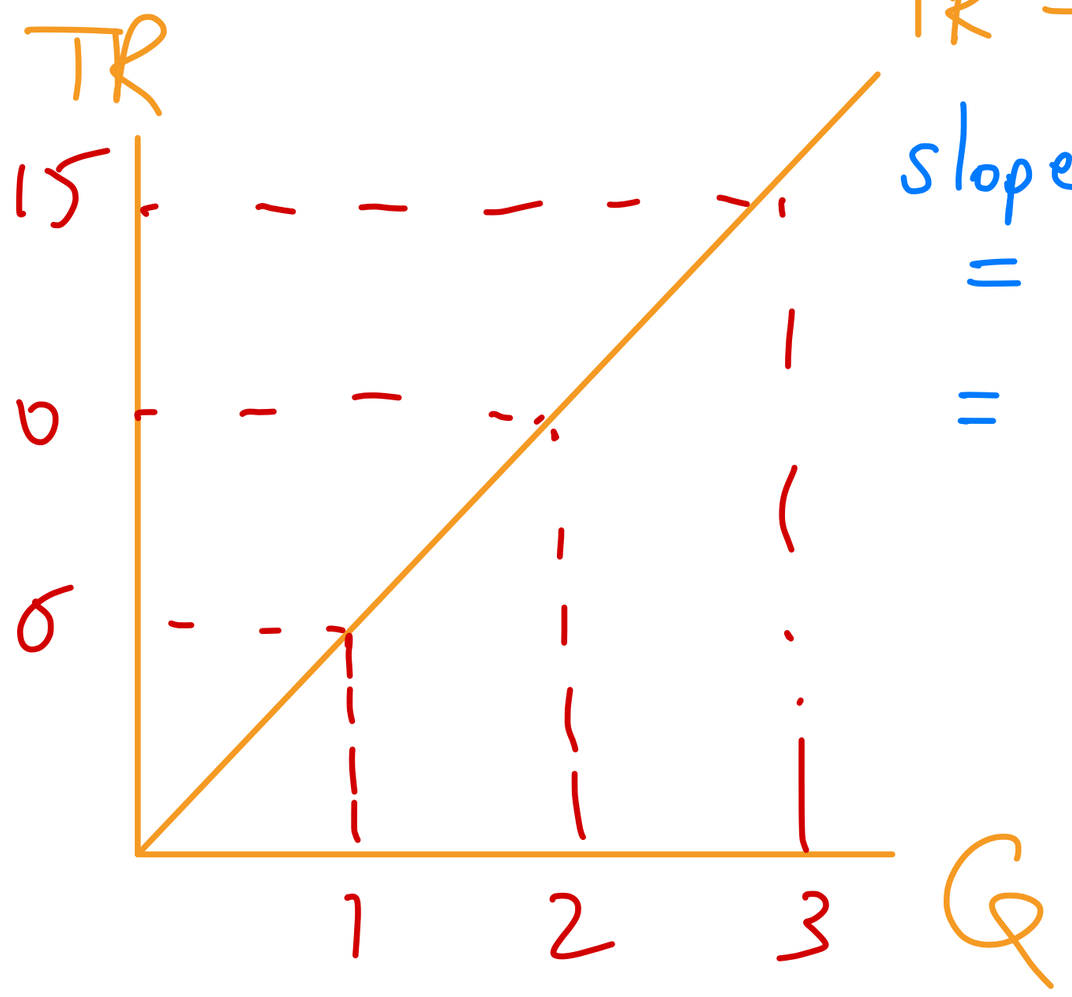
Profits are maximized where MR (slope at A) and MC (slope at B) are equal or slope of $\pi(q) = 0$



Profits are maximized where R(q) – C(q) is maximized



demand curve for individual firm



$$TR = P \times Q$$

P is constant in Perfect C.

$$AR = \frac{TR}{Q} = \frac{P \times Q}{Q} = P$$

$$MR = \frac{dTR}{dQ} = \frac{d(\overbrace{P}^{\text{constant}} \times Q)}{dQ}$$

$$MR = P\frac{dQ}{dQ} = P$$

Profit Maximization

- If the producer tries to raise price, sales are zero.
- Profit is negative to begin with since revenue is not large enough to cover fixed and variable costs
- As output rises, revenue rises faster than costs increasing profit
- Profit increases until it is maxed at q*
- Profit is maximized where MR = MC or where slopes of the TR(q) and TC(q) curves are equal

Profit Maximization

- Profit is maximized at the point at which an additional increment to output leaves profit unchanged

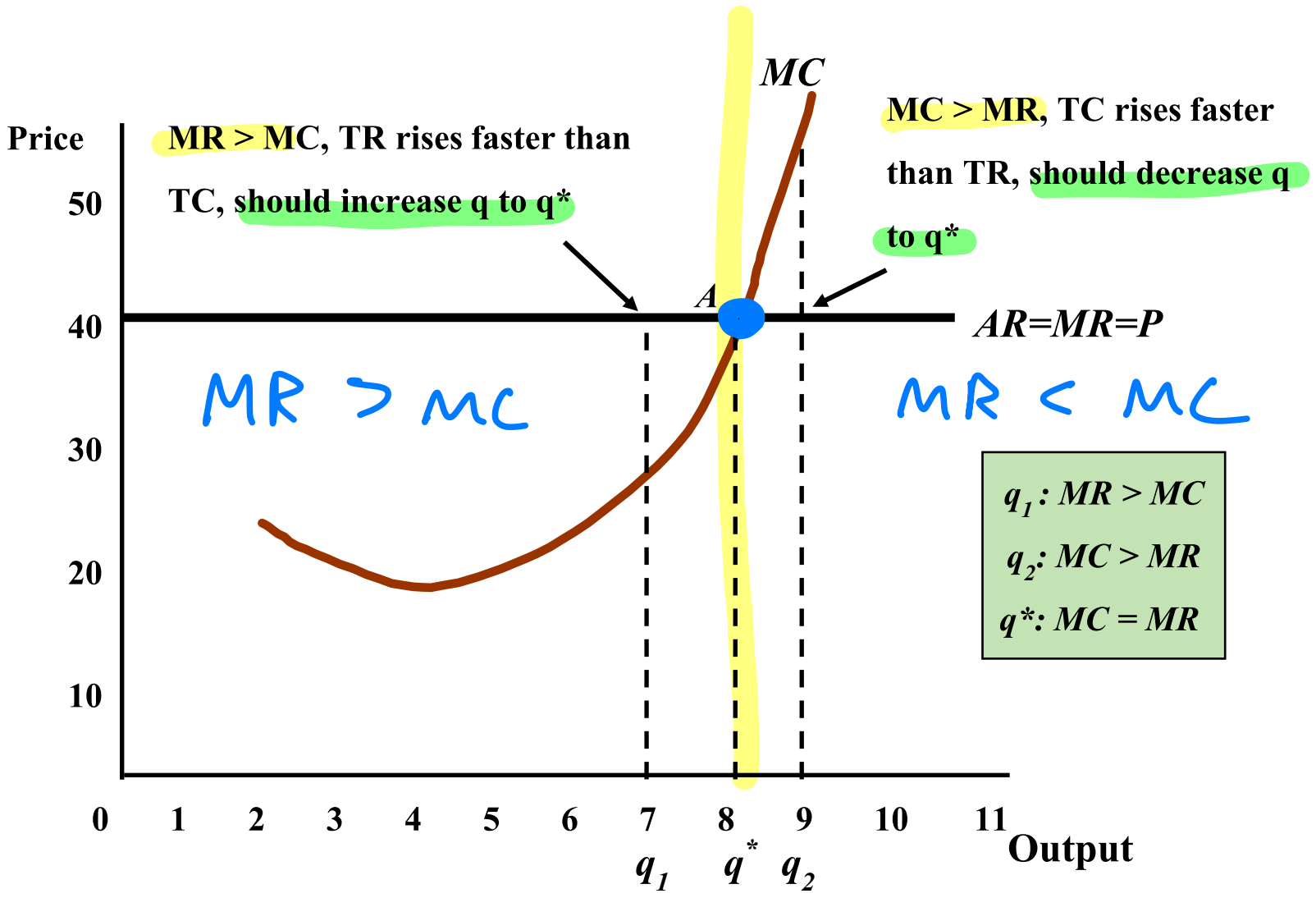
$$\text{Max } \pi = TR - TC$$

$$\frac{d\pi}{dq} = \frac{dTR}{dq} - \frac{dTC}{dq} = 0$$

$$= MR - MC = 0$$

$$MR = MC$$

Profit Maximization: MR = MC



Q	MR	MC	marginal profit	total profit
1st	10	4	+ 6	6
2nd	10	6	+ 4	10
3rd ✓	10	8	+ 2	12
4th	10	10.5	-0.5	11.5
5th	10	12	-2	9.5

MR : extra revenue from extra unit sold

MR = 4 : Q ↑ 1 unit → TR ↑ 4 units

MC : extra cost from extra unit sold

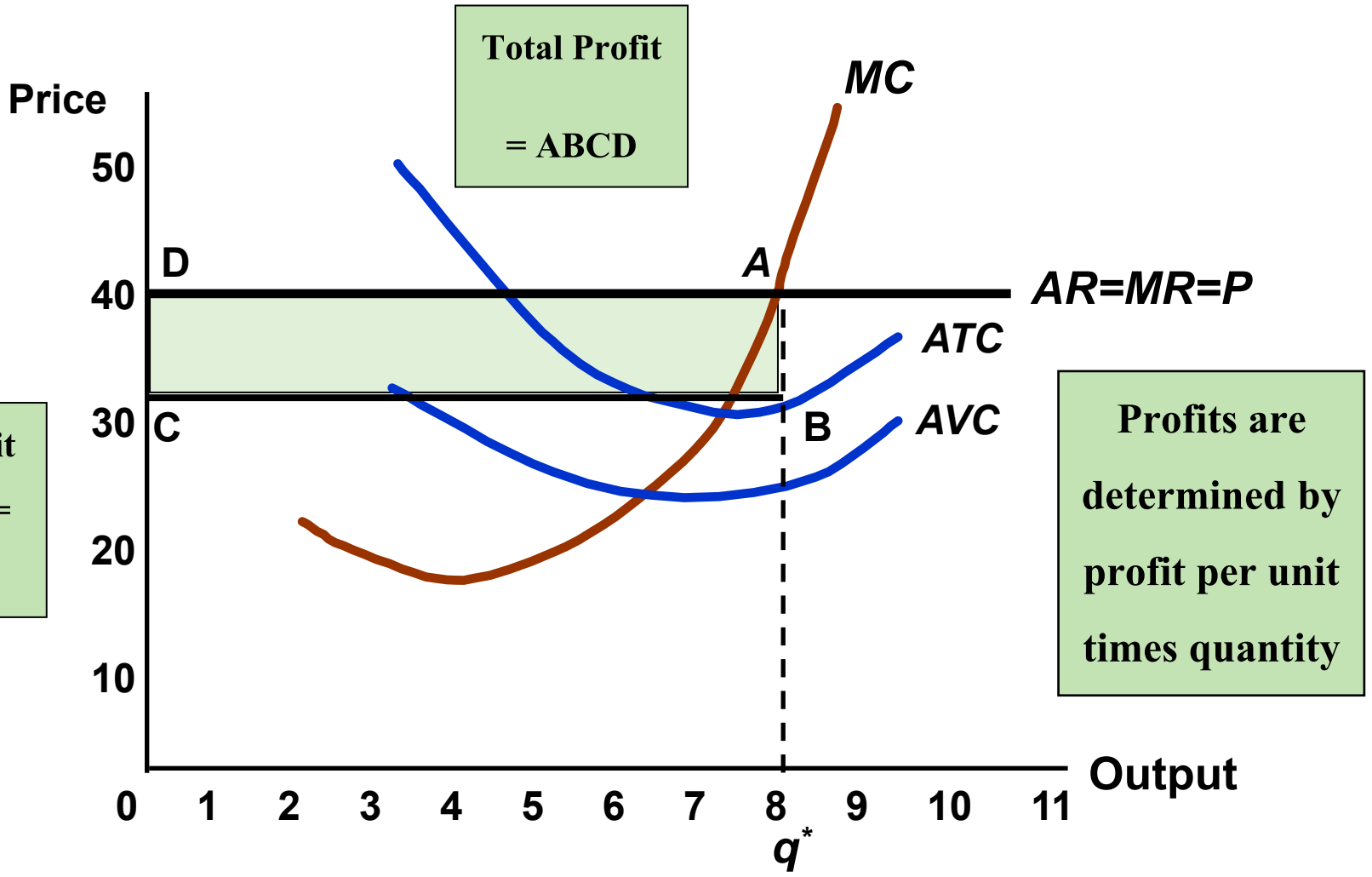
MC = 2 : Q ↑ 1 unit → TC ↑ 2 units

Profit Max : produce as long as MR ≥ MC

Choosing Output: Short Run

- The point where MR = MC, the profit maximizing output is chosen
  - MR=MC at quantity, q*, of 8
  - At a quantity less than 8, MR > MC so more profit can be gained by increasing output
  - At a quantity greater than 8, MC > MR, increasing output will decrease profits

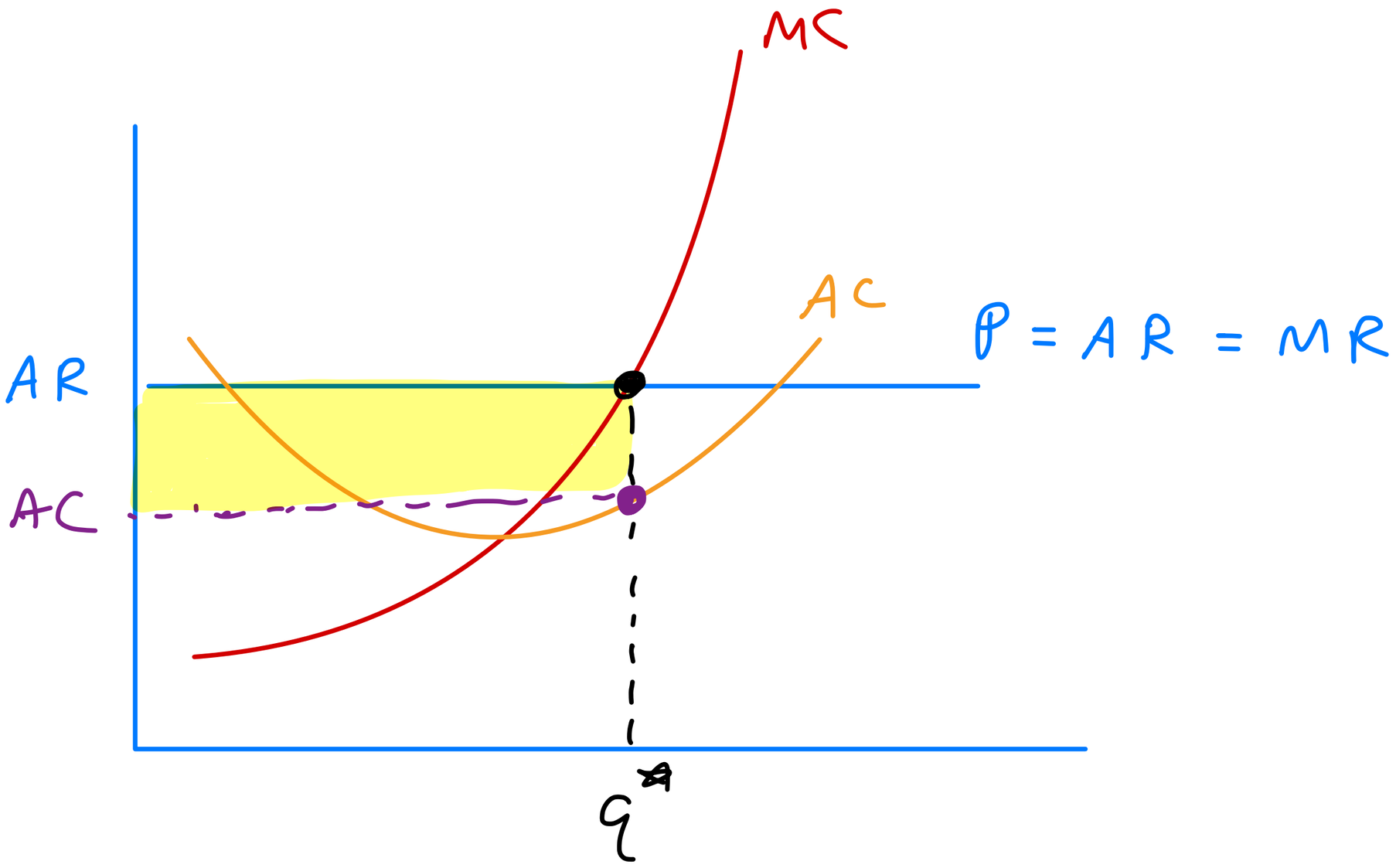
Choosing output: Positive Profits



Profit per unit = P - AC(q) = A to B

Profits are determined by profit per unit times quantity

Profit-Making Perfect Comp.



$$\text{Profit} = TR - TC$$

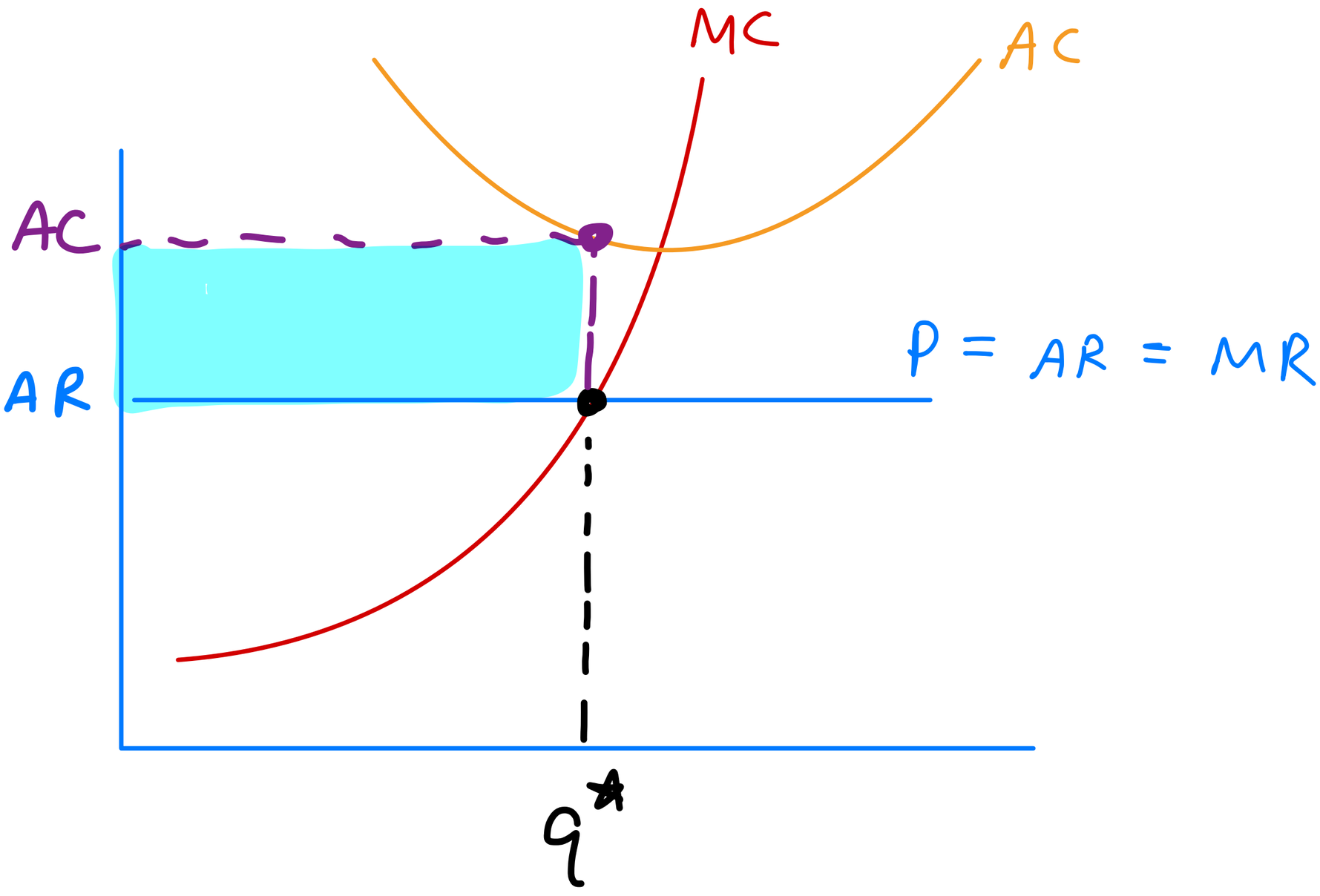
$$= (AR - AC) \times Q$$

$$= P$$

$$AR = \frac{TR}{Q} \qquad AC = \frac{TC}{Q}$$

Loss - Making Perfect Comp.

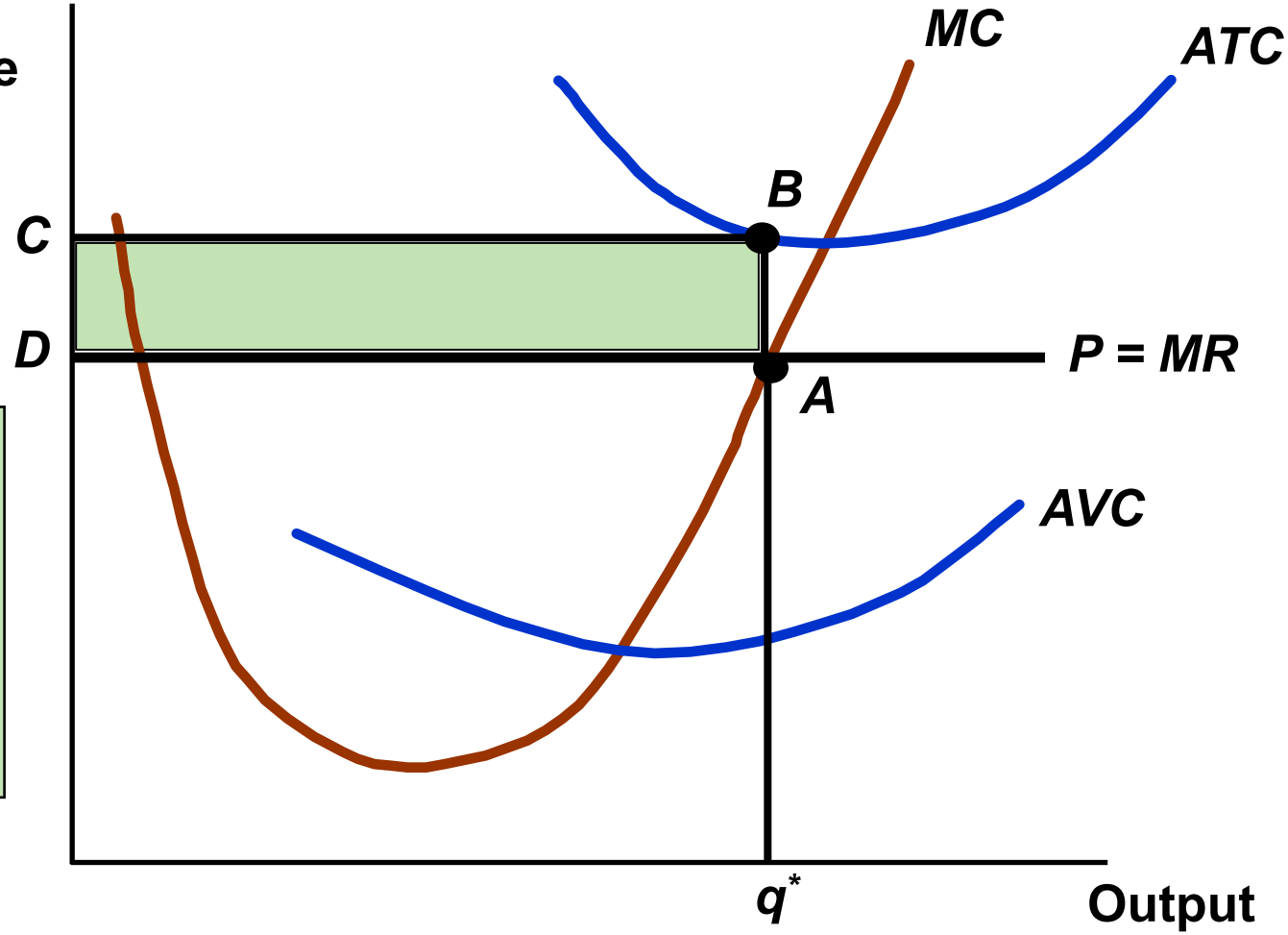
$\pi < 0$



Choosing output: Losses

- A firm does not always make profits
- It is possible for a firm to incur losses if the P < AC at the profit maximizing quantity
  - Still measured by profit per unit times quantity
  - Profit per unit is negative (P – AC < 0)

Choosing output: Losses



At q^*: MR = MC
and P < ATC
Losses =
(P- AC) x q^*
or area ABCD

Choosing output: Losses

- Why would firm produce at a loss?
  - Might think price will increase in near future
  - Shutting down and starting up could be costly
  - The loss may be smaller than when shut down
- Firm has two choices in short run when making loss
  - Continue producing
  - Shut down temporarily
  - Will compare profitability of both choices

Shutdown Conditions

In SR, firms shut down when

$$P < AVC$$

(avg. variable cost)

In LR, firms shut down when

$$P < AC$$

(avg. cost)

SR shutdown : $P < AVC$

$P = 50$ $AVC = 70$ { milk, sugar, cream }

→ each unit sold makes firm incur more loss of 20

When AVC = 30, firm makes profit
50 - 30 = 20 for each unit sold

$$\pi_{SR} = TR - TC$$

$$= P \times Q - FC - VC$$

$$= P \times Q - FC - AVC \times Q$$

$$\pi_{SR} = -FC + \underbrace{(P - AVC) \times Q}$$

e.g. rent

money made from each unit sold

$$\pi_{SR} = -FC + (P - AVC) \times Q$$

if $P < AVC$, $(P - AVC) < 0$

to max π or min loss

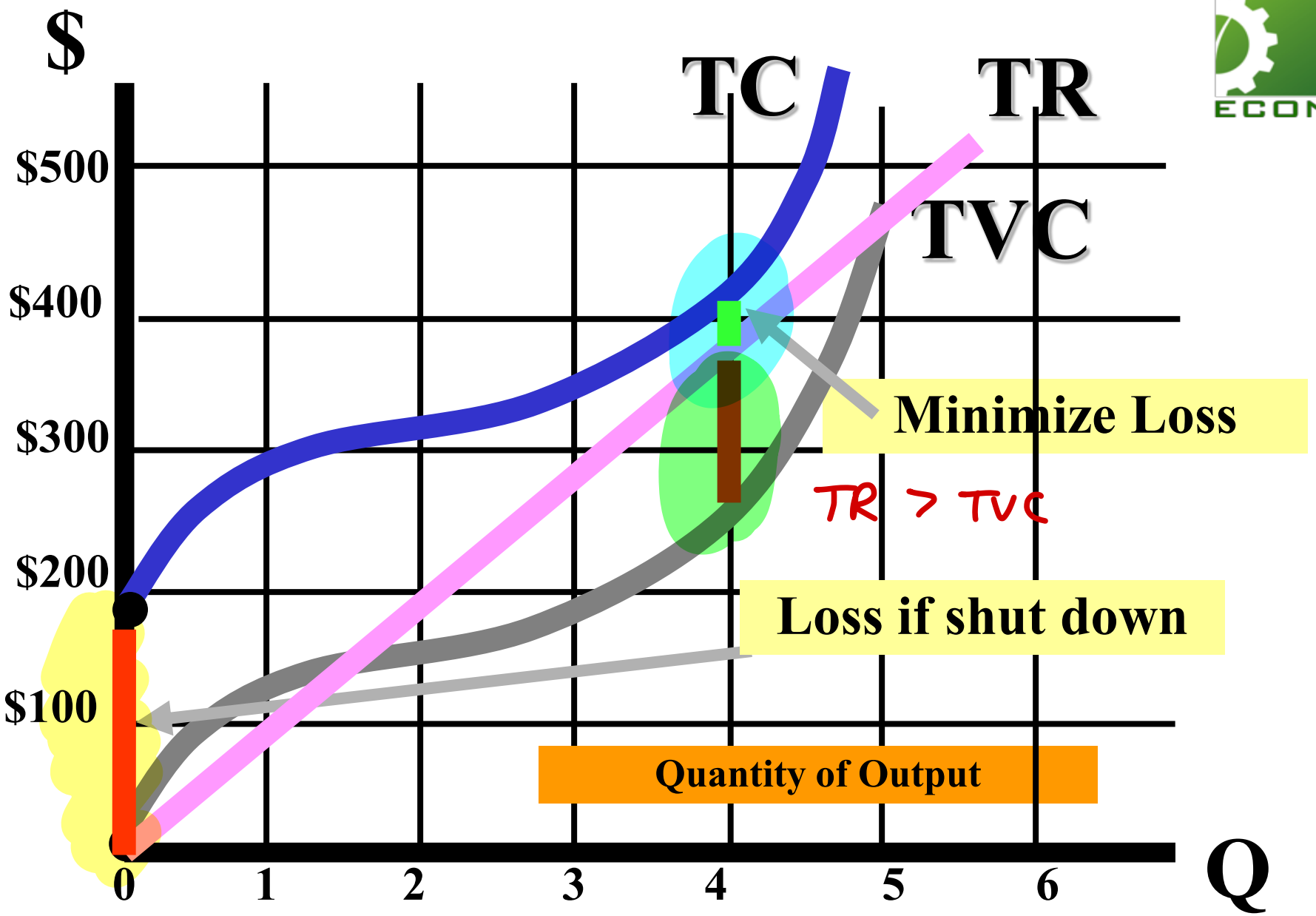
$\rightarrow$ $Q^* = 0$ $\rightarrow$ $\pi = -FC < 0$

if $P > AVC$, $(P - AVC) > 0$

to max π or min loss

$\rightarrow$ $Q^* > 0$ $\rightarrow$ $\pi =$

$$\pi_{SR} = -FC + (P - AVC) \times Q > -FC$$


$
TC
TR
TVC
$500
$400
$300
$200
$100
Minimize Loss
TR > TVC
Loss if shut down
Quantity of Output
0
1
2
3
4
5
6
Q

Diagram

1) TC > TR for all Q → making loss

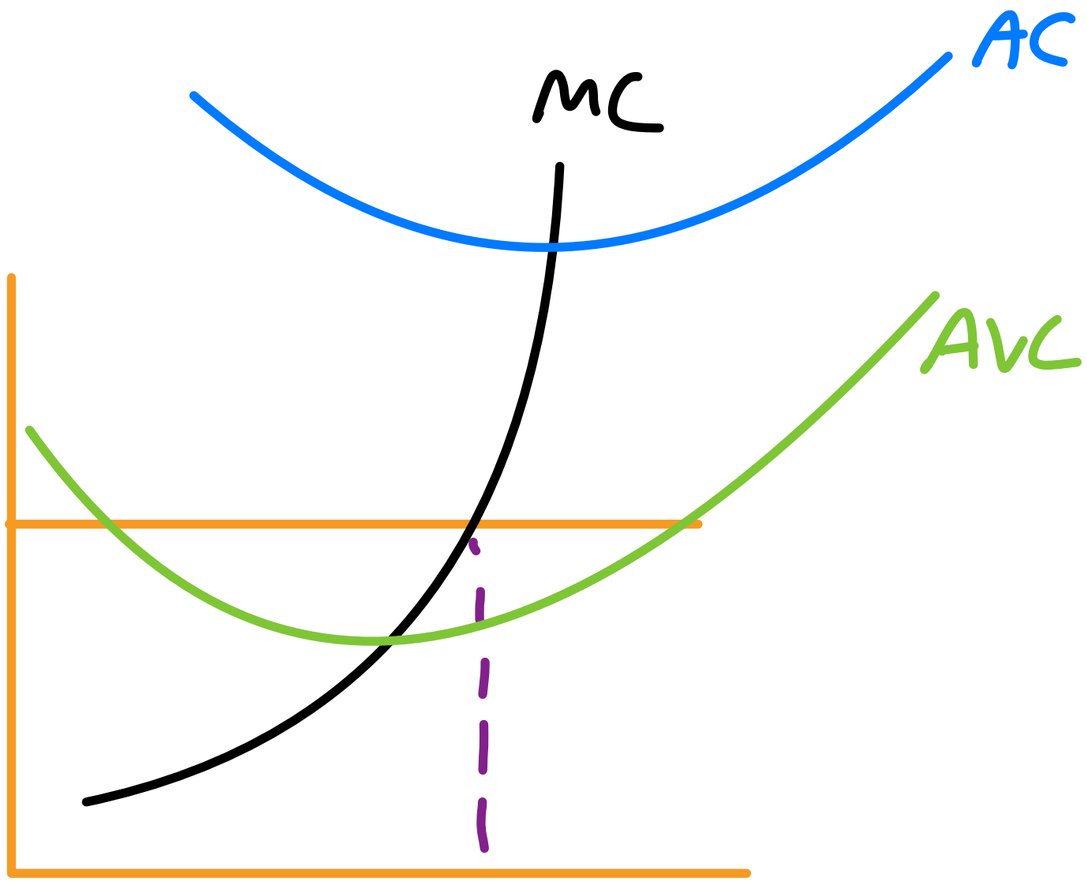
2) 2 choices

- shutdown ($Q = 0$) → high loss ≈ 180
- continue to operate → minimized loss ≈ 20

($Q^* = 4$)

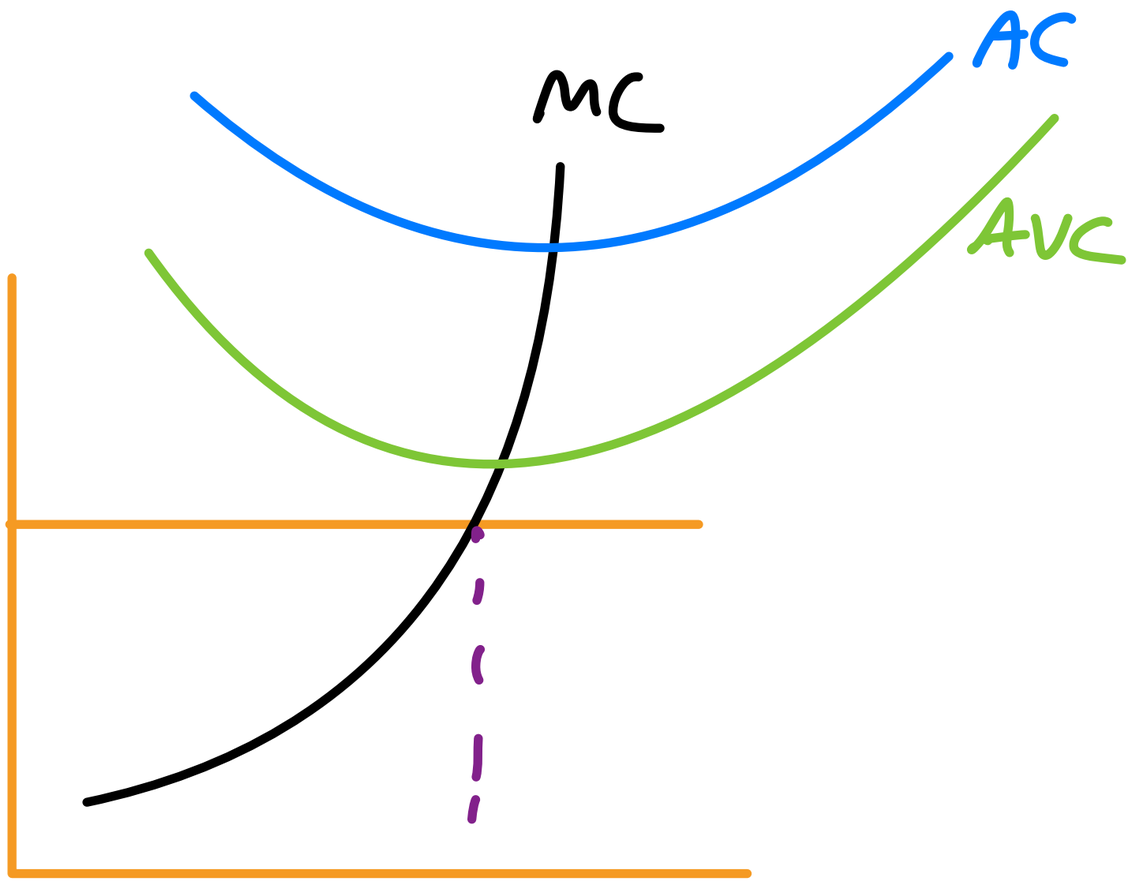
at $Q^* = 4$, firms make enough money to cover variable cost (TR − VC) and can use this money to pay for fixed cost.

★ loss is now minimized ★



P < AVC

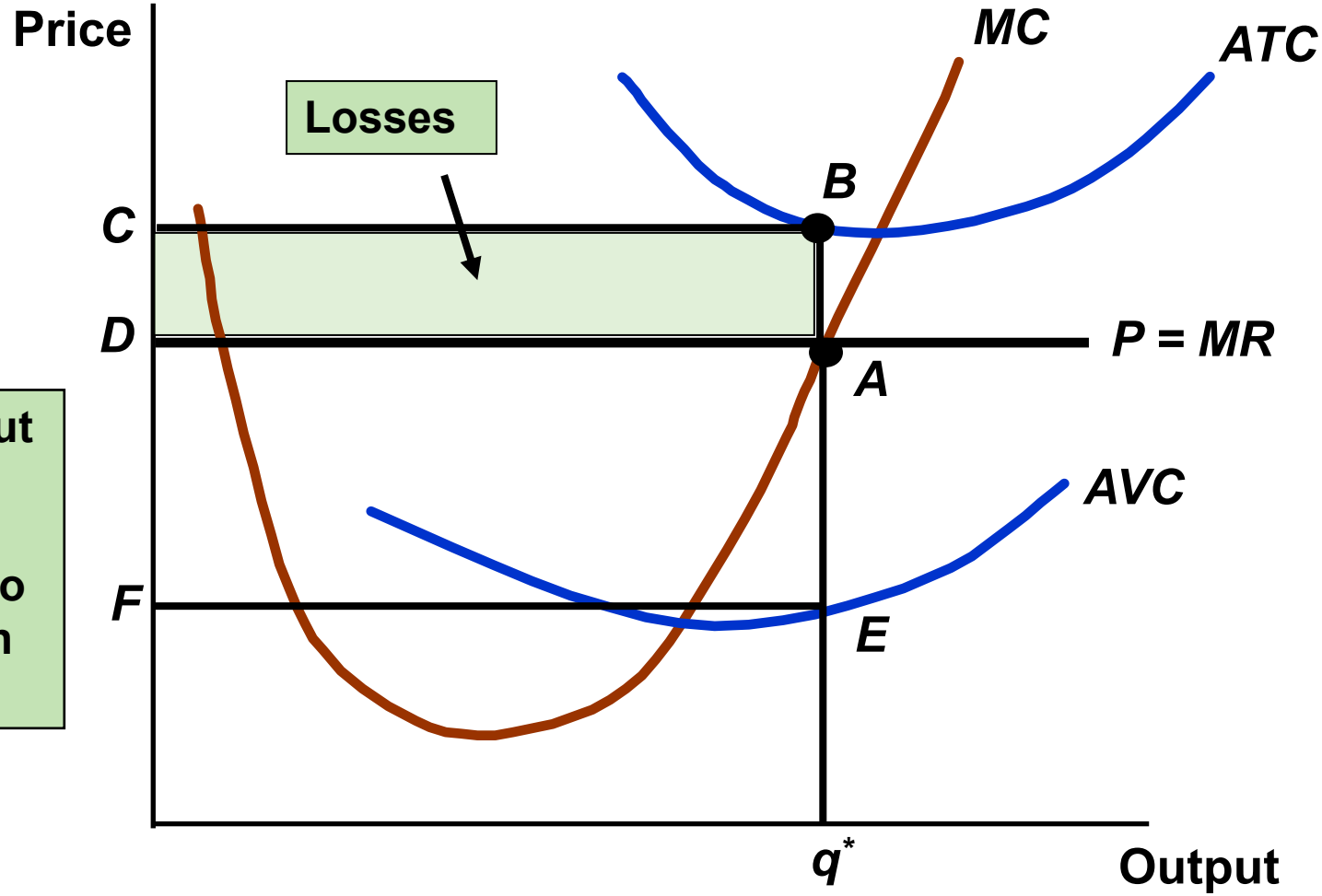
continue to operate in SR



P < AVC

shutdown in SR

Choosing output: Losses but should operate



P < ATC but > AVC so firm will continue to produce in short run

When should the firm shut down?

Operate: net revenue = PQ – TVC – TFC.

Shut down: net revenue = – TFC .

It should operate if PQ – TVC – TFC > – TFC

$$PQ - TVC > 0$$

or

$$TR > TVC$$

$$P > AVC$$

It should shut down if P ≤ minimum AVC

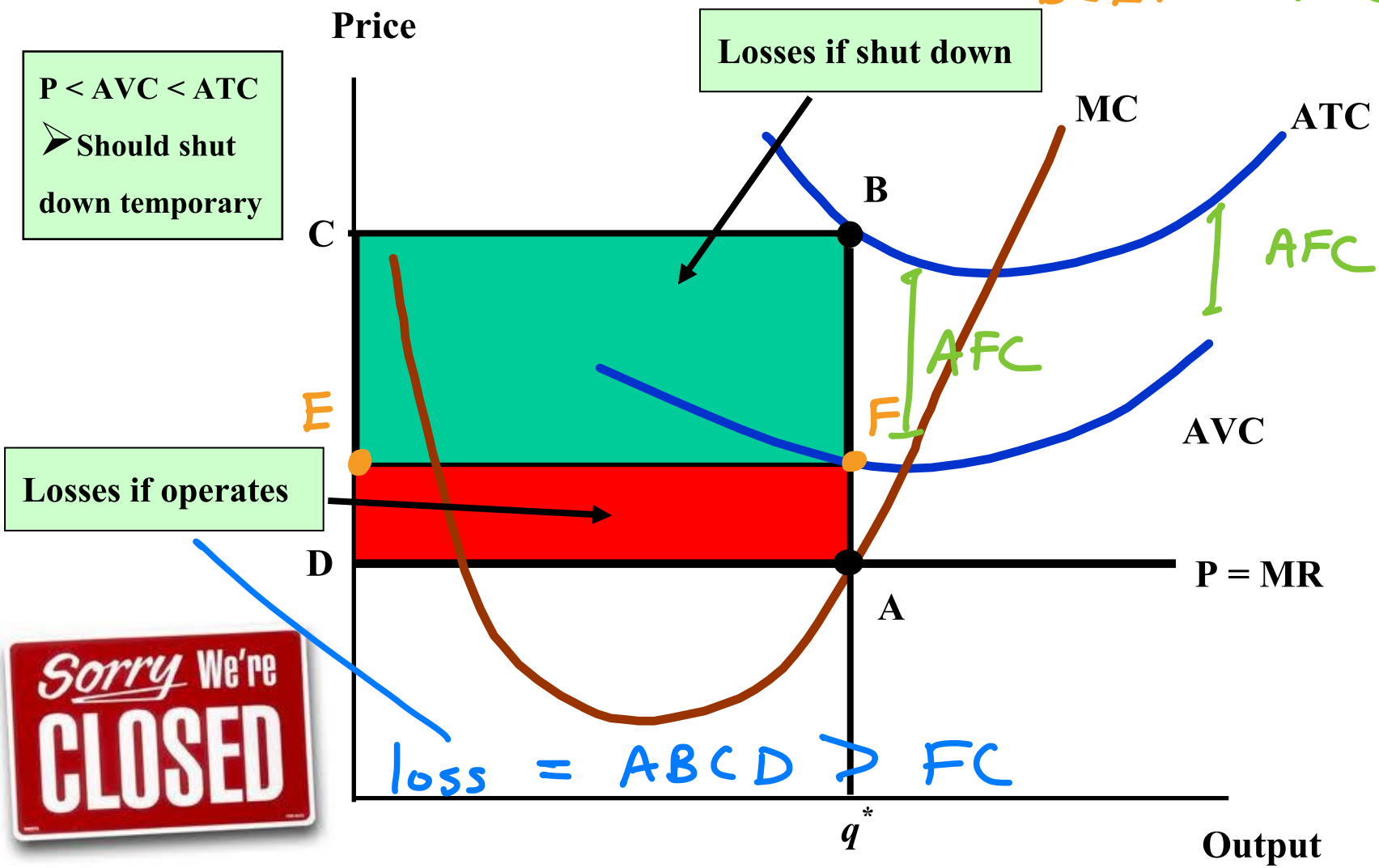
When should the firm shut down?

- When should the firm shut down?
  - If AVC < P < ATC the firm should continue producing in the short run
    - Can cover all of its variable costs and some of its fixed costs
  - If P < AVC < ATC the firm should shut-down.
    - Can not cover even its variable costs

Choosing output: Losses and should shut down

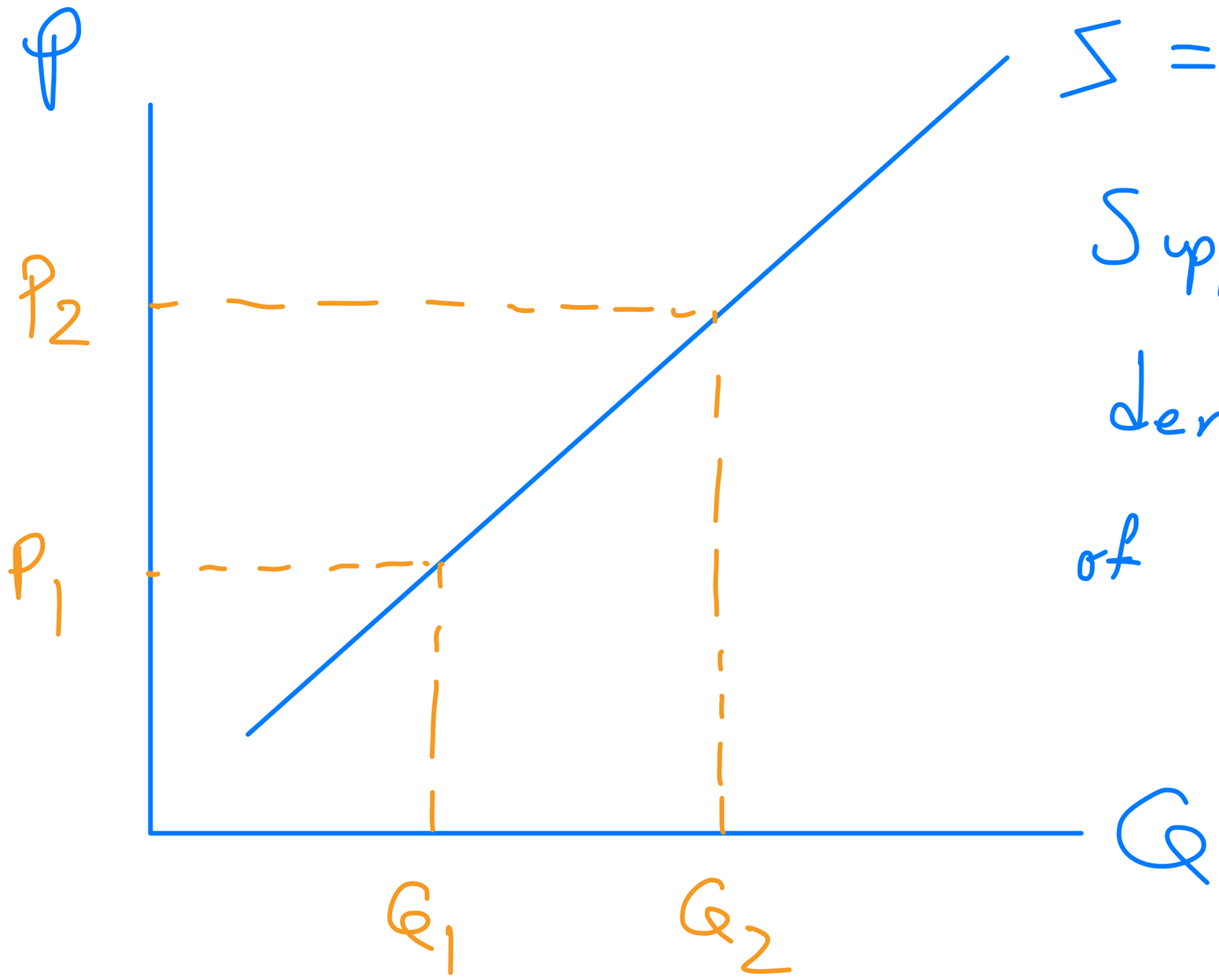
= FC = BCEF = AFC x Q

P < AVC < ATC
➢ Should shut down temporary



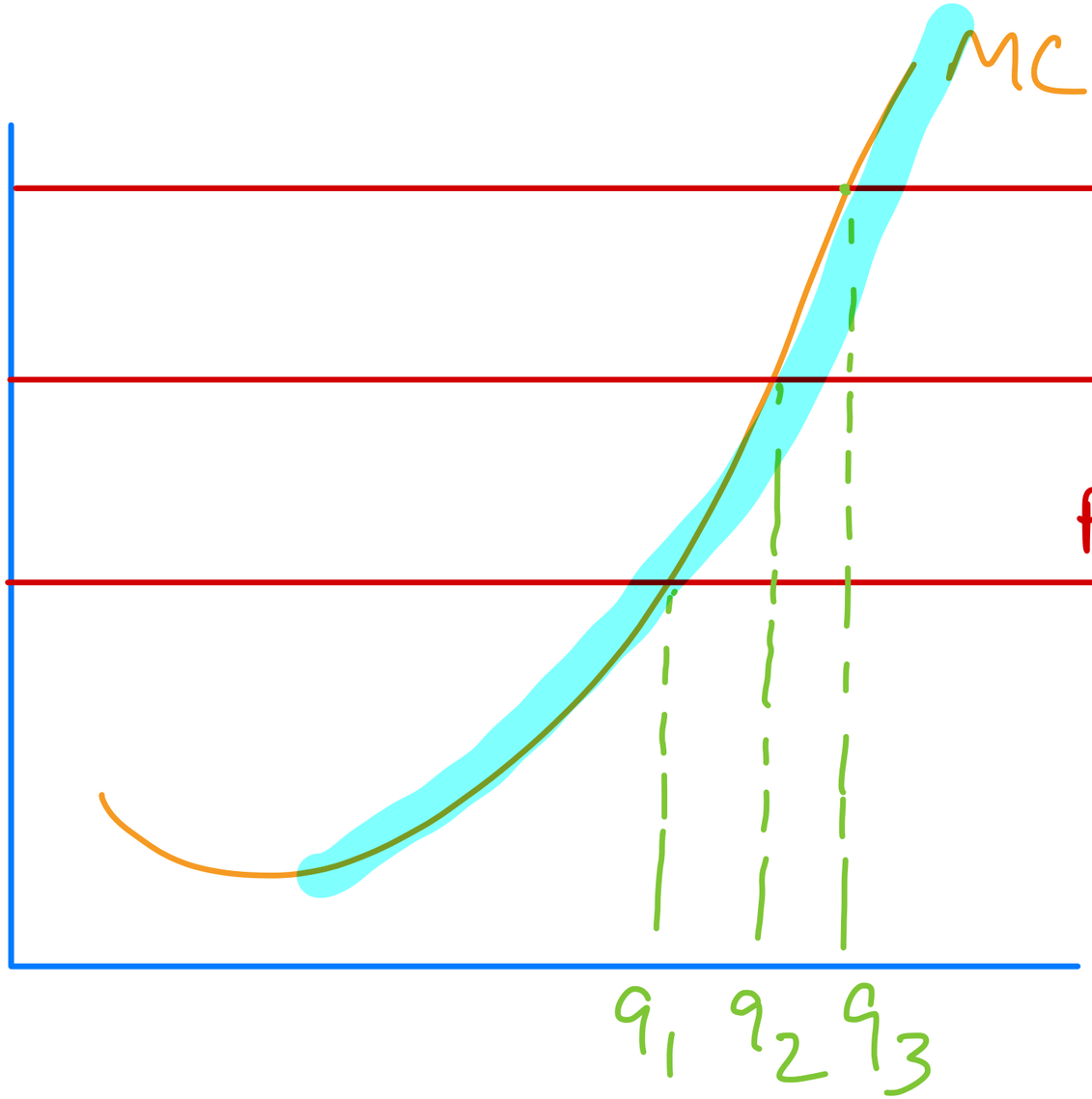
Competitive Firm – Short Run Supply

- Supply curve tells how much output will be produced at different prices
- Competitive firms determine quantity to produce where P = MC
  - Firm shuts down when P < AVC
- Competitive firms supply curve is portion of the marginal cost curve above the AVC curve



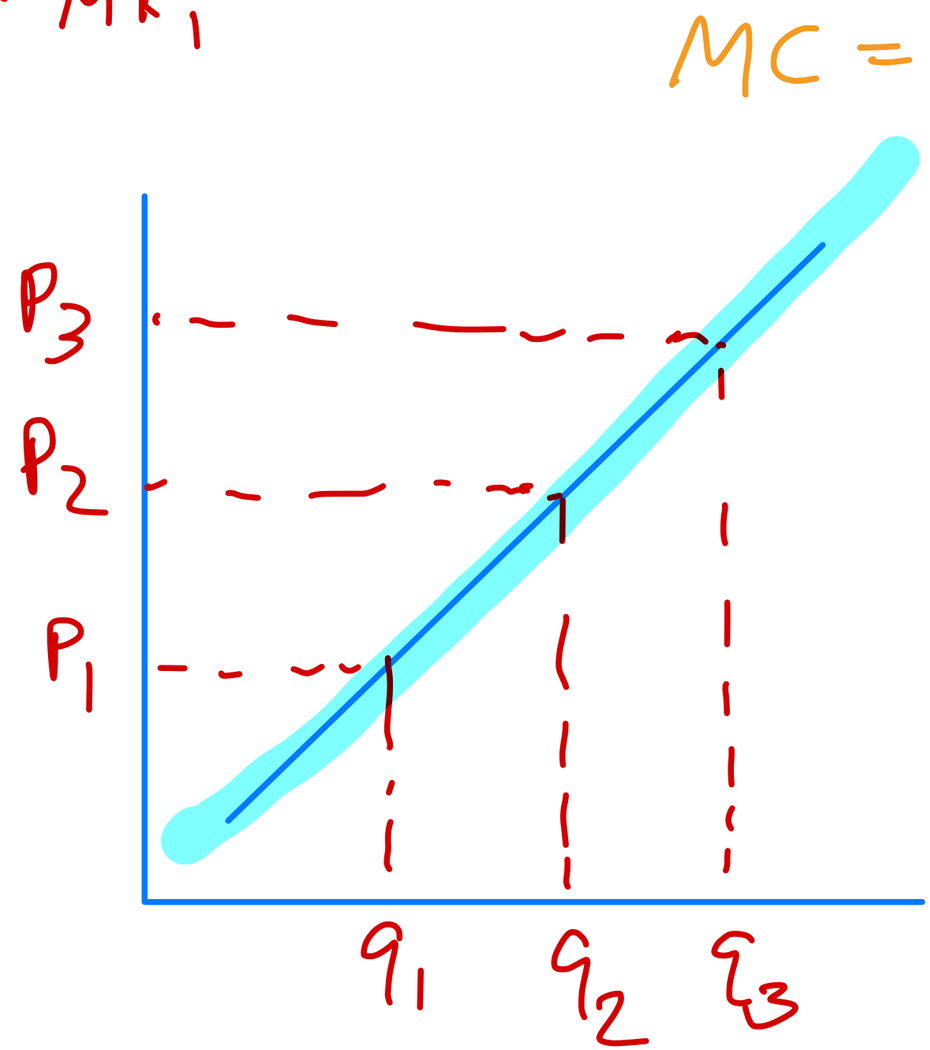
$\Sigma = MC$

Supply Curve is derived from MC of firms

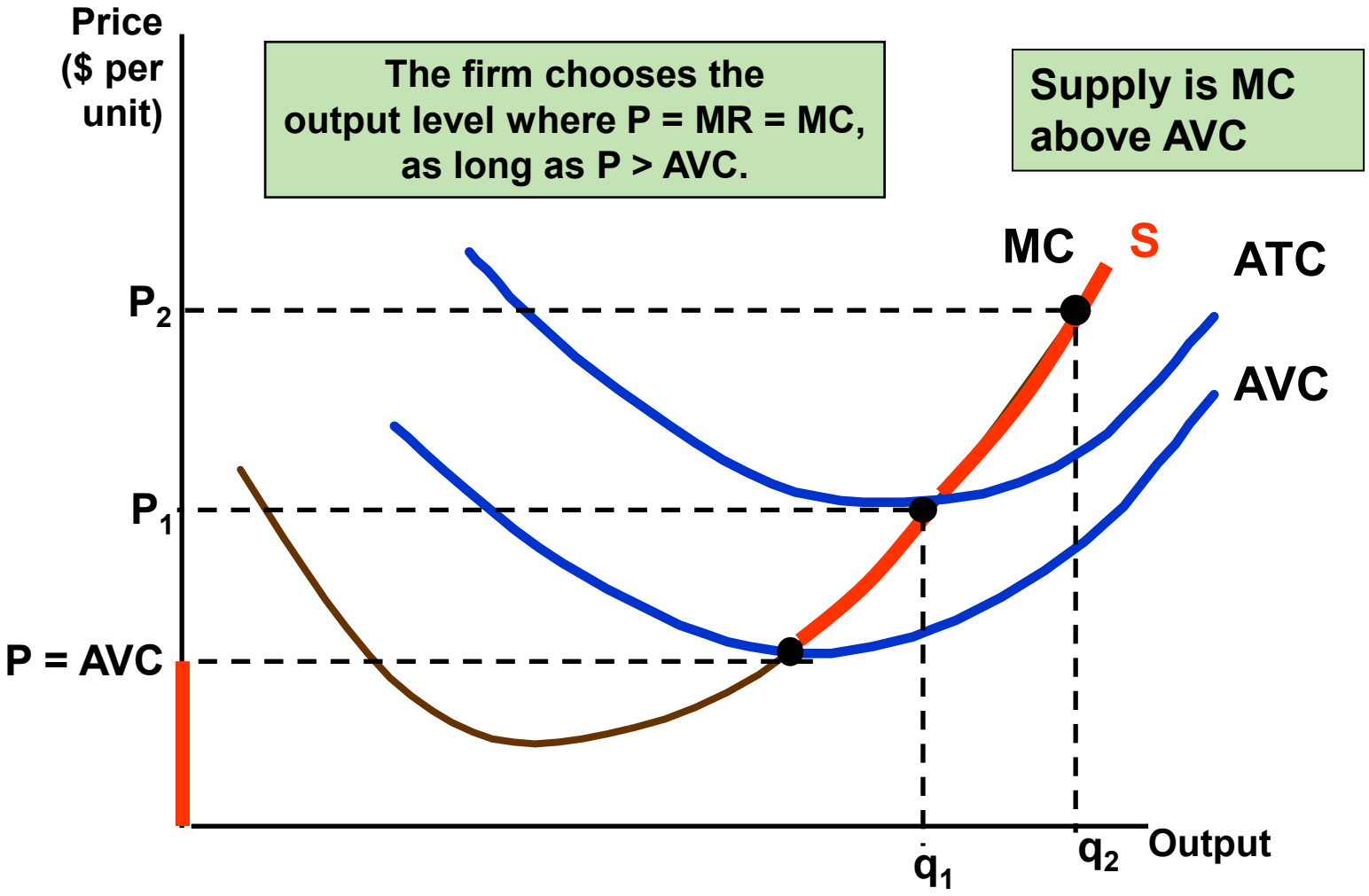


Individual firm

production decision



A Competitive Firm's Short-Run Supply Curve



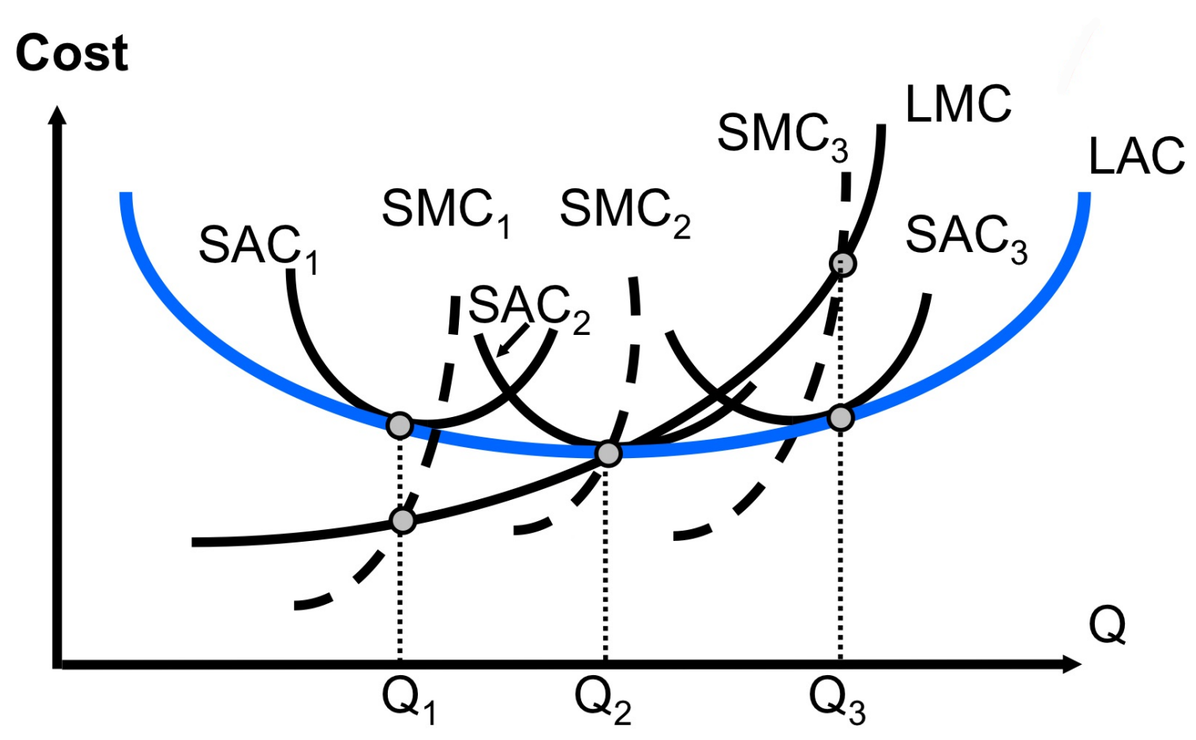
Choosing Output in the Long Run

- In short run, one or more inputs are fixed
  - Depending on the time, it may limit the flexibility of the firm
- In the long run, a firm can alter all its inputs, including the size of the plant.
- We assume free entry and free exit.
  - No legal restrictions or extra costs

★ LR is a collection of many SR ★

$\bar{K} = 1 \rightarrow \bar{K} = 2 \rightarrow \bar{K} = 3 \rightarrow \bar{K} = 4 \rightarrow$ SR

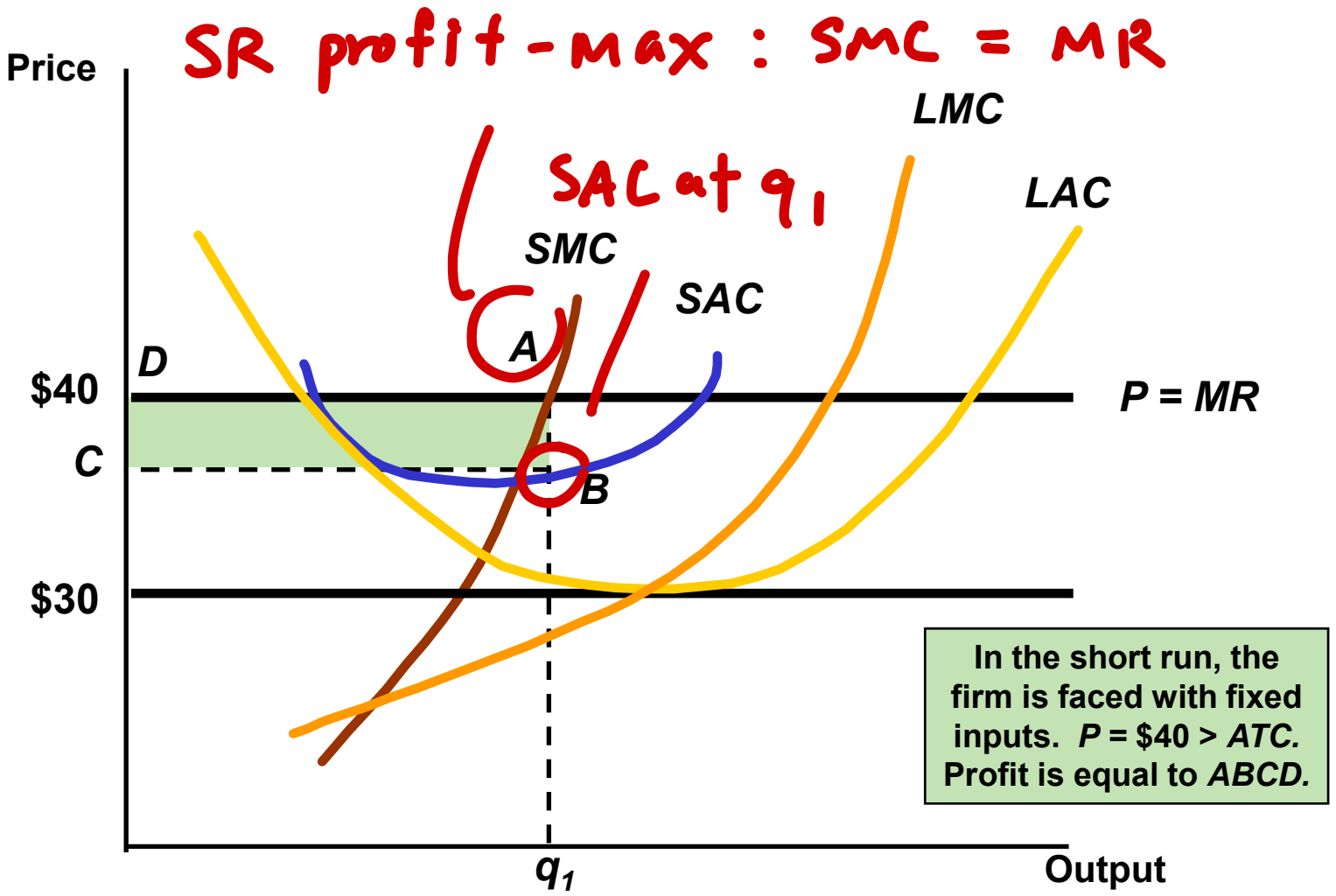
$\longrightarrow$ LR



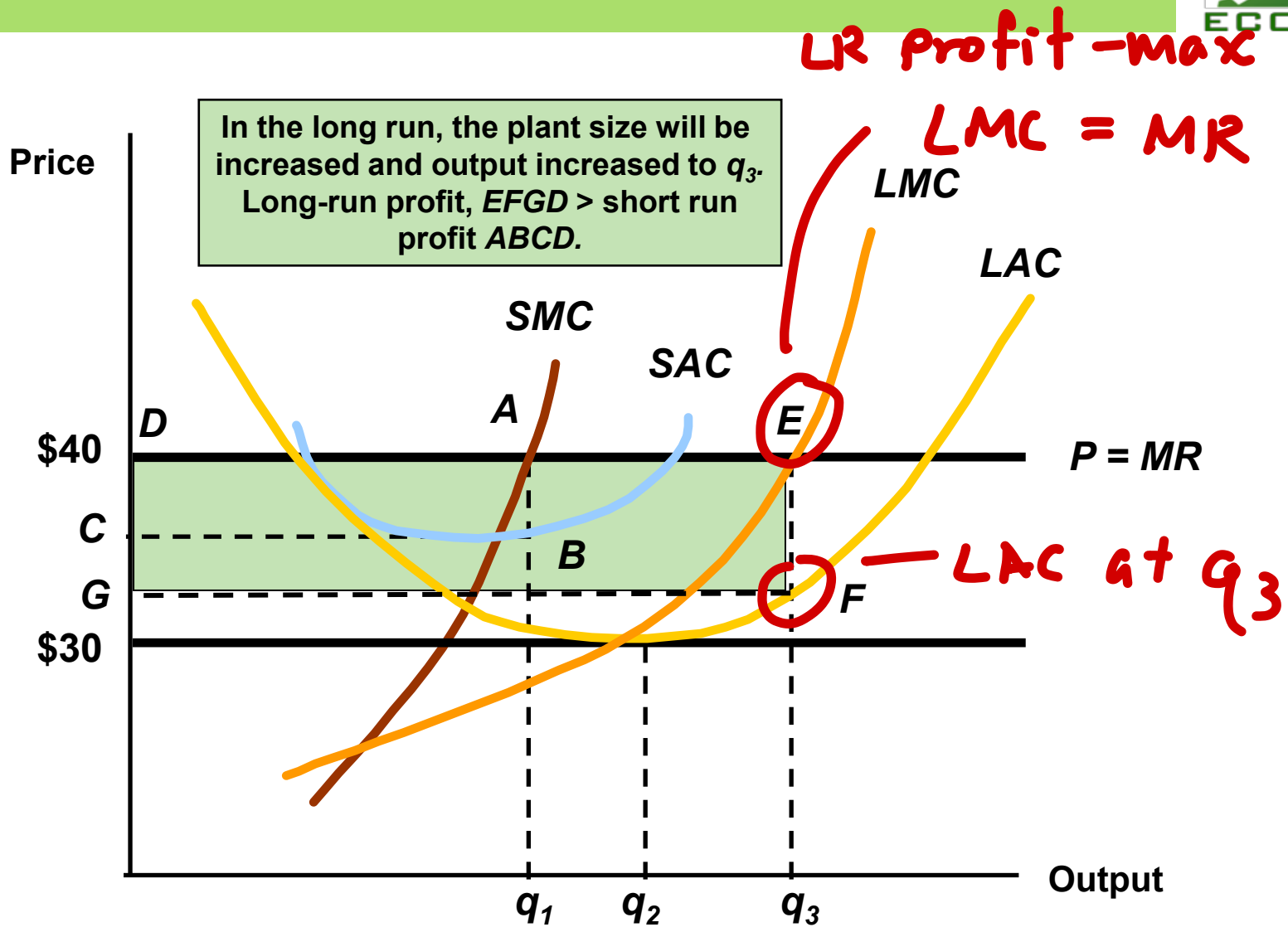
Choosing Output in the Long Run

- In the short run a firm faces a horizontal demand curve
  - Take market price as given
- The short-run average cost curve (SAC) and short run marginal cost curve (SMC) are low enough for firm to make positive profits (ABCD)
- The long run average cost curve (LRAC)
  - Economies of scale to q_2 fall in LRAC as Q increases
  - Diseconomies of scale after q_2

Output Choice in the Long Run



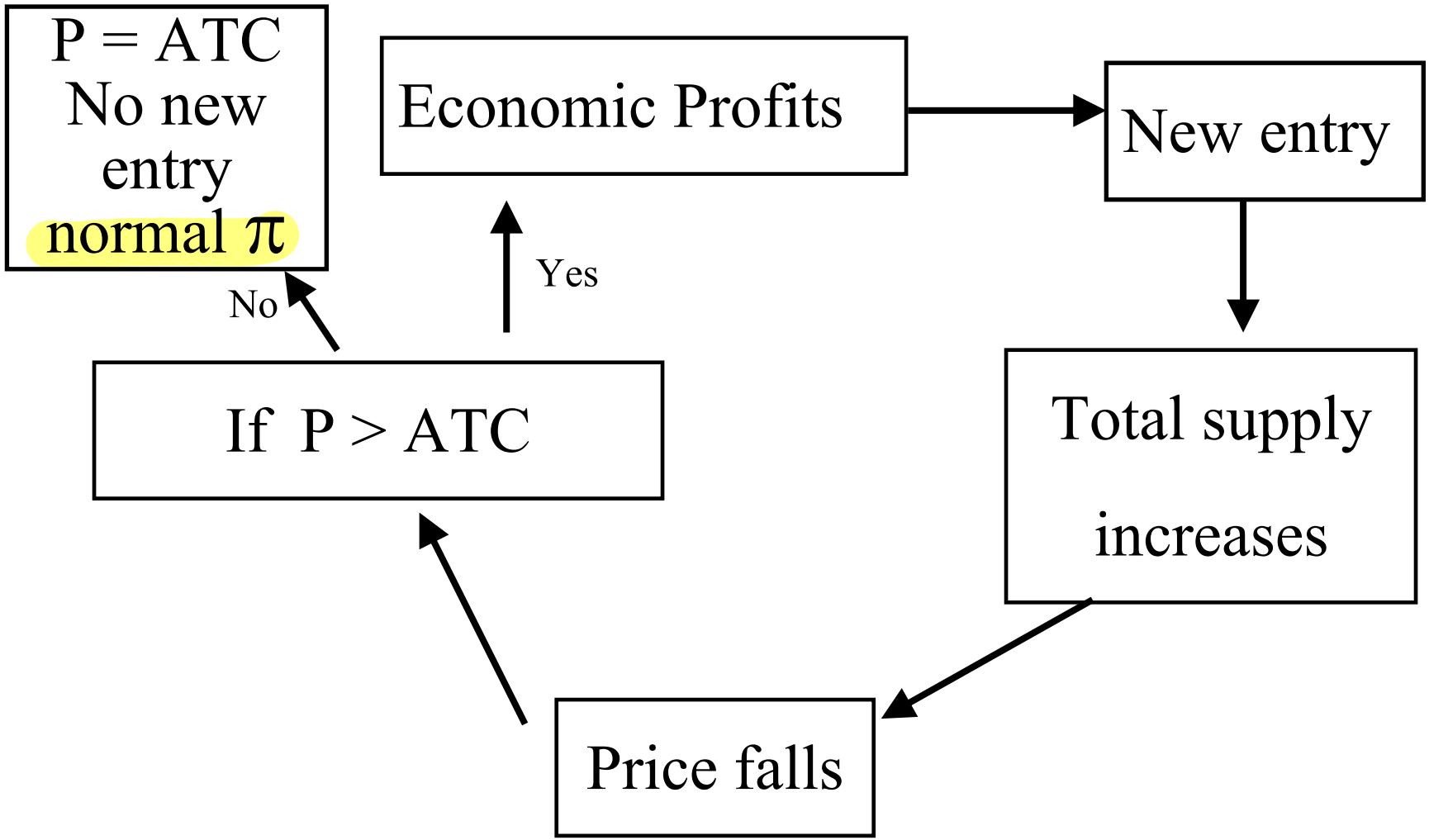
Output Choice in the Long Run



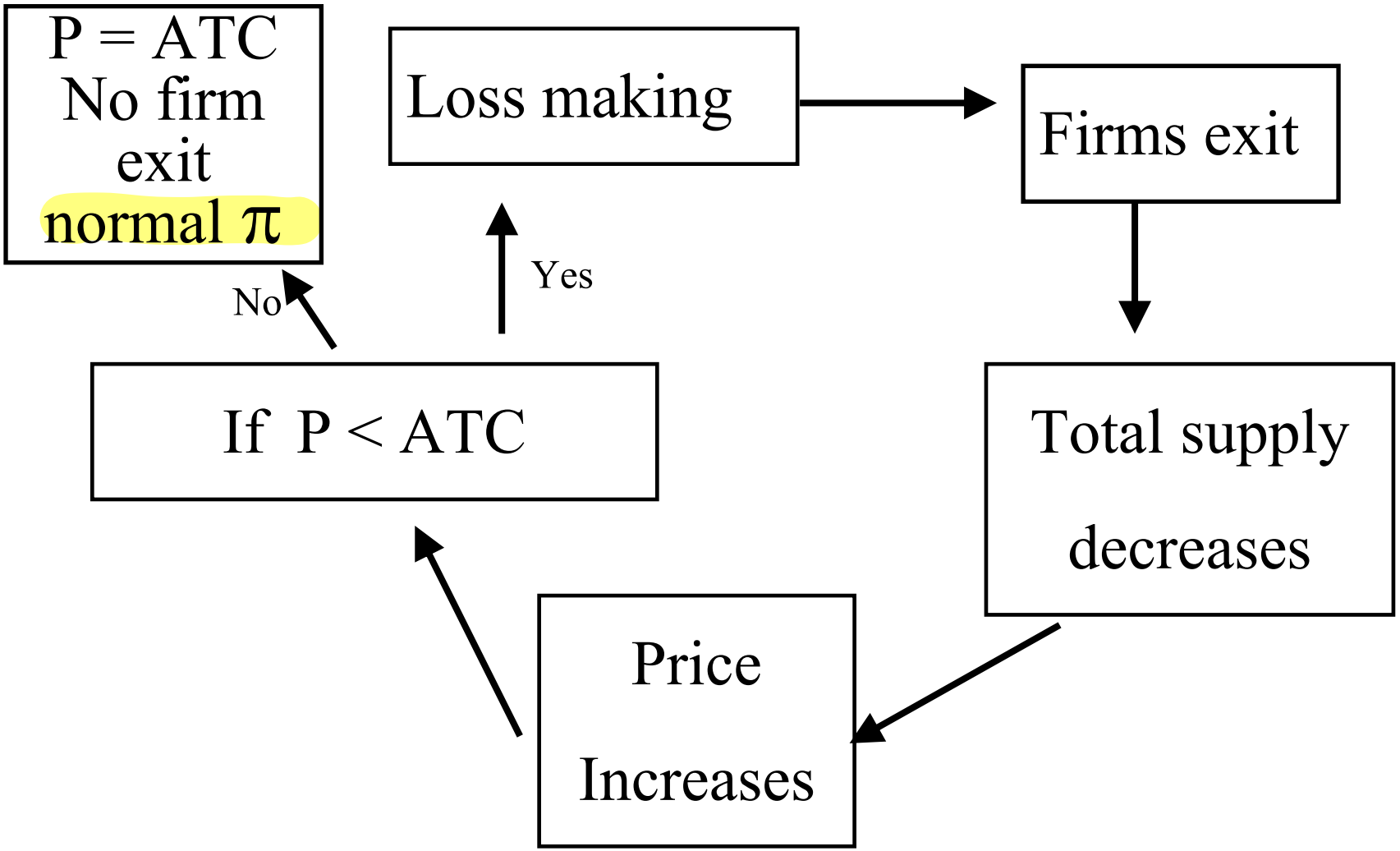
Long-run Competitive Equilibrium

- For long run equilibrium, firms must have no desire to enter or leave the industry
- Zero-Profit
  - A firm is earning a normal return on its own resources
  - Doing as well as it could by using its resources elsewhere
  - Normal profit is firm's opportunity cost of using its own resources instead of using them elsewhere

Long run Equilibrium: New Entry



Long run Equilibrium: Exit



loss-making in LR → firms fail to make normal profit ($\pi = 0$)

You

run a business

accounting profit = 50k

work as a salaryman

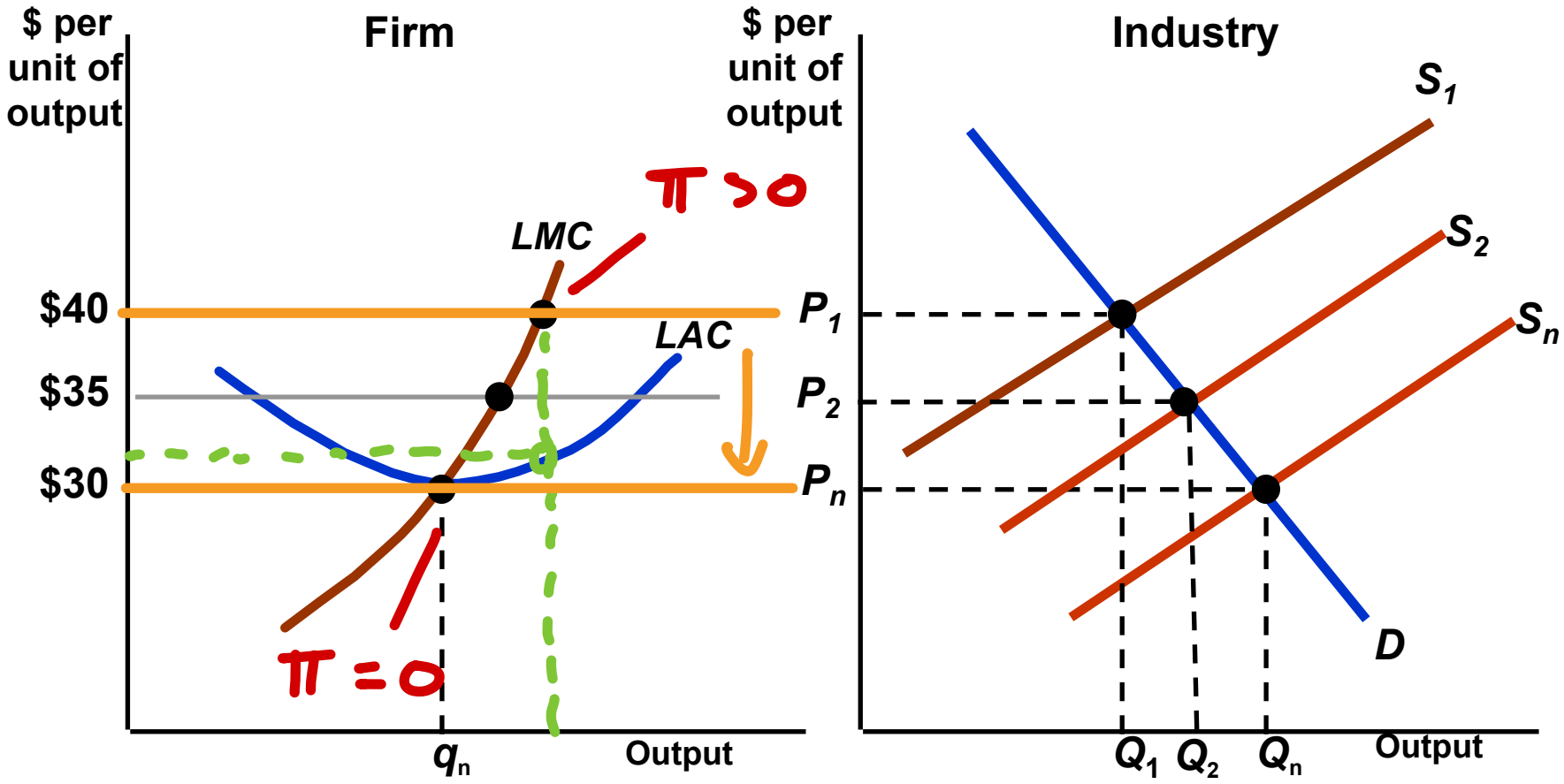
implicit cost (foregone salary) = 70k

economic profit = −20k (less than normal π)

→ you should shutdown

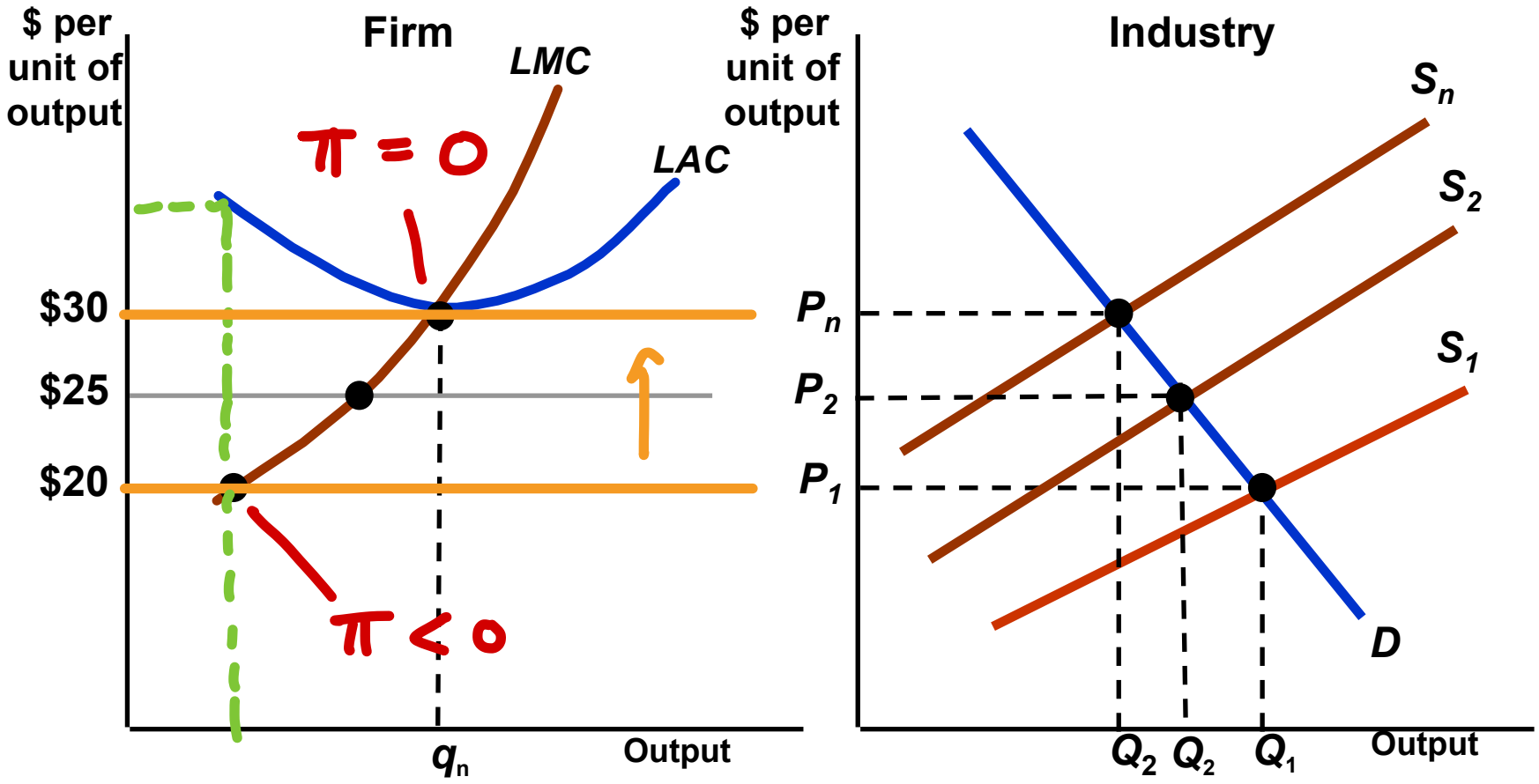
Long-Run Competitive Equilibrium – Profits

- Profit attracts firms
- Supply increases until profit = 0



Long-Run Competitive Equilibrium – Losses

- Losses cause firms to leave
- Supply decreases until profit = 0



Long-Run Competitive Equilibrium

1. All firms in industry are maximizing profits
   - P = MR = LMC = LAC
2. No firm has incentive to enter or exit industry
   - Earning zero economic profits

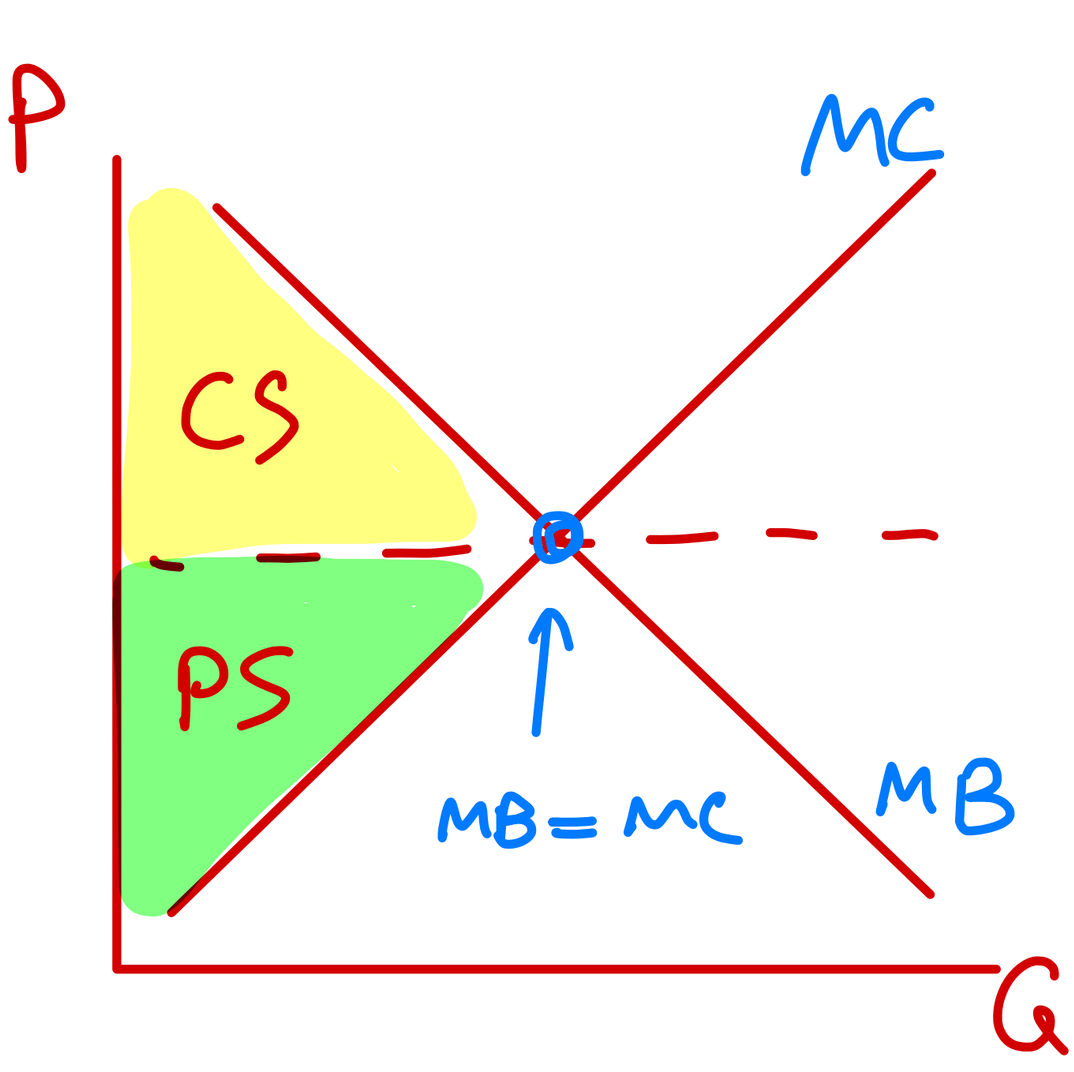
Efficiency

- Perfectly competitive market is the most efficient market
- Produce at the lowest possible cost
  - P = Minimum LAC or
  - It has productive efficiency
- Generate the highest social welfare
  - D = S and CS + PS are largest
  - P = LMC, marginal benefit = marginal cost
  - It has allocative efficiency

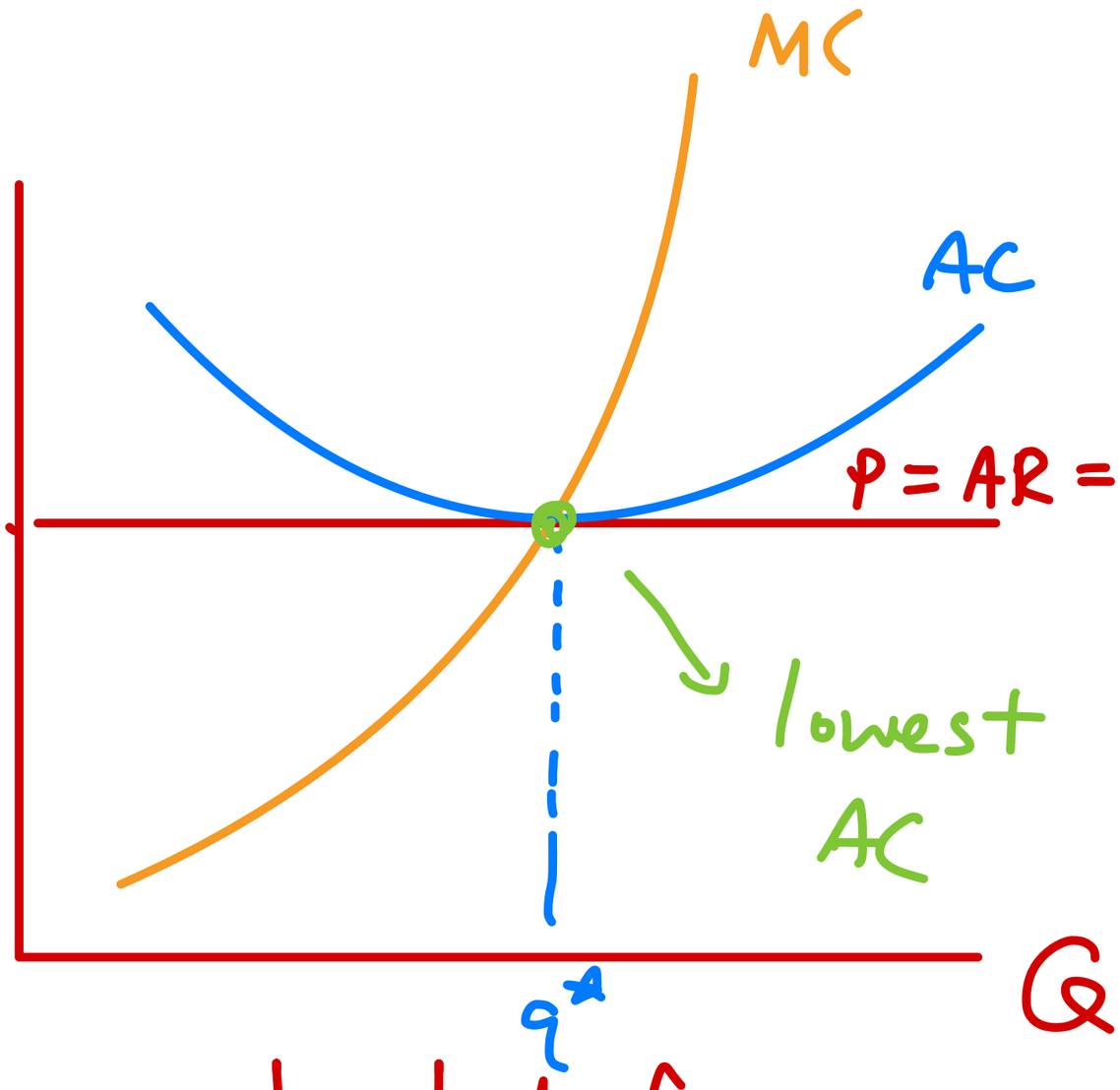
making the most of resources

no DWL

LR eqbm of Perfect Comp.



Industry



individual firm