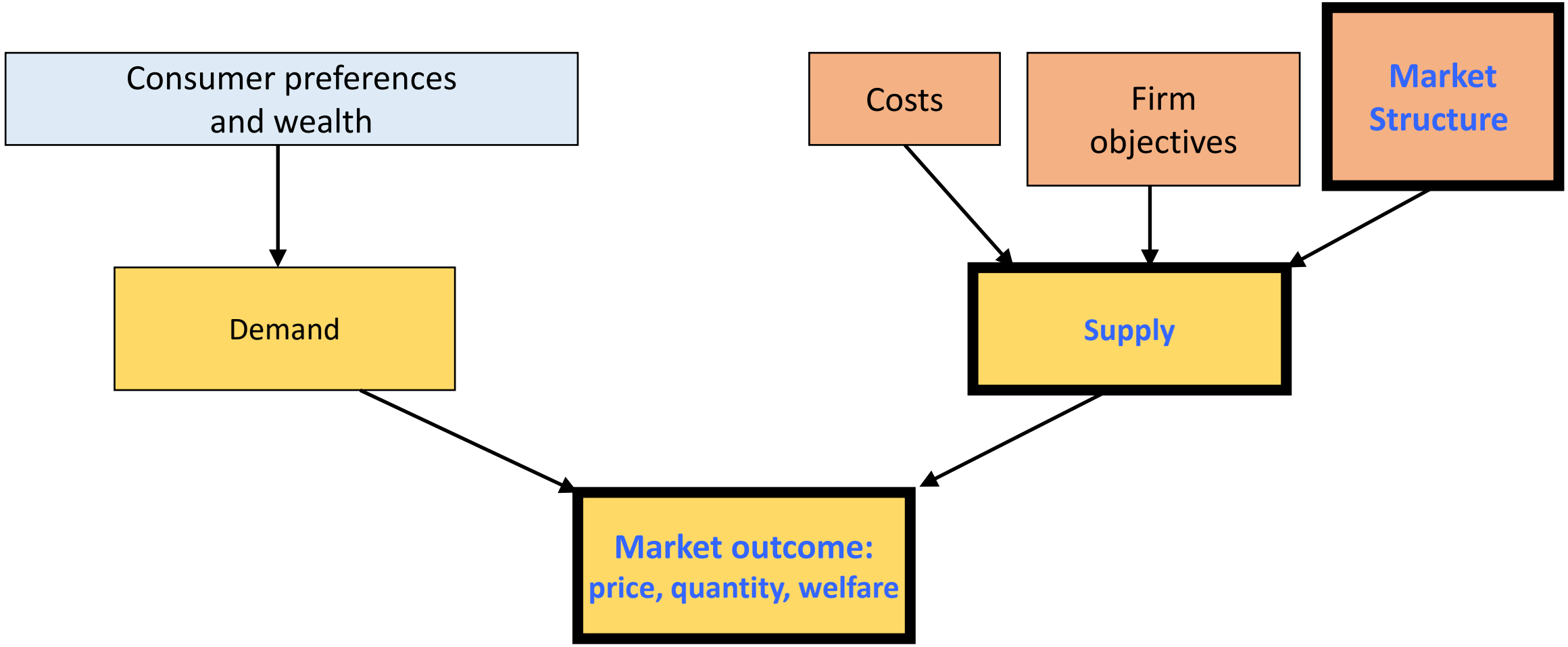
Perfect Competition

Reading: NW Ch. 11, 12

The story so far…



Background - Different market structures

- We will look at four different types of markets in turn and consider the implications for market outcomes:

- *Perfectly competitive markets*
  - These markets have **many buyers and sellers**, low barriers to entry and an identical product.
  - Consequently, firms do ***not*** have the market power to set prices.

- *Monopoly markets*
  - A market with **one seller** and high barriers to entry and the power to choose its price.

Background - Different market structures

- *Monopolistically-competitive markets*
  - There are **many firms** selling slightly differentiated products.
  - These sellers have scope to set their own prices, but there are low barriers to entry into these markets.

- *Oligopoly markets*
  - These markets are characterized by only having a **few firms**.
  - Consequently, the strategic interaction between these firms is critical to the outcome in these markets: actions by a firm are dictated by the actions of other firms in the market.

Characteristics of Perfect Competition

- Perfectly competitive markets have the following characteristics:
  - **Many buyers and sellers**. All buyers and sellers are a very small part of the total market.
  - **Homogeneous products**. Consumers are indifferent as to who they purchase from. All firms have access to the same technology.
  - **Price taker.** No individual buyer or seller has sufficient market power to influence market prices – that is, every participant is a price taker.
  - **Free entry and exit**. Firms can freely (that is, costlessly) enter and exit the market in the long run – there are no barriers to entry in the long run.

Outline

- **Perfect competition:**
  - ➢ Impact on supply:
    - short run vs. long run
    - firm and market supply
  - ➢ Market (or industry) equilibrium
    - firm profits
    - dynamics

The Supply curve in Perfect Competition

- **Short-run (SR)**
  - Each firm's plant size is given
  - Why? Some inputs cannot be altered (fixed inputs, eg capital goods)
  - Thus *number of firms* in the industry is fixed

- **Long run (LR)**
  - Each firm can change the size of its plant
  - All inputs can be varied
  - Firms can enter (and exit) the industry, thus *number of firms* is variable

Supply in the SHORT RUN

- At least one of a firm's factors of production is fixed in the short run.
  - Firm has a fixed cost of production that will be incurred regardless of its output.
  - In deciding the **level of output to produce** in the short run, a firm will ignore its fixed costs.
- If a firm produces output, its supply curve is given by its **marginal cost curve**.
- However, if a firm chooses not to produce output in the short run (q=0), we say that the firm ***shuts down***.

The short-run supply decision for a firm

- In the short run, the firm should only take into account its **variable costs**, as its fixed costs are sunk.
- Hence, we can derive the ***shut-down condition*** that a firm will shut down in the short run if total revenue is less than variable cost.

$$TR < VC$$

- We can also divide *shutdown* by the level of output q to yield.

$$TR/q < VC/q \text{ or that } p < AVC$$

The short-run supply decision for a firm

- Thus, if price falls below AVC, a firm will shut down.

- If a firm does produce a positive output, it chooses the level of output in accordance with its supply curve – that is, its MC curve
  - Reminder: a firm produces units until P=MC
- Remember that the MC curve intersects the AVC curve at its minimum.

- Hence the **shut-down rule** for a competitive firm is:

$$\mathbf{P < AVC_{MIN}}$$

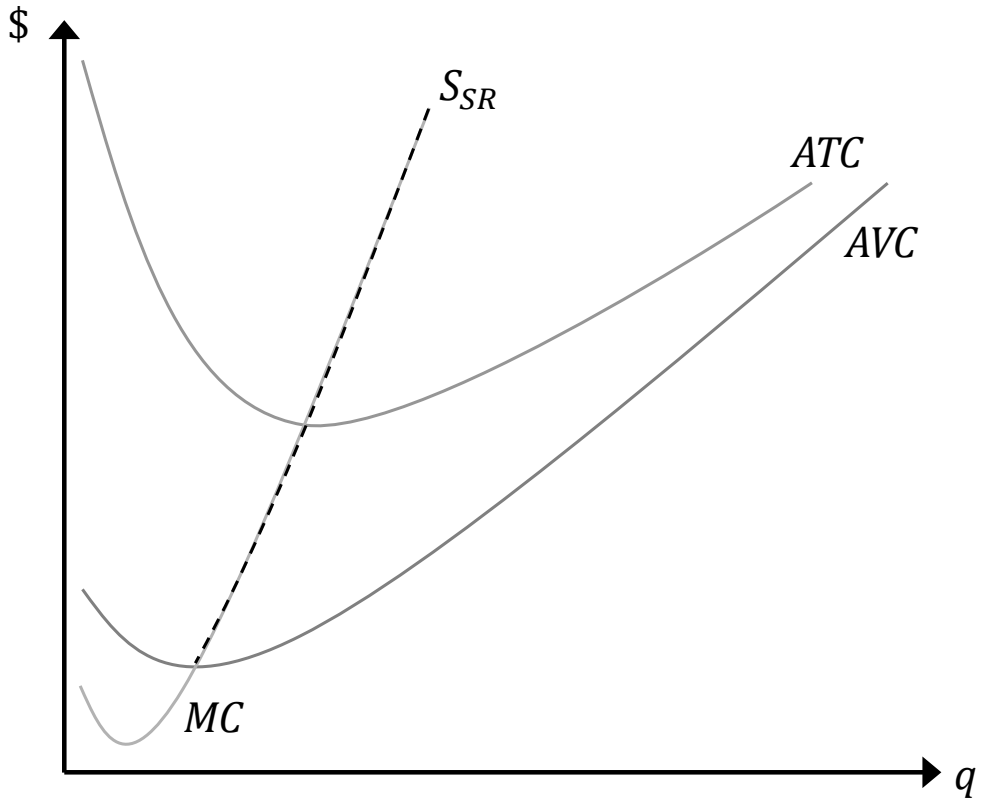
The short-run supply decision for a firm

- On the other hand, a firm will supply a **positive quantity** provided:

$$P \geq AVC_{MIN}$$

- Hence a **firm's short-run supply curve** is its MC curve that lies above AVC_{MIN}.

A firm's short-run supply curve



Market supply in the short run

- In the short run, there is **no entry or exit of firms** in the competitive market.
  - A firm is prevented from exiting the market by its fixed costs
    - if a firm in the market wishes not to produce anything, it shuts down (but does not exit).
  - No new firms can enter in the short run.

- Hence, the **number of firms** in the market is fixed in the short run.

- Thus the **short-run market supply** results from horizontal summation of the individual firms' supply curves

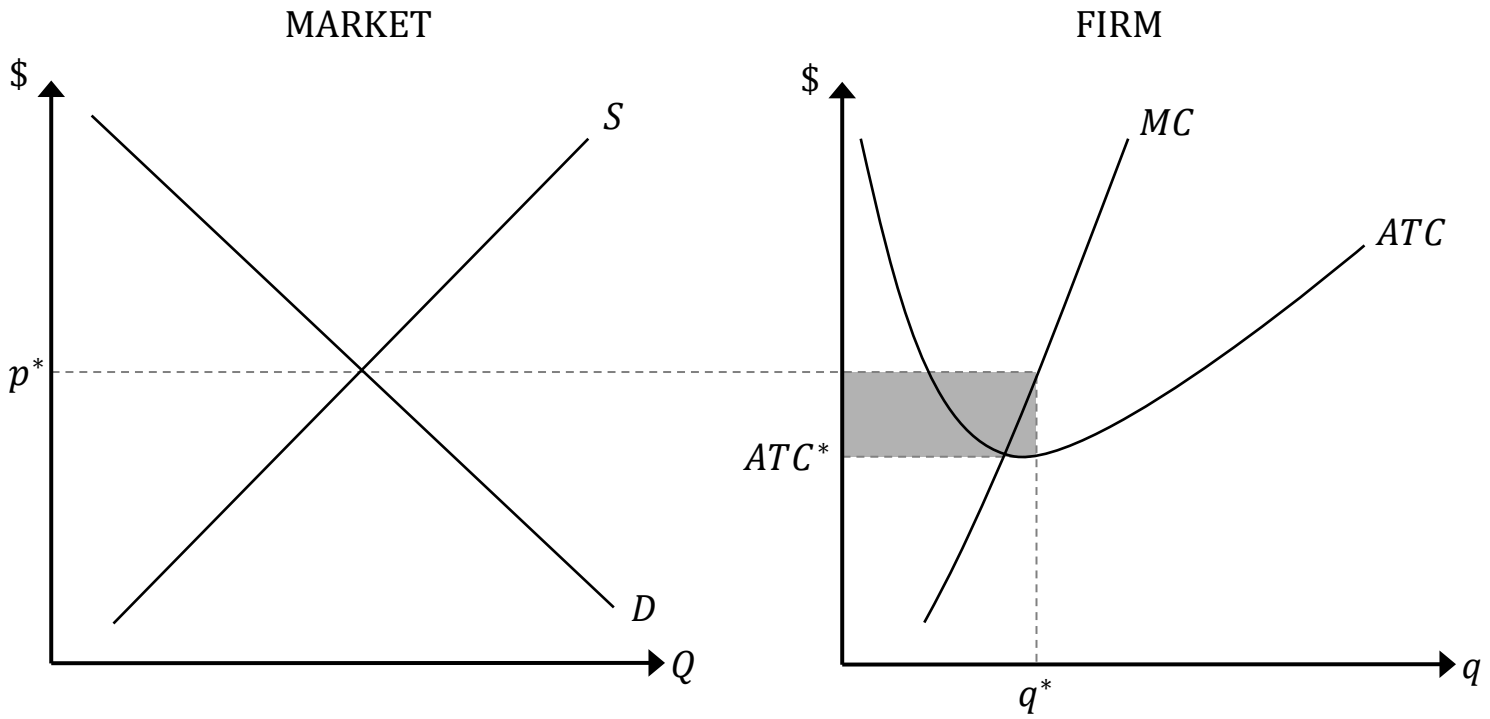
Profits and losses in the short run

- In a competitive market, it is possible for firms to make profits, break even, or incur losses in the short run.

- If a firm is making a **loss**, total revenue must be less than total costs
  - In other words, it must be that P < ATC (why?)
- Conversely, if a firm is making **profits:** TR > TC, or P > ATC
  - The difference between P and ATC at the quantity supplied is the average profit (or loss) a firm is making.

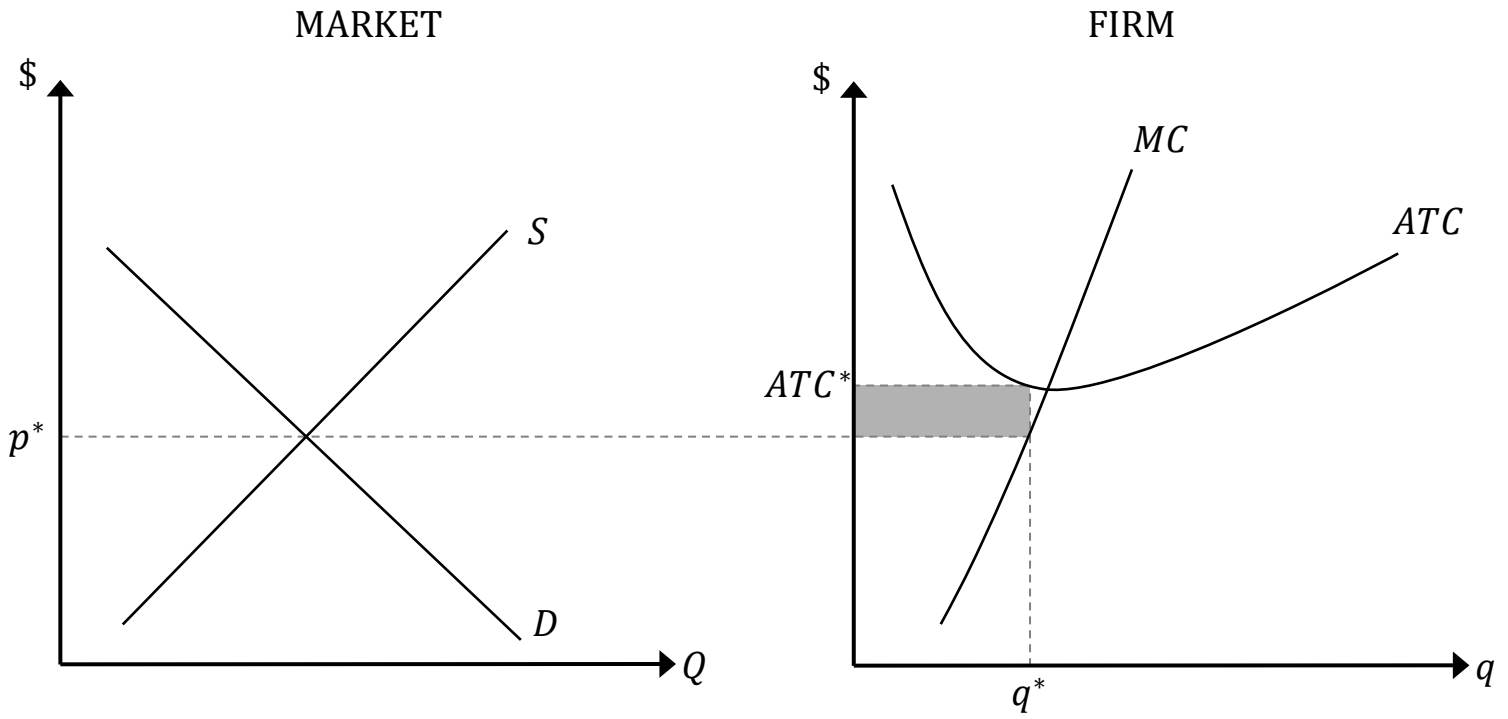
- A firm will be willing to continue to sell in the short run when making a loss provided $P > AVC_{MIN}$.
  - The firm is better off than shutting down because the extra revenue (in excess of its variable costs) help it pay for some of its fixed costs.

Profits in the short run



A firm in a perfectly competitive market, making a profit (P>ATC). The grey-shaded area represents the size of that profit.

Losses in the short run



A firm in a perfectly competitive market, making a loss (P<ATC). The grey-shaded area represents the size of that loss.

Supply in the LONG RUN

- Long run: all production factors are variable
  - firms can exit a market/industry, new firms can start operating in a market.

- In the long run, there is **free entry and exit of firms** in the market.
  - This means that all costs are opportunity costs (no sunk costs)
  - Hence, a firm deciding its level of output in the long run will take into account the costs of all inputs.
- A firm will **enter or exit the market** depending on its (anticipated) level profit or loss in the market.

- The market will reach its **long run equilibrium** when there is no longer any entry into or exit from the market – this occurs when firms are making zero (economic) profits.

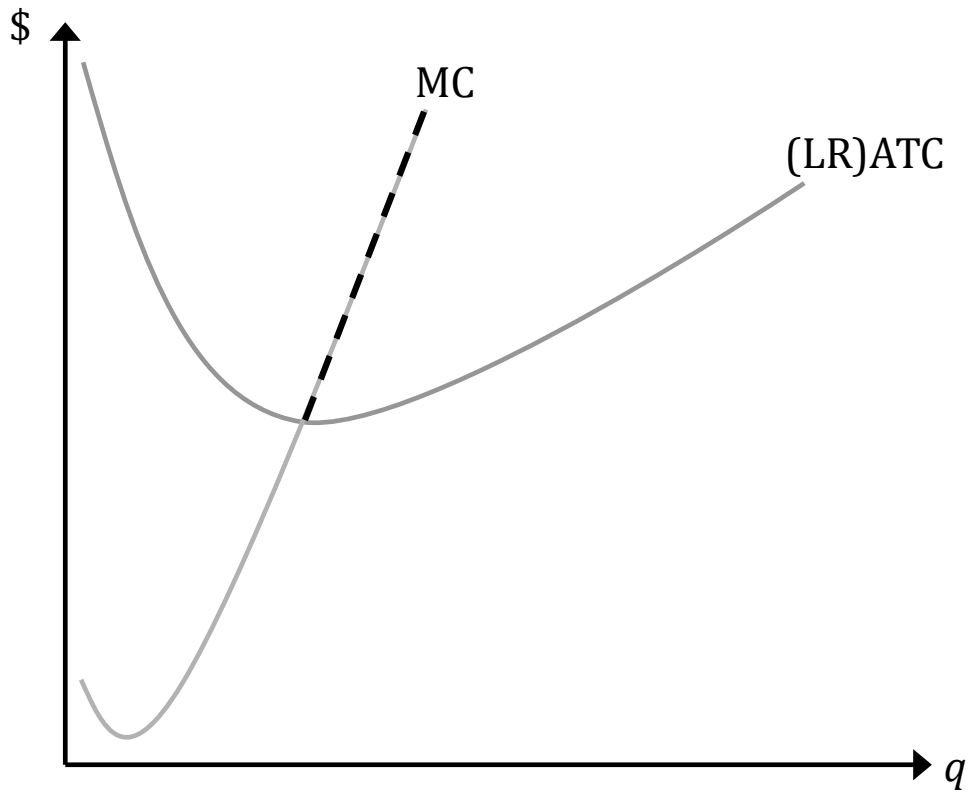
Firm supply: the exit/entry decision

- With free entry and exit in the long run, if a firm chooses to **exit** it incurs no costs (unlike the FC incurred in the short run)

- Hence, a firm will choose to **exit** the market if its total revenue is less than its total costs
  - This means that a firm will exit if: $P < ATC_{MIN.}$

- Hence a **firm's long-run supply curve** is the section of its (long-run) MC that lies above (LR)ATC_{MIN}.

A firm's long-run supply curve



The long-run supply curve of a firm is traced out by the part of the (LR)MC curve that lies above (LR)ATC_{MIN}.

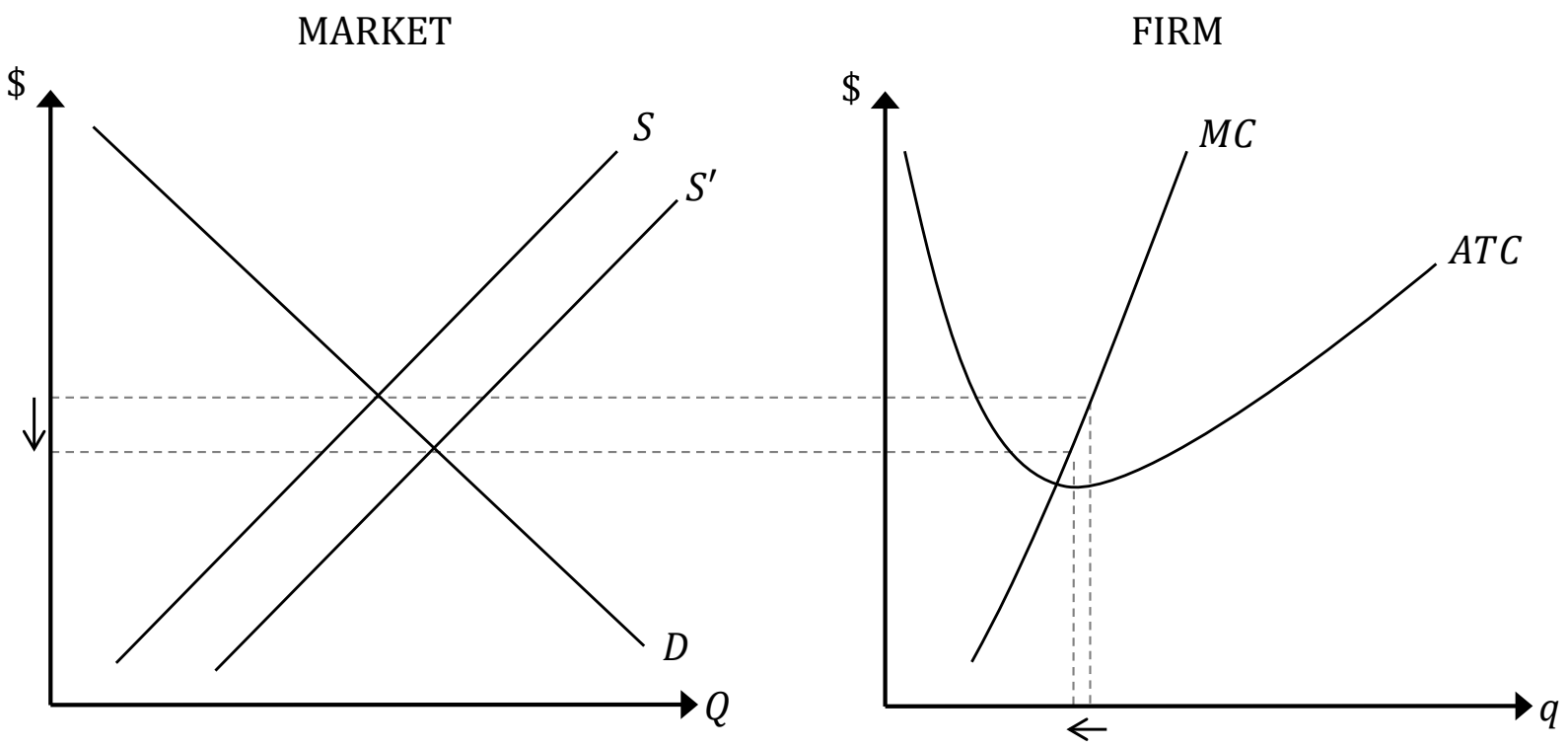
Elimination of profits and losses

- In the long run, firms can enter or exit depending on whether they are going to make a profit or loss.

- When firms in the market are profitable ($P > ATC_{MIN}$) firms will want to **enter** the market.

- The entry of more firms into the market will progressively shift the short-run market supply curve to the right, driving the **equilibrium price downwards**.

Potential profits induces entry



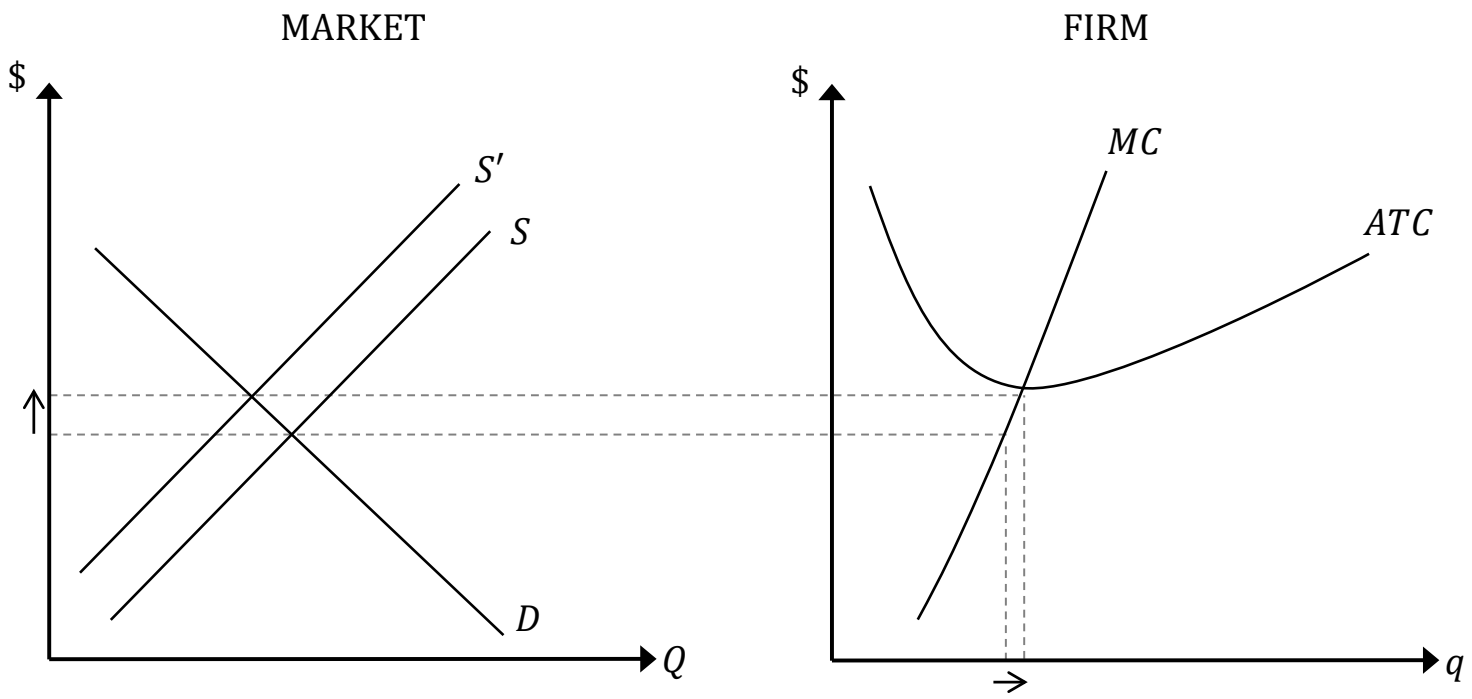
When the market price is above average total cost, profits will encourage entry into the market, resulting in an increase in supply from S to S'. This will put downward pressure on market prices.

Elimination of profits and losses

- When firms in the market are sustaining losses ($P < ATC_{MIN}$), firms will tend to **exit** the market.

- This shifts the short-run supply curve left, pushing the **equilibrium price upwards** as firms leave the industry.

Losses induce exit



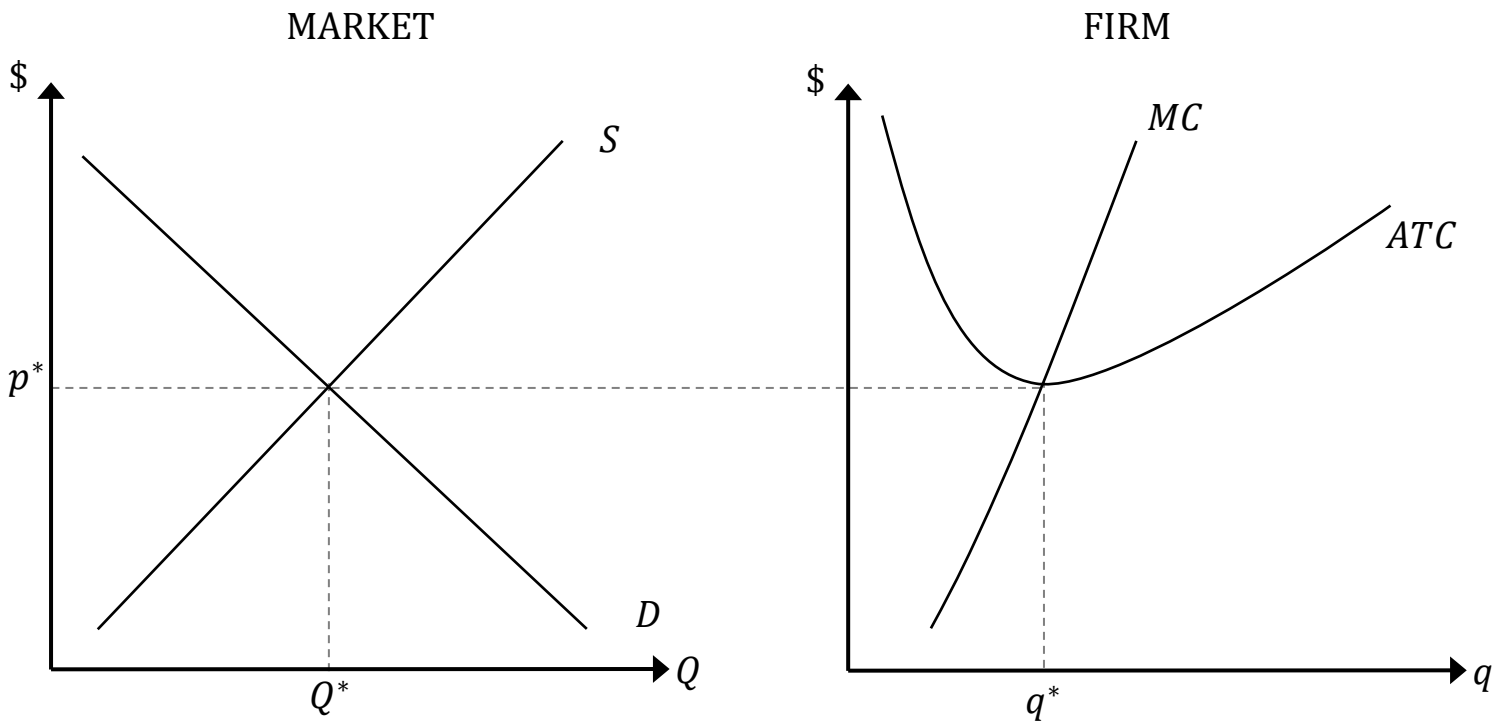
When the market price is below average total cost, firms in the market make a loss. This encourages exit, shifting the supply curve left from S to S‘ (decrease in supply), causing price to rise.

Long-run equilibrium

- In summary:

  because of free exit and entry of firms
  - Price tends to decrease when it is above ATC; and
  - Increase when it is below ATC.
- Thus price will equal ATC in the long run.
- Because the firm supply curve cuts the ATC at its minimum, the long-run market price will be $p = ATC_{MIN}$.
- As price equals average total cost, a competitive firm will make **zero (economic) profits** in the long run.

Long-run equilibrium

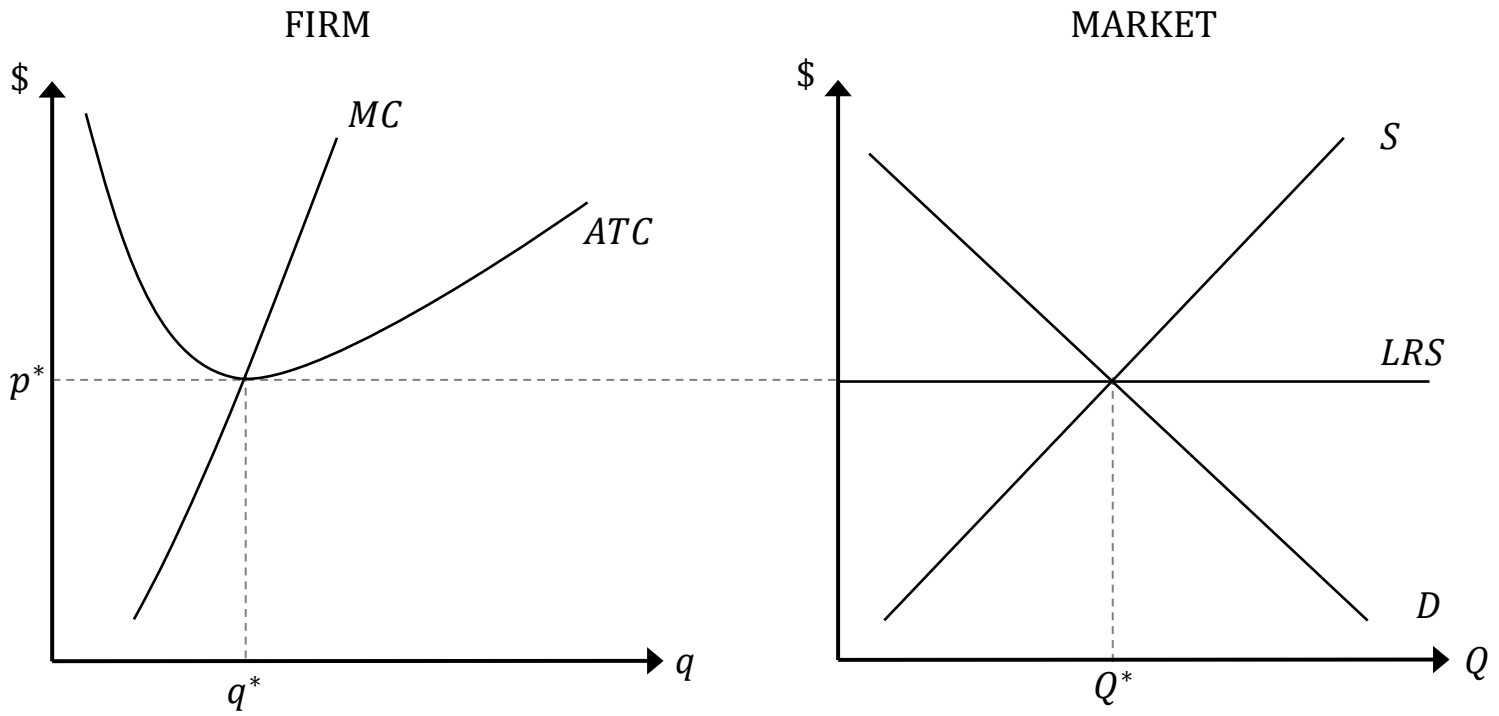


In the long run, there are zero profits in a perfectly competitive market. This requires p = ATC_{MIN}. Because there are zero profits, there is no incentive for any further exit or entry. The long-run equilibrium price is p*, the quantity traded in the market is Q* and the output of a firm is q*.

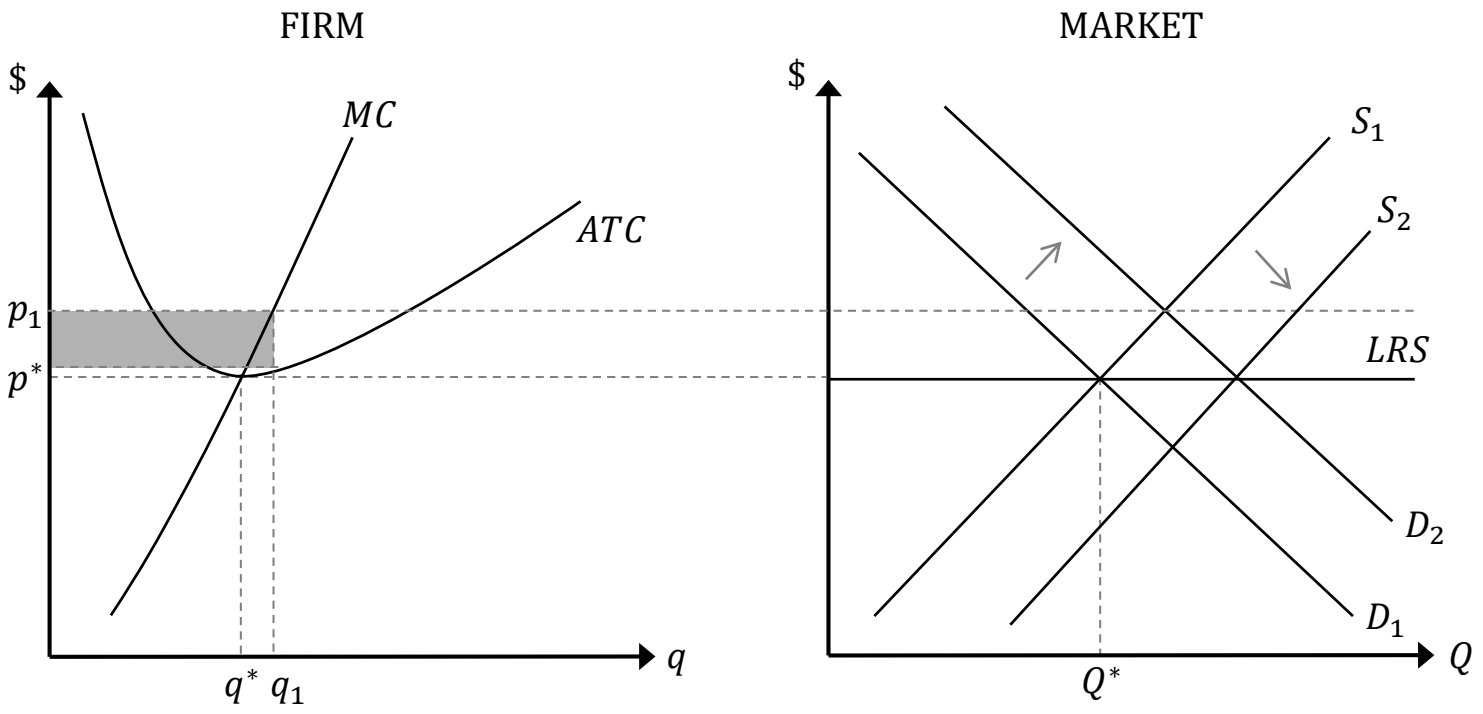
Market supply curve in the long run

- For the long-run market supply curve, we need to account for the fact that the market responds to demand via **the entry and exit of firms**.
- As noted above, in the long run price adjusts back to the minimum of average total cost, *no matter what the quantity traded in the market is.*
- Hence, taking account of exit/entry, the long-run industry supply curve is **horizontal** at ATC_{MIN}.
- An industry with a perfectly elastic long-run industry (or market) supply curve is **a constant-cost industry**.
  - Unless otherwise stated, a competitive industry is assumed to be a constant-cost industry.

Long-run market supply



Dynamics in the long run

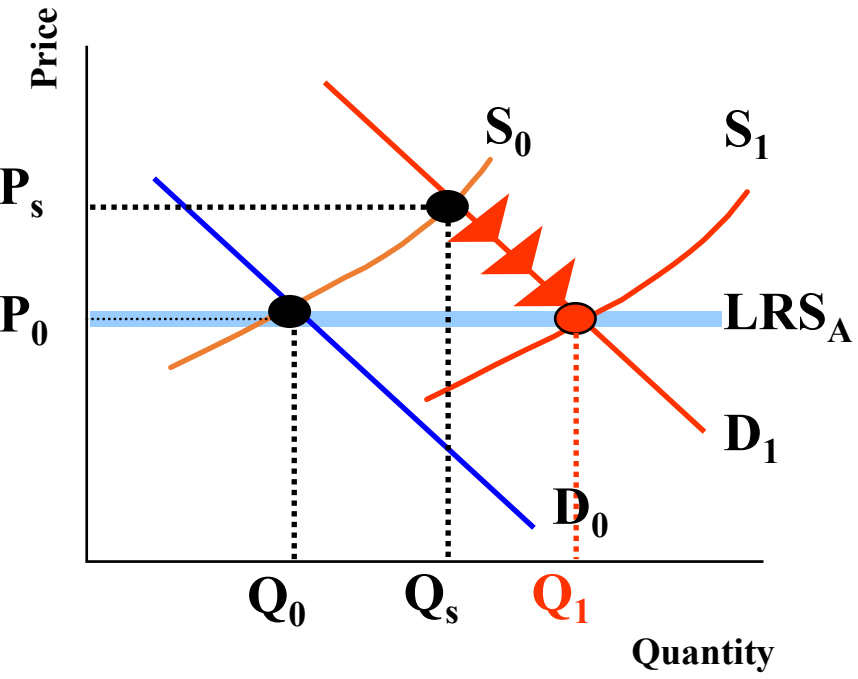


Following an unanticipated increase in demand, in the short run price rises and firms in the industry increase output (q_1) and make positive economic profits. However, in the long run, entry forces prices back down to the p* = ATC_{min}. Each firm again sells q* units and economic profits are zero.

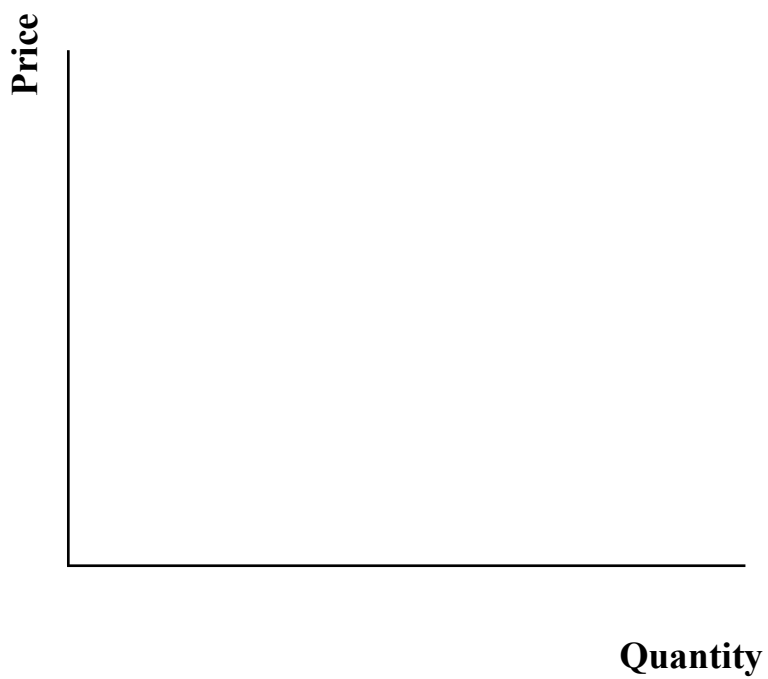
Note: ATC is LRATC, so firms operate at min LRATC, where they exhaust all economies of scale.

Dynamics in the long run:
constant-cost industry

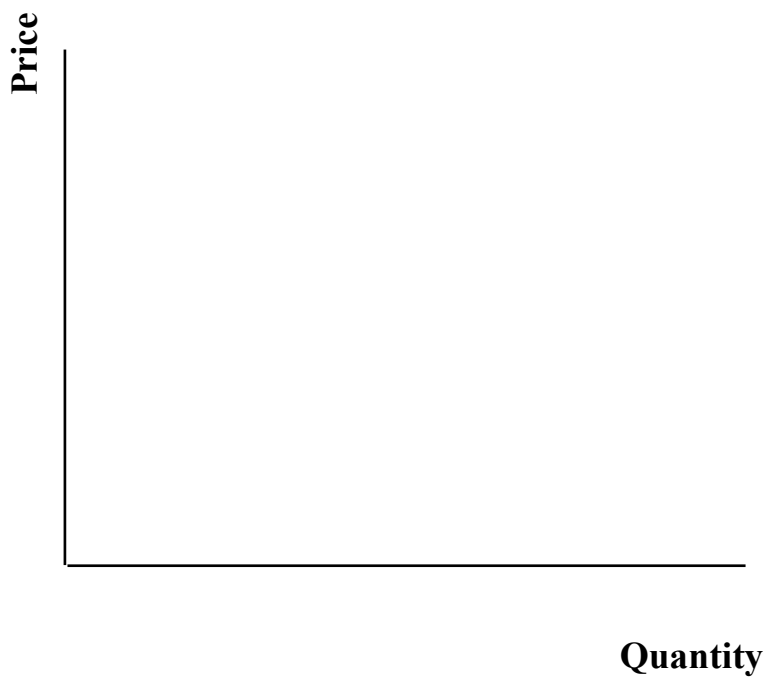
Constant-cost industry



Increasing-cost industry



Decreasing-cost industry

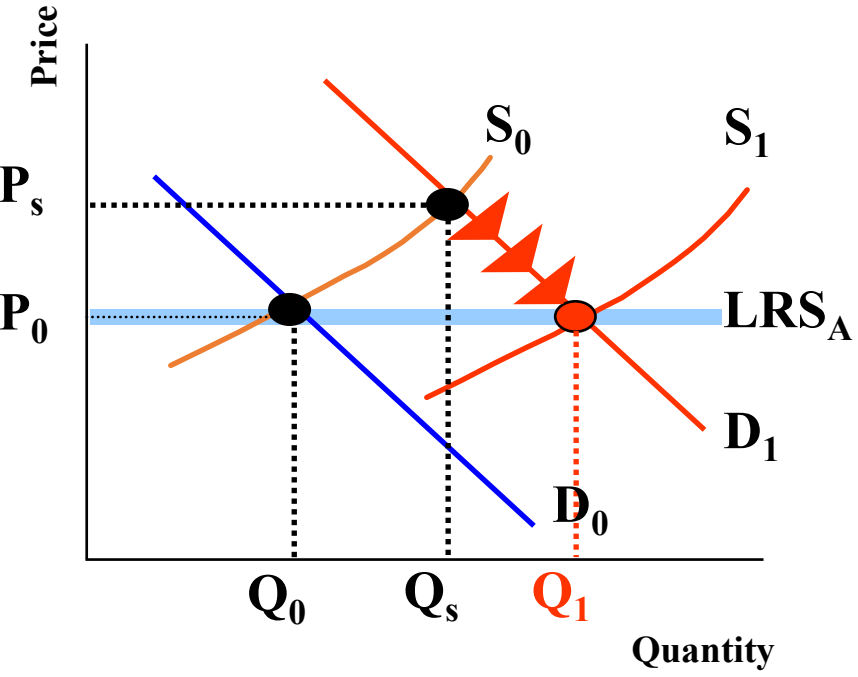


Increasing-cost industry

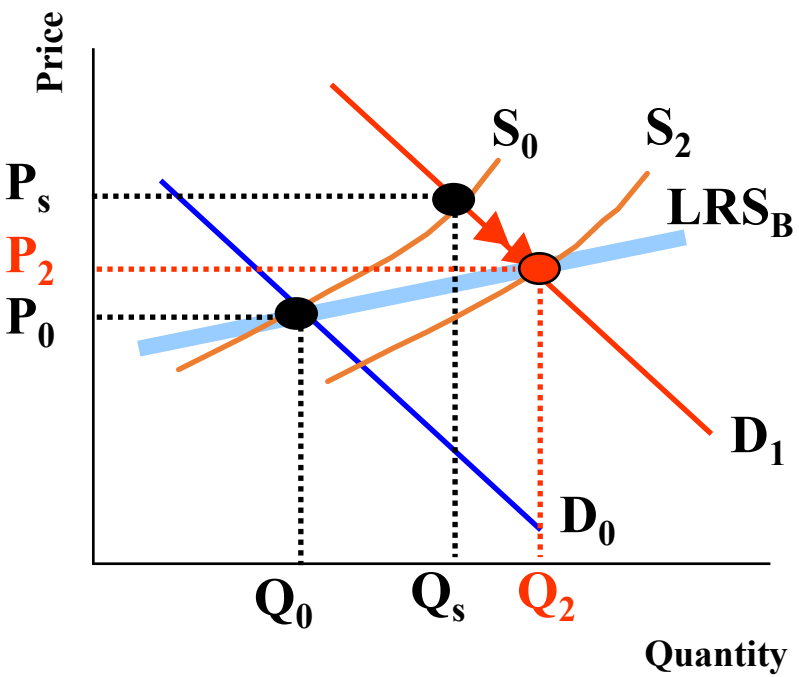
- In a constant-cost industry, entry and exit in the long run ensures that all firms earn zero profits and the price is $P^* = ATC_{min}$.
- This assumes that all firms have access to the same technology and have the same cost structure, and this cost structure does not change as the industry grows.
- However, the long-run industry supply curve need not be perfectly elastic.
- The long-run supply curve can instead be upward sloping; this is known as an ***increasing cost industry***.
  - If potential entrants have higher costs than incumbent firms (already in the market)
  - Some resources used in production may be available only in limited quantities (input prices rise as industry expands), thus costs for all firms rise
  - Congestion may rise with industry output (e.g. airlines)

Dynamics in the long run:
increasing-cost industry

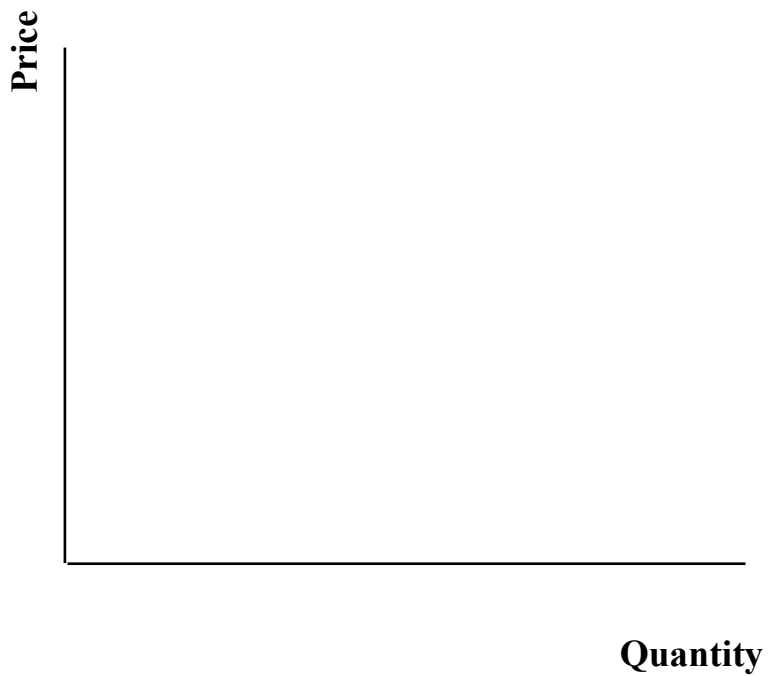
Constant-cost industry



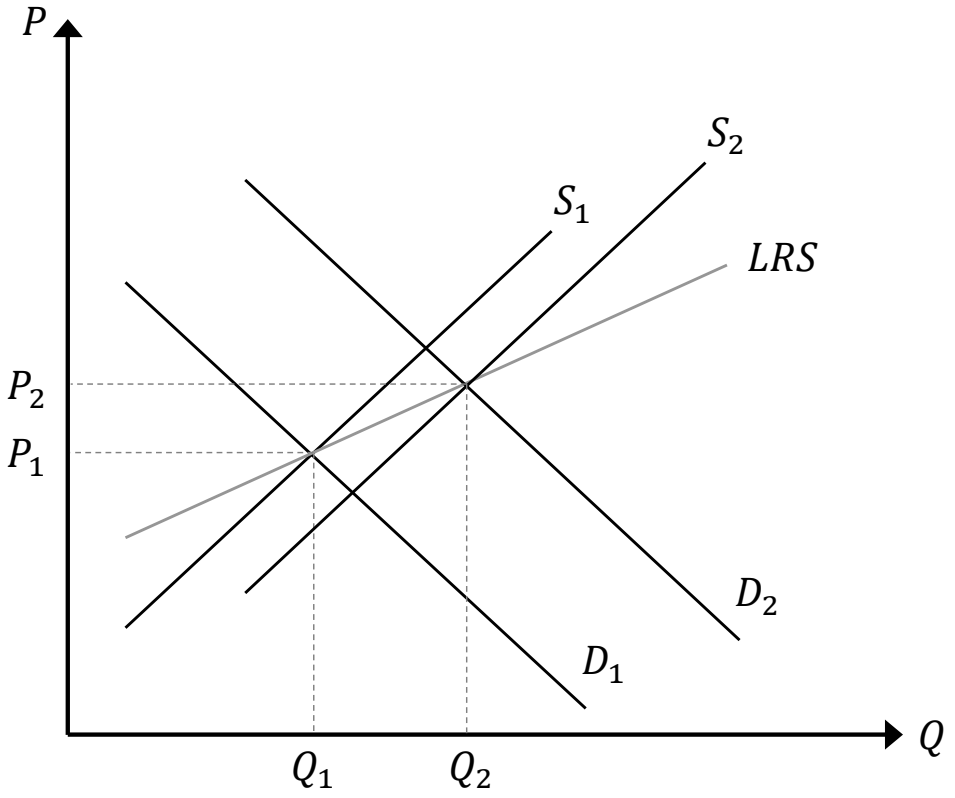
Increasing-cost industry



Decreasing-cost industry



Increasing-cost industry



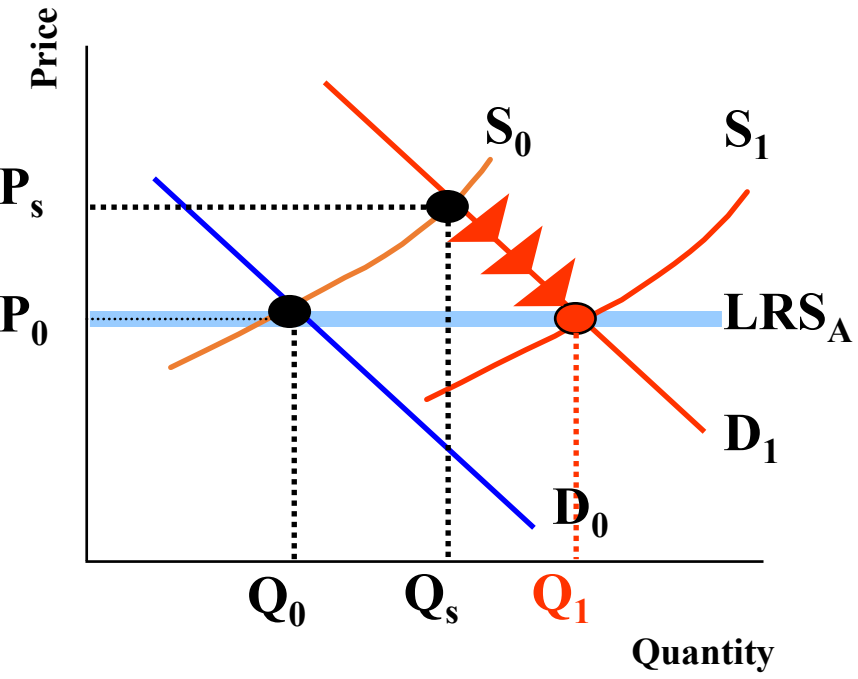
In an increasing-cost industry, the long-run industry supply curve is upwards sloping.

Decreasing-cost industry

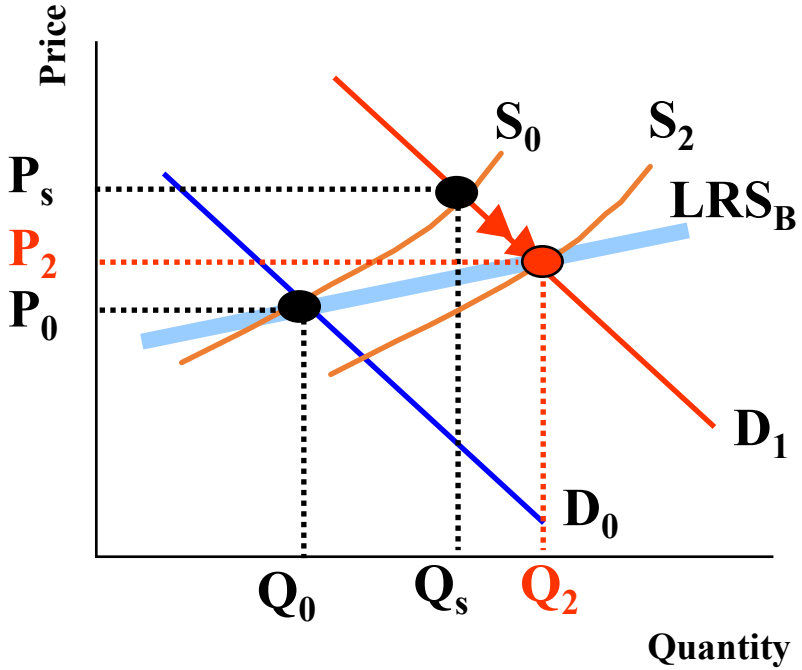
- Suppose that as output in an industry expands, costs for all firms fall.
  - If there are economies of scale in input markets
  - For example, the computer software industry – as the market has expanded average costs for all firms could actually fall.
- If this is the case, following an increase in demand, as entry will continue until it is no longer profitable, the new long-run equilibrium price has to be lower than the initial equilibrium price.
- In this case, the long-run industry supply curve is downward sloping – this is a ***decreasing cost industry***.

Dynamics in the long run:
decreasing-cost industry

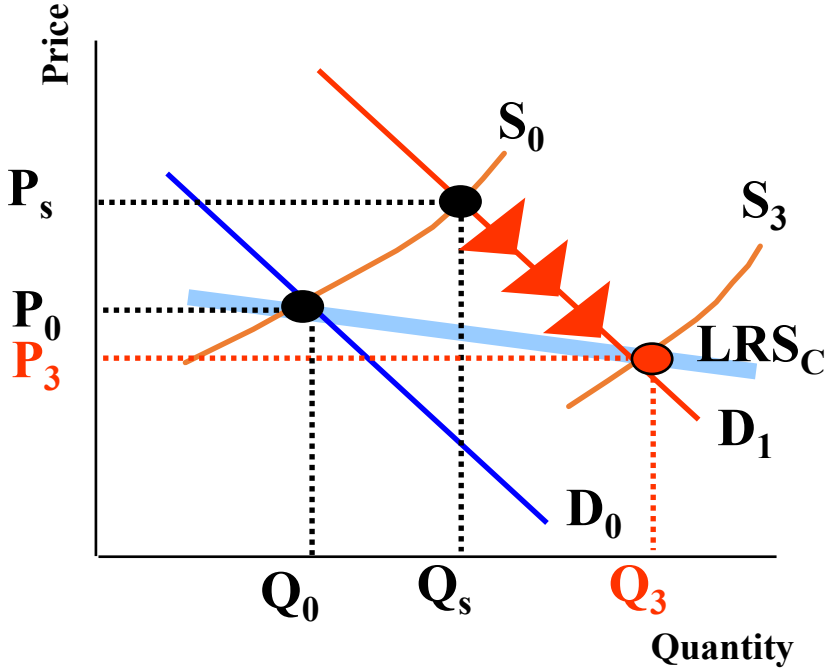
Constant-cost industry



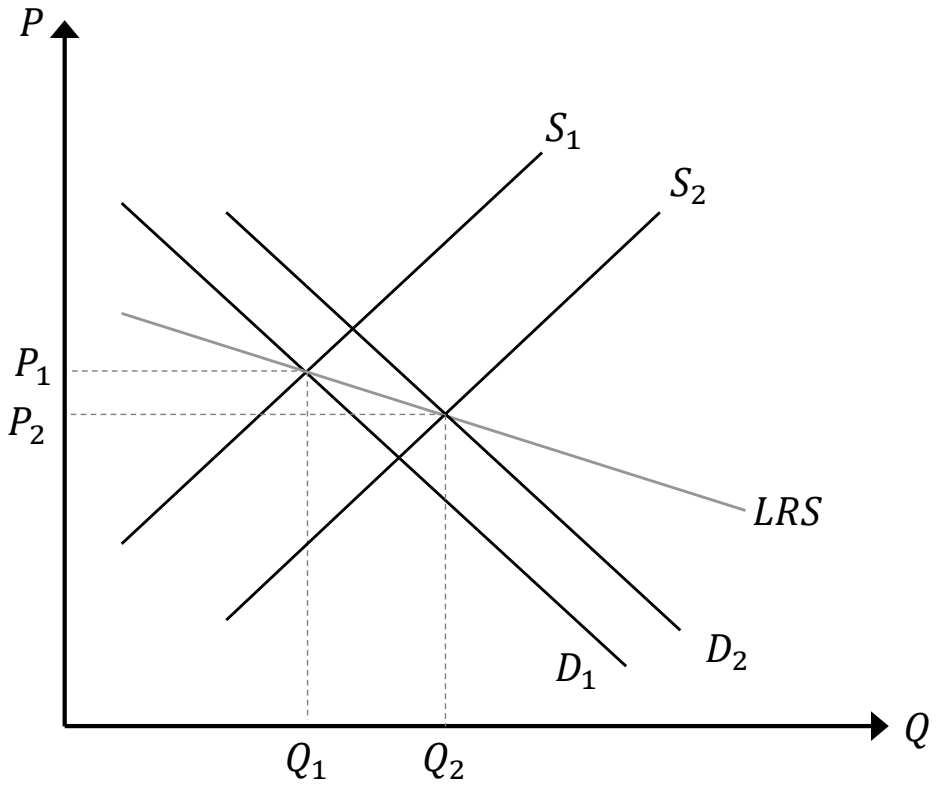
Increasing-cost industry



Decreasing-cost industry



Decreasing-cost industry



In a decreasing-cost industry, the long-run industry supply curve is downward sloping.

Summary

- Perfectly competitive market

- If a competitive firm supplies a positive quantity in a market, it sells a quantity where P = MC:
  - In the **short run** if $P < AVC_{min}$, a firm shuts down and sells zero output (incurring its fixed costs); if $P > AVC_{min}$ it supplies where P = MC.
  - In the **long run** a firm exits if $P < ATC_{min}$; if $P > ATC_{min}$ the firm sells where P = MC.
- In the short run a competitive firm can either make an economic loss or profit, or zero economic profits.

- In the long run, with free entry and exit, market price is driven back to ATC_{min}.
  - A competitive firm makes zero economic profits (just covers it opportunity costs so it has no incentive to exit and no potential entrant has an incentive to enter).
  - The long-run industry supply curve is perfectly elastic at $P = ATC_{min}$ (or might be upward or downward sloping if min cost changes as industry expands or shrinks).

What next?

- **Pricing with market power I**
  - Market power
  - Monopoly market
  - Single price monopolist

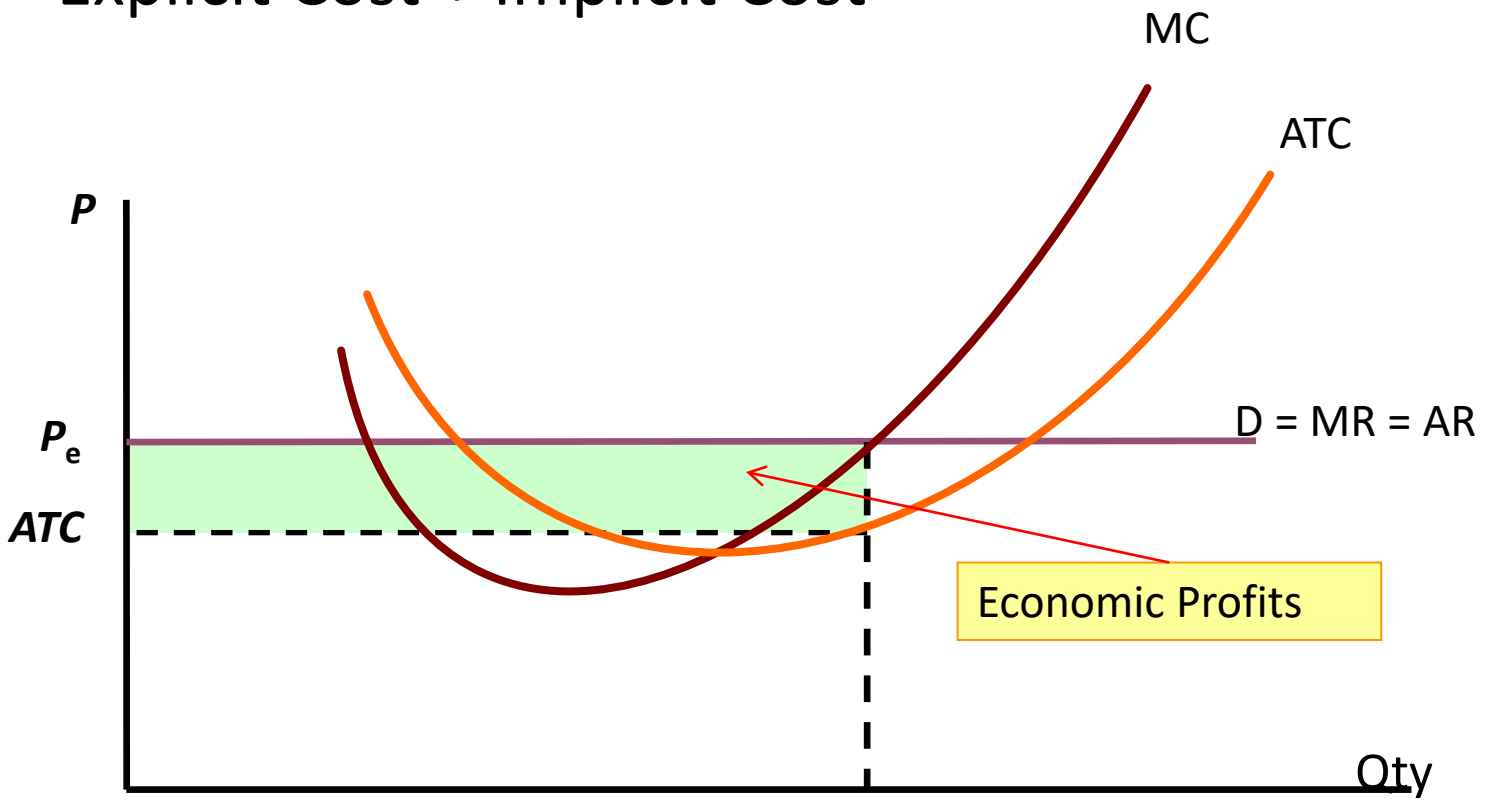
Graphs with Animations

Economic Profits

- $\pi = TR - TC$; $TR = P \times Q$; $TC = ATC \times Q$

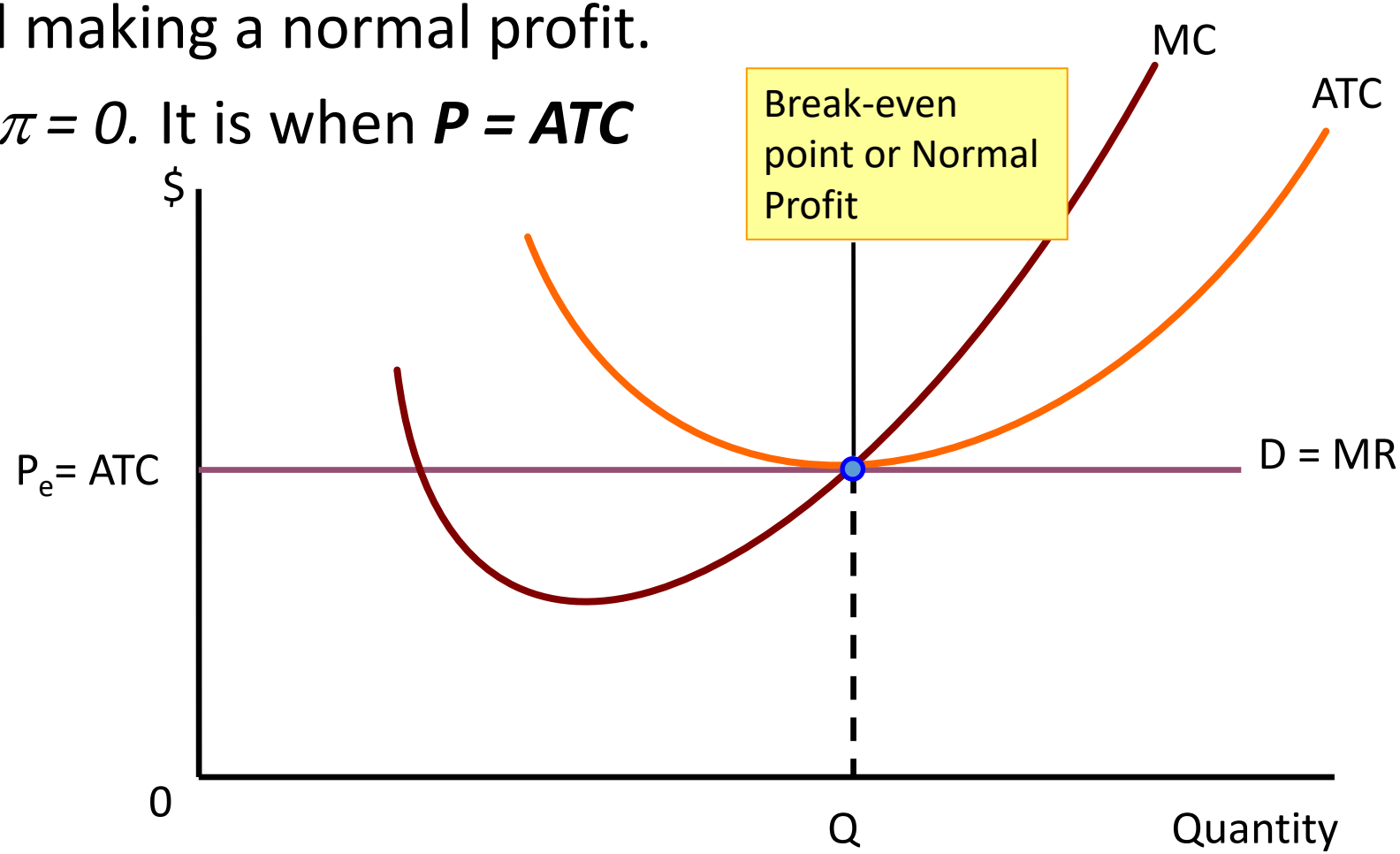
$\Rightarrow \pi = P \times Q - ATC \times Q = (P - ATC) \times Q$

- Economic Profits: $TR > TC$ or $\pi > 0$. It is when **$P > ATC$**
- Remember TC = Explicit Cost + Implicit Cost



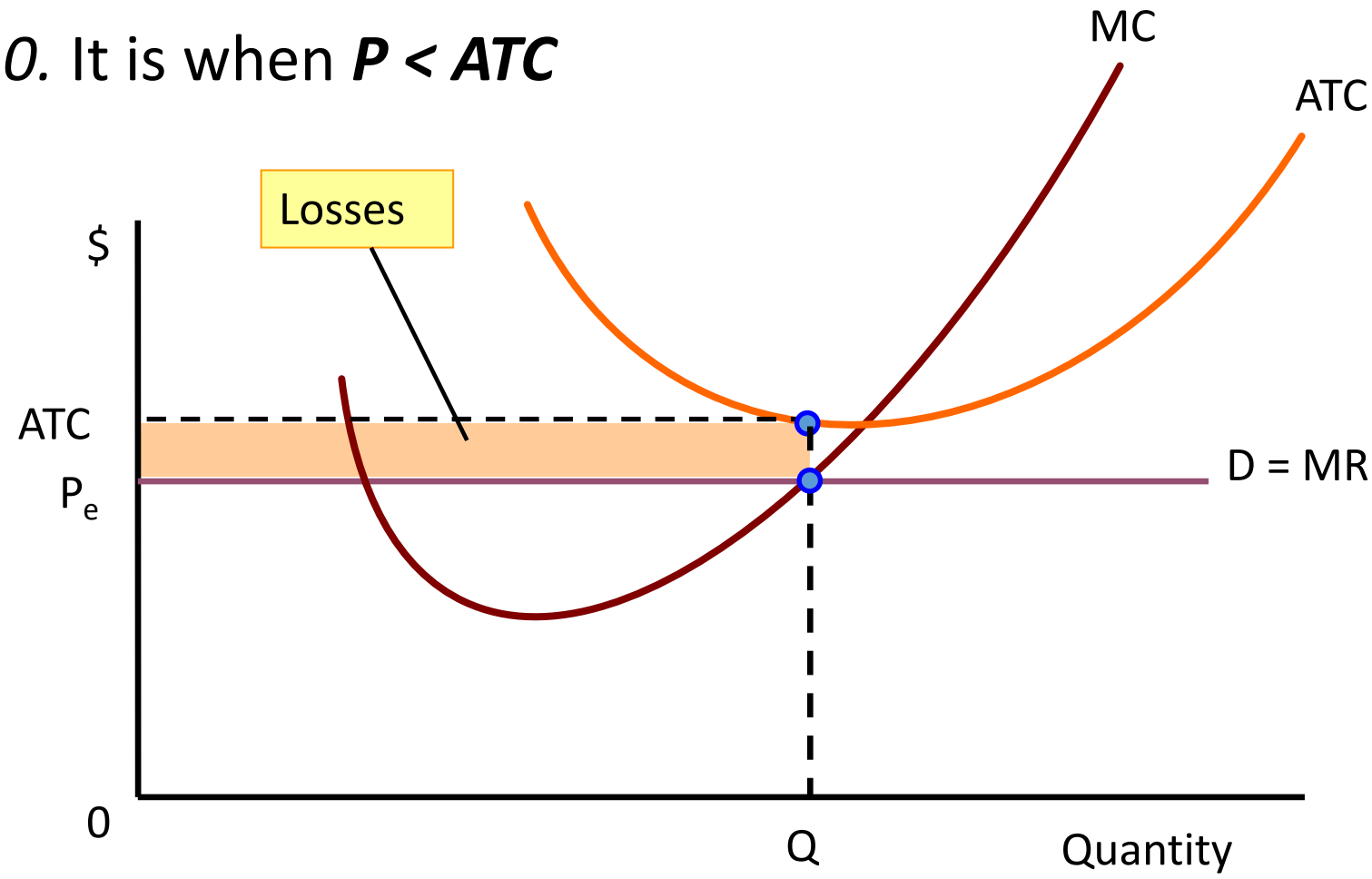
Break-Even or Normal Profits

- A firm in perfect competition is producing at the profit maximizing output and making a normal profit.
- *TR = TC* or $\pi = 0$. It is when ***P = ATC***



Make a Loss

- A firm in perfect competition is producing at the profit maximizing output, but making a loss. In this case, the firm is minimizing the losses
- *TR < TC* or $\pi < 0$. It is when ***P < ATC***



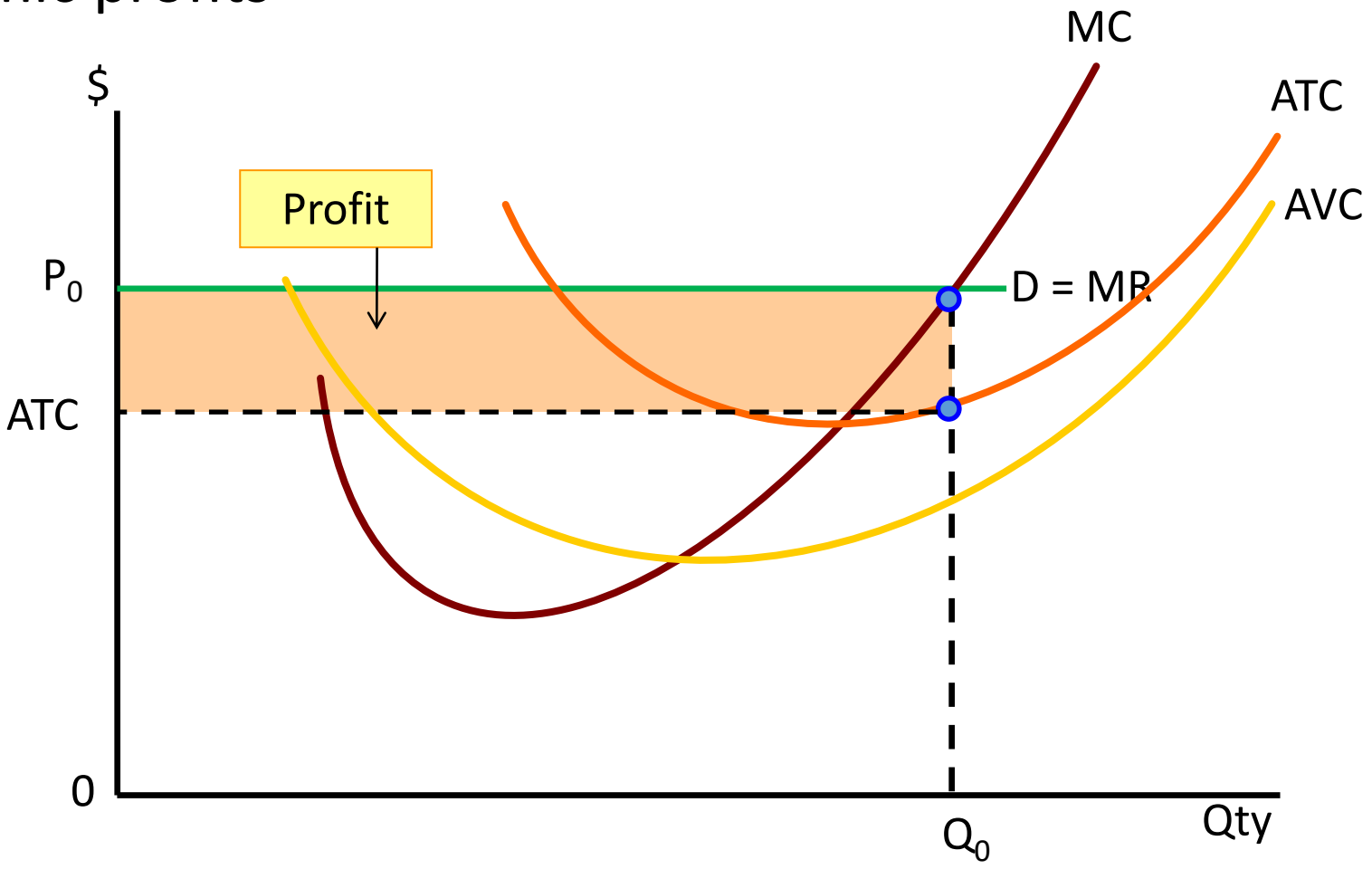
Short-run Supply Curve for a Firm under Perfect Competition

- Assuming that in the short-run, no firm will entry or exit (fixed number of firms)

  Total Cost = Total Fixed Cost + Total Variable Cost
- In the short run, fixed costs will be incurred whether or not the firm produces.
- In the short run a firm having economic profit (P > ATC) or normal profit (P = ATC) will obviously still produce
- In the short run a firm suffering losses (P < ATC) will try to minimize the losses (remember the assumption is that firms cannot enter or exist the market in the short run)
- How the firm can minimize the losses?
  - P < ATC = AFC + AVC
  - If P > AVC, firm still produces because at least some of the fixed costs are recovered
  - If P < AVC, firm will shut down. By producing, the losses are bigger

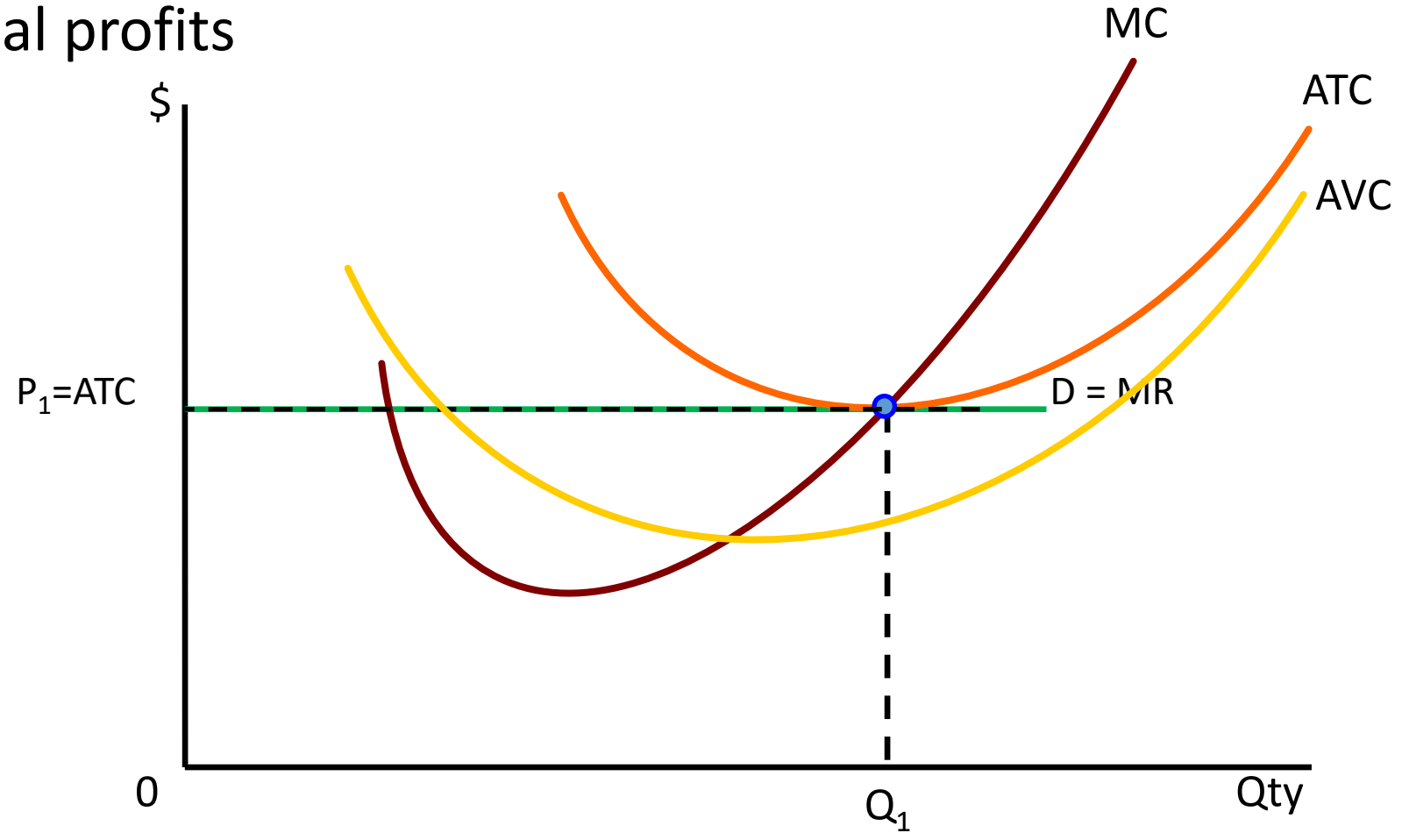
Short-run Supply Curve for a Firm under Perfect Competition

- If market equilibrium price is at P_0, firm will produces at Q_0 and making economic profits



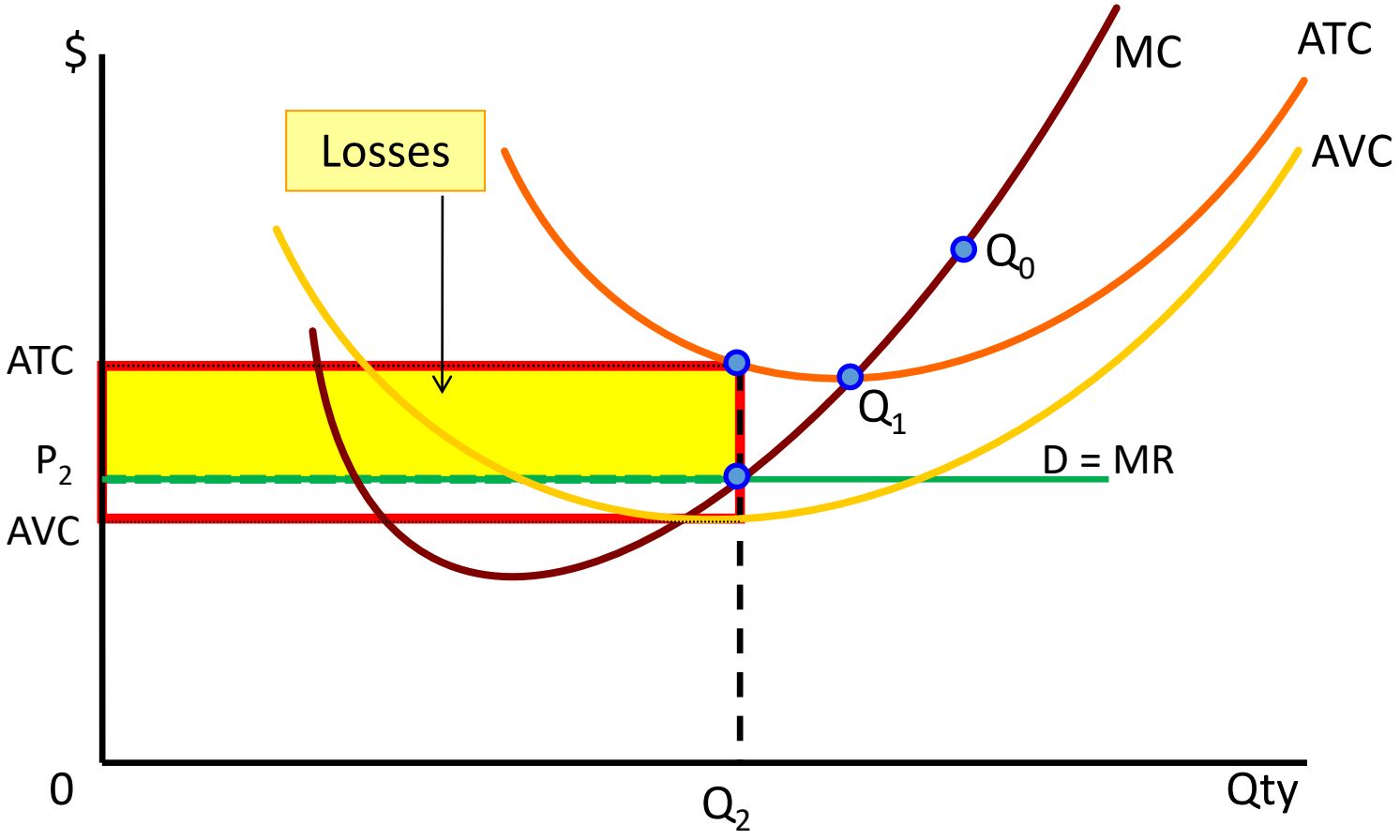
Short-run Supply Curve for a Firm under Perfect Competition

- If market equilibrium price is at P_1, firm will also produces at Q_1 and making normal profits



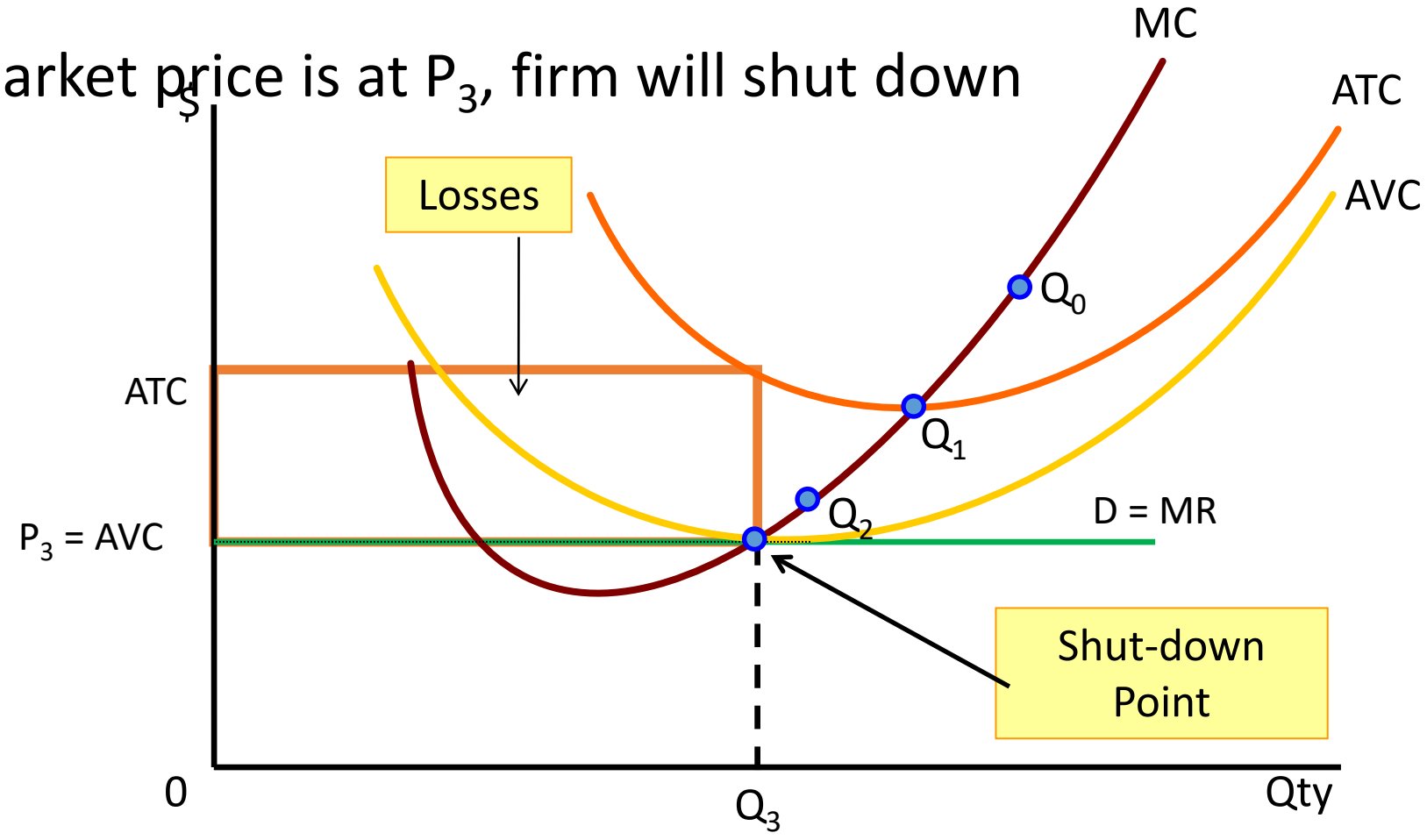
Short-run Supply Curve for a Firm under Perfect Competition

- If market equilibrium price is at P_2, firm will also produces at Q_2 and minimize the losses (yellow dash box). If not producing, the loss will be the red box



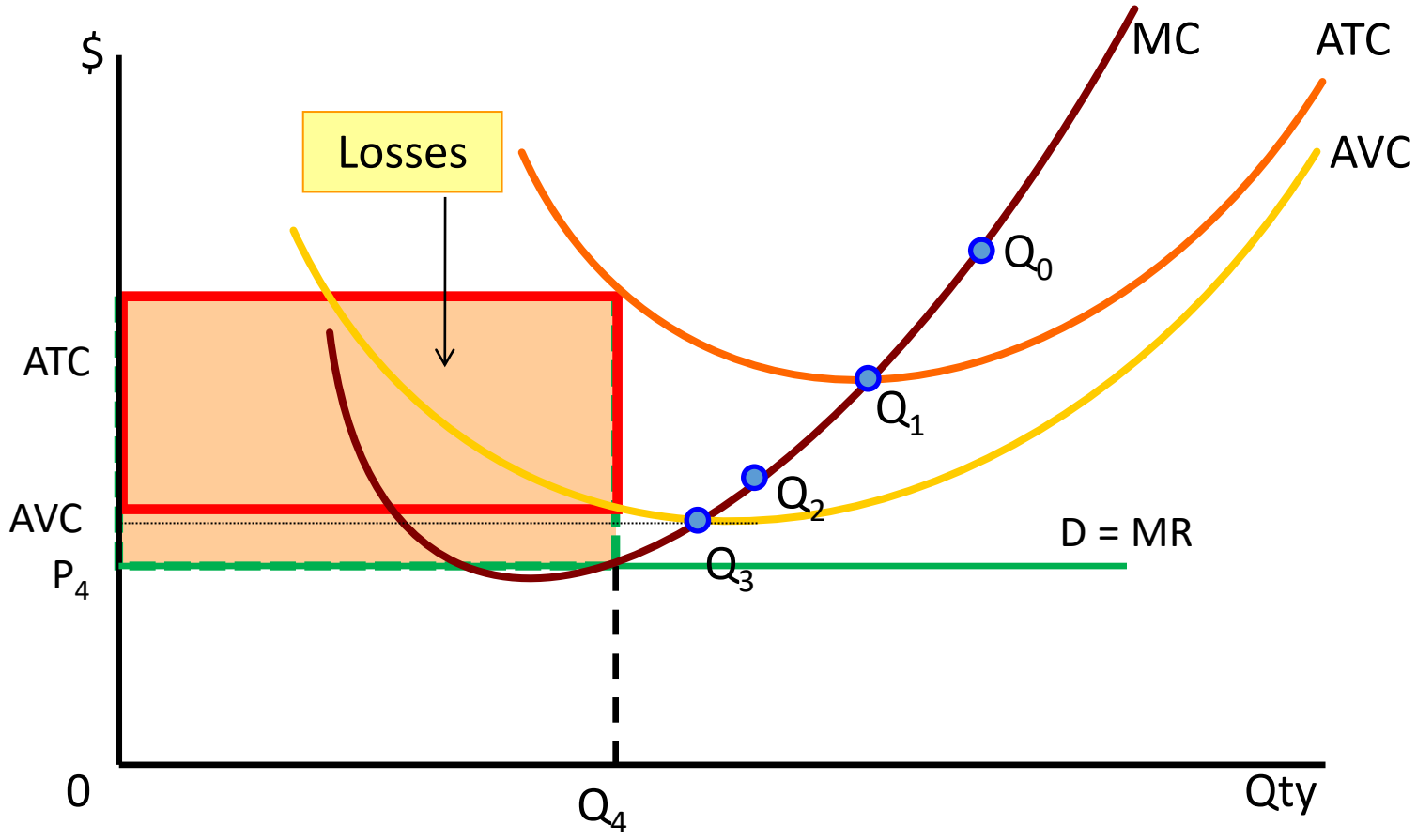
Short-run Supply Curve for a Firm under Perfect Competition

- If the market price is at P_3, firm will shut down



Short-run Supply Curve for a Firm under Perfect Competition

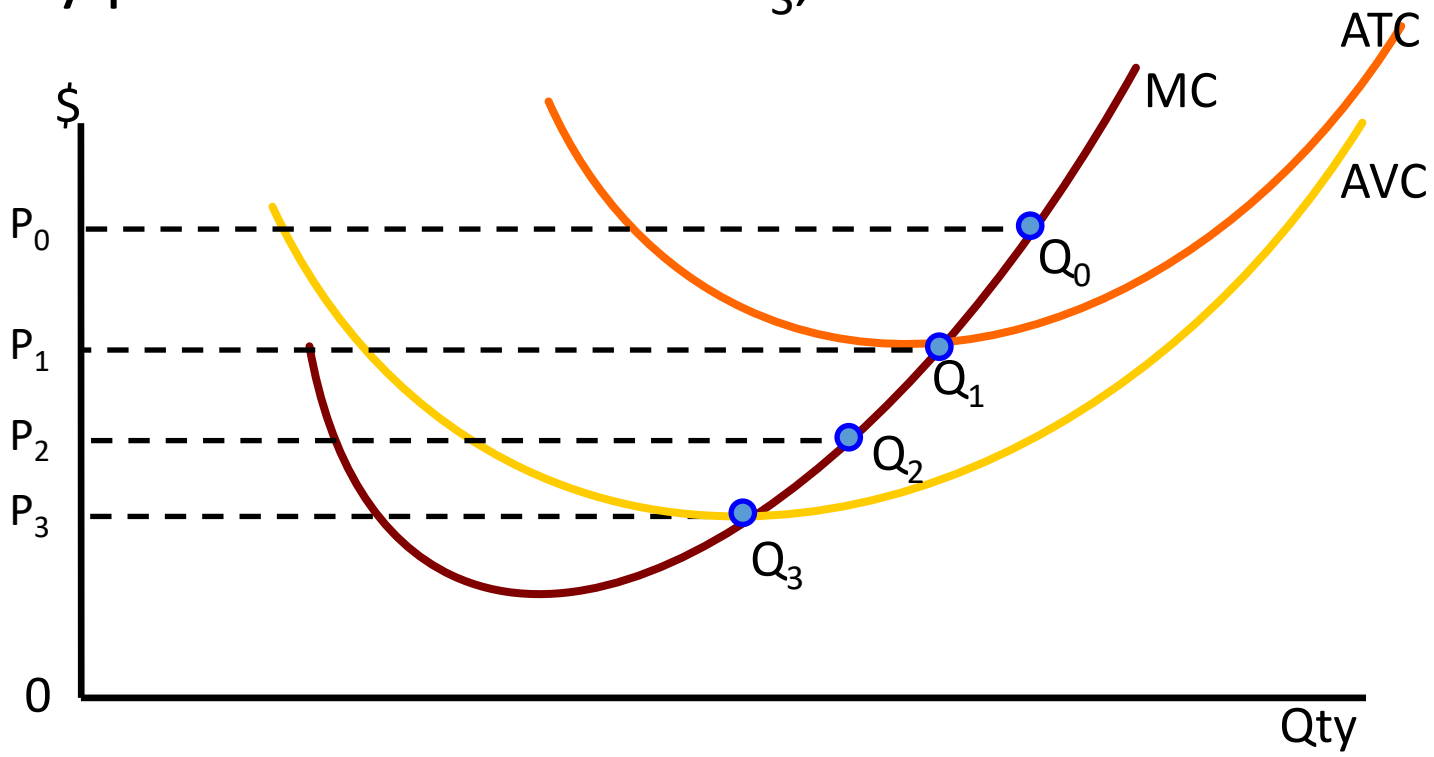
- If the market price is P_4 and firm is producing at Q_4, the losses (yellow dash box) are bigger than the losses by not producing (red box = fixed costs)



Short-run Supply Curve for a Firm under Perfect Competition

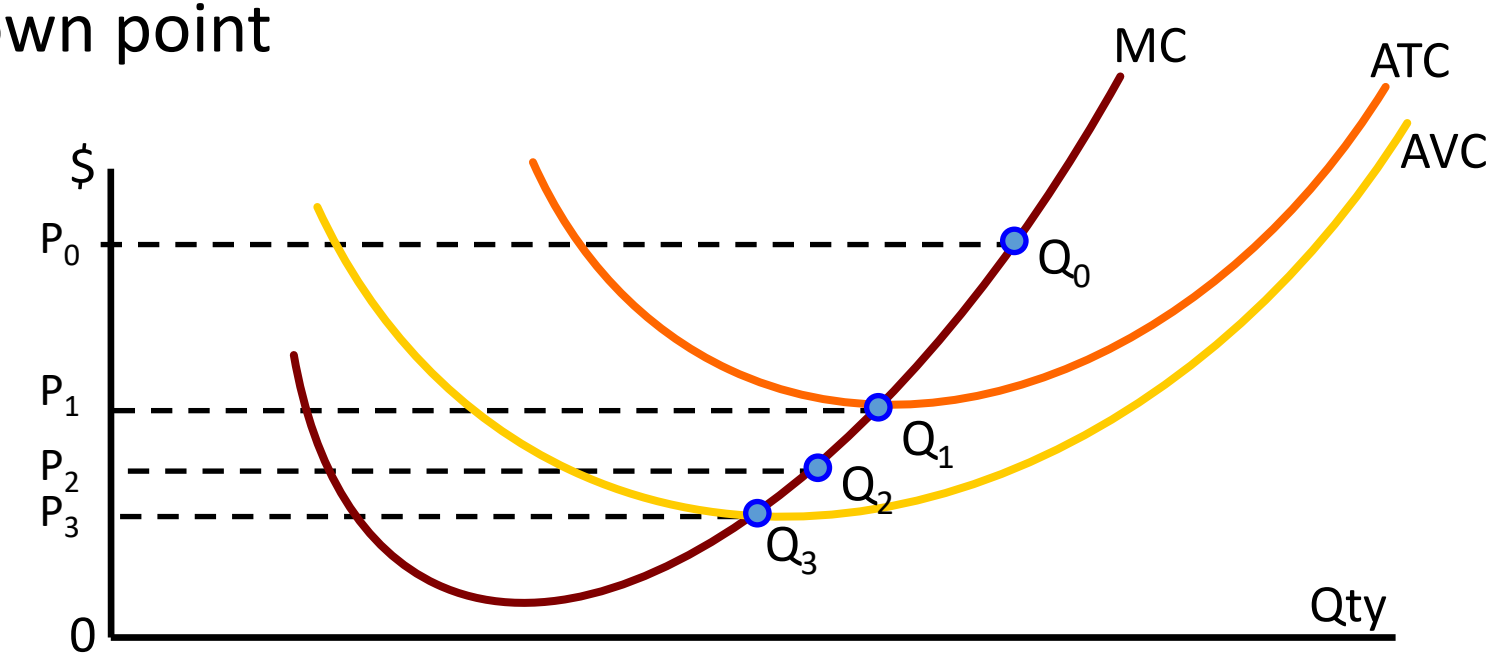
› Short run supply curve for a firm under perfect competition ***is the MC curve above the minimum of the AVC.***

- Firm maximizes the profit or minimizes the losses in the short run
- Firm only produces from Q_3 onwards, or the when the market price is minimum at P_3. Any price is smaller than P_3, firm will shut down



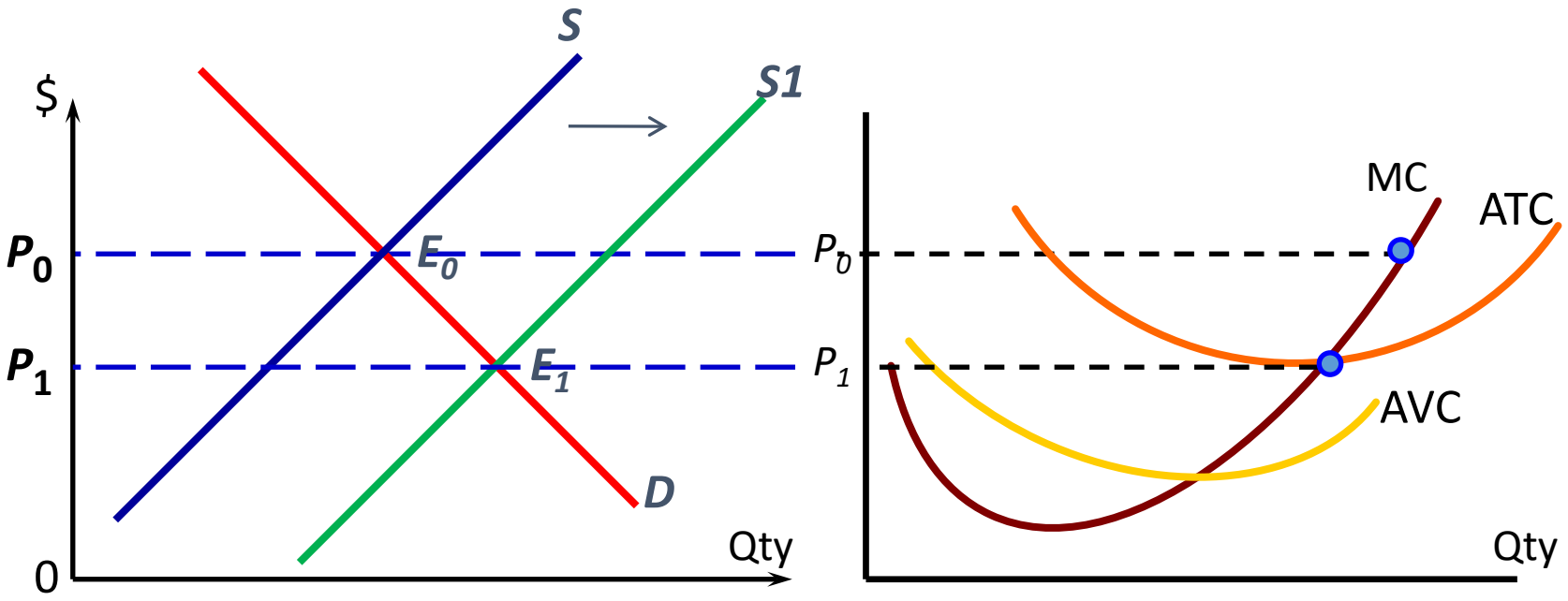
Summary of the Short-run

- Profit maximization *MR = MC*. *MC* needs to cut *MR* from below
- When market price is above P_1, firm makes economic profits
- When market price is at P_1, firm makes normal profits or break-even
- When market price is between P_3 and P_1, firm is minimizing the loss
- P_3 is the shut down point



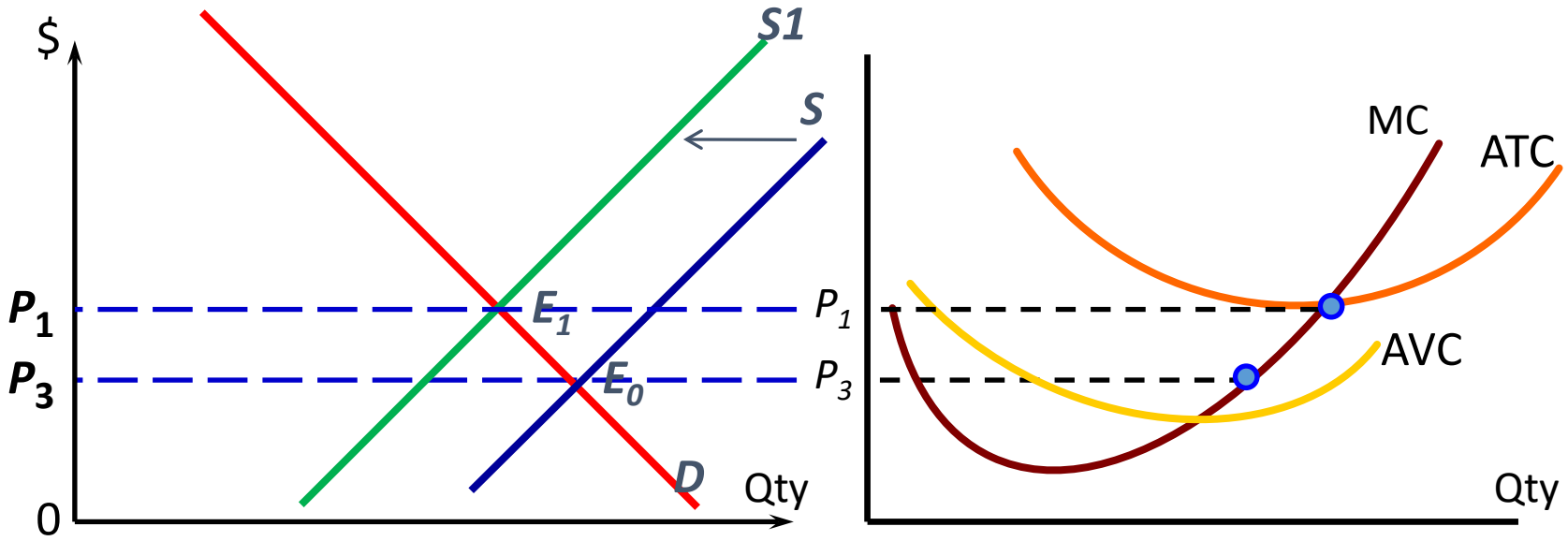
Long-run Equilibrium under Perfect Competition

- In the long-run, firms can enter or exit freely in the market, labour and capital are perfectly mobile
- If market equilibrium price is at P_0, firms in perfect competition market will make economic profits. This will lead to entry of new firms into the market
- This will make the equilibrium price lower (P_1) until firms can only make normal profit.



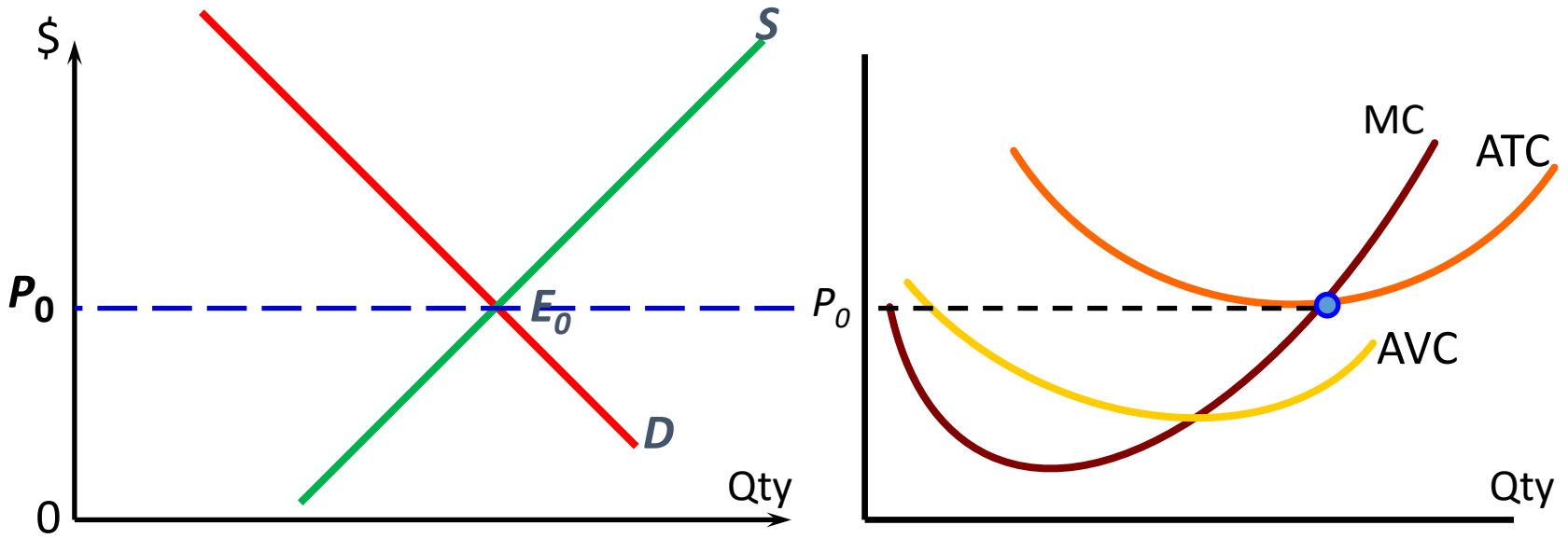
Long-run Equilibrium under Perfect Competition

- If market equilibrium price is at P_3, firms in perfect competition market will make losses. This will lead to exits of firms out of the market
- This will make the equilibrium price higher (P_1) until firms can only make normal or zero economic profit.



Long-run Equilibrium under Perfect Competition

- Hence in the equilibrium in the long run, firms can only make normal profit or zero economic profit. P = MR = MC = ATC (minimum of ATC since MC cuts the ATC at the min point)
- A firm's long run supply curve is the section of its MC that lies above minATC.



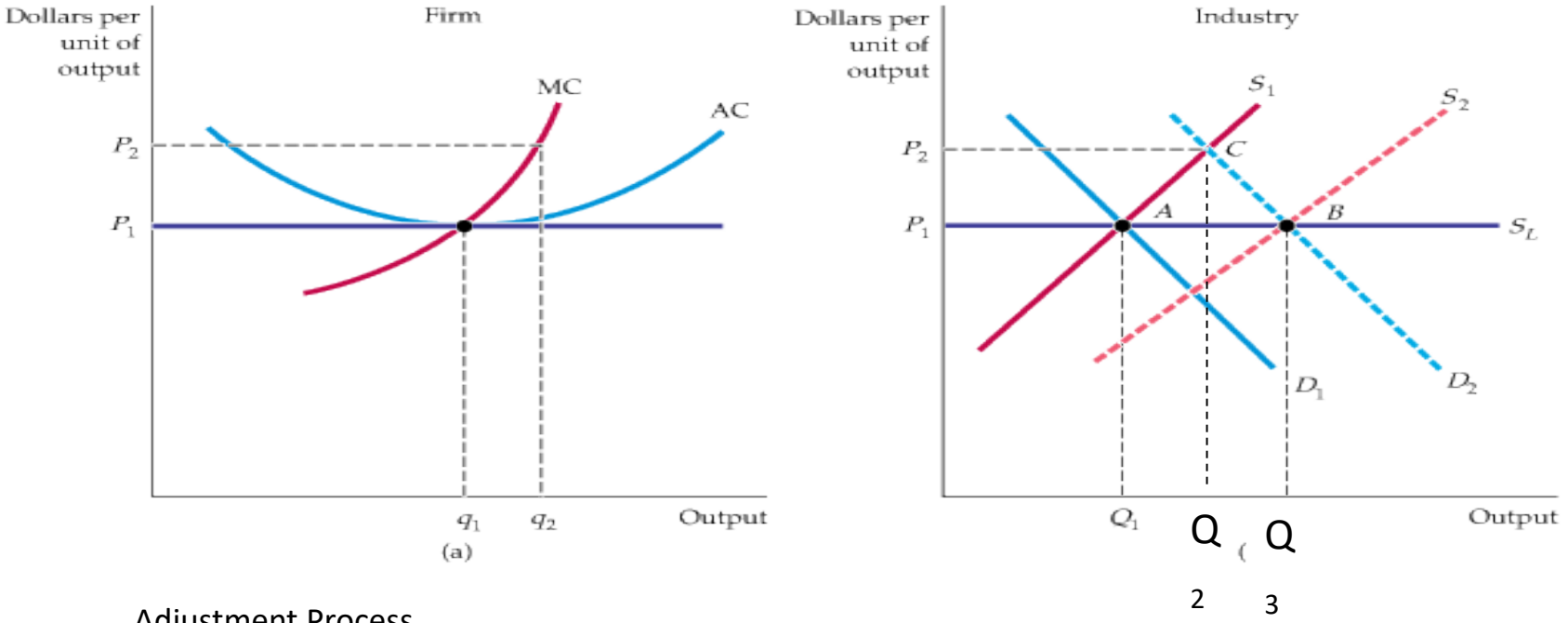
Long-run Industry Supply

- External economies
  - Factors beyond the control of an individual firm that lower costs as the industry expands.
- External diseconomies
  - Factors outside the control of a firm that raise the firm's costs as industry output increases.
- The existence of external economies or diseconomies determines the long-run industry supply curve.

Long-run Industry Supply

- External economies
  - For example, suppose that as the computer industry expands the cost of chips falls.
- External diseconomies
  - For example, suppose that as the wine industry expand the cost of water increases.

Constant Cost Industry



<u>Adjustment Process</u>

Short-Run

Industry: Demand Increases (D_1 to D_2)→Price rises (P_1 to P_2) with short-run eq at C

Firm: Output increases (q_1 to q_2) with rising MC

Long-Run

Economic Profits attract new firms → Market Supply Curve Shifts (S_1 to S_2)

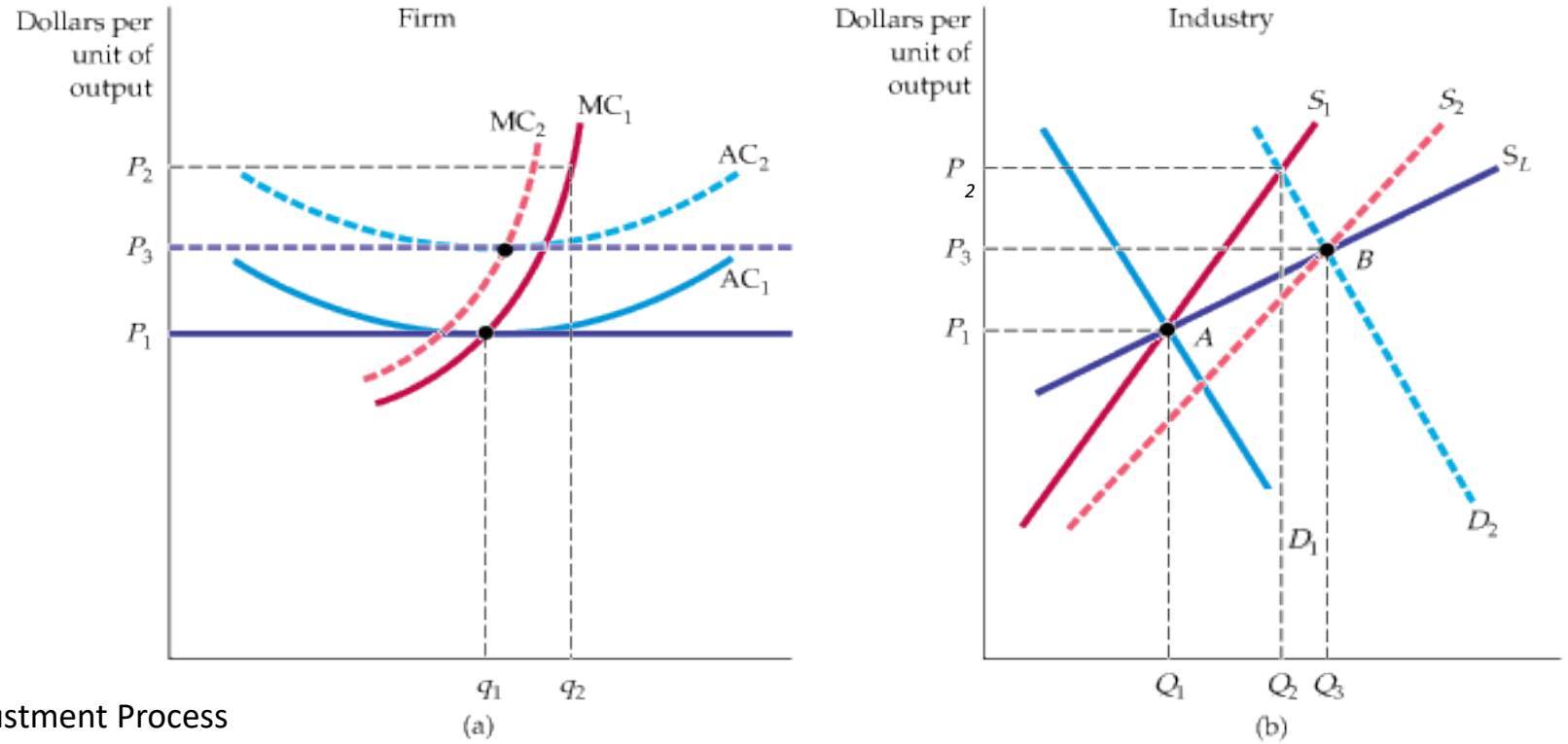
→ Prices fall back to P_1 with long-run equilibrium at B

→ Long Run Supply Curve is S_L

Increasing-cost industry

- In a constant-cost industry, entry and exit in the long run ensures that all firms earn zero profits and the price is $P^* = ATC_{min}$.
- This assumes that all firms have access to the same technology and have the same cost structure, and this cost structure does not change as the industry grows.
- However, the long-run industry supply curve need not be perfectly elastic.
- The long-run supply curve can instead be upward sloping; this is known as an ***increasing cost industry***.
  - If potential entrants have higher costs than incumbent firms (already in the market)
  - Some resources used in production may be available only in limited quantities (input prices rise as industry expands), thus costs for all firms rise
  - Congestion may rise with industry output (e.g. airlines)

Increasing Cost Industry



Adjustment Process

Short Run

Industry: Increase in Demand (D_1 to D_2) → Increase in Price (P_1 to P_2)

Firm: q_1 to q_2 by moving along MC_1

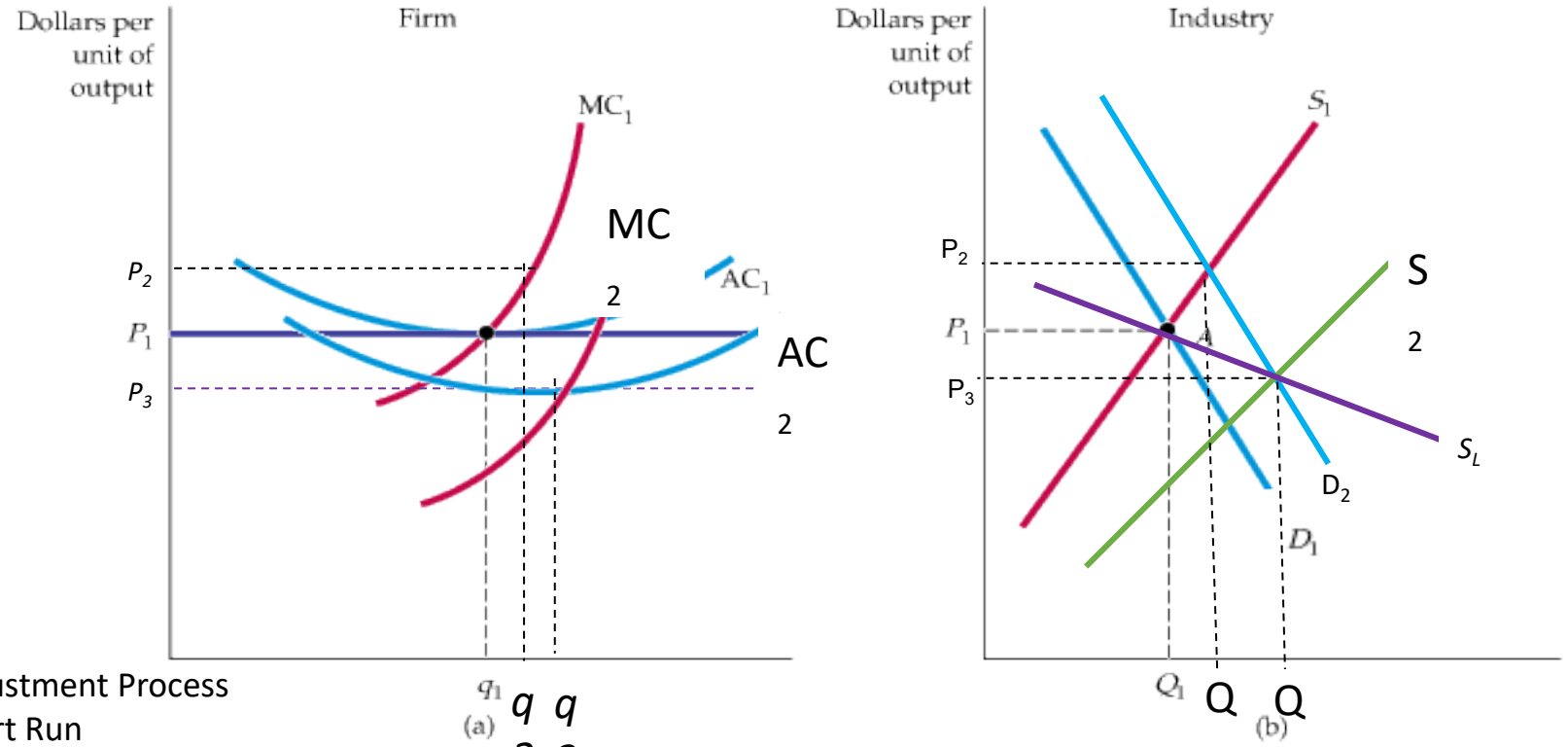
Long Run

Industry: Increase in profits causes new firms to entry industry → Shift in Short-Run Supply Curve (S_1 to S_2) →Price falls back (P_2 to P_3) →As output expands, input prices increases→AC_1 to AC_2→Economic profit eliminated→ Long Run Supply Curve is S_L

Decreasing-cost industry

- Suppose that as output in an industry expands, costs for all firms fall.
  - If there are economies of scale in input markets
  - For example, the **computer software industry** – as the market has expanded average costs for all firms could actually fall.
- If this is the case, following an increase in demand, as entry will continue until it is no longer profitable, the new long-run equilibrium price has to be lower than the initial equilibrium price.
- In this case, the long-run industry supply curve is downward sloping – this is a ***decreasing cost industry***.

Decreasing Cost Industry



Adjustment Process

Short Run

Industry: Increase in Demand (D_1 to D_2) → Increase in Price (P_1 to P_2) → Quantity increases (Q_1 to Q_2)

Firm: q_1 to q_2 by moving along MC_1

Long Run

Industry: Increase in profits causes new firms to entry industry → Shift in Short-Run Supply Curve (S_1 to S_2)

→Quantity increases (Q_2 to Q_3) Price falls back (P_2 to P_3)

→As output expands, input prices fall →AC_1 to AC_2→Economic profit is eliminated

→ Long Run Supply Curve is S_L