ECO2011 Basic Microeconomics

Mankiw Chapter 14 (Competitive Markets)
Pindyck Chapter 8 (Competitive Supply)

2025

Agenda

Motivation: The Coke–Pepsi "Secret Formula" Story

- What happened:
  - Coca-Cola employees tried to sell Coke's secret formula to Pepsi.
  - Pepsi reported them to authorities instead of using the information.

- The puzzle: why wouldn't Pepsi want to know Coke's secret recipe?

- Initial intuition:
  - Seems like a way to beat Coke = more market share, higher profits.

Things aren't so simple! (Also, executives at Pepsi are good at economics!)

Source: https://freakonomics.com/2006/07/how-much-would-pepsi-pay-to-get-cokes-secret-formula/
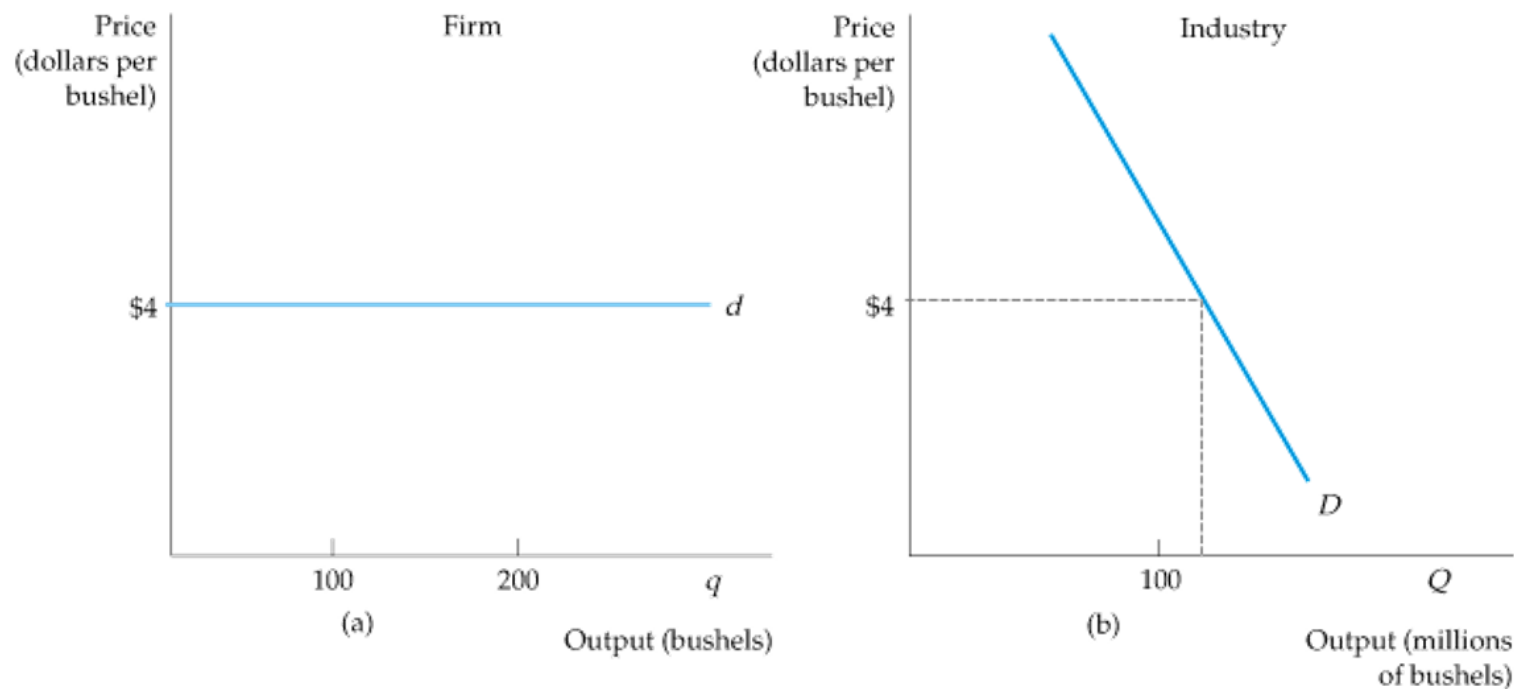
Agenda

What is a Competitive Market?

Perfectly competitive market:

1. Market with many buyers and sellers

2. Trading identical products

   ▪ Because of the first two: each buyer and seller is a price taker (takes the price as given)

3. Firms can freely enter or exit the market

Internet photo

Demand and Marginal Revenue for a Competitive Firm

- A competitive firm supplies only a small portion of the total output of all the firms in an industry. Therefore, the firm takes the market price of the product as given, choosing its output on the assumption that the price will be unaffected by the output choice.

- In (a) the demand curve facing the firm is perfectly elastic, even though the market demand curve in (b) is downward sloping.

Revenue of a Competitive Firm

- Total revenue, $TR = P \times Q$

- Average revenue, $AR = TR / Q$

- Marginal revenue, $MR = \Delta TR / \Delta Q$
  - Change in TR from an additional unit sold

Fill in the empty spaces of the table.

Q	P	TR	AR	MR
0	$10		n/a	
1	$10		$10	
2	$10			
3	$10			
4	$10	$40		
5	$10	$50		$10

Q	P	$TR = P \times Q$	$AR = \dfrac{TR}{Q}$	$MR = \dfrac{\Delta TR}{\Delta Q}$
0	$10	$0	n/a	
				$10
1	$10	$10	$10	
				$10
2	$10			
				$10
3	$10	$30	$10	
				$10
4	$10	$40	$10	
				$10
5	$10	$50	$10	

Notice that
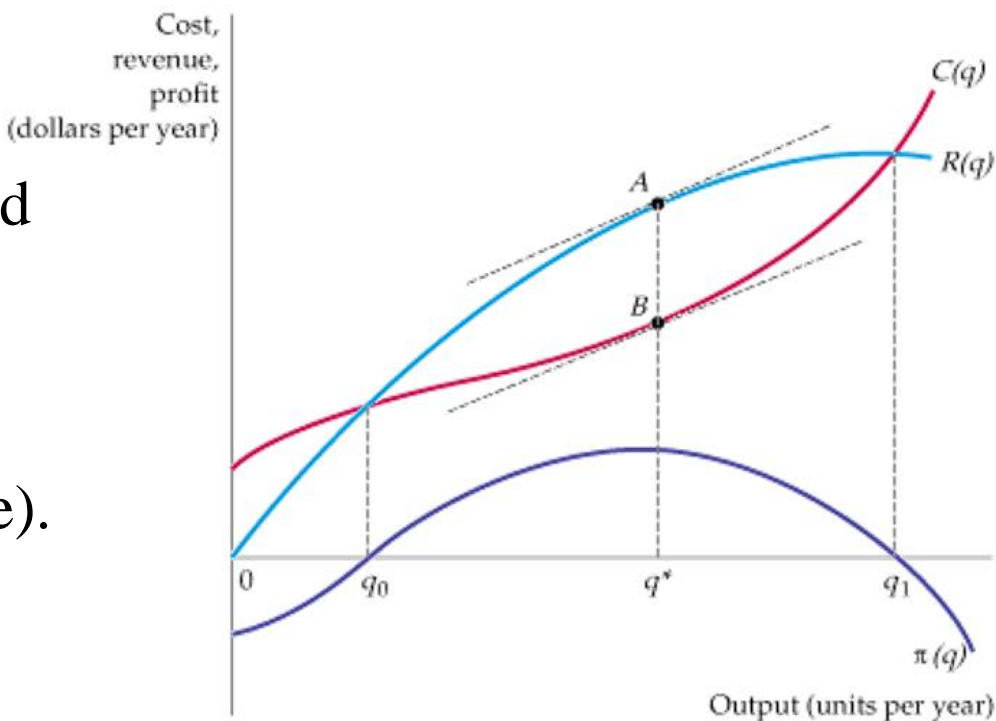$MR = P$

MR = P for a Competitive Firm

- A competitive firm
  - Can keep increasing its output without affecting the market price.
  - So, each one-unit increase in Q causes revenue to rise by P, i.e., $MR = P$.
- $MR = P$ is only true for firms in competitive markets
- For competitive firms
  - AR = P

Do Firms Maximize Profit?

▪ The assumption of profit maximization is frequently used in microeconomics because it predicts business behavior reasonably accurately and avoids unnecessary analytical complications.

▪ For smaller firms managed by their owners, profit is likely to dominate almost all decisions. In larger firms, however, managers who make day-to-day decisions usually have little contact with the owners.

▪ Firms that do not come close to maximizing profit are not likely to survive. The firms that do survive make long-run profit maximization one of their highest priorities.

Profit Maximization

- Profit: Difference between total revenue and total cost.
  - $\pi(q) = R(q) - C(q)$
- A firm chooses output q*, so that profit, the difference AB between revenue R and cost C, is maximized.
- At that output, marginal revenue (the slope of the revenue curve) is equal to marginal cost (the slope of the cost curve).
  - $\Delta\pi/\Delta q = \Delta R/\Delta q - \Delta C/\Delta q = 0$
  - $MR(q) = MC(q)$

Profit Maximization

- What Q maximizes a firm's profit?
  - Think at the margin
  - If Q increases by one unit
    - Revenue rises by MR, cost rises by MC

- Compare marginal revenue with marginal cost
  - If MR > MC: increase Q to raise profit
  - If MR < MC: decrease Q to raise profit
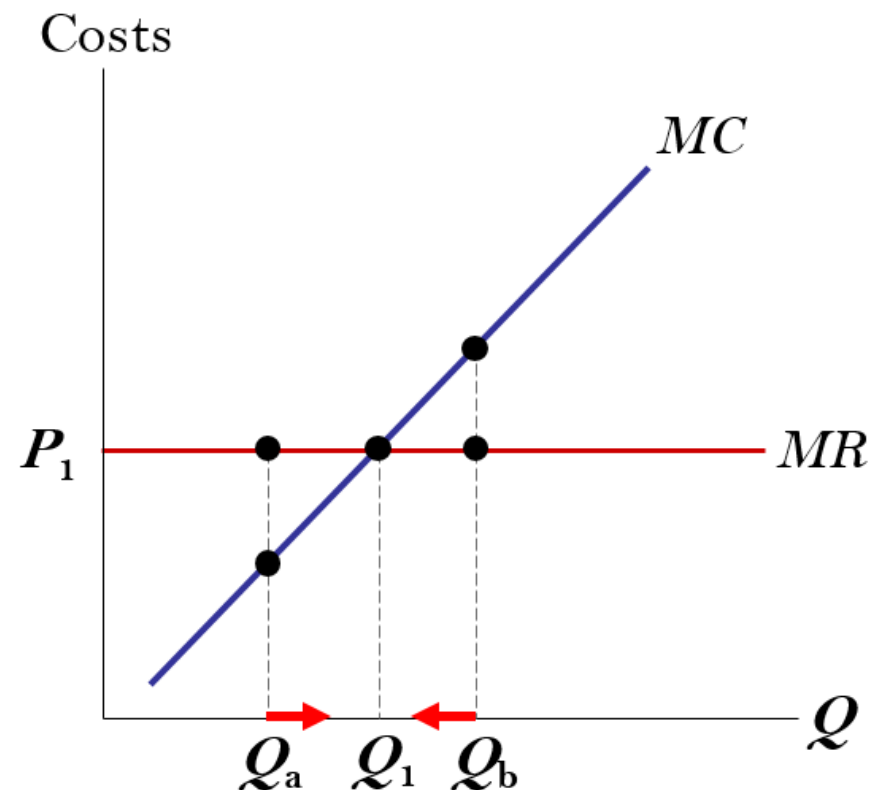 - Maximize profit for Q where MR = MC

Profit Maximization

- At any Q with $MR > MC$, increasing Q raises profit.

- At any Q with $MR < MC$, reducing Q raises profit.

Q	TR	TC	Profit	MR	MC	ΔProfit = $MR - MC$
0	$0	$5	−$5			
				$10	$4	$6
1	10	9	1			
				10	6	4
2	20	15	5			
				10	8	2
3	30	23	7			
				10	10	0
4	40	33	7			
				10	12	−2
5	50	45	5			

MC and the Firm's Supply Decision

Rule: $MR = MC$ at the profit-maximizing Q.

- At Qa, MC < MR. So, increase Q to raise profit.

- At Qb, MC > MR. So, reduce Q to raise profit.

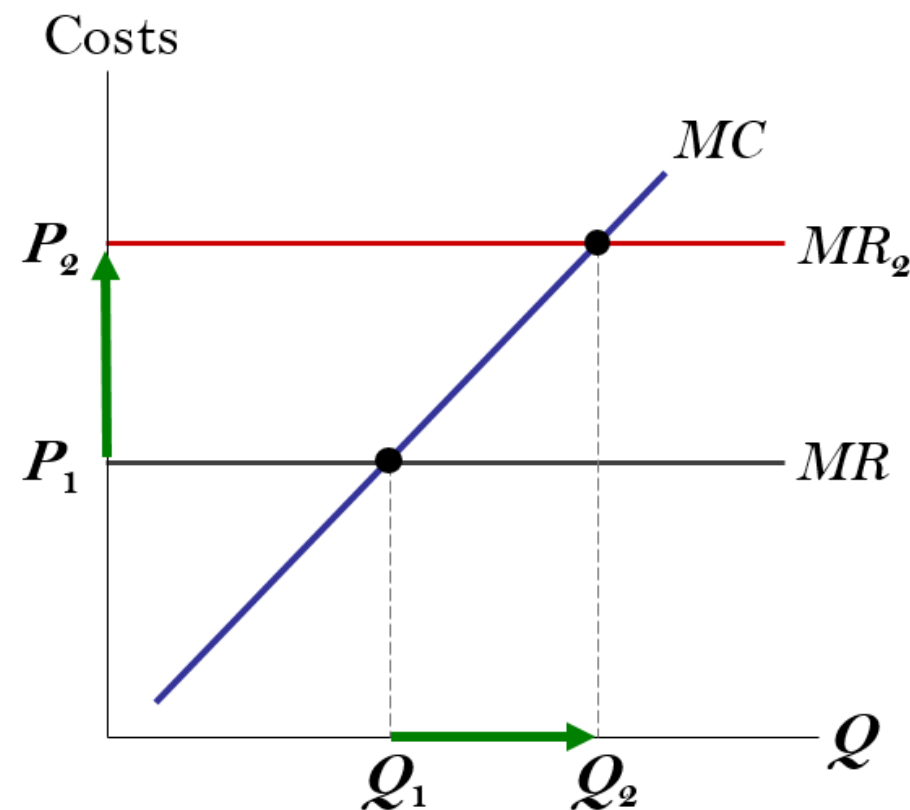- At Q1, MC = MR. Changing Q would lower profit.

Agenda

1. Motivation

2. Profit Maximization

3. **A Competitive Firm's Supply Curve**

   3.1. A Competitive Firm's SR Supply Curve

   3.2. A Competitive Firm's LR Supply Curve

4. Market Supply in a Competitive Market

   4.1. The SR Market Supply Curve

   4.2. The LR Market Supply Curve

MC and the Firm's Supply Decision

The *MC* curve <u>is</u> the firm's supply curve.

- If price rises to P2, then the profit-maximizing quantity rises to Q2.

- The MC curve determines the firm's Q at any price.

- Hence, the MC curve is the firm's supply curve

Shutdown vs. Exit

- Shutdown:
  - A <u>short-run decision</u> not to produce anything because of market conditions.
- Exit:
  - A <u>long-run decision</u> to leave the market.
- A key difference:
  - If shut down in SR, must still pay FC.
  - If exit in LR, zero costs.
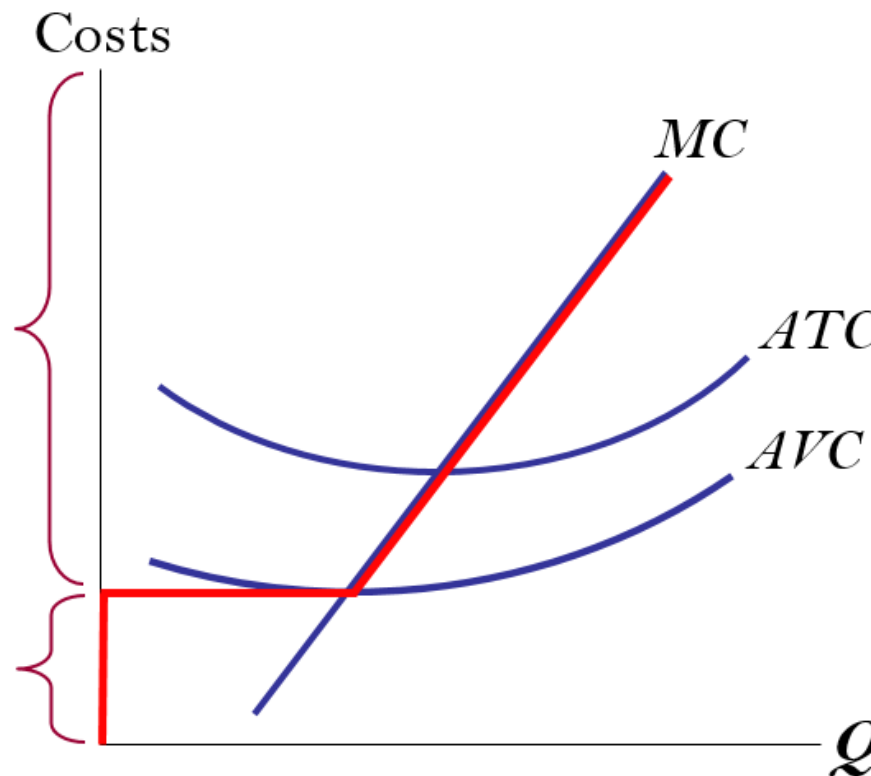
Short-run Decision to Shut Down

- Should a firm shut-down in the short run?
  - Cost of shutting down = revenue loss = TR
  - Benefit of shutting down = cost savings= VC

    (because the firm must still pay FC)

- Shut down if TR < VC, or $P < AVC$

A Competitive Firm's SR Supply Curve

The firm's short run supply curve is the portion of its MC curve above AVC.

If $P > AVC$, then firm produces Q where $P = MC$.

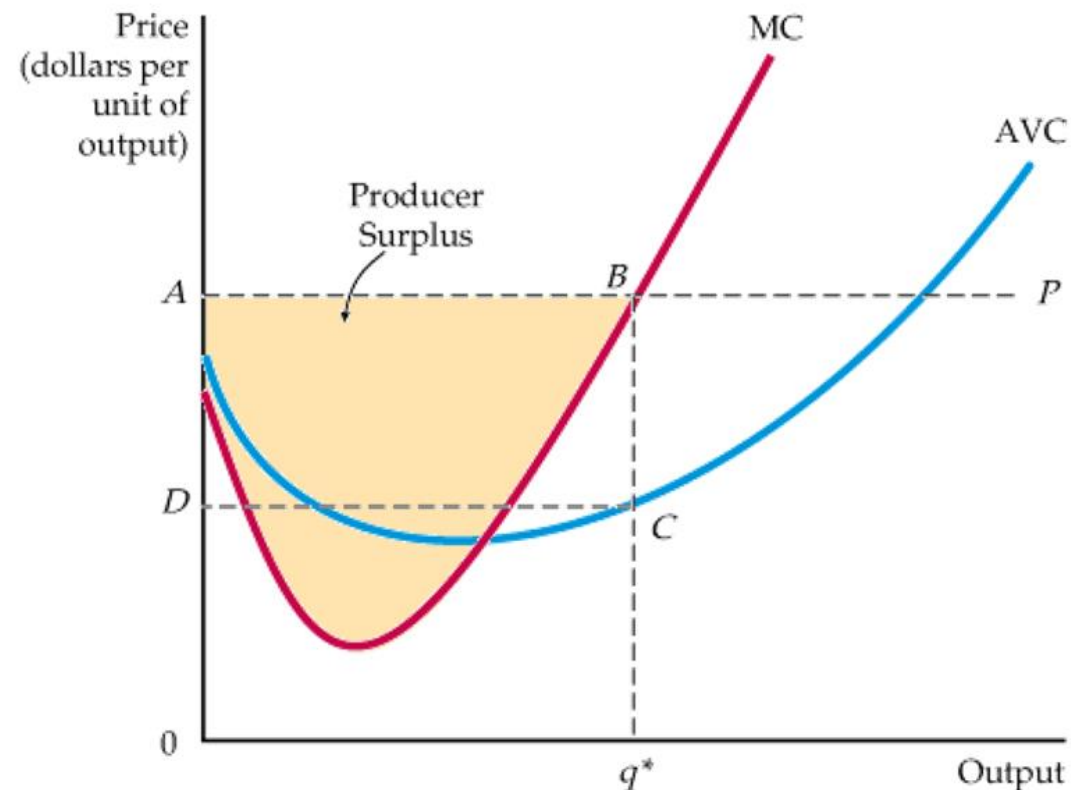If $P < AVC$, then firm shuts down (produces $Q = 0$).

The Irrelevance of Sunk Costs

- Sunk cost
  - A cost that has already been committed and cannot be recovered
  - Should be ignored when making decisions
  - You must pay them regardless of your choice
  - In the short run, FC are sunk costs
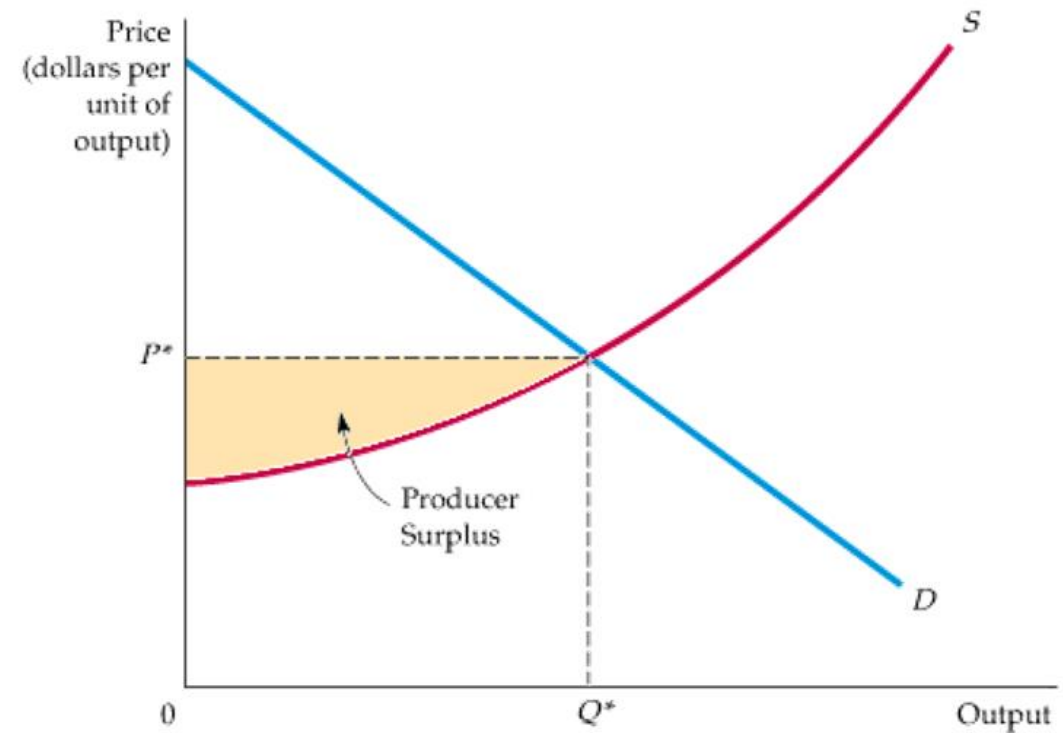   - So, FC should not matter in the decision to shut down

Producer Surplus in the Short Run

- Producer surplus: Sum over all units produced by a firm of differences between the market price of a good and the marginal cost of production.

- The producer surplus for a firm is measured by the yellow area below the market price and above the marginal cost curve, between outputs 0 and q*, the profit-maximizing output.

- Alternatively, it is equal to rectangle ABCD because the sum of all marginal costs up to q* is equal to the variable costs of producing q*.

Producer Surplus vs. Profit

- Producer surplus $= PS = R - VC$
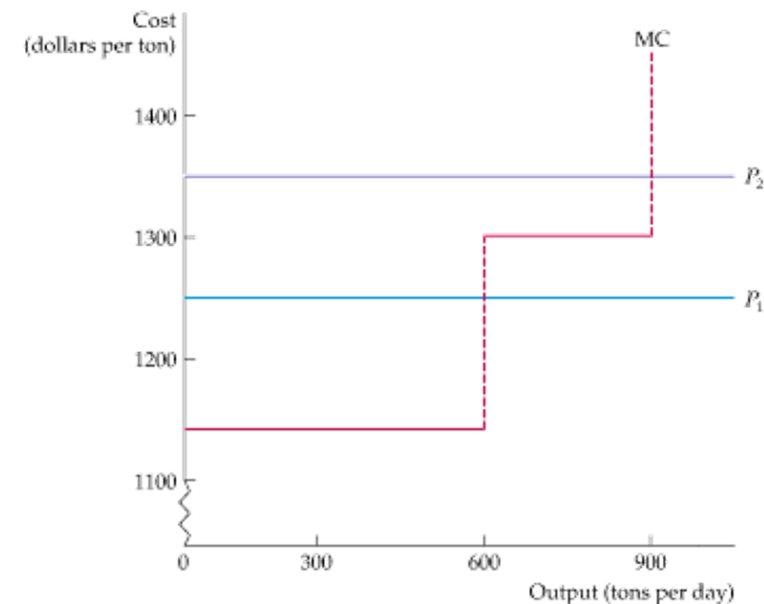
- Profit $= \pi = R - VC - FC$

The producer surplus for a market is the area below the market price and above the market supply curve, between 0 and output Q^*.

Case Study: The Short-Run Output Decision of an Aluminum Smelting Plant

- How should the manager determine the plant's profit maximizing output? Recall that the smelting plant's short-run marginal cost of production depends on whether it is running two or three shifts per day.

- In the short run, the plant should produce 600 tons per day if price is above $1140 per ton but less than $1300 per ton.

- If price is greater than $1300 per ton, it should run an overtime shift and produce 900 tons per day.

- If price drops below $1140 per ton, the firm should stop producing, but it should probably stay in business because the price may rise in the future.
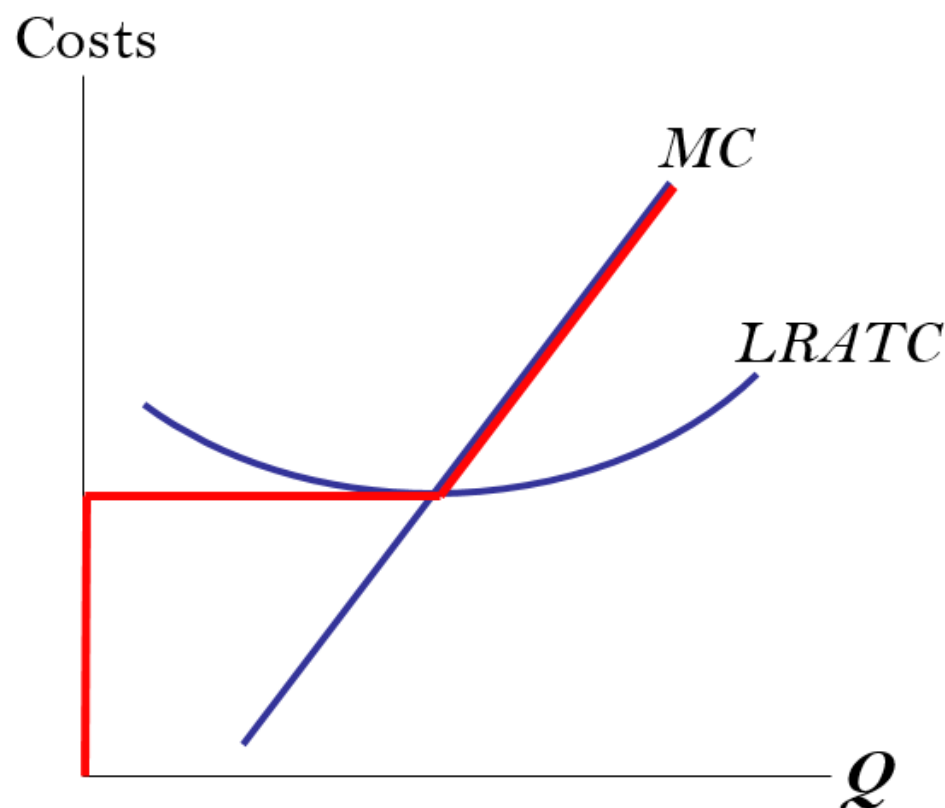
A Firm's Long-Run Decision

- Should a firm exit or enter in the long run?
  - Cost of exiting market = revenue loss = TR
  - Benefit of exiting market = cost savings = TC (remember, FC = 0 in long run)

- Firm's long-run decision
  - <u>Exit</u> the market if: TR < TC

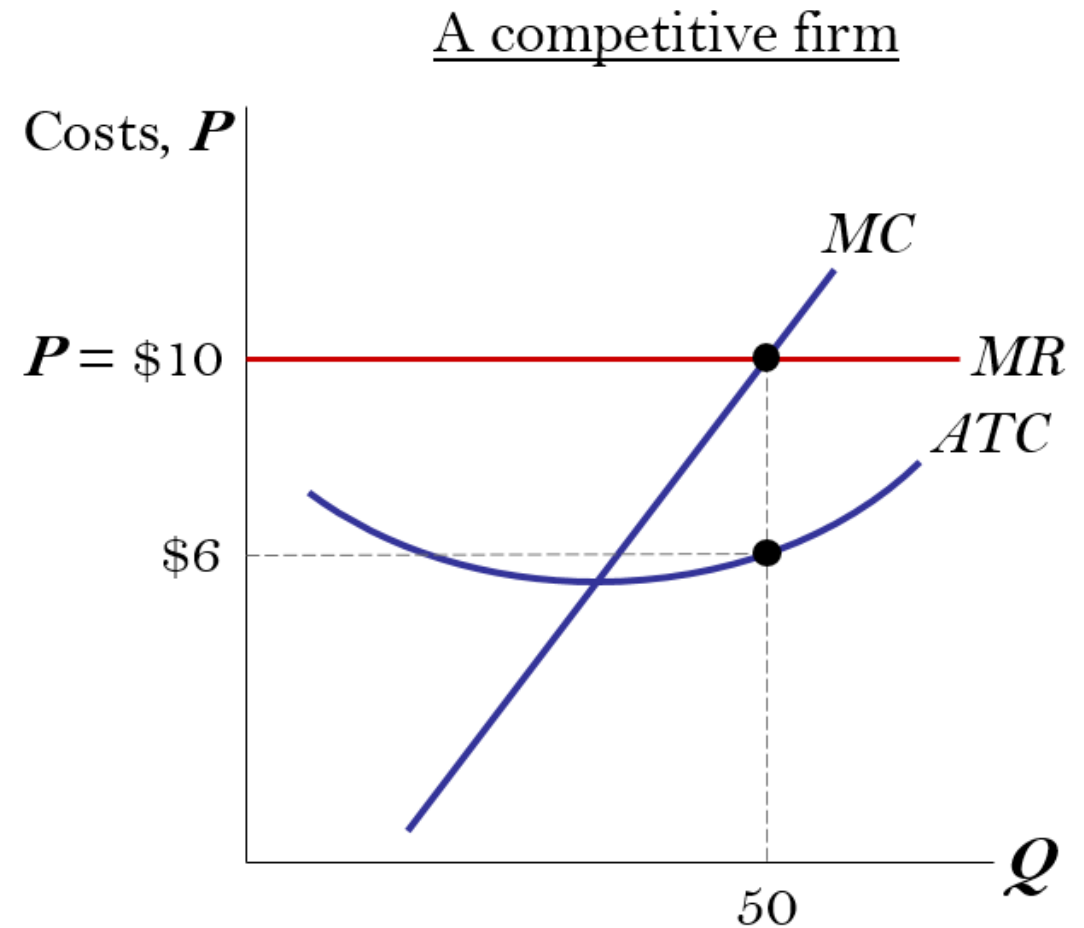   (same as: P < ATC)
  - <u>Enter</u> the market if: TR > TC

    (same as: P > ATC)

The Competitive Firm's LR Supply Curve

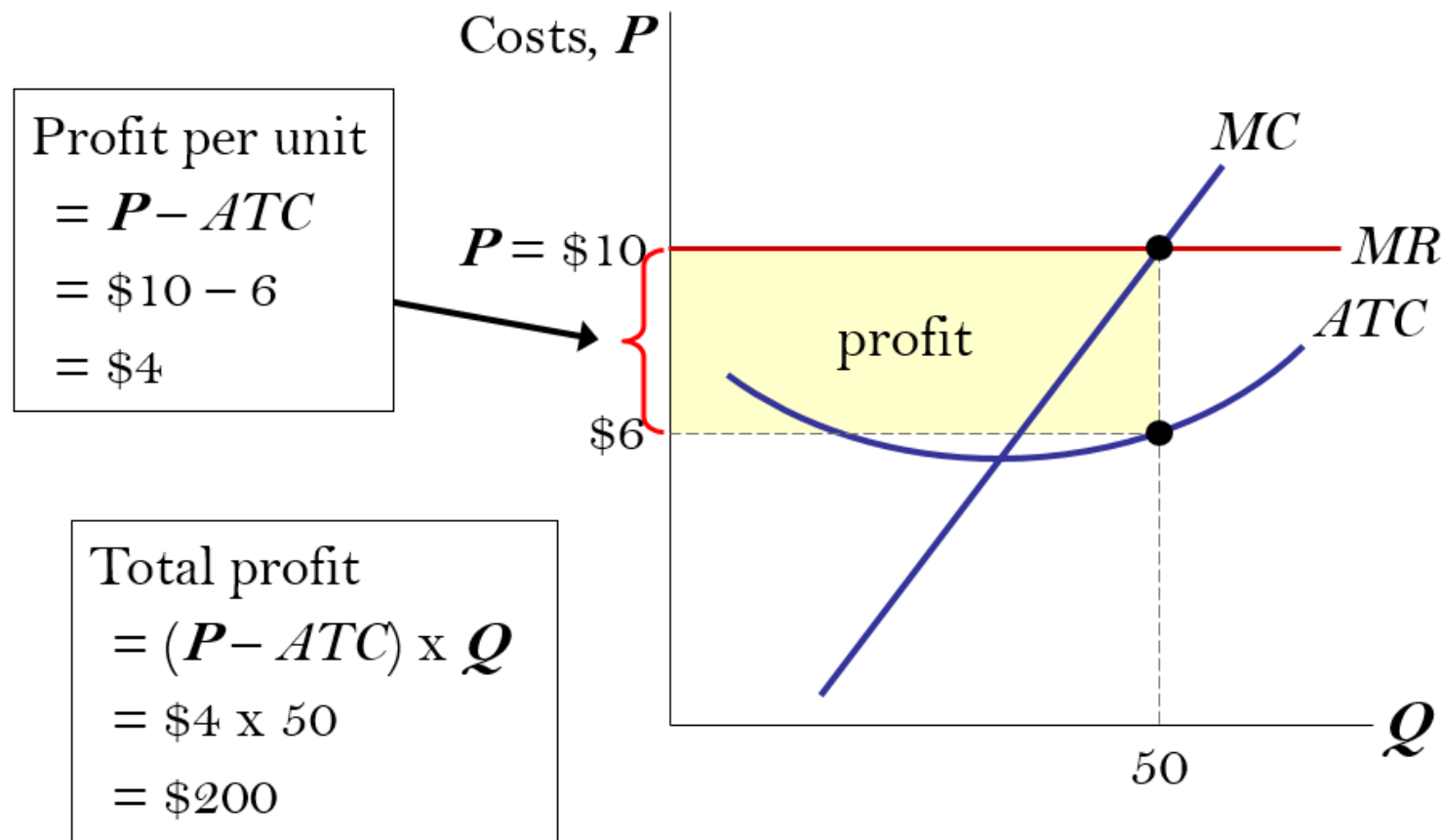The firm's LR supply curve is the portion of its *MC* curve above *LRATC*.

- Determine this firm's total profit.

- Identify the area on the graph that represents the firm's profit.

A competitive firm

Costs, P

MC

$P = \$10$ .... MR

ATC

$\$6$

50

Q

A competitive firm

Costs, P

Profit per unit
$= P - ATC$
$= \$10 - 6$
$= \$4$

$P = \$10$

MC

MR

ATC

profit

$\$6$

Total profit
$= (P - ATC) \times Q$
$= \$4 \times 50$
$= \$200$

Q

50

- Determine this firm's total loss, assuming AVC < $3.

- Identify the area on the graph that represents the firm's loss.

A competitive firm

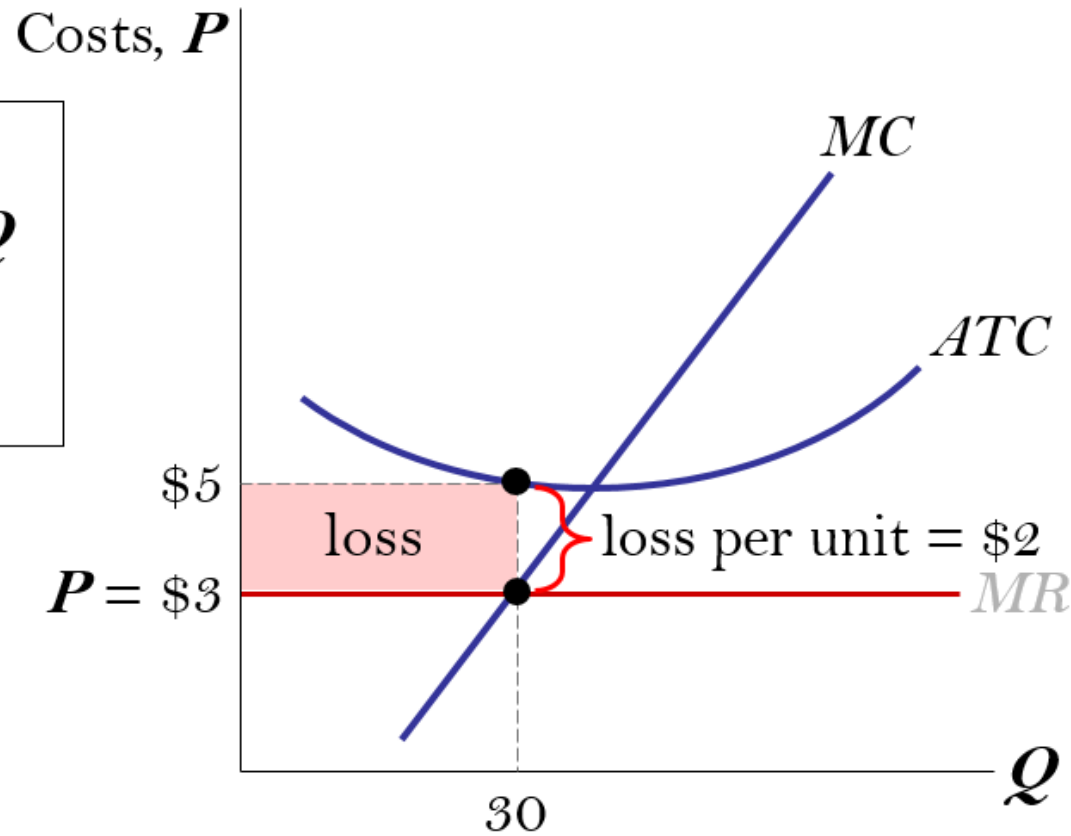## A competitive firm

Total loss
$$= (ATC - P) \times Q$$
$$= \$2 \times 30$$
$$= \$60$$

Costs, P

MC

ATC

$5

loss

loss per unit = $2

$P = \$3$

MR

30

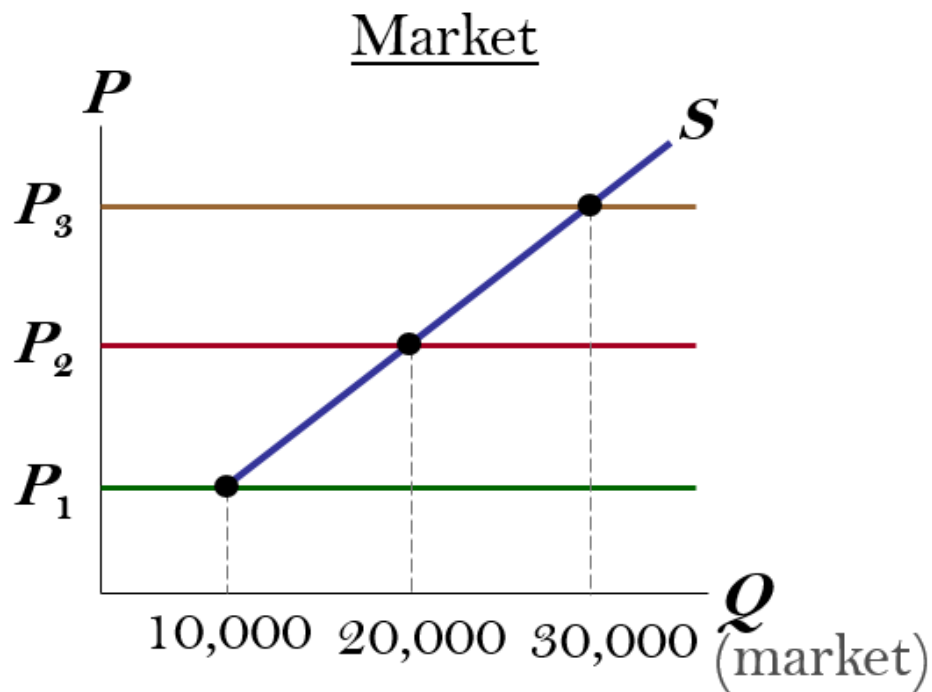Q

Agenda

Market Supply: Assumptions

1. All existing firms and potential entrants have identical costs.

2. Each firm's costs do not change as other firms enter or exit the market.

3. The number of firms in the market is
   - fixed in the short run (due to fixed costs)
   - variable in the long run (due to free entry and exit)

The SR Market Supply Curve

- As long as P ≥ AVC

  - Each firm will produce its profit-maximizing quantity, where MR = MC.

- Recall:

  - At each price, the market quantity supplied is the sum of quantities supplied by all firms

The SR Market Supply Curve

- Example: 1000 identical firms
- At each P, market Q^s = 1000 x (one firm's Q^s)

Entry & Exit in the Long Run

- In the long run, the number of firms can change due to entry and exit:
  - If existing firms earn positive economic profit:
    - New firms enter, SR market supply shifts right
    - P falls, reducing profits and slowing entry
  - If existing firms incur losses:
    - Some firms exit, SR market supply shifts left
    - P rises, reducing remaining firms' losses

The Zero-Profit Condition

- Long-run equilibrium:
  - The process of entry or exit is complete
  - Remaining firms earn zero economic profit
- Zero economic profit: when P = ATC
  - Since firms produce where P = MR = MC
  - The zero-profit condition is P = MC = ATC
  - Recall that MC intersects ATC at min ATC
  - Hence, in the long run, P = min ATC

The Zero-Profit Condition

- Why do competitive firms stay in business if they make zero profit?
  - Profit = total revenue – total cost
  - Total cost includes all implicit costs like the opportunity cost of the owner's time and money
  - Zero-profit equilibrium
    - Economic profit is zero
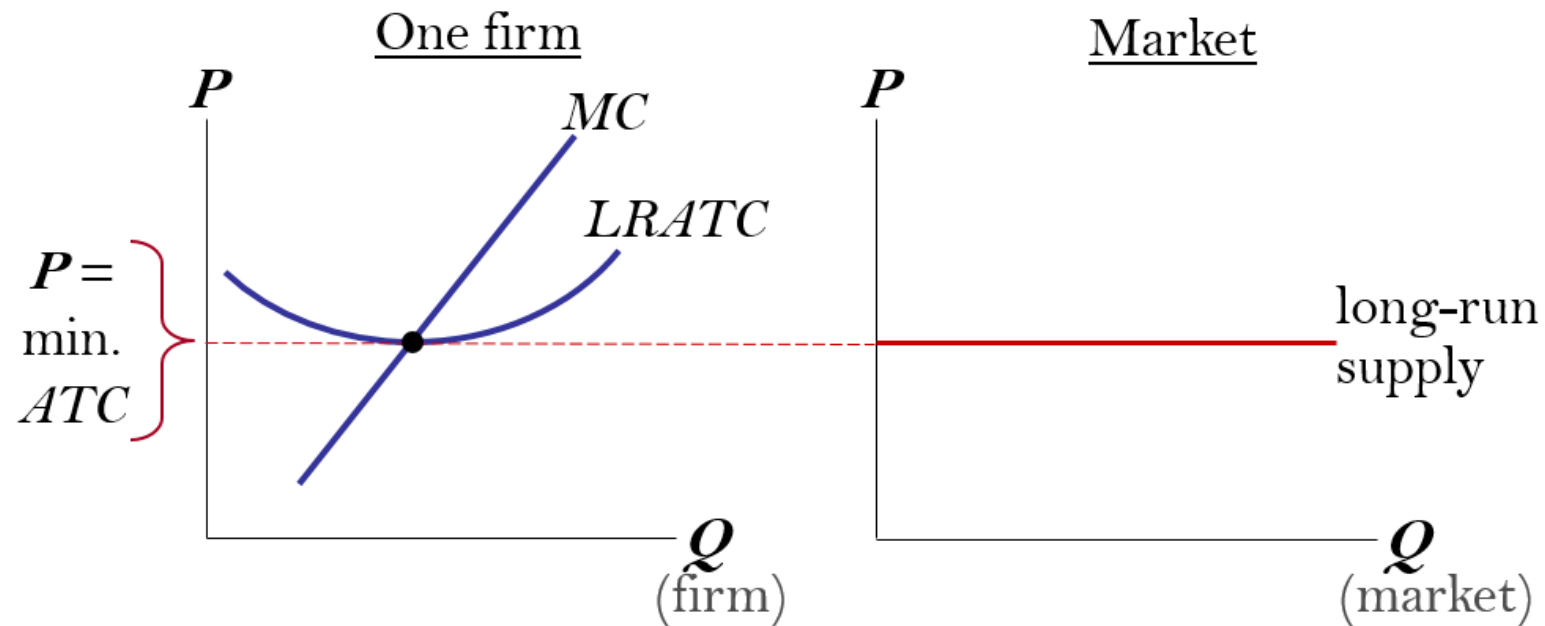   - Accounting profit is positive

Long-Run Competitive Equilibrium

- When a firm earns zero economic profit, it has no incentive to exit the industry.

- Likewise, other firms have no special incentive to enter.

- A long-run competitive equilibrium occurs when three conditions hold:

1. All firms in the industry are maximizing profit.

2. No firm has an incentive either to enter or exit the industry because all firms are earning zero economic profit.

3. The price of the product is such that the quantity supplied by the industry is equal to the quantity demanded by consumers.

The LR Market Supply Curve

In the long run, the typical firm earns zero profit.

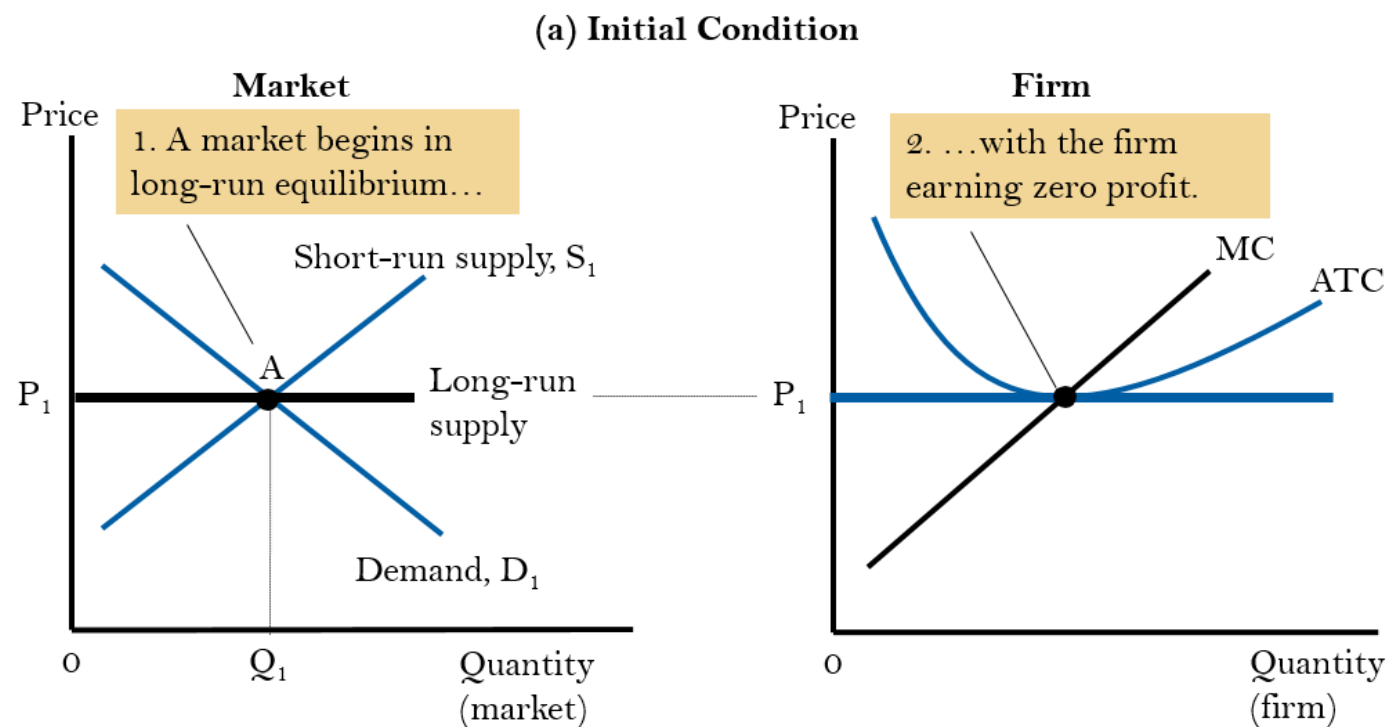The LR market supply curve is horizontal at P = minimum ATC.

One firm

Market

SR & LR Effects of an Increase in Demand

- A firm begins in long-run eq'm, but then an increase in demand raises P, leading to SR profits for the firm. Over time, profits induce entry, shifting S to the right, reducing P, driving profits to zero and restoring long-run eq'm.

An Increase in Demand in the Short Run and Long Run (a)

(a) Initial Condition

Market

Price

1. A market begins in long-run equilibrium…

Short-run supply, S_1

A

P_1 — Long-run supply

Demand, D_1

O Q_1 Quantity (market)

Firm

Price

2. …with the firm earning zero profit.
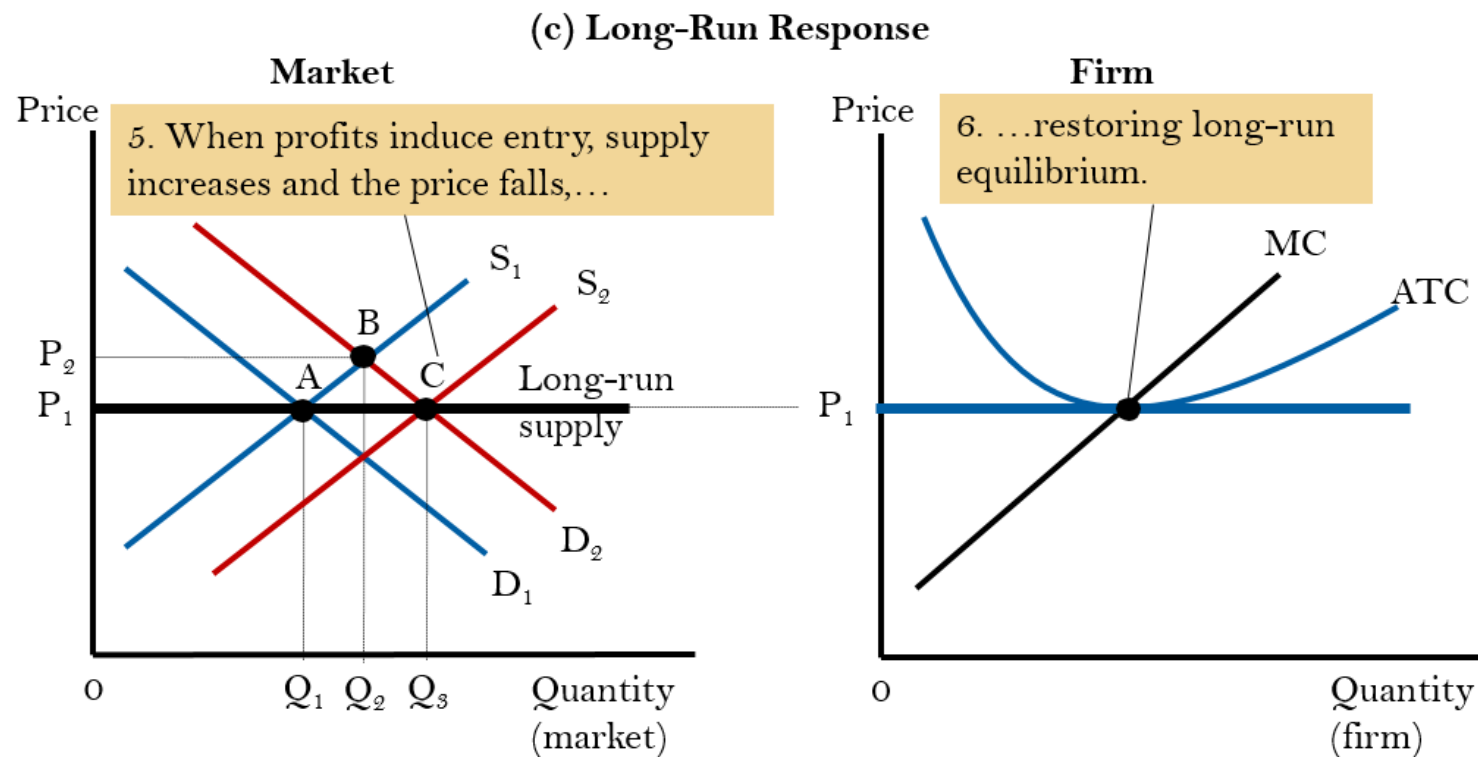
MC

ATC

P_1

O Quantity (firm)

- The market starts in a long-run equilibrium, shown as point A in panel (a). In this equilibrium, each firm makes zero profit, and the price equals the minimum average total cost.

An Increase in Demand in the Short Run and Long Run (b)

(b) Short-Run Response

Market

3. But then an increase in demand raises the price…

Firm

4. …leading to short-run profits.

- Panel (b) shows what happens in the short run when demand rises from D_1 to D_2. The equilibrium goes from point A to point B, price rises from P_1 to P_2, and the quantity sold in the market rises from Q_1 to Q_2. Because price now exceeds average total cost, each firm now makes a profit, which over time encourages new firms to enter the market.

An Increase in Demand in the Short Run and Long Run (c)

(c) Long-Run Response

This entry shifts the short-run supply curve to the right from S_1 to S_2, as shown in panel (c). In the new long-run equilibrium, point C, price has returned to P_1 but the quantity sold has increased to Q_3. Profits are again zero, and price is back to the minimum of average total cost, but the market has more firms to satisfy the greater demand.

Long-Run Supply Curve

- Long-run supply curve is horizontal if:
  - All firms have identical costs, and
  - And costs do not change as other firms enter or exit the market
- Long-run supply curve might slope upward if:
  - Firms have different costs
  - Or costs rise as firms enter the market

Upward-sloping Long-Run Supply Curve

- Firms have different costs
  - As P rises, firms with lower costs enter the market before those with higher costs.
  - Further increases in P make it worthwhile for higher-cost firms to enter the market, which increases market quantity supplied.
    - Marginal Firm
      - The marginal firm is the firm that would exit the market if the price were any lower.
  - Hence, <u>LR market supply curve slopes upward</u>

Upward-sloping Long-Run Supply Curve

- Costs rise as firms enter the market
  - In some industries, the supply of a key input is limited (e.g., amount of land suitable for farming is fixed).
  - The entry of new firms increases demand for this input, causing its price to rise.
  - This increases all firms' costs.
  - Hence, an increase in P is required to increase the market quantity supplied, so <u>the supply curve is upward-sloping</u>.

Efficiency of a Competitive Market

- Profit-maximization: Q where MC = MR
  - Perfect competition: P = MR
  - So, in the competitive equilibrium: P = MC
- The competitive equilibrium is efficient
  - Maximizes total surplus because P = MC
    - MC is the cost of producing the marginal unit
    - P is value to buyers of the marginal unit

Can You Answer the Following Questions?

- What is a perfectly competitive market?

- What is marginal revenue? How is it related to total and average revenue?

- How does a competitive firm determine the quantity that maximizes profits?

- When might a competitive firm shut down in the short run? Exit the market in the long run?

- What does the market supply curve look like in the short run? In the long run?

End