

ECO2011 Basic Microeconomics

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

2023

Motivation

Three years after graduating from CUHK(SZ), you run your own business. You must decide how much to produce, what price to charge, how many workers to hire, etc.

- What factors should affect these decisions?
 - Your costs (studied in preceding chapter)
 - How much competition you face

We begin by studying the behavior of firms in perfectly competitive markets.

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

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
- For competitive firms
 - $AR = P$
 - $MR = P$

Active Learning 1 Calculating TR, AR, MR

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		\$10
5	\$10	\$50		

Active Learning 1

Answers

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

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

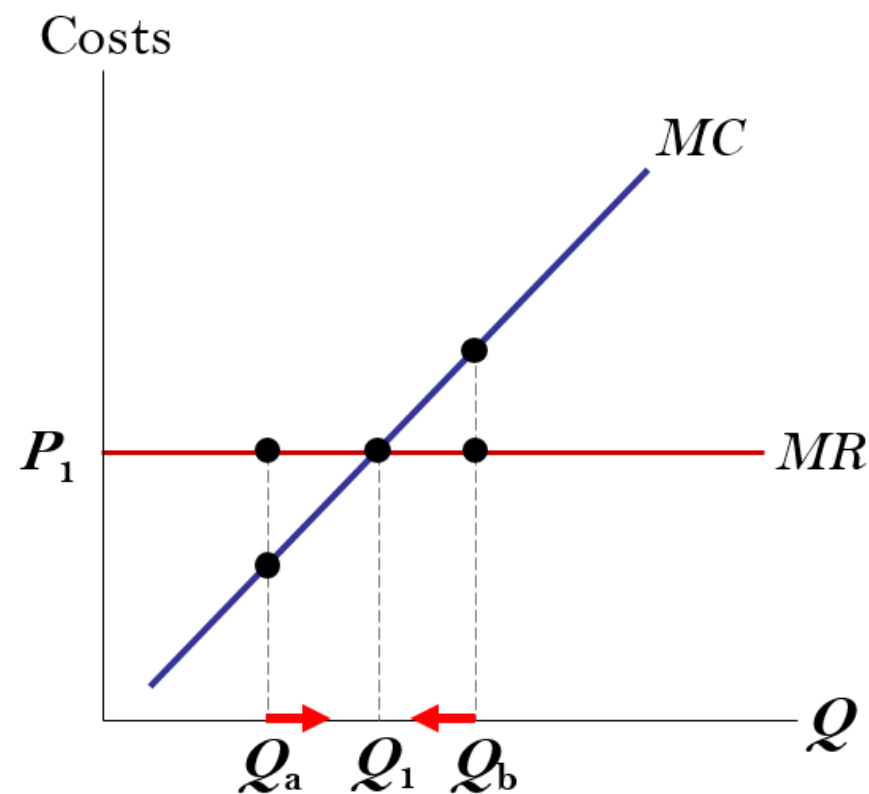
- At any Q with $MR > MC$, increasing Q raises profit.
- At any Q with $MR < MC$, reducing Q raises profit.

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

MC and the Firm's Supply Decision

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

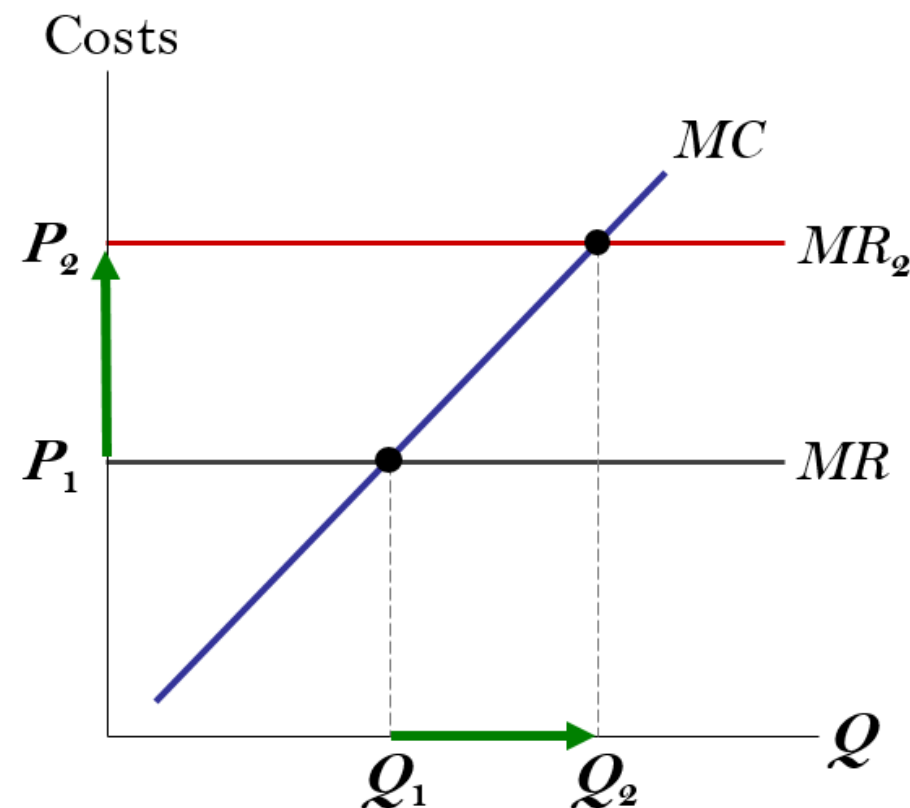
- At Q_a , $MC < MR$. So, increase Q to raise profit.
- At Q_b , $MC > MR$. So, reduce Q to raise profit.
- At Q_1 , $MC = MR$. Changing Q would lower profit.



MC and the Firm's Supply Decision

The *MC* curve is the firm's supply curve.

- If price rises to P_2 , then the profit-maximizing quantity rises to Q_2 .
- 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 short-run decision not to produce anything because of market conditions.
- Exit:
 - A long-run decision 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

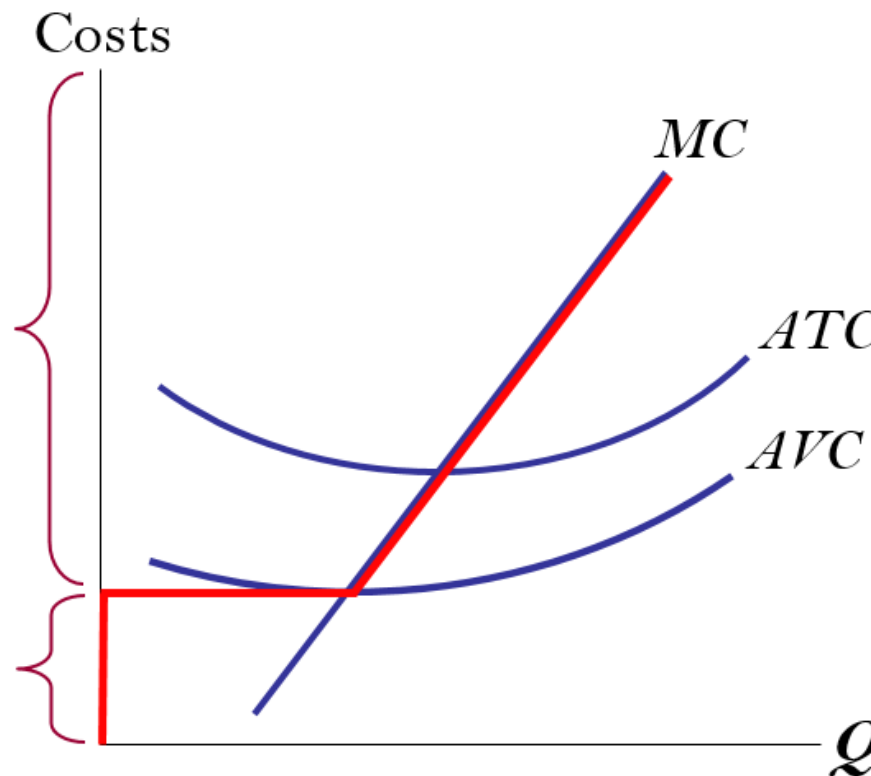
- Should a firm shut-down in the short run?
 - Cost of shutting down = revenue loss = TR
 - Benefit of shutting down = cost savings = VC
(because the firm must still pay FC)
- Shut down if $TR < VC$, or $P < AVC$

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 $Q = 0$).



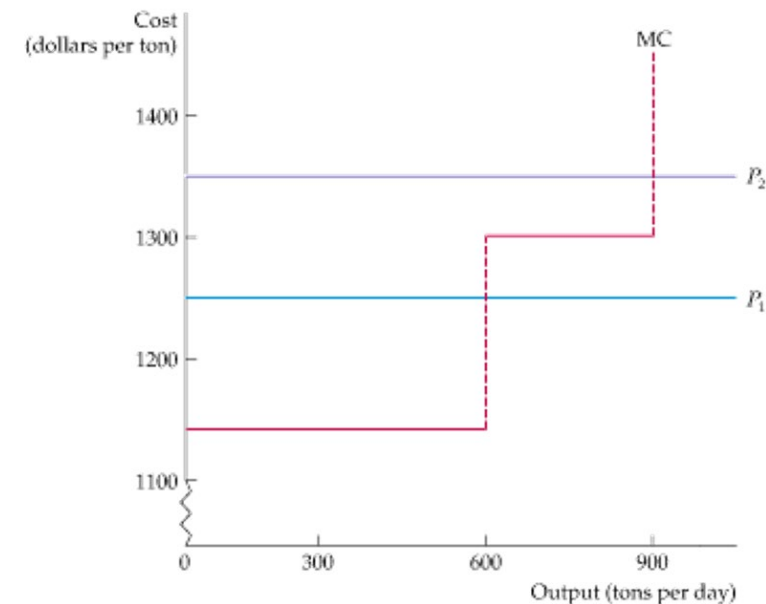
The Irrelevance of Sunk Costs

- 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

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 ton 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.

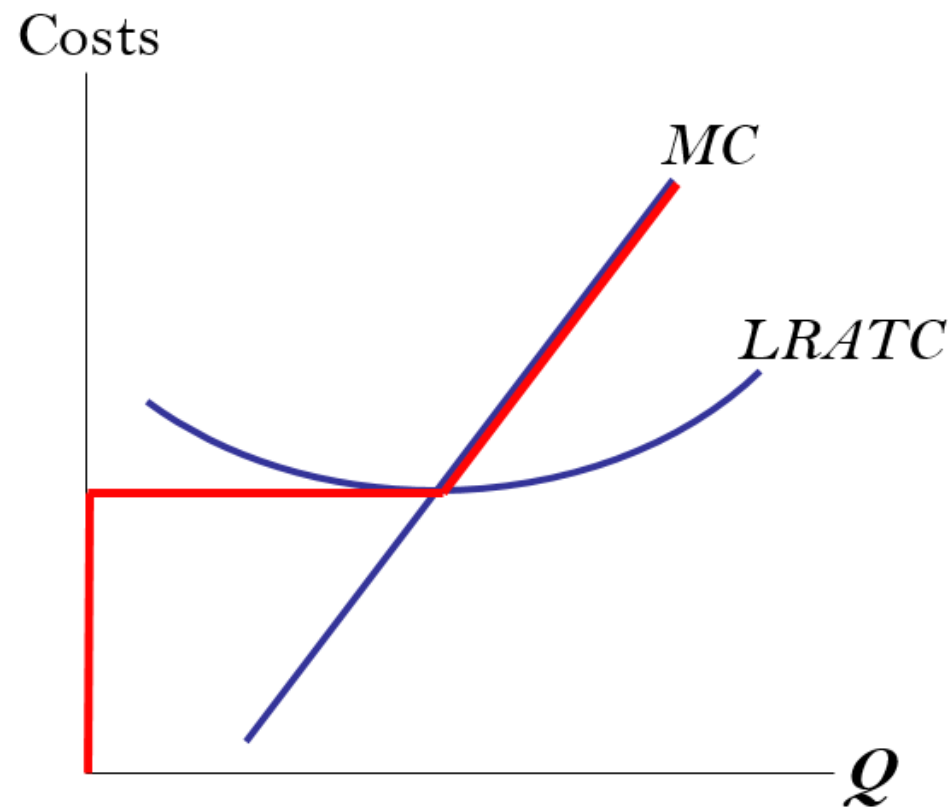


A Firm's Long-Run Decision

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

The Competitive Firm's LR Supply Curve

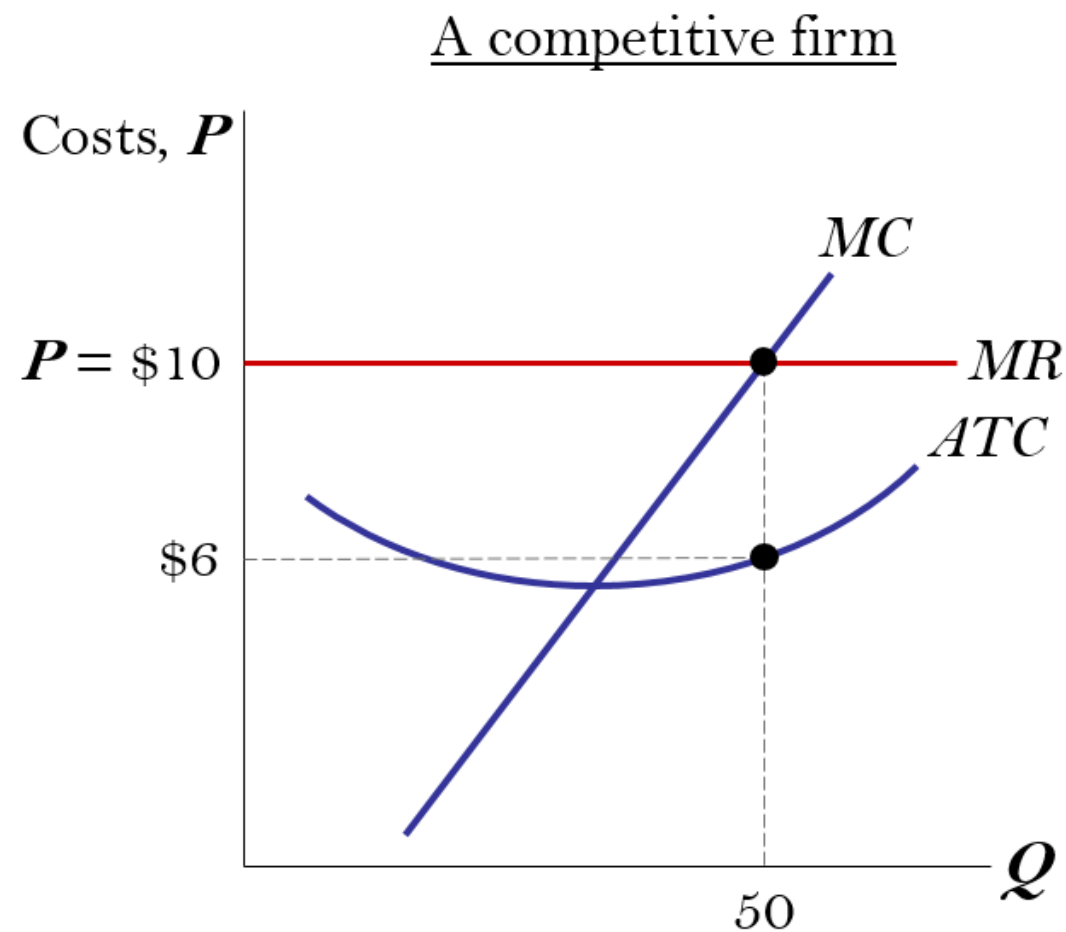
The firm's LR supply curve is the portion of its MC curve above $LRATC$.



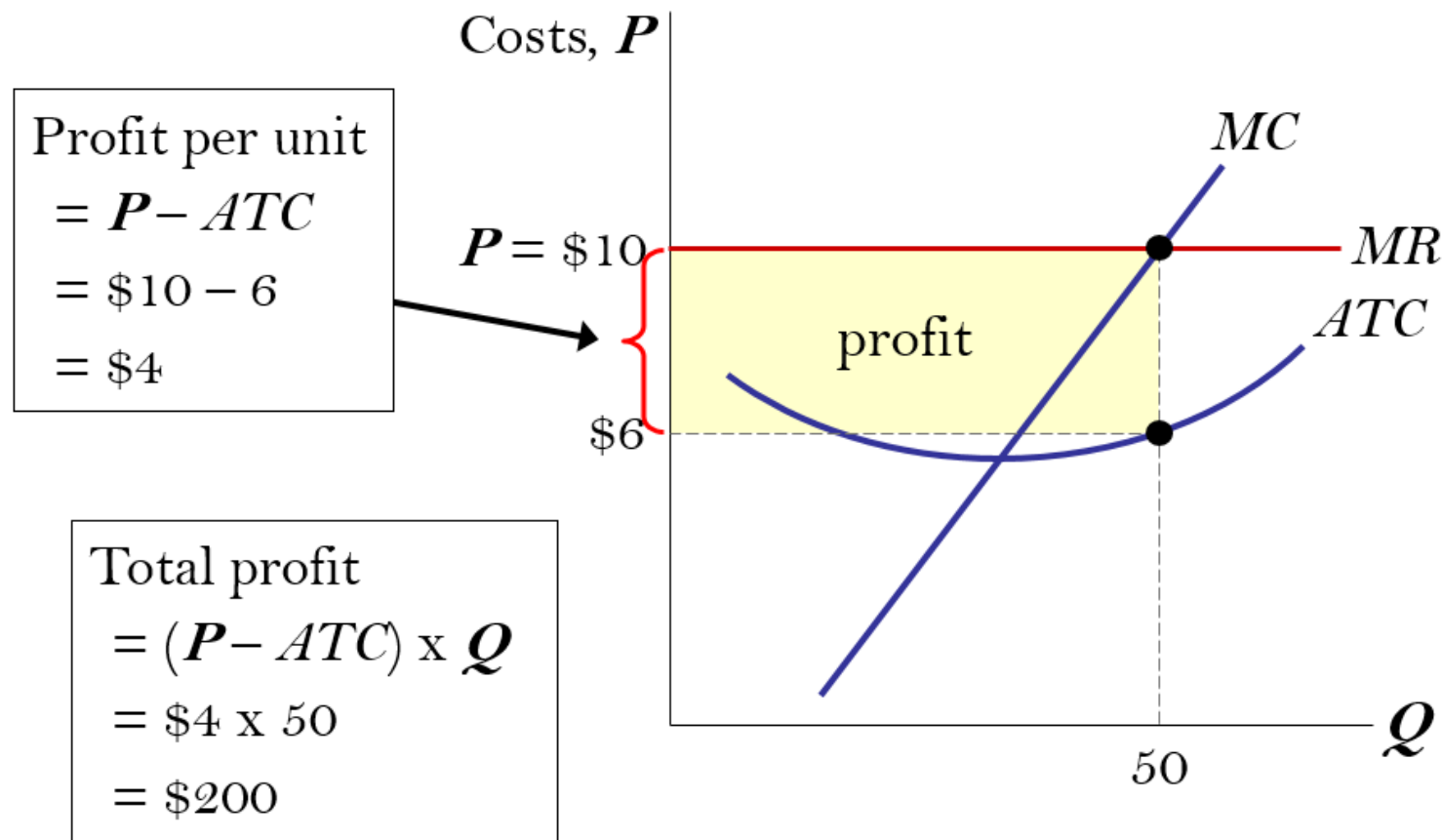
Active Learning 2

Identifying a firm's profit

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

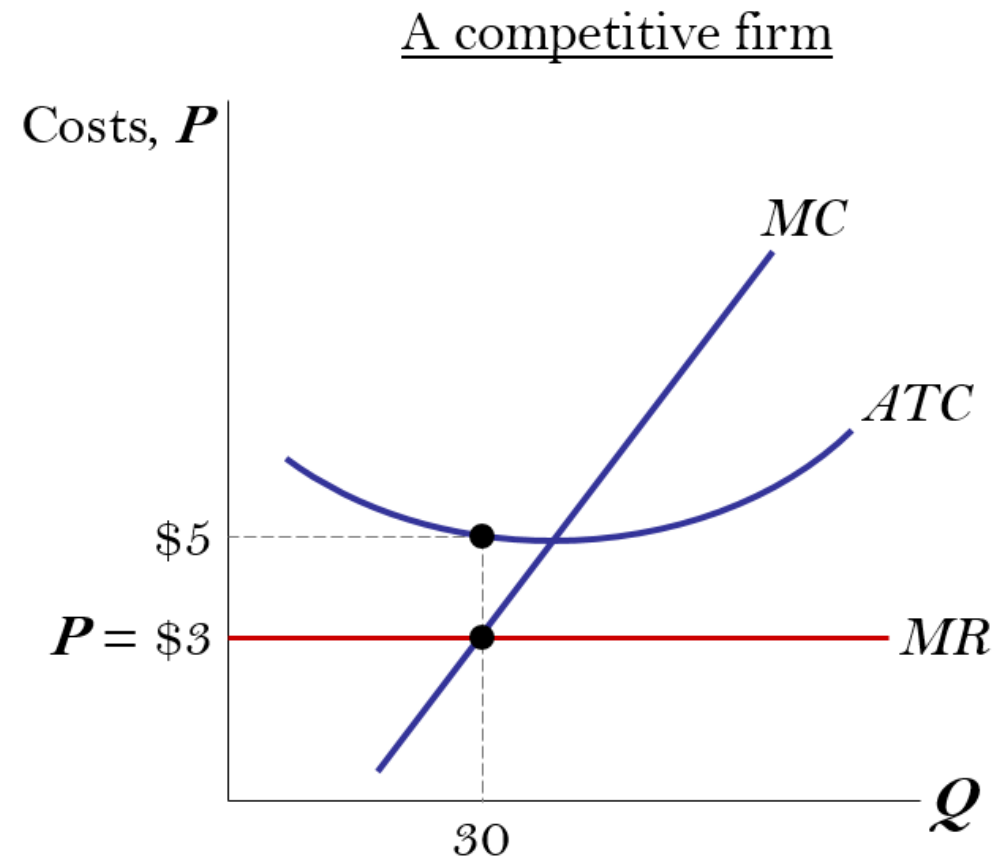


A competitive firm



Active Learning 3 Identifying a firm's loss

- Determine this firm's total loss, assuming $AVC < \$3$.
- Identify the area on the graph that represents the firm's loss.

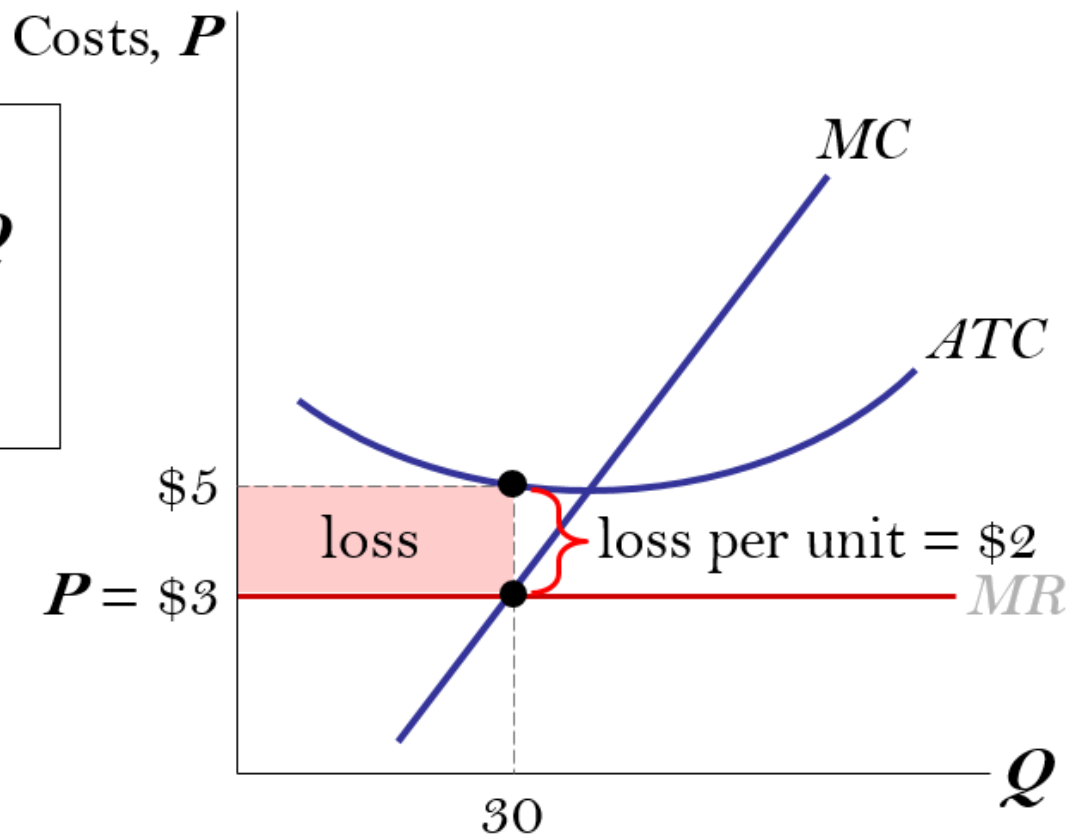


Active Learning 3

Answers

A competitive firm

$$\begin{aligned}\text{Total loss} &= (ATC - P) \times Q \\ &= \$2 \times 30 \\ &= \$60\end{aligned}$$



Market Supply: Assumptions

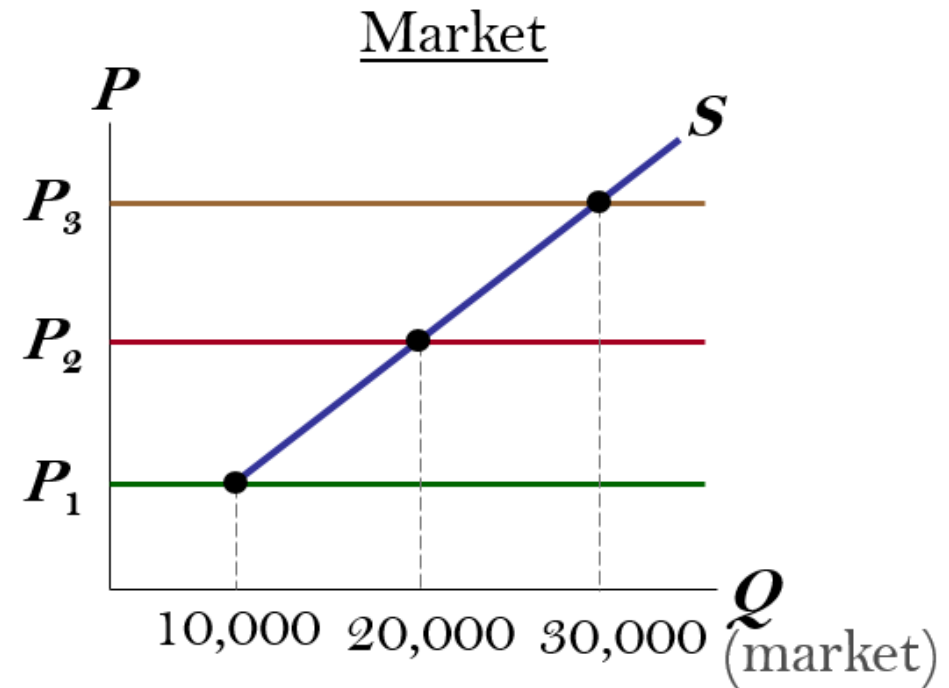
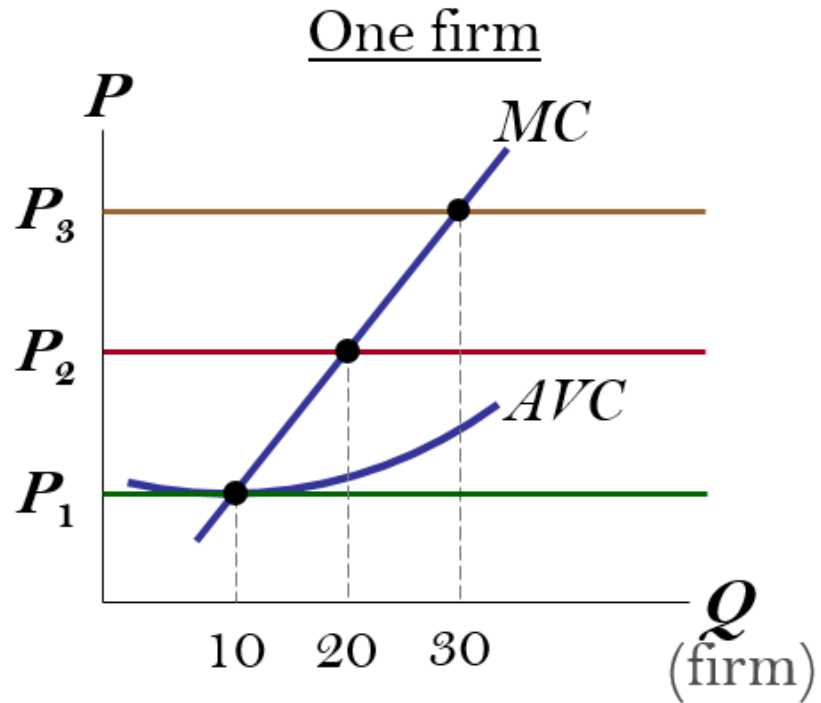
1. All existing firms and potential entrants have identical costs.
2. Each firm's costs do not change as other firms enter or exit the market.
3. The number of firms in the market is
 - fixed in the short run (due to fixed costs)
 - variable in the long run (due to free entry and exit)

The SR Market Supply Curve

- As long as $P \geq AVC$
 - Each firm will produce its profit-maximizing quantity, where $MR = MC$.
- Recall from Chapter 4:
 - 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 $Q^s = 1000 \times (\text{one firm's } Q^s)$



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, $P = \min ATC$

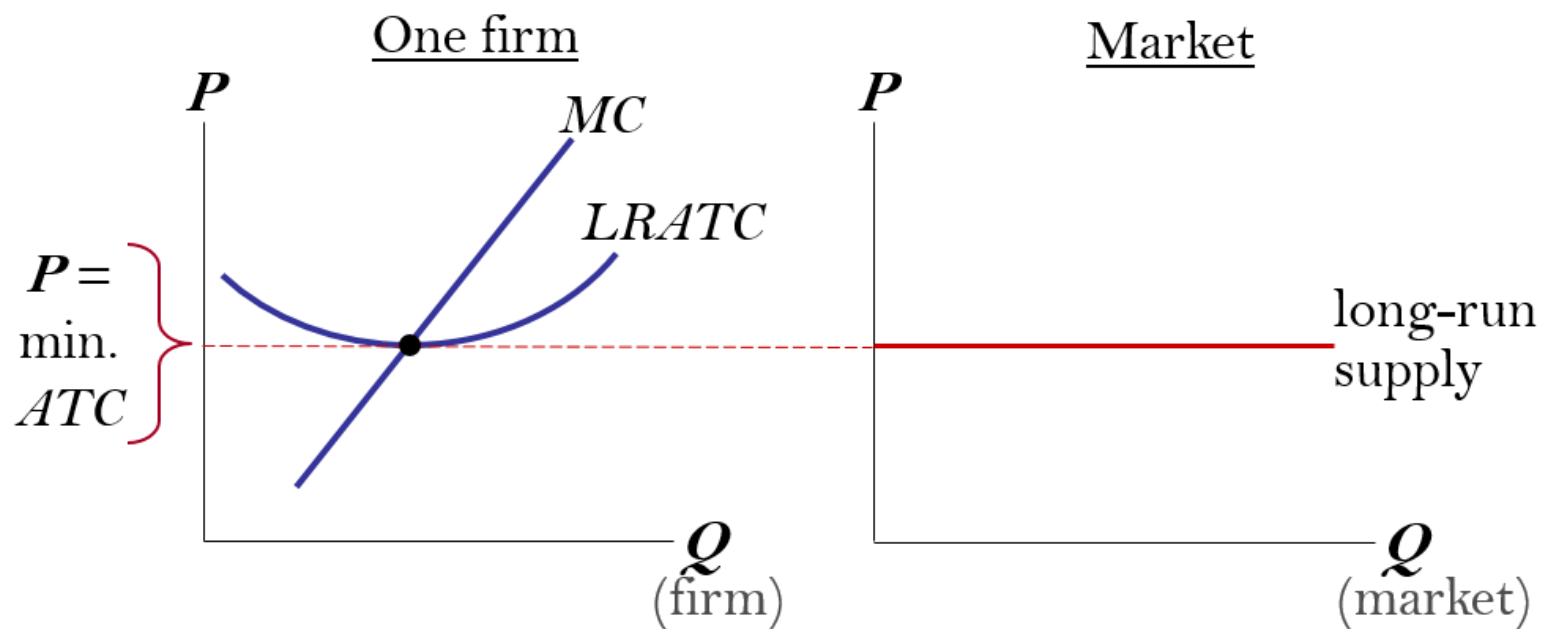
The Zero-Profit Condition

- Why do competitive firms stay in business if they make zero profit?
 - $\text{Profit} = \text{total revenue} - \text{total cost}$
 - 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

The LR Market Supply Curve

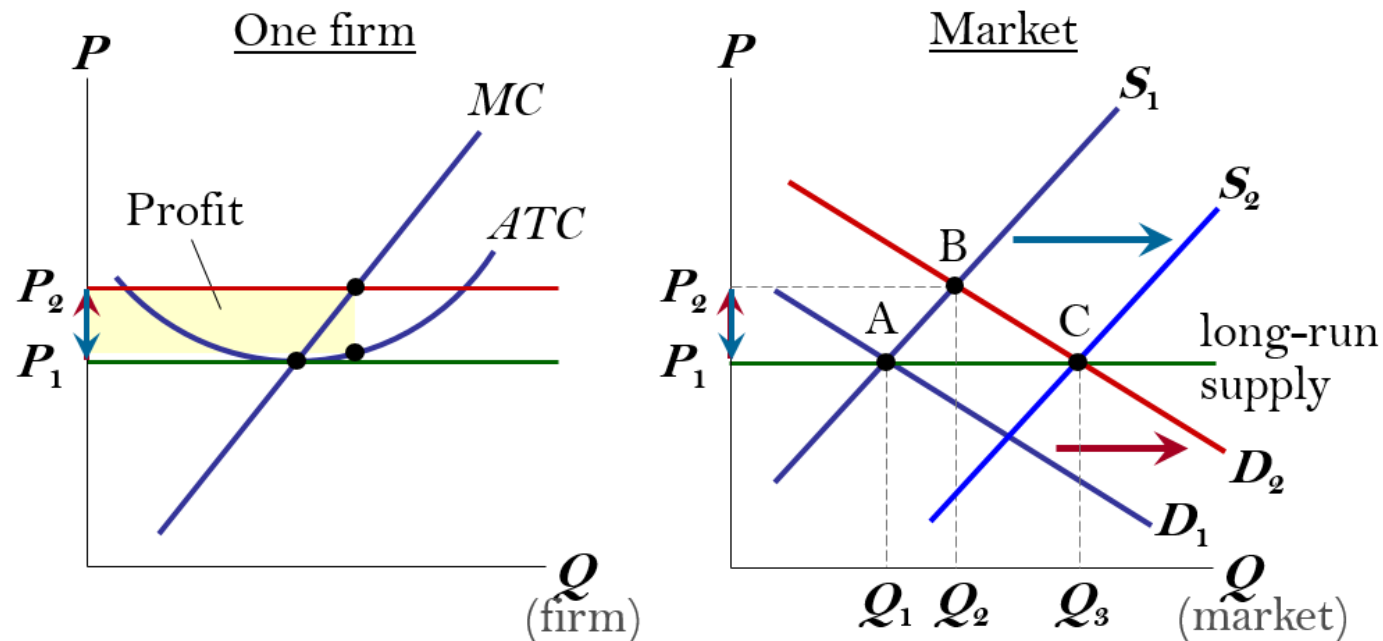
In the long run,
the typical firm
earns zero profit.

The LR market supply
curve is horizontal at
 $P = \text{minimum } ATC$.

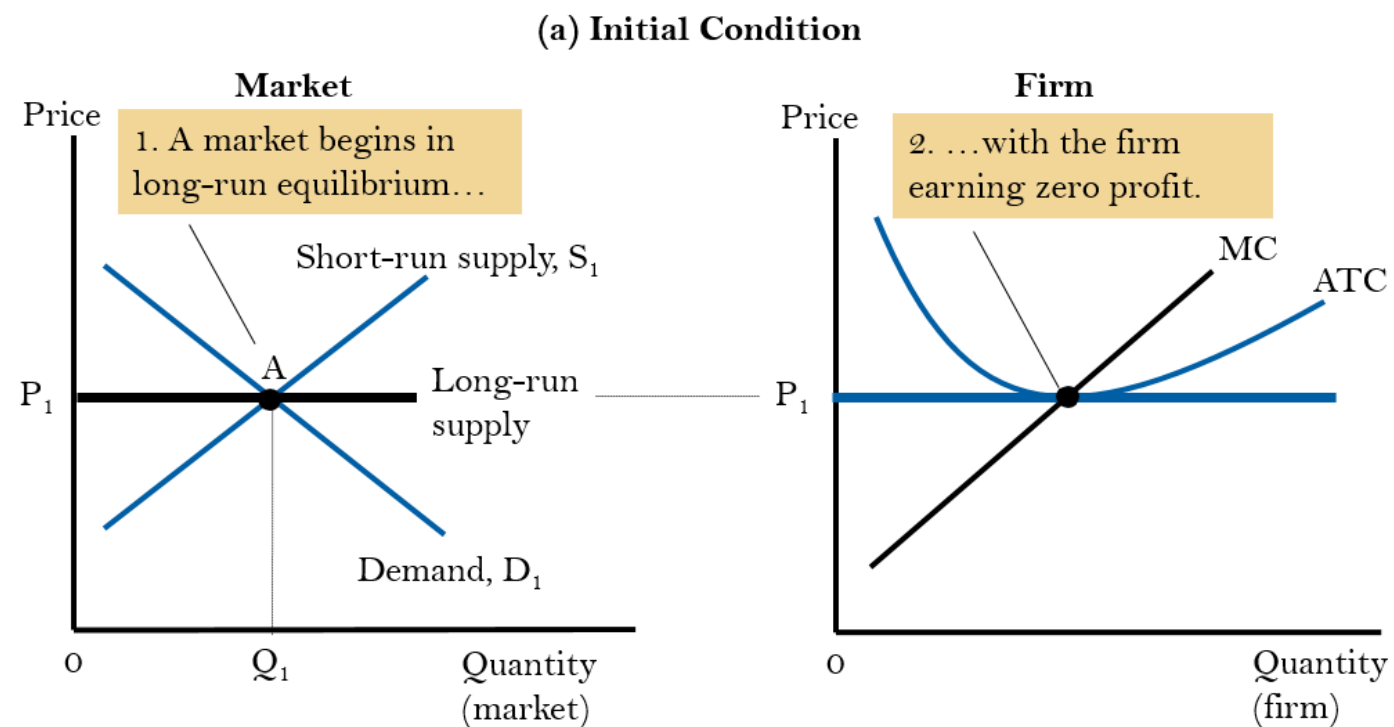


SR & LR Effects of an Increase in Demand

- 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.

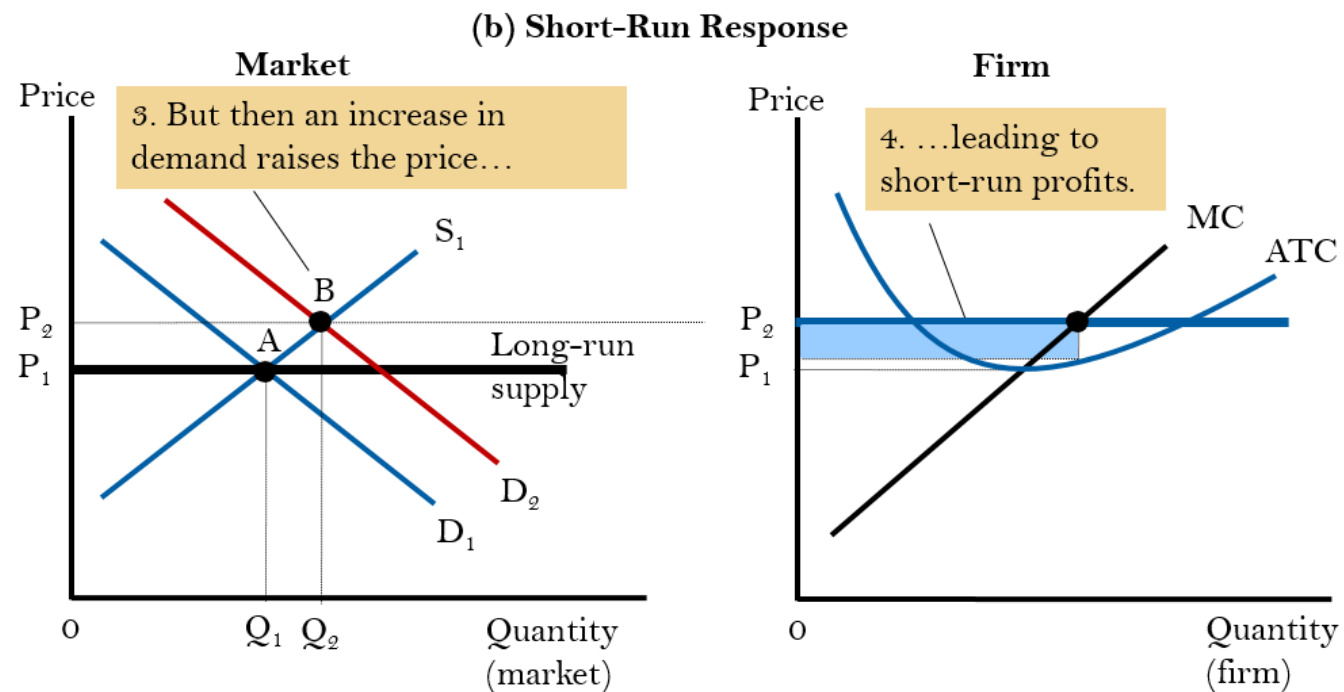


An Increase in Demand in the Short Run and Long Run (a)



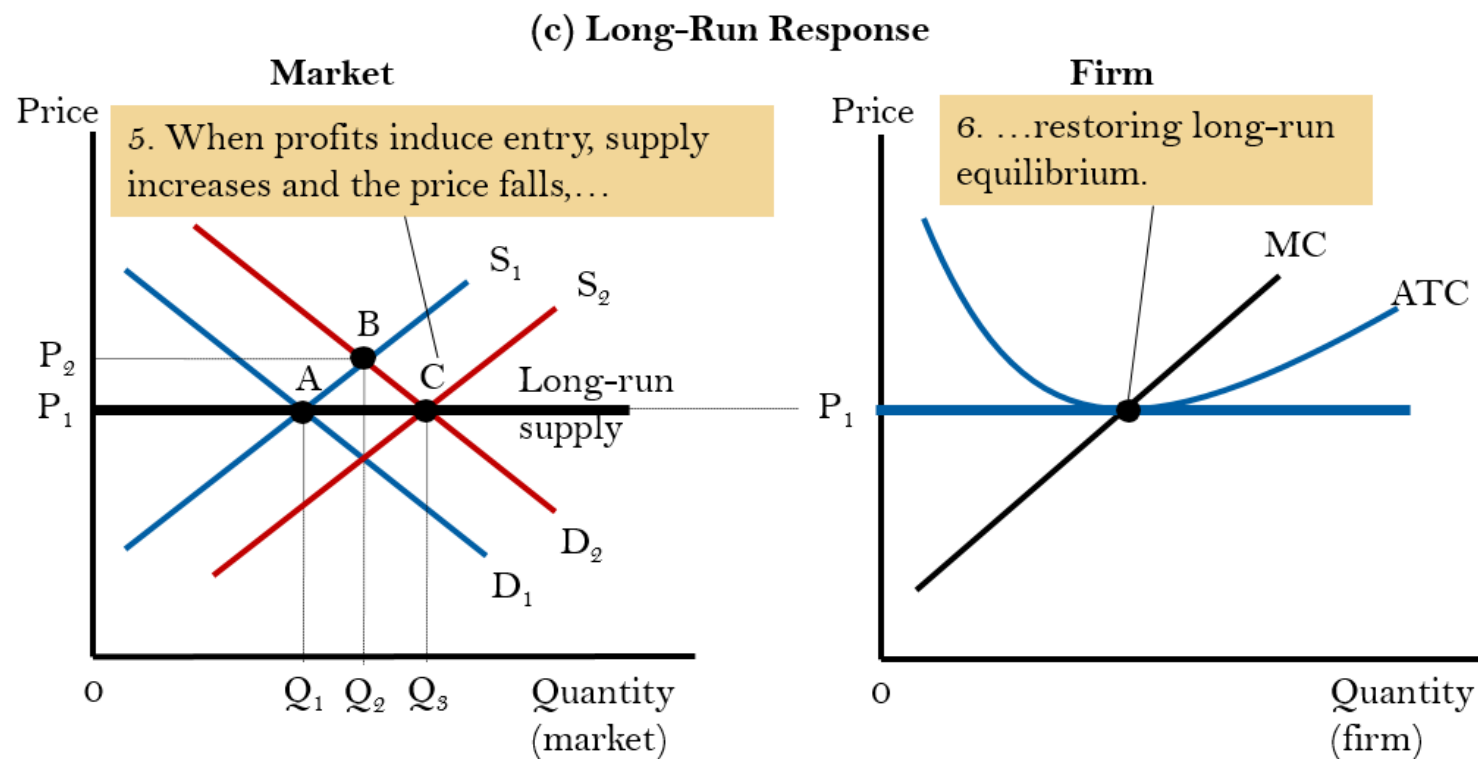
- The market starts in a long-run equilibrium, shown as point A in panel (a). In this equilibrium, each firm makes zero profit, and the price equals the minimum average total cost.

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



- 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)



- 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

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.
 - Hence, LR market supply curve slopes upward

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 the supply curve is upward-sloping.

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