Pinciples of

# Microeconomics

Sixth Edition

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## Chapter : Firms in Competitive Markets

# In this chapter, look for the answers to these 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?

# Introduction:  A Scenario

- Just after graduating, you are unemployed since no one wants to hire a BBA graduate (lol) so you run your own business.

- You have to 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.

# Characteristics of Perfect Competition

1. Many buyers and many sellers

2. The goods offered for sale are largely the same.

3. Firms can freely enter or exit the market.

- Because of 1 & 2, each buyer and seller is a "**price taker**" – takes the price as given.

# The Revenue of a Competitive Firm

- Total revenue (*TR*)

$$TR = \boldsymbol{P} \times \boldsymbol{Q}$$

- **Average revenue (*AR*)**

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

- **Marginal Revenue (*MR*):** The change in *TR* from selling one more unit.

$$MR = \frac{\Delta TR}{\Delta \boldsymbol{Q}}$$

# ACTIVE LEARNING 1: Exercise

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 | | ///// |

**Answers**

Fill in the empty spaces of the table.

| 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 | $20 | $10 | |
| | | | | $10 |
| 3 | $10 | $30 | $10 | |
| | | | | $10 |
| 4 | $10 | $40 | $10 | |
| | | | | $10 |
| 5 | $10 | $50 | $10 | |

# ACTIVE LEARNING 1: Answers

Fill in the empty spaces of the table.

| Q | P | $TR = P \times Q$ | $AR = \dfrac{TR}{Q}$ | $MR = \dfrac{\Delta TR}{\Delta Q}$ |
|---|---|---|---|---|
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| | | | | $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
$MR = P$

7

# *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 the firm's profit?

- To find the answer,
  "***Think at the margin.***"

  If increase $Q$ by one unit,
  revenue rises by $MR$,
  cost rises by $MC$.

- If $MR > MC$, then increase $Q$ to raise profit.

- If $MR < MC$, then reduce $Q$ to raise profit.

# Profit Maximization

*(continued from earlier exercise)*

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 $Q_a$, $MC < MR$.
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.
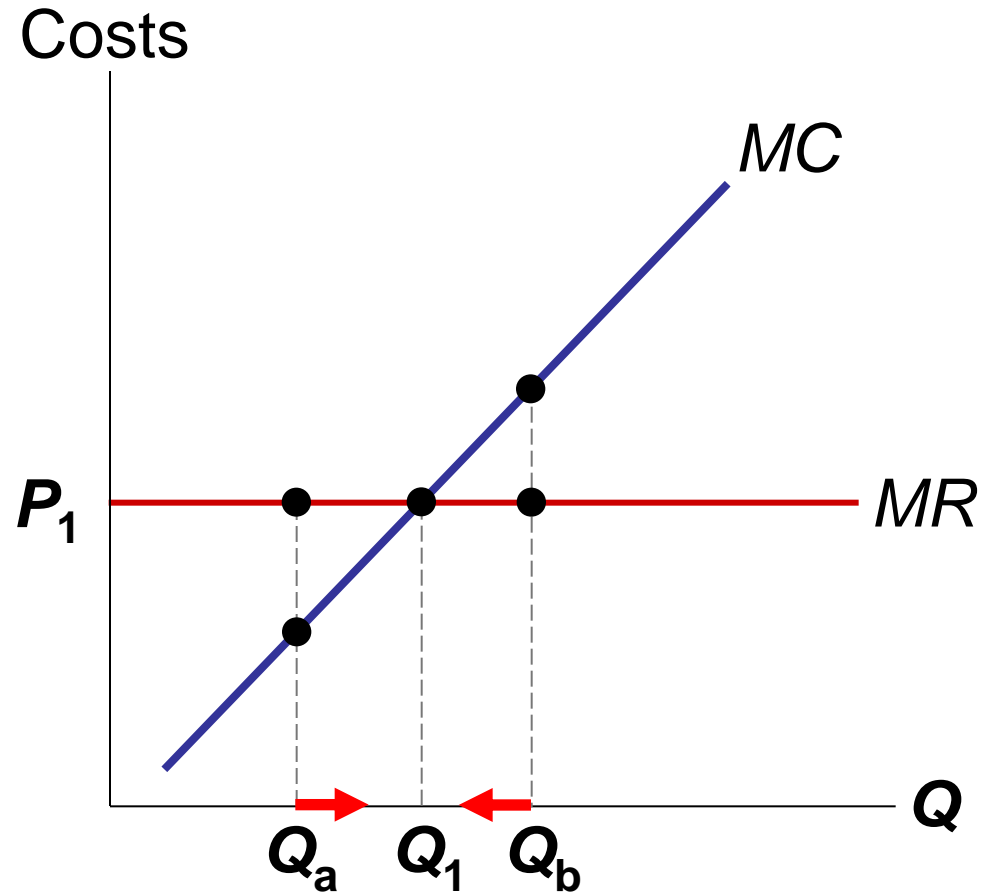
# MC and the Firm's Supply Decision

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.
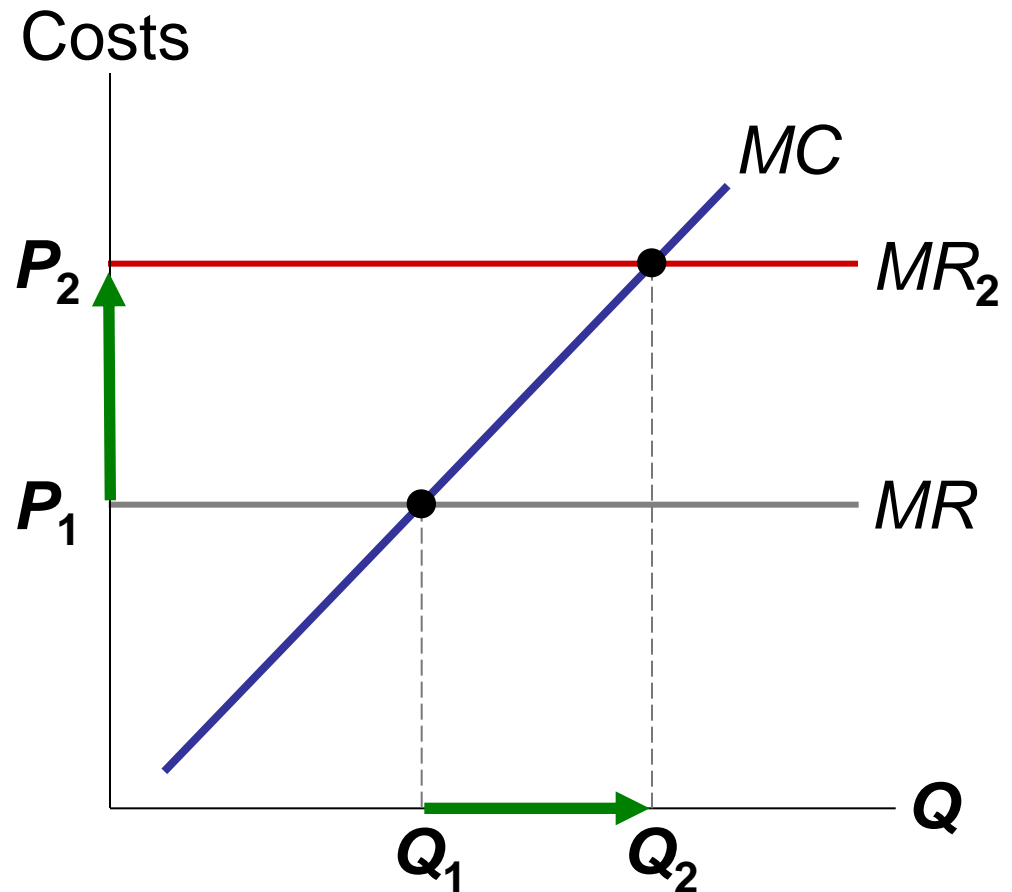
# Shutdown vs. Exit

- **Shutdown**:
  A short-run decision not to produce anything because of market conditions.

- **Exit**:
  A long-run decision to leave the market.

- A firm that shuts down temporarily must still pay its fixed costs.  A firm that exits the market does not have to pay any costs at all, fixed or variable.

# A Firm's Short-Run Decision to Shut Down

- If firm shuts down temporarily,
  - revenue falls by *TR*
  - costs fall by *VC*

- So, the firm should shut down if $TR < VC$.

- Divide both sides by **Q**:     $TR/\textbf{Q} < VC/\textbf{Q}$

- So we can write the firm's decision as:

Shut down if $P < AVC$

# A Competitive Firm's SR Supply Curve

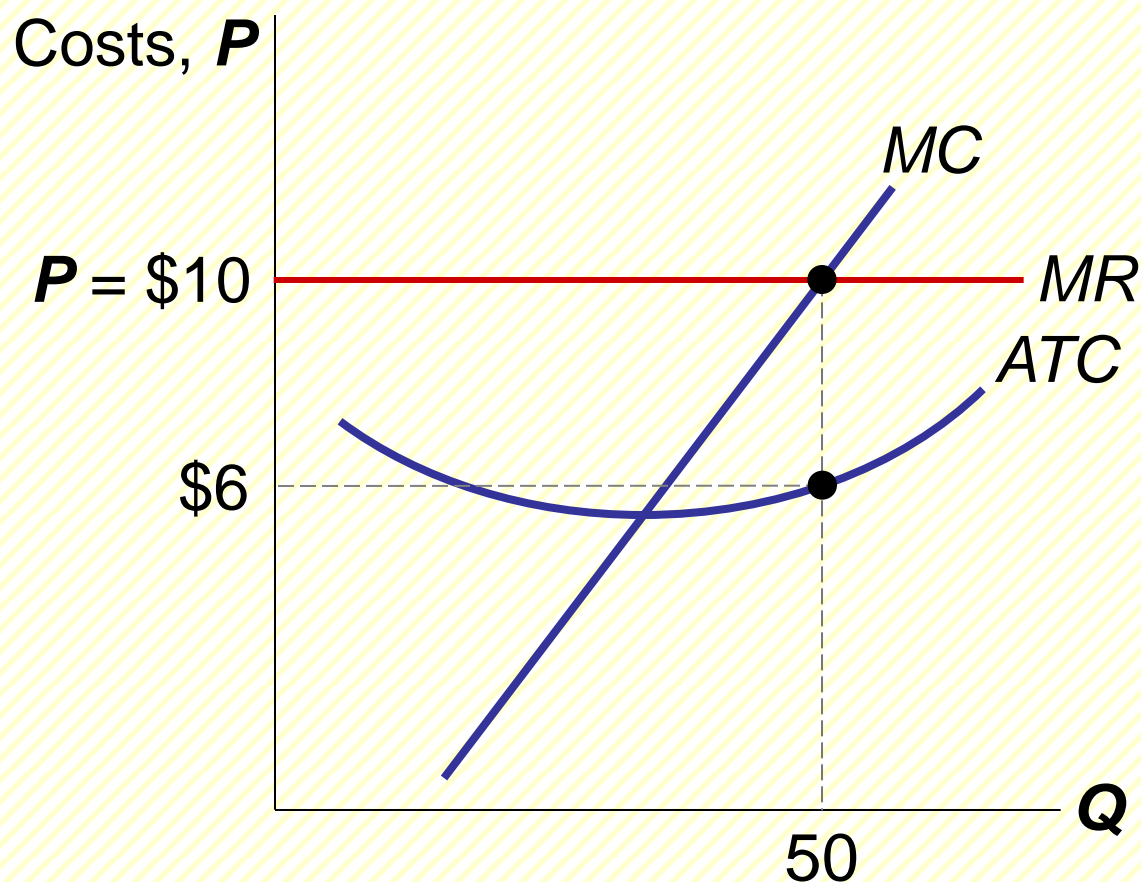The firm's SR supply curve is the portion of its *MC* curve above *AVC*.

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

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

Costs

*MC*

*ATC*

*AVC*

*Q*
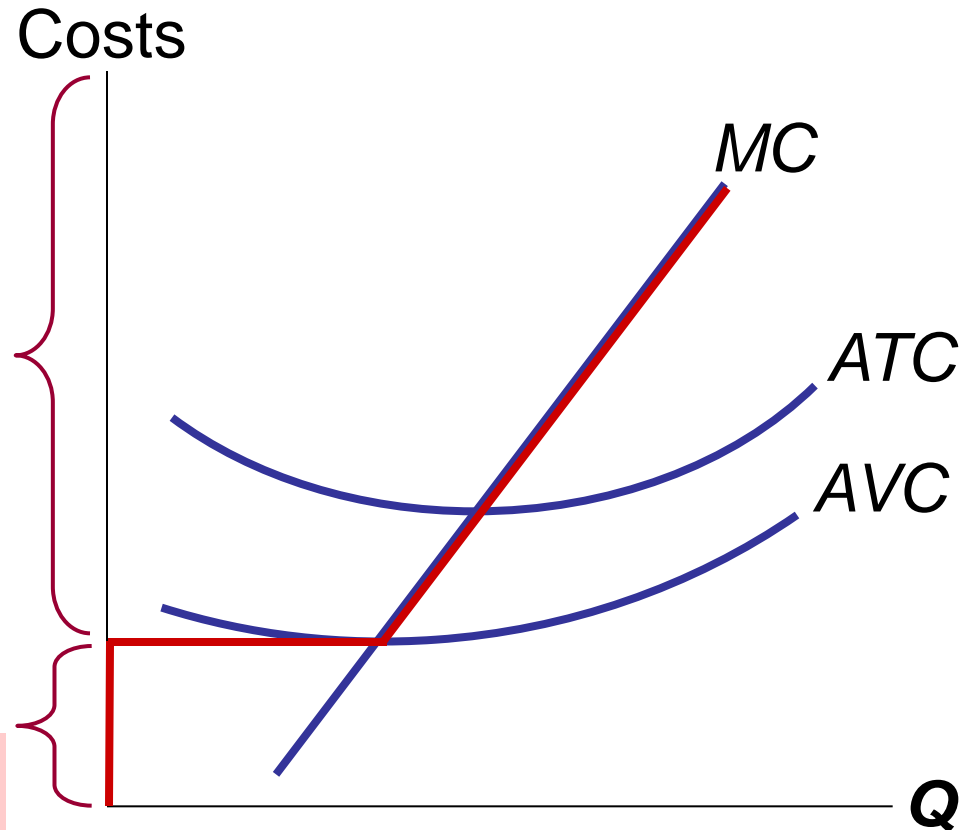
# The Irrelevance of Sunk Costs

- **Sunk cost**:  a cost that has already been committed and cannot be recovered

- Sunk costs should be irrelevant to decisions; you must pay them regardless of your choice.

- *FC* is a sunk cost:  The firm must pay its fixed costs whether it produces or shuts down.

- So, *FC* should not matter in the decision to shut down.

# A Firm's Long-Run Decision to Exit

- If firm exits the market,
  - revenue falls by *TR*
  - costs fall by *TC*

- So, the firm should exit if $TR < TC$.

- Divide both sides by **Q** to rewrite the firm's decision as:

Exit if $P < ATC$

# A New Firm's Decision to Enter the Market

- In the long run, a new firm will enter the market if it is profitable to do so:  if *TR* > *TC*.

- Divide both sides by **Q**  to express the firm's entry decision as:

Enter if  **P** > *ATC*

# The Competitive Firm's LR Supply Curve

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

Costs

*MC*

*LRATC*

*Q*
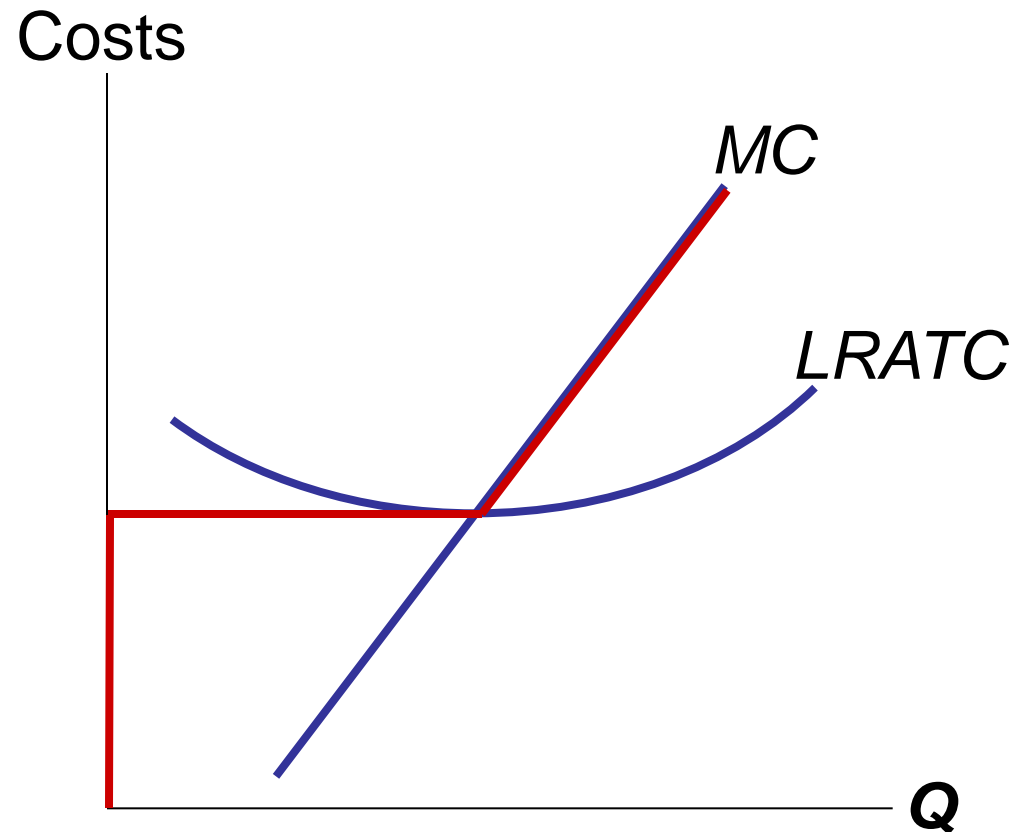
# Identifying a firm's profit

A competitive firm

Determine this firm's total profit.

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

Costs, *P*

*MC*

*P* = $10 ................................................ *MR*

*ATC*

$6

*Q*

50

20

# ACTIVE LEARNING 2A: Answers

A competitive firm

Costs, **P**

profit per unit
= **P** – ATC
= $10 – 6
= $4

Total profit
= (**P** – ATC) x **Q**
= $4 x 50
= $200

**P** = $10

$6

profit

MC

MR

ATC

50

**Q**
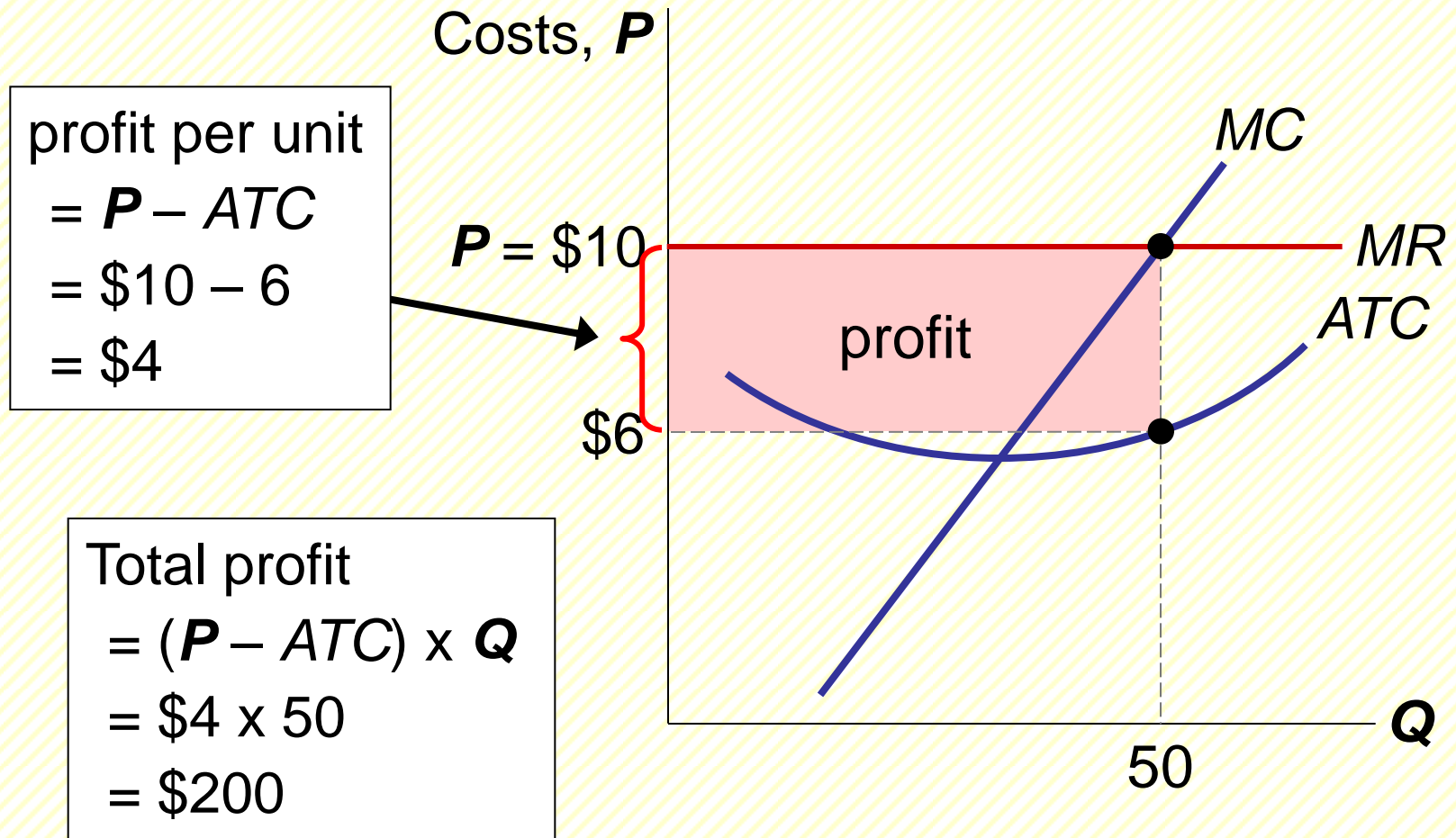
# Identifying a firm's loss

A competitive firm

Determine this firm's total loss.

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



Costs, **P**

*MC*

*ATC*

$5

**P** = $3 —————————————— *MR*

**Q**

30

22

A competitive firm

Costs, *P*

Total loss
= (*ATC* − *P*) x *Q*
= $2 x 30
= $60

*MC*

*ATC*

$5

loss

loss per unit = $2

*P* = $3

*MR*

*Q*

30

23
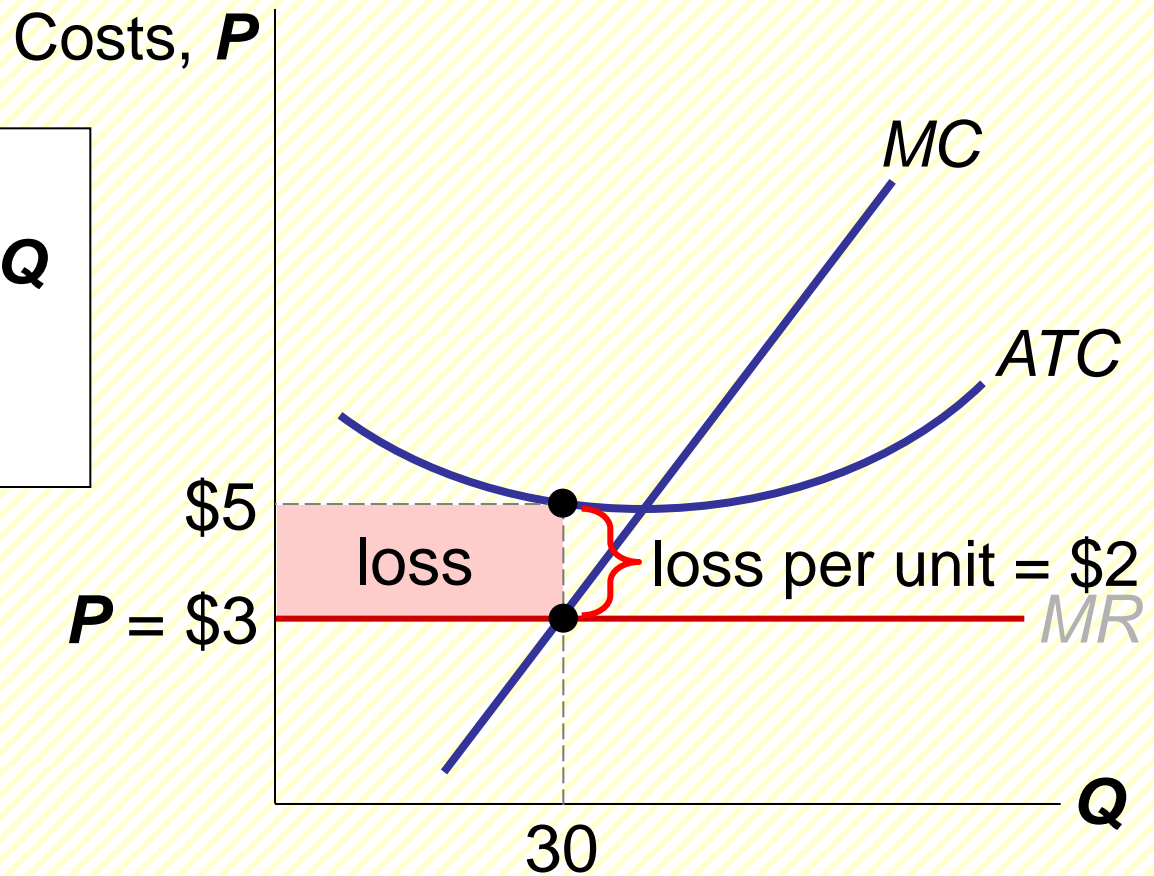
# Market Supply:  Assumptions

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 quantity supplied by each firm.

# The SR Market Supply Curve

Example: 1000 identical firms.

At each $P$, market $Q^s$ = 1000 x (one firm's $Q^s$)
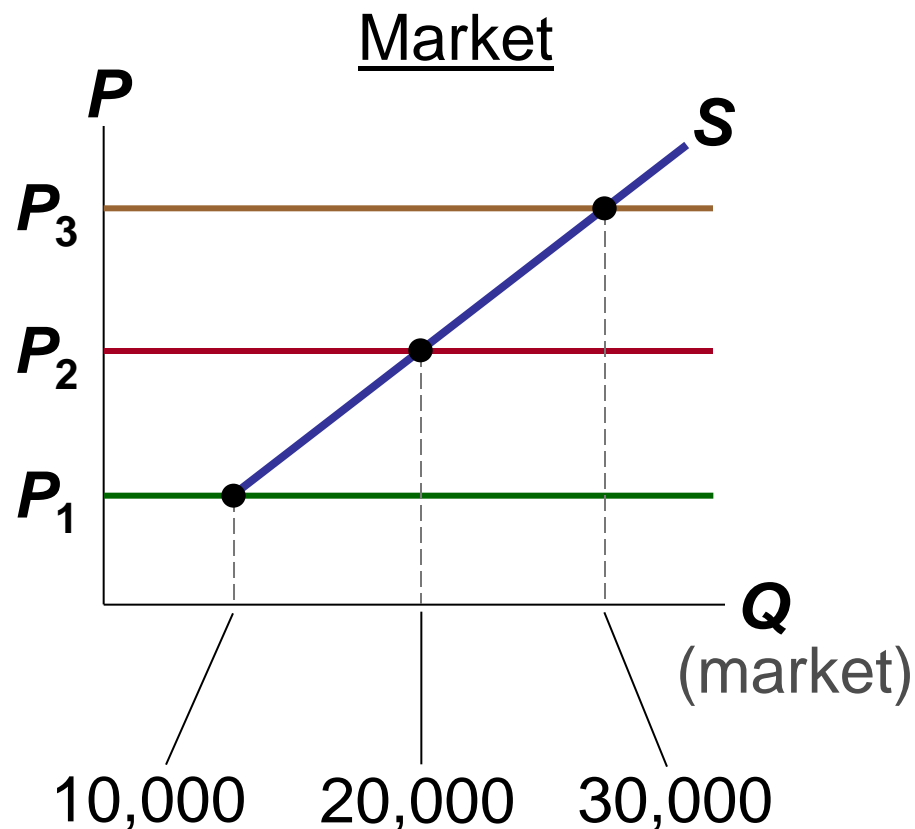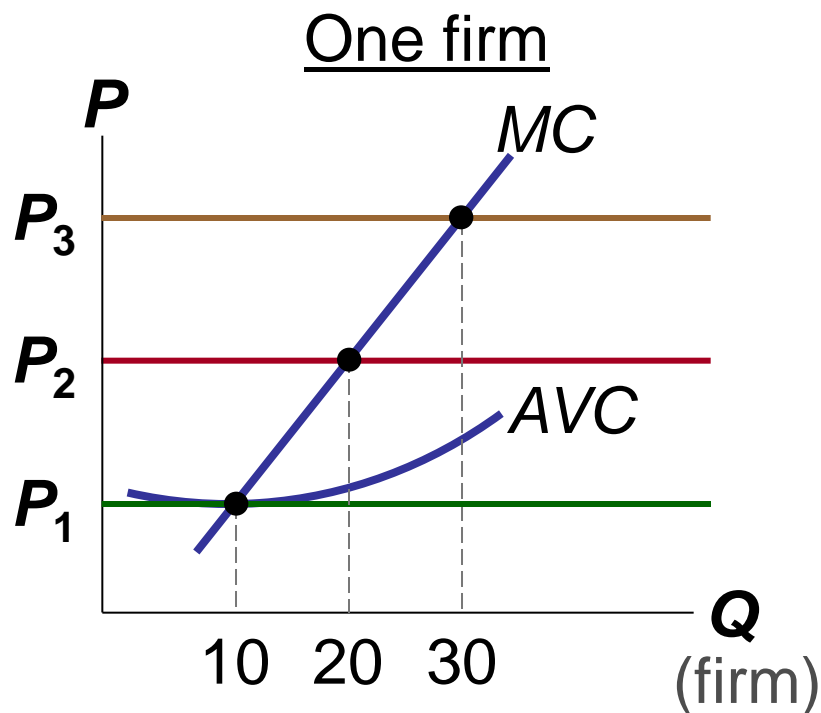


One firm

Market

# Entry & Exit in the Long Run

- In the LR, the number of firms can change due to entry & exit.

- If existing firms earn positive economic profit,
  - New firms enter.
  - SR market supply curve shifts right.
  - *P* falls, reducing firms' profits.
  - Entry stops when firms' economic profits have been driven to zero.

# Entry & Exit in the Long Run

- In the LR, the number of firms can change due to entry & exit.

- If existing firms incur losses,
    - Some will exit the market.
    - SR market supply curve shifts left.
    - *P* rises, reducing remaining firms' losses.
    - Exit stops when firms' economic losses have been driven to zero.

# The Zero-Profit Condition

- **Long-run equilibrium**:
  The process of entry or exit is complete – remaining firms earn zero economic profit.

- Zero economic profit occurs when $P = ATC$.

- Since firms produce where $P = MR = MC$,
  the zero-profit condition is  $P = MC = ATC$.

- Recall that $MC$ intersects $ATC$ at minimum $ATC$.

- Hence, in the long run, $\boxed{P = \text{minimum } ATC.}$

# 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

*P*

*MC*

*LRATC*

*P* =
min.
*ATC*

*Q*
(firm)

Market

*P*

long-run
supply

*Q*
(market)
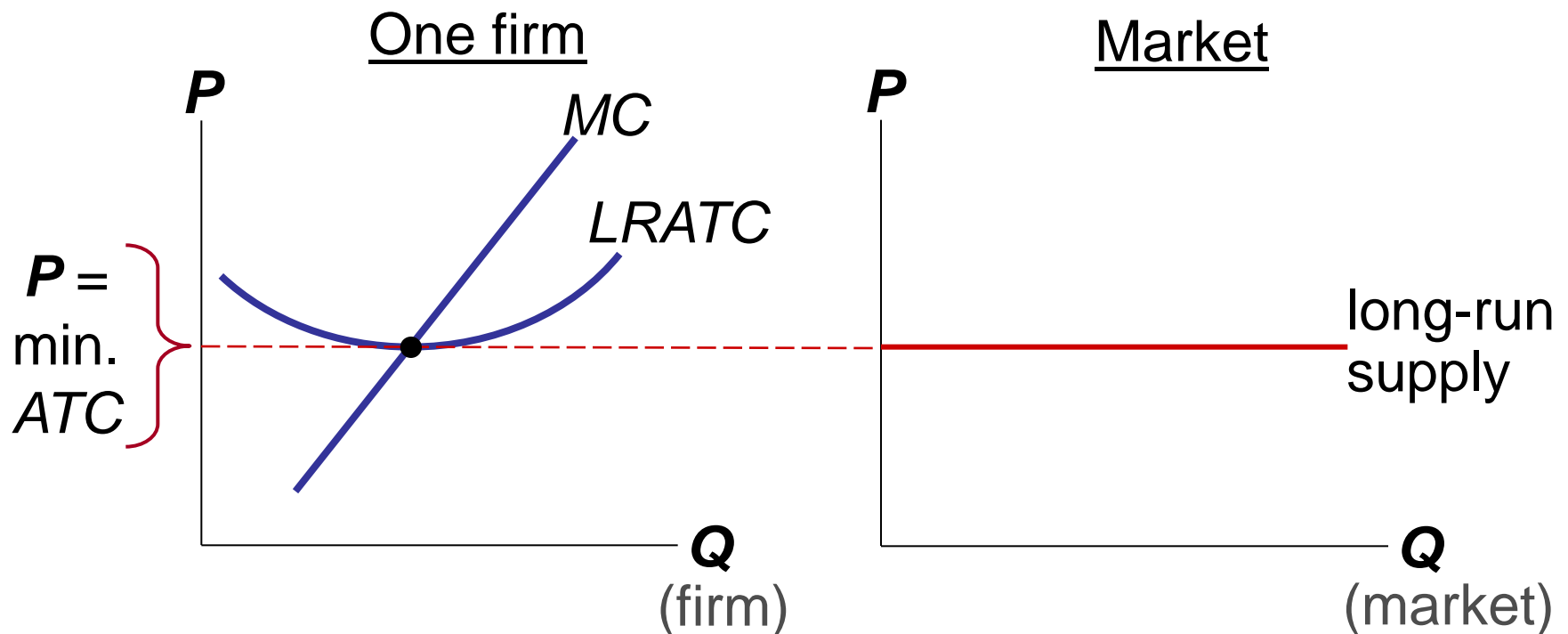
# Why Do Firms Stay in Business if Profit = 0?

- Recall, economic profit is revenue minus <u>all</u> costs – including implicit costs, like the opportunity cost of the owner's time and money.

- In the zero-profit equilibrium, firms earn enough revenue to cover these costs.
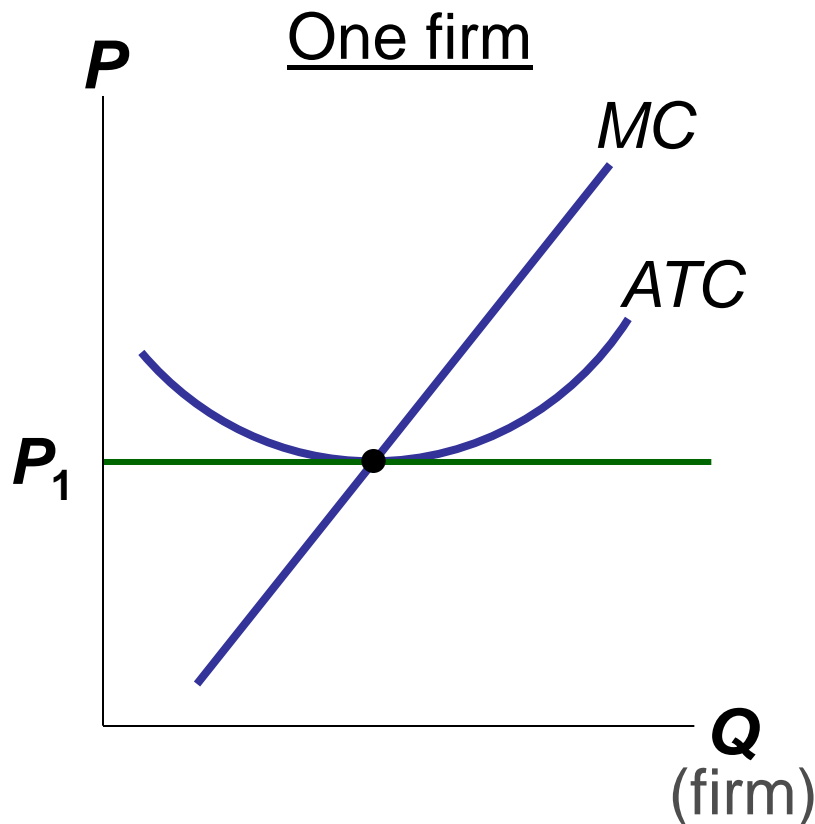
# SR & LR Effects of an Increase in Demand

A firm begins in long-run eq'm…
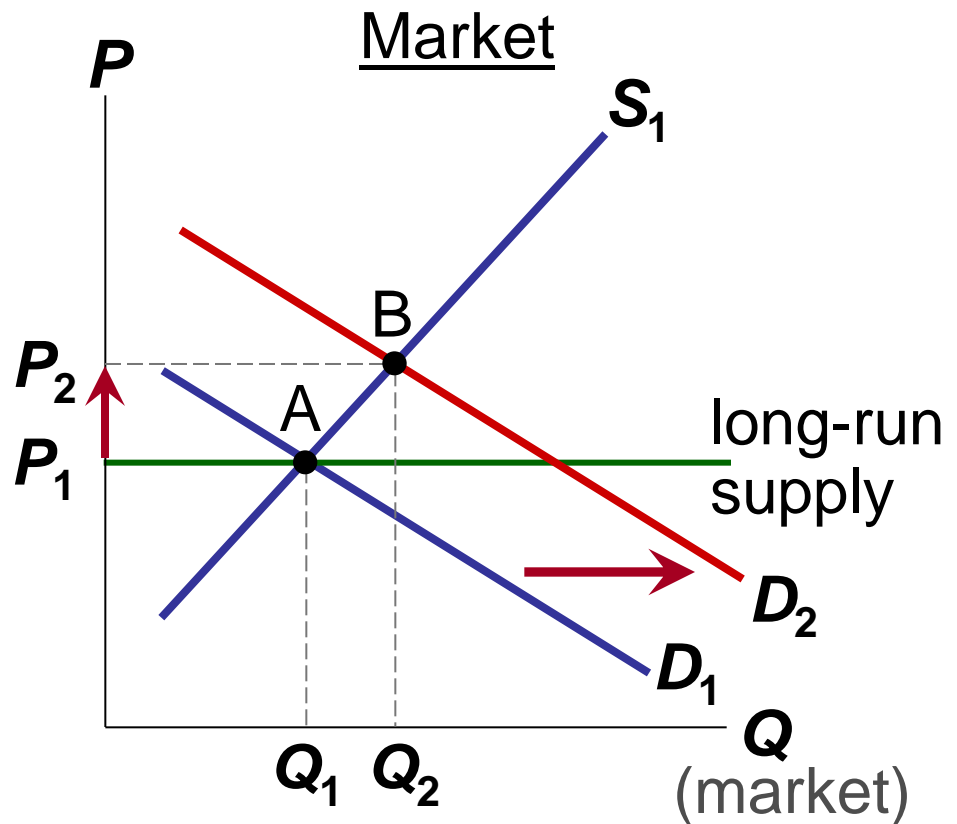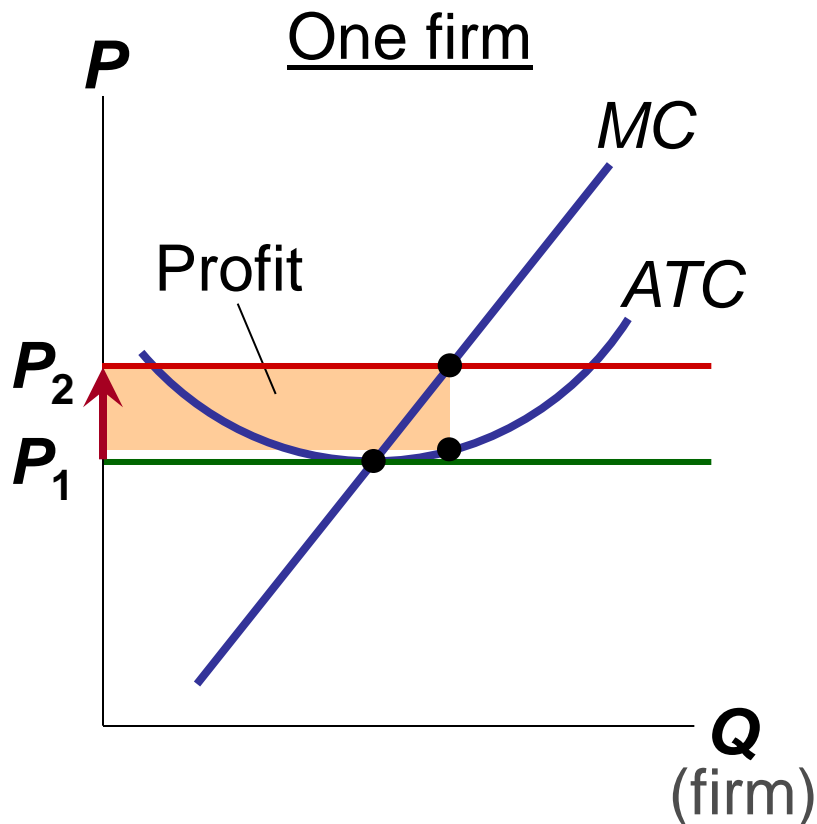
## One firm

$P$

*MC*

*ATC*

$P_1$

$Q$
(firm)

## Market

$P$

$S_1$

A

long-run supply

$P_1$

$D_1$

$Q$
(market)

$Q_1$
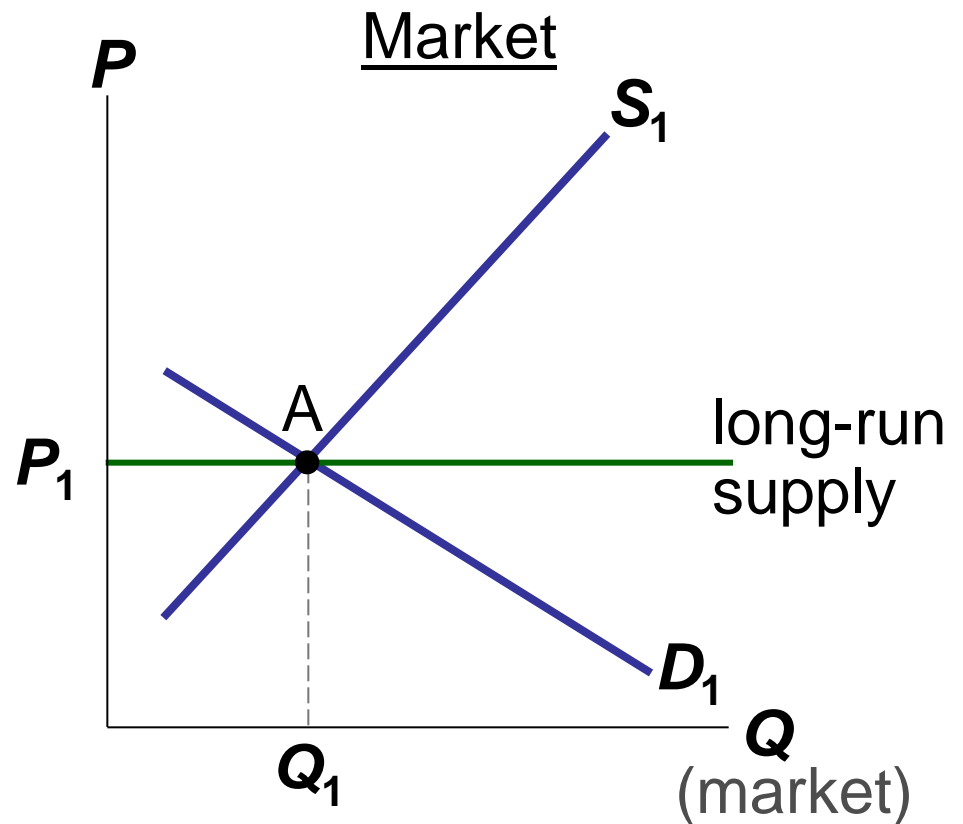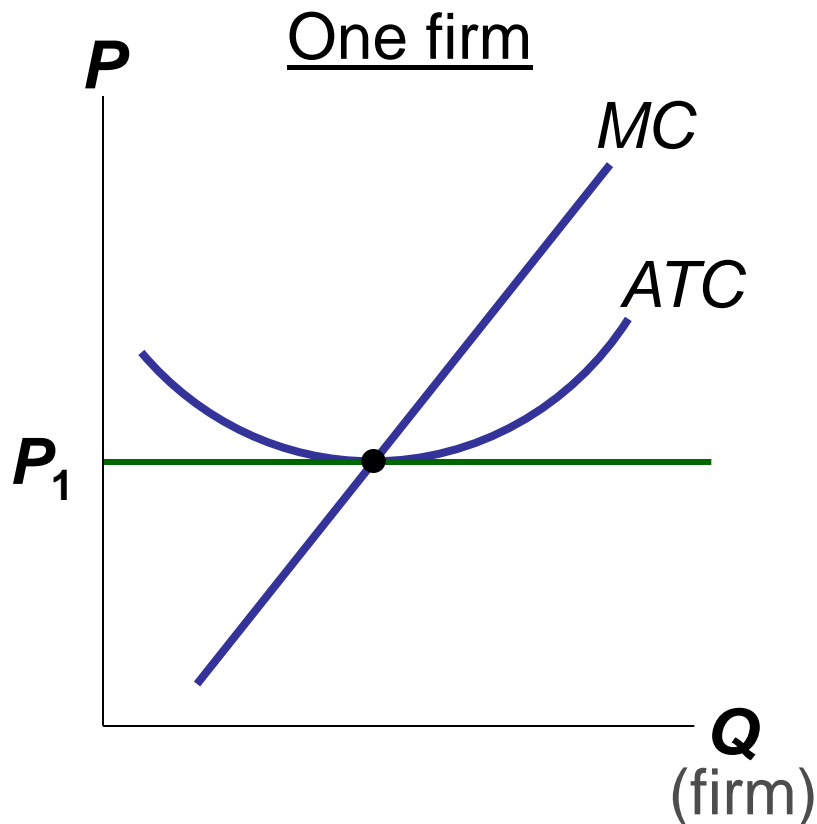
# SR & LR Effects of an Increase in Demand

…but then an increase in demand raises **P**,…



One firm

Market
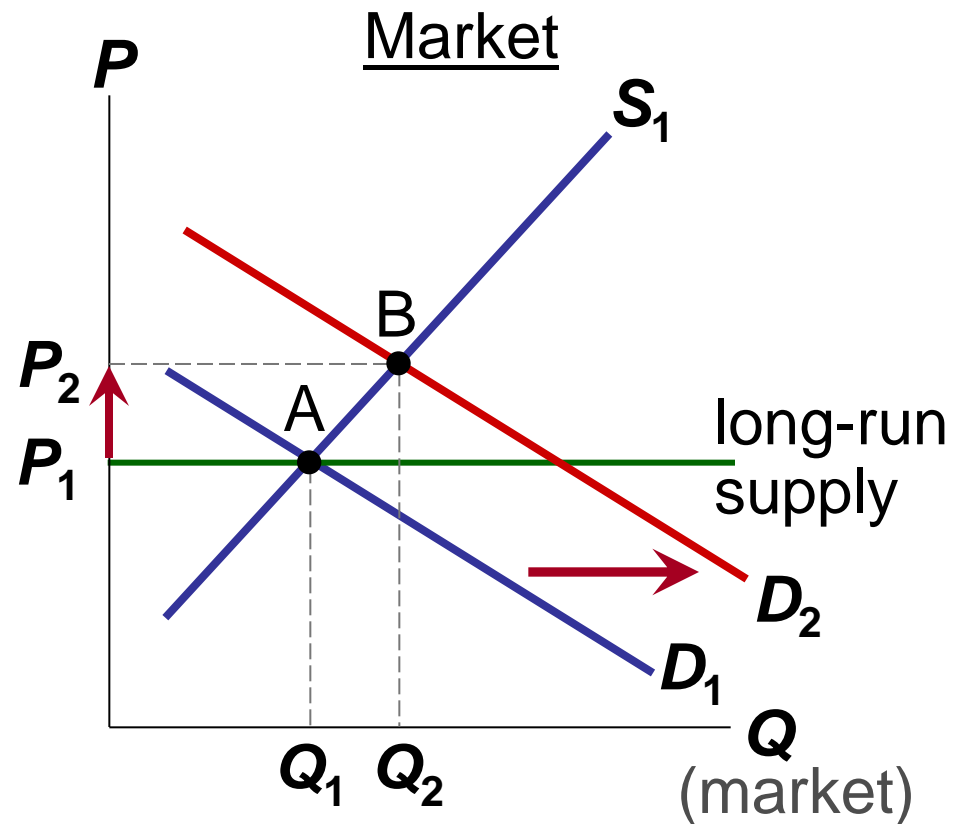
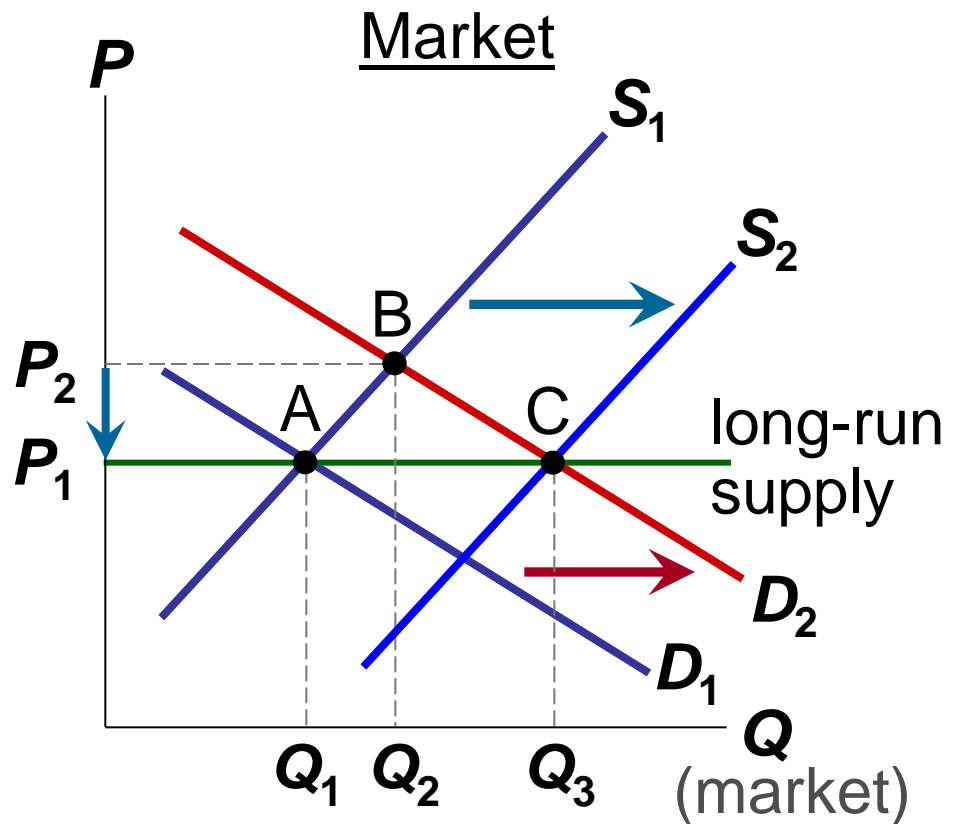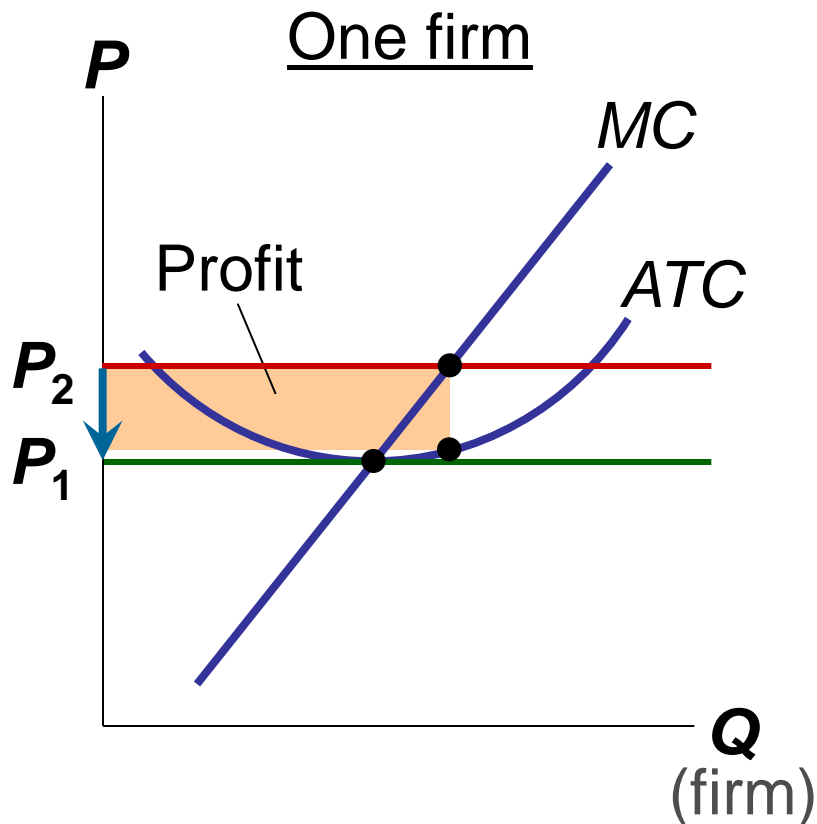# SR & LR Effects of an Increase in Demand

…leading to SR profits for the firm.



One firm

$P$

$MC$

Profit

$ATC$

$P_2$

$P_1$

$Q$
(firm)

Market

$P$

$S_1$

B
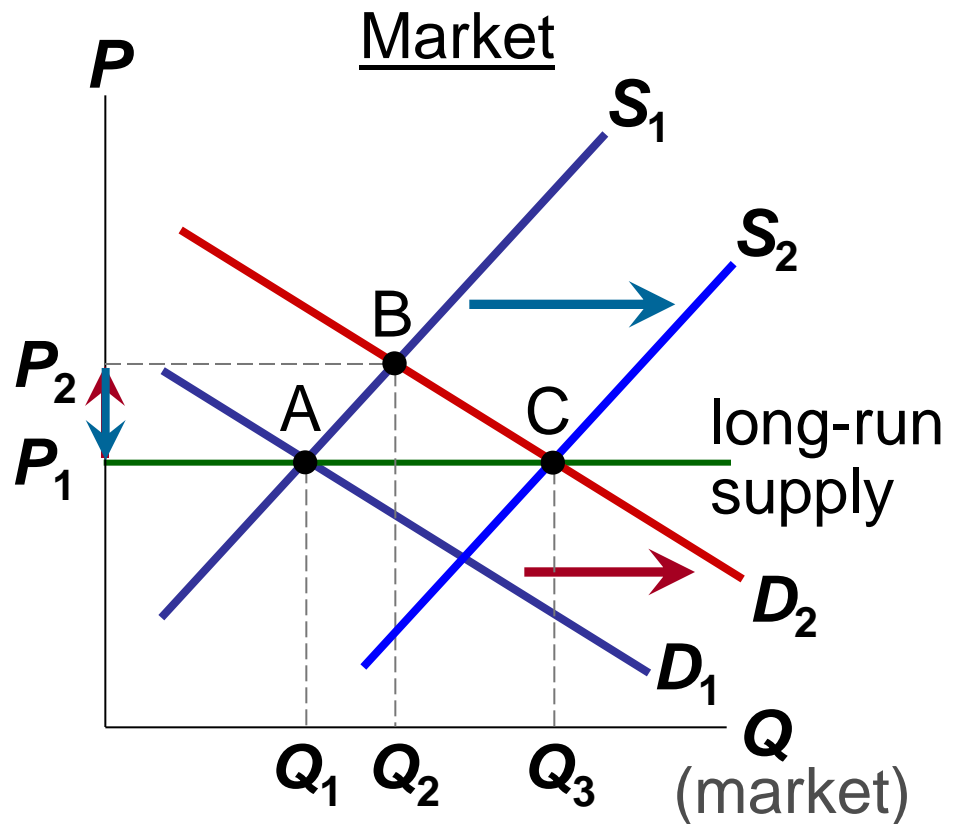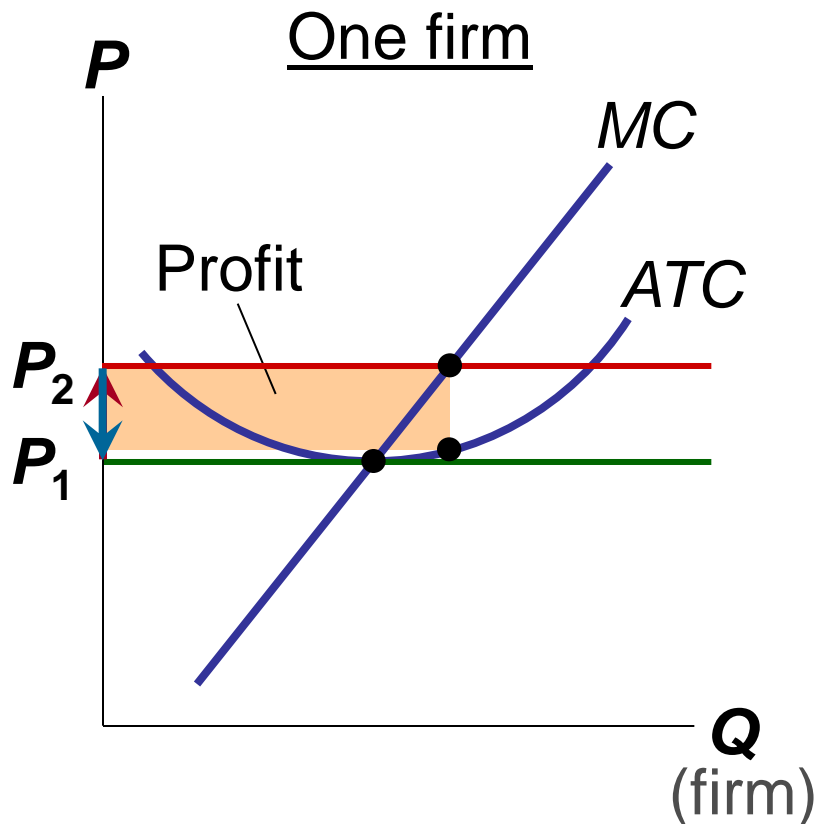
$P_2$

A

$P_1$

long-run supply

$D_2$

$D_1$

$Q$
(market)

$Q_1$ $Q_2$

# SR & LR Effects of an Increase in Demand

Over time, profits induce entry, shifting **S** to the right, reducing **P**…



One firm

Market

# SR & LR Effects of an Increase in Demand

…driving profits to zero and restoring long-run eq'm.



One firm

Market

# CONCLUSION: The Efficiency of a Competitive Market

- Profit-maximization: $MC = MR$

- Perfect competition: $P = MR$

- So, in the competitive eq'm: $P = MC$

- Recall, $MC$ is cost of producing the marginal unit. $P$ is value to buyers of the marginal unit.

- So, the competitive eq'm is efficient, maximizes total surplus.

- In the next chapter, monopoly: pricing & production decisions, deadweight loss, regulation.

# CHAPTER SUMMARY

- For a firm in a perfectly competitive market, price = marginal revenue = average revenue.

- If $P > AVC$, a firm maximizes profit by producing the quantity where $MR = MC$. If $P < AVC$, a firm will shut down in the short run.

- If $P < ATC$, a firm will exit in the long run.

- In the short run, entry is not possible, and an increase in demand increases firms' profits.

- With free entry and exit, profits = 0 in the long run, and $P$ = minimum $ATC$.