CHAPTER 14

Firms in Competitive Markets

PRINCIPLES OF
Microeonomics

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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

- Three years after graduating, 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.

Characteristics of Perfect Competition

1. Many buyers and many sellers.
2. The goods offered for sale are identical *(homogeneous).*
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*)** $AR = \dfrac{TR}{\boldsymbol{Q}} = \boldsymbol{P}$
- **Marginal revenue (*MR*)**: The change in *TR* from selling one more unit. $MR = \dfrac{\Delta TR}{\Delta \boldsymbol{Q}}$

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		
5	$10	$50		$10

ACTIVE LEARNING 1

Answers

Fill in the empty spaces of the table.

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

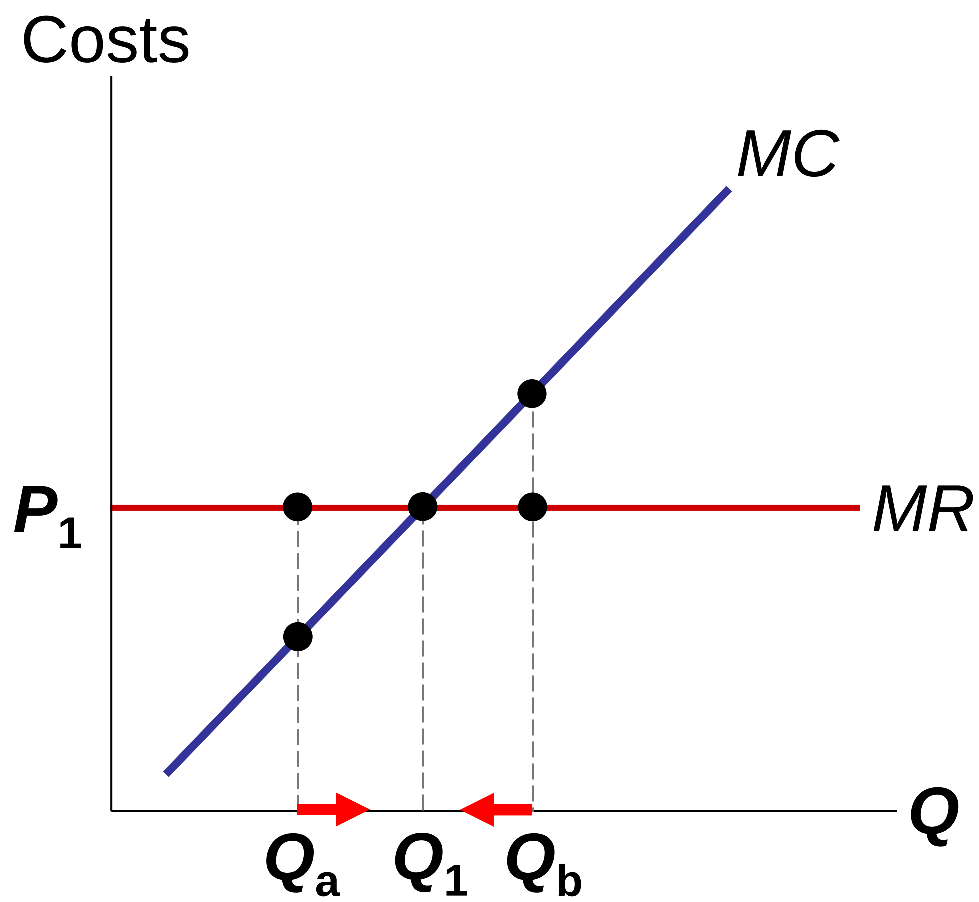
MC and the Firm's Supply Decision

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.



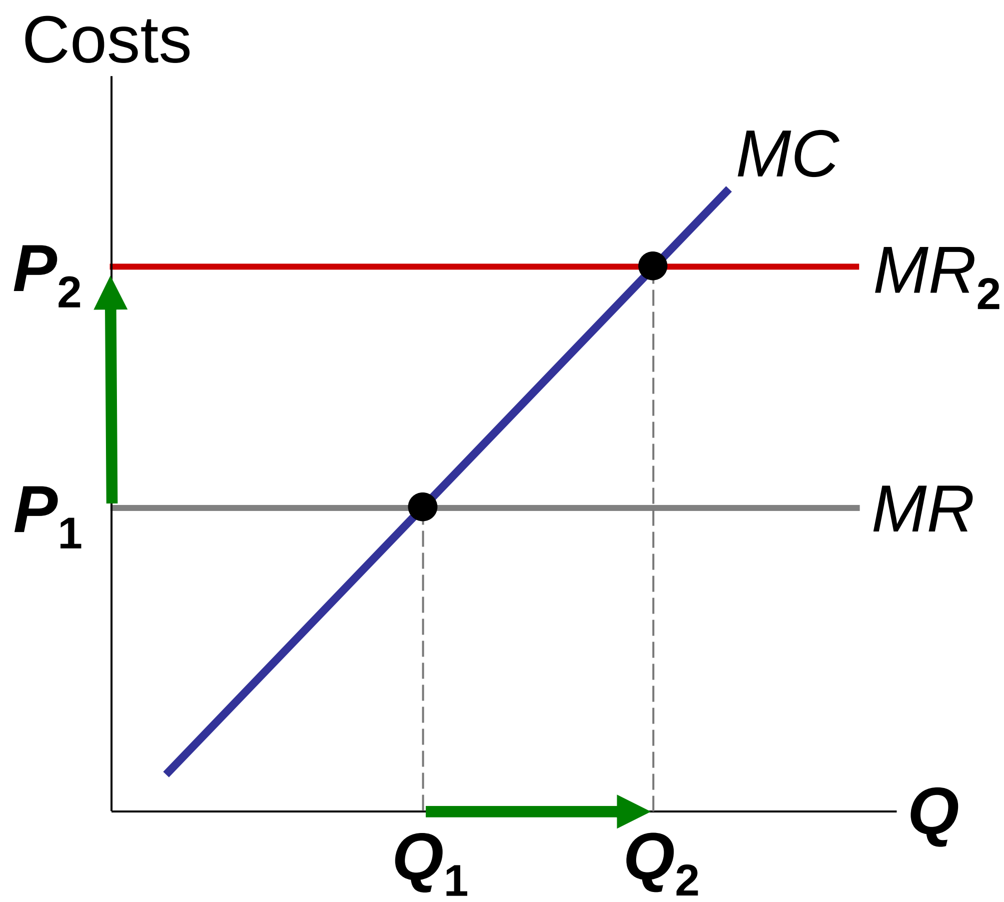
MC and the Firm's Supply Decision

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 <u>is</u> 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.

A Firm's Short-run Decision to Shut Down

- Cost of shutting down: revenue loss = TR
- Benefit of shutting down: cost savings = VC (firm must still pay FC)
- So, shut down if $\boxed{TR < VC}$
- Divide both sides by $\boldsymbol{Q}$: $TR/\boldsymbol{Q} < VC/\boldsymbol{Q}$
- So, firm's decision rule is:

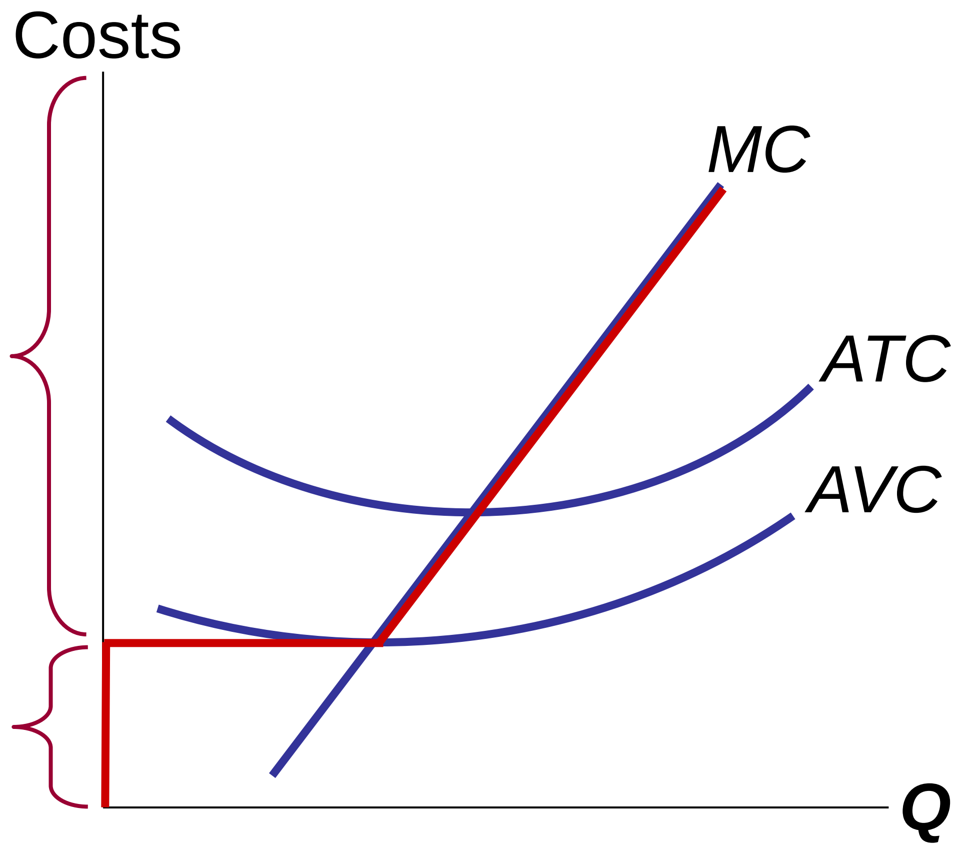
Shut down if $P < AVC$

A Competitive Firm's SR Supply Curve

The firm's SR supply curve is the portion of its *MC* curve abo

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
- 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

- Cost of exiting the market: revenue loss = TR
- Benefit of exiting the market: cost savings = TC (zero FC in the long run)
- So, firm exits if $\boxed{TR < TC}$
- Divide both sides by $\boldsymbol{Q}$ to write the firm's decision rule as:

Exit if $\boldsymbol{P} < ATC$

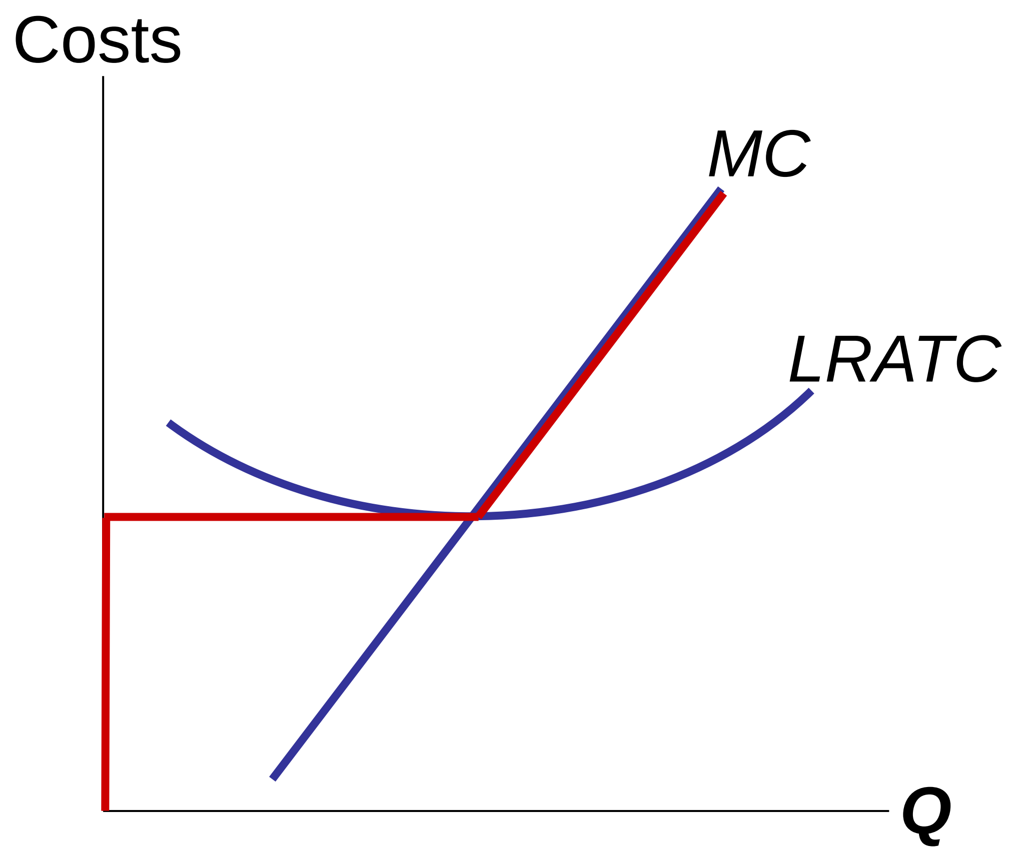
A New Firm's Decision to Enter Market

- 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 $\boldsymbol{Q}$ to express the firm's entry decision as:

Enter if $\boldsymbol{P} > ATC$

The Competitive Firm's Supply Curve

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



Profit Maximization

- Profit = TR – TC

  = (P x Q) – (ATC x Q)

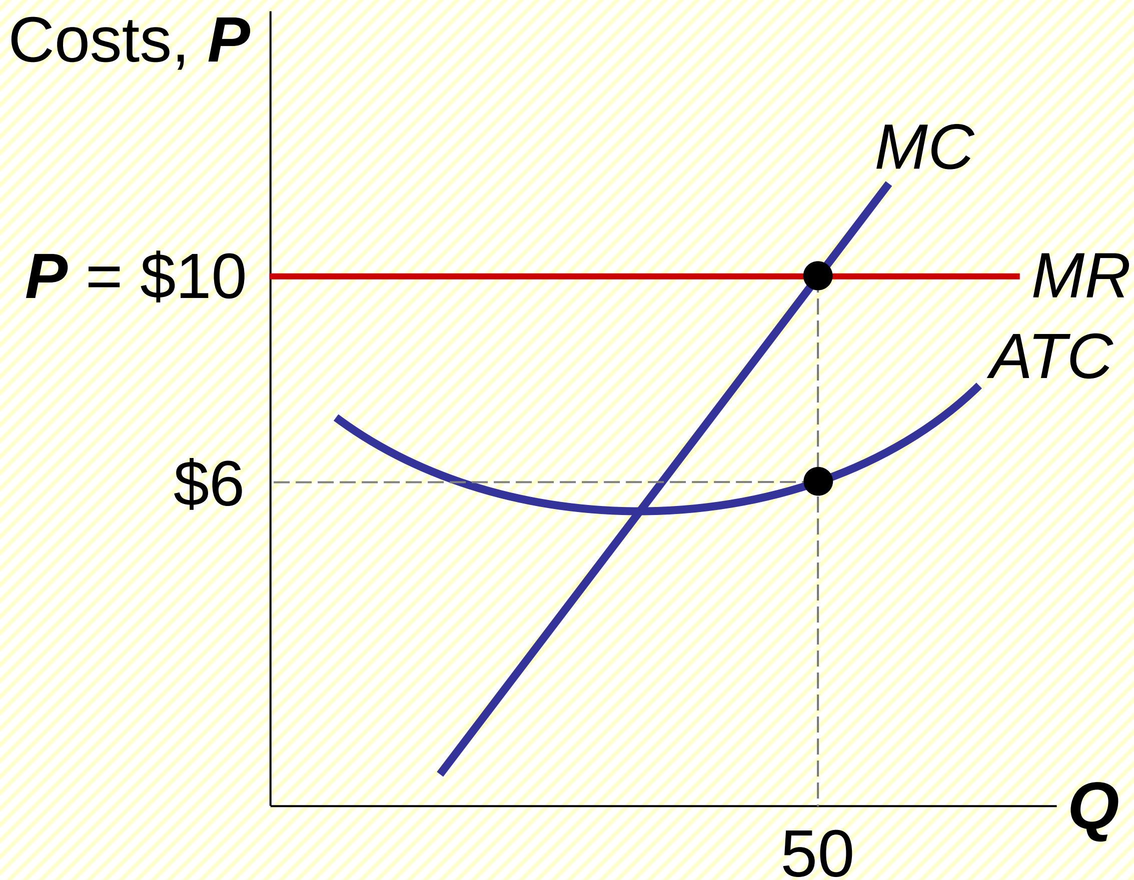
  = Q x (P – ATC)

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.

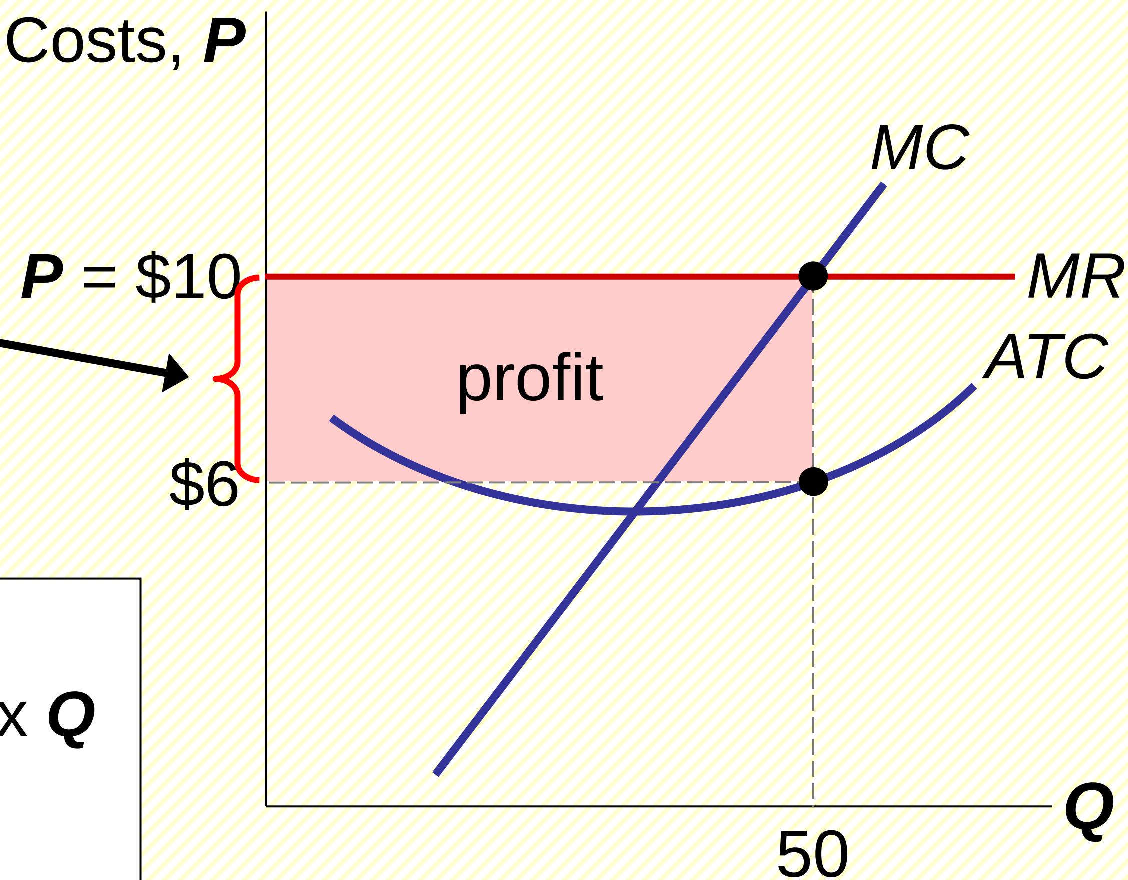
A competitive firm



ACTIVE LEARNING **2**

Answers

A competitive firm



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

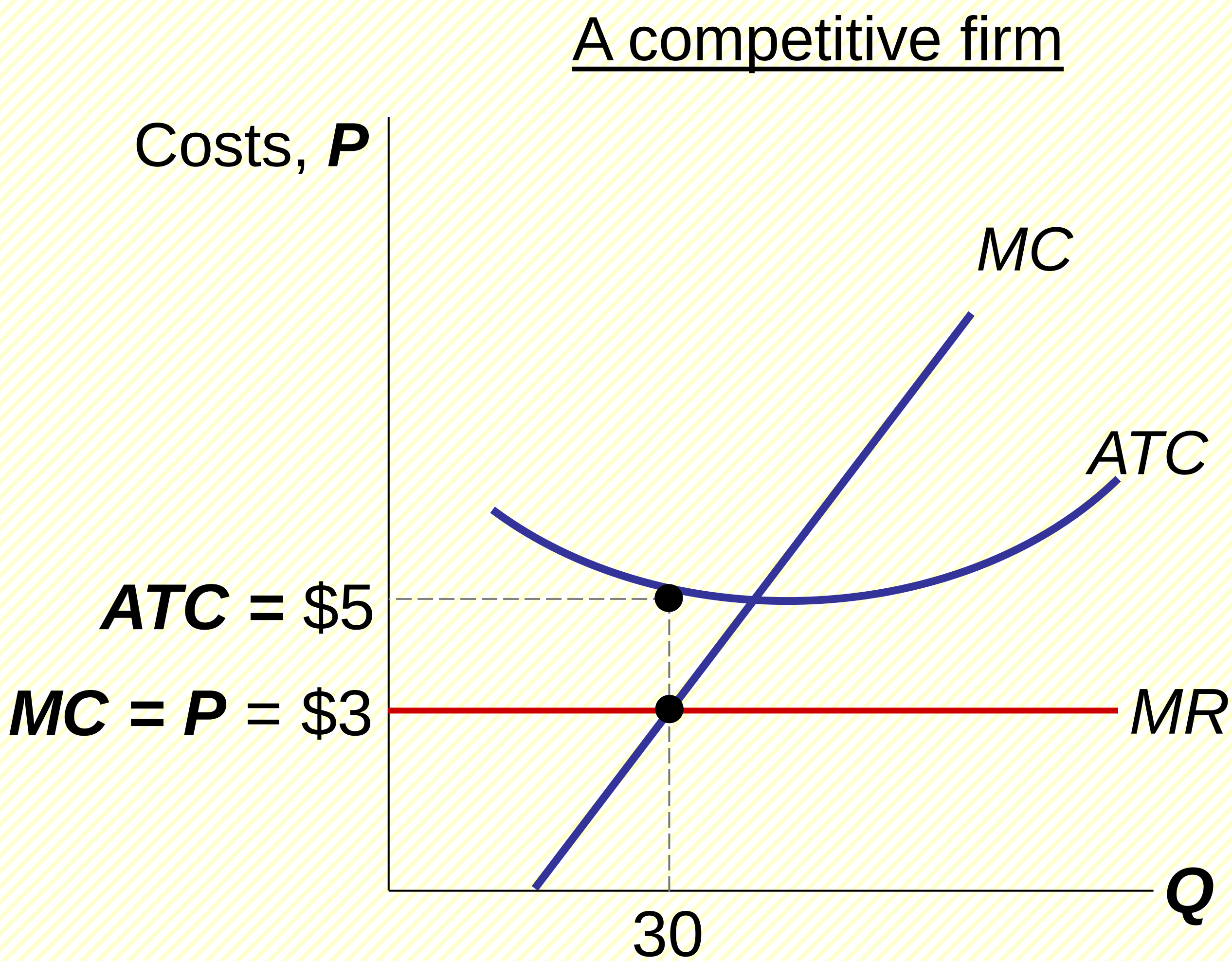
Total profit
= (***P*** – *ATC*) x ***Q***
= $4 x 50
= $200

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.



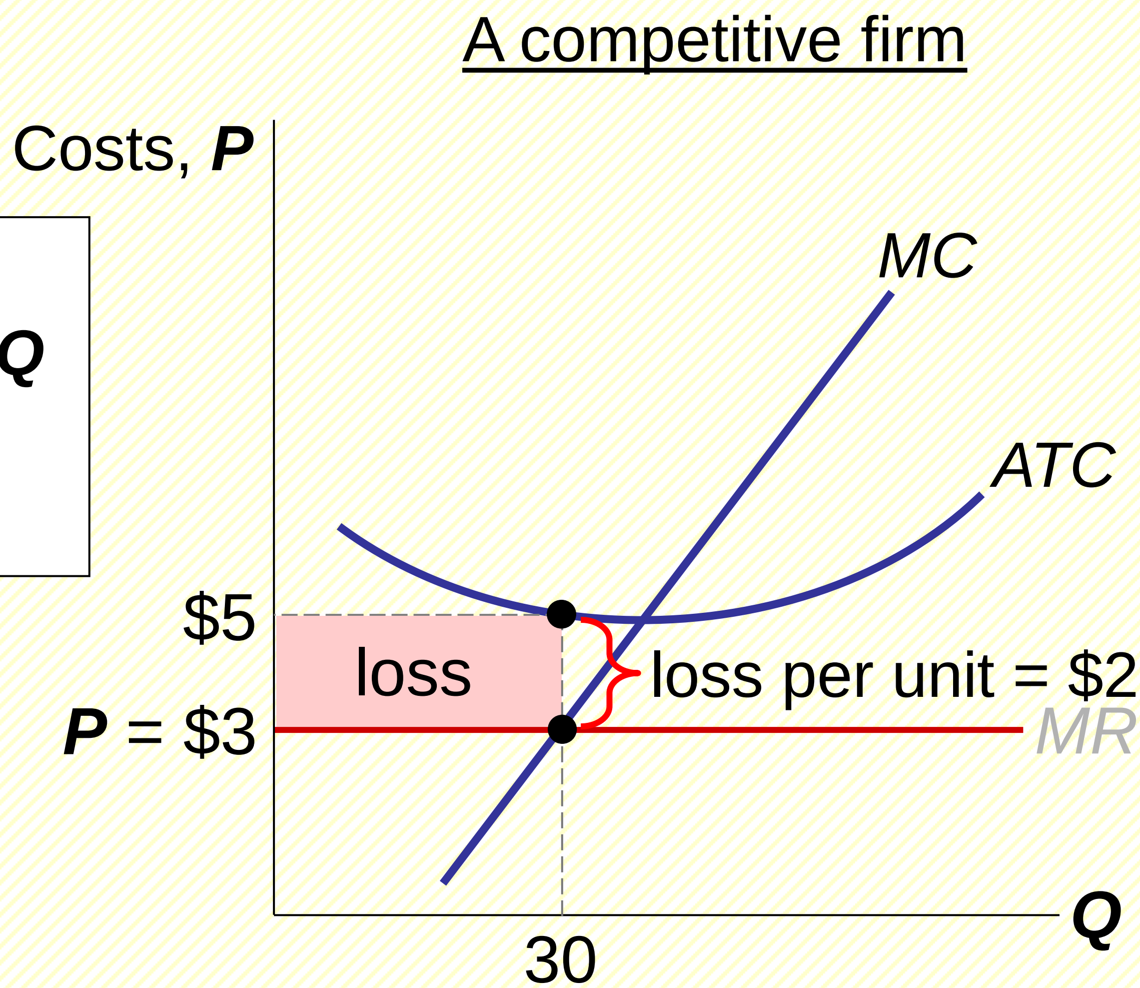
ACTIVE LEARNING 3
Answers

Total loss

= (*ATC* – ***P***) x ***Q***

= - \$2 x 30

= - \$ 60



ACTIVE LEARNING **3**

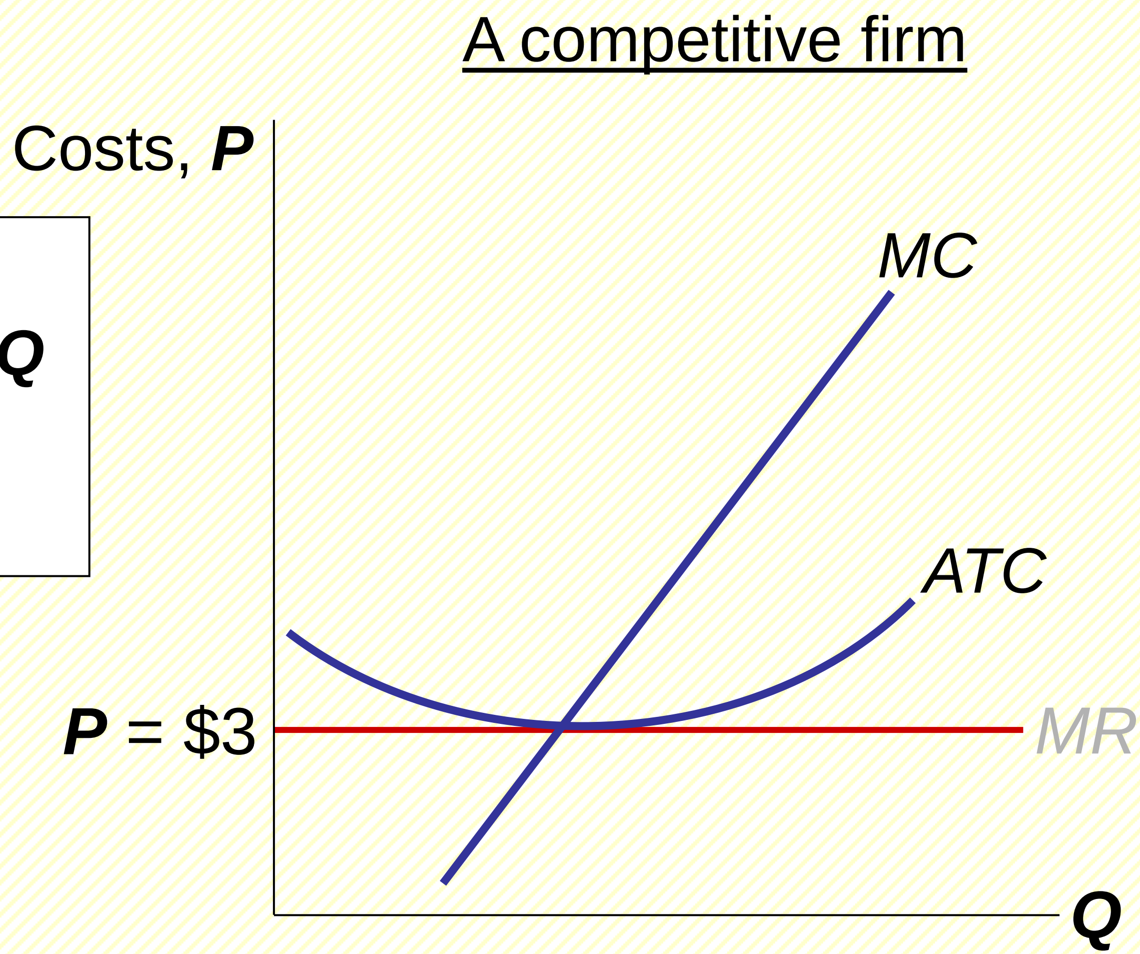
Zero-profit condition

Total loss

= (ATC – P) x Q

= \$0 x 30

= \$0



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)

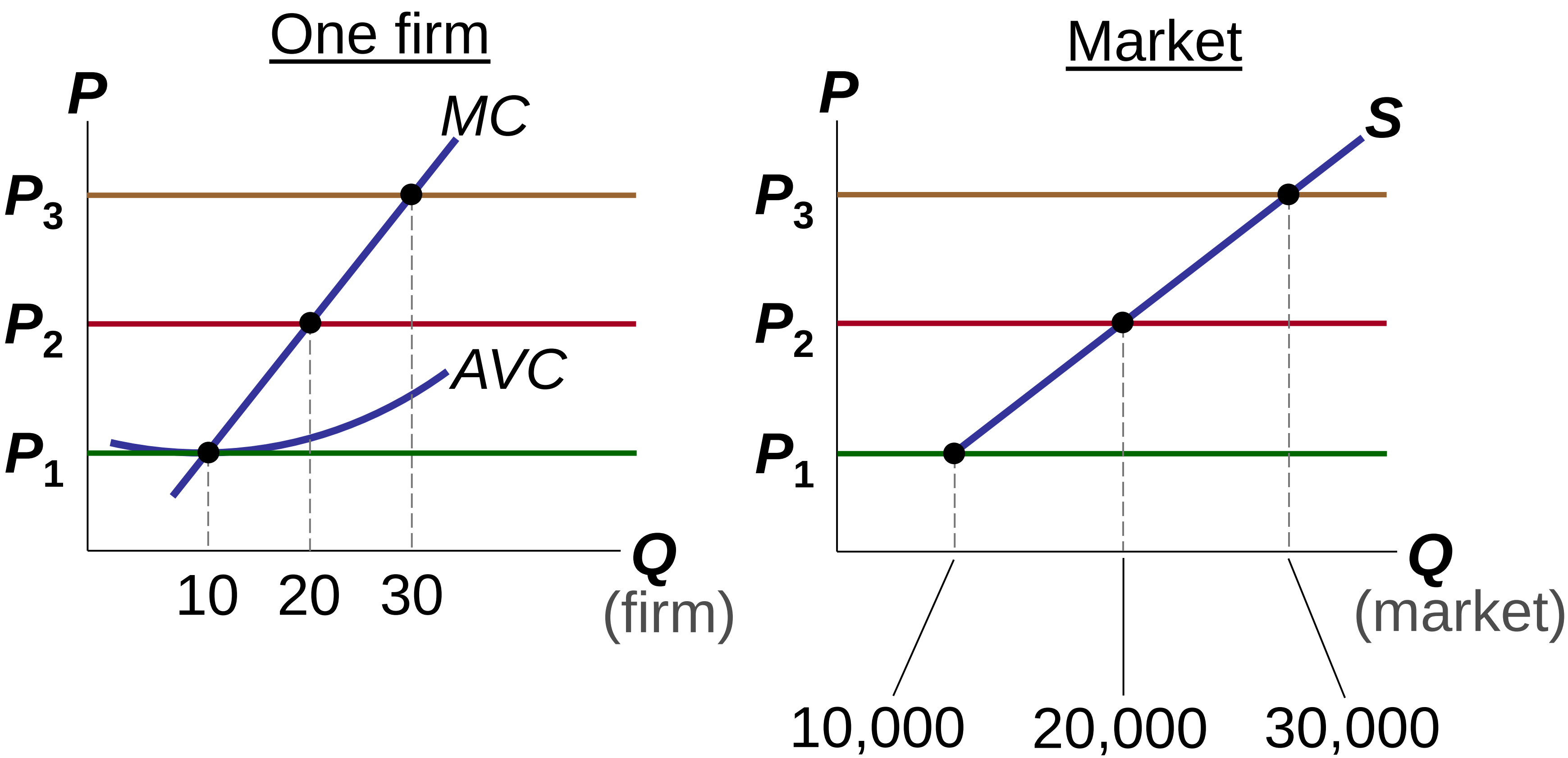
The SR Market Supply Curve

- As long as ***P*** ≥ *AVC*, each firm will produce its profit-maximizing quantity, where *MR* = *MC*.
- Recall 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 $\boldsymbol{Q^s}$ = 1000 x (one firm's $\boldsymbol{Q^s}$)



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 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 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, ***P*** = minimum *ATC*.

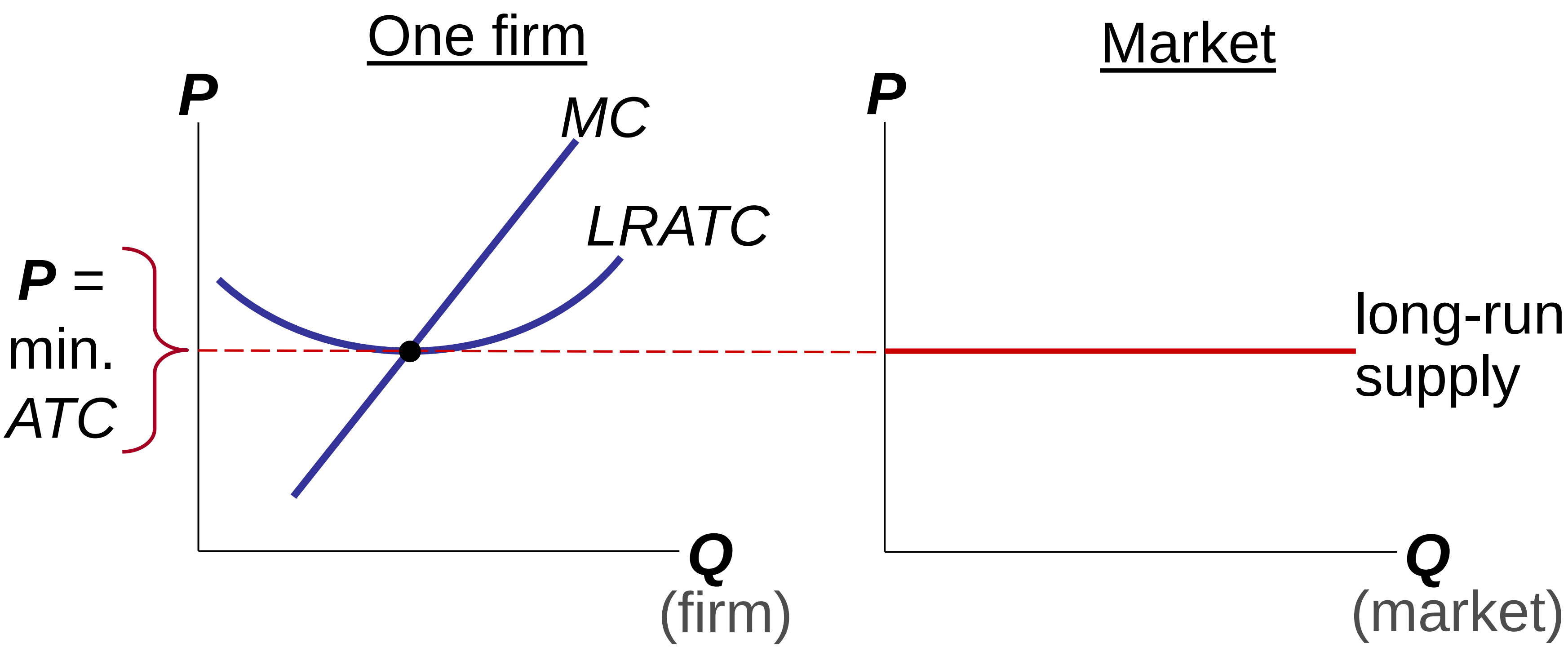
Why Do Firms Stay in Business if Profit = 0?

- 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
  - 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*** = minimum *ATC*.



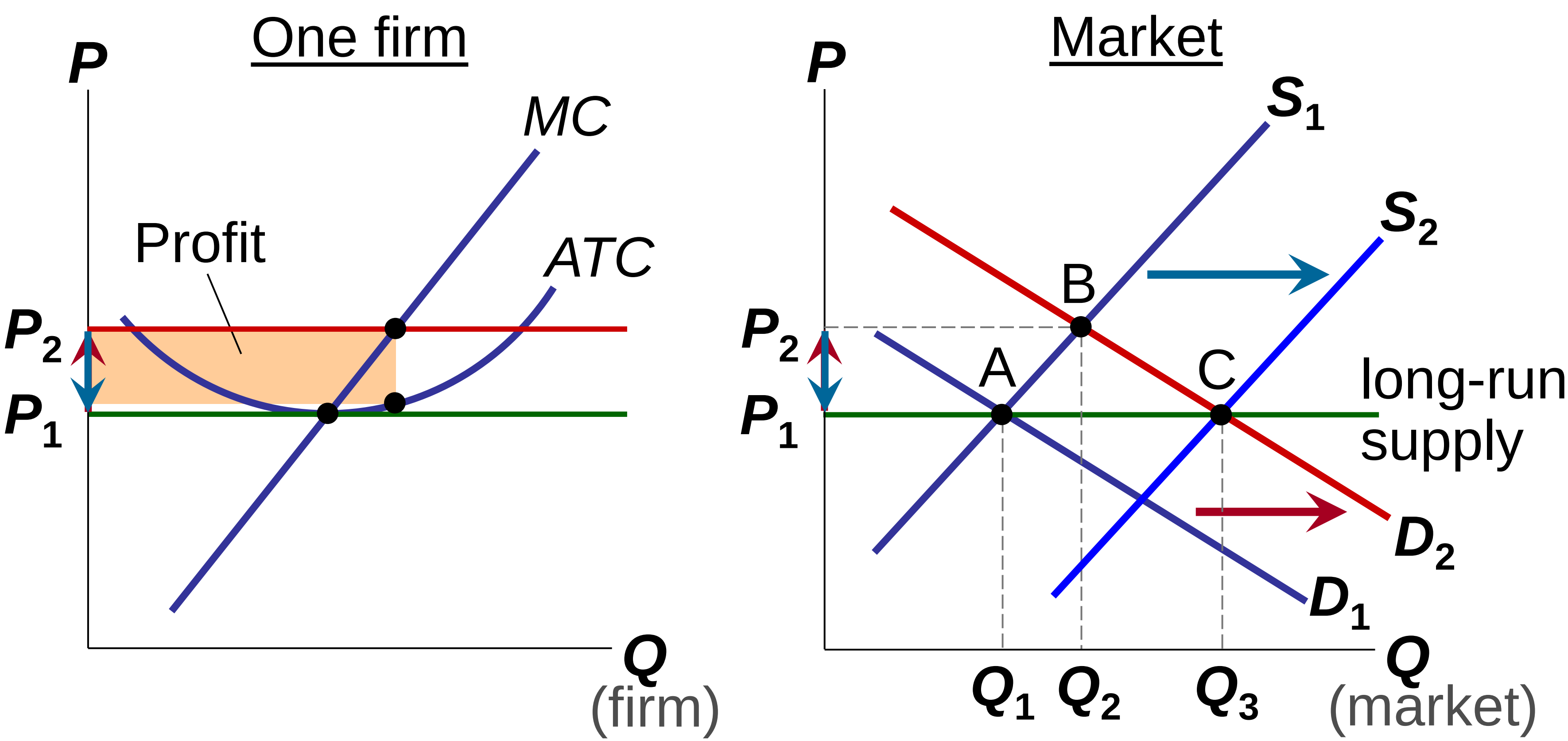
SR & LR Effects of an Increase in Demand

A firm begins in … but then an increase

…leading t … duce entry,

profits for t … ıt, reducing ***P***…

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



Why the LR Supply Curve Might Slope Upward

- The LR market supply curve is horizontal if
  1) all firms have identical costs, and
  2) costs do not change as other firms enter or exit the market.
- If either of these assumptions is not true, then LR supply curve slopes upward.

1) 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.
- At any ***P***,
  - For the marginal firm,
    P = minimum *ATC* and profit = 0.
  - For lower-cost firms, profit > 0.

2) 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.

CONCLUSION: The Efficiency of a Competitive Market

- Profit-maximization: $MC = MR$
- Perfect competition: $\boldsymbol{P} = MR$
- So, in the competitive eq'm: $\boldsymbol{P} = MC$
- 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.