



# Unit 7: Firms in Competitive Markets

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## Objectives

In this unit, 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 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.

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## 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.

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## The Revenue of a Competitive Firm

- Total revenue ( $TR$ )

$$TR = P \times Q$$

- Average revenue ( $AR$ )

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

- Marginal Revenue ( $MR$ ):

The change in  $TR$  from selling one more unit.

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

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## 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		
5	\$10	\$50		\$10

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## $MR = P$ 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.

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## 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.



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## Profit Maximization

(continued from earlier exercise)

Q	TR	TC	Profit	MR	MC	$\Delta\text{Profit} = \text{MR} - \text{MC}$
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

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

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

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## MC and the Firm's Supply Decision

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

At  $Q_a$ ,  $MC < MR$ .

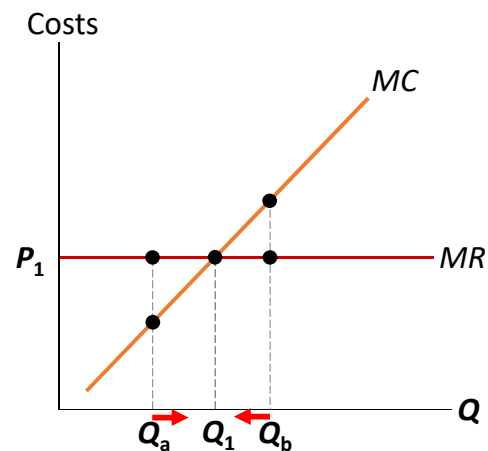
So, increase  $Q$  to raise profit.

At  $Q_b$ ,  $MC > MR$ .

So, reduce  $Q$  to raise profit.

At  $Q_1$ ,  $MC = MR$ .

Changing  $Q$  would lower profit.



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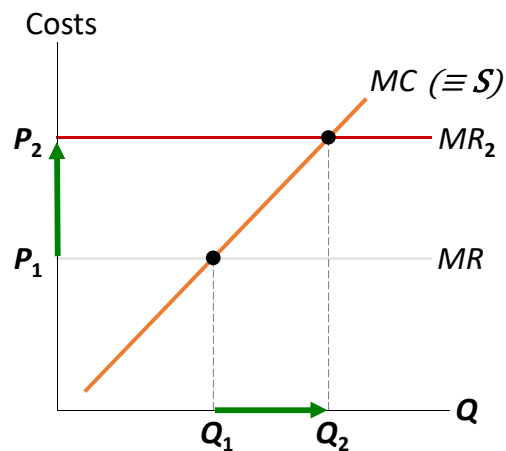
## MC and the Firm's Supply Decision

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.



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## Shutdown vs. Exit

- **Shutdown:**

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

- A firm that shuts down temporarily must still pay its fixed costs.

- **Exit:**

A long-run decision to leave the market.

- A firm that exits the market does not have to pay any costs at all, fixed or variable.

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## 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  $Q$ :  $TR/Q < VC/Q$
- So we can write the firm's decision as:

Shut down if  $P < AVC$

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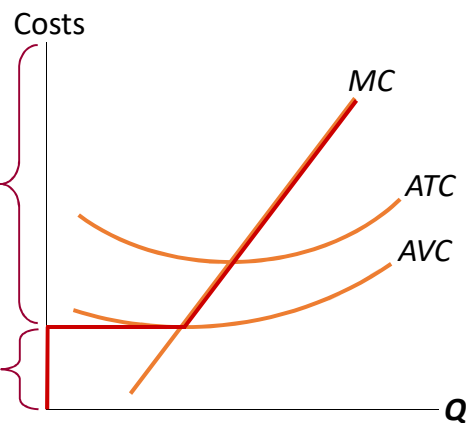


## A Competitive Firm's SR Supply Curve

The firm's SR supply curve is the portion of its  $MC$  curve above

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

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



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## 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.



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## 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  $P < ATC$



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## 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  $Q$  to express the firm's entry decision as:

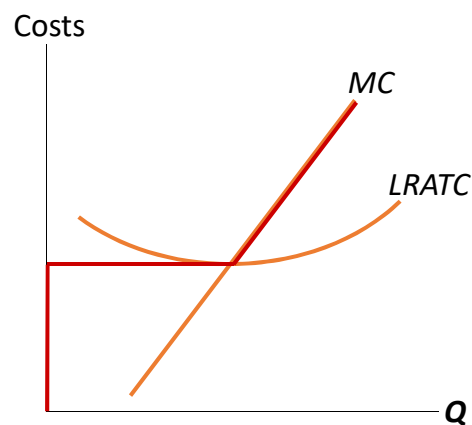
Enter if  $P > ATC$

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## The Competitive Firm's Supply Curve

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



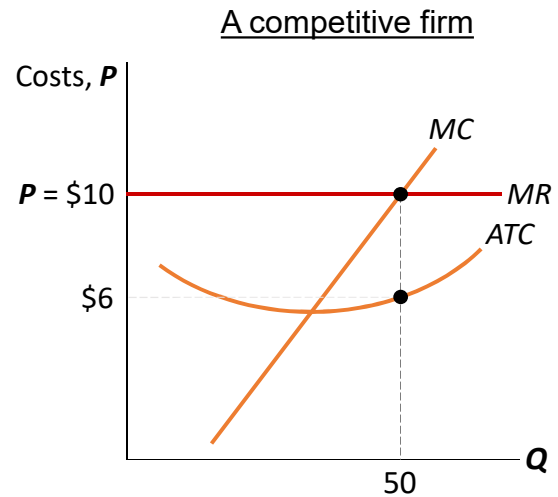
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## ACTIVE LEARNING 2A: Identifying a firm's profit

Determine  
this firm's  
total profit.

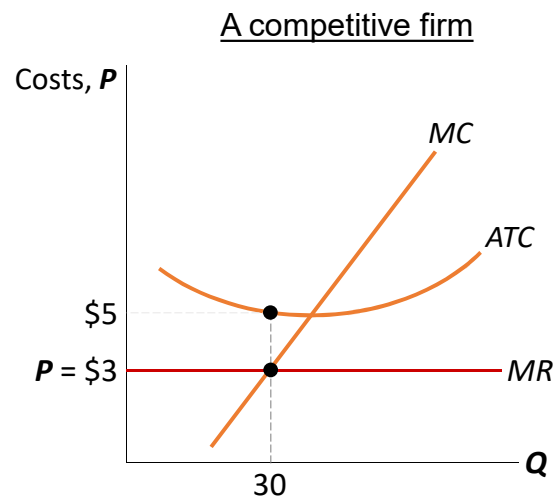
Identify the area on the  
graph that represents  
the firm's profit.



## ACTIVE LEARNING 2B: Identifying a firm's loss

Determine  
this firm's  
total loss.

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





## 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)

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## The SR Market Supply Curve

- As long as  $P \geq AVC$ , each firm will produce its profit-maximizing quantity, where  $MR = MC$ .
- Recall from Unit 2:  
At each price, the market quantity supplied is the sum of quantity supplied by each firm.

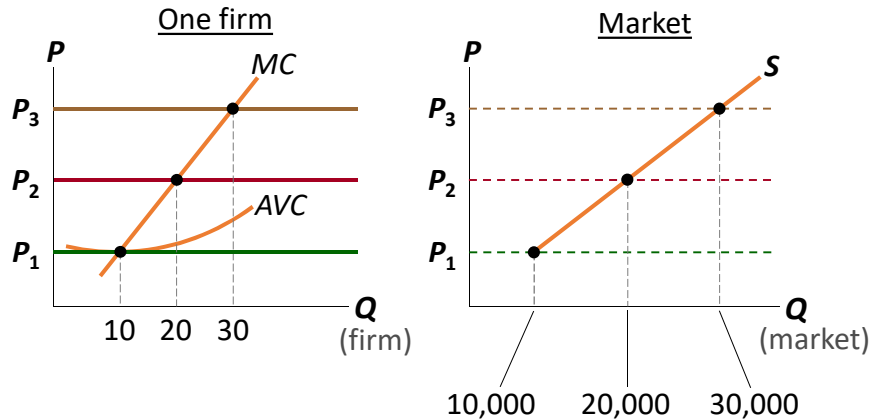
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## The SR Market Supply Curve

Example: 1000 identical firms.

At each  $P$ , market  $Q^s = 1000 \times (\text{one firm's } Q^s)$



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## 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.

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## 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.

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## 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,  $P = \text{minimum } ATC$ .

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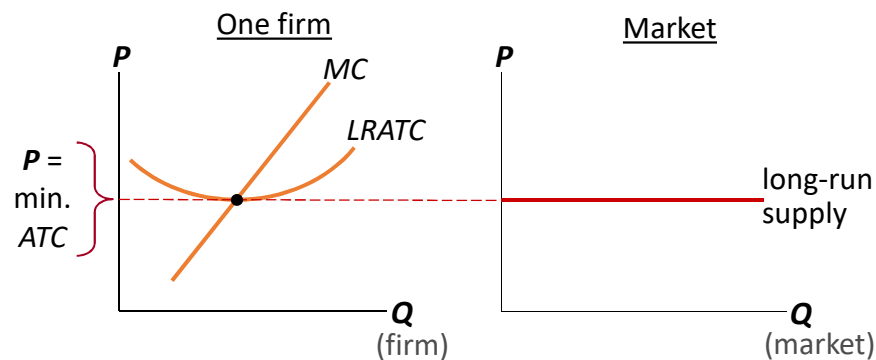




## The LR Market Supply Curve

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

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



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## Why Do Firms Stay in Business if Profit = 0?

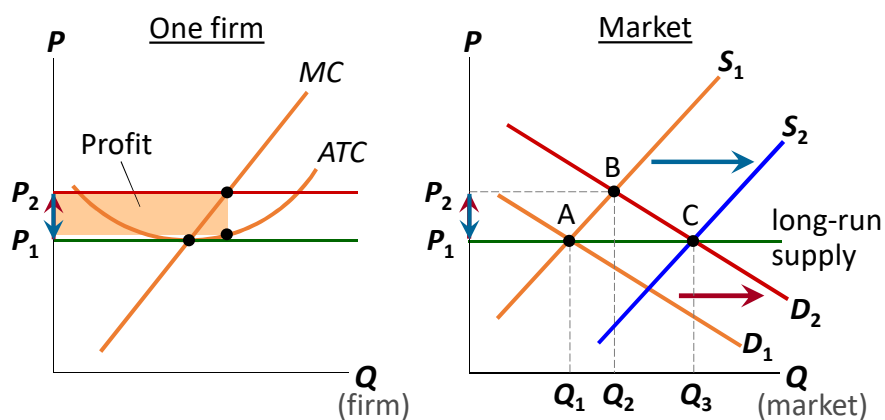
- Recall, economic profit is revenue minus all costs – including implicit costs, like the opportunity cost of the owner's time and money.
- In the zero-profit equilibrium, firms earn enough revenue to cover these costs.

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## SR & LR Effects of an Increase in Demand

A firm begins in  $P_1$  but then an increase in demand leads to  $P_2$  driving profits to zero. This causes entry, increasing supply and restoring long-run equilibrium at  $P_1$  and  $Q_3$ .



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## Why the LR Supply Curve Might Slope Upward

- The LR market supply curve is horizontal if
  - all firms have identical costs, and
  - 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.

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## 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,  
 $P = \text{minimum } ATC$  and profit = 0.
  - For lower-cost firms, profit  $> 0$ .

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## 2) Costs Rise as Firms Enter the Market

- In some industries, the supply of a key input is limited (e.g., there's a fixed amount of land suitable for farming).
- 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.

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## 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.

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## 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  $ATC$ .

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