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PRINCIPLES OF  
**ECONOMICS**  
Eight Edition



CHAPTER  
**14**

**Firms in  
Competitive Markets**

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## The Big Picture

- ▶ Chapter 13: The cost of production
  - ▶ Now, we will look at firm's revenue
  - ▶ But revenue depends on market structure
1. Competitive market (this chapter)
  2. Monopoly (chapter 15)
  3. Monopolistic Competition (chapter 16)
  4. Oligopoly (chapter 17)
- ▶ Are there other types of markets? Yes, not now

2018/11/26

Perfect Competition

Joseph Tao-yi Wang

## Competitive Market Experiment

- ▶ 3 students form a group, each group will be either Ace group or Beta group
- ▶ Ace groups each have 44 Black (Green) stickers, 9 Purple (Red) stickers
- ▶ Beta groups each have 6 Black (Green) stickers, 41 Purple (Red) stickers
- ▶ Earnings Table (A or B) is provided

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## Competitive Market Experiment

- ▶ In round 1, you may only trade with "the other group" (A1 with B1, A2 with B2, etc.)
- ▶ In round 2, you may walk around bargain and trade with any group you like
- ▶ Record your trade and "current" portfolio on the record sheet after each trade
- ▶ NOTE: Please double-check your trade with others—you will earn ZERO points if they don't match!!!

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## 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?

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## 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.

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## What is a Competitive Market?

**Perfectly competitive market:**

- **Perfect Substitutes** exists (Can buy from her if not from you). Typically because:
  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

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## 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
  - $AR = P$
  - $MR = P$

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### 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

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### 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	\$20	\$10	\$10
3	\$10	\$30	\$10	\$10
4	\$10	\$40	\$10	\$10
5	\$10	\$50	\$10	\$10

Notice that  $MR = P$

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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 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  $MR = MC$ !

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### 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	$\Delta\text{Profit} = MR - MC$
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

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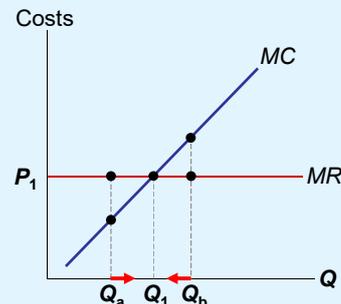
### MC and the Firm's Supply Decision

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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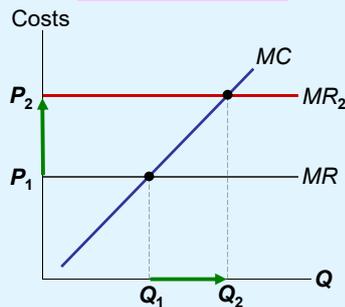
### MC and the Firm's Supply Decision

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

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.
- **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.

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### 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  $P < AVC$

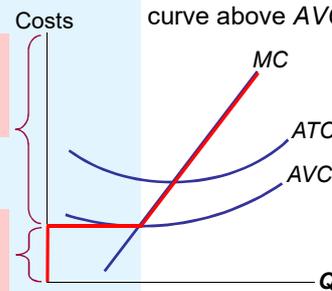
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### A Competitive Firm's SR Supply Curve

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  $Q = 0$ ).



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### 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

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### 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:  $P > ATC$ )

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### The Competitive Firm's LR Supply Curve

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

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### 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.

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### Active Learning 2 Answers

A competitive firm

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

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

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### 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.

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### Active Learning 3 Answers

A competitive firm

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

Costs,  $P$

$MC$

$ATC$

$MR$

$Q$

$P = \$3$

loss

loss per unit = \$2

30

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### Market Supply: Assumptions

- All existing firms and potential entrants have identical costs.
- Each firm's costs do not change as other firms enter or exit the market.
- 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 Chapter 4:
  - At each price, the market quantity supplied is the sum of quantities supplied by all firms

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### The SR Market Supply Curve

Example: 1000 identical firms  
 At each  $P$ , market  $Q^s = 1000 \times$  (one firm's  $Q^s$ )

One firm

Market

$P_3$

$P_2$

$P_1$

$Q$  (firm)

$Q$  (market)

10,000 20,000 30,000

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### 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

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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: 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,  $P = \text{min ATC}$

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## 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

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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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## SR & LR Effects of an Increase in Demand

A firm begins in but then an increase ...leading to driving profits to zero ...due to entry, profits for firms and restoring long-run eq'm. it, reducing  $P$ ...

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## 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

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## 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

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## 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.

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### 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

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### Summary

- A competitive firm is a price taker
  - Its revenue is proportional to the amount of output it produces.
  - $P = MR = AR$
  - The firm's marginal-cost curve is its supply curve
- Short run: a firm cannot recover its FC
  - Shut down temporarily if  $P < AVC$
- Long run: the firm can recover both FC and VC
  - Exit if  $P < ATC$

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### Summary

- In a market with free entry and exit, profit is driven to zero in the long run.
  - All firms produce at efficient scale,  $P = \min ATC$
  - The number of firms adjusts to satisfy the quantity demanded at this price.
- Changes in demand have different effects over different time horizons.
  - Short run, an increase in demand raises prices and leads to profits (a decrease in demand lowers prices and leads to losses).
  - Long run: zero-profit equilibrium

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### Chapter 14: Perfect Competition

- ▶ Products are **Perfect Substitutes**
- ▶ Result: **Price Taking**
- ▶  $P = MR = MC$
- ▶ **SR**: Will operate if  $P > AVC$  (FC is sunk)
- ▶ **LR**: Will operate at  $P = ATC$ 
  - ▶ Firms enter if  $P > ATC$ ; exit if  $P < ATC$
- ▶ Homework: Mankiw, Ch.14, Problem 3-5, 9, 11

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### Chapter 14: Perfect Competition

- ▶ Challenge Questions (Past Finals)
  - ▶ 2009 - Essay C
  - ▶ 2010 - Essay B
  - ▶ 2012 - Essay A4-5
  - ▶ 2013 - Part III
  - ▶ 2014 - Essay C3-4
  - ▶ 2017 - Essay D2-D3

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