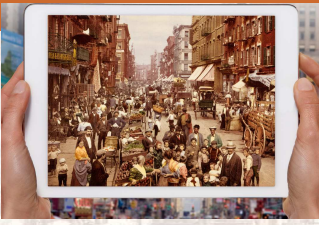


N. GREGORY MANKIWI

PRINCIPLES OF  
**ECONOMICS**  
Eight Edition



CHAPTER  
**14**

**Firms in  
Competitive Markets**

Premium PowerPoint Slides by:  
V. Andreea CHIRITESCU  
Eastern Illinois University

Modified by Joseph Tao-yi Wang

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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

2017/11/20

Perfect Competition

Joseph Tao-yi Wang

### 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 x 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.

Q	TR	TC	Profit	MR	MC	$\Delta Profit = MR - MC$
0	\$0	\$5	-\$5	\$10	\$4	\$6
1	10	9	1		10	6
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			

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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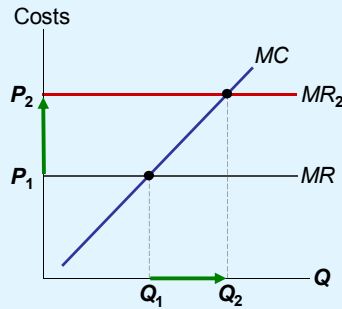
### MC and the Firm's Supply Decision

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

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  $P < AVC$**

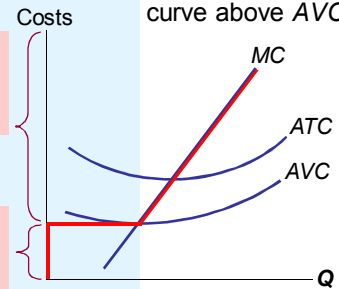
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### A Competitive Firm's SR Supply Curve

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

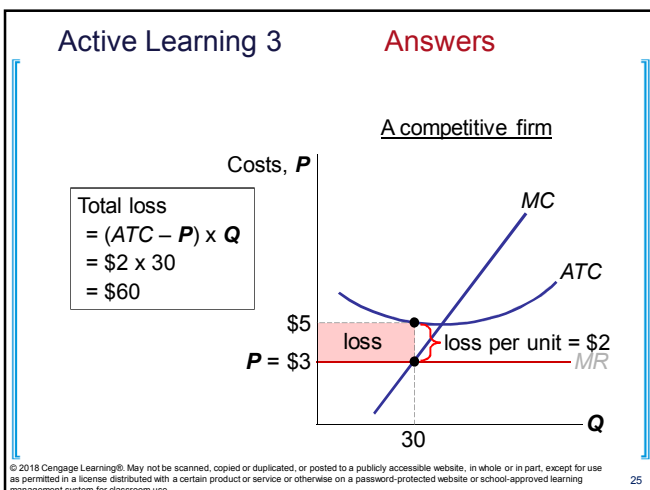
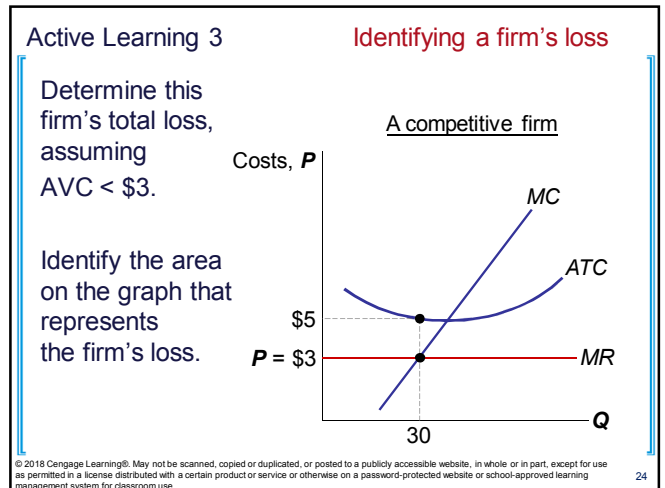
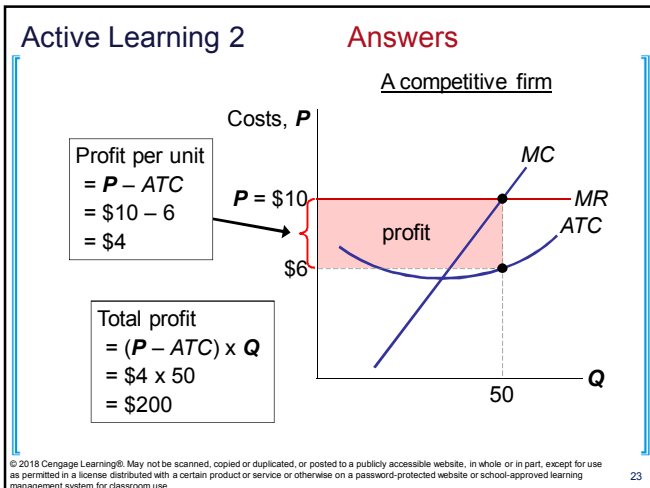
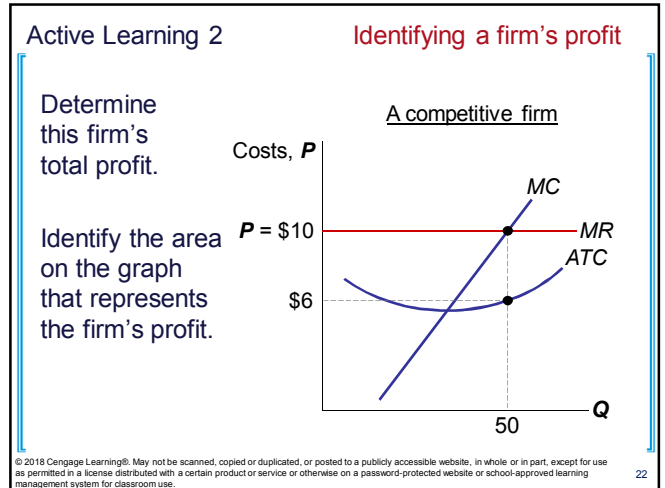
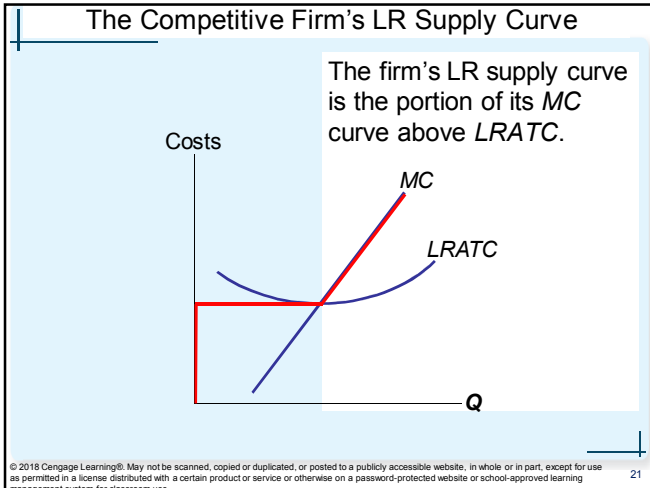
- **Sunk cost**
  - A cost that has already been committed and cannot be recovered
  - Should be ignored when making decisions
  - You must pay them regardless of your choice
  - In the short run, FC are sunk costs
    - So, FC should not matter in the decision to shut down

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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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- ### 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 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  $Q^s$ )

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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

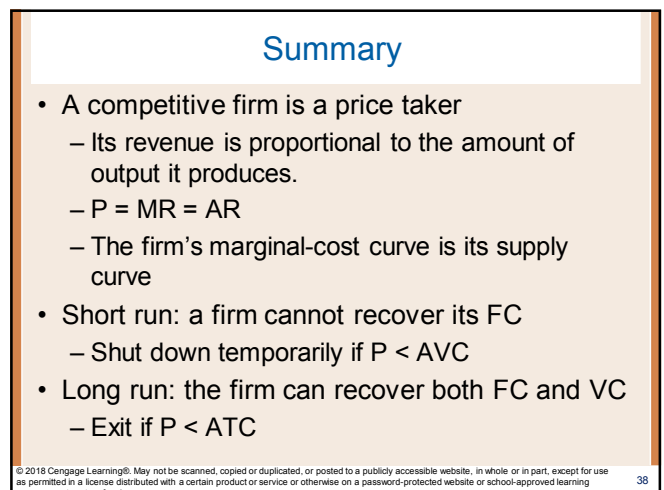
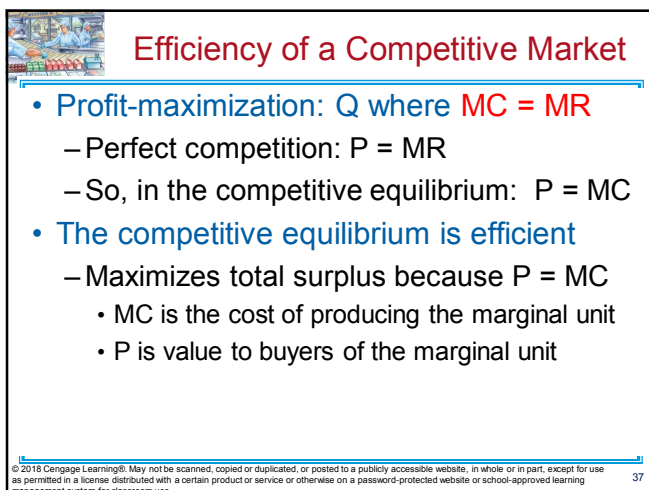
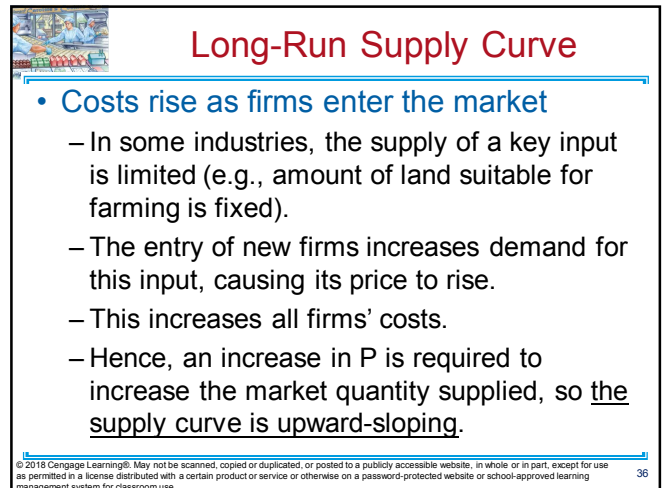
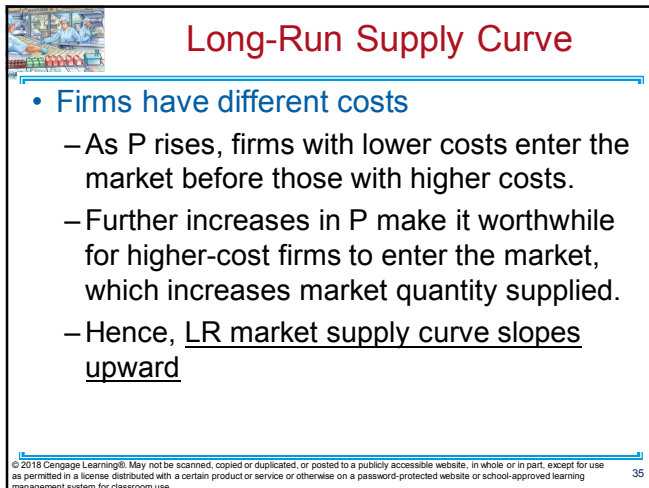
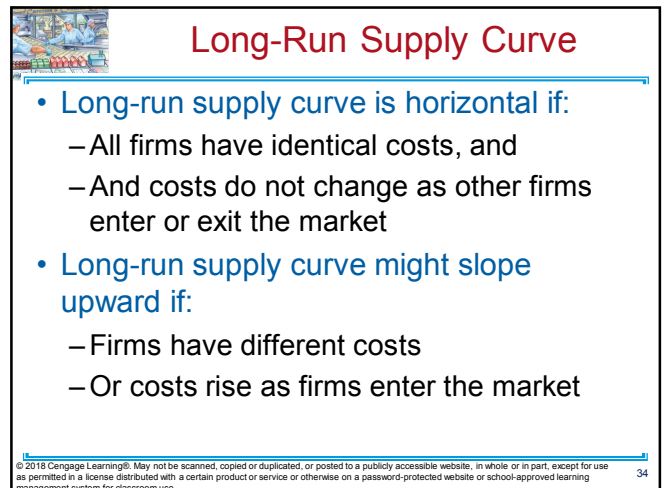
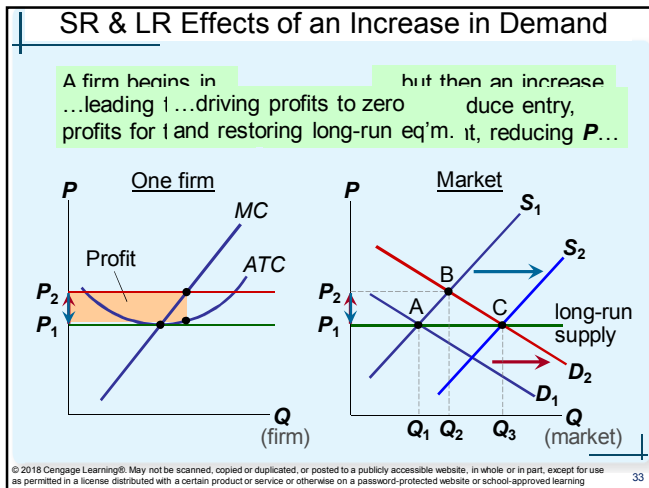
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### The LR Market Supply Curve

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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## 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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Perfect Competition

Joseph Tao-yi Wang

## 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

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Perfect Competition

Joseph Tao-yi Wang