Slide 1

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PRINCIPLES OF
ECONOMICS
Eight Edition

CHAPTER
14

Firms in Competitive Markets

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Slide 2

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

2019/11/22 | Perfect Competition | Joseph Tao-yi Wang

Slide 5

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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Slide 8

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	$TR = P \times Q$	$AR = \dfrac{TR}{Q}$	$MR = \dfrac{\Delta TR}{\Delta Q}$
0	$10	$0	n/a	$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

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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	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			

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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 <u>is</u> the firm's supply curve.

Shutdown vs. Exit

- Shutdown:
  - A <u>short-run decision</u> not to produce anything because of market conditions.
- Exit:
  - A <u>long-run decision</u> to leave the market.
- A key difference:
  - If shut down in SR, must still pay FC.
  - If exit in LR, zero costs.

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*

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).

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

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
  - <u>Exit</u> the market if: TR < TC (same as: P < ATC)
  - <u>Enter</u> the market if: TR > TC (same as: 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

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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.

A competitive firm

Costs, *P*

P = $10 — *MR*

MC

ATC

$6

50

Q

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Active Learning 2 — Answers

A competitive firm

Costs, *P*

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

P = $10 — *MR*

MC

profit

ATC

$6

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

50

Q

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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.

A competitive firm

Costs, *P*

MC

ATC

$5

P = $3 — *MR*

30

Q

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Active Learning 3 — Answers

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*

30

Q

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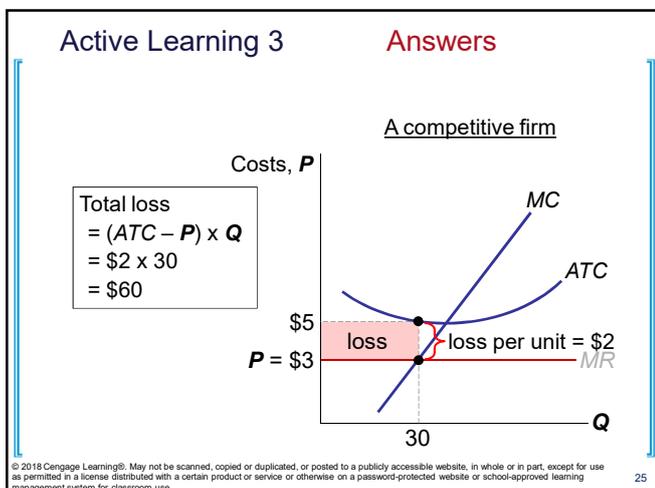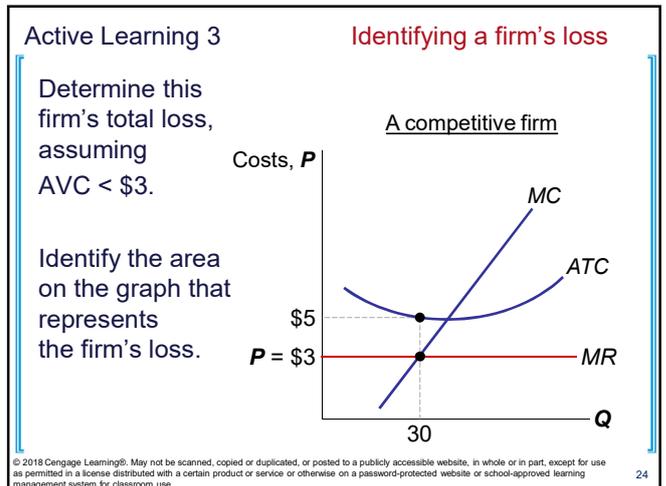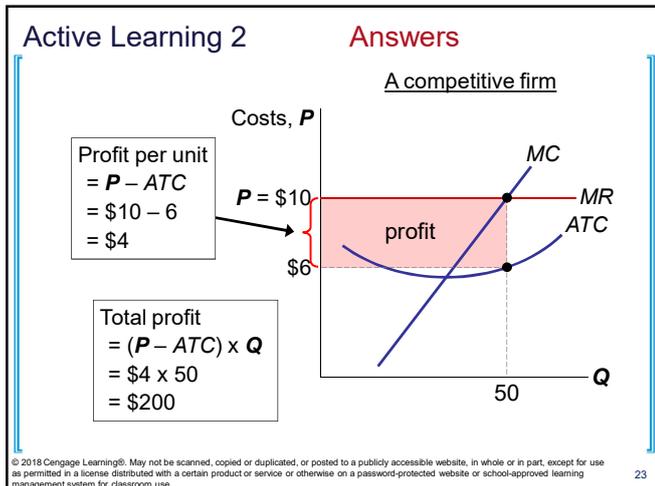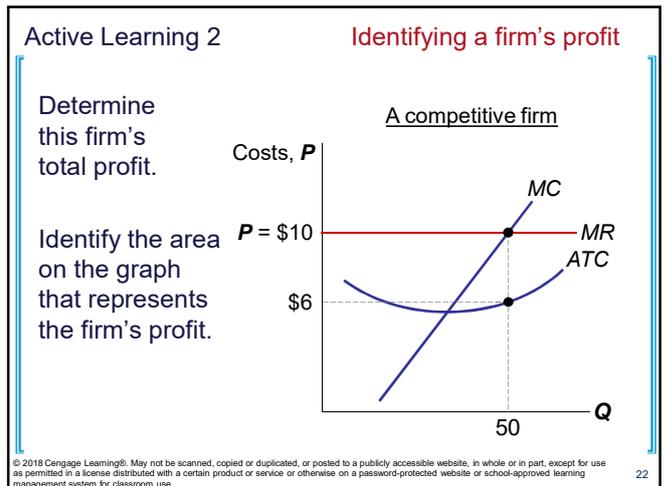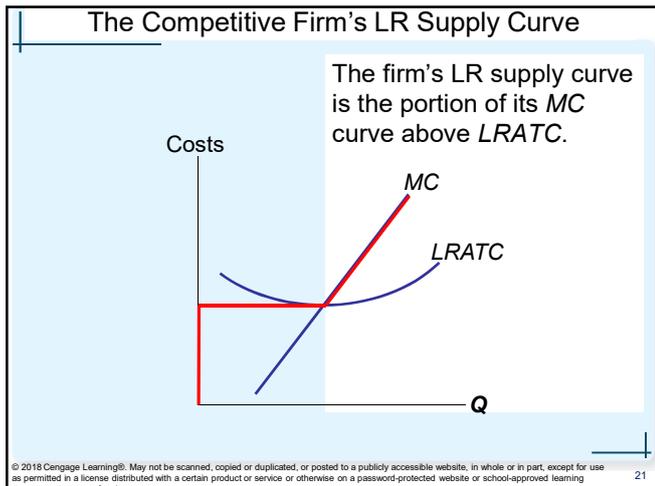
Market Supply: Assumptions

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 ≥ 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 **Q**^{s} = 1000 x (one firm's **Q**^{s})

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

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 = min ATC

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
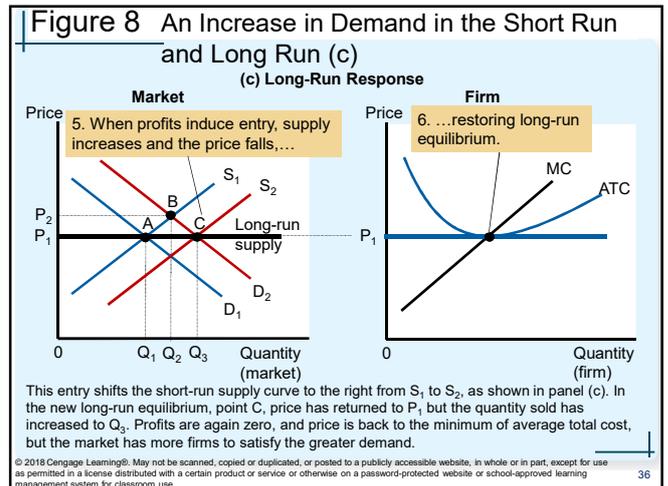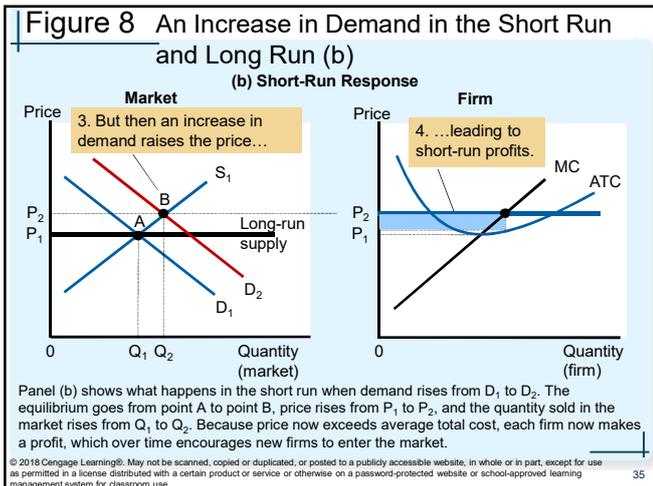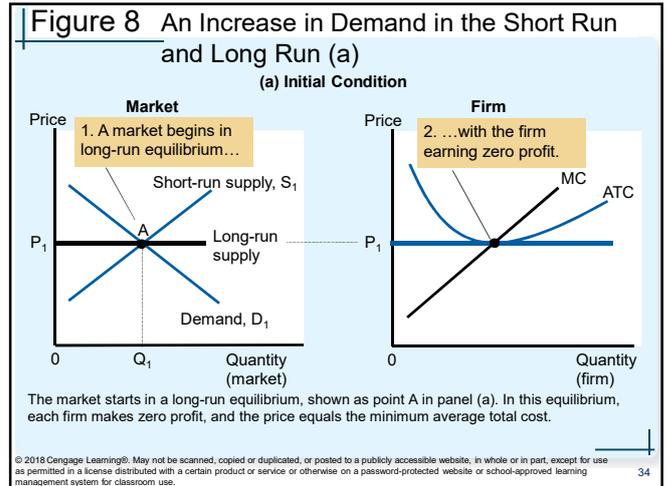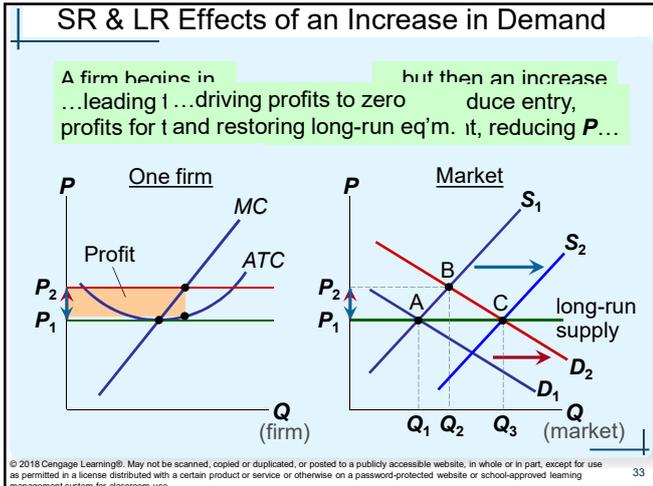   - Accounting profit is positive

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 …driving profits to zero   duce entry,
profits for t and restoring long-run eq'm. It, reducing **P**…

One firm / Market

Figure 8   An Increase in Demand in the Short Run and Long Run (a)

(a) Initial Condition

1. A market begins in long-run equilibrium…

2. …with the firm earning zero profit.

The market starts in a long-run equilibrium, shown as point A in panel (a). In this equilibrium, each firm makes zero profit, and the price equals the minimum average total cost.

Figure 8   An Increase in Demand in the Short Run and Long Run (b)

(b) Short-Run Response

3. But then an increase in demand raises the price…

4. …leading to short-run profits.

Panel (b) shows what happens in the short run when demand rises from D_1 to D_2. The equilibrium goes from point A to point B, price rises from P_1 to P_2, and the quantity sold in the market rises from Q_1 to Q_2. Because price now exceeds average total cost, each firm now makes a profit, which over time encourages new firms to enter the market.

Figure 8   An Increase in Demand in the Short Run and Long Run (c)

(c) Long-Run Response

5. When profits induce entry, supply increases and the price falls,…

6. …restoring long-run equilibrium.

This entry shifts the short-run supply curve to the right from S_1 to S_2, as shown in panel (c). In the new long-run equilibrium, point C, price has returned to P_1 but the quantity sold has increased to Q_3. Profits are again zero, and price is back to the minimum of average total cost, but the market has more firms to satisfy the greater demand.

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

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

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

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
  - ‣ 2018 - Essay C2