chapter:

12

>> Perfect Competition and The Supply Curve

Krugman/Wells Economics

WHAT YOU WILL LEARN IN THIS CHAPTER

➢ What a **perfectly competitive market** is and the characteristics of a **perfectly competitive industry**

➢ How a **price-taking producer** determines its profit-maximizing quantity of output

➢ How to assess whether or not a producer is profitable and why an unprofitable producer may continue to operate in the short run

➢ Why industries behave differently in the short run and the long run

➢ What determines the **industry supply curve** in both the short run and the long run

Perfect Competition

- A **price-taking producer** is a producer whose actions have no effect on the market price of the good it sells.
- A **price-taking consumer** is a consumer whose actions have no effect on the market price of the good he or she buys.
- A **perfectly competitive market** is a market in which all market participants are price-takers.
- A **perfectly competitive industry** is an industry in which producers are price-takers.

Two Necessary Conditions for Perfect Competition

1) For an industry to be perfectly competitive, it must contain many producers, none of whom have a large **market share**.
   - A producer's **market share** is the fraction of the total industry output accounted for by that producer's output.

2) An industry can be perfectly competitive only if consumers regard the products of all producers as equivalent.
   - A good is a **standardized product**, also known as a **commodity**, when consumers regard the products of different producers as the same good.

Free Entry and Exit

- There is **free entry and exit** into and from an industry when new producers can easily enter into or leave that industry.

- Free entry and exit ensure:
  - that the number of producers in an industry can adjust to changing market conditions, and,
  - that producers in an industry cannot artificially keep other firms out.

Production and Profits

Profit for Jennifer and Jason's Farm When Market Price Is $18

Quantity of tomatoes Q (bushels)	Total revenue of output TR	Total cost of output TC	Profit TR − TC
0	$0	$14	$−14
1	18	30	−12
2	36	36	0
3	54	44	10
4	72	56	16
5	90	72	18
6	108	92	16
7	126	116	10

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Using Marginal Analysis to Choose the Profit-Maximizing Quantity of Output

- **Marginal revenue** is the change in total revenue generated by an additional unit of output.

$$\text{Marginal revenue} = \frac{\text{Change in total revenue}}{\text{Change in output}} = \frac{\text{Change in total revenue}}{\text{generated by one additional unit of output}}$$

MR = ΔTR/ΔQ

The Optimal Output Rule

- The **optimal output rule** says that profit is maximized by producing the quantity of output at which the marginal cost of the last unit produced is equal to its marginal revenue.

Short-Run Costs for Jennifer and Jason's Farm

Quantity of tomatoes Q (bushels)	Variable cost of output VC	Total cost of output TC	Marginal cost of bushel $MC = \Delta TC/\Delta Q$	Marginal revenue of bushel	Net gain of bushel = $MR - MC$
0	$0	$14			
			$16	$18	$2
1	16	30			
			6	18	12
2	22	36			
			8	18	10
3	30	44			
			12	18	6
4	42	56			
			16	18	2
5	58	72			
			20	18	−2
6	78	92			
			24	18	−6
7	102	116			

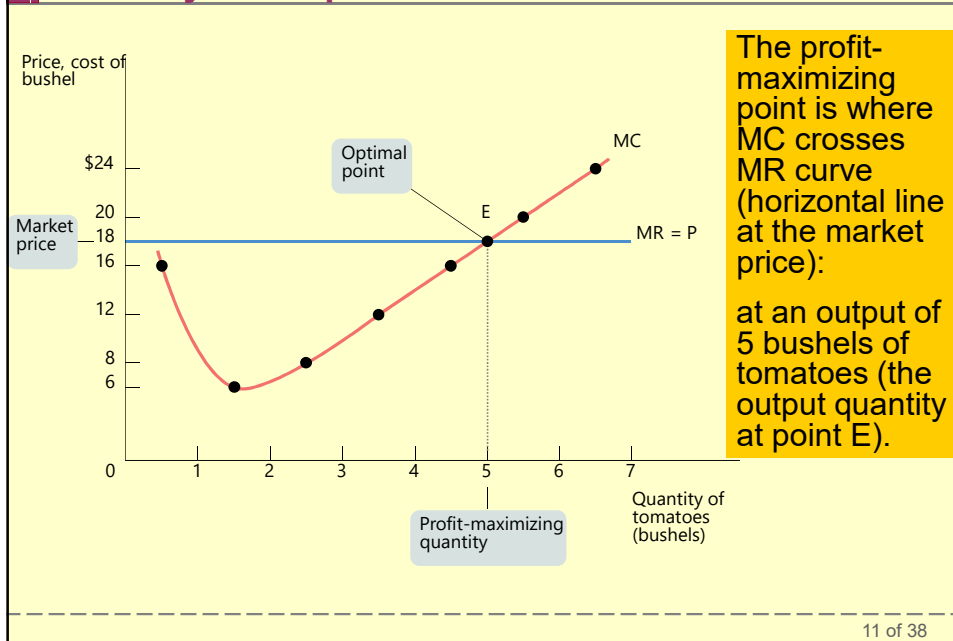## Marginal Analysis Leads to Profit-Maximizing Quantity of Output

- The **price-taking firm's optimal output rule** says that a price-taking firm's profit is maximized by producing the quantity of output at which the marginal cost of the last unit produced is equal to the market price.

- The **marginal revenue curve** shows how marginal revenue varies as output varies.

The Price-Taking Firm's Profit-Maximizing Quantity of Output

Price, cost of bushel

Optimal point

MC

$24

20
18 — E
16

MR = P

Market price

12

8
6

Profit-maximizing quantity

Quantity of tomatoes (bushels)

0   1   2   3   4   5   6   7

The profit-maximizing point is where MC crosses MR curve (horizontal line at the market price):

at an output of 5 bushels of tomatoes (the output quantity at point E).

When Is Production Profitable?

- If **TR > TC**, the firm is **profitable**.

- If **TR = TC**, the firm **breaks even**.

- If **TR < TC**, the firm **incurs a loss**.

Short-Run Average Costs

Short-Run Average Costs for Jennifer and Jason's Farm

Quantity of tomatoes Q (bushels)	Variable cost VC	Total cost TC	Short-run average variable cost of bushel AVC = VC/Q	Short-run average total cost of bushel ATC = TC/Q
1	$16.00	$30.00	$16.00	$30.00
2	22.00	36.00	11.00	18.00
3	30.00	44.00	10.00	14.67
4	42.00	56.00	10.50	14.00
5	58.00	72.00	11.60	14.40
6	78.00	92.00	13.00	15.33
7	102.00	116.00	14.57	16.57

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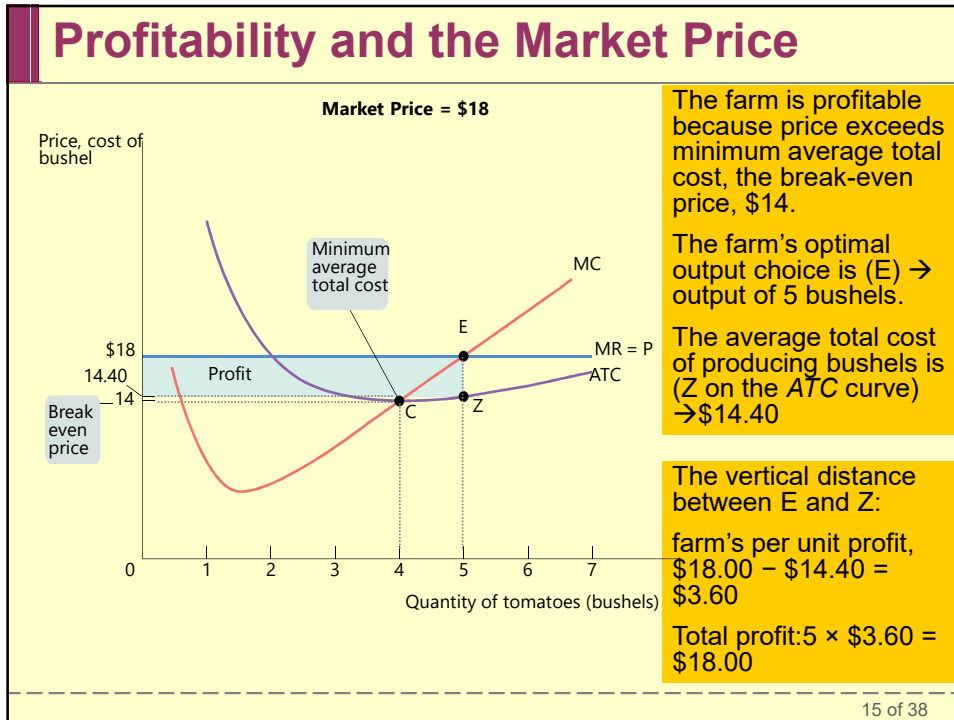## Costs and Production in the Short Run
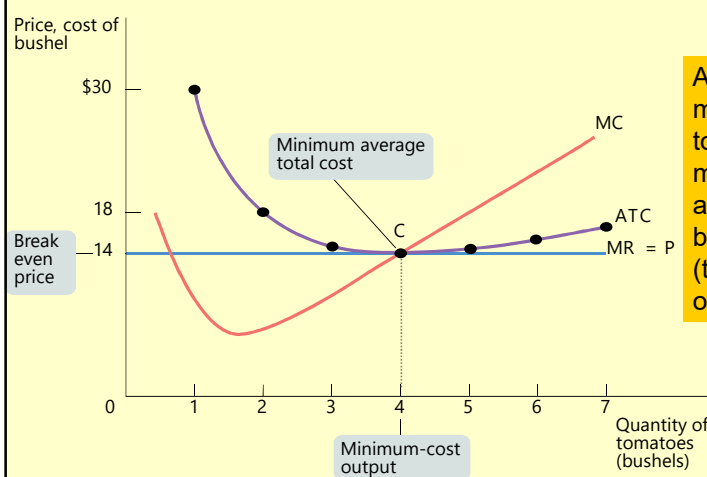
At point *C* (the minimum average total cost), the market price is $14 and output is 4 bushels of tomatoes (the minimum-cost output).
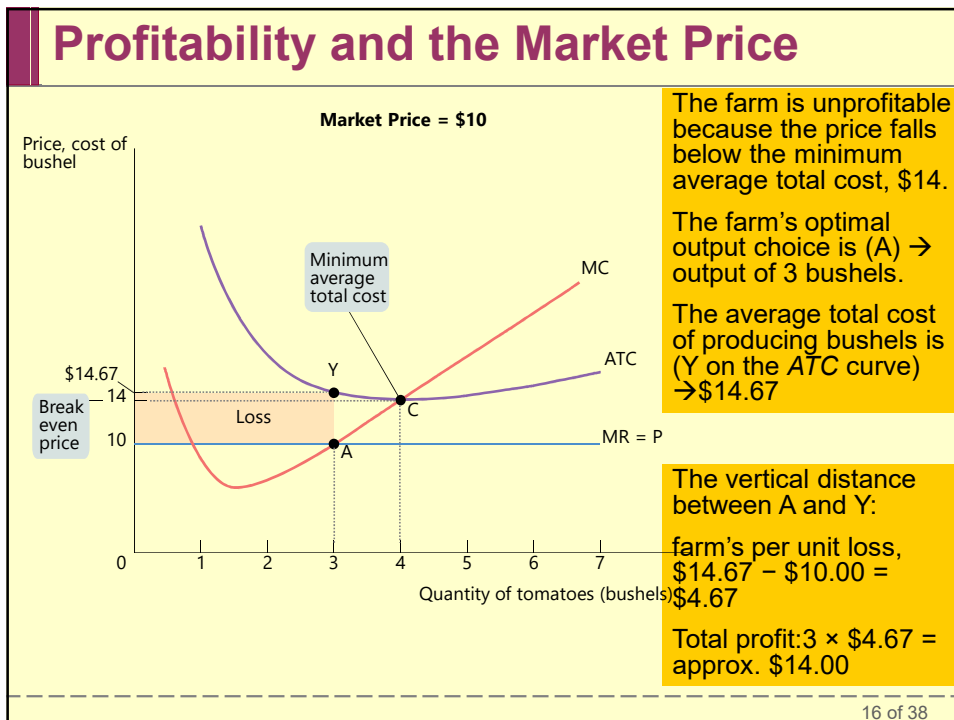
This is where MC cuts the ATC curve at its minimum. Minimum average total cost is equal to the firm's *break-even price*.

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Profitability and the Market Price

Market Price = $18

Price, cost of bushel

Minimum average total cost

MC

E

$18

14.40

—14

Profit

MR = P

ATC

C

Z

Break even price

0 1 2 3 4 5 6 7

Quantity of tomatoes (bushels)

The farm is profitable because price exceeds minimum average total cost, the break-even price, $14.

The farm's optimal output choice is (E) → output of 5 bushels.

The average total cost of producing bushels is (Z on the *ATC* curve) →$14.40

The vertical distance between E and Z:

farm's per unit profit, $18.00 − $14.40 = $3.60

Total profit:5 × $3.60 = $18.00

Profitability and the Market Price

Market Price = $10

Price, cost of bushel

Minimum average total cost

MC

ATC

$14.67

Y

—14

Loss

C

Break even price

10

MR = P

A

0 1 2 3 4 5 6 7

Quantity of tomatoes (bushels)

The farm is unprofitable because the price falls below the minimum average total cost, $14.

The farm's optimal output choice is (A) → output of 3 bushels.

The average total cost of producing bushels is (Y on the *ATC* curve) →$14.67

The vertical distance between A and Y:

farm's per unit loss, $14.67 − $10.00 = $4.67

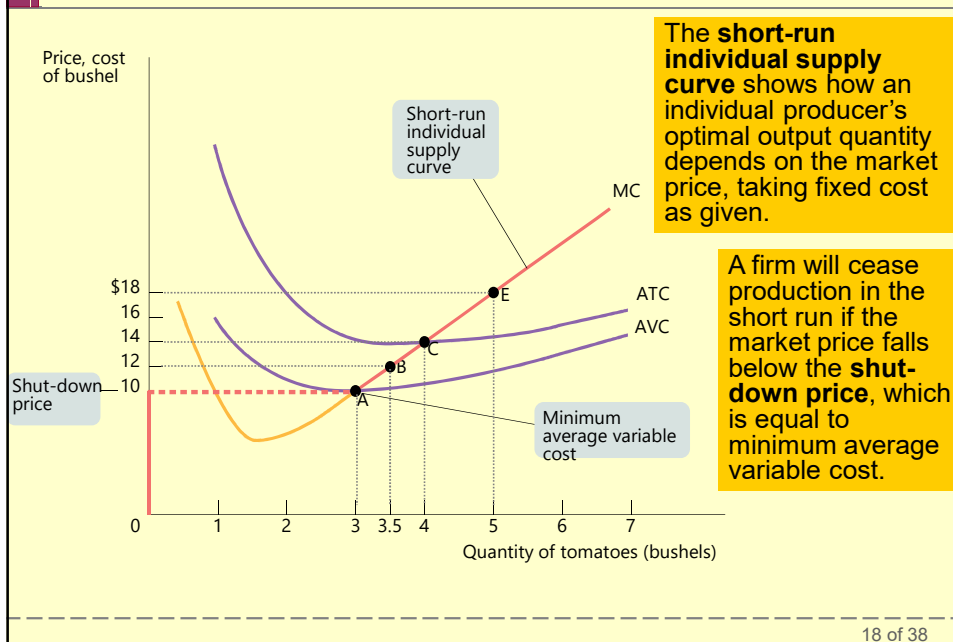Total profit:3 × $4.67 = approx. $14.00

Profit, Break-Even or Loss

- The **break-even price** of a price-taking firm is the market price at which it earns zero profits.

- Whenever market price exceeds minimum average total cost, the producer is profitable.

- Whenever the market price equals minimum average total cost, the producer breaks even.

- Whenever market price is less than minimum average total cost, the producer is unprofitable.

The Short-Run Individual Supply Curve

The **short-run individual supply curve** shows how an individual producer's optimal output quantity depends on the market price, taking fixed cost as given.

A firm will cease production in the short run if the market price falls below the **shut-down price**, which is equal to minimum average variable cost.

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Summary of the Competitive Firm's Profitability and Production Conditions

Profitability Condition (minimum *ATC* = break-even price)	Result
P > minimum *ATC*	Firm profitable. Entry into industry in the long run.
P = minimum *ATC*	Firm breaks even. No entry into or exit from industry in the long run.
P < minimum *ATC*	Firm unprofitable. Exit from industry in the long run.
Production Condition (minimum *AVC* = shut-down price)	**Result**
P > minimum *AVC*	Firm produces in the short run. If *P* < minimum *ATC*, firm covers variable cost and some but not all of fixed cost. If *P* > minimum *ATC*, firm covers all variable cost and fixed cost.
P = minimum *AVC*	Firm indifferent between producing in the short run or not. Just covers variable cost.
P < minimum *AVC*	Firm shuts down in the short run. Does not cover variable cost.

Industry Supply Curve

- The **industry supply curve** shows the relationship between the price of a good and the total output of the industry as a whole.
- The short-run industry supply curve shows how the quantity supplied by an industry depends on the market price given a fixed number of producers.
- There is a **short-run market equilibrium** when the quantity supplied equals the quantity demanded, taking the number of producers as given.

The Long-Run Industry Supply Curve

- A market is in **long-run market equilibrium** when the quantity supplied equals the quantity demanded, given that sufficient time has elapsed for entry into and exit from the industry to occur.

The Short-Run Market Equilibrium

Price, cost of bushel

$26
22
18 — Market price
14
10 — Shut-down price

Short-run industry supply curve, S

E MKT

D

0   200 300 400 500 600 700

Quantity of tomatoes (bushels)

The **short-run industry supply curve** shows how the quantity supplied by an industry depends on the market price given a fixed number of producers.

There is a **short-run market equilibrium** when the quantity supplied equals the quantity demanded, taking the number of producers as given.
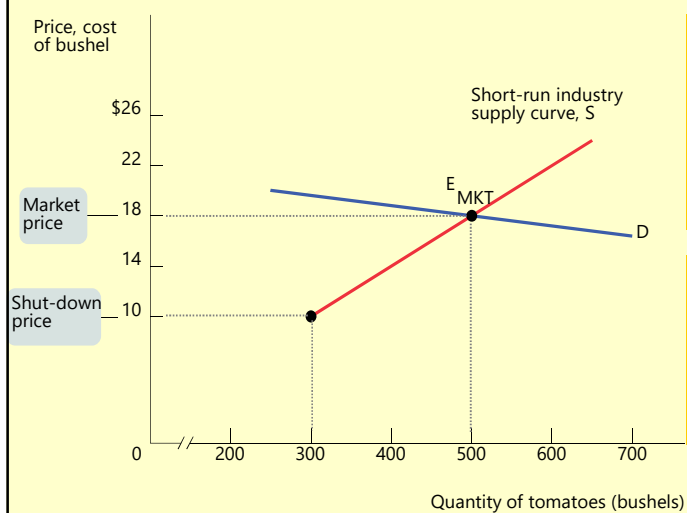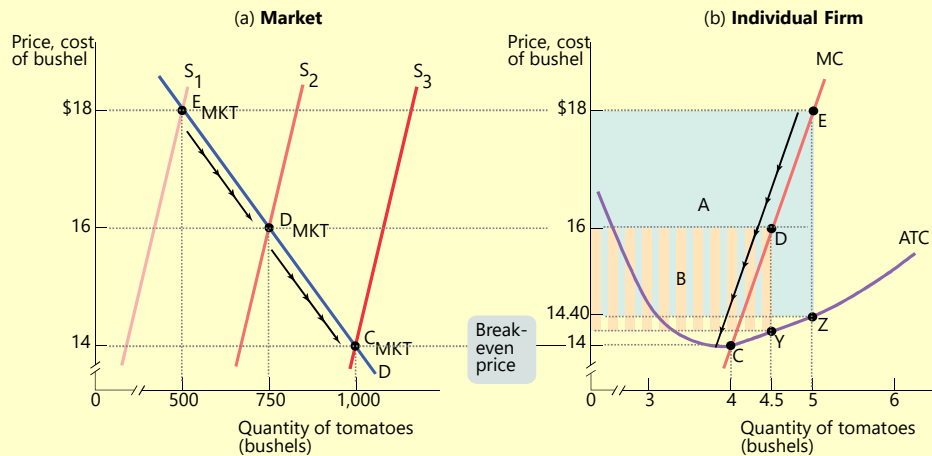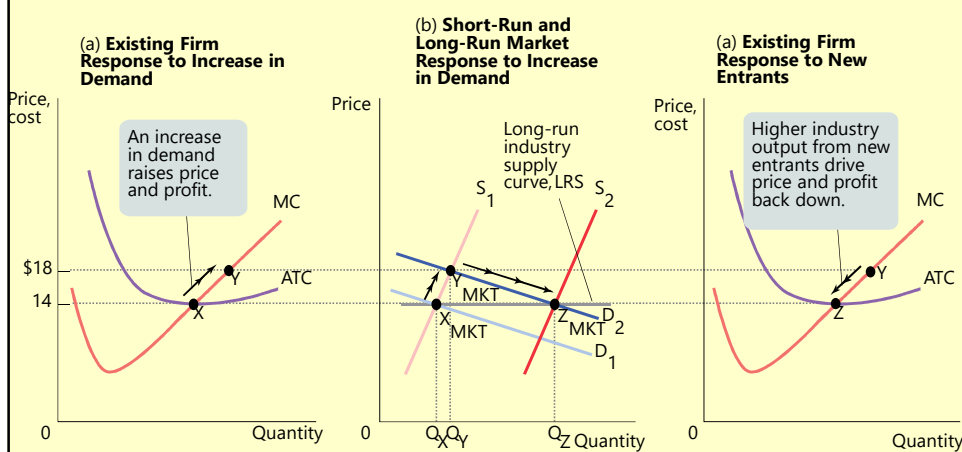
The Long-Run Market Equilibrium

(a) **Market**

(b) **Individual Firm**

Price, cost of bushel

S_1 S_2 S_3

$18

E_{MKT}

16 D_{MKT}

14 C_{MKT} D

0 500 750 1,000

Quantity of tomatoes (bushels)

Price, cost of bushel

MC

$18 E

A

16 D

ATC

B

14.40 Z

14 C Y

Break-even price

0 3 4 4.5 5 6

Quantity of tomatoes (bushels)

A market is in **long-run market equilibrium** when the quantity supplied equals the quantity demanded, given that sufficient time has elapsed for entry into and exit from the industry to occur.
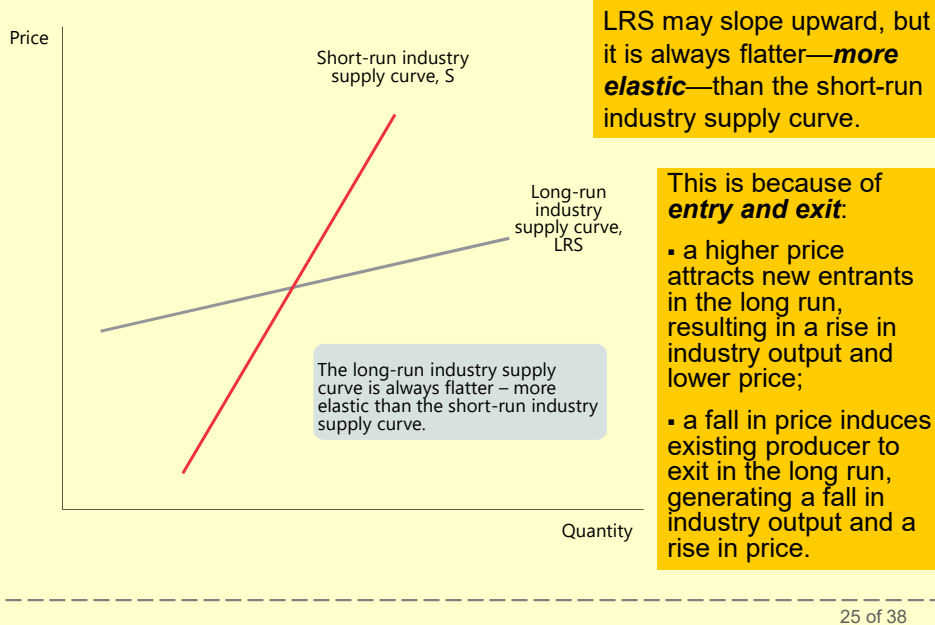
The Effect of an Increase in Demand in the Short Run and the Long Run

(a) **Existing Firm Response to Increase in Demand**

Price, cost

An increase in demand raises price and profit.

MC

$18 Y ATC

14 X

0 Quantity

(b) **Short-Run and Long-Run Market Response to Increase in Demand**

Price

Long-run industry supply curve, LRS

S_1 S_2

MKT

X Z D_2
MKT D_1

0 $Q_X Q_Y$ Q_Z Quantity

Increase in output from new entrants

(a) **Existing Firm Response to New Entrants**

Price, cost

Higher industry output from new entrants drive price and profit back down.

MC

Y ATC

Z

0 Quantity

The **LRS** shows how the quantity supplied responds to the price once producers have had time to enter or exit the industry.

D↑ → P↑ → non-zero profits → entry → S↑ → P↓ → back to zero profit (on LRS curve)

Comparing the Short-Run and Long-Run Industry Supply Curves

Price

Short-run industry supply curve, S

Long-run industry supply curve, LRS

The long-run industry supply curve is always flatter – more elastic than the short-run industry supply curve.

Quantity

LRS may slope upward, but it is always flatter—*more elastic*—than the short-run industry supply curve.

This is because of *entry and exit*:

▪ a higher price attracts new entrants in the long run, resulting in a rise in industry output and lower price;

▪ a fall in price induces existing producer to exit in the long run, generating a fall in industry output and a rise in price.

Conclusions

- Three conclusions about the cost of production and efficiency in the long-run equilibrium of a perfectly competitive industry:

    - In a perfectly competitive industry in equilibrium, the value of marginal cost is the same for all firms.

    - In a perfectly competitive industry with free entry and exit, each firm will have zero economic profits in long-run equilibrium.

    - The long-run market equilibrium of a perfectly competitive industry is efficient: no mutually beneficial transactions go unexploited.

The End of Chapter 12

coming attraction:
Chapter 13:
Monopoly