

Supply in a Competitive Market

Introduction (1/1)

In this chapter, we introduce the concept of **Profit Maximization**.

Given a price and cost structure, firms choose a quantity of output that maximizes profits (or minimizes losses).

This chapter focuses on the case of **Perfect Competition**.

Chapter Outline

- 8.1 Market Structures and Perfect Competition in the Short Run
- 8.2 Profit Maximization in a Perfectly Competitive Market
- 8.3 Perfect Competition in the Short Run
- 8.4 Perfectly Competitive Industries in the Long Run
- 8.5 Producer Surplus, Economic Rents, and Economic Profits
- 8.6 Conclusion

Market Structures and Perfect Competition in the Short Run (1/5)

Market Structure refers to the competitive environment in which firms operate; three major primary characteristics broadly define market structure.

1. **Number of firms:** In general, the more companies in a given market, the more competitive it is.
2. **Whether the consumer cares which company made the good:** In general, the more indistinguishable or identical the products are, the more competitive the market is.
3. **Barriers to entry:** If new firms can enter the market easily, the market is more competitive.

Market Structures and Perfect Competition in the Short Run (2/5)

Table 8.1 Four Basic Market Structures

	Perfect Competition	Monopolistic Competition	Oligopoly	Monopoly
Number of Firms	Many	Many	Few	One
Type of Products Sold	Identical	Differentiated	Identical or differentiated	Unique
Barriers to Entry	None	None	Some	Many

Market Structures and Perfect Competition in the Short Run (3/5)

Under **perfect competition** (PC), a market is composed of many firms producing identical products, with no barriers to entry. The implication of these assumptions is that firms are **price takers**.

- Individual firms are unable to influence market price by altering the quantity produced; market supply is largely relative to firm supply.
 - A classic example is a small farmer producing a commodity crop (e.g., corn, tomatoes, watermelon, etc.).
 - For most goods and services, however, these conditions are *rarely* met.

So, why do we focus on perfect competition?

- There are only a few PC markets, but there are many that are *almost* PC.
- PC is a benchmark against which economists measure the efficiency of other markets.

Market Structures and Perfect Competition in the Short Run (4/5)

The Demand Curve as Seen by a Price Taker

If a firm must sell its product at the same price, no matter the quantity produced, what does that imply for the shape of the demand curve as seen by an individual firm?

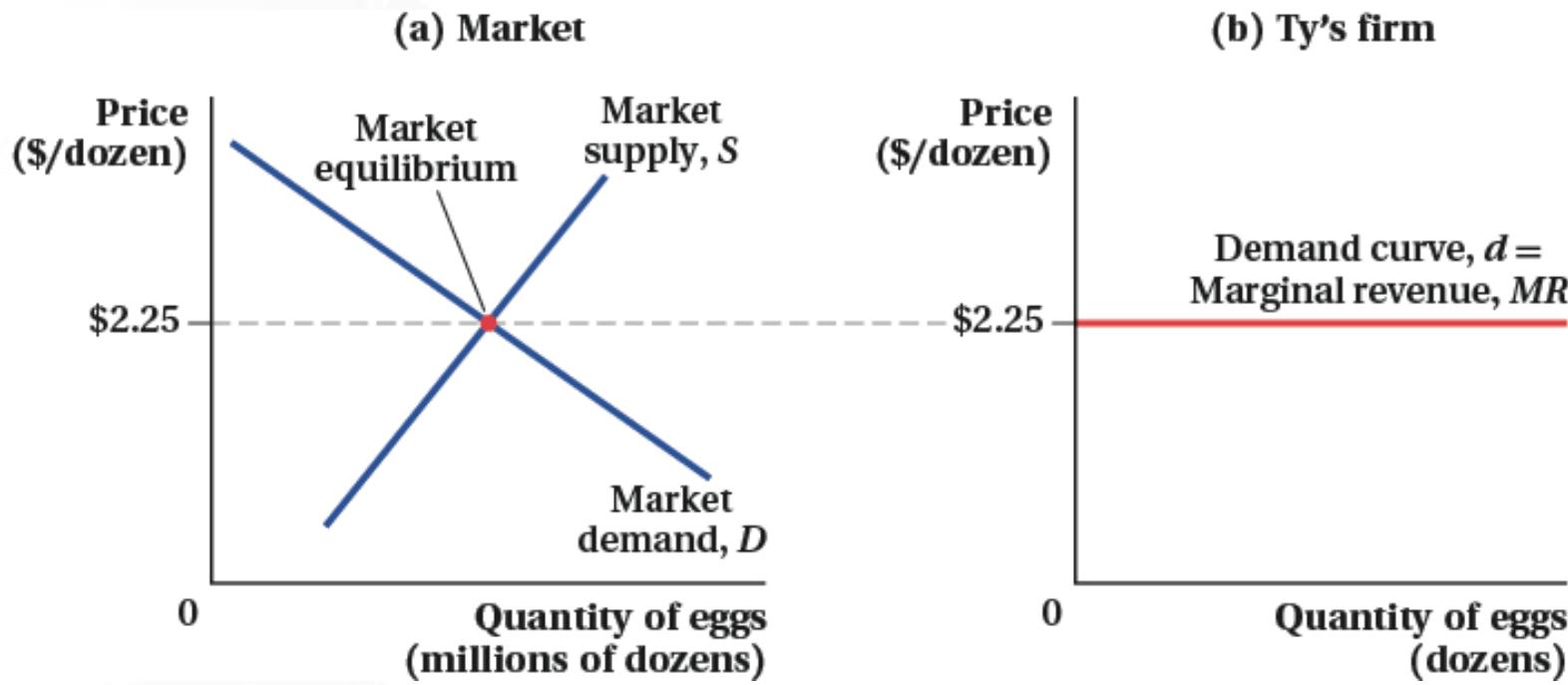
It must be horizontal and, therefore, is *perfectly elastic*.

This is a *fundamental assumption*.

- The demand curve facing a firm in a perfectly competitive market is perfectly elastic at the market equilibrium price.

Market Structures and Perfect Competition in the Short Run (5/5)

Figure 8.1 Market and Firm Demand in Perfect Competition



Profit Maximization in a Perfectly Competitive Market (1/14)

Economists generally assume firms choose how much to produce with the goal of maximizing profits.

Profit is the difference between a firm's total revenue and total cost.

- Profit is maximized when the marginal cost of production is equal to the market price ($MC = P$).
 - Marginal revenue is equal to price under perfect competition.
 - $P = MC = MR$

A perfectly competitive firm maximizes its profit when it produces the quantity of output at which the marginal cost of production equals the market price.

Profit Maximization in a Perfectly Competitive Market (2/14)

Total Revenue, Total Cost, and Profit Maximization

Mathematically, profit is given by

$$\pi = TR - TC$$

where TR is total revenue, and TC is total cost.

To determine the level of output that maximizes profit, think about how TR and TC change as output increases.

From Chapter 7, $MC = \frac{\Delta TC}{\Delta Q}$

Profit Maximization in a Perfectly Competitive Market (3/14)

Total Revenue, Total Cost, and Profit Maximization

Similarly, the additional revenue from selling one additional unit of output is referred to as ***marginal revenue***.

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

In perfect competition,

$$MR_{PC} = \frac{\Delta TR}{\Delta Q} = \frac{\Delta(P \times Q)}{\Delta Q} = P \frac{\Delta Q}{\Delta Q} = P$$

or, marginal revenue is simply equal to market price in a perfectly competitive market structure.

- Recall the fundamental assumption of a perfectly elastic demand curve.

Profit Maximization in a Perfectly Competitive Market (4/14)

How a Perfectly Competitive Firm Maximizes Profit

To maximize profit, a firm will produce until the marginal cost of producing one more unit of output is equal to the marginal revenue (in this case, price).

$$\frac{\Delta TR}{\Delta Q} = P = \frac{\Delta TC}{\Delta Q} = MC$$

What happens if $MC < P$?

- Profit could be increased by producing additional units.

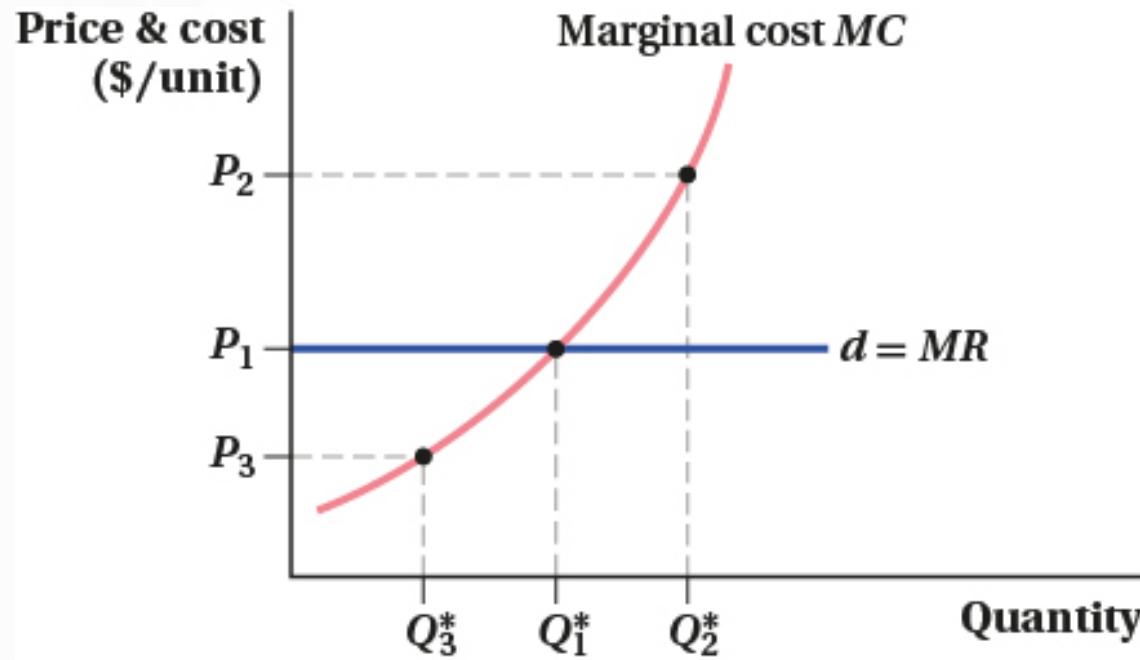
Conversely, what if $MC > P$?

- Profit could be increased by reducing production.
- Currently, *additional* units will cost you more to produce than you are selling them for.

These results follow from the assumption that the marginal cost curve approaches the marginal revenue curve from below.

Profit Maximization in a Perfectly Competitive Market (5/14)

Figure 8.3 Profit Maximization for a Perfectly Competitive Firm Occurs Where $MR = P = MC$



Profit Maximization in a Perfectly Competitive Market (6/14): Question 1

Assume the market for oranges is perfectly competitive and the market equilibrium price for pound of oranges is \$3.00. Thomas is an individual orange grower with a short-run total cost of $TC = Q + 0.025Q^2$ and a marginal cost of: $MC = 1 + 0.05Q$.

How many pounds of oranges should Thomas harvest if he wants to maximize profits?

- A. 3
- B. 40
- C. 80
- D. 120

Profit Maximization in a Perfectly Competitive Market (6/14): Question 1 – Correct Answer

Assume the market for oranges is perfectly competitive and the market equilibrium price for pound of oranges is \$3.00. Thomas is an individual orange grower with a short-run total cost of $TC = Q + 0.025Q^2$ and a marginal cost of: $MC = 1 + 0.05Q$.

How many pounds of oranges should Thomas harvest if he wants to maximize profits?

- A. 3
- B. 40 (correct answer)**
- C. 80
- D. 120

Profit Maximization in a Perfectly Competitive Market (7/14)

Measuring a Firm's Profit

To measure profit, simply subtract total cost from total revenue.

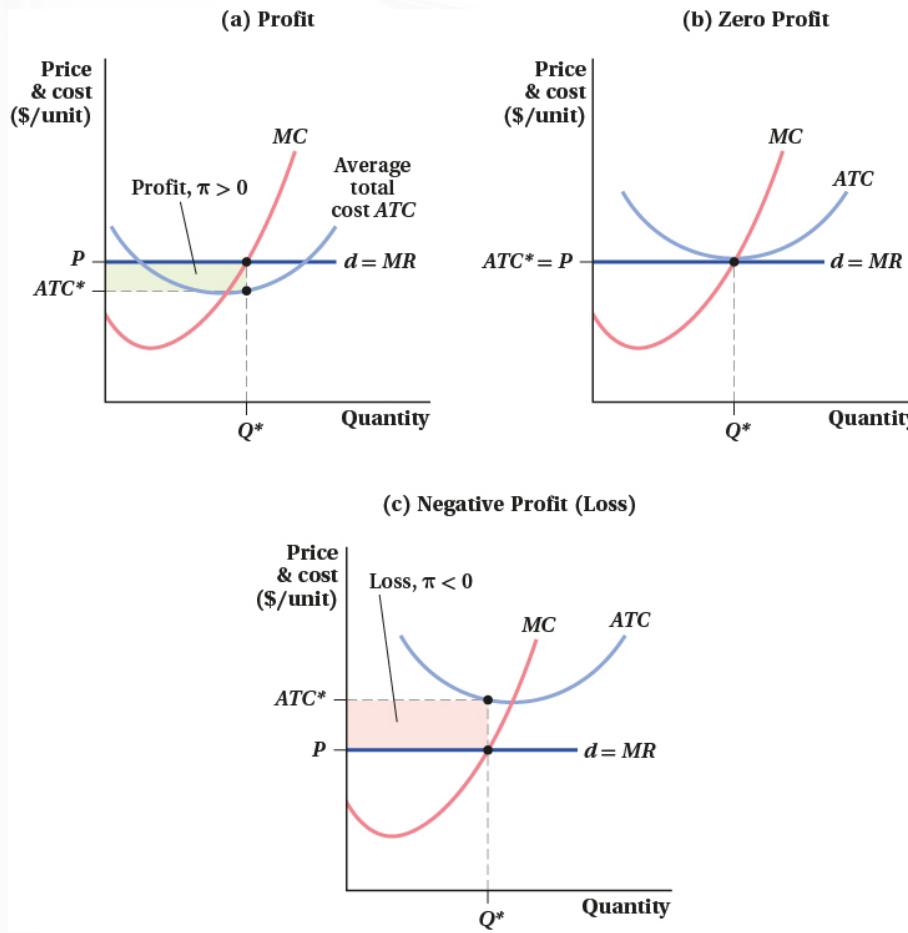
$$\begin{aligned}\pi &= TR - TC \\ &= (P \times Q) - (ATC \times Q) \\ &= (P - ATC) \times Q\end{aligned}$$

Graphically, profit is measured by computing the area of a rectangle.

- Length = Q
- Height = the difference between P and ATC .

Profit Maximization in a Perfectly Competitive Market (8/14)

Figure 8.4 Measuring Profit



Profit Maximization in a Perfectly Competitive Market (9/14)

Determining Whether to Shut Down

What happens if profit is negative? Should a firm shut down?

In the short run, the firm still has to pay its fixed costs. If the firm shuts down, profits are given by

$$\begin{aligned}\pi_{\text{shut down}} &= TR - TC = TR - (FC + VC) \\ &= 0 - (FC + 0) = -FC\end{aligned}$$

Alternatively, if the firm continues operating,

$$\pi_{\text{operate}} = TR - TC = TR - (FC + VC)$$

The difference is given by $\pi_{\text{operate}} - \pi_{\text{shut down}} = TR - VC$

In general, firms should remain open and operating in the *short run* as long as revenue can cover variable costs, even if net profit is negative.

Profit Maximization in a Perfectly Competitive Market (10/14)

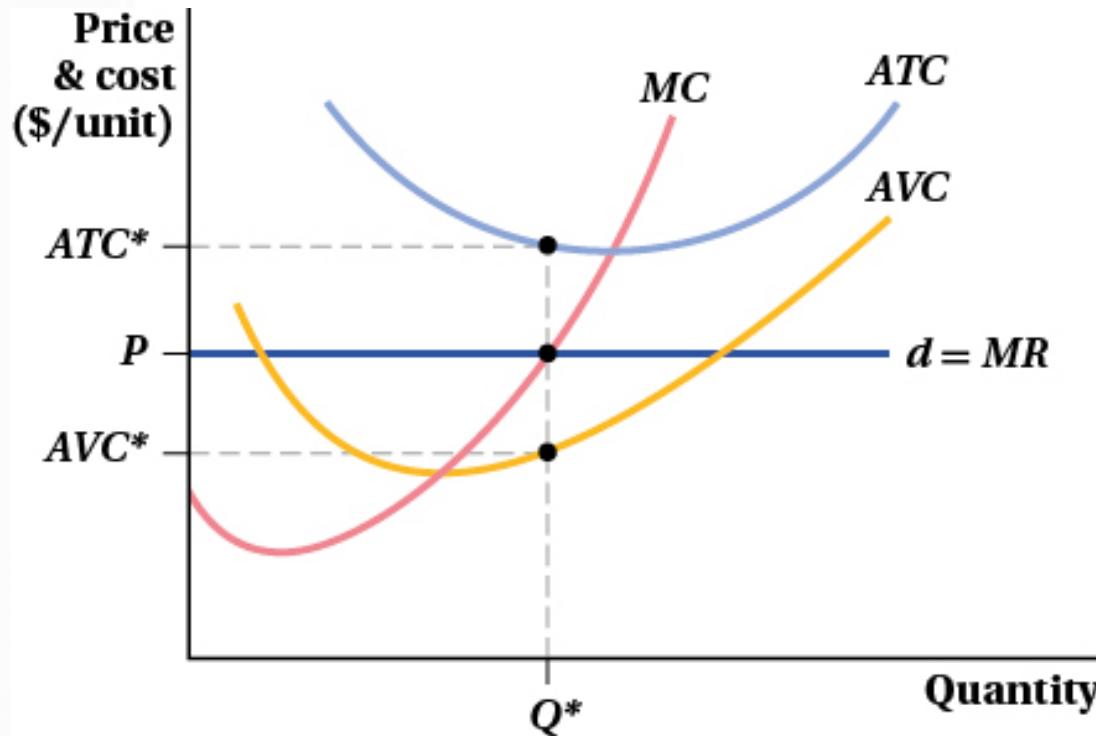
Determining Whether to Shut Down

Table 8.2 Deciding Whether to Operate at a Loss or Shut Down in the Short Run

	Shut Down	Operate
Revenue	None	Some (TR)
Cost	Fixed (FC)	Fixed (FC) + Variable (VC)
Loss	$-FC$	$TR - FC - VC$

Profit Maximization in a Perfectly Competitive Market (11/14)

Figure 8.5 Deciding Whether to Operate or Shut Down in the Short Run



Profit Maximization in a Perfectly Competitive Market (12/14)

Determining Whether to Shut Down

Continue operating if $TR \geq VC$ or $P \geq AVC^*$

where the * indicates the profit-maximizing (or loss-minimizing) quantity.

Shut down if $TR < VC$ or $P < AVC^*$

Continue operating as long as you cover your variable costs!

Profit Maximization in a Perfectly Competitive Market (13/14): Question 2

8.2

Assume the market for corn is perfectly competitive and the market equilibrium price for a bushel of corn is \$4.00. Kim is a corn farmer with a profit maximizing output of 500 bushels of corn. At this output level, her AVC = \$3.00 and ATC = \$6.00.

What are Kim's profits / losses from producing 500 bushels of corn?

- A. -\$1,000
- B. -\$500
- C. \$500
- D. \$1,000

Profit Maximization in a Perfectly Competitive Market (13/14): Question 2 – Correct Answer

Assume the market for corn is perfectly competitive and the market equilibrium price for bushel of corn is \$4.00. Kim is a corn farmer with a profit maximizing output of 500 bushels of corn. At this output level, her AVC = \$3.00 and ATC = \$6.00.

What are Kim's profits / losses from producing 500 bushels of corn?

- A. -\$1,000 (correct answer)
- B. -\$500
- C. \$500
- D. \$1,000

Profit Maximization in a Perfectly Competitive Market (14/14): Question 3

Assume the market for corn is perfectly competitive and the market equilibrium price for bushel of corn is \$4.00. Kim is a corn farmer with a profit maximizing output of 500 bushels of corn. At this output level, her $AVC = \$3.00$ and $ATC = \$6.00$.

In terms of short run decisions, which of the following is true?

- A. Kim should shut down to minimize losses.
- B. Kim should increase output to increase profits.
- C. Kim should decrease output to increase profits.
- D. Kim should continue to produce 500 bushels to minimize losses.

Profit Maximization in a Perfectly Competitive Market (14/14): Question 3 – Correct Answer

Assume the market for corn is perfectly competitive and the market equilibrium price for bushel of corn is \$4.00. Kim is a corn farmer with a profit maximizing output of 500 bushels of corn. At this output level, her AVC = \$3.00 and ATC = \$6.00.

In terms of short run decisions, which of the following is true?

- A. Kim should shut down to minimize losses.
- B. Kim should increase output to increase profits.
- C. Kim should decrease output to increase profits.
- D. **Kim should continue to produce 500 bushels to minimize losses. (correct answer)**

Perfect Competition in the Short Run (1/7)

8.3

A Firm's Short-Run Supply Curve in a Perfectly Competitive Market

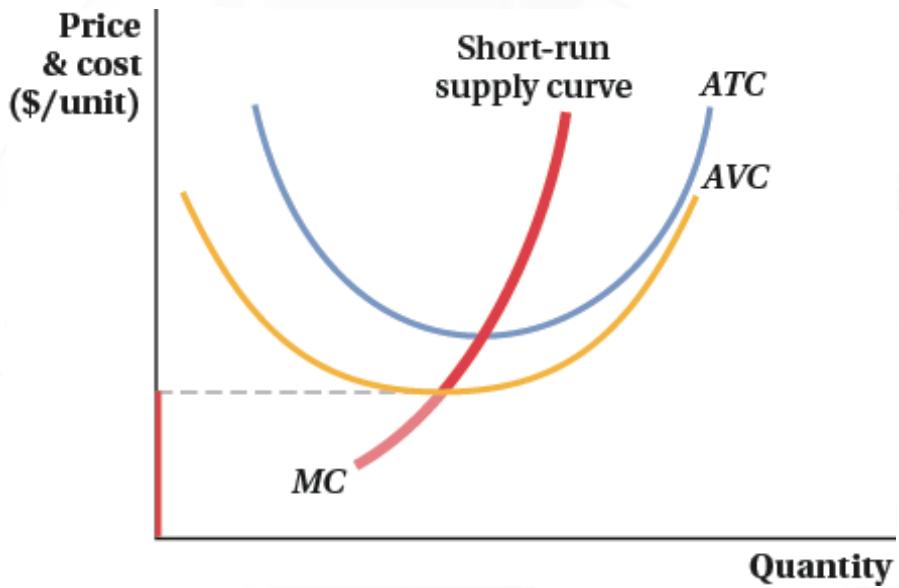
The supply curve from Chapter 2 shows the quantity supplied at each price.

Individual firms will choose to produce where price equals marginal cost; the short-run supply curve is equal to the short-run marginal cost curve.

- One caveat: Only the portion of the short-run marginal cost curve above the average variable cost (AVC) curve will be on the firm's supply curve.
- Why?
 - **The firm won't produce (or will shutdown) if $P < AVC$.**

Perfect Competition in the Short Run (2/7)

Figure 8.6 The Perfectly Competitive Firm's Short-Run Supply Curve



Below average variable cost (AVC), the firm will shut down (supply is zero).

Above average variable cost, the marginal cost (MC) curve is the short-run supply curve.

Perfect Competition in the Short Run (3/7)

The Short-Run Supply Curve for a Perfectly Competitive Industry

We know individual firms cannot affect market price in a perfectly competitive industry.

Market price is instead determined by the interaction between market supply and market demand.

Market supply is the horizontal sum of all individual firms' supply curves.

Perfect Competition in the Short Run (4/7)

8.3

Producer Surplus for a Competitive Firm

Marginal cost slopes upward; therefore, in most circumstances some output is being sold at a price above the cost of production.

Producer surplus is the sum of the differences between marginal cost and the price of output at every level of output.

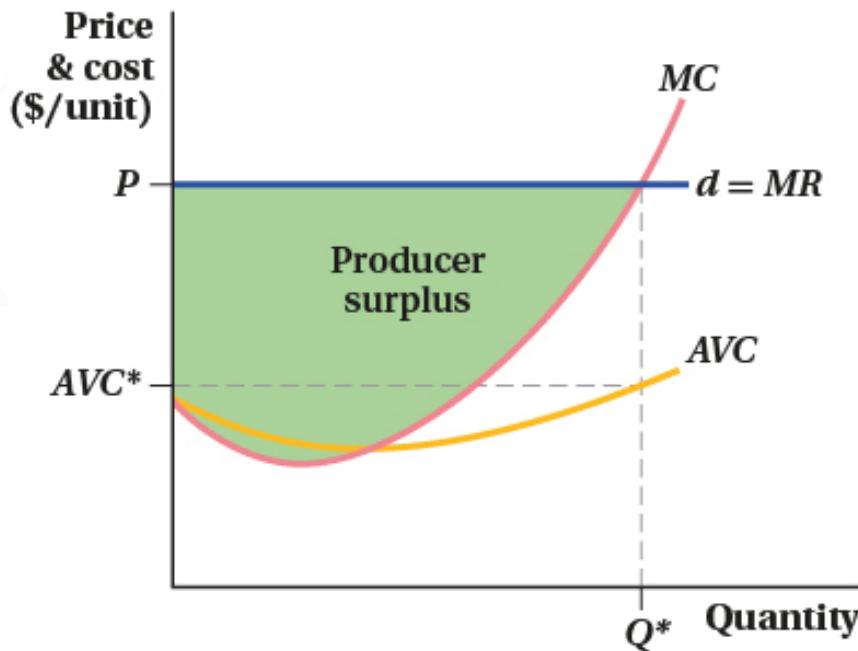
This is equivalent to the difference between total revenue and total variable cost.

$$PS = TR - VC$$

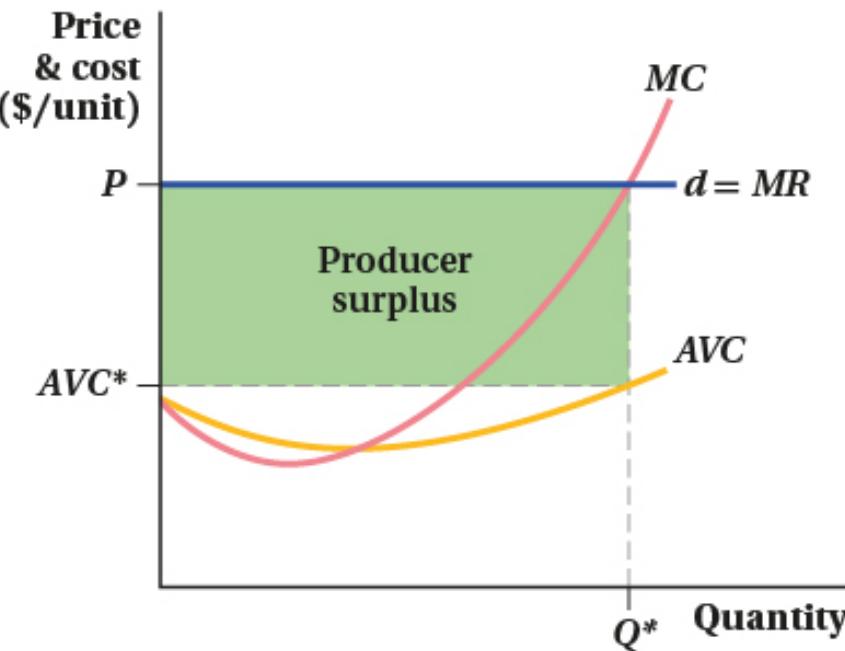
Perfect Competition in the Short Run (5/7)

Figure 8.10 Producer Surplus for a Firm in Perfect Competition

(a) Producer Surplus: Adding All of the Price-Marginal Cost Markups



(b) Producer Surplus: Total Revenue Minus Variable Costs



Perfect Competition in the Short Run (6/7)

8.3

Producer Surplus and Profit

Producer surplus is closely related to profit, but they are not the same thing.

$$PS = TR - VC,$$

$$\pi = TR - VC - FC = PS - FC$$

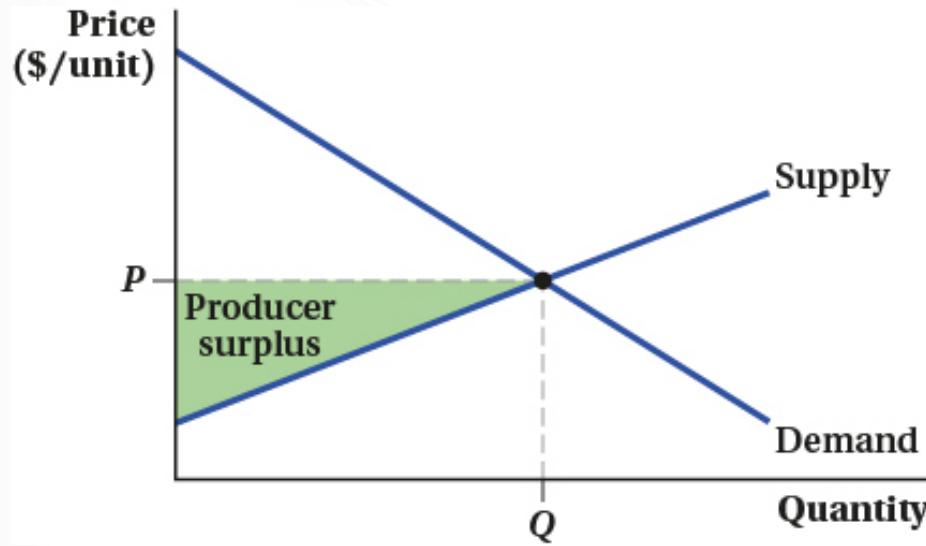
Firms will *operate* without making a profit, but they will *shut down* if they are not making any producer surplus.

Perfect Competition in the Short Run (7/7)

Producer Surplus for a Competitive Industry

- Producer surplus for an entire industry is the sum of individual firms' surplus.
- Remember that, in the PC industry, the supply curve is the marginal cost curve above minimum AVC.

Figure 8.11 Industry Producer Surplus



Perfectly Competitive Industries in the Long Run (1/8)

The long run differs from the short run in a number of ways.

1. In the short run, some costs are fixed; in the long run, all inputs, and therefore costs, may be adjusted.
2. In the long run, firms can enter and exit freely in response to market conditions.
3. The short-run supply curve is the portion of the short-run marginal cost curve above the short-run average *variable* cost curve.
 - In the long run, firms will not stay in business unless all costs can be covered by revenue, therefore:
 - The long-run supply curve is the portion of the marginal cost curve above the long-run average *total* cost curve.

Perfectly Competitive Industries in the Long Run (2/8)

Entry

Perfectly competitive markets are characterized by **free entry**.

- The ability of a firm to enter an industry without encountering legal or technical barriers

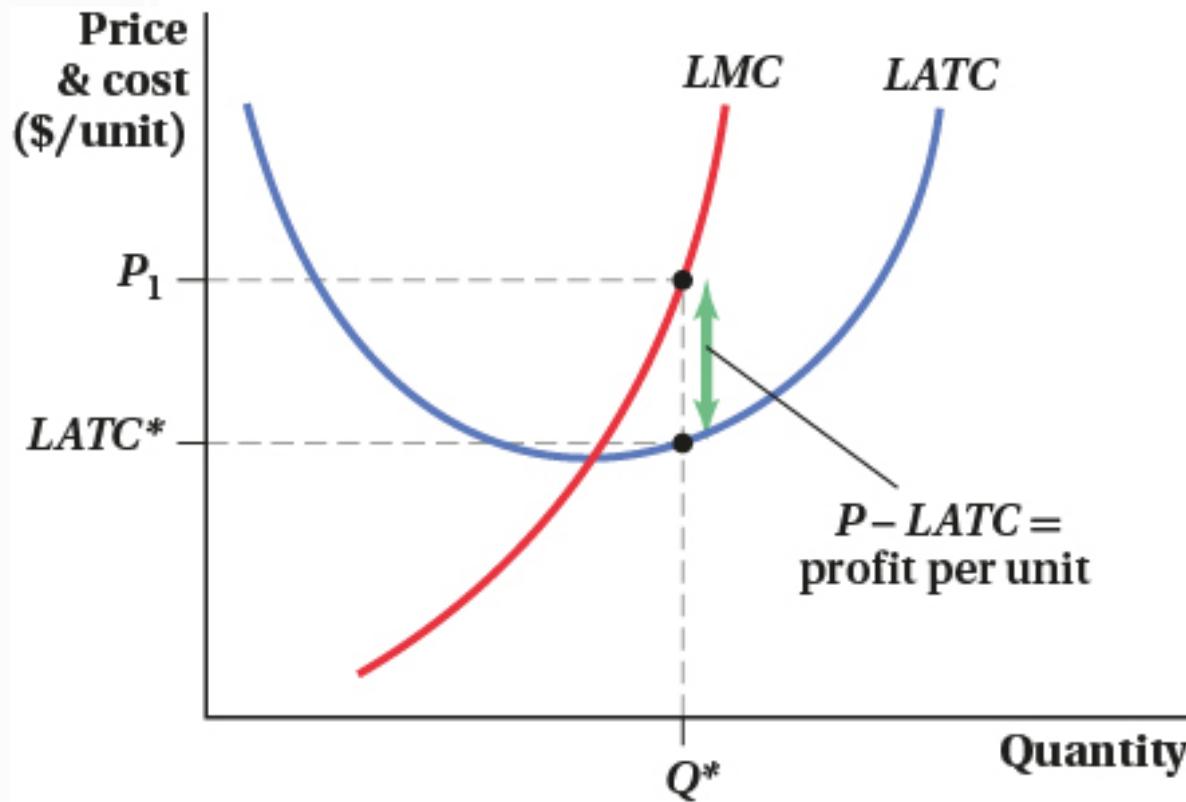
What market conditions would have to exist for a firm to decide to begin operation in a particular market?

- Firms will only enter if they see profit being made.
- Remember that the long-run ATC includes *all* costs, including opportunity costs.
- If there are positive economic “profits,” new firms will enter.

When firms enter a market, the supply curve shifts outward.

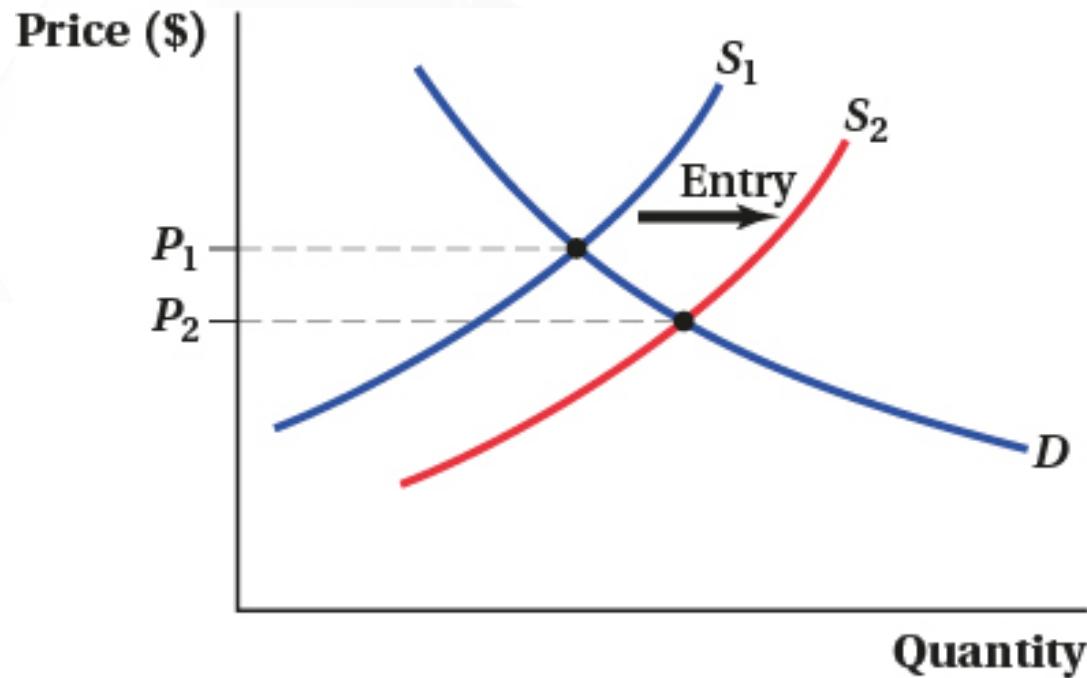
Perfectly Competitive Industries in the Long Run (3/8)

Figure 8.14 Positive Long-Run Profit



Perfectly Competitive Industries in the Long Run (4/8)

Figure 8.15 Entry of New Firms Increases Supply and Lowers Equilibrium Price



If profits are positive in the long run, a lack of barriers to entry means more firms will start producing.

Perfectly Competitive Industries in the Long Run (5/8)

Exit

Perfectly competitive markets are characterized by **free exit**.

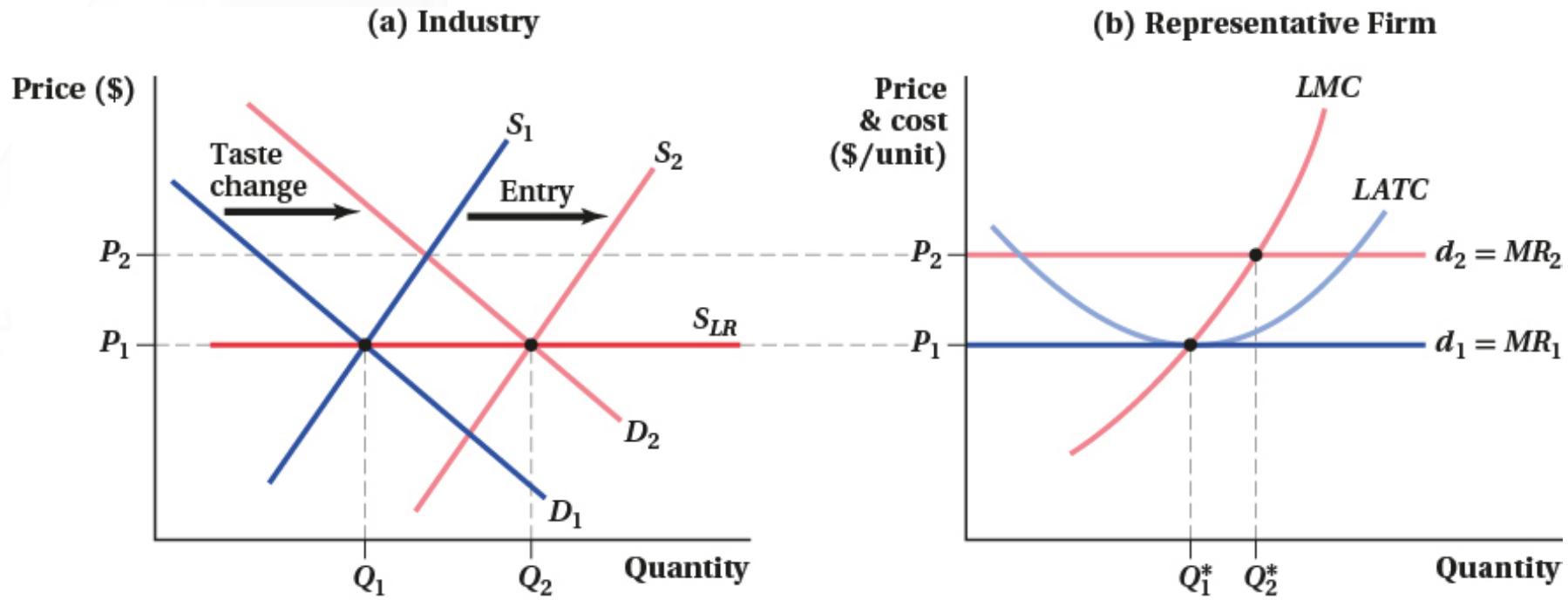
- The ability of a firm to exit an industry without encountering legal or technical barriers

Opposite of entry, exit causes the industry supply curve to shift inward.

- Firms will exit (and market price will rise) until market price equals minimum of the long-run average total cost curve.

Perfectly Competitive Industries in the Long Run (6/8)

Figure 8.16 Deriving the Long-Run Industry Supply Curve



Perfectly Competitive Industries in the Long Run (7/8)

Adjustments Between Long-Run Equilibria

Describe the process of adjustment to a new market equilibrium in response to the following:

An increase in demand (like the earlier graphs):

- Existing firms enjoy positive economic profits in the short run because $P > LRATC$.
- New firms eventually enter the market, supply shifts out, and price falls to minimum long-run average total cost.

An increase in production costs:

- Some firms will experience negative economic profits in the short run.
- Eventually these firms will exit the industry and supply will shift inward, driving up the market price until it is equal to long-run average total cost.

Perfectly Competitive Industries in the Long Run (8/8)

LR Supply in Constant-, Increasing-, and Decreasing-Cost Industries

The analysis so far describes the case in which LR average cost is constant, no matter the output level.

- Implies a horizontal long-run supply curve
- Called a **constant-cost** industry

Increasing-cost industries are characterized by LR average costs that increase with industry output.

- Possibly due to competition over a scarce input (e.g., oil production)
- Results in an upward-sloped long-run supply curve

Decreasing-cost industries are characterized by long-run average costs that fall with industry output.

- Results in a downward-sloped long-run supply curve
- Possibly due to increasing returns to scale at the industry level or in the production of one or more of the industry's inputs

Producer Surplus, Economic Rents, and Economic Profits (1/2)

Cost Differences and Economic Rent in Perfect Competition

In the LR, there is no potential for economic profit in a perfectly competitive industry.

- Assumes producers have identical cost curves.
- However, some firms may be more efficient than others.
- More efficient firms earn ***economic rent***, or returns to specialized inputs above what firms paid for them.

In a perfectly competitive market consisting of firms with different LR average cost curves:

- the LR market price equals the minimum average total cost of the highest-cost firm in the industry.
- the highest-cost firm makes zero profit and zero producer surplus.

Producer Surplus, Economic Rents, and Economic Profits (2/2)

Cost Differences and Economic Rent in Perfect Competition

Important distinction: Economic rent \neq economic profit.

Economic rent is included in the *opportunity costs* associated with the use of an input.

- An excellent manager or a trade secret would likely be useful in other ventures as well.
- These “rents” often accrue to the more-productive-than-average inputs (e.g., salaries to the best managers).

Economic profit includes all opportunity costs

Conclusion (1/1)

Chapter 8 has analyzed the decisions facing firms in a perfectly competitive industry:

- Characterized by few barriers to entry, a large number of firms producing identical products, and firms that are price takers
- Firms maximize profits by setting marginal cost equal to market price.

In the next chapters, we relax some of the assumptions of perfect competition to include product differentiation, barriers to entry, and other characteristics common to real-world markets.