



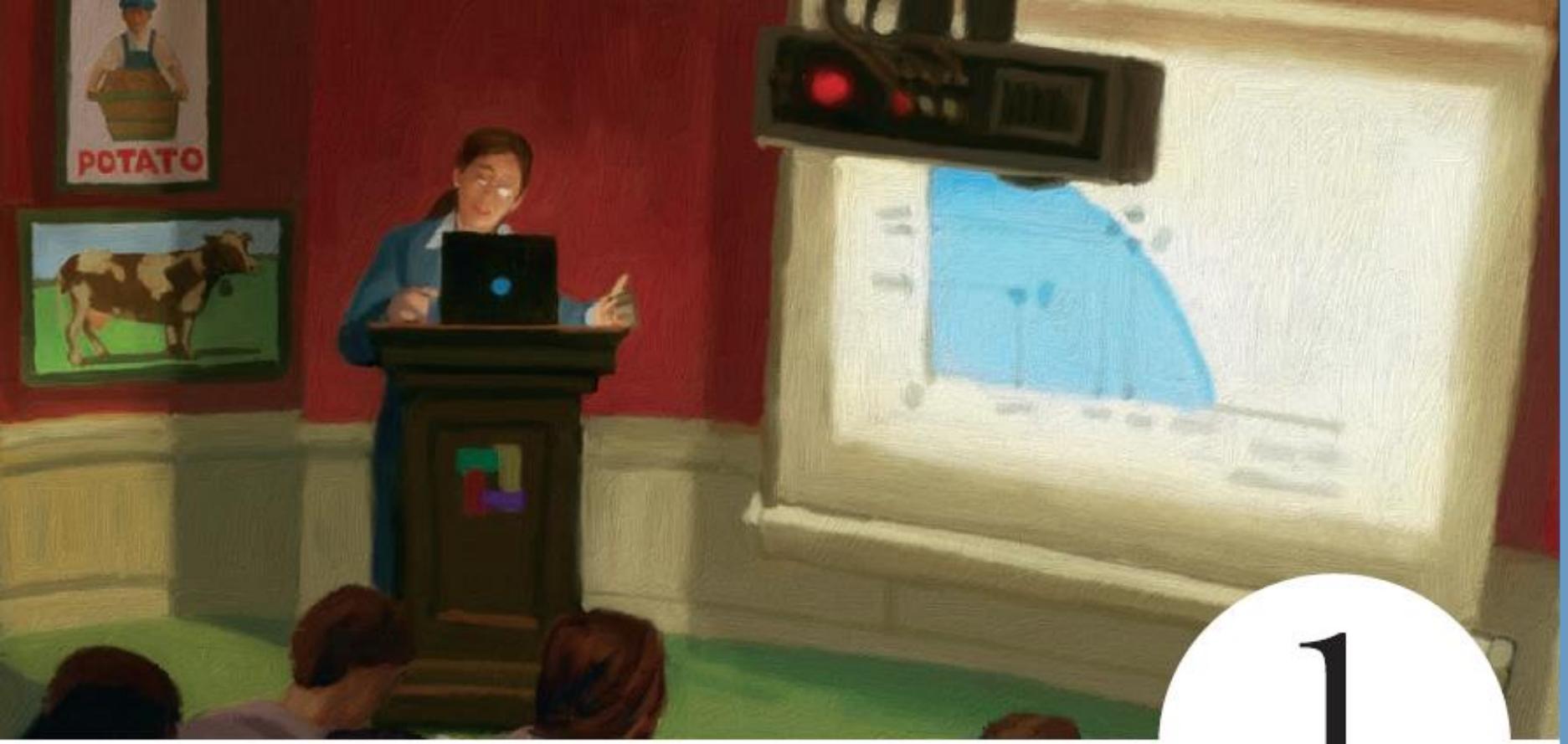
## PowerPoint® Lecture Presentation

# Principles of Economics, Fourth Edition

**N. Gregory Mankiw**

Prepared by Kathryn Nantz and Laurence Miners, Fairfield University.

SOUTH-WESTERN  
THOMSON LEARNING™



1

## Ten Principles of Economics

# Economy. . .

. . . The word *economy* comes from a Greek word for “one who manages a household.”



# TEN PRINCIPLES OF ECONOMICS

A household and an economy face many decisions:

- Who will work?
- What goods and how many of them should be produced?
- What resources should be used in production?
- At what price should the goods be sold?



# TEN PRINCIPLES OF ECONOMICS

- Society and Scarce Resources:
  - The management of society's resources is important because resources are scarce.
  - *Scarcity*. . . means that society has limited resources and therefore cannot produce all the goods and services people wish to have.



# TEN PRINCIPLES OF ECONOMICS

*Economics* is the study of how society manages its scarce resources.

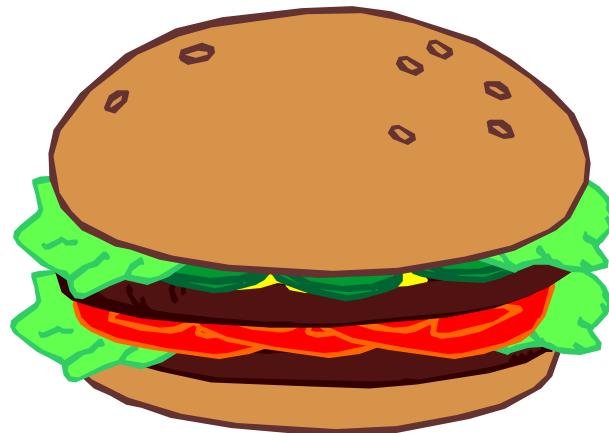


# HOW PEOPLE MAKE DECISIONS

- People face trade-offs.
- The cost of something is what you give up to get it.
- Rational people think at the margin.
- People respond to incentives.

# Principle #1: People Face Trade-offs.

- “There is no such thing as a free lunch!”



# Principle #1: People Face Trade-offs.

- To get one thing, we usually have to give up another thing.
  - Guns v. butter
  - Food v. clothing
  - Leisure time v. work
  - Efficiency v. equity

# Principle #1: People Face Trade-offs

- Efficiency v. Equity
  - *Efficiency* means society gets the most that it can from its scarce resources.
  - *Equity* means the benefits of those resources are distributed fairly among the members of society.

# Principle #2: The Cost of Something Is What You Give Up to Get It.

- Decisions require comparing costs and benefits of alternatives.
  - Whether to go to college or to work?
  - Whether to study or go out on a date?
  - Whether to go to class or sleep in?
- The *opportunity cost* of an item is what you give up to obtain that item.

# Principle #2: The Cost of Something Is What You Give Up to Get It.



- Basketball star LeBron James understands opportunity costs and *incentives*. He chose to skip college and go straight from high school to the pros where he earns millions of dollars.

# Principle #3: Rational People Think at the Margin.

- *Marginal changes* are small, incremental adjustments to an existing plan of action.

People make decisions by comparing costs and benefits at the margin.

# Principle #4: People Respond to Incentives.

- Marginal changes in costs or benefits motivate people to respond.
- The decision to choose one alternative over another occurs when that alternative's marginal benefits exceed its marginal costs!



# HOW PEOPLE INTERACT

- Trade can make everyone better off.
- Markets are usually a good way to organize economic activity.
- Governments can sometimes improve economic outcomes.

# Principle #5: Trade Can Make Everyone Better Off.

- People gain from their ability to trade with one another.
- Competition results in gains from trading.
- Trade allows people to specialize in what they do best.

# Principle #6: Markets Are Usually a Good Way to Organize Economic Activity.

- A *market economy* is an economy that allocates resources through the decentralized decisions of many firms and households as they interact in markets for goods and services.
  - Households decide what to buy and who to work for.
  - Firms decide who to hire and what to produce.

# Principle #6: Markets Are Usually a Good Way to Organize Economic Activity.

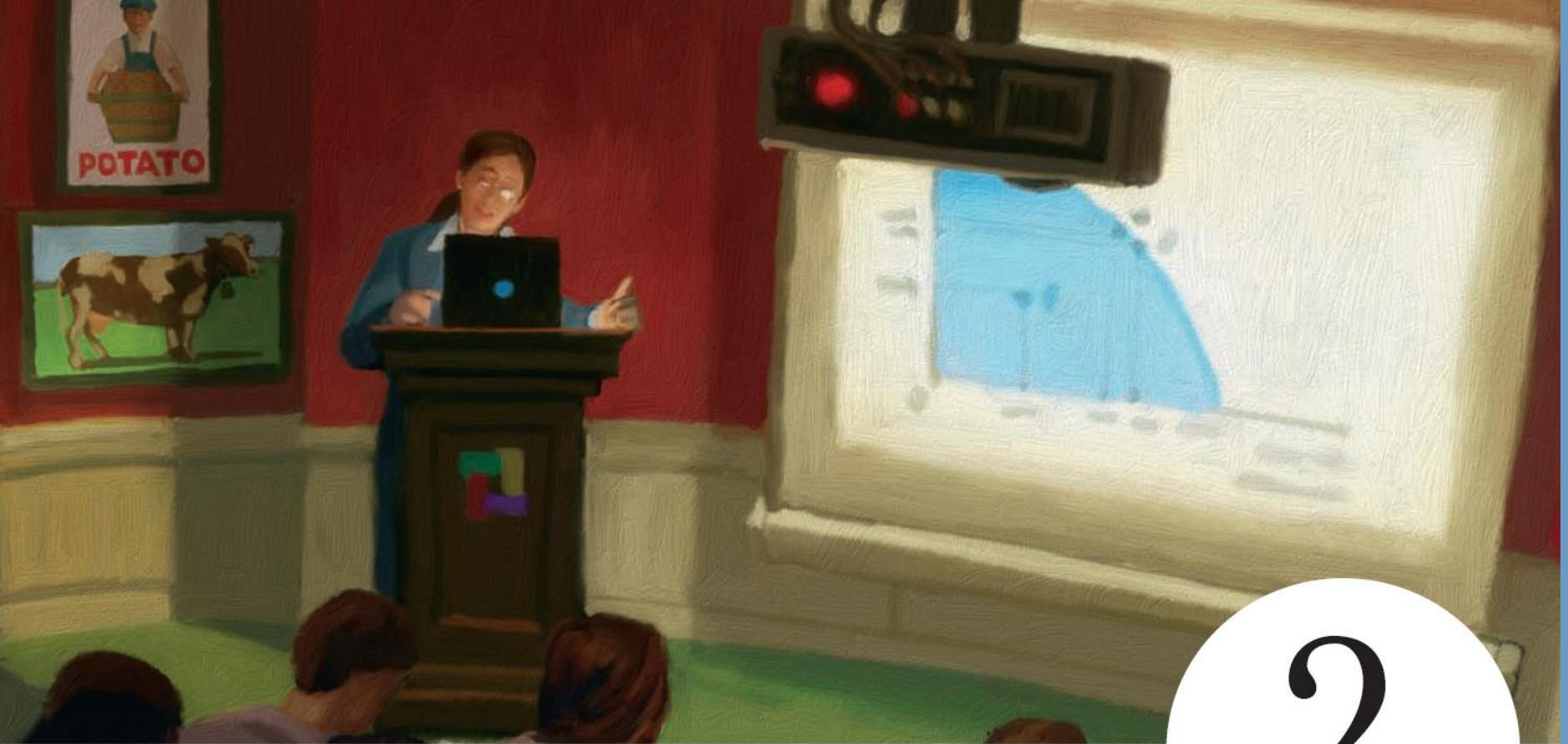
- Adam Smith made the observation that households and firms interacting in markets act as if guided by an “invisible hand.”
  - Because households and firms look at prices when deciding what to buy and sell, they unknowingly take into account the social costs of their actions.
  - As a result, prices guide decision makers to reach outcomes that tend to maximize the welfare of society as a whole.

# Principle #7: Governments Can Sometimes Improve Market Outcomes.

- Markets work only if property rights are enforced.
  - *Property rights* are the ability of an individual to own and exercise control over a scarce resource
- *Market failure* occurs when the market fails to allocate resources efficiently.
- When the market fails (breaks down) government can intervene to promote efficiency and equity.

# Principle #7: Governments Can Sometimes Improve Market Outcomes.

- Market failure may be caused by:
  - an *externality*, which is the impact of one person or firm's actions on the well-being of a bystander.
  - *market power*, which is the ability of a single person or firm to unduly influence market prices.



2

## Thinking Like an Economist



# Thinking Like an Economist

Every field of study has its own terminology

- Mathematics
  - integrals ♦ axioms ♦ vector spaces
- Psychology
  - ego ♦ id ♦ cognitive dissonance
- Law
  - promissory ♦ estoppel ♦ torts ♦ venues
- Economics
  - supply ♦ opportunity cost ♦ elasticity ♦ consumer surplus ♦ demand ♦ comparative advantage ♦ deadweight loss



# Thinking Like an Economist

Economics trains you to. . . .

- Think in terms of alternatives.
- Evaluate the cost of individual and social choices.
- Examine and understand how certain events and issues are related.



# THE ECONOMIST AS A SCIENTIST

The economic way of thinking . . .

- Involves thinking analytically and objectively.
- Makes use of the scientific method.
- Uses abstract models to help explain how a complex, real world operates.
- Develops theories, collects and analyzes data to evaluate the theories.

# The Scientific Method: Observation, Theory, and More Observation

- Uses abstract models to help explain how a complex, real world operates.
- Develops theories, collects and analyzes data to evaluate the theories.

# The Role of Assumptions

- Economists make assumptions in order to make the world easier to understand.
- The art in scientific thinking is deciding which assumptions to make.
- Economists use different assumptions to answer different questions.

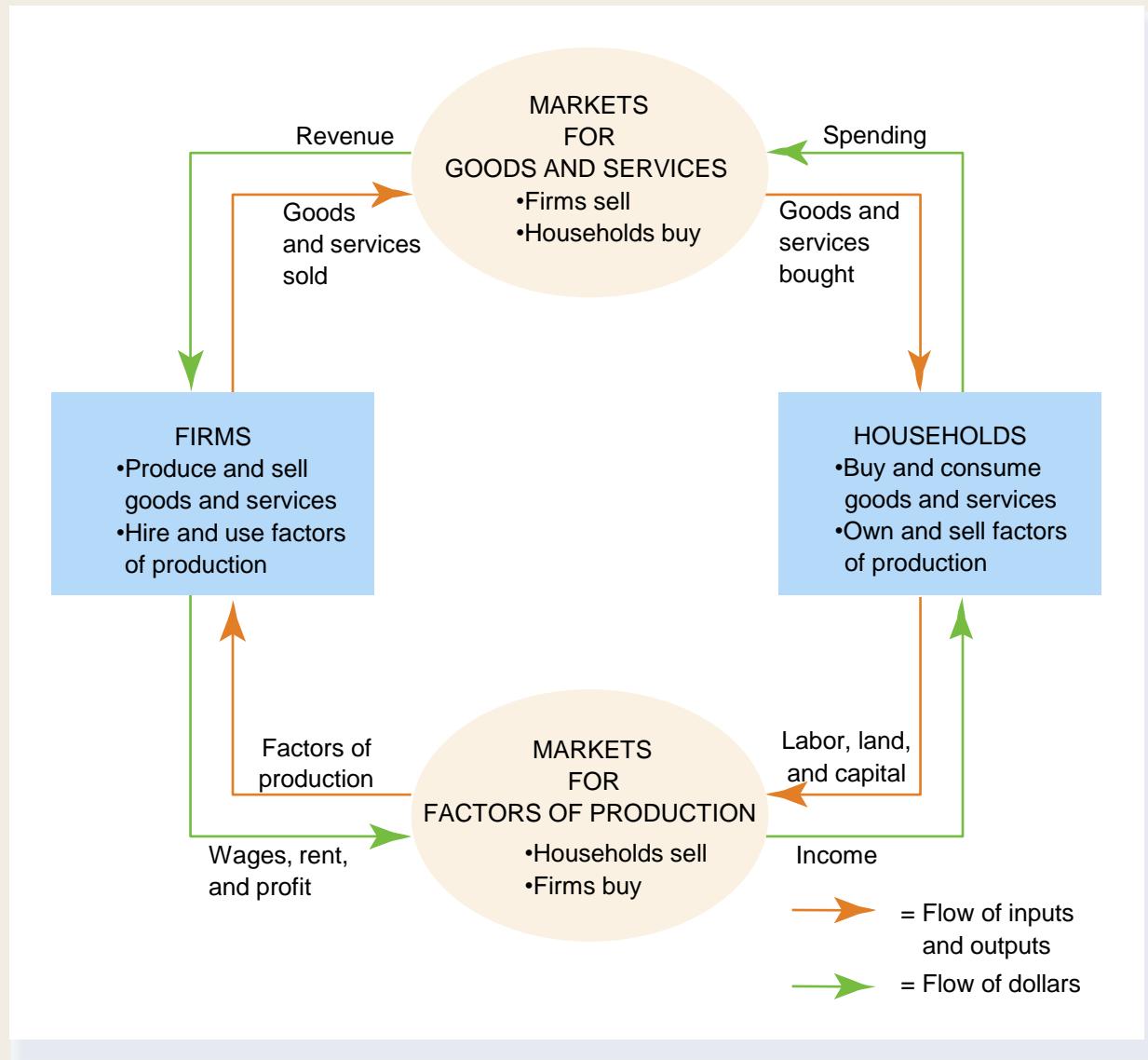
# Economic Models

- Economists use models to simplify reality in order to improve our understanding of the world.
- Two of the most basic economic models are:
  - The Circular Flow Diagram
  - The Production Possibilities Frontier

# Our First Model: The Circular-Flow Diagram

- The *circular-flow diagram* is a visual model of the economy that shows how dollars flow through markets among households and firms.

# Figure 1 The Circular Flow



# Our First Model: The Circular-Flow Diagram

- Firms
  - Produce and sell goods and services
  - Hire and use factors of production
- Households
  - Buy and consume goods and services
  - Own and sell factors of production

# Our First Model: The Circular-Flow Diagram

- Markets for Goods and Services
  - Firms sell
  - Households buy
- Markets for Factors of Production
  - Households sell
  - Firms buy

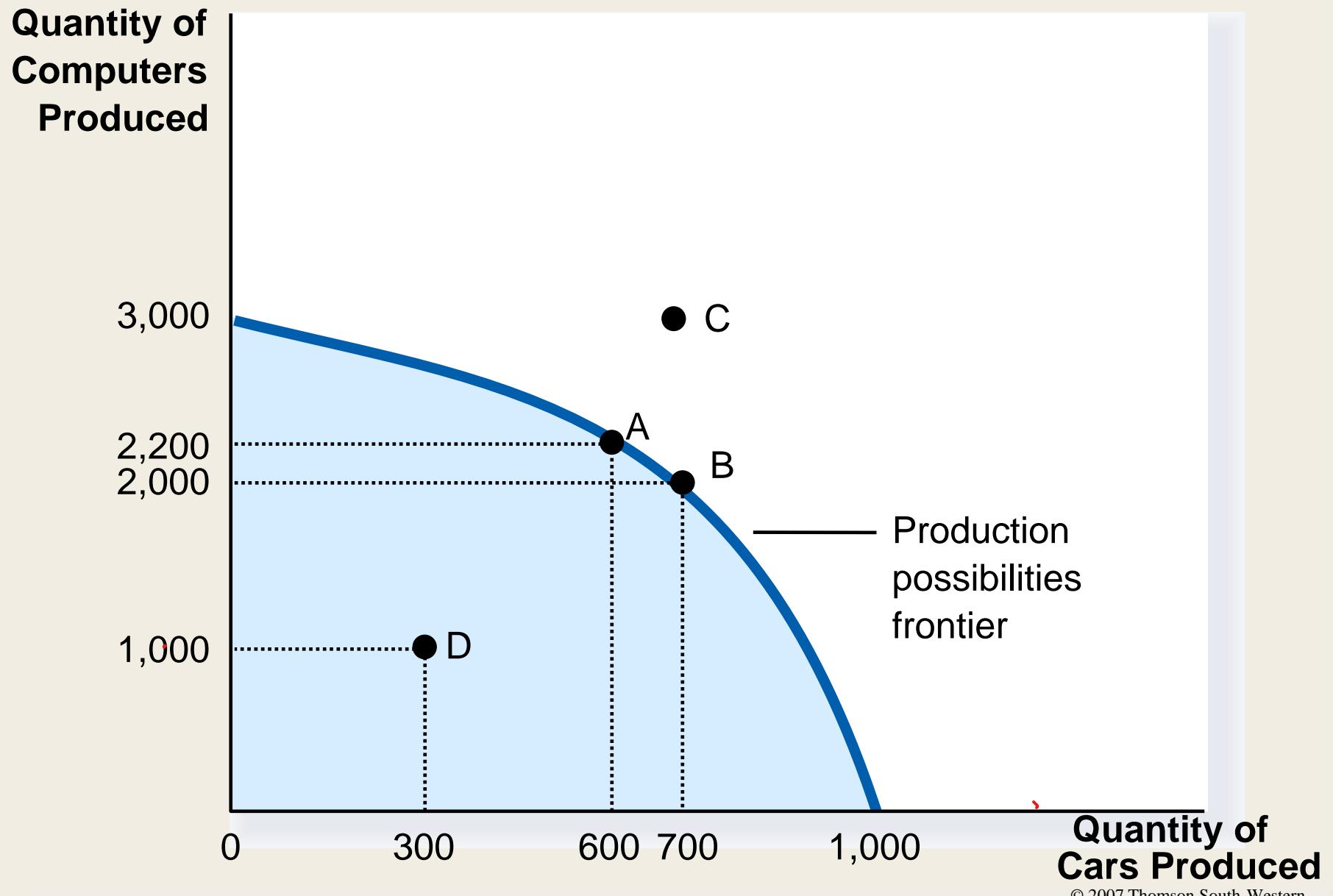
# Our First Model: The Circular-Flow Diagram

- Factors of Production
  - Inputs used to produce goods and services
  - Land, labor, and capital

# Our Second Model: The Production Possibilities Frontier

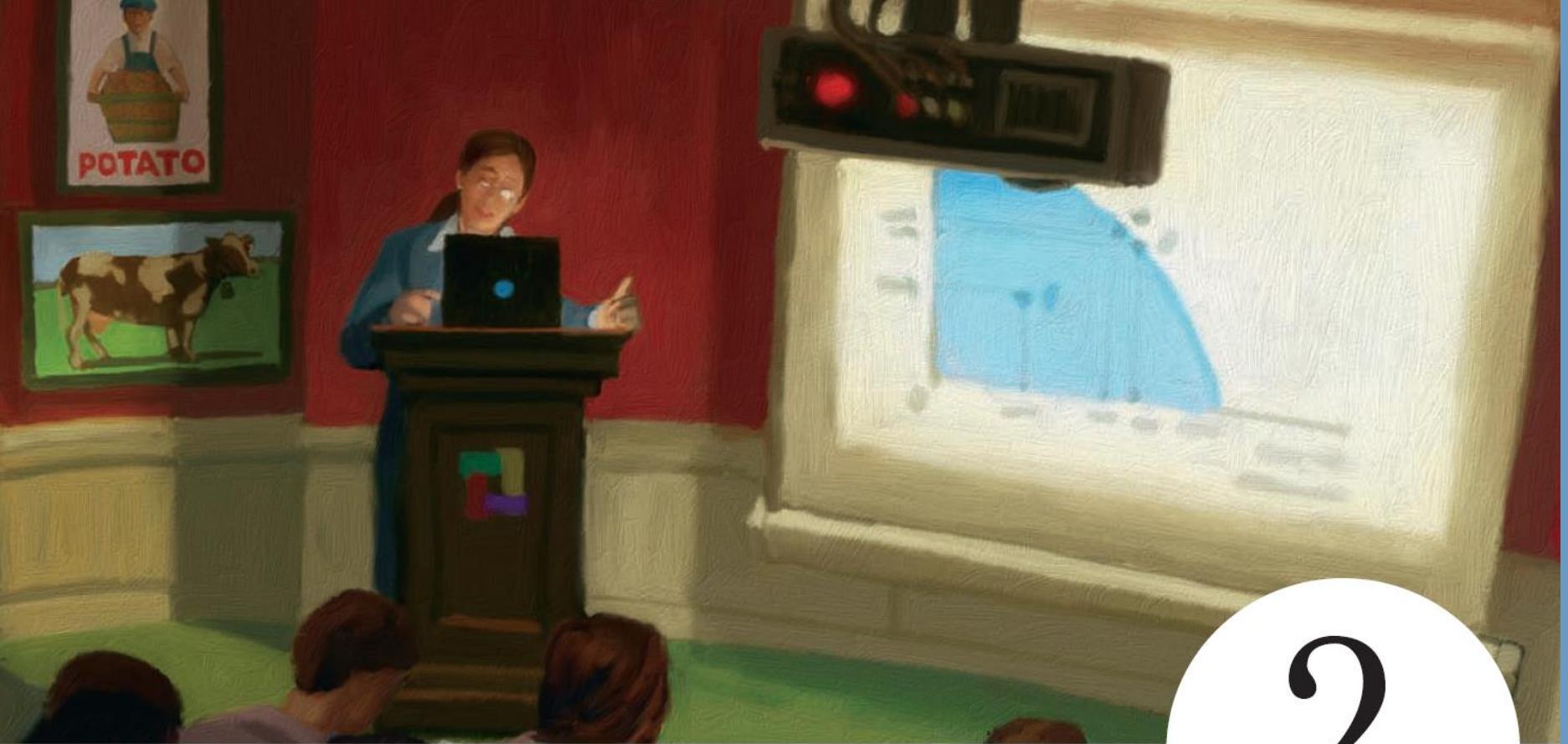
- The *production possibilities frontier* is a graph that shows the combinations of output that the economy can possibly produce given the available factors of production and the available production technology.

## Figure 2 The Production Possibilities Frontier



# Our Second Model: The Production Possibilities Frontier

- Concepts illustrated by the production possibilities frontier
  - Efficiency
  - Trade-offs
  - Opportunity cost
  - Economic growth



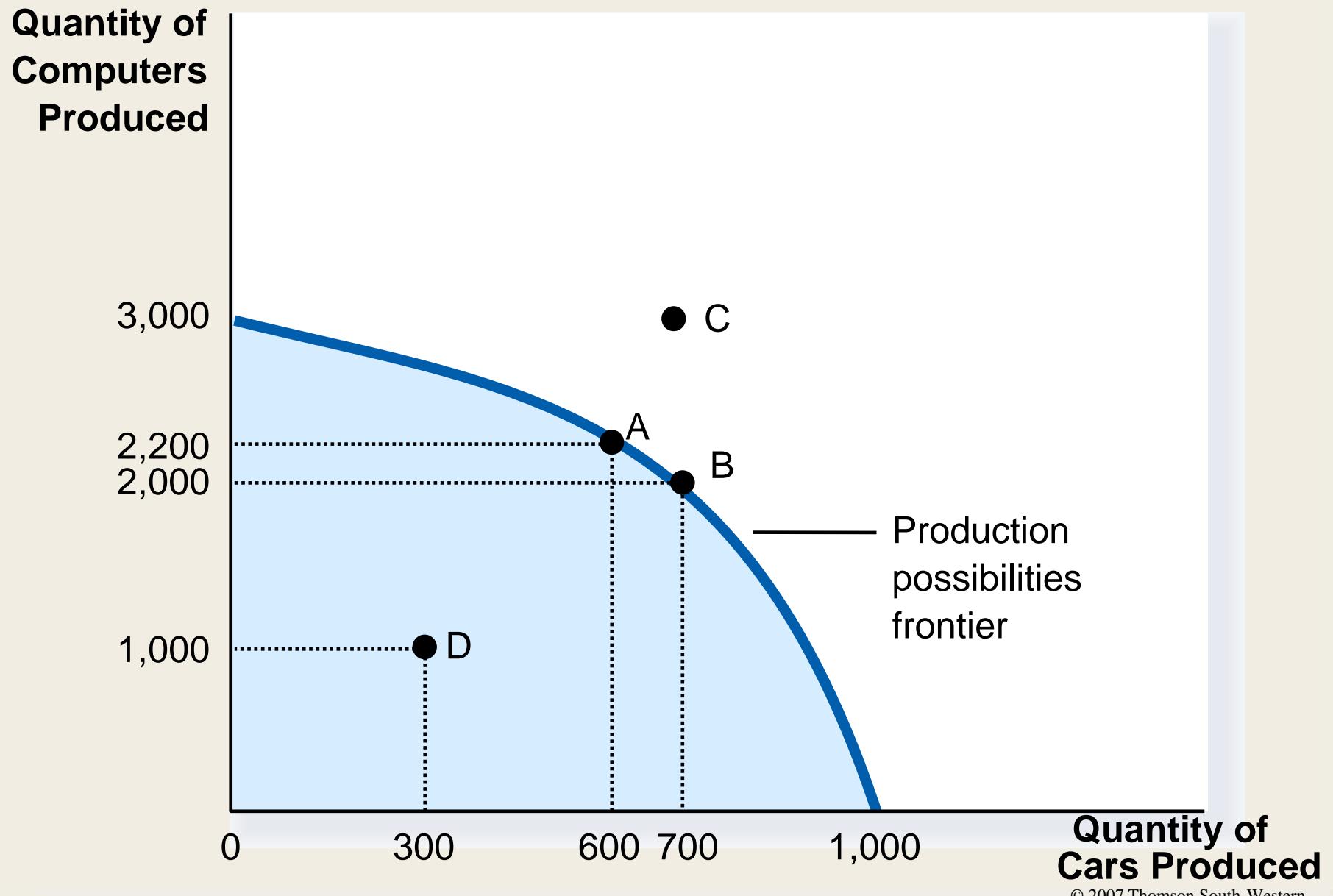
2

## Thinking Like an Economist

# Our Second Model: The Production Possibilities Frontier

- The *production possibilities frontier* is a graph that shows the combinations of output that the economy can possibly produce given the available factors of production and the available production technology.

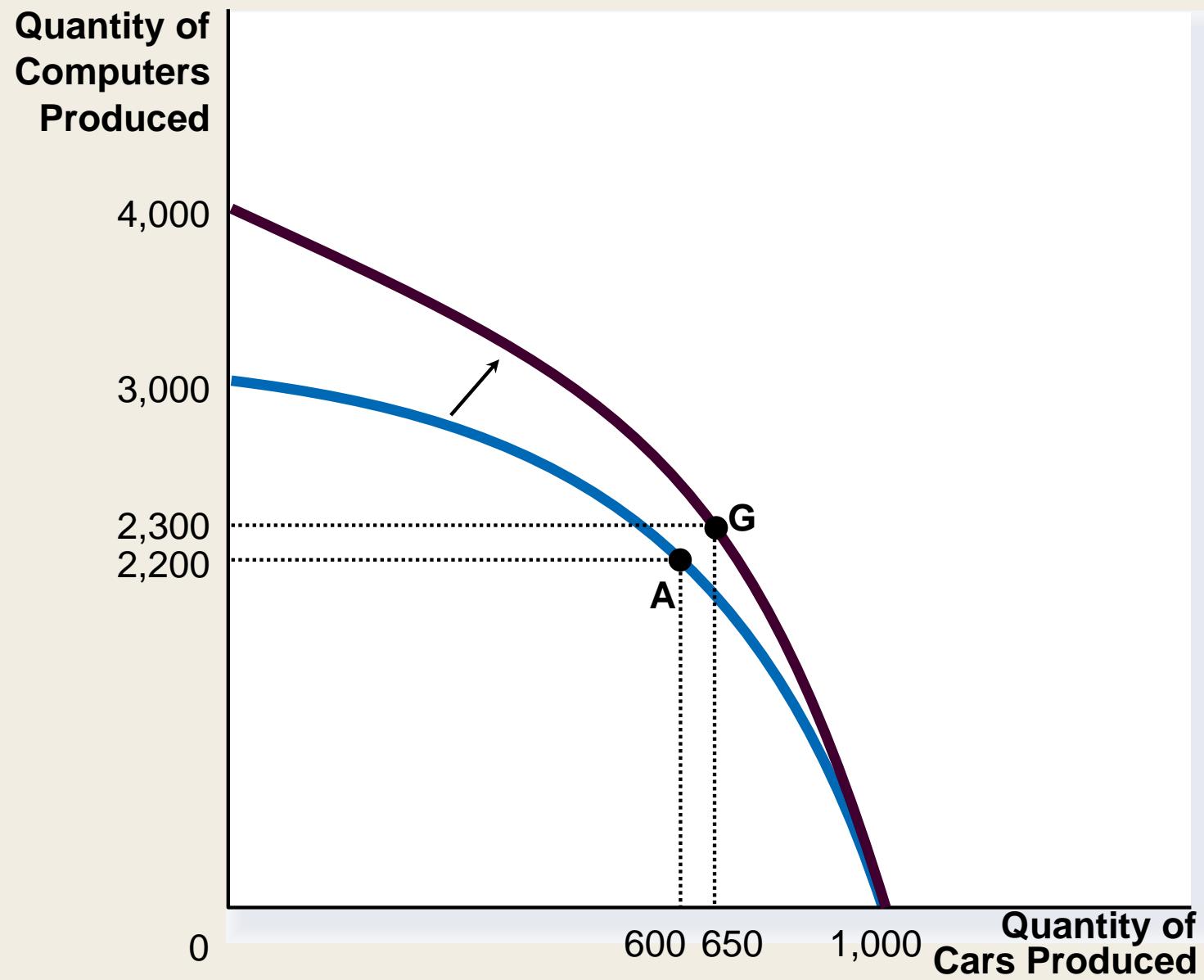
## Figure 2 The Production Possibilities Frontier



# Our Second Model: The Production Possibilities Frontier

- Concepts illustrated by the production possibilities frontier
  - Efficiency
  - Trade-offs
  - Opportunity cost
  - Economic growth

## Figure 3 A Shift in the Production Possibilities Frontier



# Microeconomics and Macroeconomics

- *Microeconomics* focuses on the individual parts of the economy.
  - How households and firms make decisions and how they interact in specific markets
- *Macroeconomics* looks at the economy as a whole.
  - Economy-wide phenomena, including inflation, unemployment, and economic growth



# THE ECONOMIST AS POLICY ADVISOR

- When economists are trying to explain the world, they are scientists.
- When economists are trying to change the world, they are policy advisors.

# Positive versus Normative Analysis

- *Positive statements* are statements that attempt to describe the world as it is.
  - Called descriptive analysis
- *Normative statements* are statements about how the world should be.
  - Called prescriptive analysis

# Positive Versus Normative Analysis

Are the following positive or normative statements?

- An increase in the minimum wage will cause a decrease in employment among the least-skilled.
- **POSITIVE**
- Higher federal budget deficits will cause interest rates to increase.
- **POSITIVE**

# Positive Versus Normative Analysis

- Are the following positive or normative statements?
  - The income gains from a higher minimum wage are worth more than any slight reductions in employment.
    - NORMATIVE
  - State governments should be allowed to collect from tobacco companies the costs of treating smoking-related illnesses among the poor.
    - NORMATIVE





# WHY ECONOMISTS DISAGREE

- They may disagree about the validity of alternative positive theories about how the world works.
- They may have different values and, therefore, different normative views about what policy should try to accomplish.

# Summary

---

- Economists try to address their subjects with a scientist's objectivity.
  - They make appropriate assumptions and build simplified models in order to understand the world around them.
  - Two simple economic models are the circular-flow diagram and the production possibilities frontier.

# Summary

---

- Economics is divided into two subfields:
  - Microeconomics is the study of decision-making by households and firms in the marketplace.
  - Macroeconomics is the study of the forces and trends that affect the economy as a whole.

# Summary

---

- A positive statement is an assertion about how the world is.
- A normative statement is an assertion about how the world ought to be.
- When economists make normative statements, they are acting more as policy advisors than scientists.

# Summary

---

- Economists who advise policymakers offer conflicting advice either because of differences in scientific judgments or because of differences in values.
- At other times, economists are united in the advice they offer, but policymakers may choose to ignore it.



4

## The Market Forces of Supply and Demand



# MARKETS AND COMPETITION

- Supply and demand are the two words that economists use most often.
- Supply and demand are the forces that make market economies work.
- Modern microeconomics is about supply, demand, and market equilibrium.

# What Is a Market?

- A *market* is a group of buyers and sellers of a particular good or service.



- The terms supply and demand refer to the behavior of people . . . as they interact with one another in markets.

# What Is a Market?

- Buyers determine *demand*.
- Sellers determine *supply*.

# What Is Competition?

- A *competitive market* is a market in which there are many buyers and sellers so that each has a negligible impact on the market price.

# What Is Competition?

- Competition: Perfect and Otherwise
  - Perfect Competition
    - Products are the same
    - Numerous buyers and sellers so that each has no influence over price
    - Buyers and Sellers are price takers
  - Monopoly
    - One seller, and seller controls price

# What Is Competition?

- Competition: Perfect and Otherwise
  - Oligopoly
    - Few sellers
    - Not always aggressive competition
  - Monopolistic Competition
    - Many sellers
    - Slightly differentiated products
    - Each seller may set price for its own product



# DEMAND



- *Quantity demanded* is the amount of a good that buyers are willing and able to purchase.
- Law of Demand
  - The *law of demand* states that, other things equal, the quantity demanded of a good falls when the price of the good rises.

# The Demand Curve: The Relationship between Price and Quantity Demanded

- Demand Schedule

- The *demand schedule* is a table that shows the relationship between the price of the good and the quantity demanded.



# Catherine's Demand Schedule

Price of Ice-Cream Cone	Quantity of Cones Demanded
\$0.00	12
0.50	10
1.00	8
1.50	6
2.00	4
2.50	2
3.00	0



# The Demand Curve: The Relationship between Price and Quantity Demanded

- Demand Curve
  - The *demand curve* is a graph of the relationship between the price of a good and the quantity demanded.



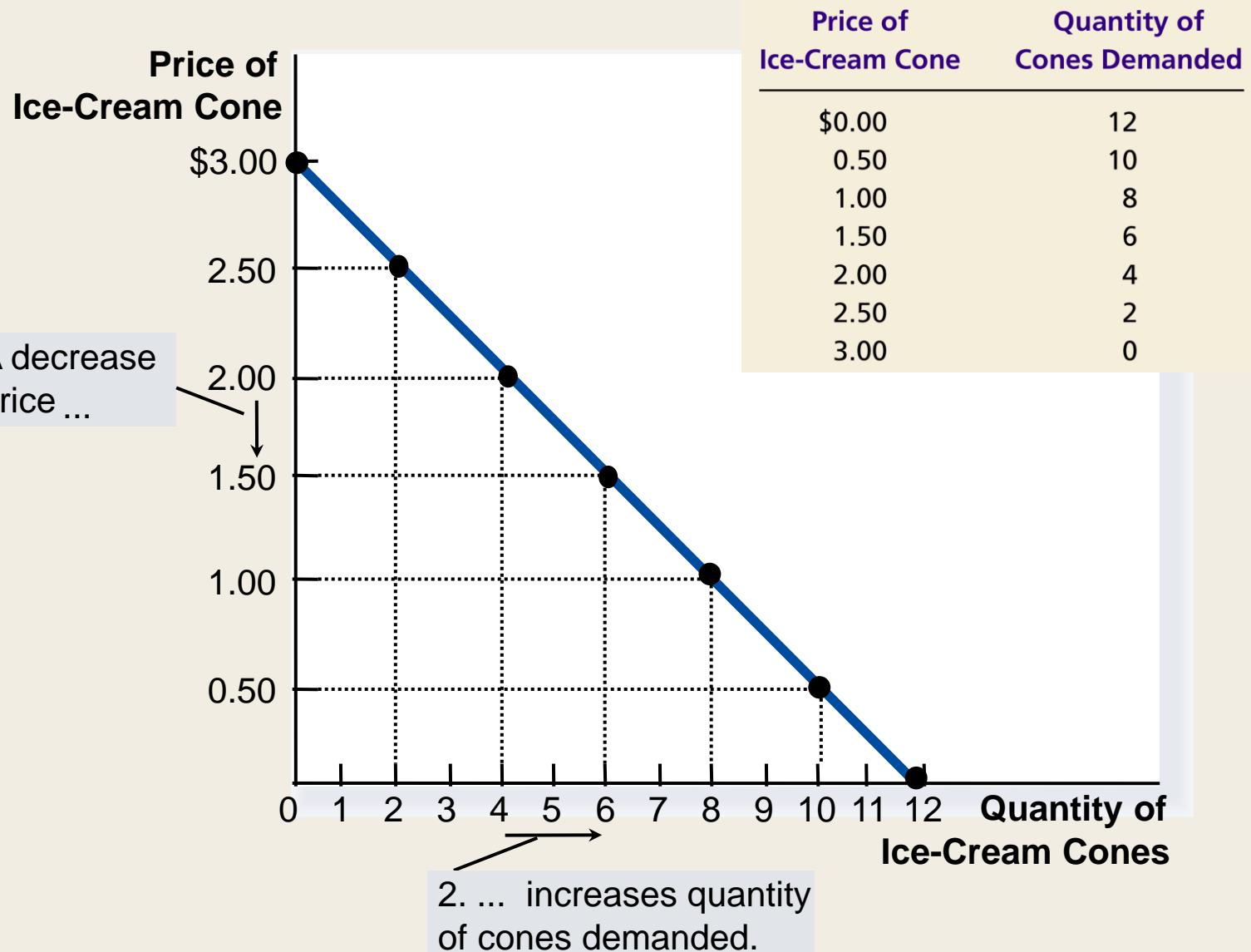
4

## The Market Forces of Supply and Demand

# The Demand Curve: The Relationship between Price and Quantity Demanded

- Demand Curve
  - The *demand curve* is a graph of the relationship between the price of a good and the quantity demanded.

# Figure 1 Catherine's Demand Schedule and Demand Curve



# Market Demand versus Individual Demand

- Market demand refers to the sum of all individual demands for a particular good or service.
- Graphically, individual demand curves are summed horizontally to obtain the market demand curve.

# The Market Demand Curve

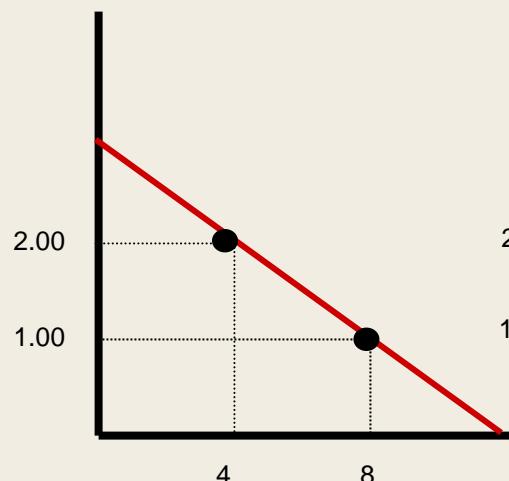
When the price is \$2.00,  
Catherine will demand 4  
ice-cream cones.

When the price is \$2.00,  
Nicholas will demand 3  
ice-cream cones.

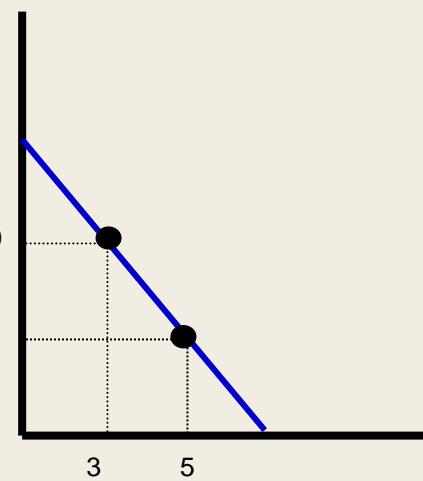
The market demand at  
\$2.00 will be 7 ice-cream  
cones.

Catherine's Demand + Nicholas's Demand = Market Demand

Price of Ice-Cream Cone



Price of Ice-Cream Cone



Price of Ice-Cream Cone



When the price is \$1.00,  
Catherine will demand 8  
ice-cream cones.

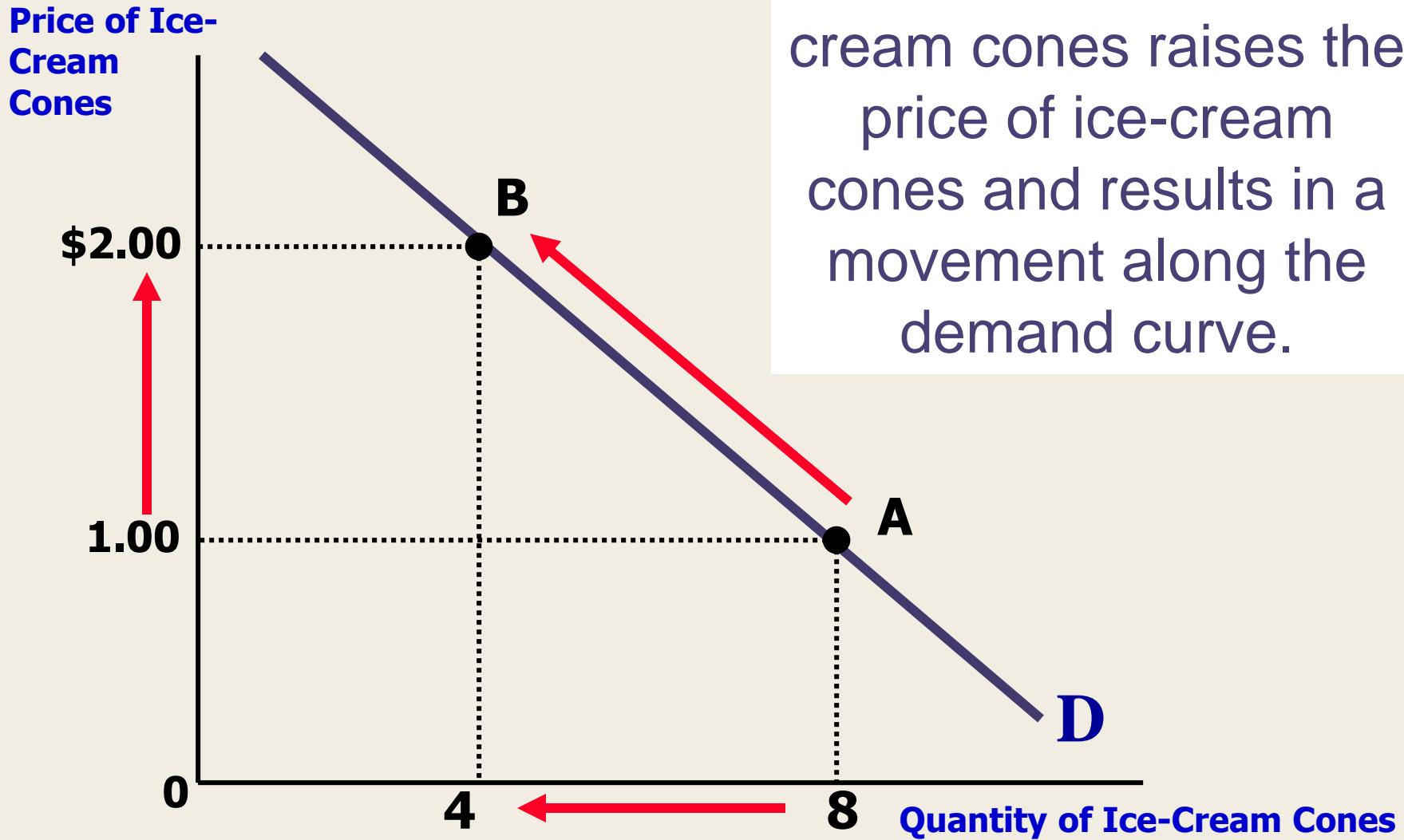
When the price is \$1.00,  
Nicholas will demand 5  
ice-cream cones.

The market demand at  
\$1.00, will be 13 ice-  
cream cones.

# Shifts in the Demand Curve

- Change in Quantity Demanded
  - Movement along the demand curve.
  - Caused by a change in the price of the product.

## Changes in Quantity Demanded



A tax on sellers of ice-cream cones raises the price of ice-cream cones and results in a movement along the demand curve.

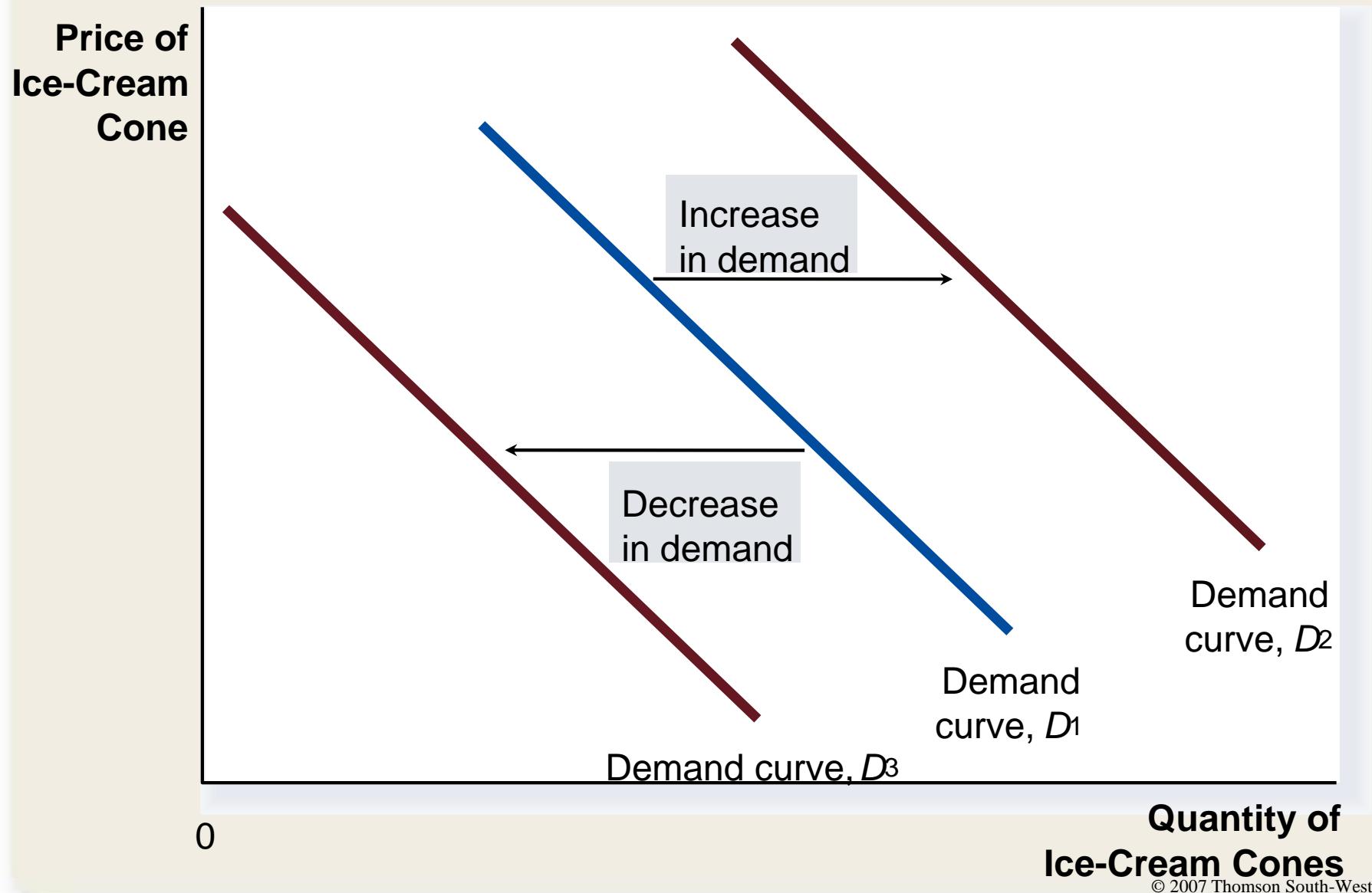
# Shifts in the Demand Curve

- Consumer income
- Prices of related goods
- Tastes
- Expectations
- Number of buyers

# Shifts in the Demand Curve

- Change in Demand
  - A shift in the demand curve, either to the left or right.
  - Caused by any change that alters the quantity demanded at every price.

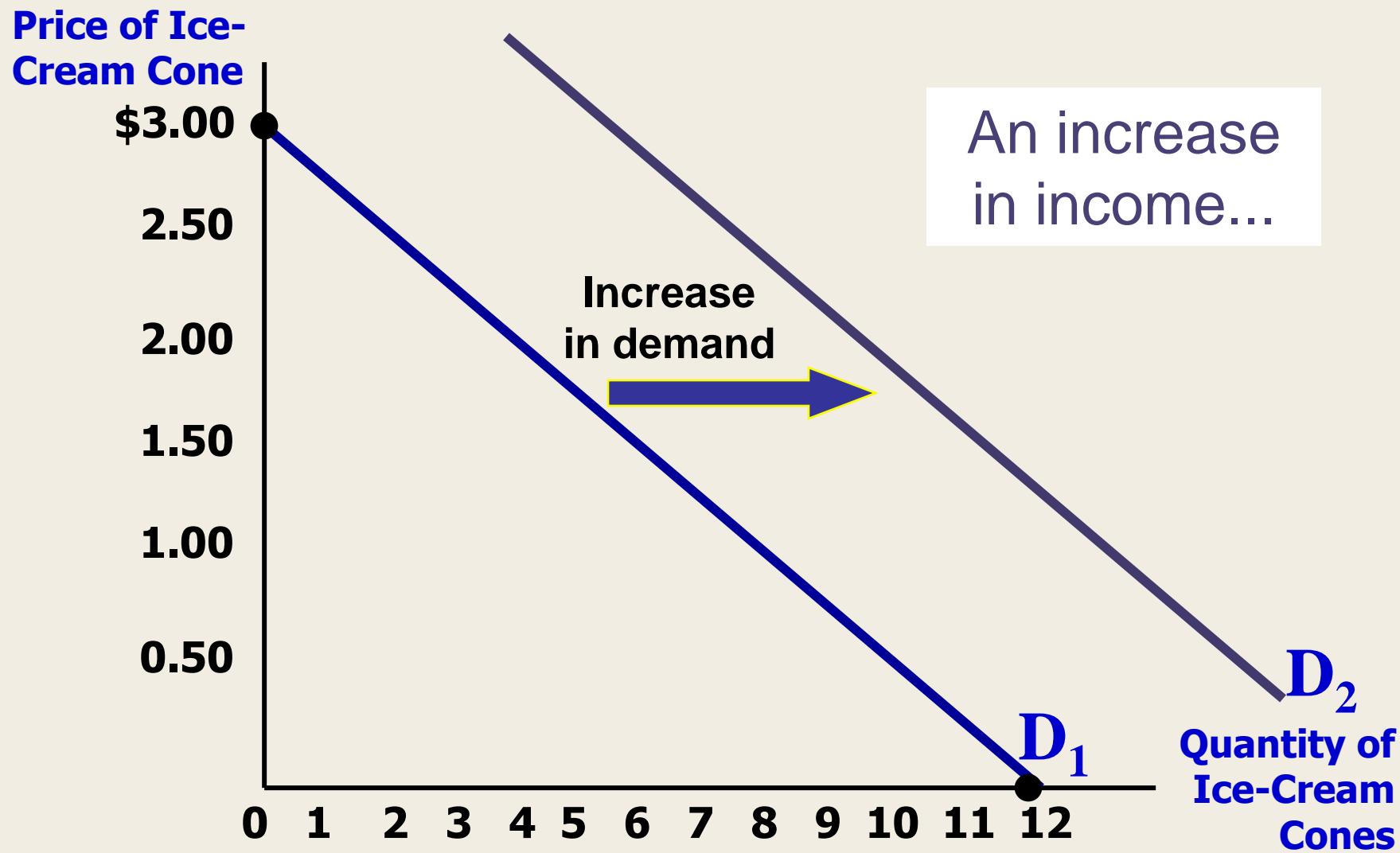
## Figure 3 Shifts in the Demand Curve



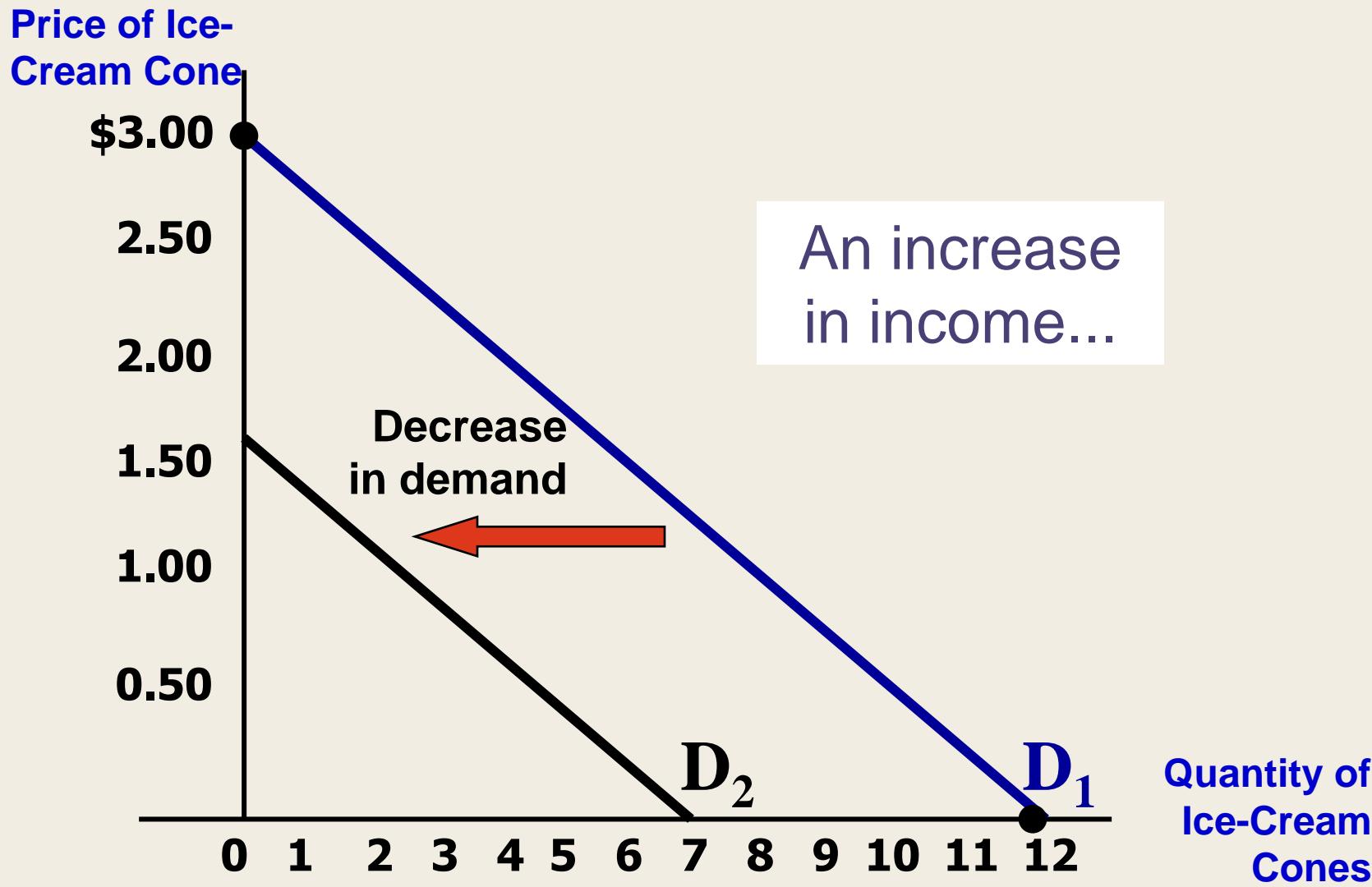
# Shifts in the Demand Curve

- Consumer Income
  - As income increases the demand for a *normal good* will increase.
  - As income increases the demand for an *inferior good* will decrease.

## Consumer Income Normal Good



# Consumer Income Inferior Good



# Shifts in the Demand Curve

- Prices of Related Goods
  - When a fall in the price of one good reduces the demand for another good, the two goods are called *substitutes*.
  - When a fall in the price of one good increases the demand for another good, the two goods are called *complements*.

## Table 1 Variables That Influence Buyers

Variable	A Change in This Variable. . .
Price	Represents a movement along the demand curve
Income	Shifts the demand curve
Prices of related goods	Shifts the demand curve
Tastes	Shifts the demand curve
Expectations	Shifts the demand curve
Number of buyers	Shifts the demand curve



# SUPPLY

- *Quantity supplied* is the amount of a good that sellers are willing and able to sell.
- Law of Supply
  - The *law of supply* states that, other things equal, the quantity supplied of a good rises when the price of the good rises.

# The Supply Curve: The Relationship between Price and Quantity Supplied

- Supply Schedule
  - The *supply schedule* is a table that shows the relationship between the price of the good and the quantity supplied.

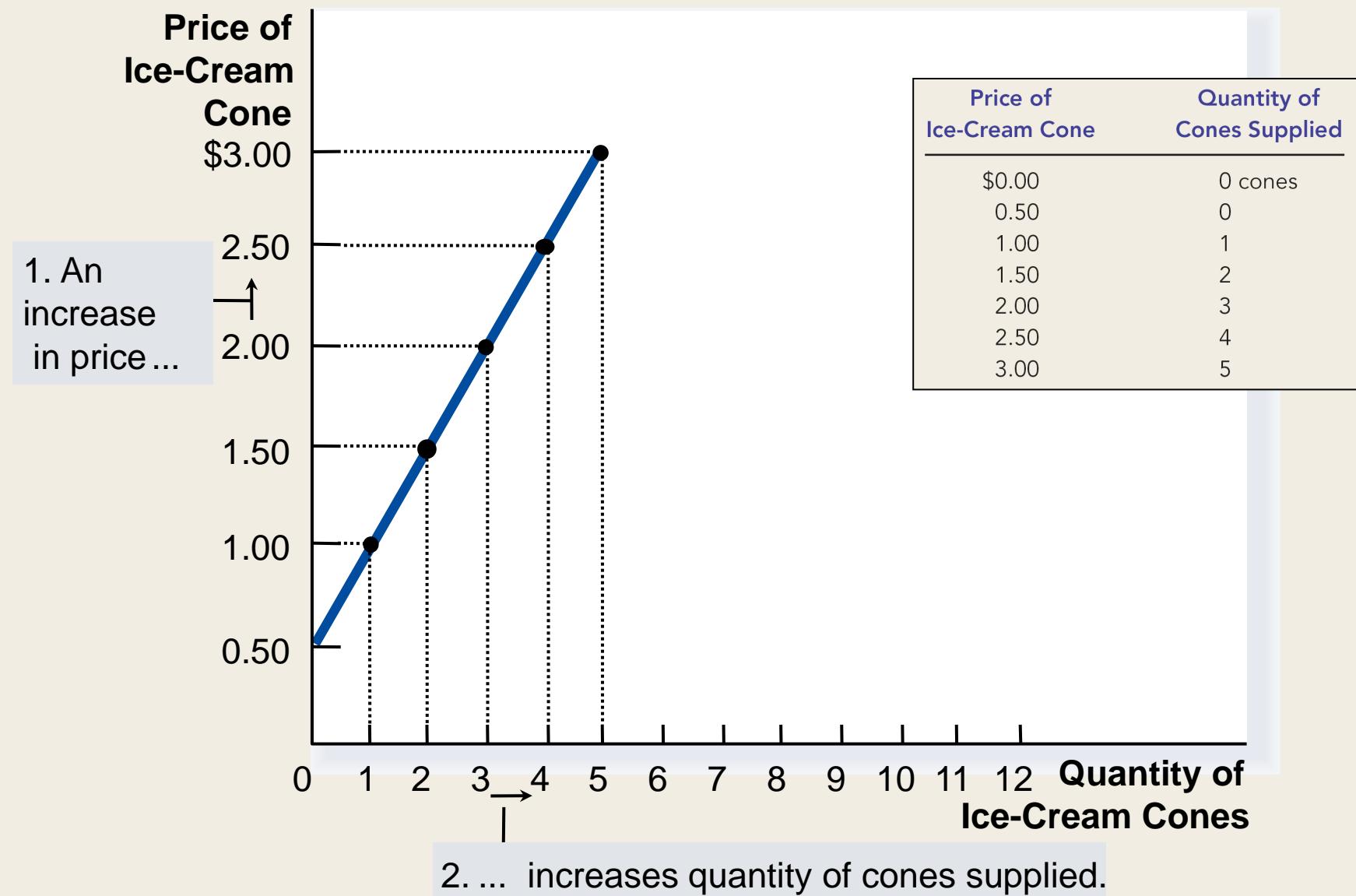
# Ben's Supply Schedule

Price of Ice-Cream Cone	Quantity of Cones Supplied
\$0.00	0 cones
0.50	0
1.00	1
1.50	2
2.00	3
2.50	4
3.00	5

# The Supply Curve: The Relationship between Price and Quantity Supplied

- Supply Curve
  - The *supply curve* is the graph of the relationship between the price of a good and the quantity supplied.

## Figure 5 Ben's Supply Schedule and Supply Curve





# SUPPLY

- *Quantity supplied* is the amount of a good that sellers are willing and able to sell.
- Law of Supply
  - The *law of supply* states that, other things equal, the quantity supplied of a good rises when the price of the good rises.

# The Supply Curve: The Relationship between Price and Quantity Supplied

- Supply Schedule
  - The *supply schedule* is a table that shows the relationship between the price of the good and the quantity supplied.

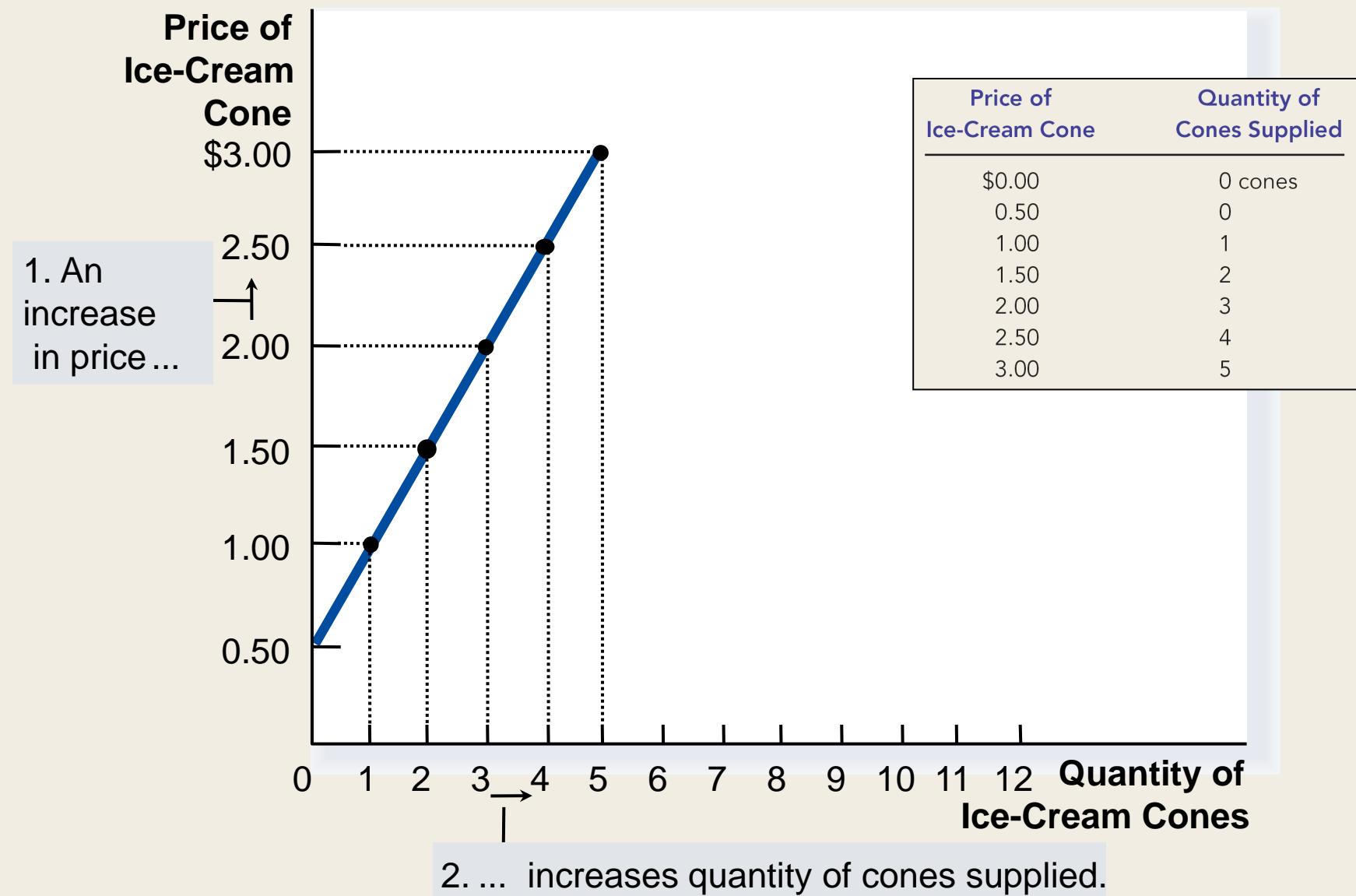
# Ben's Supply Schedule

Price of Ice-Cream Cone	Quantity of Cones Supplied
\$0.00	0 cones
0.50	0
1.00	1
1.50	2
2.00	3
2.50	4
3.00	5

# The Supply Curve: The Relationship between Price and Quantity Supplied

- Supply Curve
  - The *supply curve* is the graph of the relationship between the price of a good and the quantity supplied.

## Figure 5 Ben's Supply Schedule and Supply Curve



# Market Supply versus Individual Supply

- Market supply refers to the sum of all individual supplies for all sellers of a particular good or service.
- Graphically, individual supply curves are summed horizontally to obtain the market supply curve.

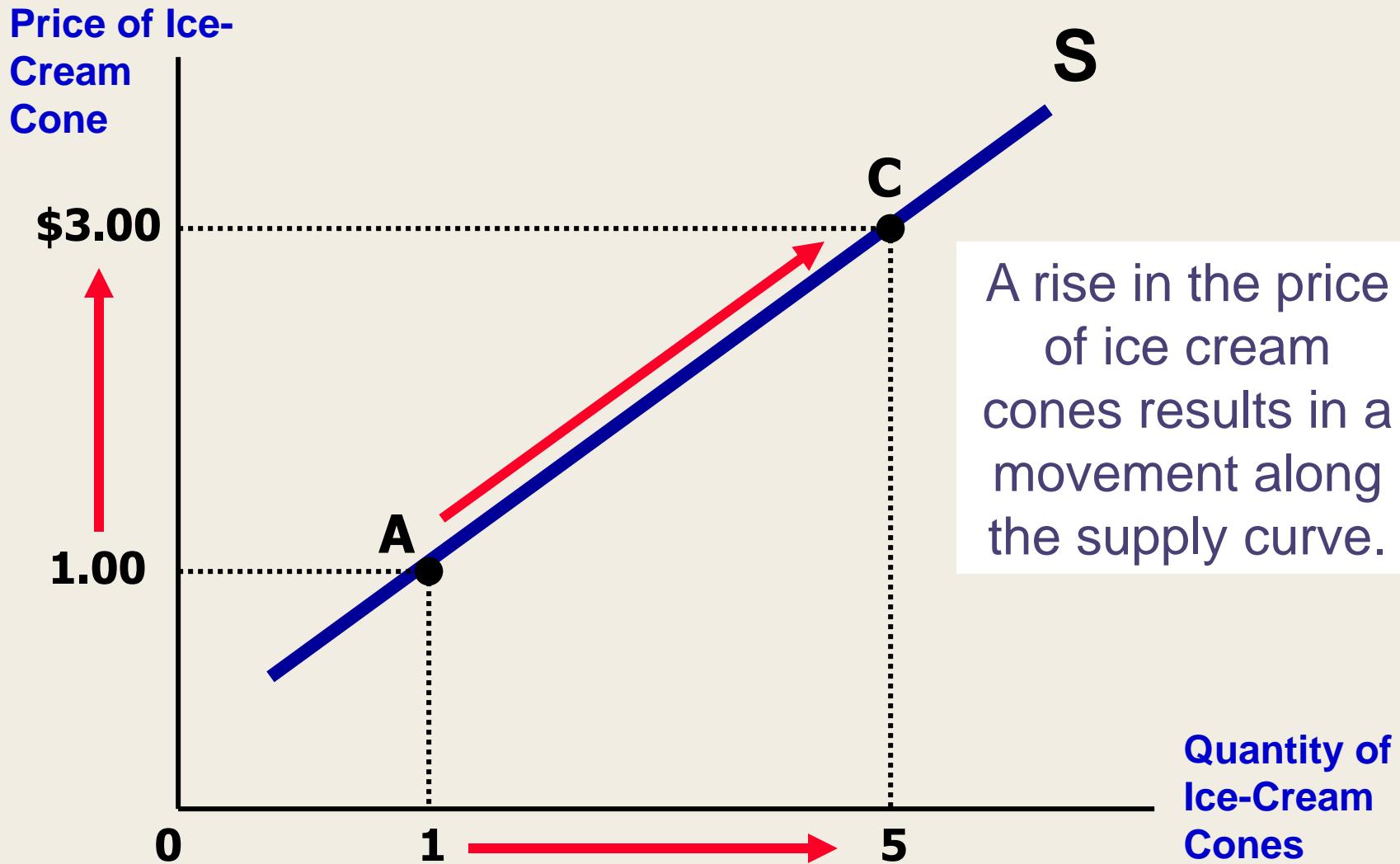
# Shifts in the Supply Curve

- Input prices
- Technology
- Expectations
- Number of sellers

# Shifts in the Supply Curve

- Change in Quantity Supplied
  - Movement along the supply curve.
  - Caused by a change in anything that alters the quantity supplied at each price.

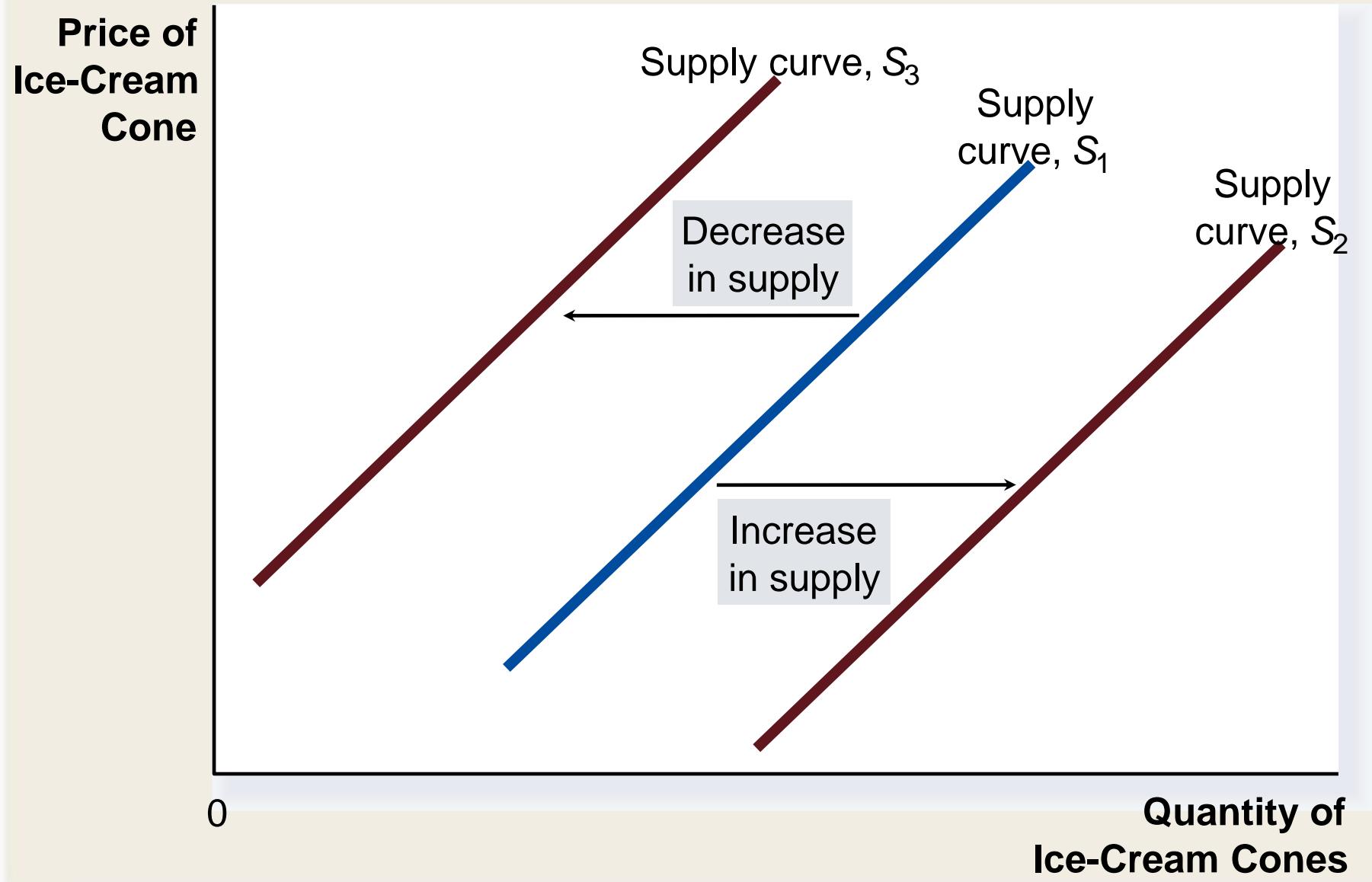
# Change in Quantity Supplied



# Shifts in the Supply Curve

- Change in Supply
  - A shift in the supply curve, either to the left or right.
  - Caused by a change in a determinant other than price.

## Figure 7 Shifts in the Supply Curve



## Table 2: Variables That Influence Sellers

Variable	A Change in This Variable . . .
Price	Represents a movement along the supply curve
Input prices	Shifts the supply curve
Technology	Shifts the supply curve
Expectations	Shifts the supply curve
Number of sellers	Shifts the supply curve



# SUPPLY AND DEMAND TOGETHER

- *Equilibrium* refers to a situation in which the price has reached the level where quantity supplied equals quantity demanded.



# SUPPLY AND DEMAND TOGETHER

- *Equilibrium Price*
  - The price that balances quantity supplied and quantity demanded.
  - On a graph, it is the price at which the supply and demand curves intersect.
- *Equilibrium Quantity*
  - The quantity supplied and the quantity demanded at the equilibrium price.
  - On a graph it is the quantity at which the supply and demand curves intersect.

# SUPPLY AND DEMAND TOGETHER

**Demand Schedule**

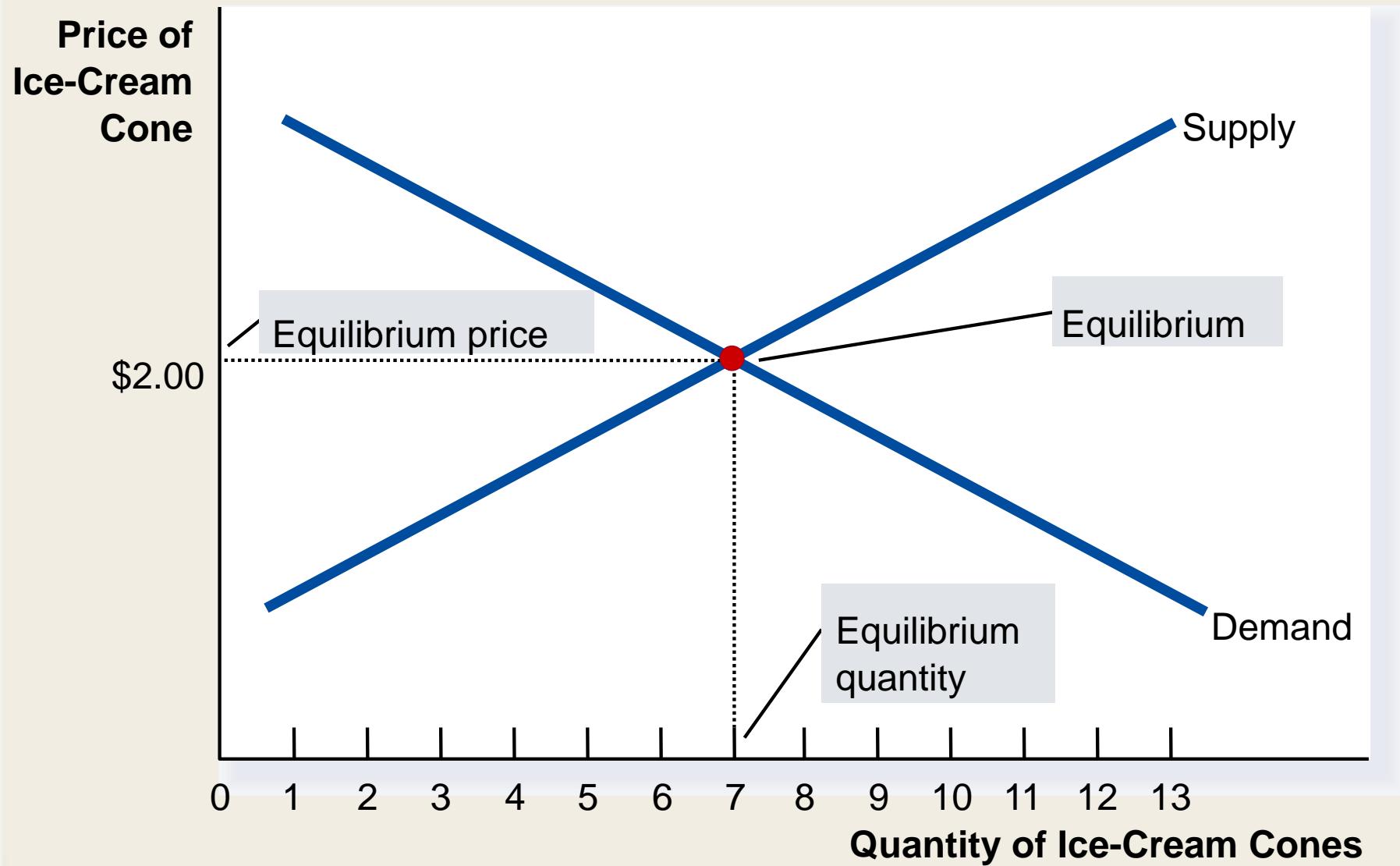
Price of Ice-Cream Cone	Market
\$0.00	19
0.50	16
1.00	13
1.50	10
2.00	7
2.50	4
3.00	1

**Supply Schedule**

Price of Ice-Cream Cone	Market
\$0.00	0
0.50	0
1.00	1
1.50	4
2.00	7
2.50	10
3.00	13

At \$2.00, the quantity demanded  
is equal to the quantity supplied!

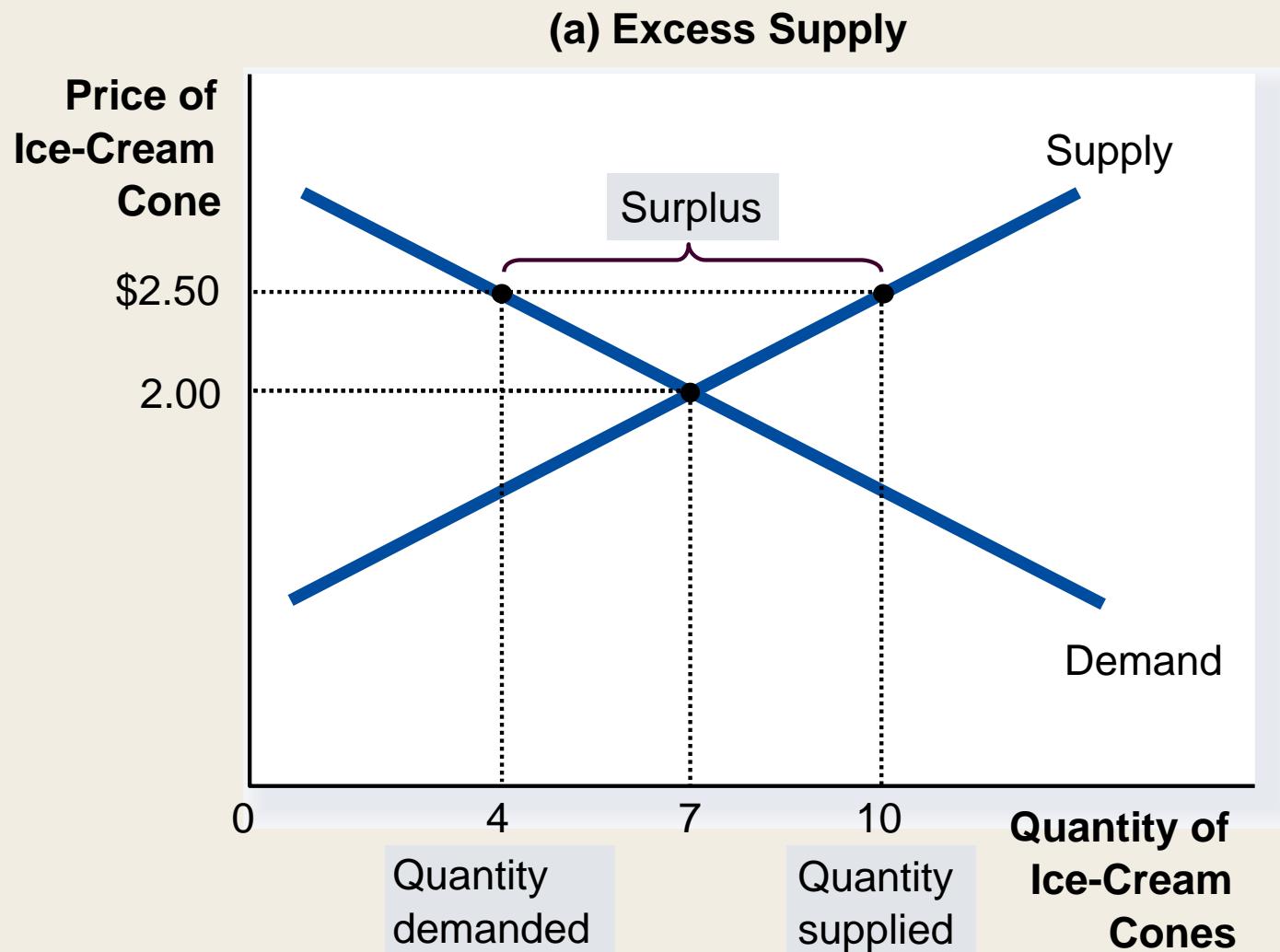
## Figure 8 The Equilibrium of Supply and Demand



# Equilibrium

- *Surplus*
  - When price > equilibrium price, then quantity supplied > quantity demanded.
    - There is excess supply or a surplus.
    - Suppliers will lower the price to increase sales, thereby moving toward equilibrium.

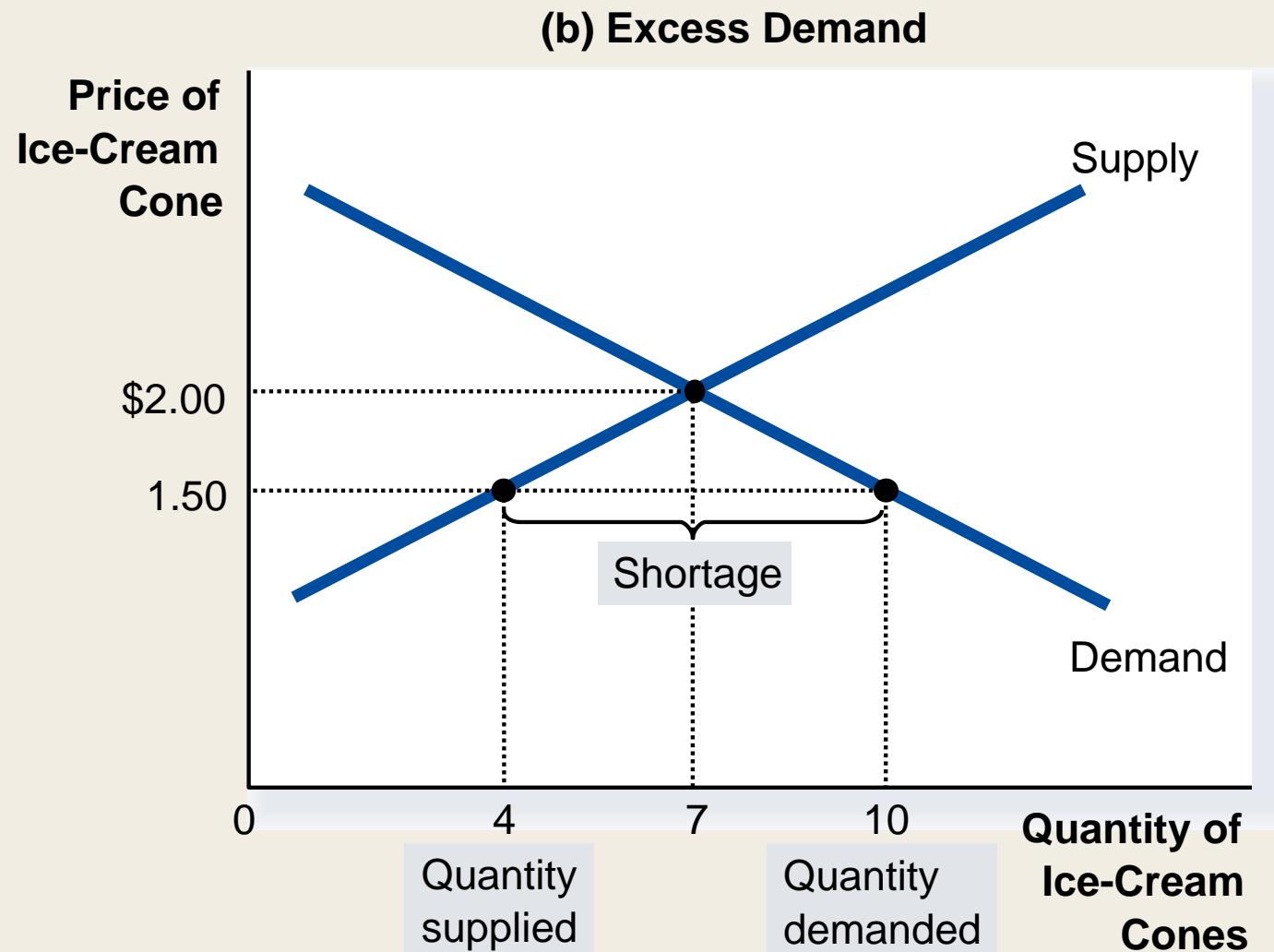
## Figure 9 Markets Not in Equilibrium



# Equilibrium

- *Shortage*
  - When price < equilibrium price, then quantity demanded > the quantity supplied.
    - There is excess demand or a shortage.
    - Suppliers will raise the price due to too many buyers chasing too few goods, thereby moving toward equilibrium.

## Figure 9 Markets Not in Equilibrium



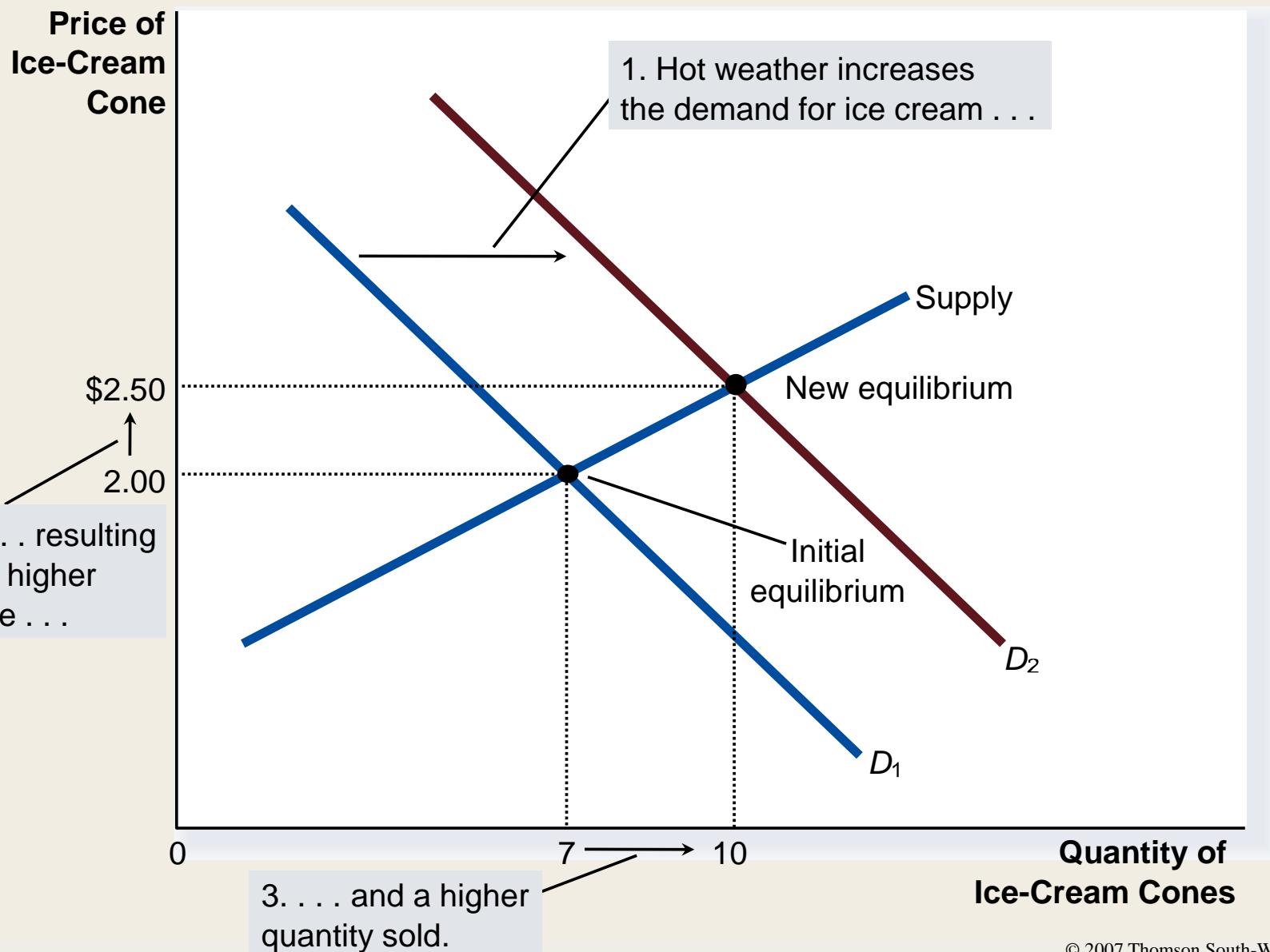
# Equilibrium

- *Law of supply and demand*
  - The claim that the price of any good adjusts to bring the quantity supplied and the quantity demanded for that good into balance.

## **Table 3: Three Steps for Analyzing Changes in Equilibrium**

1. Decide whether the event shifts the supply or demand curve (or perhaps both).
2. Decide in which direction the curve shifts.
3. Use the supply-and-demand diagram to see how the shift changes the equilibrium price and quantity.

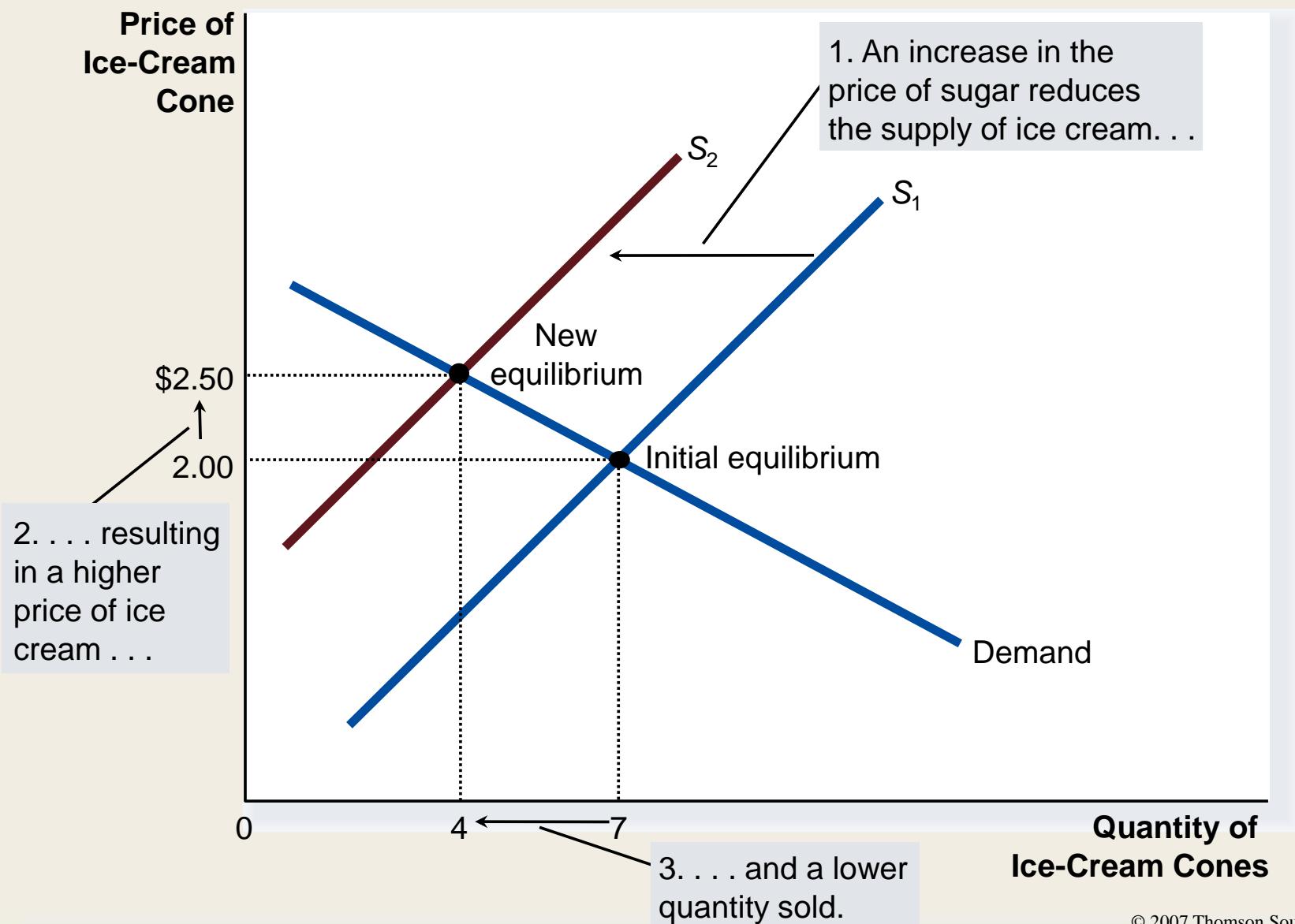
## Figure 10 How an Increase in Demand Affects the Equilibrium



# Three Steps to Analyzing Changes in Equilibrium

- Shifts in Curves versus Movements along Curves
  - A shift in the supply curve is called a change in supply.
  - A movement along a fixed supply curve is called a change in quantity supplied.
  - A shift in the demand curve is called a change in demand.
  - A movement along a fixed demand curve is called a change in quantity demanded.

## Figure 11 How a Decrease in Supply Affects the Equilibrium



**Table 4: What Happens to Price and Quantity When Supply or Demand Shifts?**

	No Change in Supply	An Increase in Supply	A Decrease in Supply
No Change in Demand	$P$ same $Q$ same	$P$ down $Q$ up	$P$ up $Q$ down
An Increase in Demand	$P$ up $Q$ up	$P$ ambiguous $Q$ up	$P$ up $Q$ ambiguous
A Decrease in Demand	$P$ down $Q$ down	$P$ down $Q$ ambiguous	$P$ ambiguous $Q$ down

# Summary

---

- Economists use the model of supply and demand to analyze competitive markets.
- In a competitive market, there are many buyers and sellers, each of whom has little or no influence on the market price.

# Summary

---

- The demand curve shows how the quantity of a good depends upon the price.
  - According to the law of demand, as the price of a good falls, the quantity demanded rises. Therefore, the demand curve slopes downward.
  - In addition to price, other determinants of how much consumers want to buy include income, the prices of complements and substitutes, tastes, expectations, and the number of buyers.
  - If one of these factors changes, the demand curve shifts.

# Summary

---

- The supply curve shows how the quantity of a good supplied depends upon the price.
  - According to the law of supply, as the price of a good rises, the quantity supplied rises. Therefore, the supply curve slopes upward.
  - In addition to price, other determinants of how much producers want to sell include input prices, technology, expectations, and the number of sellers.
  - If one of these factors changes, the supply curve shifts.

# Summary

---

- Market equilibrium is determined by the intersection of the supply and demand curves.
- At the equilibrium price, the quantity demanded equals the quantity supplied.
- The behavior of buyers and sellers naturally drives markets toward their equilibrium.

# Summary

---

- To analyze how any event influences a market, we use the supply-and-demand diagram to examine how the event affects the equilibrium price and quantity.
- In market economics, prices are the signals that guide economic decisions and thereby allocate resources.



5

## Elasticity and Its Application

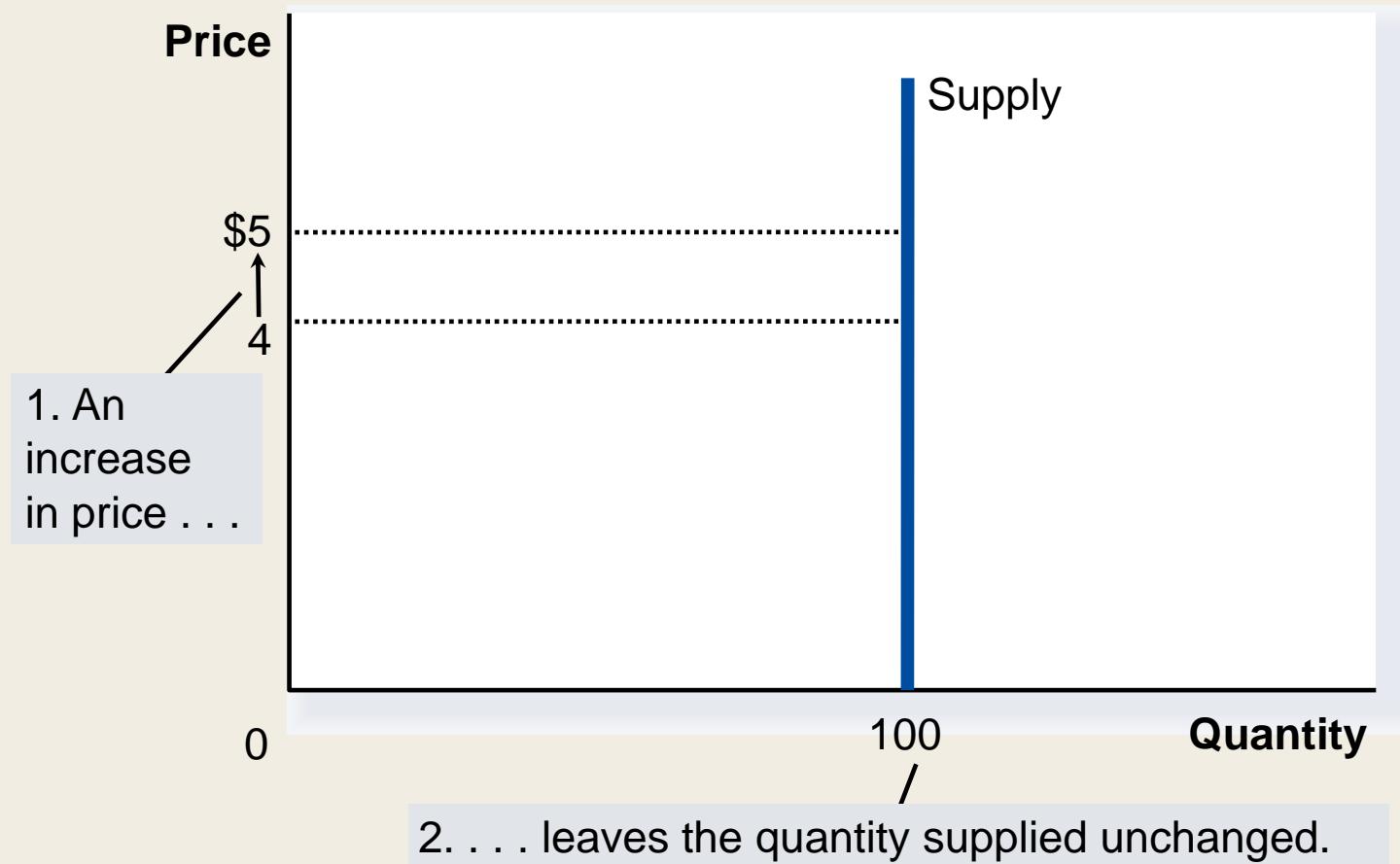


# THE ELASTICITY OF SUPPLY

- *Price elasticity of supply* is a measure of how much the quantity supplied of a good responds to a change in the price of that good.
- Price elasticity of supply is the percentage change in quantity supplied resulting from a percentage change in price.

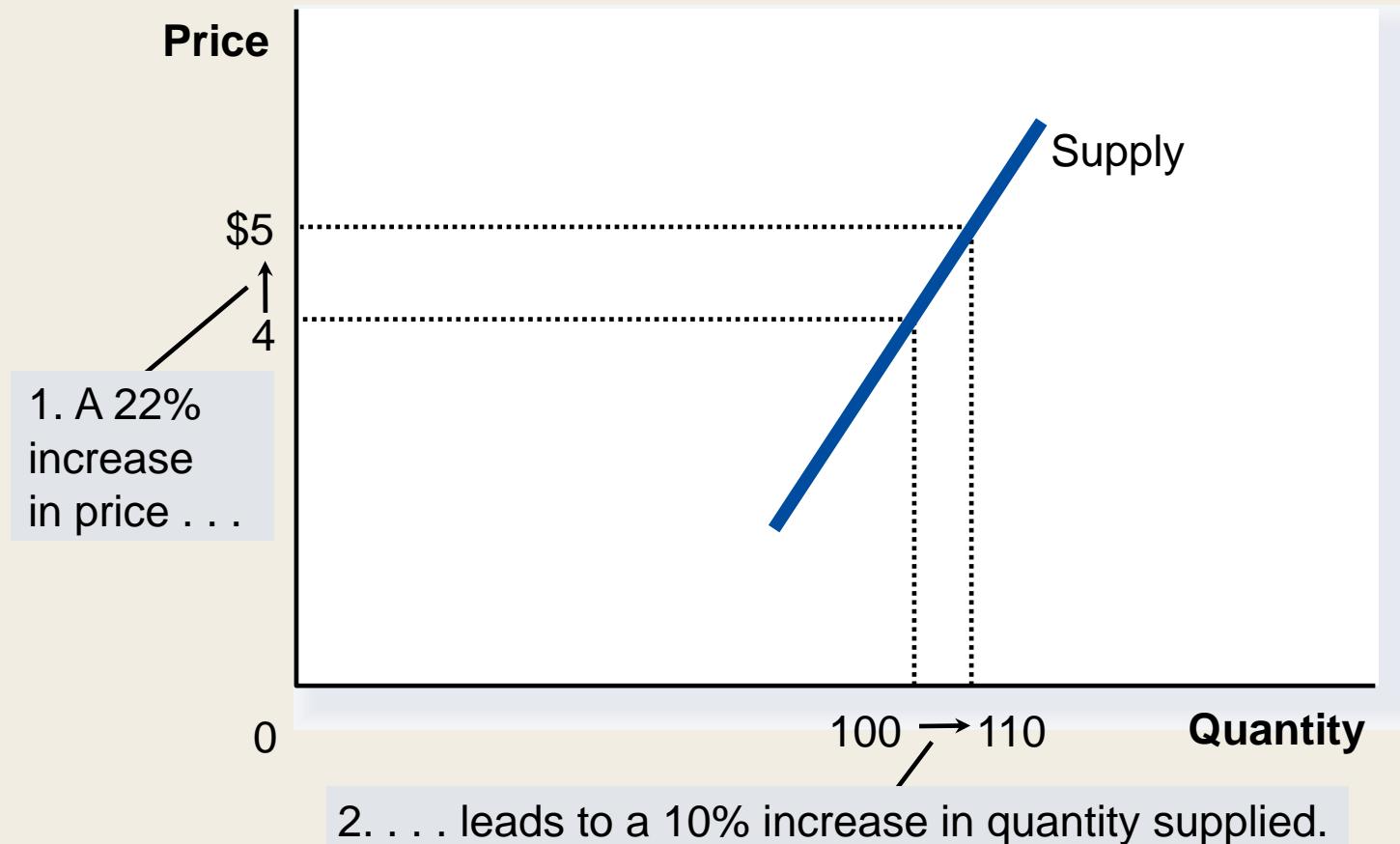
# Figure 5 The Price Elasticity of Supply

## (a) Perfectly Inelastic Supply: Elasticity Equals 0



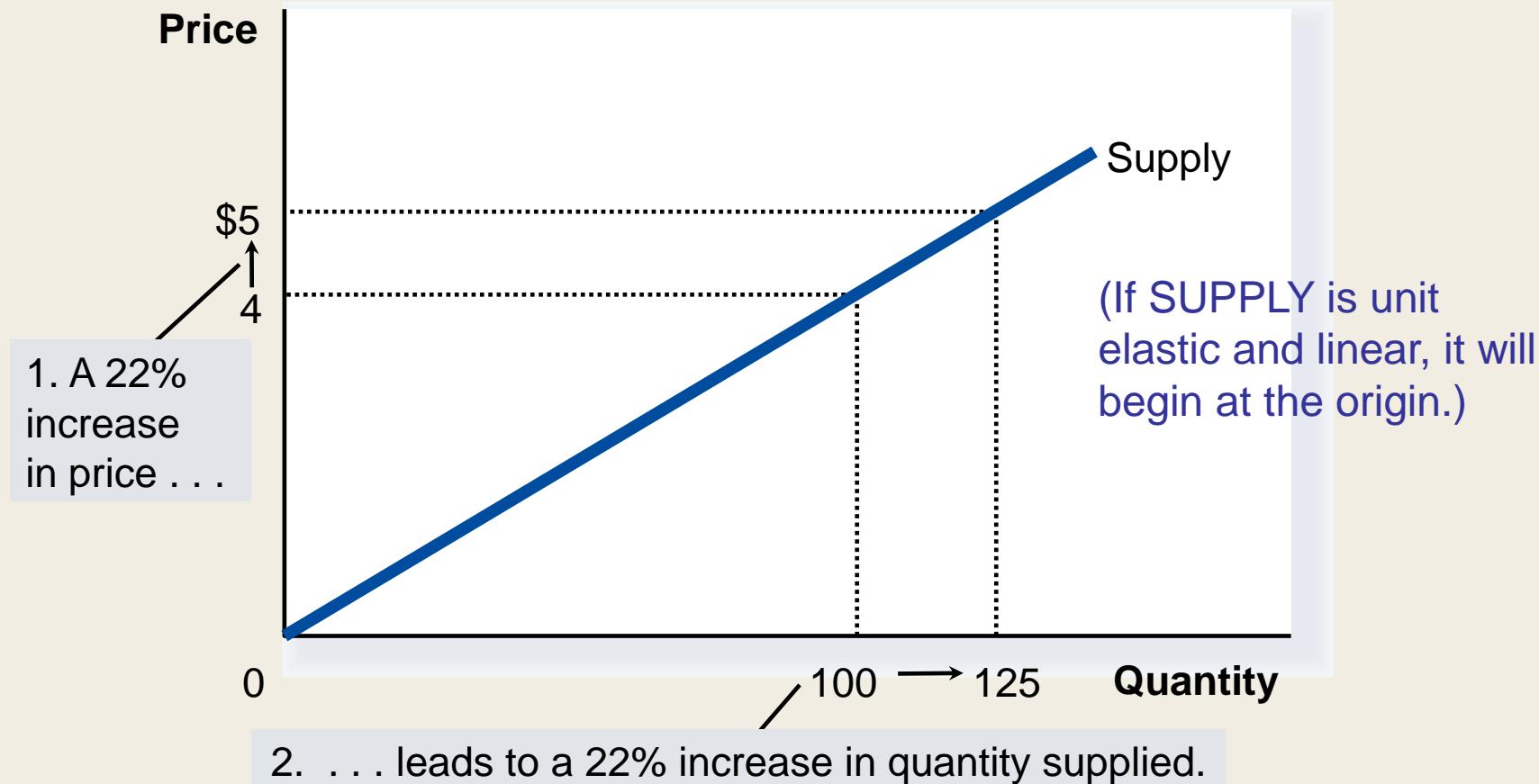
## Figure 5 The Price Elasticity of Supply

### (b) Inelastic Supply: Elasticity Is Less Than 1



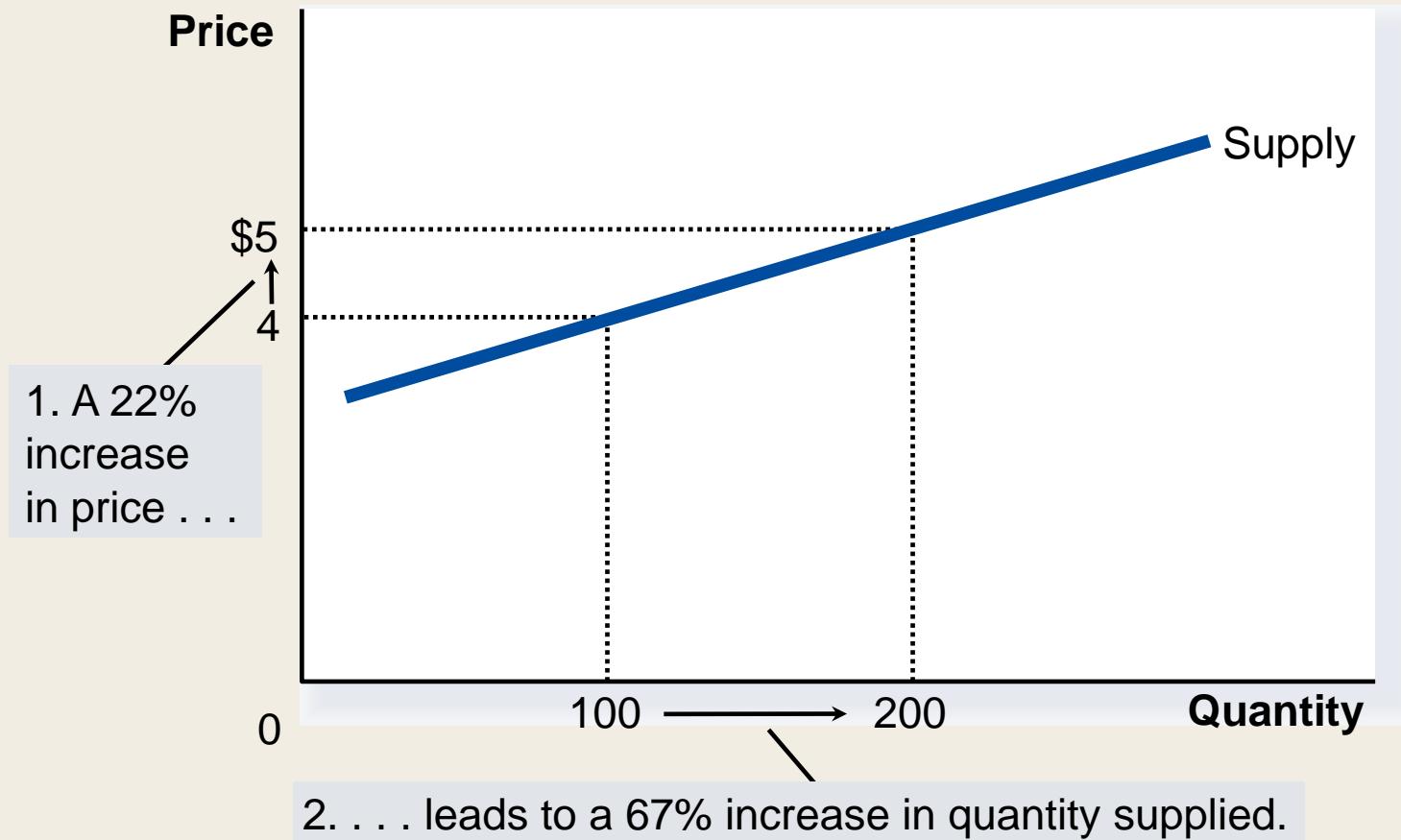
## Figure 5 The Price Elasticity of Supply

### (c) Unit Elastic Supply: Elasticity Equals 1



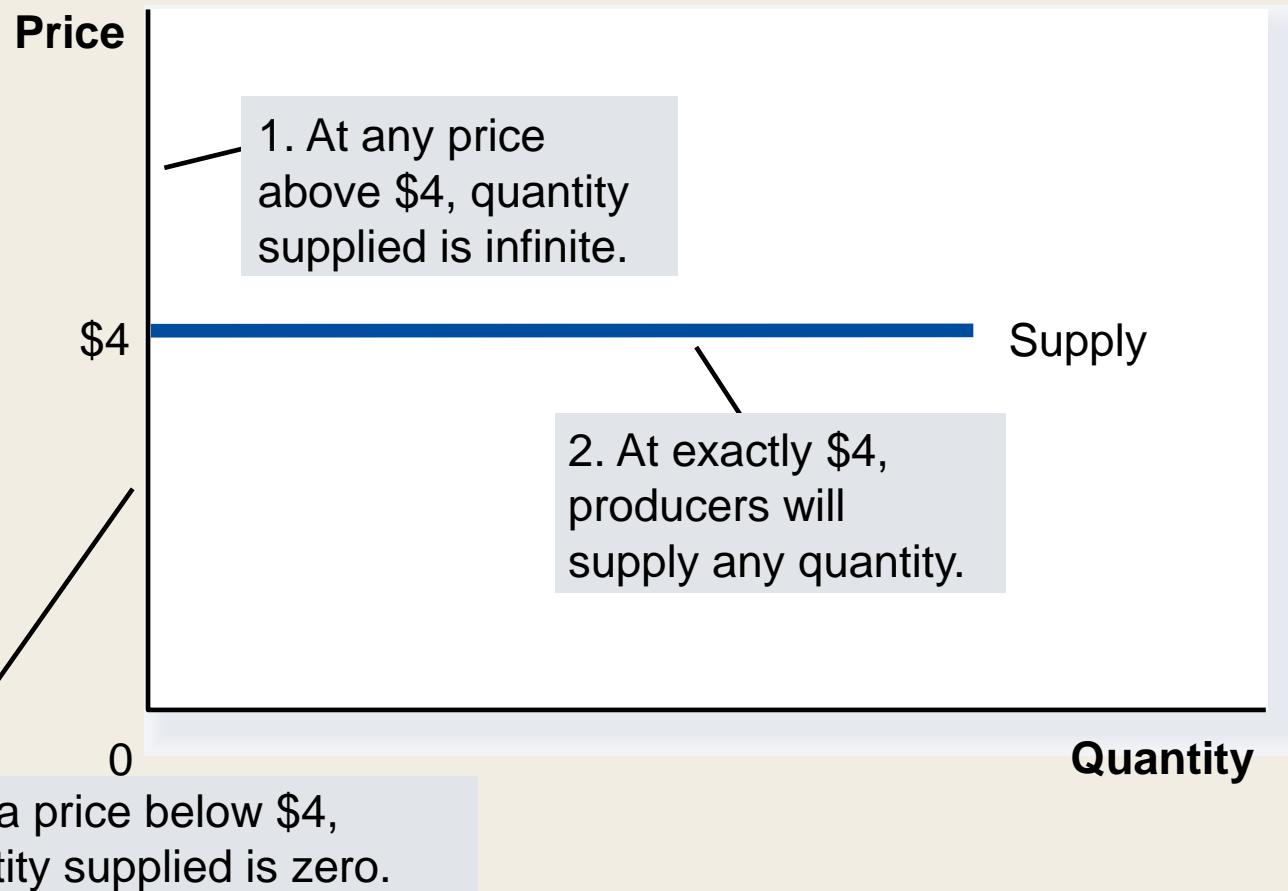
## Figure 5 The Price Elasticity of Supply

### (d) Elastic Supply: Elasticity Is Greater Than 1



## Figure 5 The Price Elasticity of Supply

### (e) Perfectly Elastic Supply: Elasticity Equals Infinity



# The Price Elasticity of Supply and Its Determinants

- Ability of sellers to change the amount of the good they produce.
  - Beach-front land is inelastic.
  - Books, cars, or manufactured goods are elastic.
- Time period
  - Supply is more elastic in the long run.

# Computing the Price Elasticity of Supply

- The price elasticity of supply is computed as the percentage change in the quantity supplied divided by the percentage change in price.

$$\text{Price elasticity of supply} = \frac{\text{Percentage change in quantity supplied}}{\text{Percentage change in price}}$$



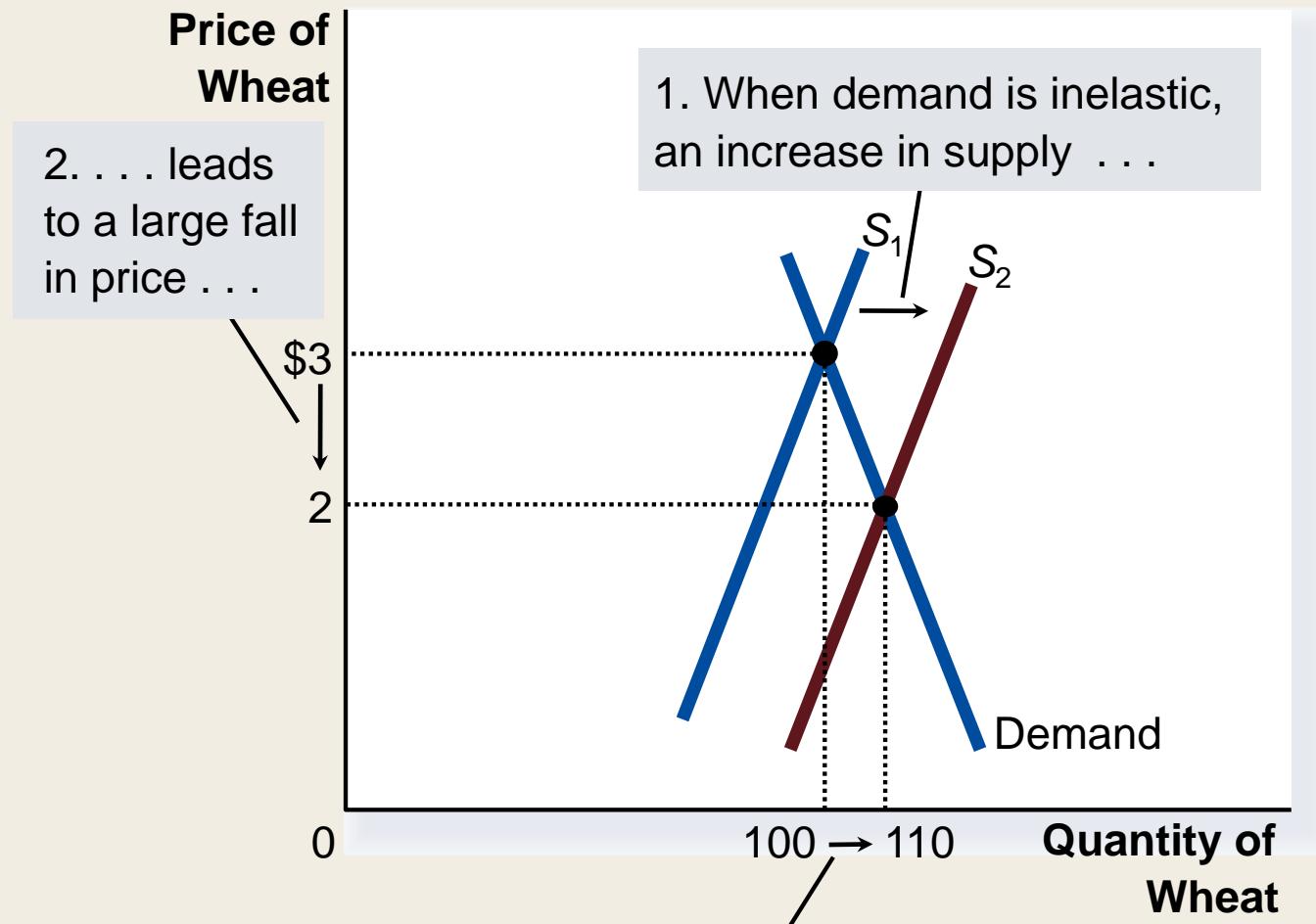
# TWO APPLICATIONS OF SUPPLY, DEMAND, AND ELASTICITY

- Can good news for farming be bad news for farmers?
- What happens to wheat farmers and the market for wheat when university agronomists discover a new wheat hybrid that is more productive than existing varieties?

# Can Good News for Farming Be Bad News for Farmers?

- Examine whether the supply or demand curve shifts.
- Determine the direction of the shift of the curve.
- Use the supply-and-demand diagram to see how the market equilibrium changes.

## Figure 7 An Increase in Supply in the Market for Wheat



3. . . and a proportionately smaller increase in quantity sold. As a result, revenue falls from \$300 to \$220.

## Compute the Price Elasticity of Demand When There Is a Change in Supply

$$E_D = \frac{\frac{100 - 110}{(100 + 110) / 2}}{(3.00 - 2.00) / 2}$$
$$= \frac{-0.095}{0.4} \approx -0.24$$

Demand is inelastic.

# Why Did OPEC Fail to Keep the Price of Oil High?

- Supply and Demand can behave differently in the short run and the long run
  - In the short run, both supply and demand for oil are relatively inelastic
  - But in the long run, both are elastic



5

## Elasticity and Its Application

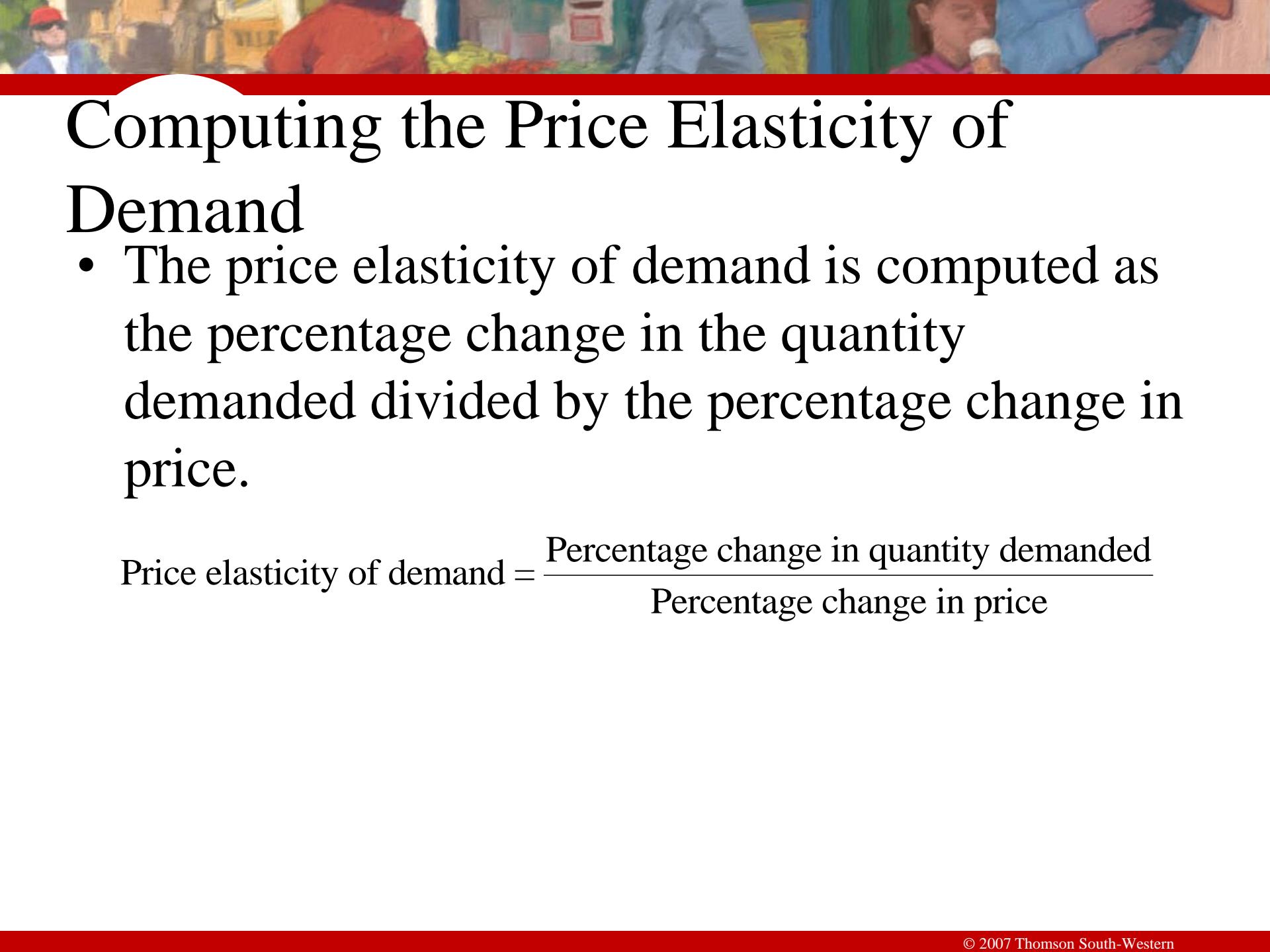
# Elasticity . . .

- ... allows us to analyze supply and demand with greater precision.
- ... is a measure of how much buyers and sellers respond to changes in market conditions



# THE ELASTICITY OF DEMAND

- The *price elasticity of demand* is a measure of how much the quantity demanded of a good responds to a change in the price of that good.
- When we talk about *elasticity*, that responsiveness is always measured in percentage terms.
- Specifically, the price elasticity of demand is the percentage change in quantity demanded due to a percentage change in the price.



# Computing the Price Elasticity of Demand

- The price elasticity of demand is computed as the percentage change in the quantity demanded divided by the percentage change in price.

$$\text{Price elasticity of demand} = \frac{\text{Percentage change in quantity demanded}}{\text{Percentage change in price}}$$

# The Price Elasticity of Demand and Its Determinants

- Availability of Close Substitutes
- Necessities versus Luxuries
- Definition of the Market
- Time Horizon

# The Price Elasticity of Demand and Its Determinants

- Demand tends to be more elastic:
  - the larger the number of close substitutes.
  - if the good is a luxury.
  - the longer the time period.

# The Midpoint Method: A Better Way to Calculate Percentage Changes and Elasticities

- The midpoint formula is preferable when calculating the price elasticity of demand because it gives the same answer regardless of the direction of the price change.

$$\text{Price elasticity of demand} = \frac{(Q_2 - Q_1)/[(Q_2 + Q_1)/2]}{(P_2 - P_1)/[(P_2 + P_1)/2]}$$

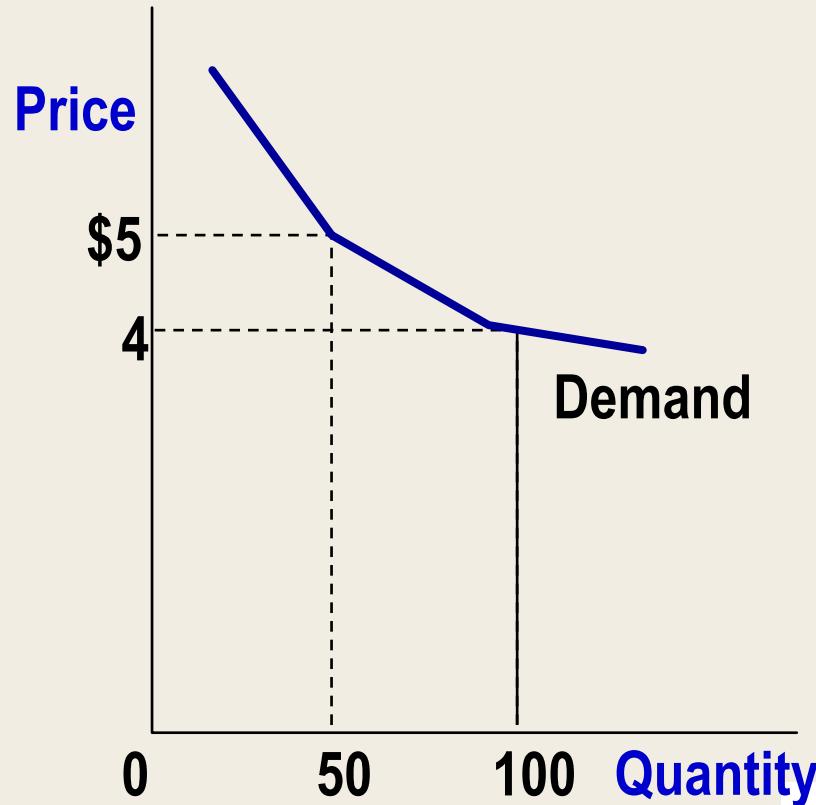
# The Midpoint Method: A Better Way to Calculate Percentage Changes and Elasticities

- Example: If the price of an ice cream cone increases from \$2.00 to \$2.20 and the amount you buy falls from 10 to 8 cones, then your elasticity of demand, using the midpoint formula, would be calculated as:  $x/y$ , where  $x=(8-10)/((10+8)/2)$ , and  $y=(2.20-2.00)/((2.00+2.20)/2) = -2.32$

# The Variety of Demand Curves

- Inelastic Demand
  - Quantity demanded does not respond strongly to price changes.
  - Absolute Value of Price elasticity of demand is between zero and one.
- Elastic Demand
  - Quantity demanded responds strongly to changes in price.
  - Absolute Value of Price elasticity of demand is greater than one.

## Computing the Price Elasticity of Demand



$$E_D = \frac{\frac{(100 - 50)}{(100 + 50)/2}}{\frac{(4.00 - 5.00)}{(4.00 + 5.00)/2}}$$
$$= \frac{67 \text{ percent}}{-22 \text{ percent}} = -3$$

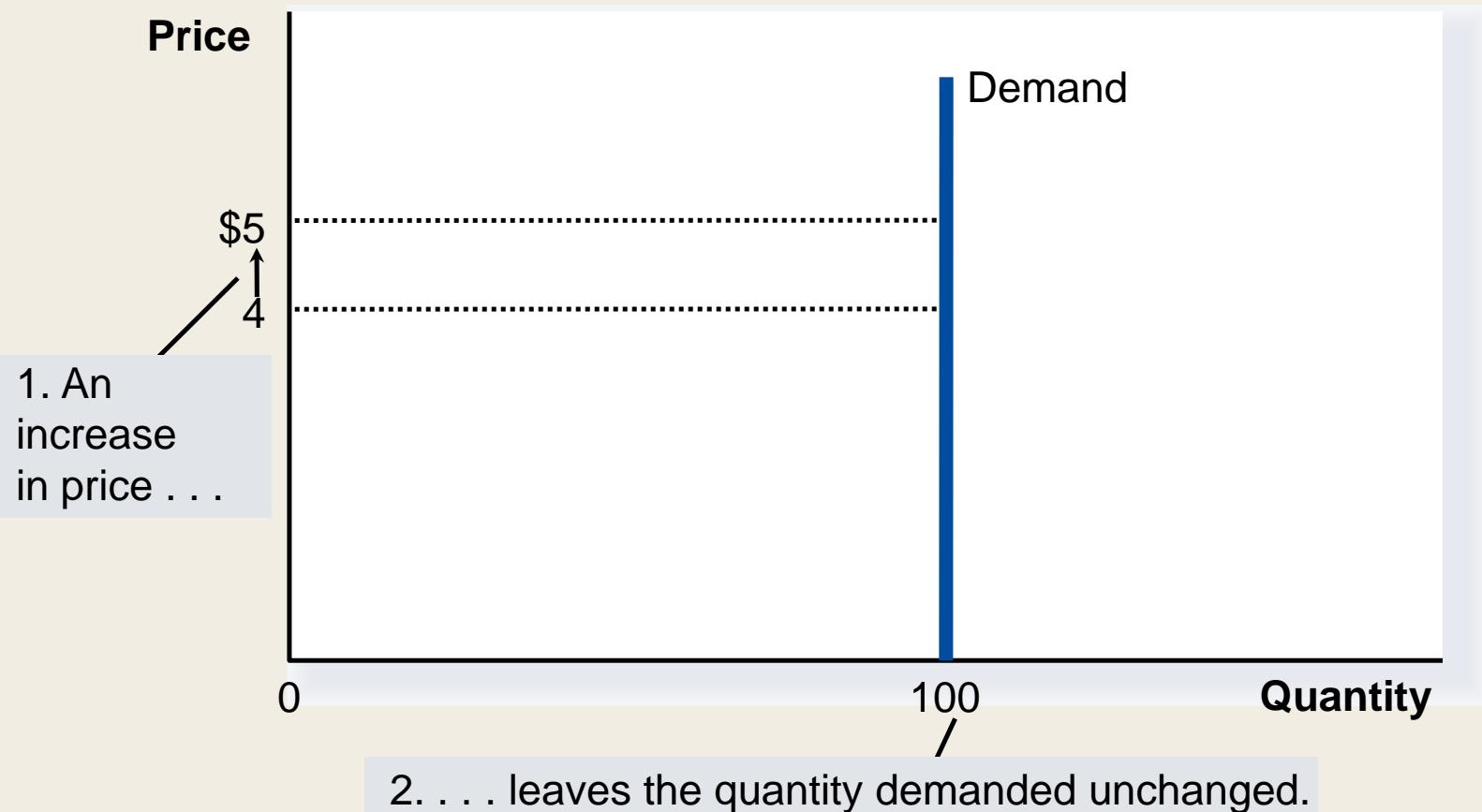
Demand is price elastic.

# The Variety of Demand Curves

- Perfectly Inelastic
  - Quantity demanded does not respond to price changes.
- Perfectly Elastic
  - Quantity demanded changes infinitely with any change in price.
- Unit Elastic
  - Quantity demanded changes by the same percentage as the price.

# Figure 1 The Price Elasticity of Demand

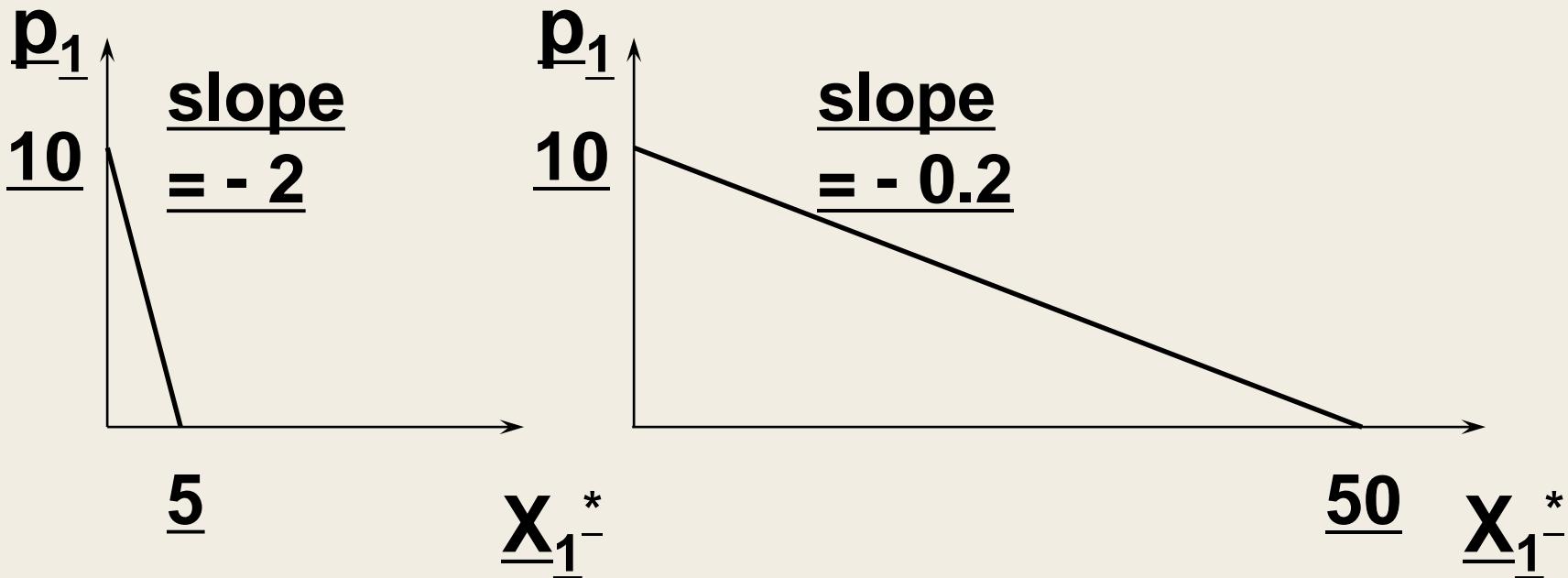
## (a) Perfectly Inelastic Demand: Elasticity Equals 0



## The Variety of Demand Curves

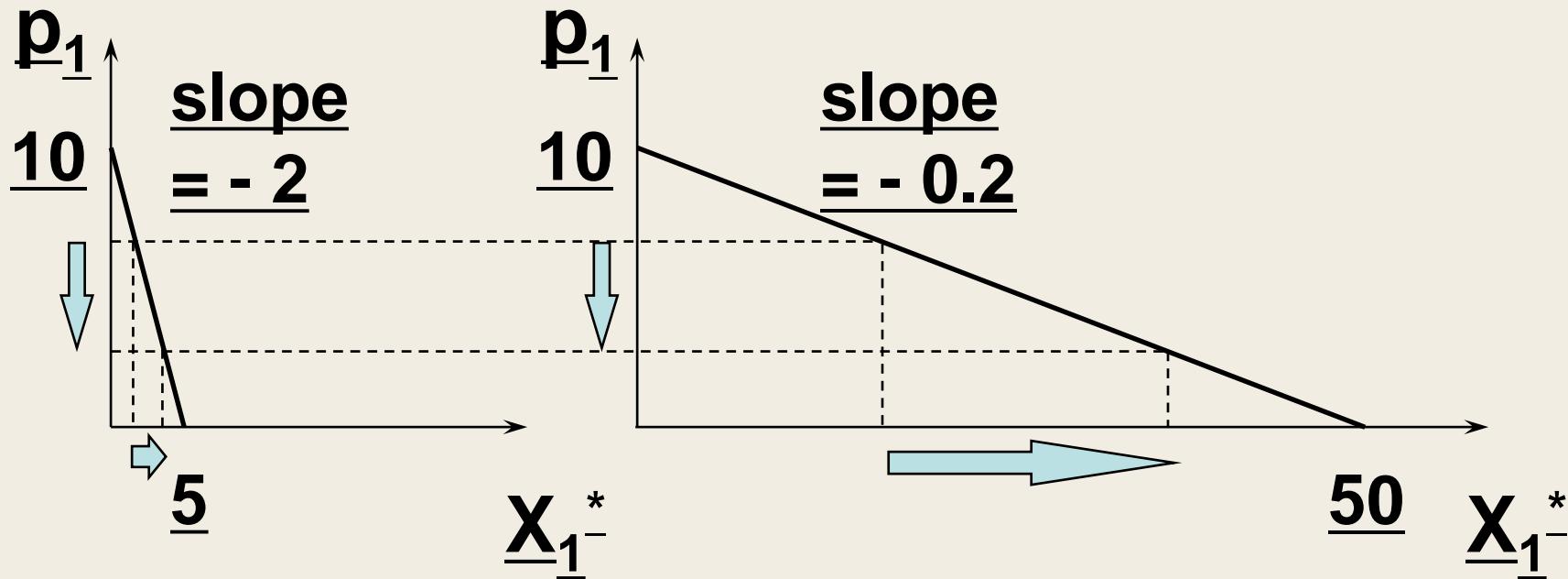
- Because the price elasticity of demand measures how much quantity demanded responds to the price, it is closely related to the slope of the demand curve.
- But it is not the same thing as the slope!

## Own-Price Elasticity of Demand



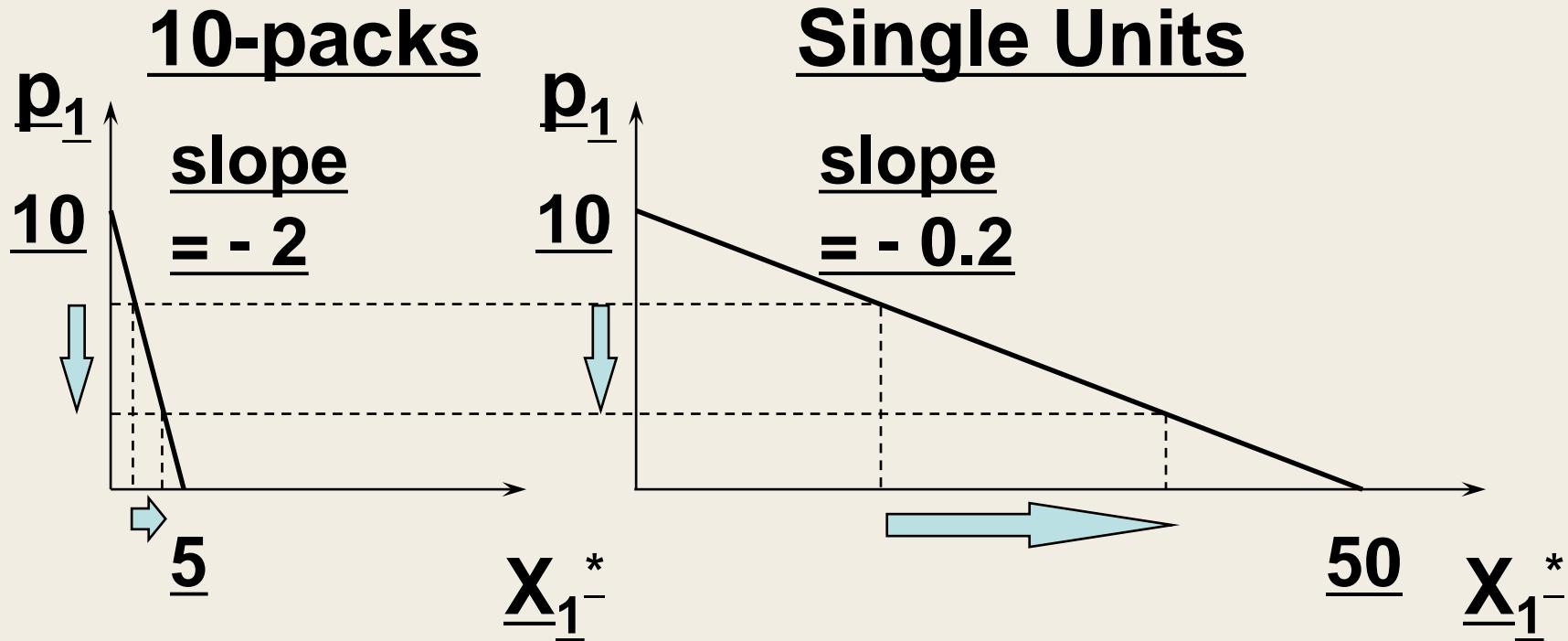
In which case is the quantity demanded  $\underline{x}_1^*$  more sensitive to changes to  $p_1$ ?

## Own-Price Elasticity of Demand



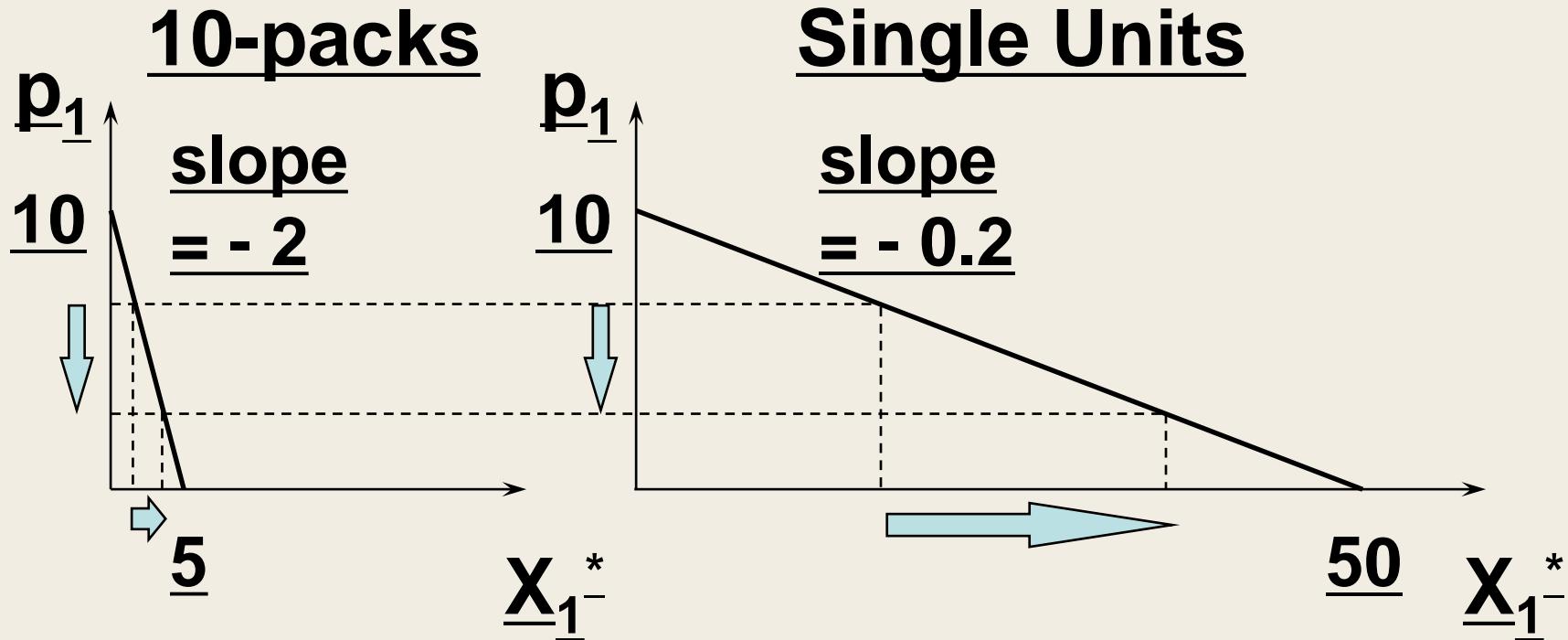
In which case is the quantity demanded  $X_1^*$  more sensitive to changes to  $p_1$ ?

## Own-Price Elasticity of Demand



In which case is the quantity demanded  $\underline{x_1}^*$  more sensitive to changes to  $\underline{p_1}$ ?

## Own-Price Elasticity of Demand



In which case is the quantity demanded  $\underline{x_1}^*$  more sensitive to changes to  $p_1$ ?  
It is the same in both cases.

## Own-Price Elasticity of Demand

- Q: Why not just use the slope of a demand curve to measure the sensitivity of quantity demanded to a change in a commodity's own price?
- A: Because the value of sensitivity then depends upon the (arbitrary) units of measurement used for quantity demanded.

## Own-Price Elasticity of Demand

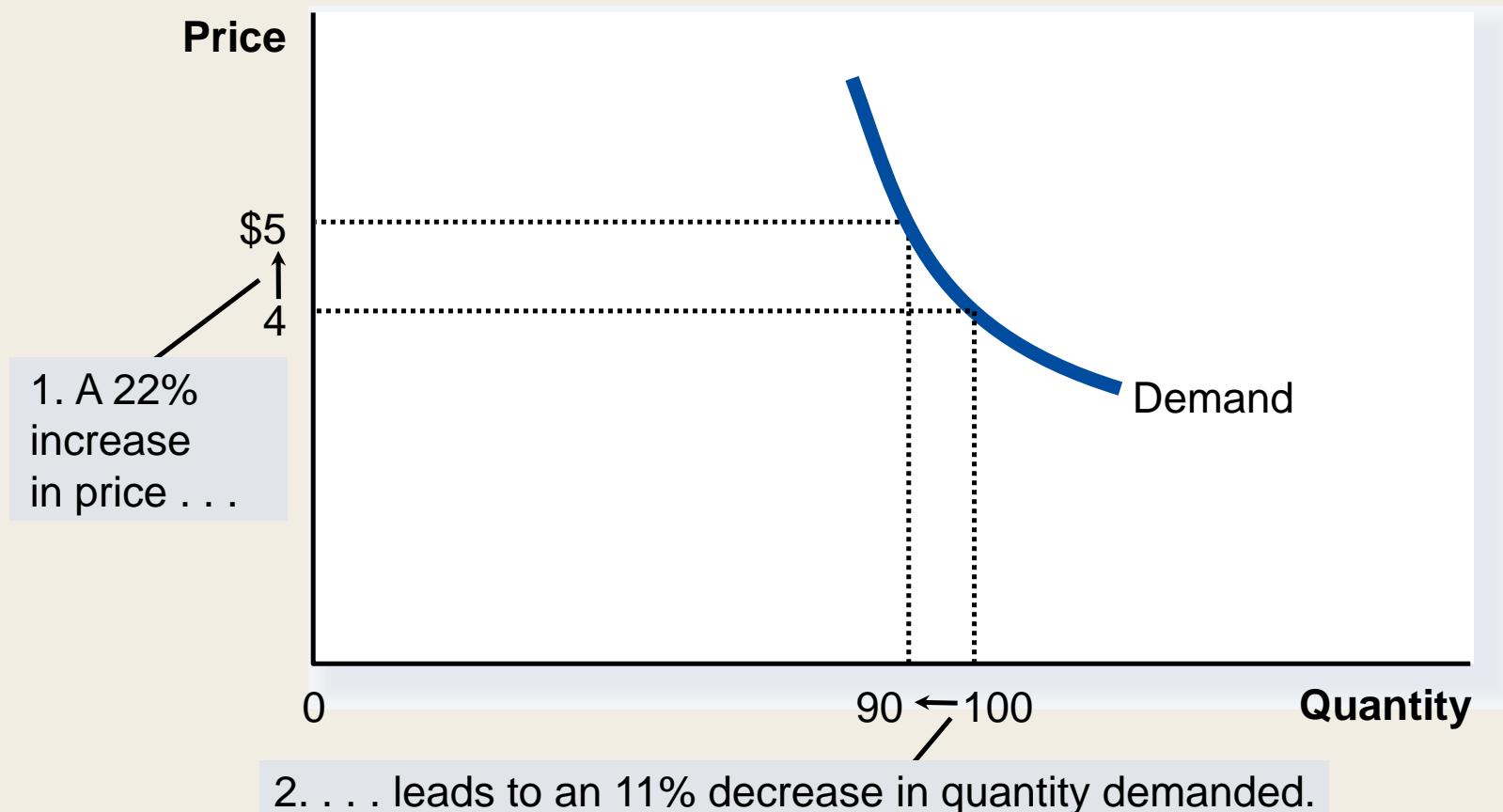
$$\varepsilon_{x_1^*, p_1}^* = \frac{\% \Delta x_1^*}{\% \Delta p_1}$$

is a ratio of percentages and so has no units of measurement.

Hence own-price elasticity of demand is a sensitivity measure that is independent of units of measurement.

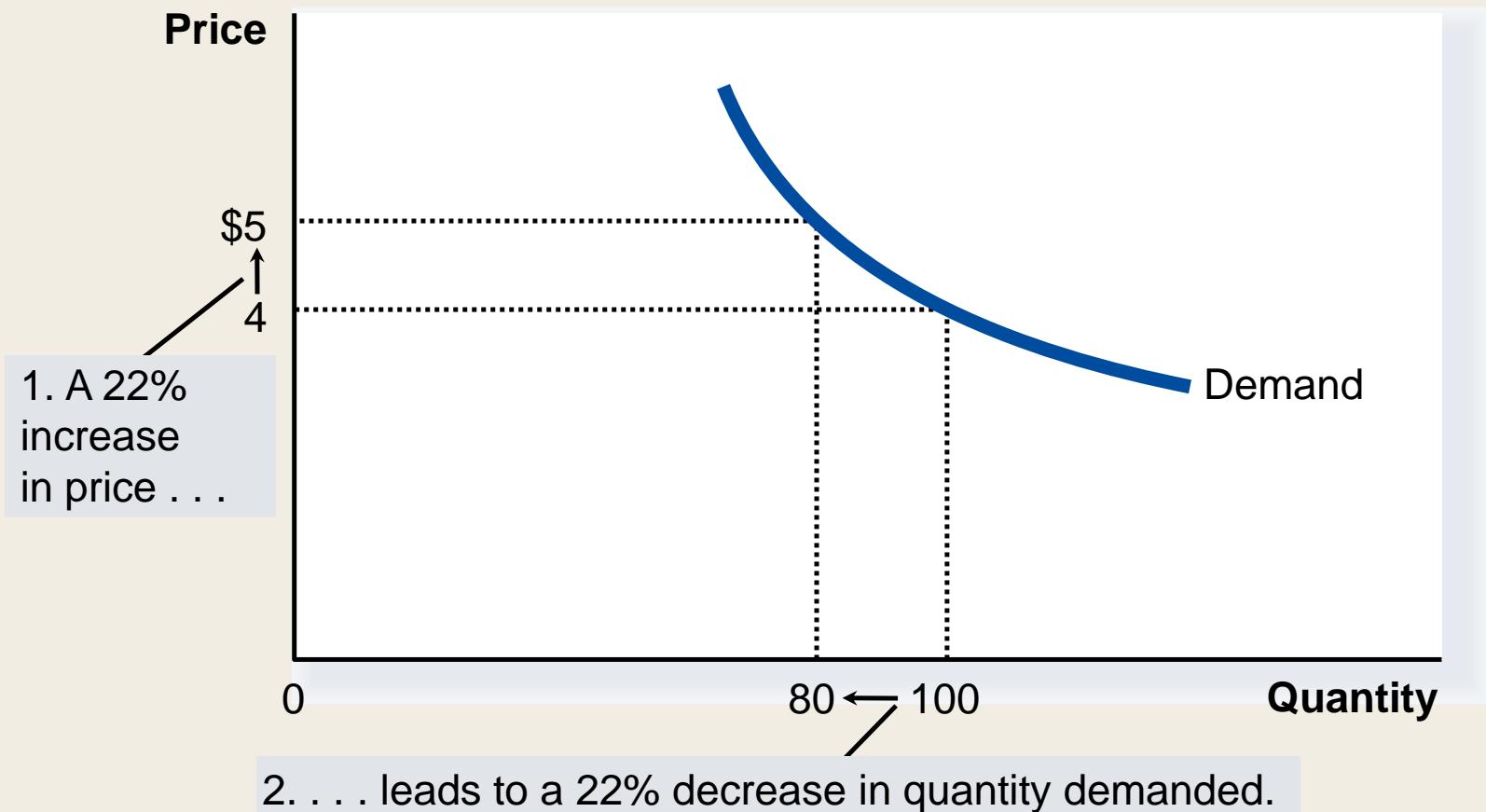
# Figure 1 The Price Elasticity of Demand

(b) Inelastic Demand: Absolute value of Elasticity Is Between 0 and 1



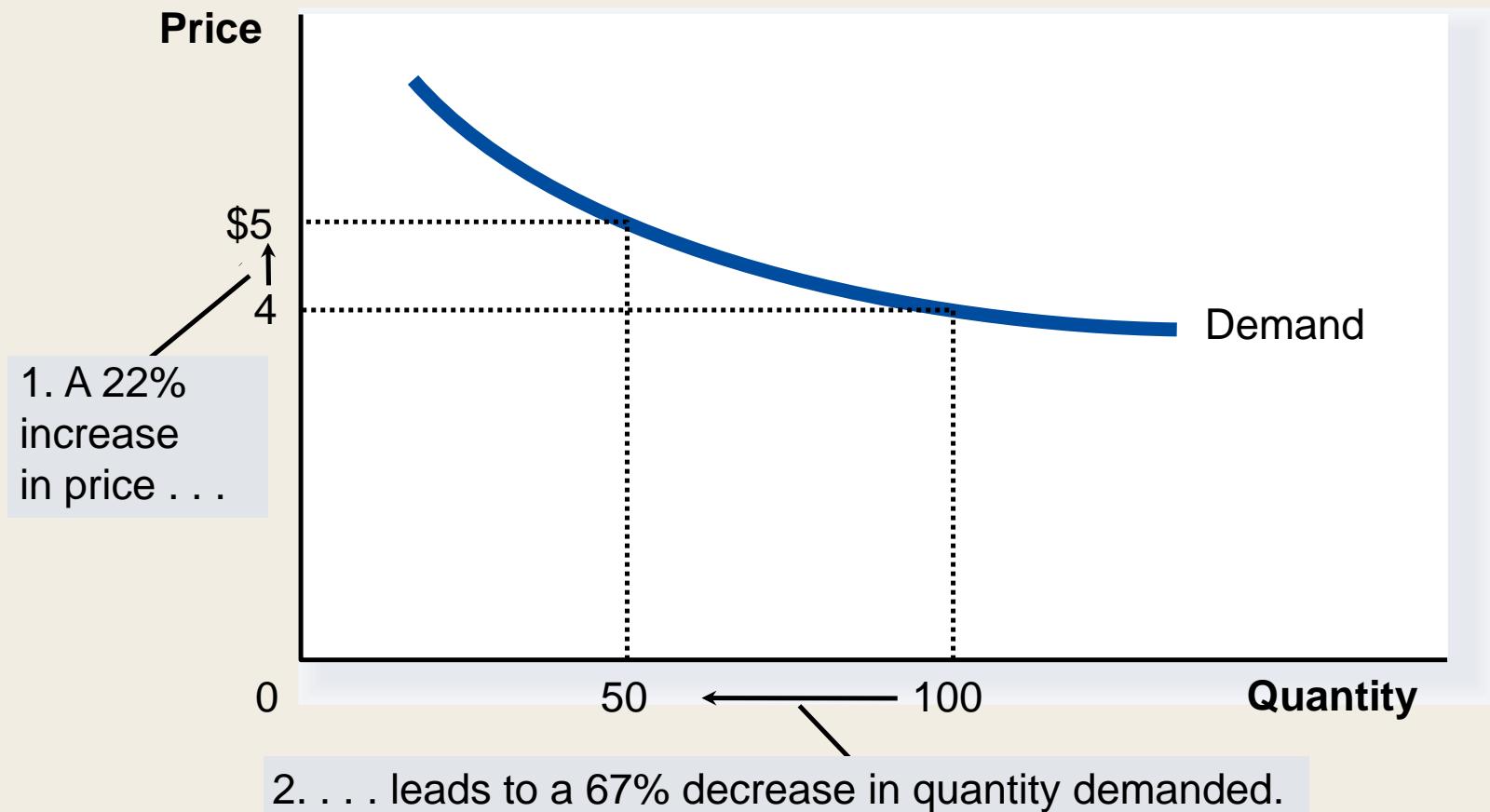
# Figure 1 The Price Elasticity of Demand

## (c) Unit Elastic Demand: Absolute value of Elasticity Equals 1



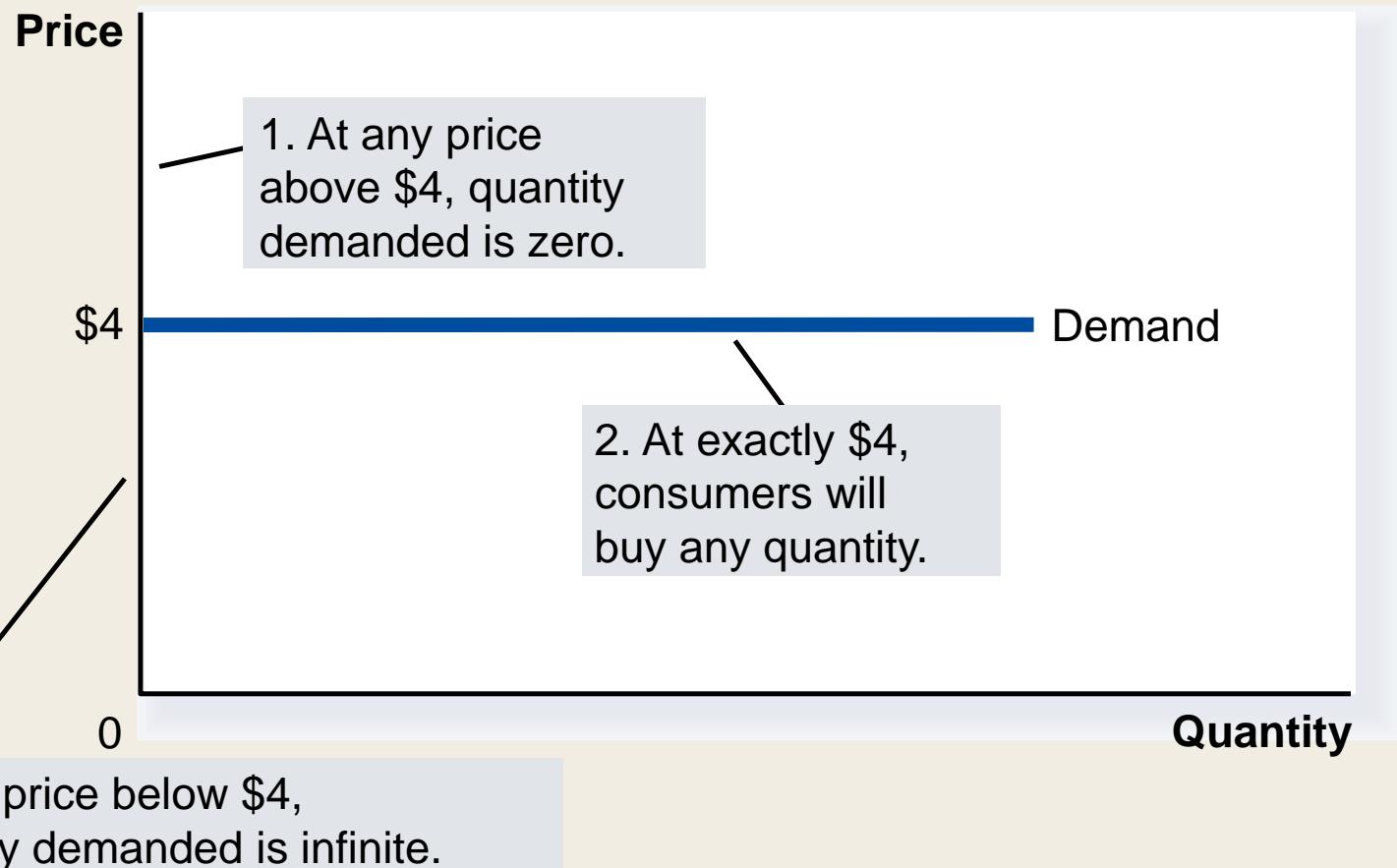
# Figure 1 The Price Elasticity of Demand

(d) Elastic Demand: Absolute value of Elasticity Is Greater Than 1



# Figure 1 The Price Elasticity of Demand

## (e) Perfectly Elastic Demand: Absolute value of Elasticity Equals Infinity

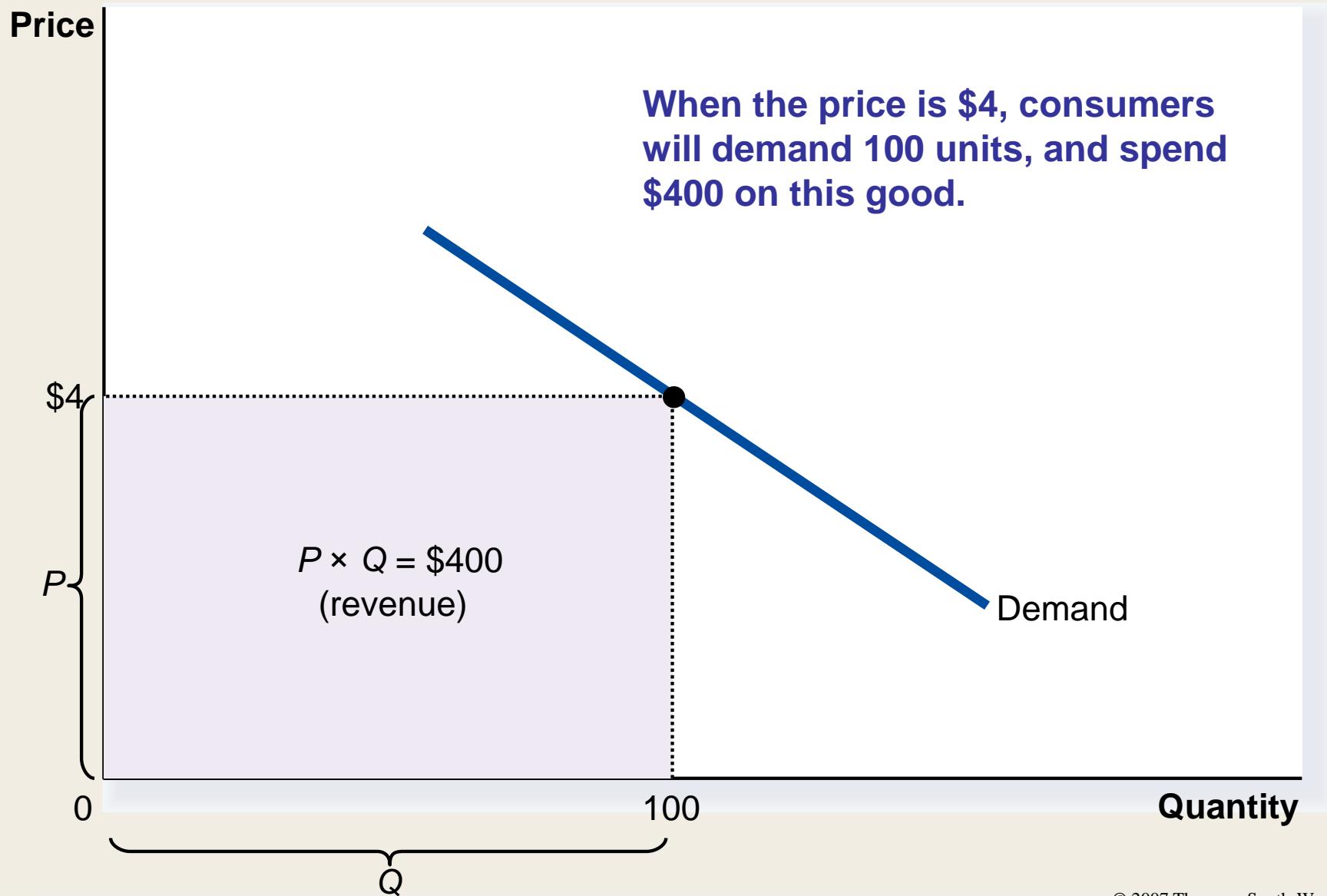


# Total Revenue and the Price Elasticity of Demand

- *Total revenue* is the amount paid by buyers and received by sellers of a good.
- Computed as the price of the good times the quantity sold.

$$TR = P \times Q$$

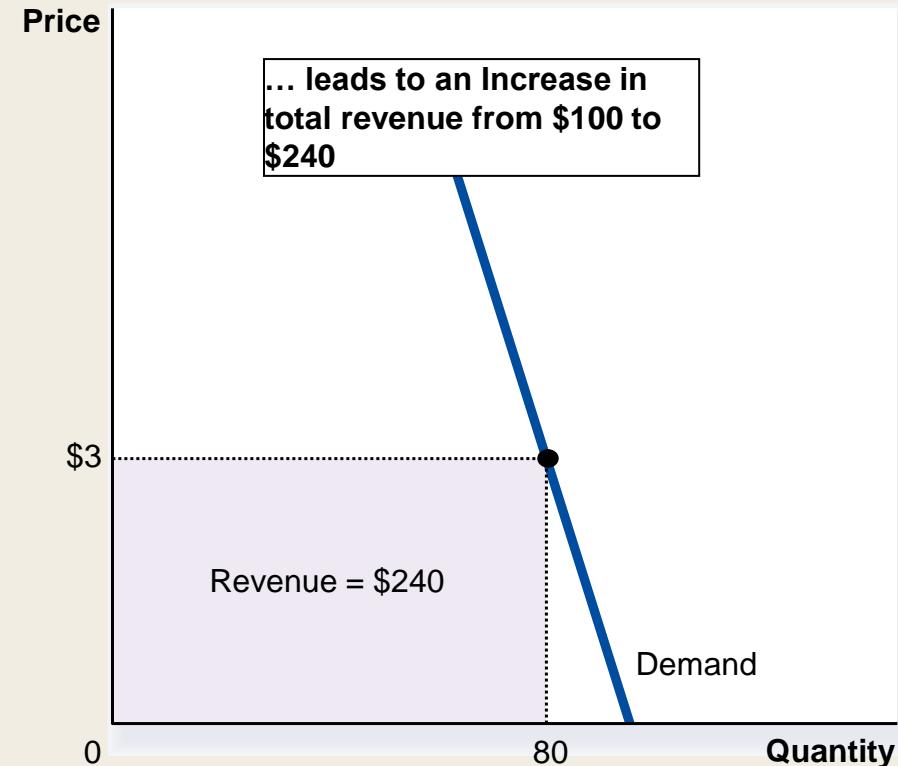
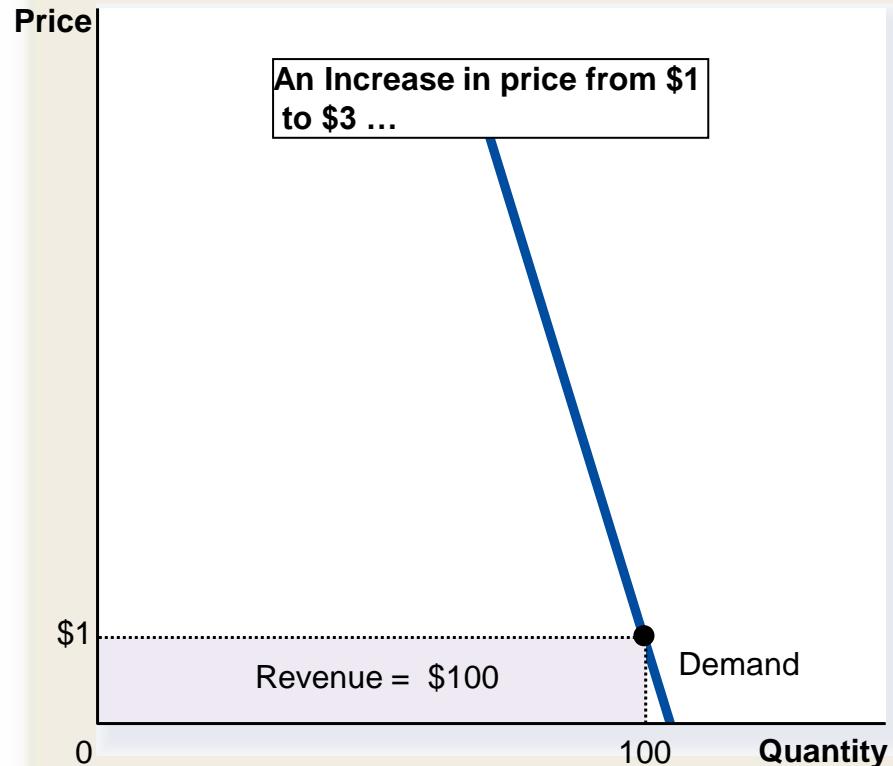
## Figure 2 Total Revenue



# Elasticity and Total Revenue along a Linear Demand Curve

- With an inelastic demand curve, an increase in price leads to a decrease in quantity that is proportionately smaller. Thus, total revenue increases.

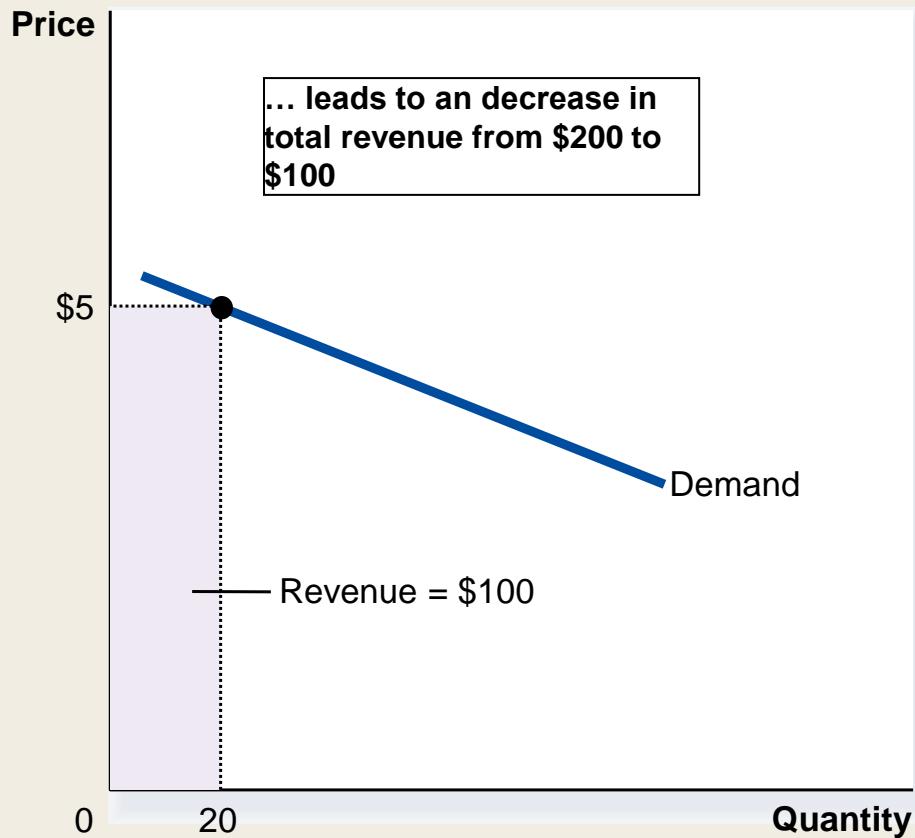
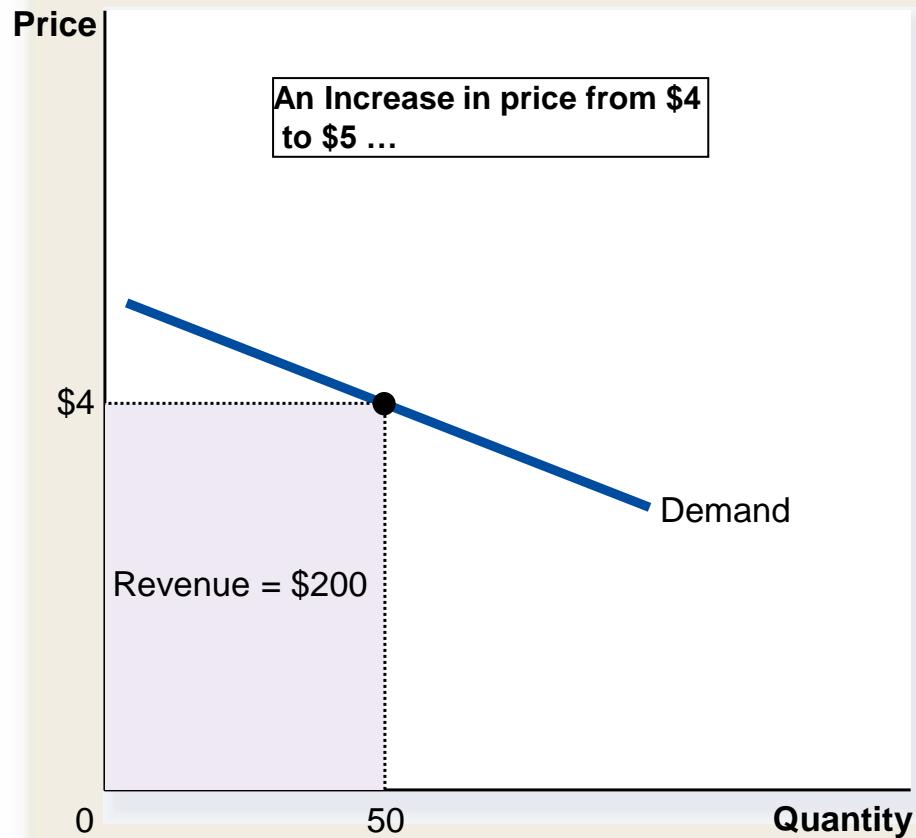
## Figure 3 How Total Revenue Changes When Price Changes: Inelastic Demand



## Elasticity and Total Revenue along a Linear Demand Curve

- With an elastic demand curve, an increase in the price leads to a decrease in quantity demanded that is proportionately larger. Thus, *total revenue decreases*.

## Figure 3 How Total Revenue Changes When Price Changes: Elastic Demand

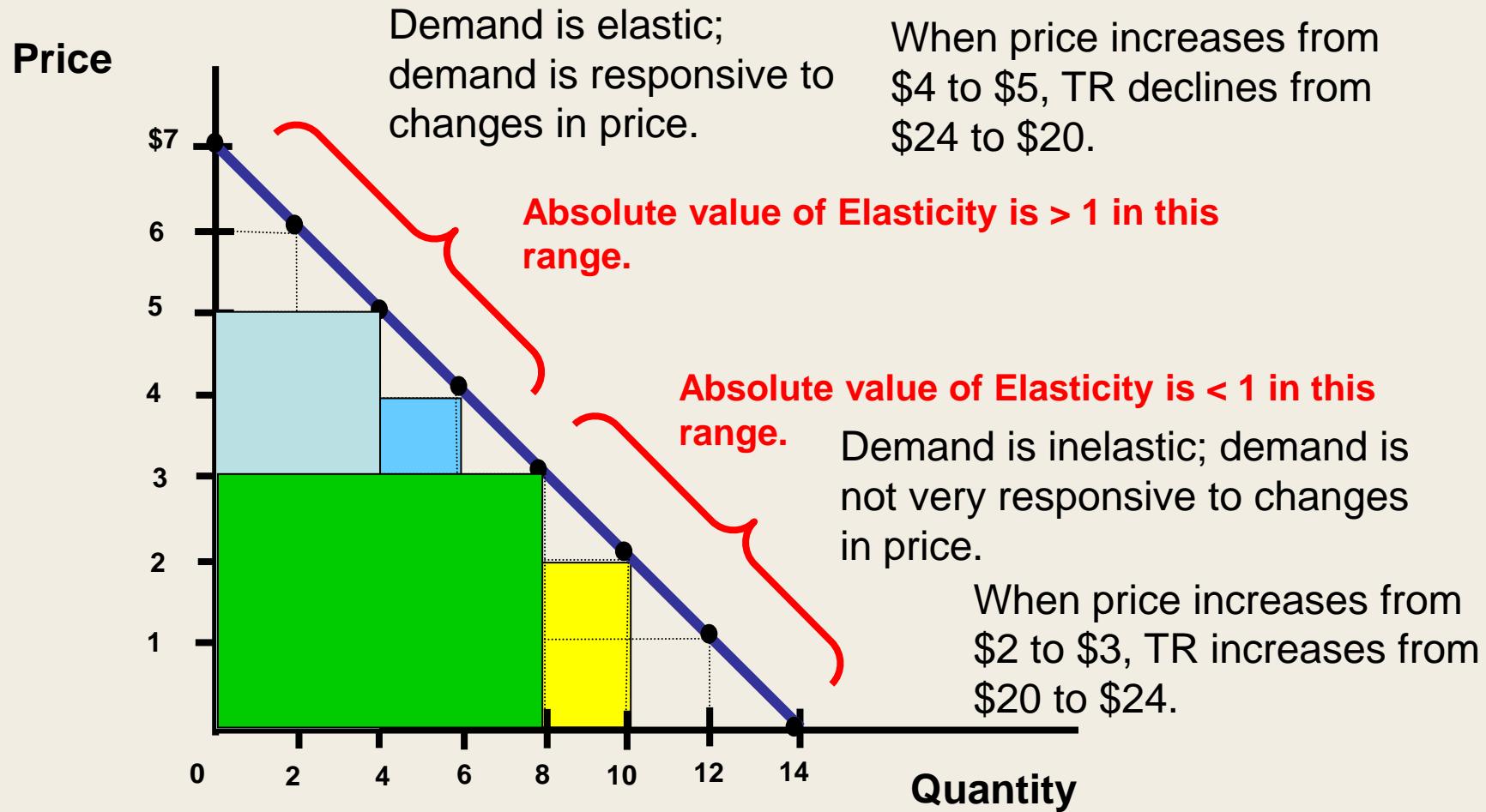


Note that with each price increase, the Law of Demand still holds – an increase in price leads to a decrease in the quantity demanded. It is the change in TR that varies!

# Elasticity of a Linear Demand Curve

Price	Quantity	Total Revenue (Price × Quantity)	Percent Change in Price	Percent Change in Quantity	Elasticity	Description
\$7	0	\$0				
6	2	12	15	200	13.0	Elastic
5	4	20	18	67	3.7	Elastic
4	6	24	22	40	1.8	Elastic
3	8	24	29	29	1.0	Unit elastic
2	10	20	40	22	0.6	Inelastic
1	12	12	67	18	0.3	Inelastic
0	14	0	200	15	0.1	Inelastic

## Figure 4 Elasticity of a Linear Demand Curve



# Other Demand Elasticities

- Income Elasticity of Demand
  - *Income elasticity of demand* measures how much the quantity demanded of a good responds to a change in consumers' income.
  - It is computed as the percentage change in the quantity demanded divided by the percentage change in income.

# Other Demand Elasticities

- Computing Income Elasticity

Income elasticity of demand = 
$$\frac{\text{Percentage change in quantity demanded}}{\text{Percentage change in income}}$$

**Remember, all elasticities are measured by dividing one percentage change by another**

# Other Demand Elasticities

- Income Elasticity
  - Types of Goods
    - Normal Goods: Income elasticity is positive
    - Inferior Goods: Income elasticity is negative
  - Higher income raises the quantity demanded for normal goods but lowers the quantity demanded for inferior goods.

# Other Demand Elasticities

- Income Elasticity
  - Goods consumers regard as necessities tend to be income inelastic
    - Examples include food, fuel, clothing, utilities, and medical services.
  - Goods consumers regard as luxuries tend to be income elastic.
    - Examples include sports cars, furs, and expensive foods.

# Other Demand Elasticities

- *Cross-price elasticity of demand*
  - A measure of how much the quantity demanded of one good responds to a change in the price of another good, computed as the percentage change in quantity demanded of the first good divided by the percentage change in the price of the second good
  - For complements, cross price elasticity is negative
  - For substitutes, cross price elasticity is positive

$$\text{Cross - price elasticity of demand} = \frac{\% \text{change in quantity demanded of good 1}}{\% \text{change in price of good 2}}$$

# Summary

---

- Price elasticity of demand measures how much the quantity demanded responds to changes in the price.
- Price elasticity of demand is calculated as the percentage change in quantity demanded divided by the percentage change in price.
  - If a demand curve is elastic, total revenue falls when the price rises.
  - If it is inelastic, total revenue rises as the price rises.

# Summary

---

- The income elasticity of demand measures how much the quantity demanded responds to changes in consumers' income.
- The cross-price elasticity of demand measures how much the quantity demanded of one good responds to the price of another good.
- The price elasticity of supply measures how much the quantity supplied responds to changes in the price.

# Summary

---

- In most markets, supply is more elastic in the long run than in the short run.
- The price elasticity of supply is calculated as the percentage change in quantity supplied divided by the percentage change in price.
- The tools of supply and demand can be applied in many different types of markets.



# 6

## Supply, Demand, and Government Policies



# Supply, Demand, and Government Policies

- In a free, unregulated market system, market forces establish equilibrium prices and exchange quantities.
- While equilibrium conditions may be efficient, it may be true that not everyone is satisfied.
- One of the roles of economists is to use their theories to assist in the development of policies.



# CONTROLS ON PRICES

- Are usually enacted when policymakers believe the market price is unfair to buyers or sellers.
- Result in government-created price ceilings and floors.



# CONTROLS ON PRICES

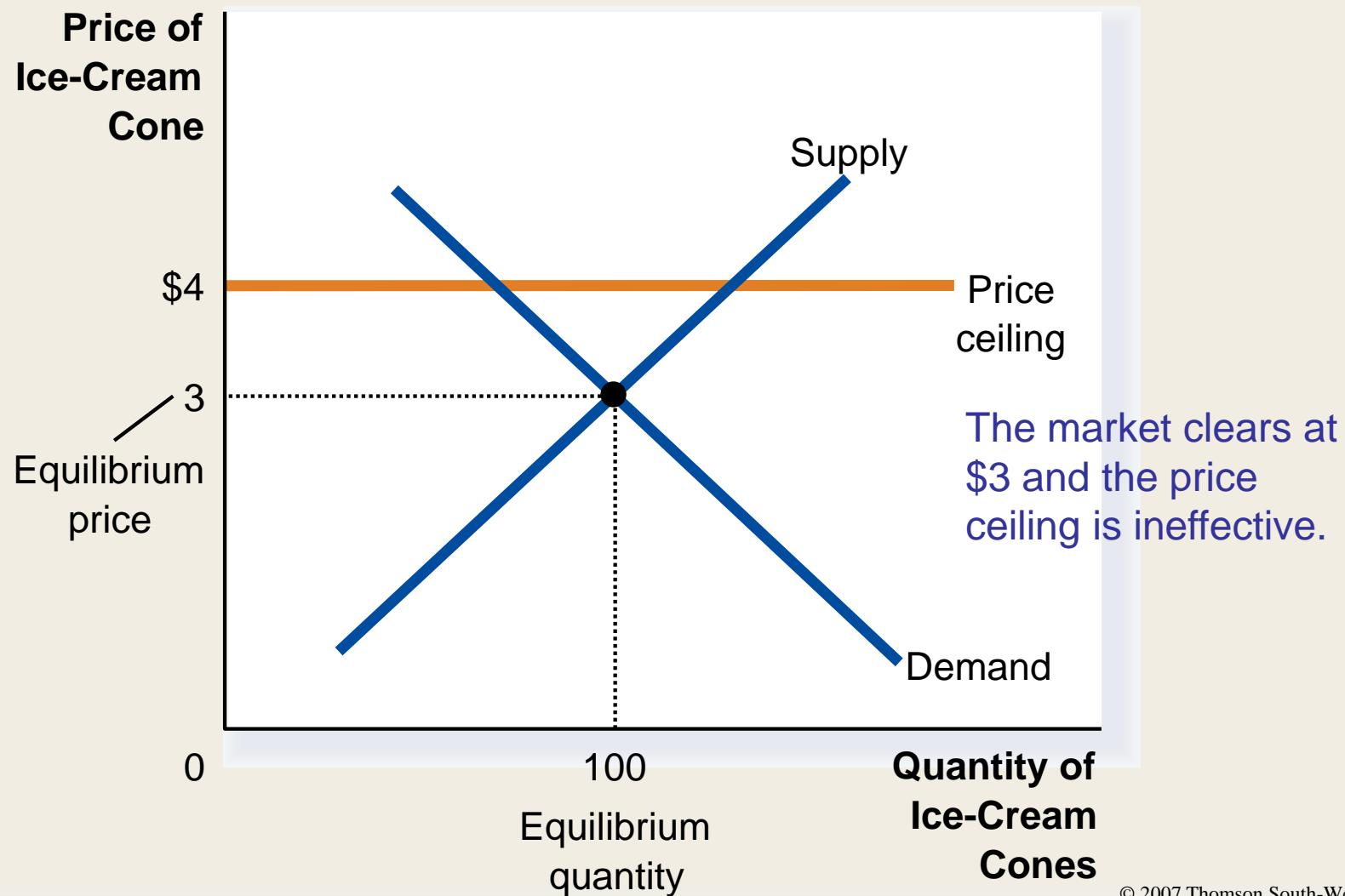
- *Price Ceiling*
  - A legal *maximum* on the price at which a good can be sold.
- *Price Floor*
  - A legal *minimum* on the price at which a good can be sold.

# How Price Ceilings Affect Market Outcomes

- Two outcomes are possible when the government imposes a price ceiling:
  - The price ceiling is not binding if set above the equilibrium price.
  - The price ceiling is binding if set below the equilibrium price, leading to a shortage.

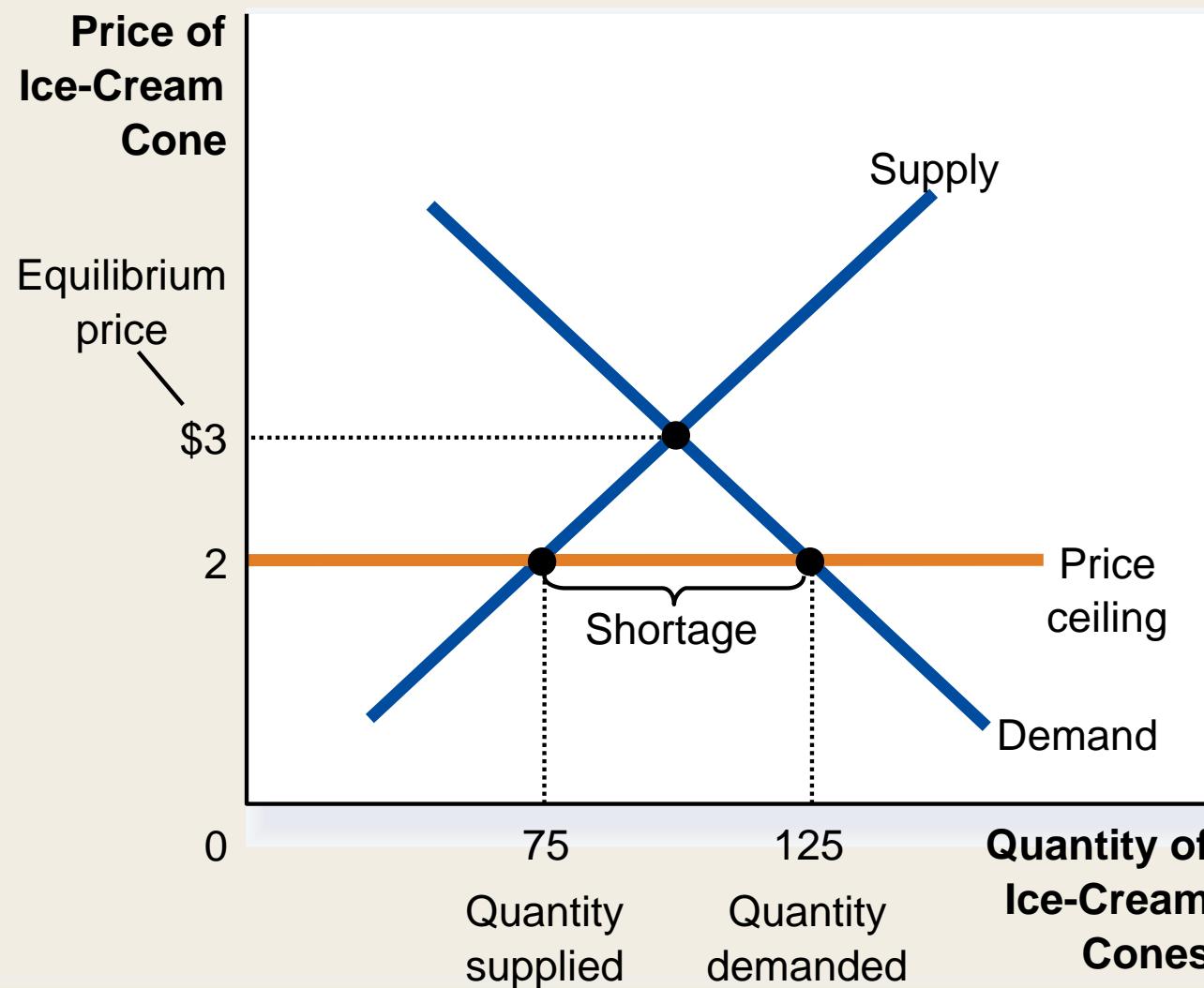
# Figure 1 A Market with a Price Ceiling

## (a) A Price Ceiling That Is Not Binding



# Figure 1 A Market with a Price Ceiling

## (b) A Price Ceiling That Is Binding



# How Price Ceilings Affect Market Outcomes

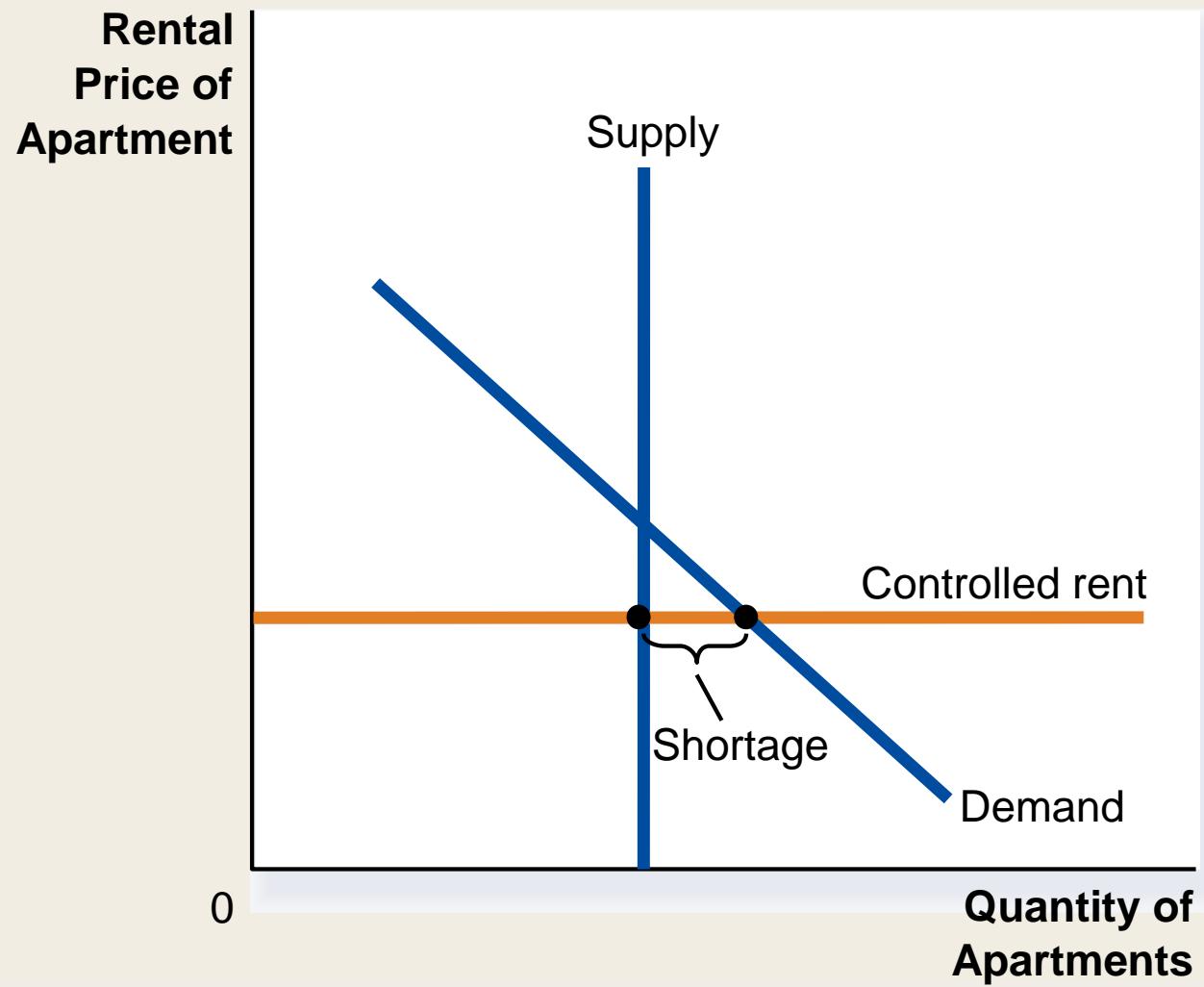
- Effects of Price Ceilings
- A binding price ceiling creates
  - Shortages because  $Q_D > Q_S$ .
    - Example: Gasoline shortage of the 1970s
  - Nonprice rationing
    - Examples: Long lines, discrimination by sellers

# CASE STUDY: Rent Control in the Short Run and Long Run

- Rent controls are ceilings placed on the rents that landlords may charge their tenants.
- The goal of rent control policy is to help the poor by making housing more affordable.

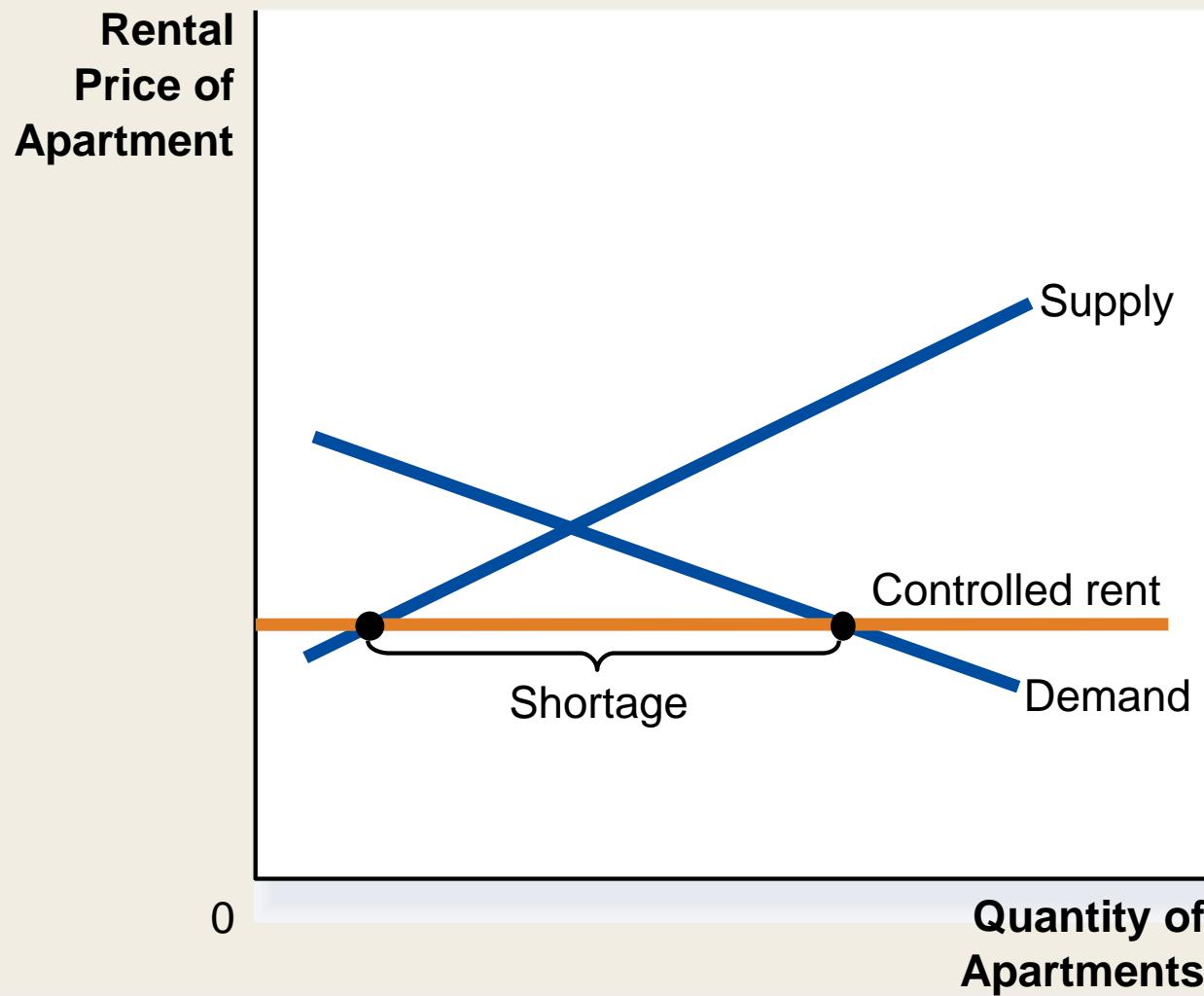
# Figure 3 Rent Control in the Short Run and in the Long Run

(a) Rent Control in the Short Run  
(supply and demand are inelastic)



## Figure 3 Rent Control in the Short Run and in the Long Run

(b) Rent Control in the Long Run  
(supply and demand are elastic)

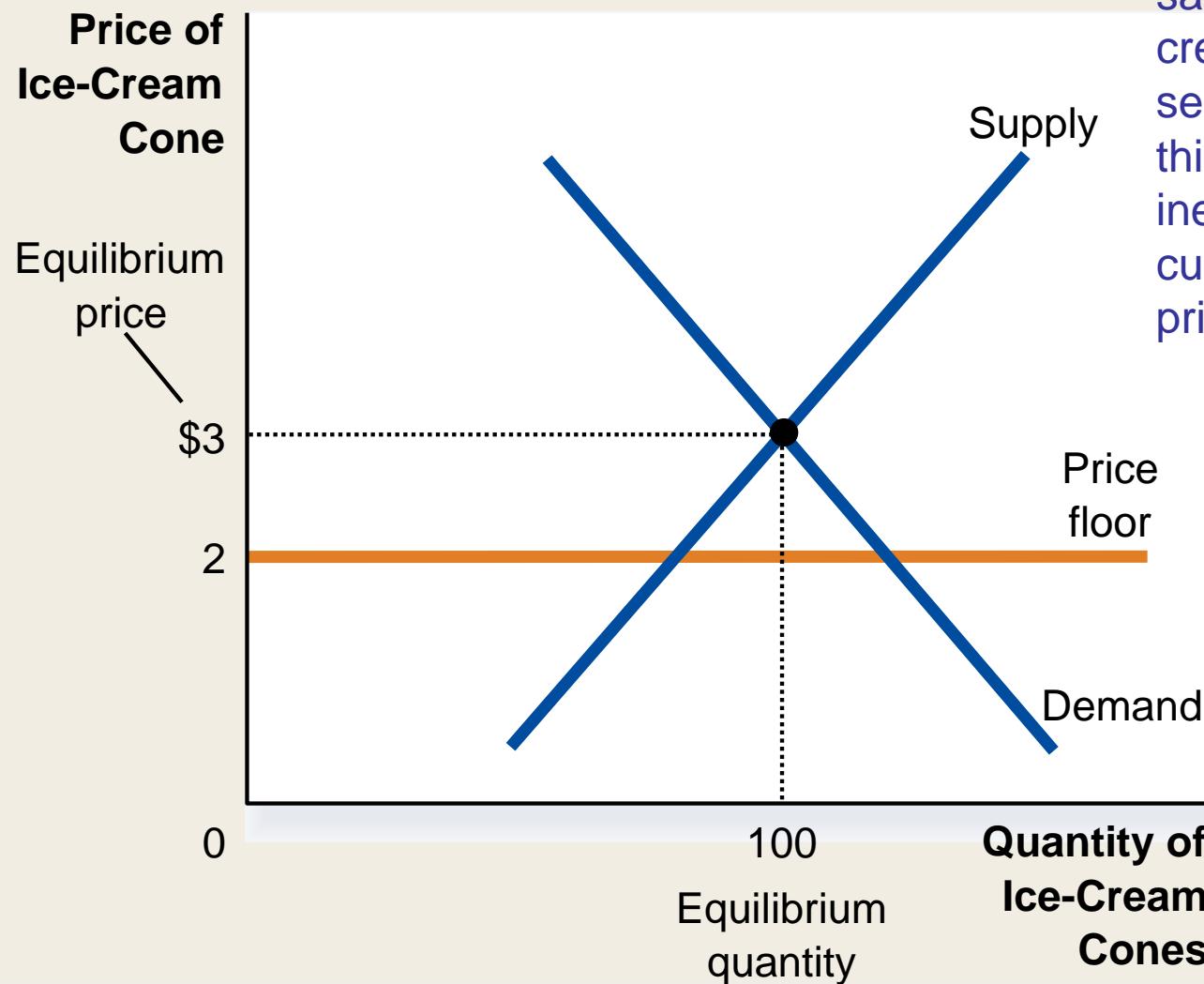


# How Price Floors Affect Market Outcomes

- When the government imposes a price floor, two outcomes are possible.
  - The price floor is not binding if set below the equilibrium price.
  - The price floor is binding if set above the equilibrium price, leading to a surplus.

## Figure 4 A Market with a Price Floor

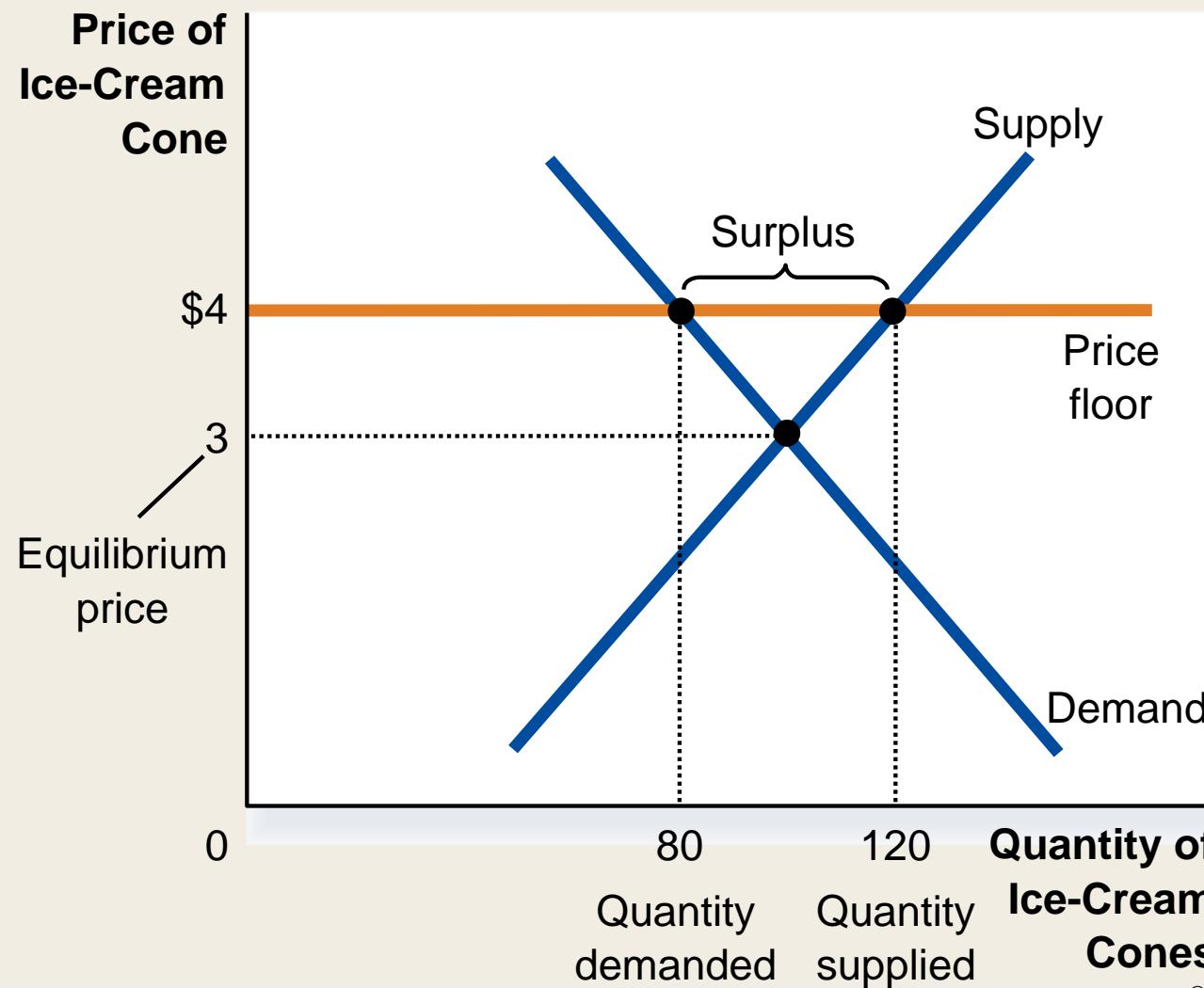
(a) A Price Floor That Is Not Binding



The government says that ice-cream cones must sell for at least \$2; this legislation is ineffective at the current market price.

## Figure 4 A Market with a Price Floor

### (b) A Price Floor That Is Binding

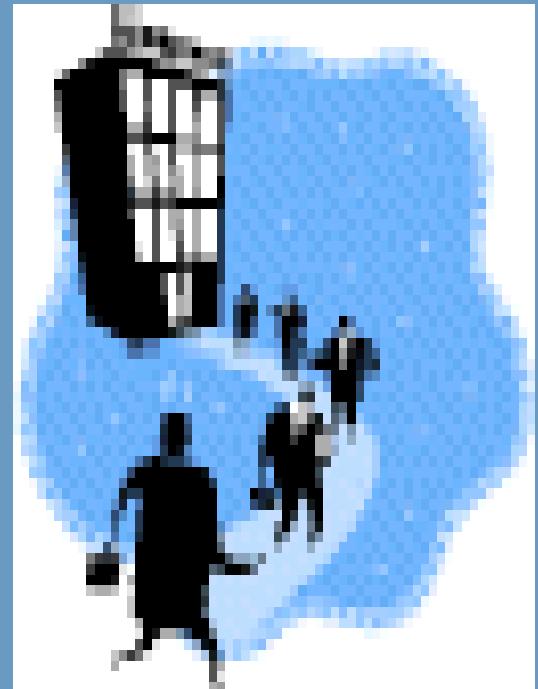


# How Price Floors Affect Market Outcomes

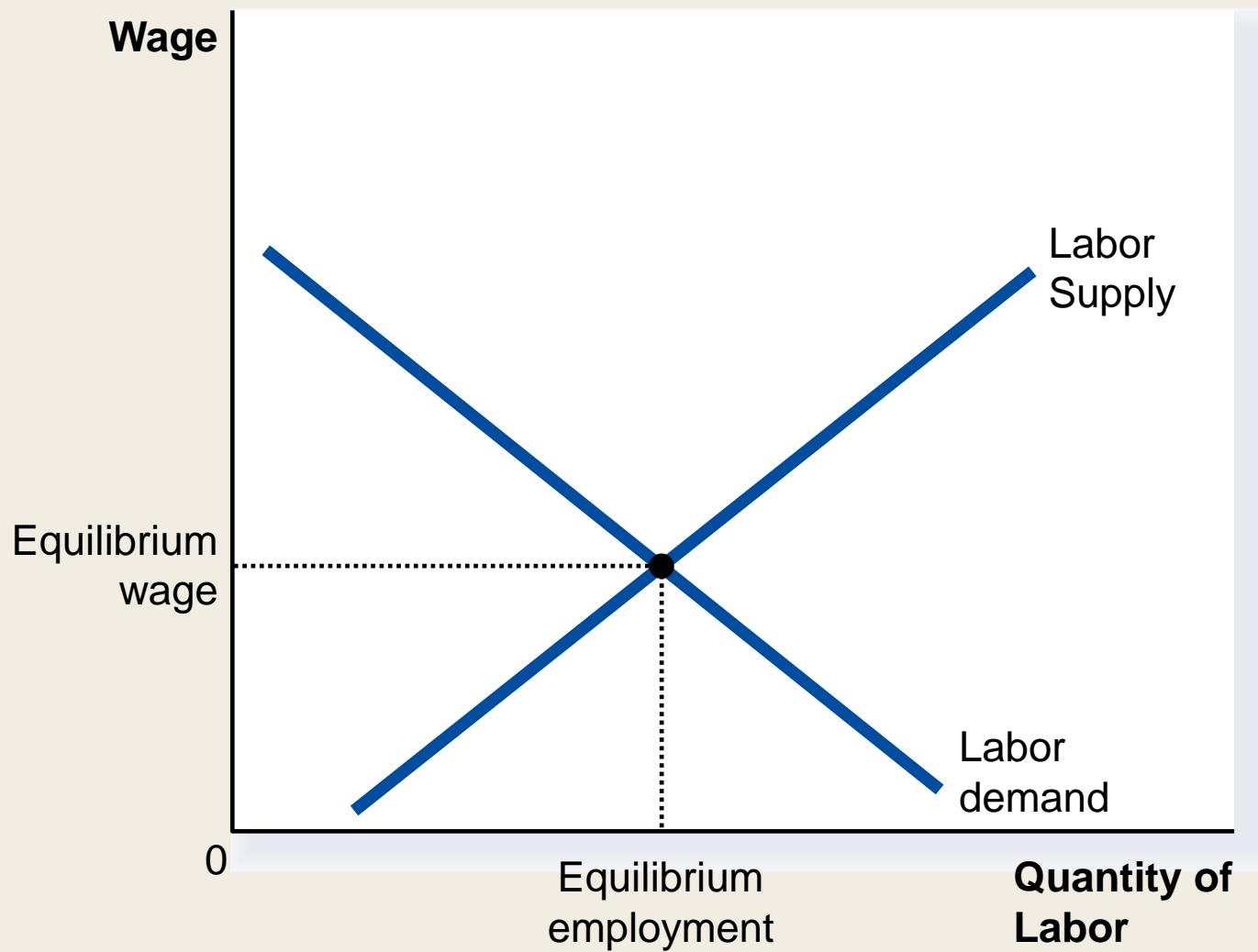
- A price floor prevents supply and demand from moving toward the equilibrium price and quantity.
- When the market price hits the floor, it can fall no further, and the market price equals the floor price.

# CASE STUDY: The Minimum Wage

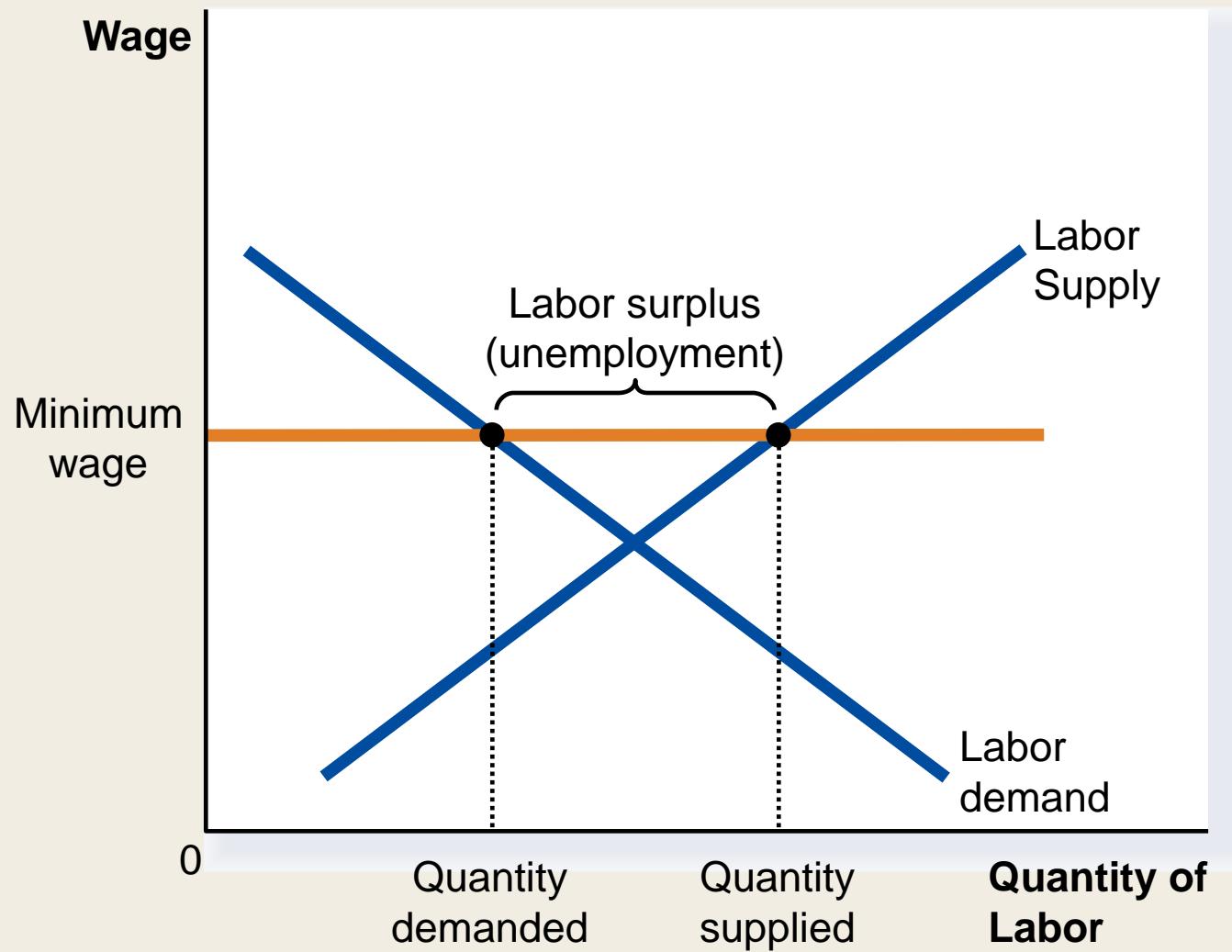
- An important example of a price floor is the minimum wage.
- Minimum wage laws dictate the lowest price possible for labor that any employer may pay.



## Figure 5 How the Minimum Wage Affects the Labor Market



## Figure 5 How the Minimum Wage Affects the Labor Market





# TAXES

- Governments levy taxes to raise revenue for public projects.

# How Taxes on Buyers (and Sellers) Affect Market Outcomes

- Taxes discourage market activity.
- When a good is taxed, the quantity sold is smaller.
- Buyers and sellers share the tax burden.



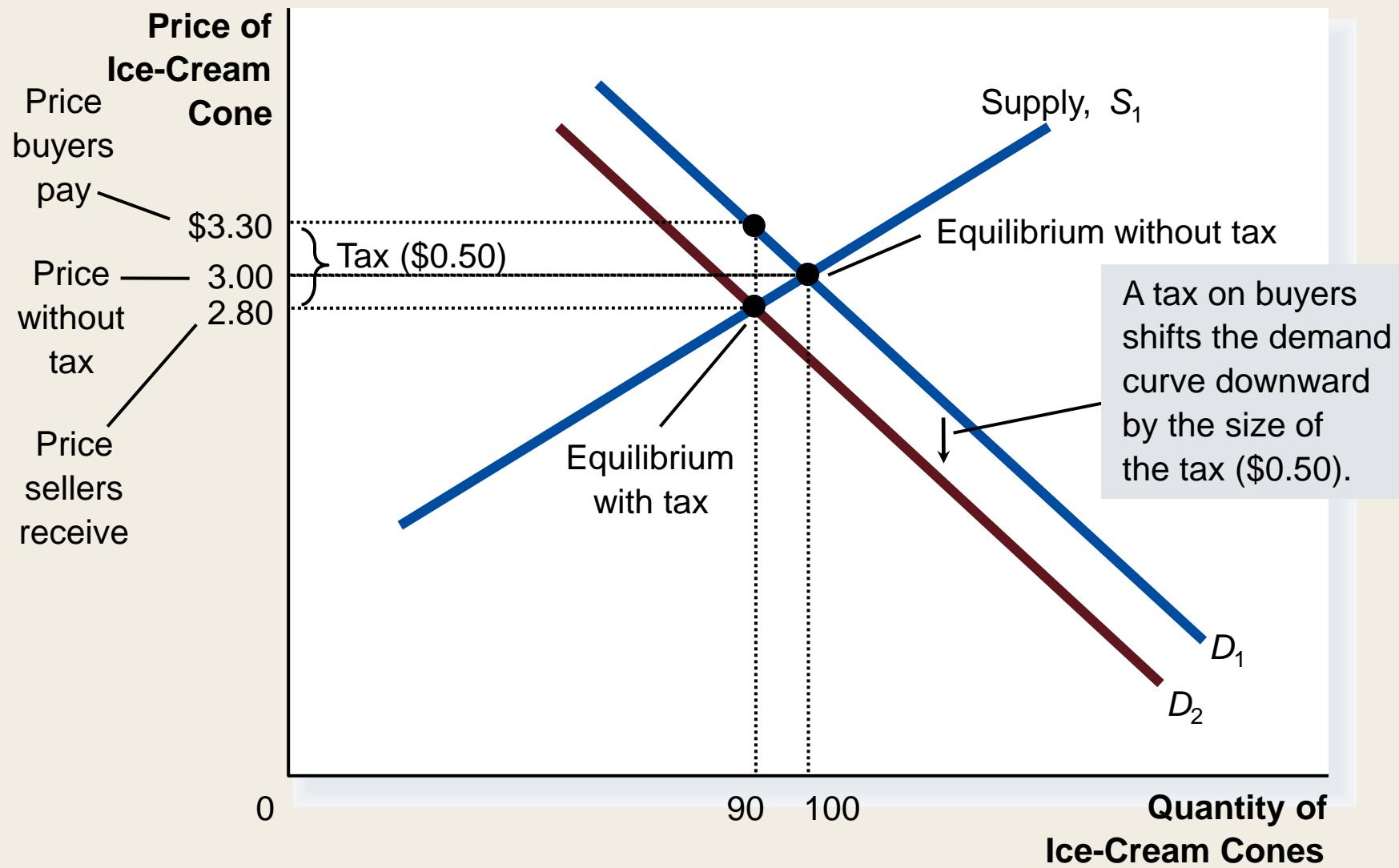
# How Taxes on Buyers Affect Market Outcomes

- Elasticity and tax incidence
  - *Tax incidence* is the manner in which the burden of a tax is shared among participants in a market.

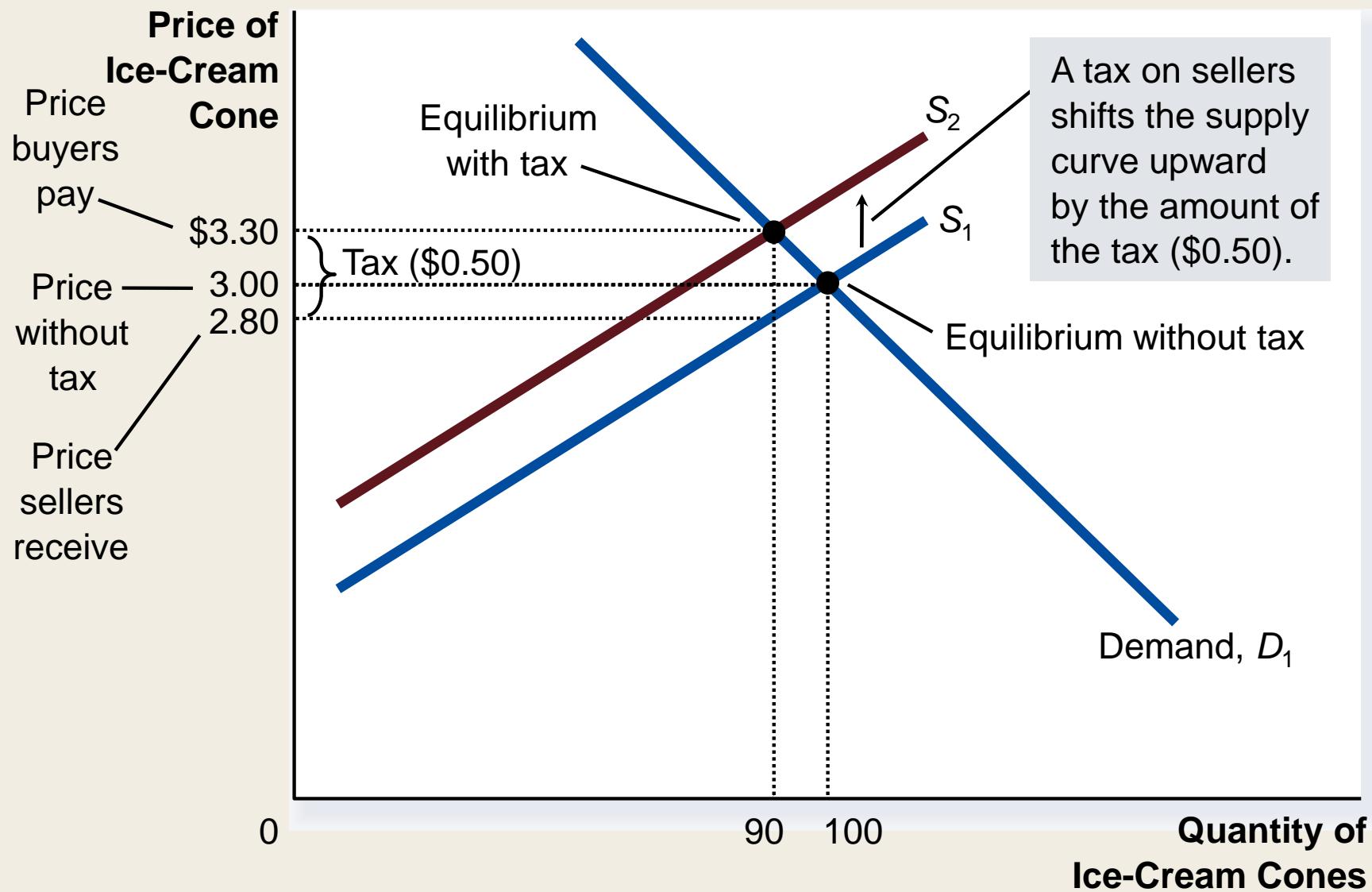
# How Taxes on Buyers Affect Market Outcomes

- Elasticity and Tax Incidence
  - Tax incidence is the study of who bears the burden of a tax.
  - Taxes result in a change in market equilibrium.
  - Buyers pay more and sellers receive less, regardless of whom the tax is levied on.

## Figure 6 A Tax on Buyers



## Figure 7 A Tax on Sellers

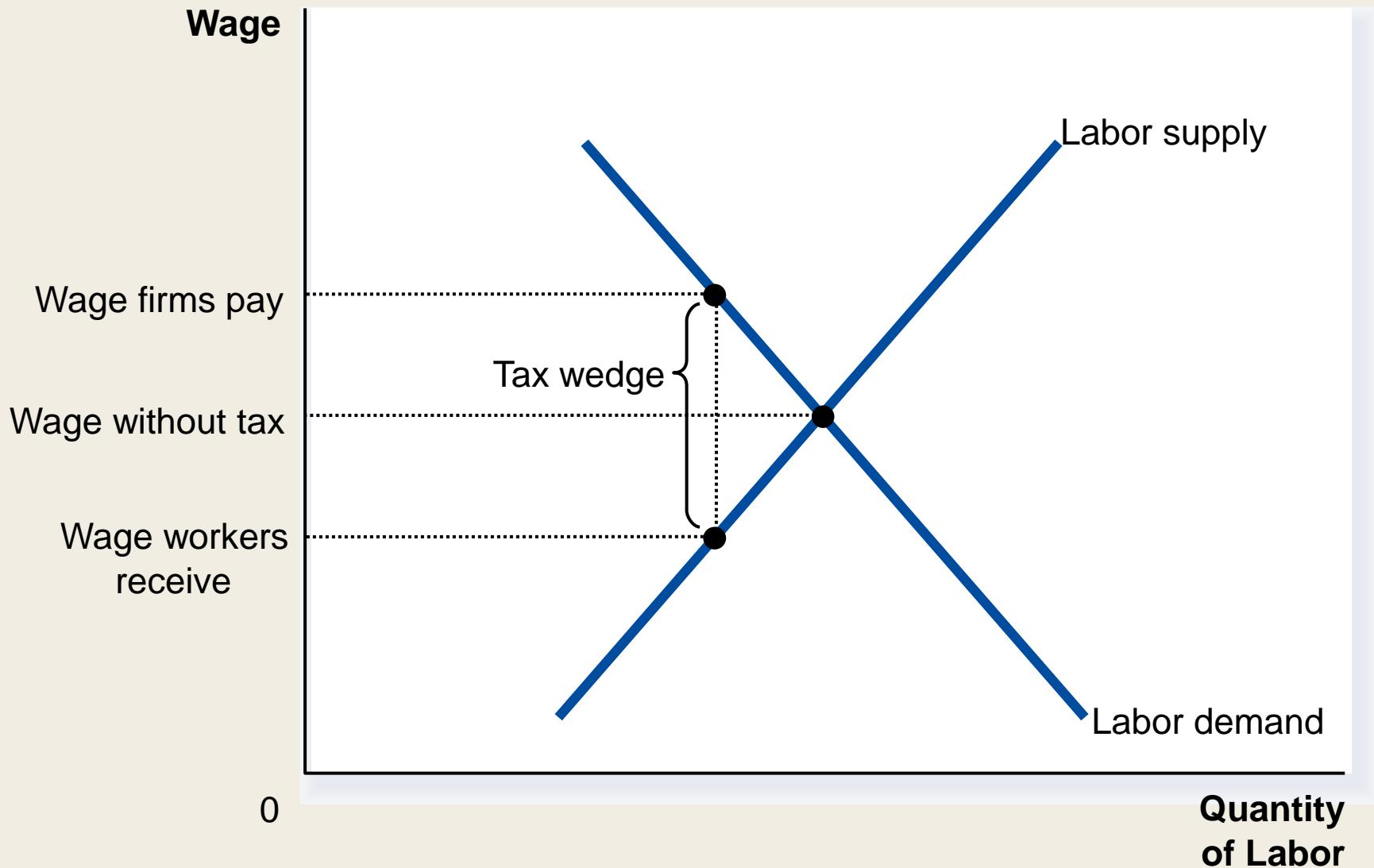


# Elasticity and Tax Incidence

- What was the impact of tax?
  - Taxes discourage market activity.
  - When a good is taxed, the quantity sold is smaller.
  - Buyers and sellers share the tax burden.



## Figure 8 A Payroll Tax

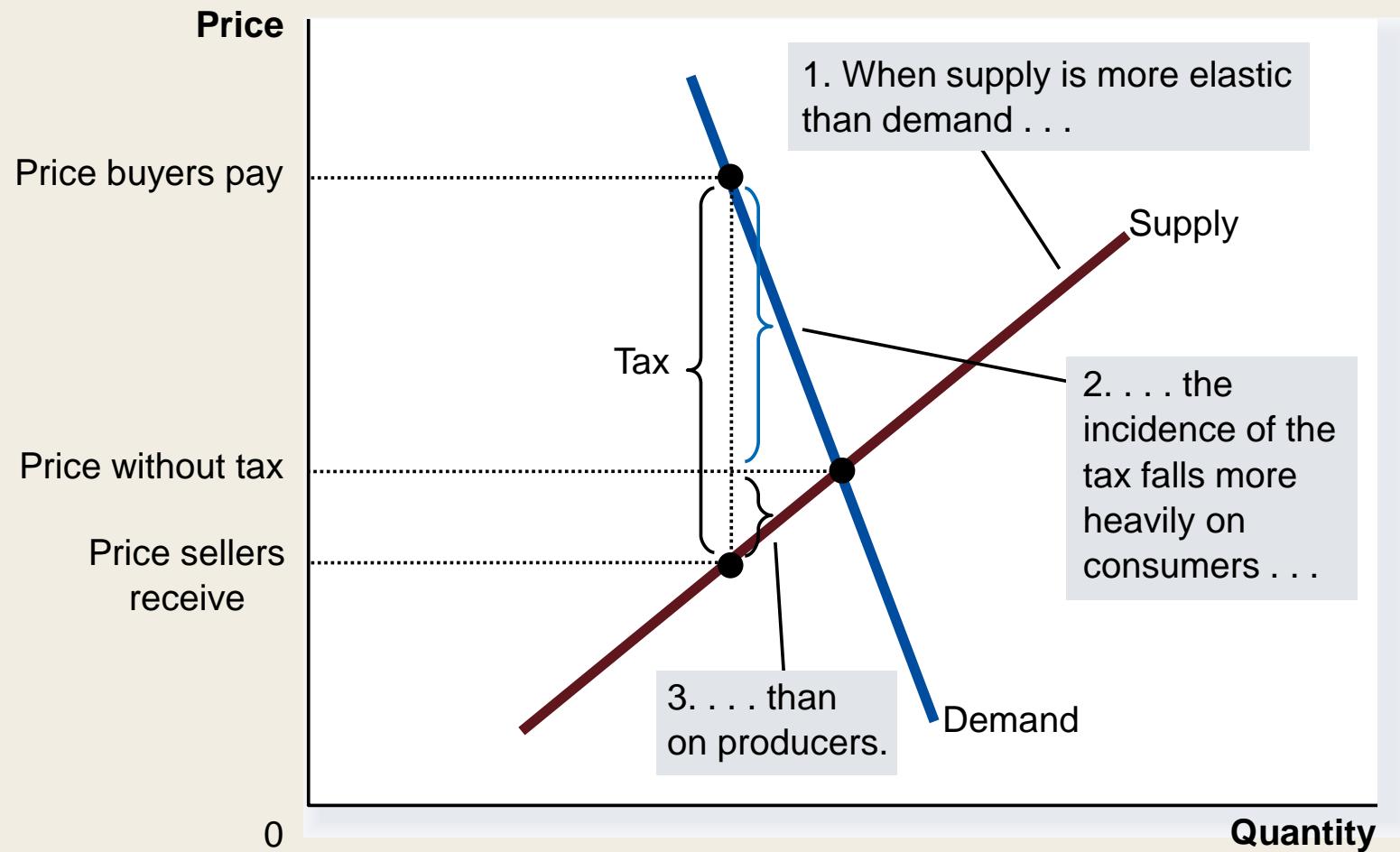


# Elasticity and Tax Incidence

- In what proportions is the burden of the tax divided?
- How do the effects of taxes on sellers compare to those levied on buyers?
- The answers to these questions depend on the elasticity of demand and the elasticity of supply.

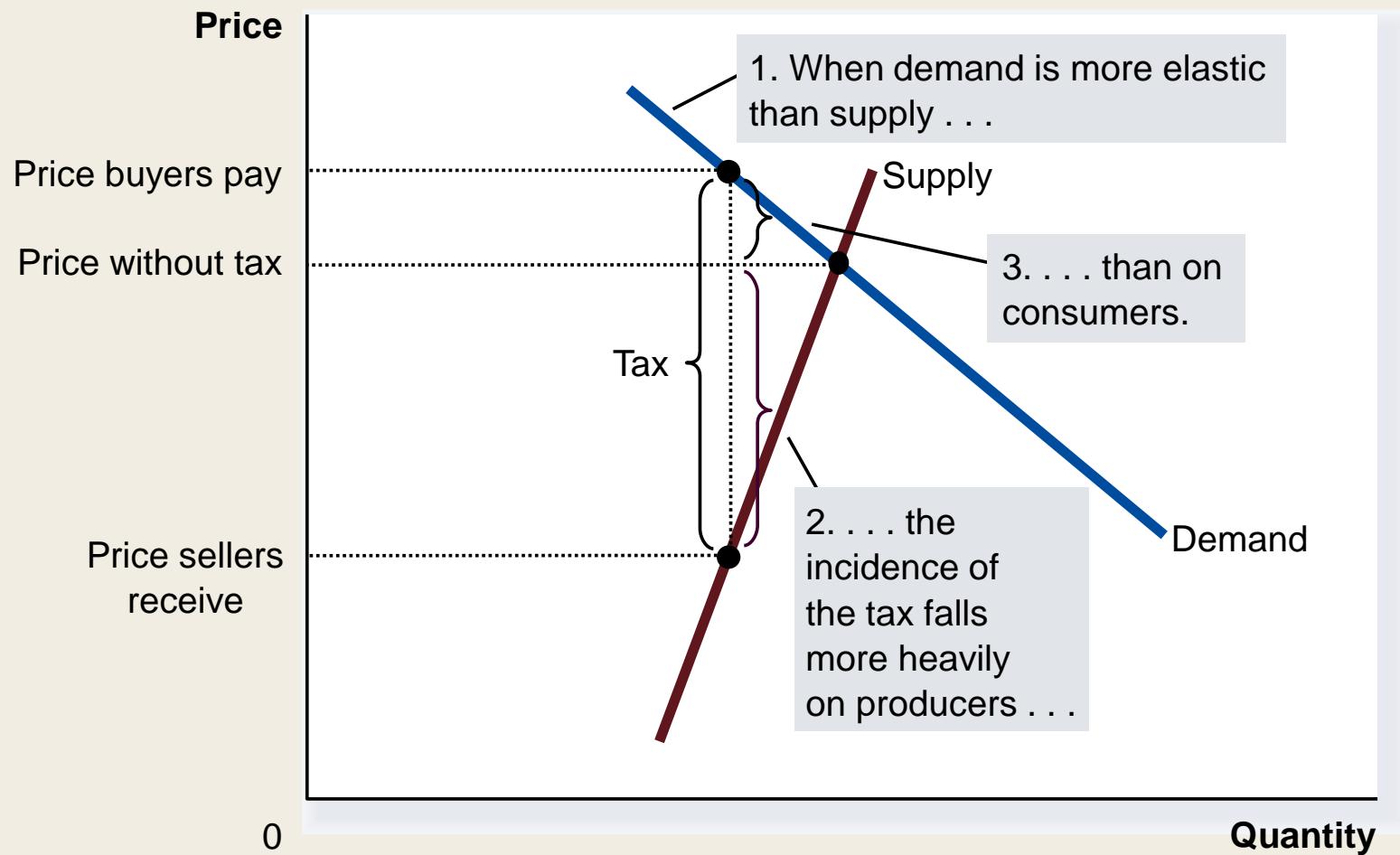
# Figure 9 How the Burden of a Tax Is Divided

## (a) Elastic Supply, Inelastic Demand



## Figure 9 How the Burden of a Tax Is Divided

(b) Inelastic Supply, Elastic Demand



# Elasticity and Tax Incidence

So, how is the burden of the tax divided?

The burden of a tax falls more heavily on the side of the market that is less elastic.



# Summary

---

- Price controls include price ceilings and price floors.
- A price ceiling is a legal maximum on the price of a good or service.
  - An example is rent control.
- A price floor is a legal minimum on the price of a good or a service.
  - An example is the minimum wage.

# Summary

---

- Taxes are used to raise revenue for public purposes.
- When the government levies a tax on a good, the equilibrium quantity of the good falls.
- A tax on a good places a wedge between the price paid by buyers and the price received by sellers.

# Summary

---

- The incidence of a tax refers to who bears the burden of a tax.
- The incidence of a tax does not depend on whether the tax is levied on buyers or sellers.
- The incidence of the tax depends on the price elasticities of supply and demand.
- The burden tends to fall on the side of the market that is less elastic.



13

## The Costs of Production



# The Costs of Production

- The Market Forces of Supply and Demand
  - *Supply* and *demand* are the two words that economists use most often.
  - *Supply* and *demand* are the forces that make market economies work.
  - Modern microeconomics is about supply, demand, and market equilibrium.



# WHAT ARE COSTS?

- According to the Law of Supply:
  - Firms are willing to produce and sell a greater quantity of a good when the price of the good is high.
  - This results in a supply curve that slopes upward.

# WHAT ARE COSTS?

- The Firm's Objective
  - The economic goal of the firm is to maximize profits.



# Total Revenue, Total Cost, and Profit

- *Total Revenue*
  - The amount a firm receives for the sale of its output.
- *Total Cost*
  - The market value of the inputs a firm uses in production.

# Total Revenue, Total Cost, and Profit

- *Profit* is the firm's total revenue minus its total cost.
- Profit = Total revenue - Total cost

# Costs as Opportunity Costs

- A firm's cost of production includes all the opportunity costs of making its output of goods and services.
- Explicit and Implicit Costs
  - A firm's cost of production include *explicit costs* and *implicit costs*.
    - Explicit costs are input costs that require a direct outlay of money by the firm.
    - Implicit costs are input costs that do not require an outlay of money by the firm.

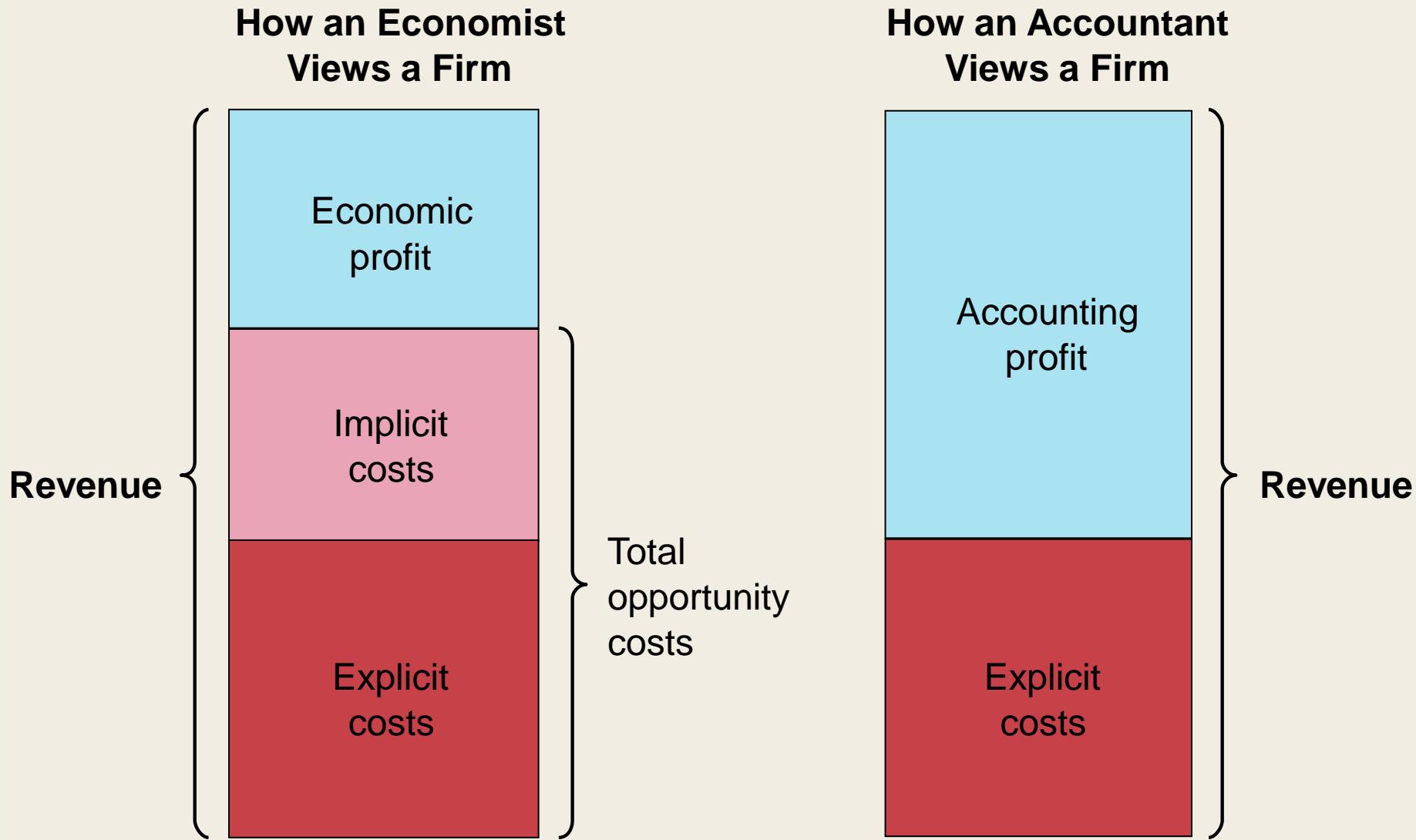
# Economic Profit versus Accounting Profit

- Economists measure a firm's *economic profit* as total revenue minus total cost, including both explicit and implicit costs.
- Accountants measure the *accounting profit* as the firm's total revenue minus only the firm's explicit costs.

# Economic Profit versus Accounting Profit

- When total revenue exceeds both explicit and implicit costs, the firm earns economic profit.
- Economic profit is smaller than accounting profit.

# Figure 1 Economists versus Accountants





# PRODUCTION AND COSTS

- The Production Function
  - The *production function* shows the relationship between quantity of inputs used to make a good and the quantity of output of that good.

# The Production Function

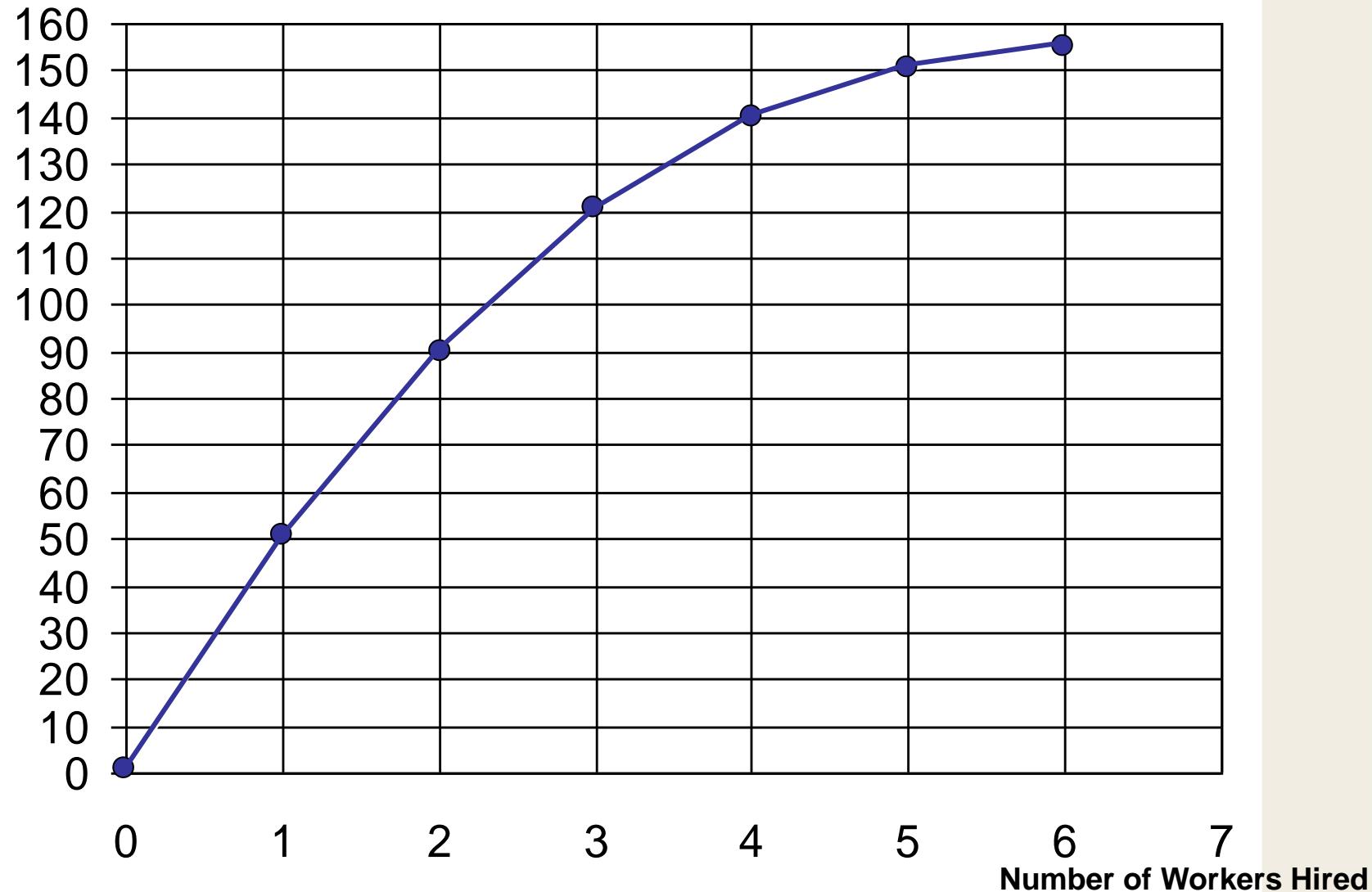
- Marginal Product
  - The *marginal product* of any input in the production process is the increase in output that arises from an additional unit of that input.

# The Production Function

- *Diminishing marginal product* is the property whereby the marginal product of an input declines as the quantity of the input increases.
  - Example: As more and more workers are hired at a firm, each additional worker contributes less and less to production because the firm has a limited amount of equipment.

## Figure 2 Hungry Helen's Production Function

Quantity of output



# The Production Function

- Diminishing Marginal Product
  - The slope of the production function measures the marginal product of an input, such as a worker.
  - When the marginal product declines, the production function becomes flatter.

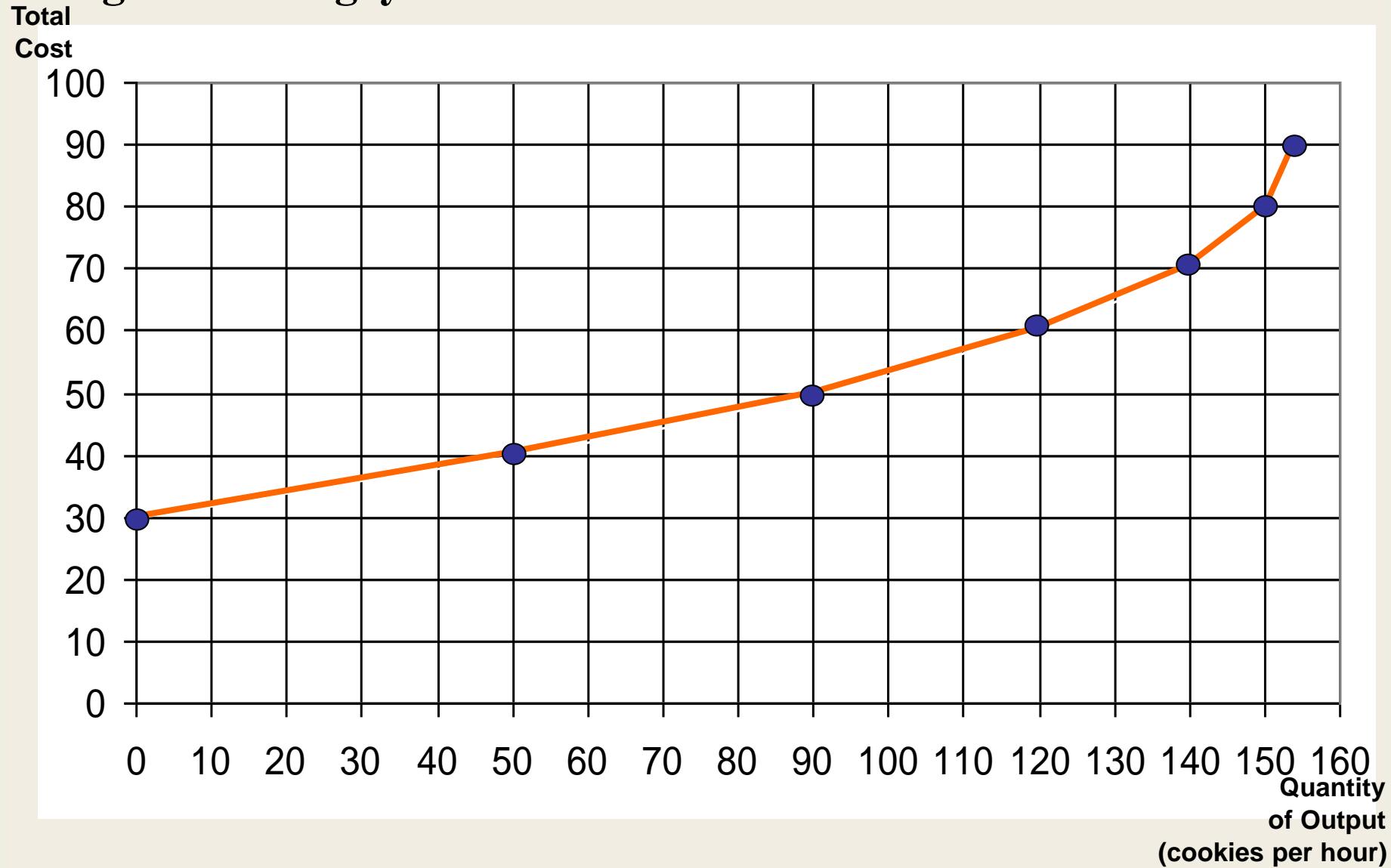
# From the Production Function to the Total-Cost Curve

- The relationship between the quantity a firm can produce and its costs determines pricing decisions.
- The total-cost curve shows this relationship graphically.

**Table 1 A Production Function and Total Cost: Hungry Helen's Cookie Factory**

Number of Workers	Output (quantity of cookies produced per hour)	Marginal Product of Labor	Cost of Factory	Cost of Workers	Total Cost of Inputs (cost of factory + cost of workers)
0	0		\$30	\$0	\$30
1	50	50	30	10	40
2	90	40	30	20	50
3	120	30	30	30	60
4	140	20	30	40	70
5	150	10	30	50	80
6	155	5	30	60	90

## Figure 2 Hungry Helen's Total-Cost Curve





# THE VARIOUS MEASURES OF COST

- Costs of production may be divided into *fixed costs* and *variable costs*.
  - **Fixed costs** are those costs that *do not vary* with the quantity of output produced.
  - **Variable costs** are those costs that *do vary* with the quantity of output produced.

# Fixed and Variable Costs

- Total Costs
  - Total Fixed Costs (TFC)
  - Total Variable Costs (TVC)
  - Total Costs (TC)
  - $TC = TFC + TVC$

## Table 2 The Various Measures of Cost: Thirsty Thelma's Lemonade Stand

Quantity of Lemonade (Glasses per hour)	Total Cost	Fixed Cost	Variable Cost	Average Fixed Cost	Average Variable Cost	Average Total Cost	Marginal Cost
0	\$ 3.00	\$3.00	\$ 0.00	—	—	—	\$0.30
1	3.30	3.00	0.30	\$3.00	\$0.30	\$3.30	0.50
2	3.80	3.00	0.80	1.50	0.40	1.90	0.70
3	4.50	3.00	1.50	1.00	0.50	1.50	0.90
4	5.40	3.00	2.40	0.75	0.60	1.35	1.10
5	6.50	3.00	3.50	0.60	0.70	1.30	1.30
6	7.80	3.00	4.80	0.50	0.80	1.30	1.50
7	9.30	3.00	6.30	0.43	0.90	1.33	1.70
8	11.00	3.00	8.00	0.38	1.00	1.38	1.90
9	12.90	3.00	9.90	0.33	1.10	1.43	2.10
10	15.00	3.00	12.00	0.30	1.20	1.50	

# Fixed and Variable Costs

- Average Costs
  - Average costs can be determined by dividing the firm's costs by the quantity of output it produces.
  - The average cost is the cost of each typical unit of product.

# Fixed and Variable Costs

- Average Costs
  - *Average Fixed Costs* (AFC)
  - *Average Variable Costs* (AVC)
  - *Average Total Costs* (ATC)
  - $ATC = AFC + AVC$

# Average and Marginal Costs

$$AFC = \frac{\text{Fixed cost}}{\text{Quantity}} = \frac{FC}{Q}$$

$$AVC = \frac{\text{Variable cost}}{\text{Quantity}} = \frac{VC}{Q}$$

$$ATC = \frac{\text{Total cost}}{\text{Quantity}} = \frac{TC}{Q}$$

# Average and Marginal Costs

- Marginal Cost
  - *Marginal cost* (MC) measures the increase in total cost that arises from an extra unit of production.
  - Marginal cost helps answer the following question:
    - How much does it cost to produce an additional unit of output?

# Average and Marginal Cost

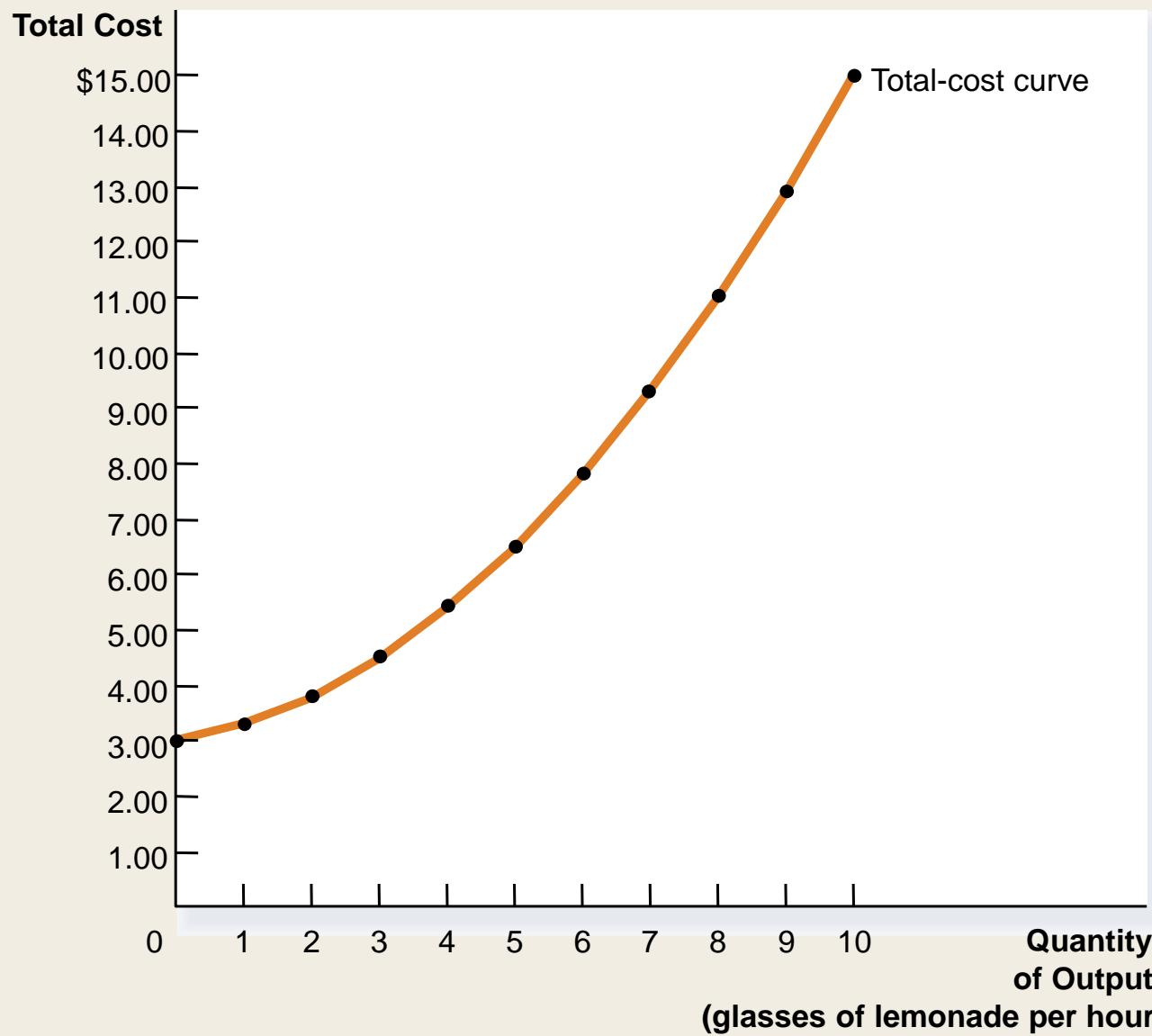
$$MC = \frac{\text{(change in total cost)}}{\text{(change in quantity)}} = \frac{\Delta TC}{\Delta Q}$$

# Thirsty Thelma's Lemonade Stand

Note how Marginal Cost changes with each change in Quantity.

Quantity	Total Cost	Marginal Cost	Quantity	Total Cost	Marginal Cost
0	\$3.00	—			
1	3.30	\$0.30	6	\$7.80	\$1.30
2	3.80	0.50	7	9.30	1.50
3	4.50	0.70	8	11.00	1.70
4	5.40	0.90	9	12.90	1.90
5	6.50	1.10	10	15.00	2.10

## Figure 3 Thirsty Thelma's Total-Cost Curves



# Cost Curves and Their Shapes

- Marginal cost rises with the amount of output produced.
  - This reflects the property of diminishing marginal product.

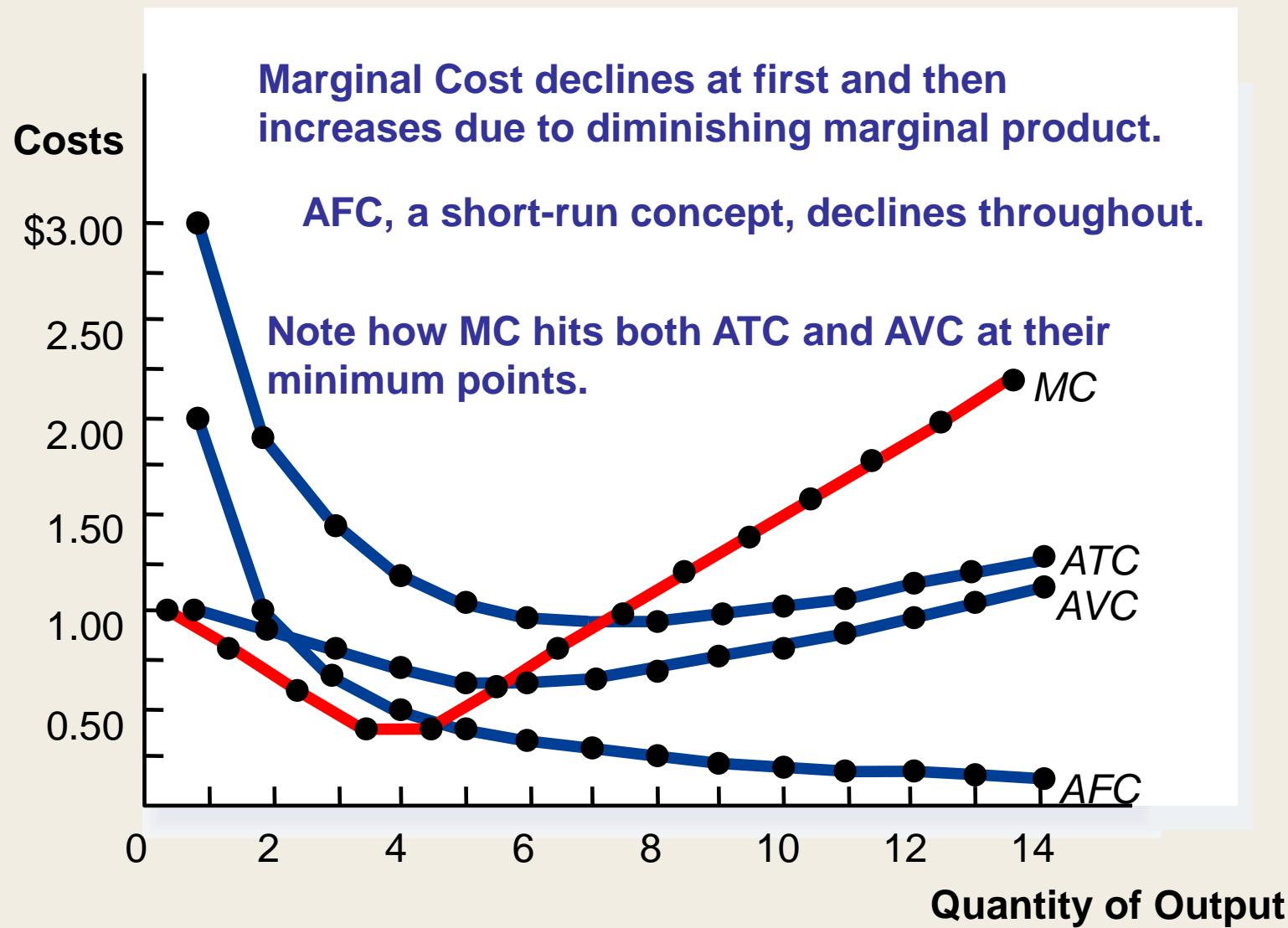
# Cost Curves and Their Shapes

- Relationship between Marginal Cost and Average Total Cost
  - Whenever marginal cost is less than average total cost, average total cost is falling.
  - Whenever marginal cost is greater than average total cost, average total cost is rising.

# Cost Curves and Their Shapes

- Relationship between Marginal Cost and Average Total Cost
  - The marginal-cost curve crosses the average-total-cost curve at the efficient scale.
    - *Efficient scale* is the quantity that minimizes average total cost.

## Figure 5 Cost Curves for a Typical Firm



# Typical Cost Curves

- Three Important Properties of Cost Curves
  - Marginal cost eventually rises with the quantity of output.
  - The marginal-cost curve crosses the average-total-cost curve at the minimum of average total cost.

# Cost Curves and Their Shapes

- The average total-cost curve is U-shaped.
- At very low levels of output average total cost is high because fixed cost is spread over only a few units.
- Average total cost declines as output increases.
- Average total cost starts rising because average variable cost rises substantially.

# Cost Curves and Their Shapes

- The bottom of the U-shaped ATC curve occurs at the quantity that minimizes average total cost. This quantity is sometimes called the efficient scale of the firm.



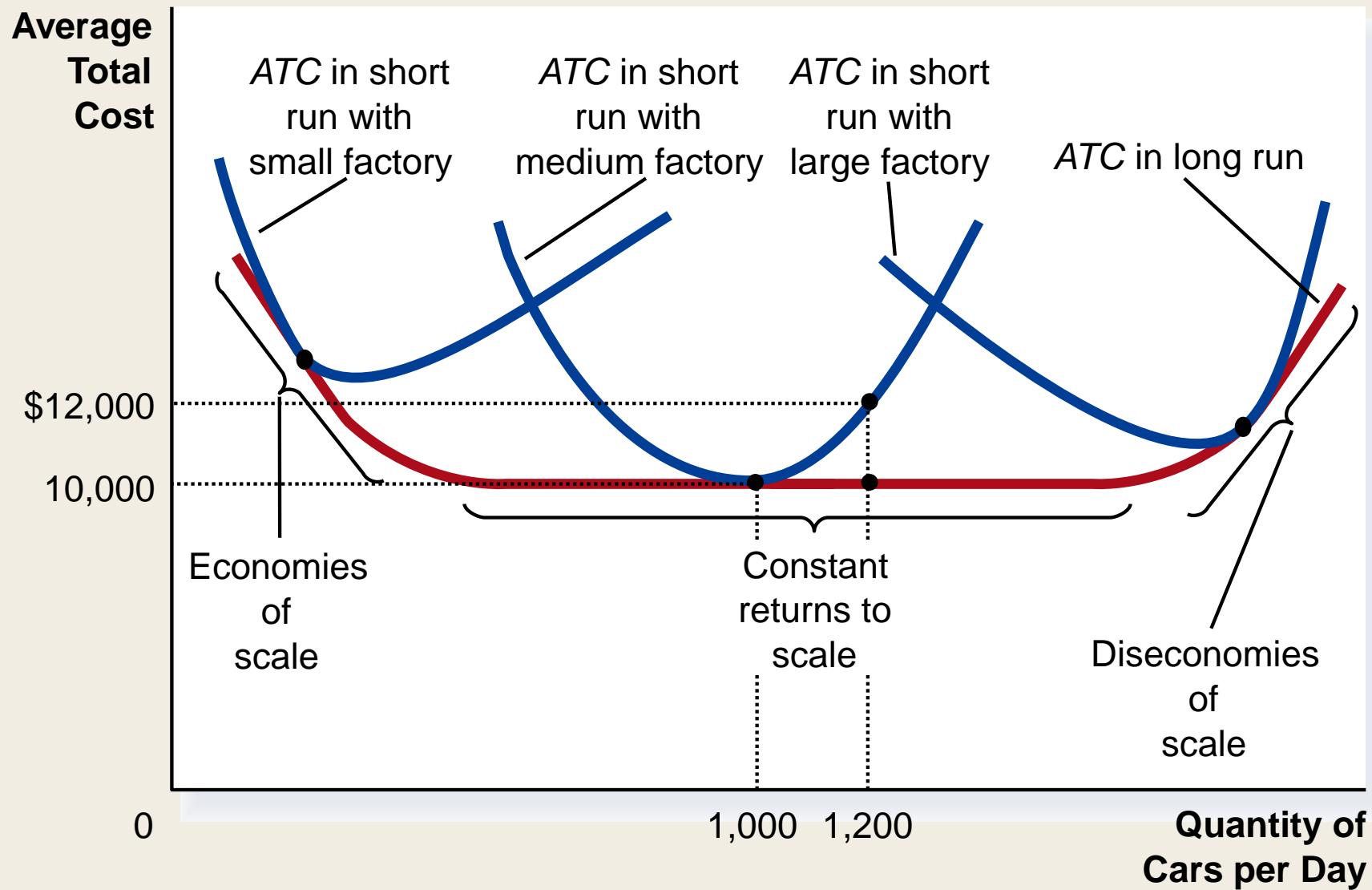
# COSTS IN THE SHORT RUN AND IN THE LONG RUN

- For many firms, the division of total costs between fixed and variable costs depends on the time horizon being considered.
  - In the short run, some costs are fixed.
  - In the long run, *all* fixed costs become variable costs.
- Because many costs are fixed in the short run but variable in the long run, a firm's long-run cost curves differ from its short-run cost curves.

# Economies and Diseconomies of Scale

- *Economies of scale* refer to the property whereby long-run average total cost falls as the quantity of output increases.
- *Diseconomies of scale* refer to the property whereby long-run average total cost rises as the quantity of output increases.
- *Constant returns to scale* refers to the property whereby long-run average total cost stays the same as the quantity of output increases.

## Figure 6 Average Total Cost in the Short and Long Run



# Summary

---

- The goal of firms is to maximize profit, which equals total revenue minus total cost.
- When analyzing a firm's behavior, it is important to include all the opportunity costs of production.
- Some opportunity costs are explicit while other opportunity costs are implicit.

# Summary

---

- A firm's costs reflect its production process.
  - A typical firm's production function gets flatter as the quantity of input increases, displaying the property of diminishing marginal product.
  - A firm's total costs are divided between fixed and variable costs. Fixed costs do not change when the firm alters the quantity of output produced; variable costs do change as the firm alters quantity of output produced.

# Summary

---

- Average total cost is total cost divided by the quantity of output.
- Marginal cost is the amount by which total cost would rise if output were increased by one unit.
- The marginal cost always rises with the quantity of output.
- Average cost first falls as output increases and then rises.

# Summary

---

- The average-total-cost curve is U-shaped.
- The marginal-cost curve always crosses the average-total-cost curve at the minimum of ATC.
- A firm's costs often depend on the time horizon being considered.
- In particular, many costs are fixed in the short run but variable in the long run.



14

## Firms in Competitive Markets



# WHAT IS A COMPETITIVE MARKET?

- A *competitive market* has many buyers and sellers trading identical products so that each buyer and seller is a price taker.
  - Buyers and sellers must accept the price determined by the market.

# The Meaning of Competition

- A *perfectly competitive market* has the following characteristics:
  - There are many buyers and sellers in the market.
  - The goods offered by the various sellers are largely the same.
  - Firms can freely enter or exit the market.

# The Meaning of Competition

- As a result of its characteristics, the perfectly competitive market has the following outcomes:
  - The actions of any single buyer or seller in the market have a negligible impact on the market price.
  - Each buyer and seller takes the market price as given.

# The Revenue of a Competitive Firm

- Total revenue for a firm is the selling price times the quantity sold.
- $TR = (P \times Q)$
- Total revenue is proportional to the amount of output.

# The Revenue of a Competitive Firm

- *Average revenue* tells us how much revenue a firm receives for the typical unit sold.
- Average revenue is total revenue divided by the quantity sold.

# The Revenue of a Competitive Firm

- In perfect competition, average revenue equals the price of the good.

$$\text{Average Revenue} = \frac{\text{Total revenue}}{\text{Quantity}}$$

$$= \frac{\text{Price} \times \text{Quantity}}{\text{Quantity}}$$

= Price

# The Revenue of a Competitive Firm

- *Marginal revenue* is the change in total revenue from an additional unit sold.
- $MR = \Delta TR / \Delta Q$
- For competitive firms, marginal revenue equals the price of the good.

**Table 1 Total, Average, and Marginal Revenue for a Competitive Firm**

Quantity (Q)	Price (P)	Total Revenue ( $TR = P \times Q$ )	Average Revenue ( $AR = TR / Q$ )	Marginal Revenue ( $MR = \Delta TR / \Delta Q$ )
1 gallon	\$6	\$ 6	\$6	\$6
2	6	12	6	6
3	6	18	6	6
4	6	24	6	6
5	6	30	6	6
6	6	36	6	6
7	6	42	6	6
8	6	48	6	



# PROFIT MAXIMIZATION AND THE COMPETITIVE FIRM'S SUPPLY CURVE

- The goal of a competitive firm is to maximize profit.
- This means that the firm will want to produce the quantity that maximizes the *difference between total revenue and total cost*.

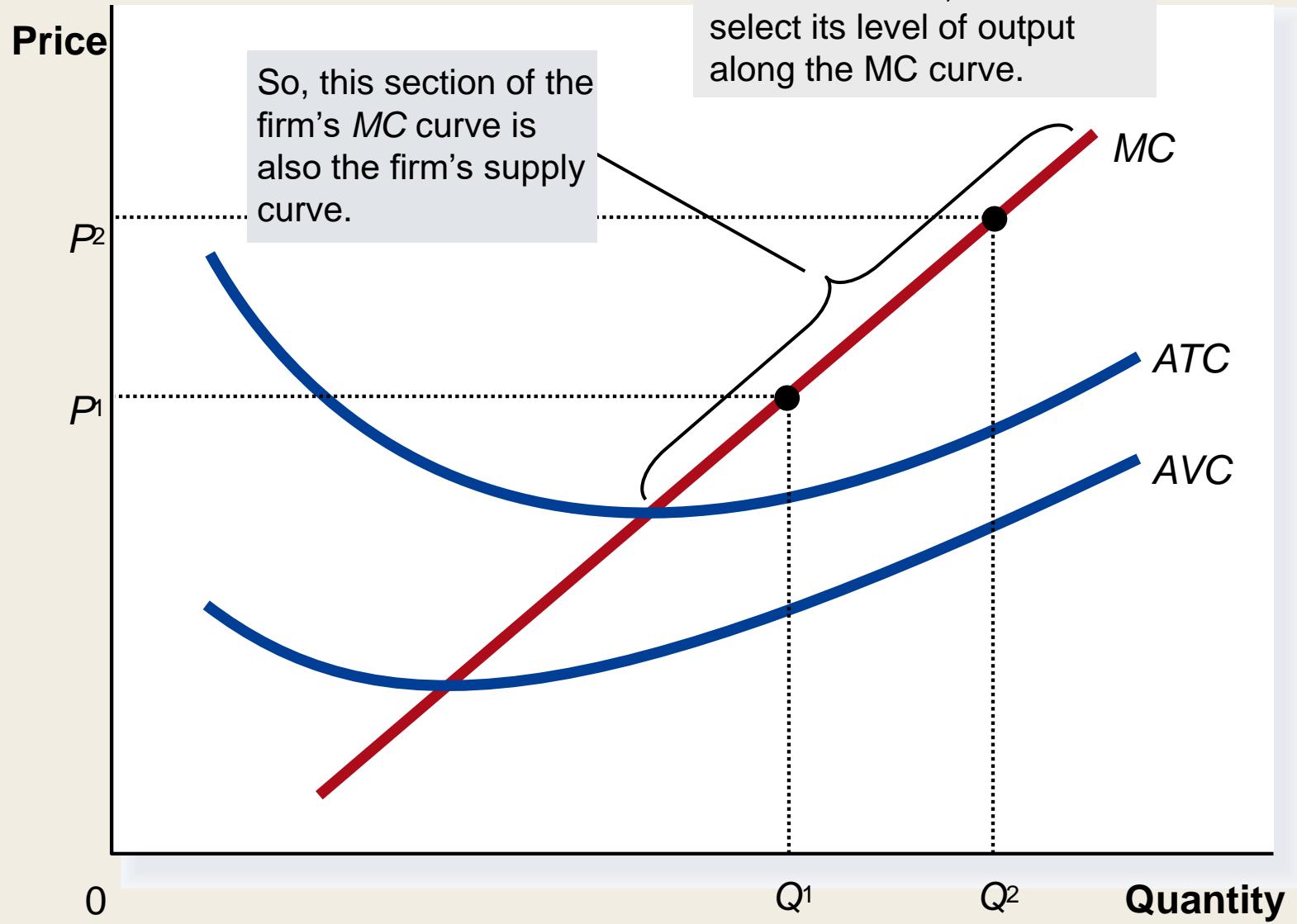
## Table 2 Profit Maximization: A Numerical Example

Quantity (Q)	Total Revenue (TR)	Total Cost (TC)	Profit ( $TR - TC$ )	Marginal Revenue ( $MR = \Delta TR / \Delta Q$ )	Marginal Cost ( $MC = \Delta TC / \Delta Q$ )	Change in Profit ( $MR - MC$ )
0 gallons	\$ 0	\$ 3	-\$3			
1	6	5	1	\$6	\$2	\$4
2	12	8	4	6	3	3
3	18	12	6	6	4	2
4	24	17	7	6	5	1
5	30	23	7	6	6	0
6	36	30	6	6	7	-1
7	42	38	4	6	8	-2
8	48	47	1		9	-3

# The Marginal Cost-Curve and the Firm's Supply Decision

- Profit maximization occurs at the quantity where *marginal revenue equals marginal cost*.
  - When  $MR > MC$ , *increase Q*
  - When  $MR < MC$ , *decrease Q*
  - When  $MR = MC$ , profit is maximized.
  - *Under perfect competition, P=MR=AR*

## Figure 2 Marginal Cost as the Competitive Firm's Supply Curve



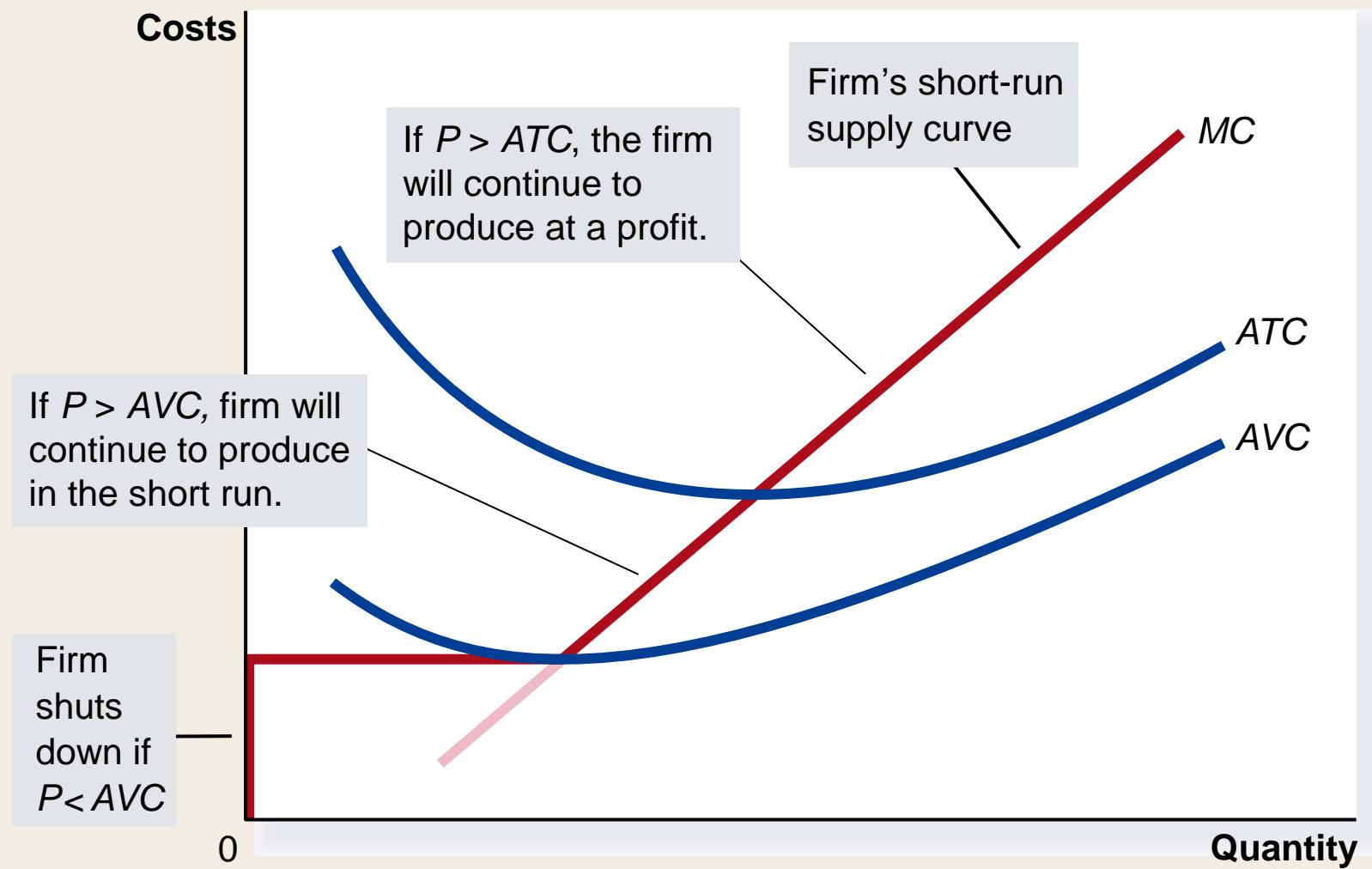
# The Firm's Short-Run Decision to Shut Down

- A shutdown refers to a short-run decision not to produce anything during a specific period of time because of current market conditions.
- Exit refers to a long-run decision to leave the market.

# The Firm's Short-Run Decision to Shut Down

- The firm shuts down if the revenue it gets from producing is less than the variable cost of production.
  - Shut down if  $TR < VC$
  - Shut down if  $TR/Q < VC/Q$
  - Shut down if  $P < AVC$

## Figure 3 The Competitive Firm's Short-Run Supply Curve



# The Firm's Short-Run Decision to Shut Down

- The portion of the marginal-cost curve that lies above average variable cost is the competitive firm's short-run supply curve.

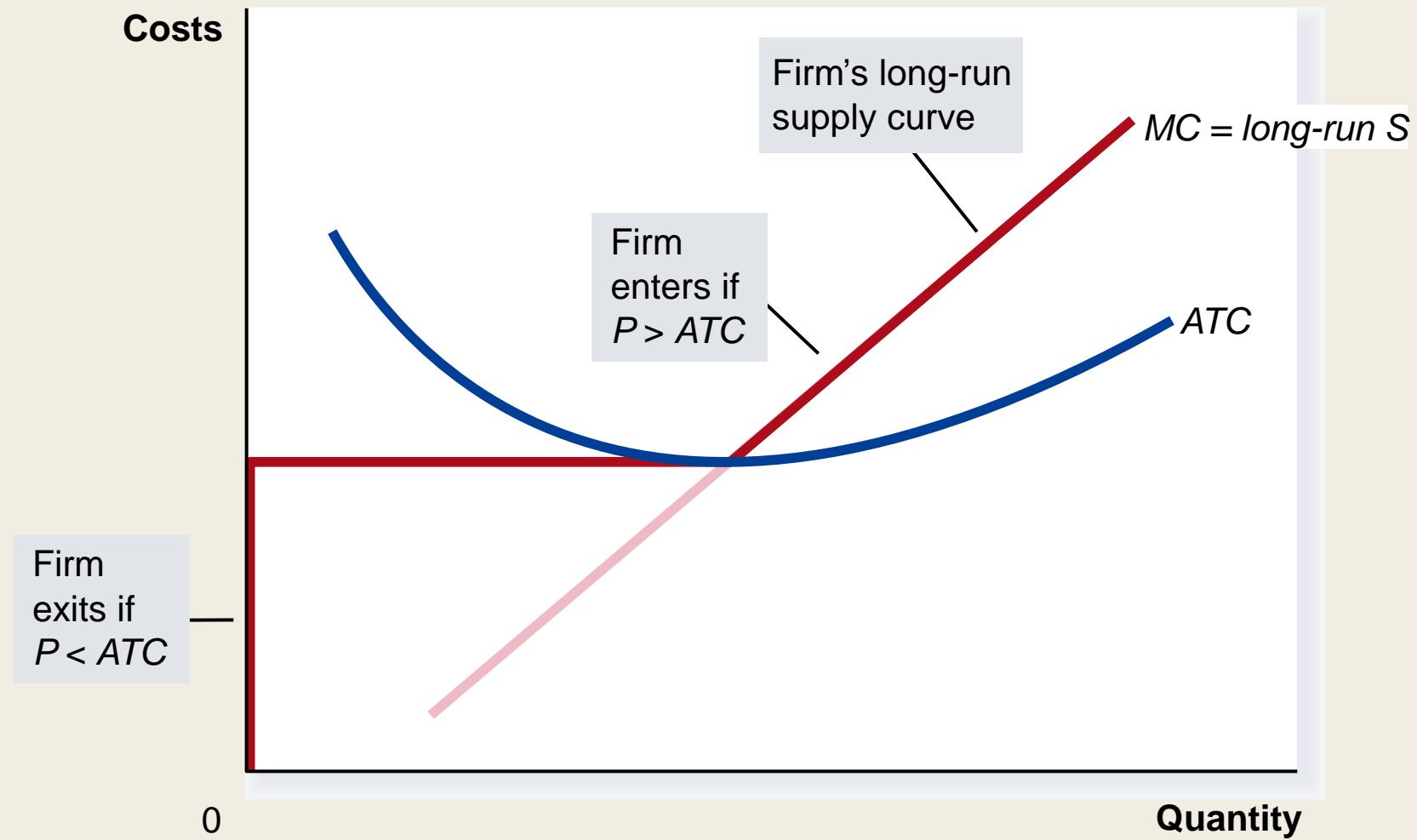
# The Firm's Long-Run Decision to Exit or Enter a Market

- In the long run, the firm exits if the revenue it would get from producing is less than its total cost.
  - Exit if  $TR < TC$
  - Exit if  $TR/Q < TC/Q$
  - Exit if  $P < ATC$

# The Firm's Long-Run Decision to Exit or Enter a Market

- A firm will enter the industry if such an action would be profitable.
  - Enter if  $TR > TC$
  - Enter if  $TR/Q > TC/Q$
  - Enter if  $P > ATC$

## Figure 4 The Competitive Firm's Long-Run Supply Curve

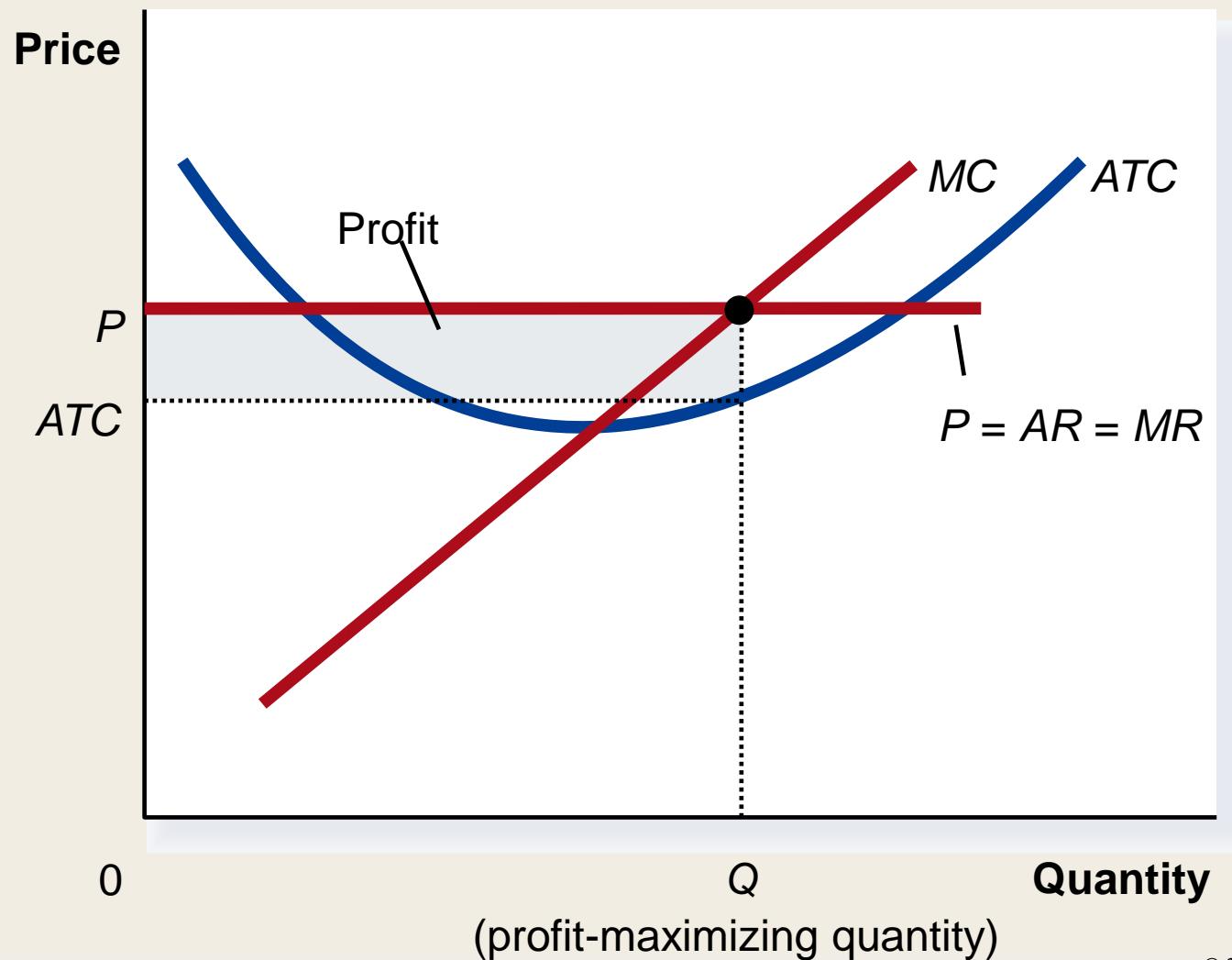


# Measuring Profit in Our Graph for the Competitive Firm

- Profit =  $TR - TC$
- Profit =  $(TR/Q - TC/Q) \times Q$
- Profit =  $(P - ATC) \times Q$

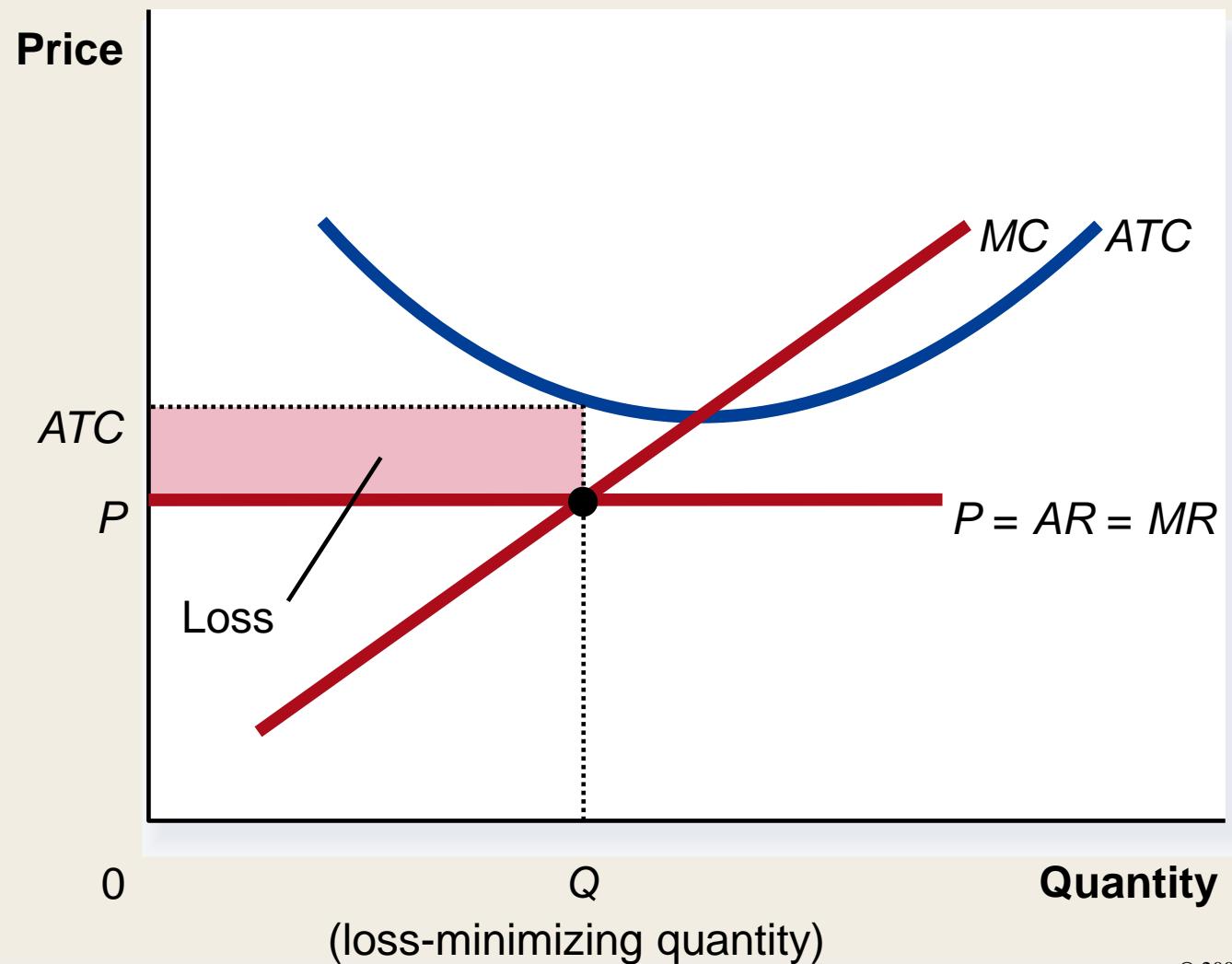
# Figure 5 Profit as the Area between Price and Average Total Cost

(a) A Firm with Profits



# Figure 5 Profit as the Area between Price and Average Total Cost

(b) A Firm with Losses





# THE SUPPLY CURVE IN A COMPETITIVE MARKET

- The competitive firm's *long-run supply curve* is the portion of its marginal-cost curve that lies above average total cost.



# THE SUPPLY CURVE IN A COMPETITIVE MARKET

- Short-Run Supply Curve
  - The portion of its marginal cost curve that lies above average variable cost.
- Long-Run Supply Curve
  - The marginal cost curve above the minimum point of its average total cost curve.



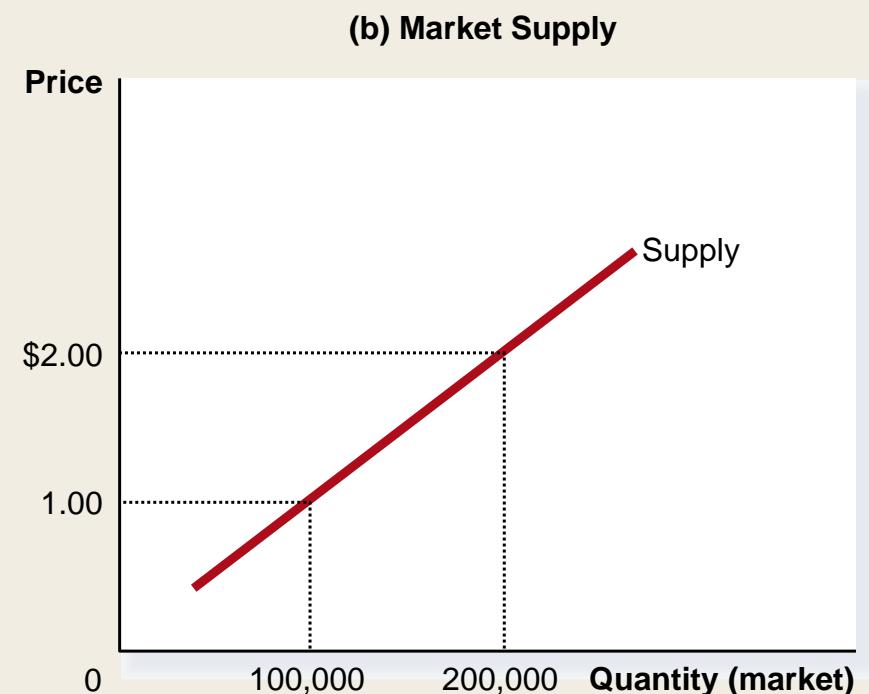
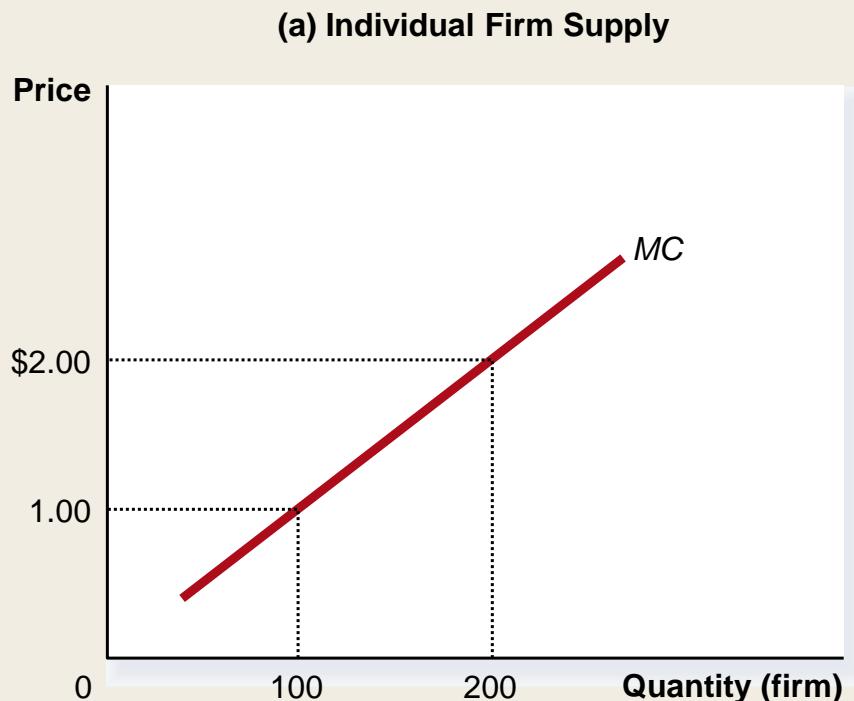
# THE SUPPLY CURVE IN A COMPETITIVE MARKET

- Market supply equals the sum of the quantities supplied by the individual firms in the market.

# The Short Run: Market Supply with a Fixed Number of Firms

- For any given price, each firm supplies a quantity of output so that its marginal cost equals price.
- The market supply curve reflects the individual firms' marginal cost curves.

## Figure 6 Short-Run Market Supply

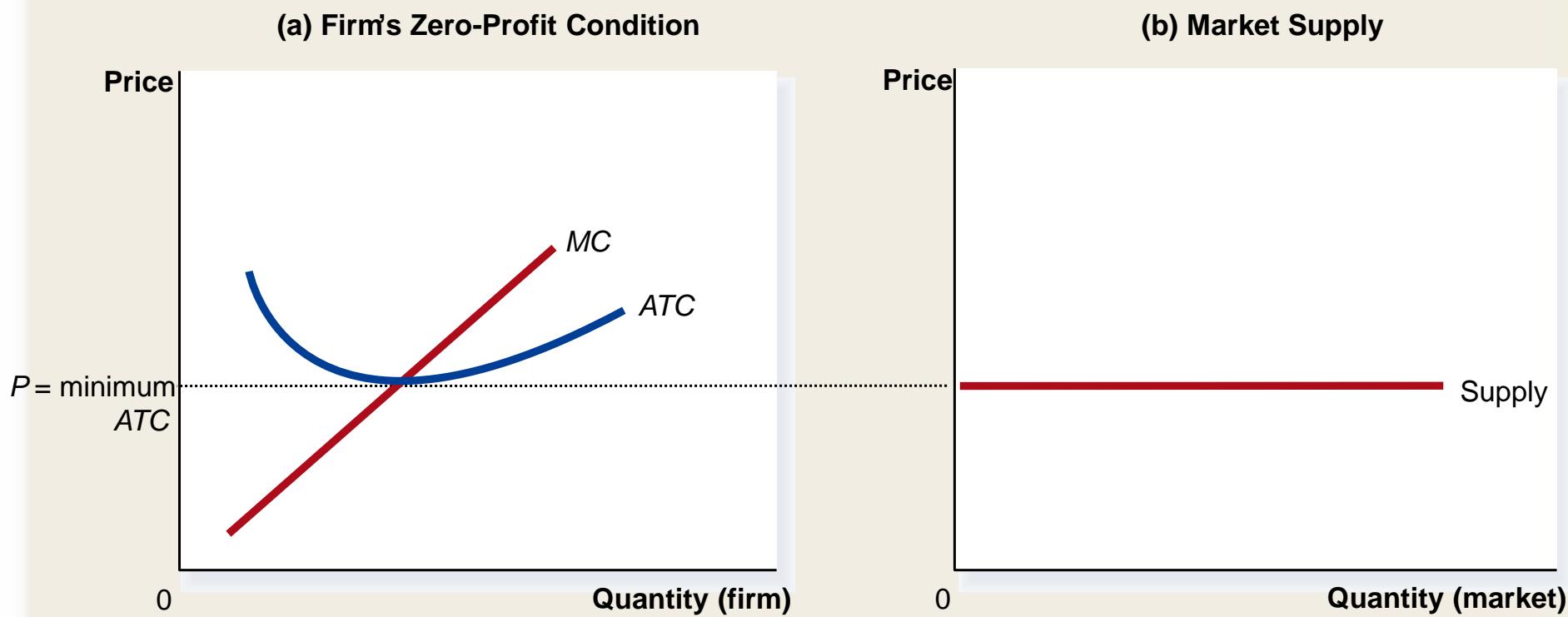


If the industry has 1000 identical firms, then at each market price, industry output will be 1000 times larger than the representative firm's output.

# The Long Run: Market Supply with Entry and Exit

- Firms will enter or exit the market until profit is driven to zero.
- In the long run, price equals the minimum of average total cost.
- The long-run market supply curve is horizontal at this price.

## Figure 7 Long-Run Market Supply



# The Long Run: Market Supply with Entry and Exit

- At the end of the process of entry and exit, firms that remain must be making zero economic profit.
- The process of entry and exit ends only when price and average total cost are driven to equality.
- Long-run equilibrium must have firms operating at their efficient scale.

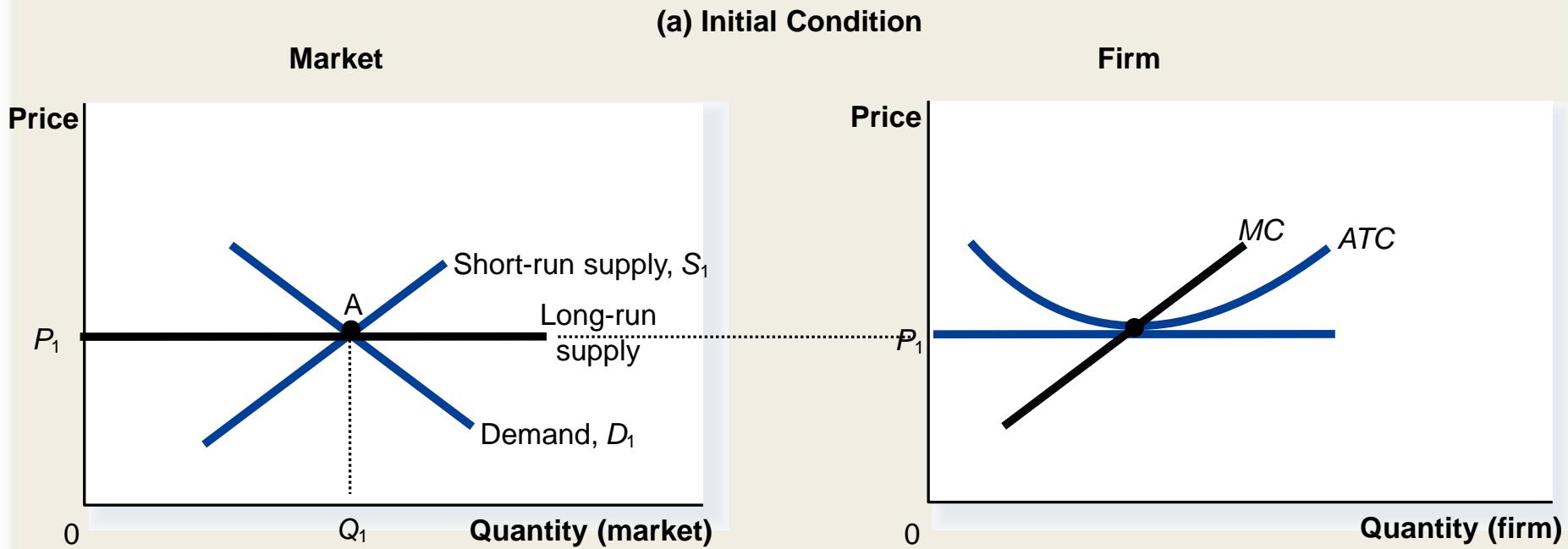
# Why Do Competitive Firms Stay in Business If They Make Zero Profit?

- Profit equals total revenue minus total cost.
- Total cost includes all the opportunity costs of the firm.
- In the zero-profit equilibrium, the firm's revenue compensates the owners for the time and money they expend to keep the business going.

# A Shift in Demand in the Short Run and Long Run

- An increase in demand raises price and quantity in the short run.
- Firms earn profits because price now exceeds average total cost.

## Figure 8 An Increase in Demand in the Short Run and Long Run



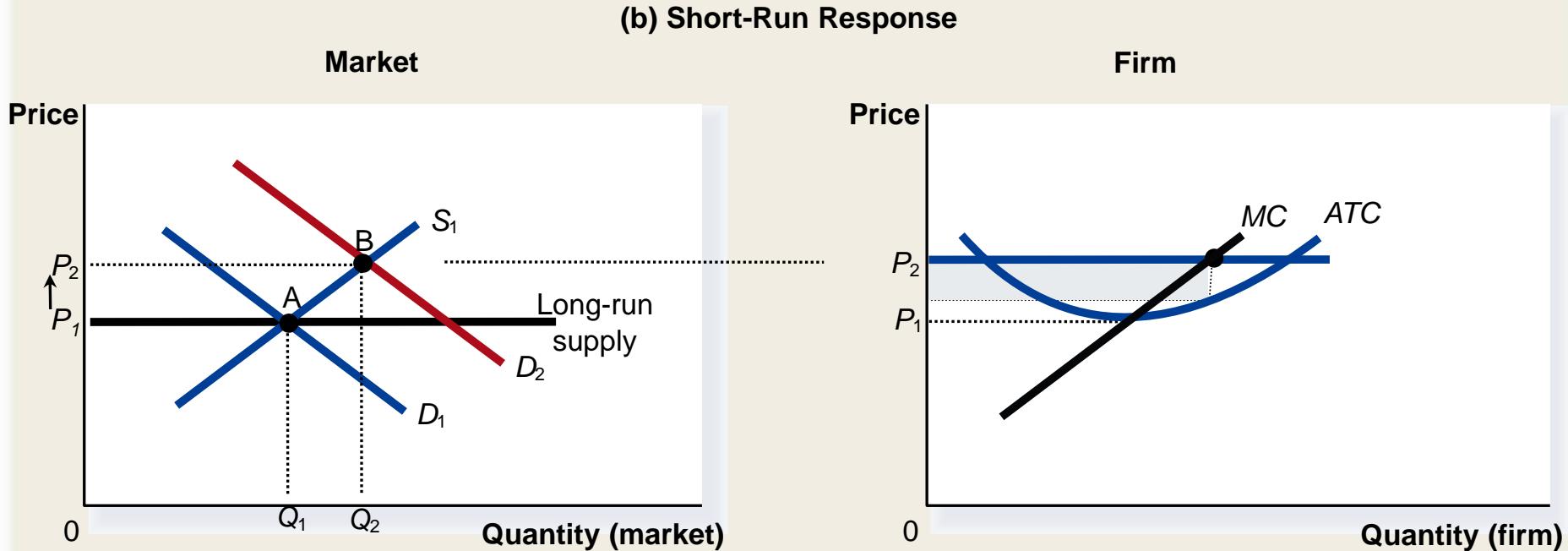
A market begins in long run equilibrium.

And firms earn zero profit.

# Figure 8 An Increase in Demand in the Short Run and Long Run

An increase in market demand...  
...raises price and output.

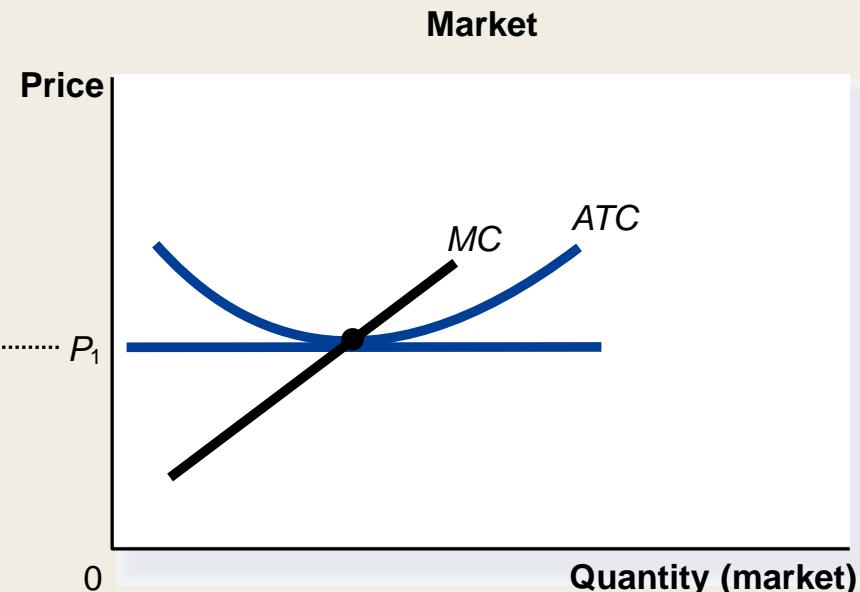
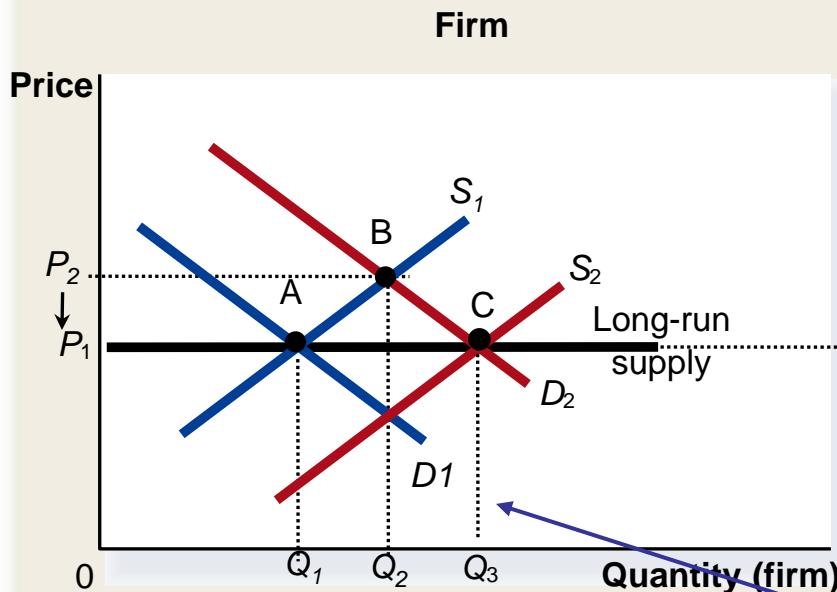
The higher P encourages firms to produce more....and generates short-run profit.



# Figure 8 An Increase in Demand in the Short Run and Long Run

Profits induce entry and market supply increases.

(c) Long-Run Response



The increase in supply lowers market price.

In the long run market price is restored, but market supply is greater.

# Summary

---

- Because a competitive firm is a price taker, its revenue is proportional to the amount of output it produces.
- The price of the good equals both the firm's average revenue and its marginal revenue.

# Summary

---

- To maximize profit, a firm chooses the quantity of output such that marginal revenue equals marginal cost.
- This is also the quantity at which price equals marginal cost.
- Therefore, the firm's marginal cost curve is its supply curve.

# Summary

---

- In the short run, when a firm cannot recover its fixed costs, the firm will choose to shut down temporarily if the price of the good is less than average variable cost.
- In the long run, when the firm can recover both fixed and variable costs, it will choose to exit if the price is less than average total cost.

# Summary

---

- In a market with free entry and exit, profits are driven to zero in the long run and all firms produce at the efficient scale.
- Changes in demand have different effects over different time horizons.
- In the long run, the number of firms adjusts to drive the market back to the zero-profit equilibrium.



15

## Monopoly



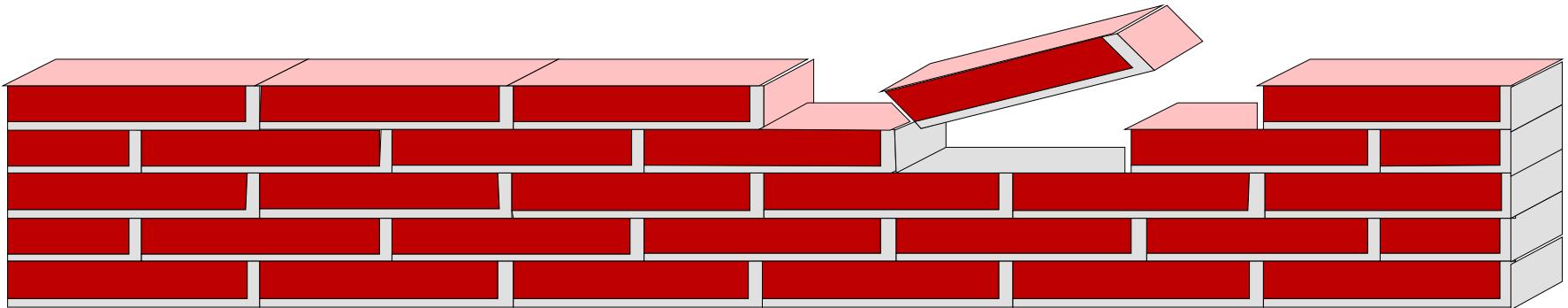
# Monopoly

- While a competitive firm is a *price taker*, a monopoly firm is a *price maker*.
- A firm is considered a *monopoly* if . . .
  - it is the sole seller of its product.
  - its product does not have close substitutes.



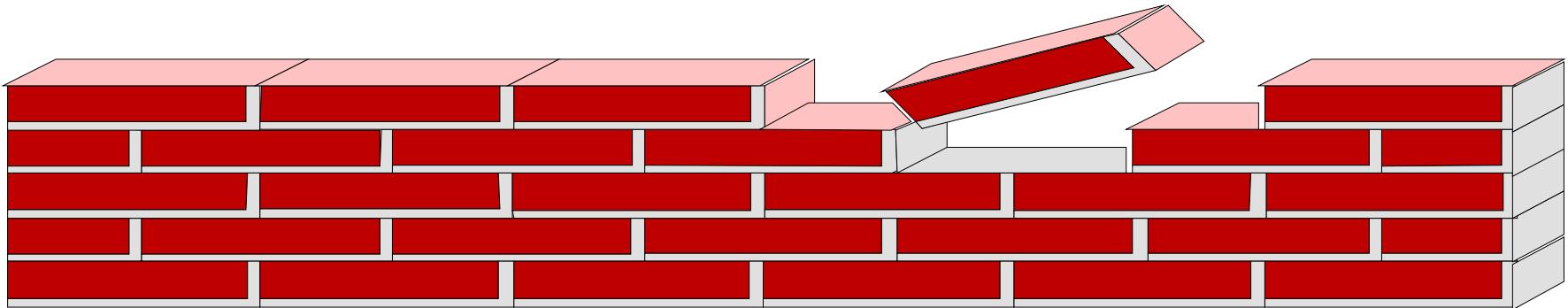
# WHY MONOPOLIES ARISE

- The fundamental cause of monopoly is *barriers to entry*.



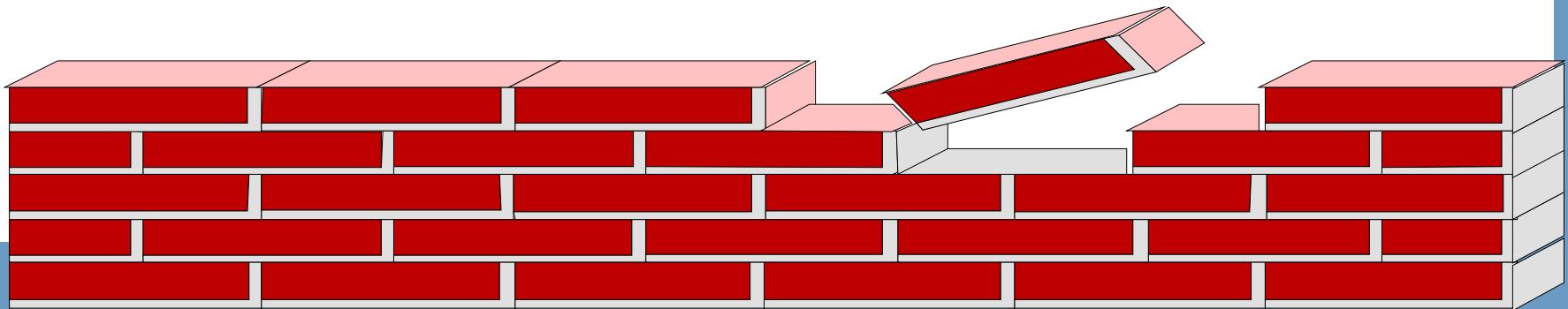
# WHY MONOPOLIES ARISE

- Barriers to entry have three sources:
  - Ownership of a key resource.
  - The government gives a single firm the exclusive right to produce some good.
  - Costs of production make a single producer more efficient than a large number of producers.



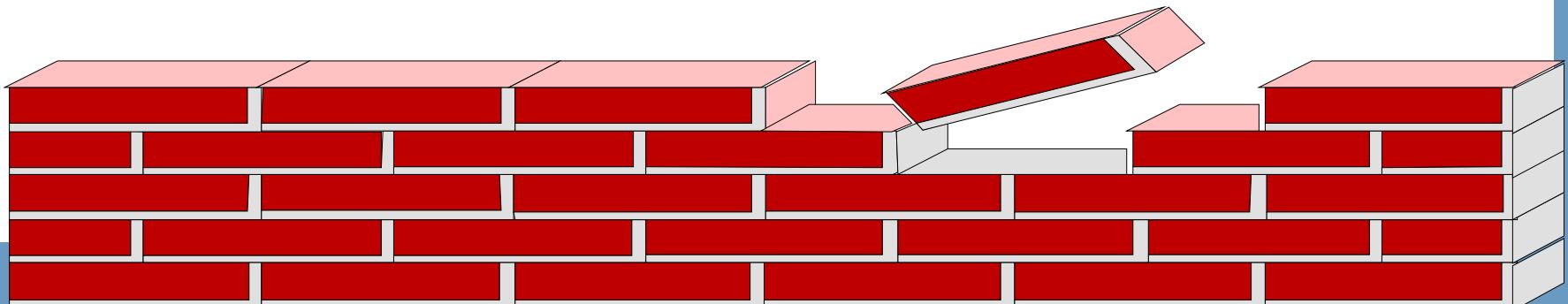
# Monopoly Resources

- Although exclusive ownership of a key resource is a potential source of monopoly, in practice monopolies rarely arise for this reason.



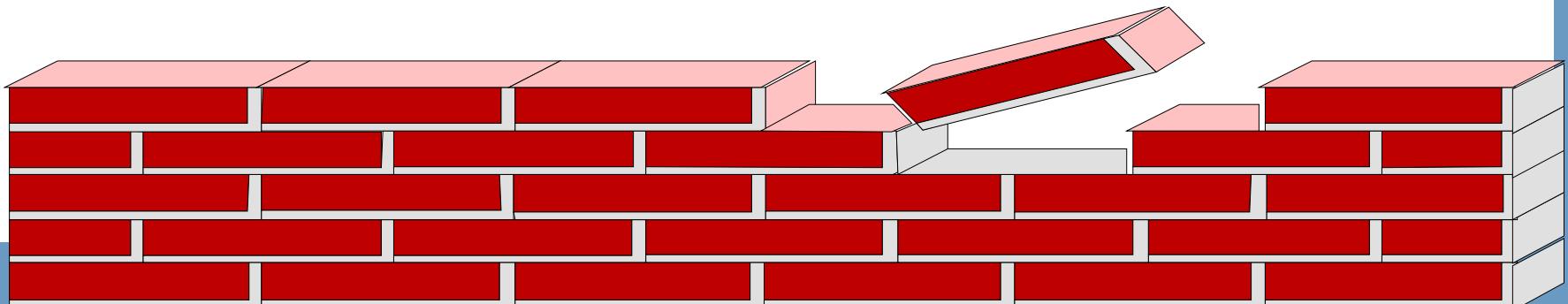
# Government-Created Monopolies

- Governments may restrict entry by giving a single firm the exclusive right to sell a particular good in certain markets.
- Patent and copyright laws are two important examples of how government creates a monopoly to serve the public interest.

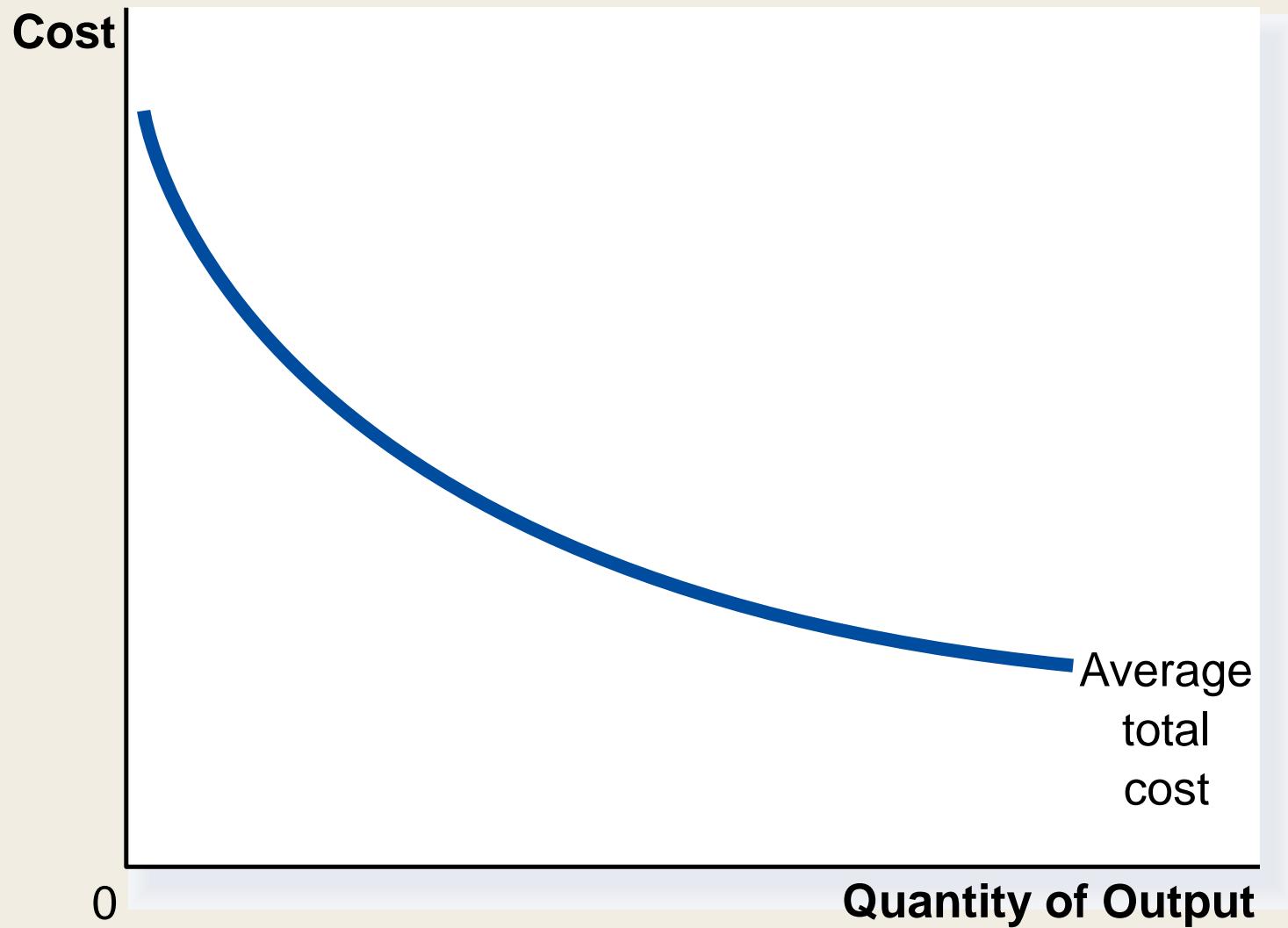


# Natural Monopolies

- An industry is a *natural monopoly* when a single firm can supply a good or service to an entire market at a smaller cost than could two or more firms.
- A natural monopoly arises when there are economies of scale over the relevant range of output.



## Figure 1 Economies of Scale as a Cause of Monopoly



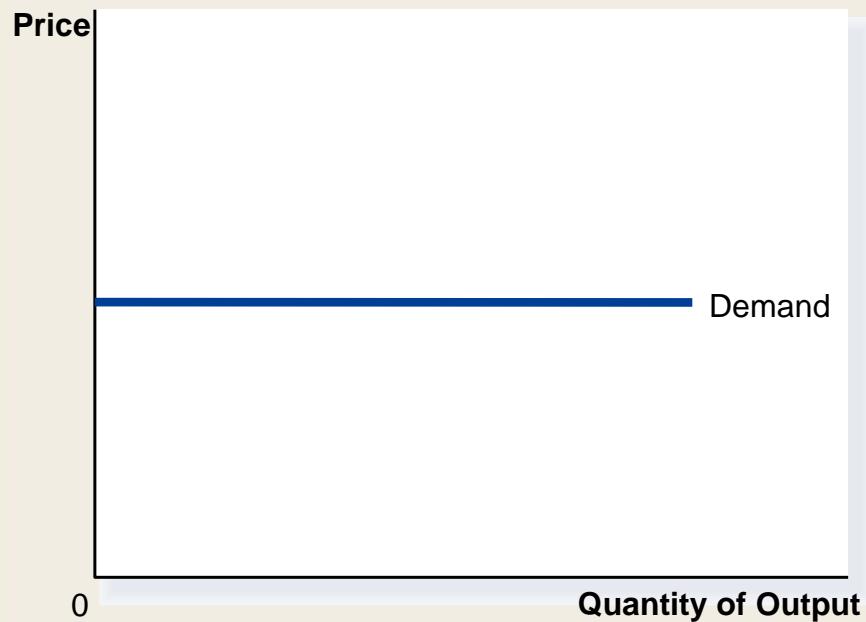


# HOW MONOPOLIES MAKE PRODUCTION AND PRICING DECISIONS

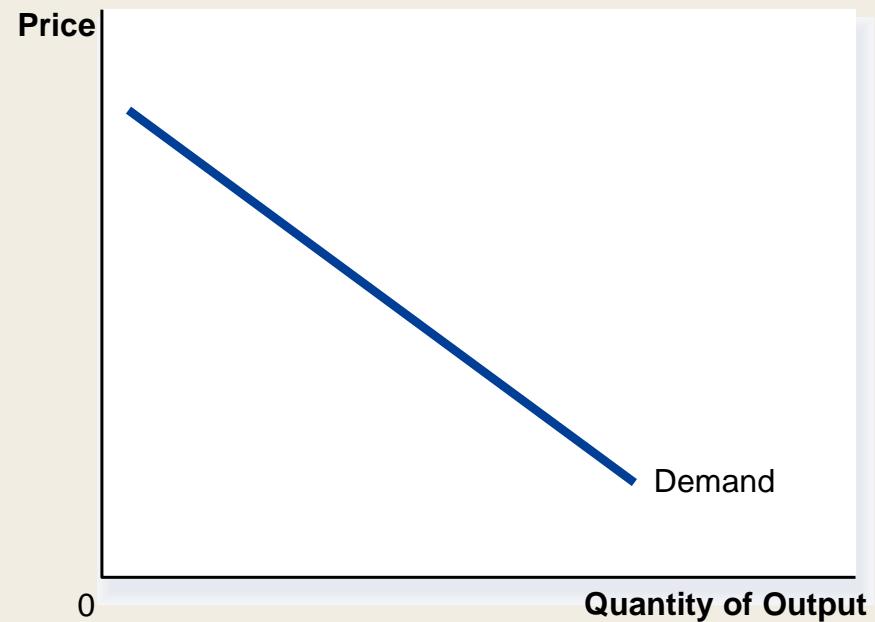
- Monopoly versus Competition
  - Monopoly
    - Is the sole producer
    - Faces a downward-sloping demand curve
    - Is a price maker
    - Reduces price to increase sales
  - Competitive Firm
    - Is one of many producers
    - Faces a horizontal demand curve
    - Is a price taker
    - Sells as much or as little at same price

## Figure 2 Demand Curves for Competitive and Monopoly Firms

(a) A Competitive Firm's Demand Curve



(b) A Monopolist's Demand Curve



Since a monopoly is the sole producer in its market, it faces the market demand curve.

# A Monopoly's Revenue

- Total Revenue
  - $P \times Q = TR$
- Average Revenue
  - $TR/Q = AR = P$
- Marginal Revenue
  - $\Delta TR/\Delta Q = MR$

## Table 1 A Monopoly's Total, Average, and Marginal Revenue

Quantity of Water (Q)	Price (P)	Total Revenue ( $TR = P \times Q$ )	Average Revenue ( $AR = TR / Q$ )	Marginal Revenue ( $MR = \Delta TR / \Delta Q$ )
0 gallons	\$11	\$ 0	—	\$10
1	10	10	\$10	8
2	9	18	9	6
3	8	24	8	4
4	7	28	7	2
5	6	30	6	0
6	5	30	5	-2
7	4	28	4	-4
8	3	24	3	

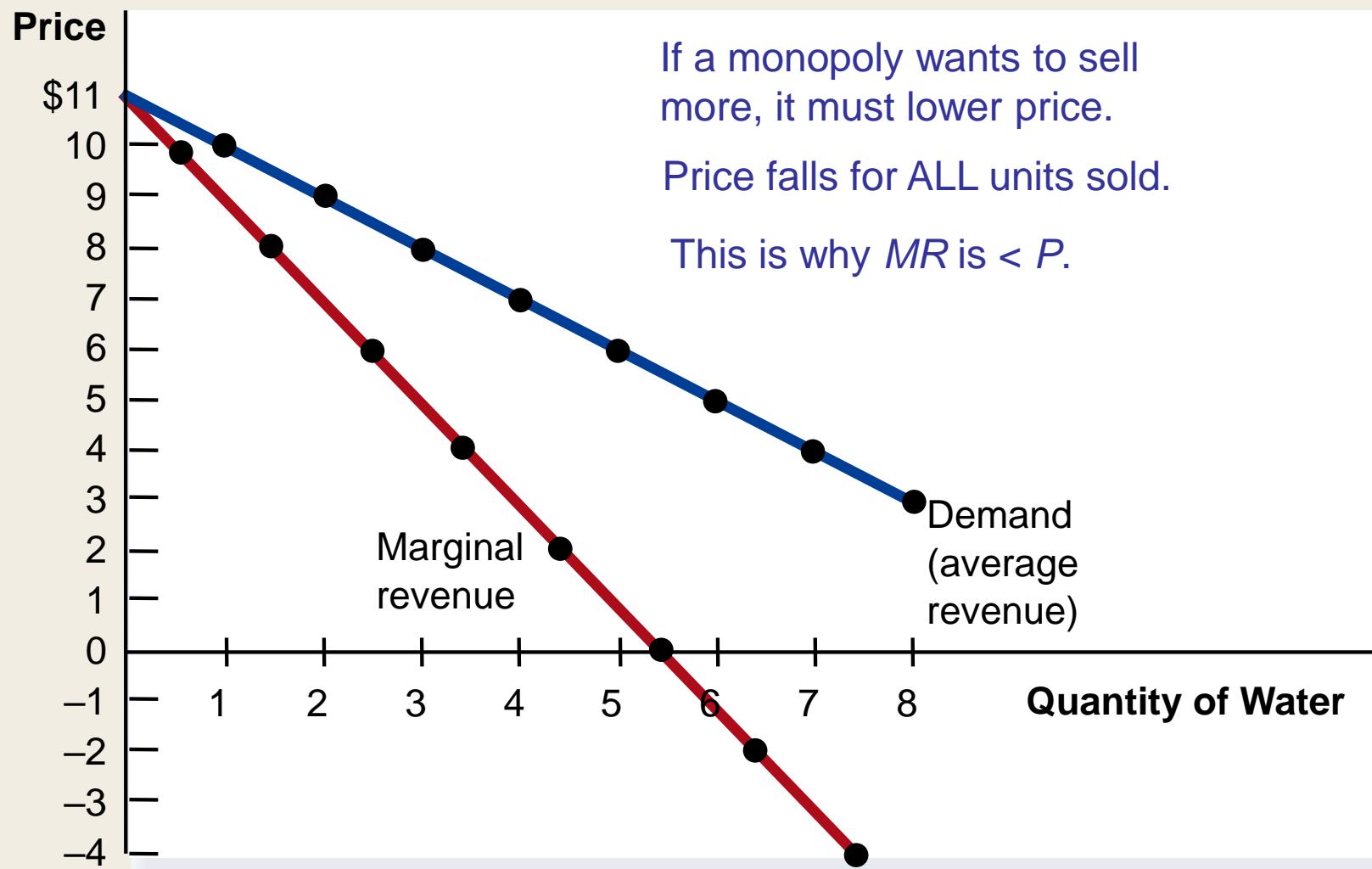
# A Monopoly's Revenue

- A Monopoly's Marginal Revenue
  - A monopolist's marginal revenue is always less than the price of its good.
    - The demand curve is downward sloping.
    - When a monopoly drops the price to sell one more unit, the revenue received from previously sold units also decreases.

# A Monopoly's Revenue

- A Monopoly's Marginal Revenue
  - When a monopoly increases the amount it sells, it has two effects on total revenue ( $P \times Q$ ).
    - The output effect—more output is sold, so  $Q$  is higher.
    - The price effect—price falls, so  $P$  is lower.

## Figure 3 Demand and Marginal-Revenue Curves for a Monopoly

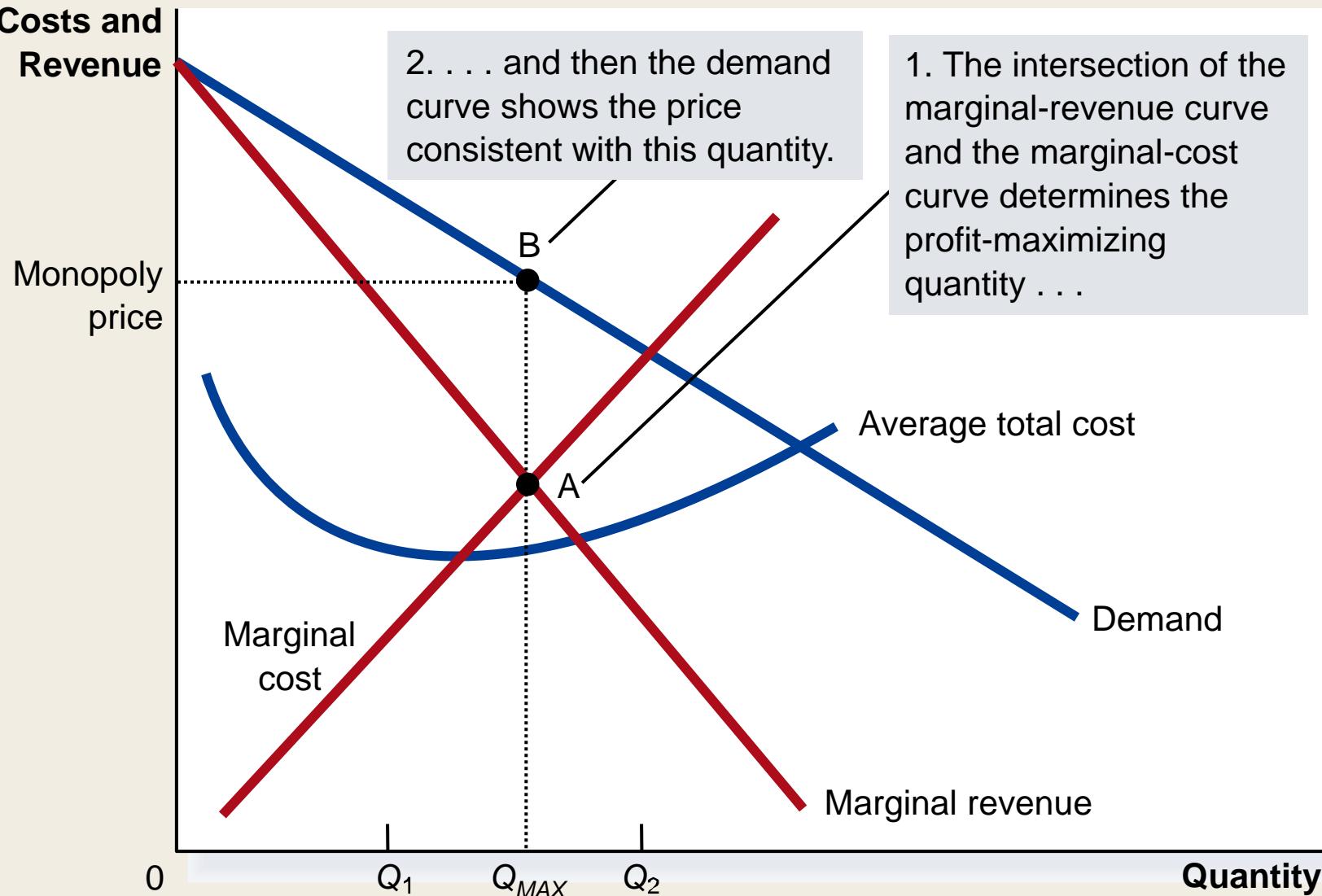


# Profit Maximization

- A monopoly maximizes profit by producing the quantity at which marginal revenue equals marginal cost.
- It then uses the demand curve to find the price that will induce consumers to buy that quantity.

## Figure 4 Profit Maximization for a Monopoly

Costs and Revenue



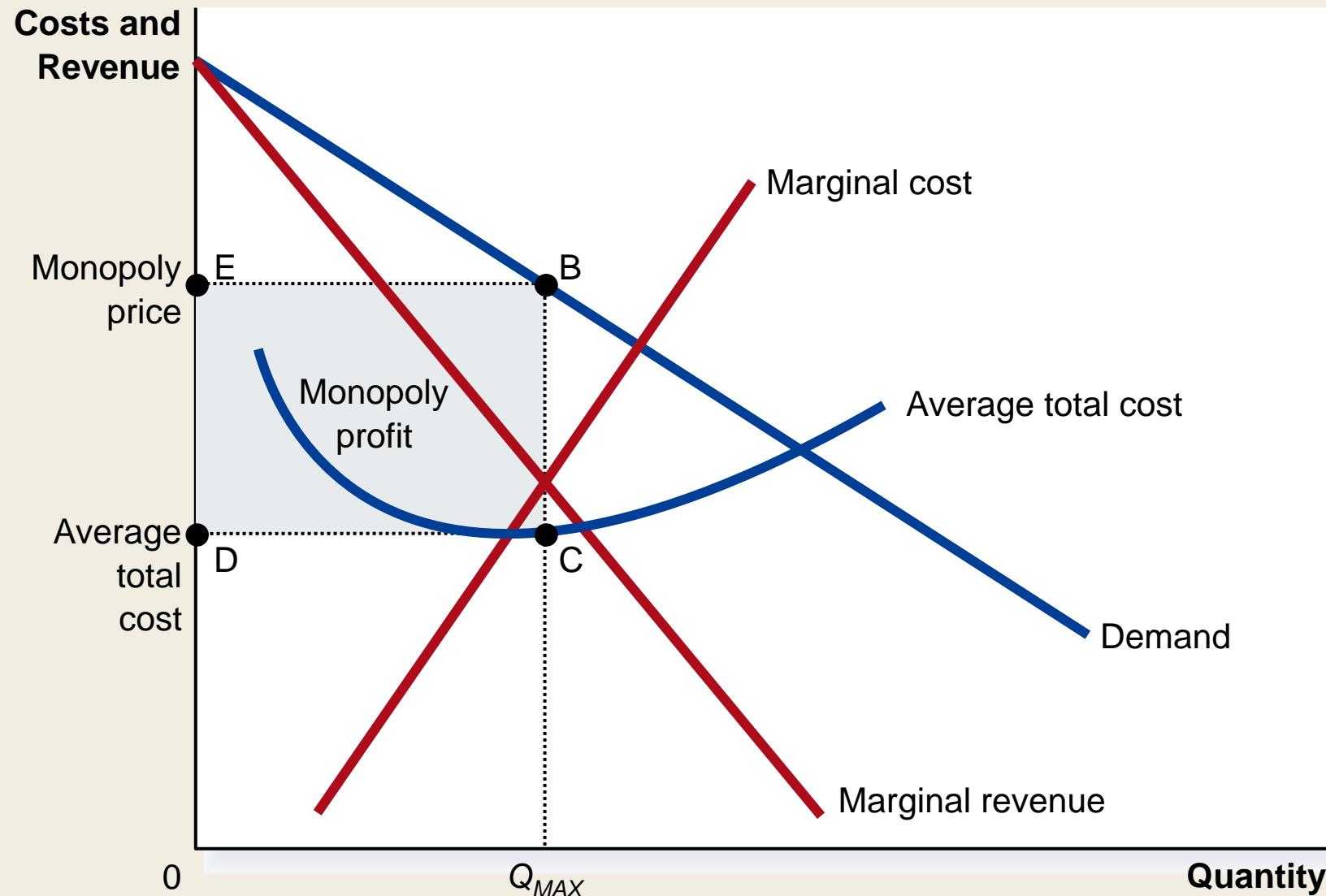
# Profit Maximization

- Comparing Monopoly and Competition
  - For a competitive firm, price equals marginal cost.
    - $P = MR = MC$
  - For a monopoly firm, price exceeds marginal cost.
    - $P > MR = MC$
- Remember, all profit-maximizing firms set  $MR = MC$ .

# A Monopoly's Profit

- Profit equals total revenue minus total costs.
  - $\text{Profit} = TR - TC$
  - $\text{Profit} = (TR/Q - TC/Q) \times Q$
  - $\text{Profit} = (P - ATC) \times Q$

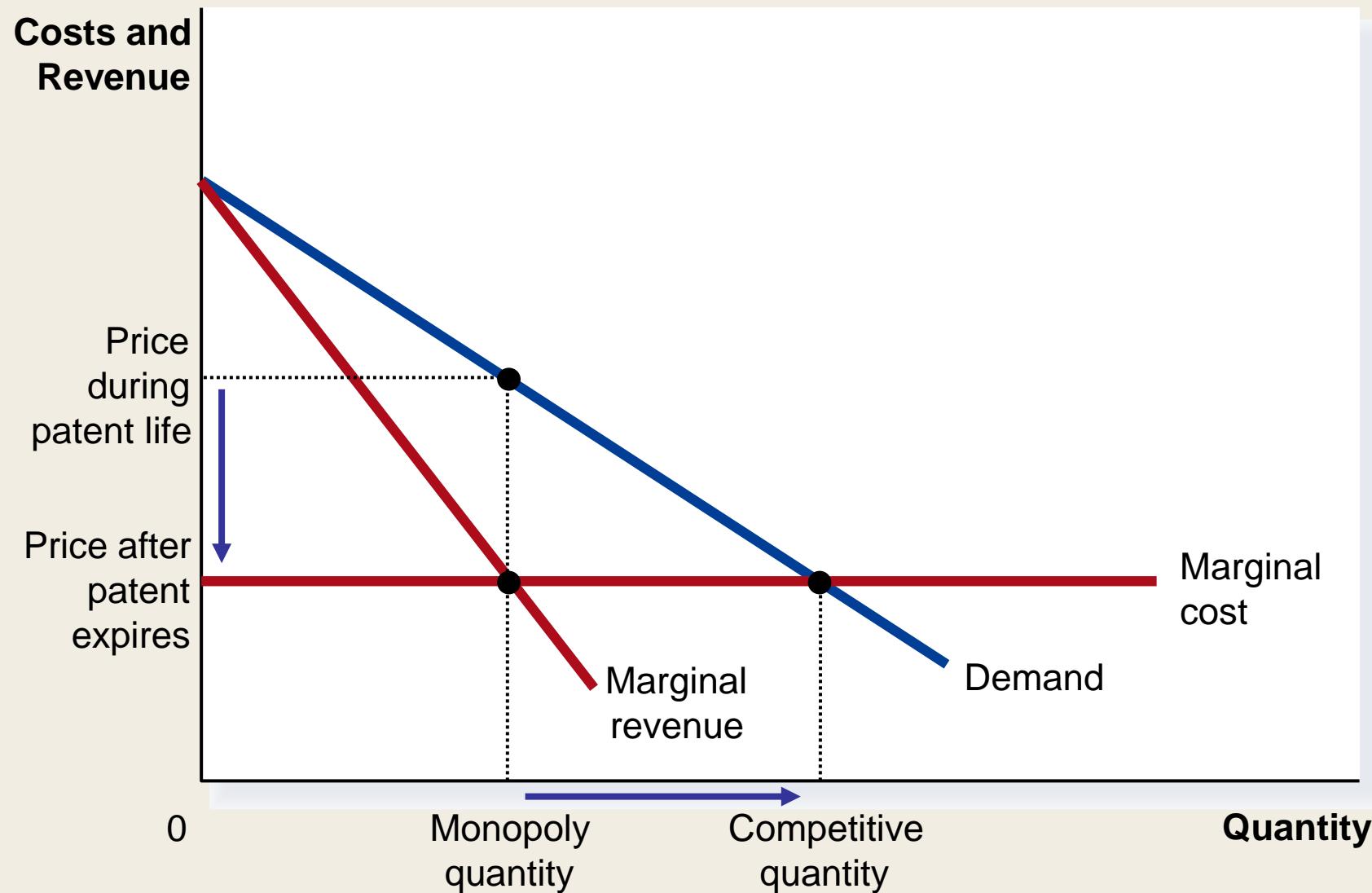
## Figure 5 The Monopolist's Profit



# A Monopolist's Profit

- The monopolist will receive economic profits as long as price is greater than average total cost.

## Figure 6 The Market for Drugs





# PRICE DISCRIMINATION

- *Price discrimination* is the business practice of selling the same good at different prices to different customers, even though the costs for producing for the two customers are the same.

# The Analytics of Price Discrimination

- Price discrimination is not possible when a good is sold in a competitive market since there are many firms all selling at the market price. In order to price discriminate, the firm must have some *market power*.
- Perfect Price Discrimination
  - Perfect price discrimination refers to the situation when the monopolist knows exactly the willingness to pay of each customer and can charge each customer a different price.

# The Analytics of Price Discrimination

- Two important effects of price discrimination:
  - It can increase the monopolist's profits.

# Examples of Price Discrimination

- Movie tickets
- Airline prices
- Discount coupons
- Financial aid
- Quantity discounts



# CONCLUSION: THE PREVALENCE OF MONOPOLY

- How prevalent are the problems of monopolies?
  - Monopolies are common.
  - Most firms have some control over their prices because of differentiated products.
  - Firms with substantial monopoly power are rare.
  - Few goods are truly unique.

## Table 2 Competition versus Monopoly: A Summary Comparison

	Competition	Monopoly
<b>Similarities</b>		
Goal of firms	Maximize profits	Maximize profits
Rule for maximizing	$MR = MC$	$MR = MC$
Can earn economic profits in the short run?	Yes	Yes
<b>Differences</b>		
Number of firms	Many	One
Marginal revenue	$MR = P$	$MR < P$
Price	$P = MC$	$P > MC$
Produces welfare-maximizing level of output?	Yes	No
Entry in long run?	Yes	No
Can earn economic profits in long run?	No	Yes
Price discrimination possible?	No	Yes

# Summary

---

- A monopoly is a firm that is the sole seller in its market.
- It faces a downward-sloping demand curve for its product.
- A monopoly's marginal revenue is always below the price of its good.

# Summary

---

- Like a competitive firm, a monopoly maximizes profit by producing the quantity at which marginal cost and marginal revenue are equal.
- Unlike a competitive firm, its price exceeds its marginal revenue, so its price exceeds marginal cost.

# Summary

---

- Monopolists can raise their profits by charging different prices to different buyers based on their willingness to pay.



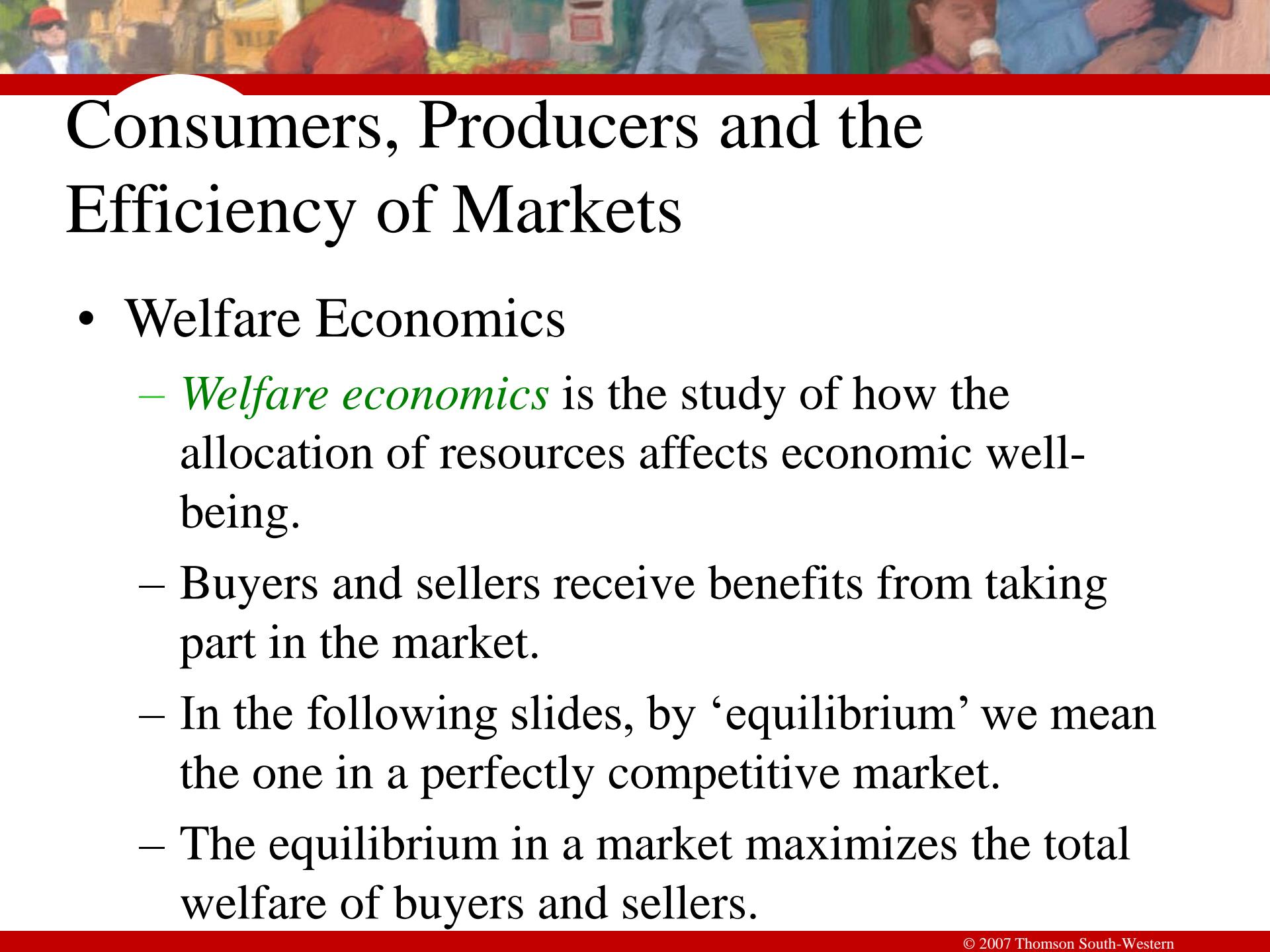
7

## Consumers, Producers, and the Efficiency of Markets



# Consumers, Producers and the Efficiency of Markets

- Revisiting the Market Equilibrium
  - Do the equilibrium price and quantity maximize the total welfare of buyers and sellers?
  - Market equilibrium reflects the way markets allocate scarce resources.
  - Whether the market allocation is desirable can be addressed by welfare economics.



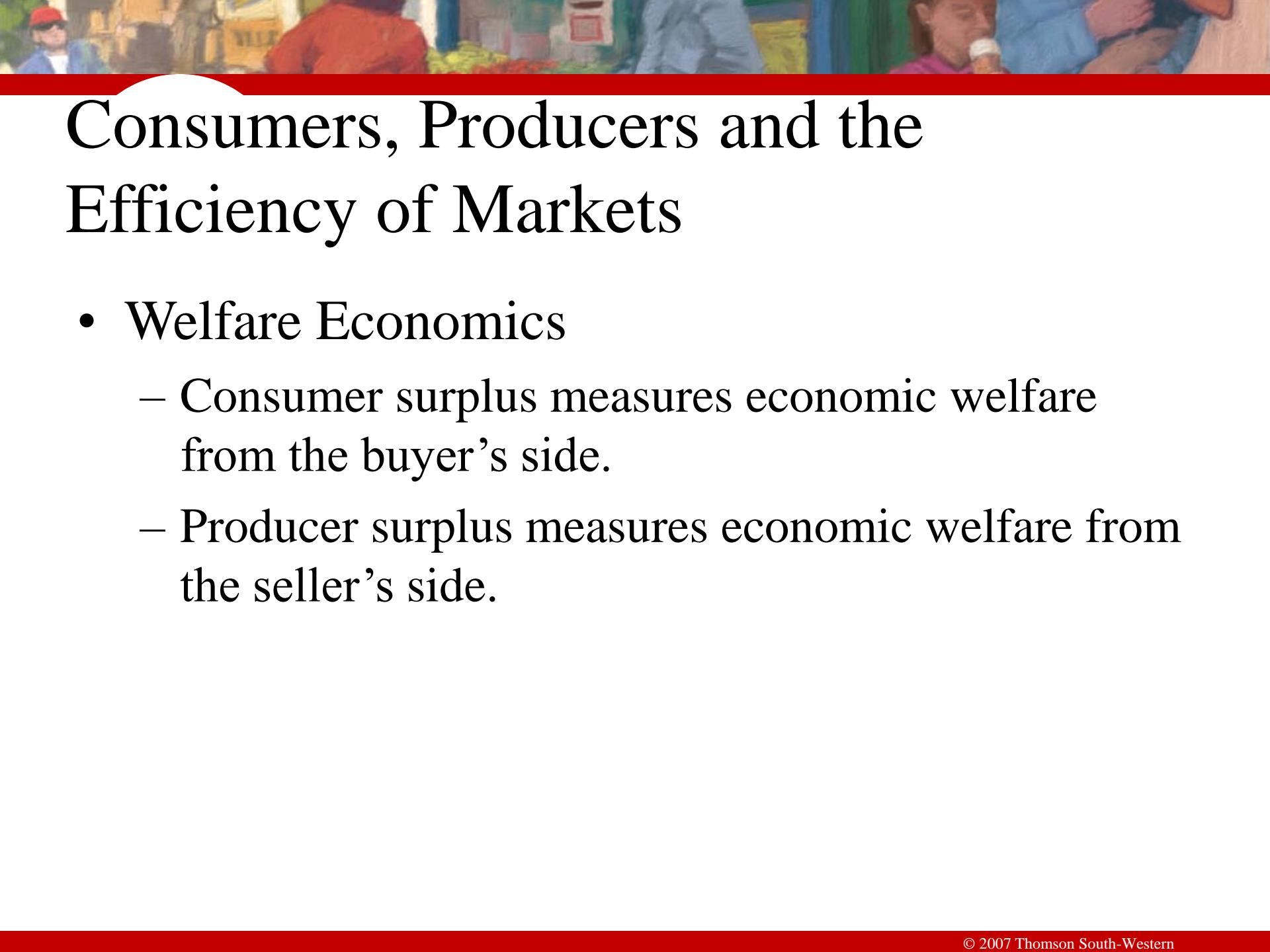
# Consumers, Producers and the Efficiency of Markets

- Welfare Economics
  - *Welfare economics* is the study of how the allocation of resources affects economic well-being.
  - Buyers and sellers receive benefits from taking part in the market.
  - In the following slides, by ‘equilibrium’ we mean the one in a perfectly competitive market.
  - The equilibrium in a market maximizes the total welfare of buyers and sellers.



# Consumers, Producers and the Efficiency of Markets

- Welfare Economics
  - Equilibrium in the market results in maximum benefits, and therefore maximum total welfare for both the consumers and the producers of the product.



# Consumers, Producers and the Efficiency of Markets

- Welfare Economics
  - Consumer surplus measures economic welfare from the buyer's side.
  - Producer surplus measures economic welfare from the seller's side.



# CONSUMER SURPLUS

- *Willingness to pay* is the maximum amount that a buyer will pay for a good.
- It measures how much the buyer values the good or service.



# CONSUMER SURPLUS

- *Consumer surplus* is the buyer's willingness to pay for a good minus the amount the buyer actually pays for it.

**Table 1: Four Possible Buyers' Willingness to Pay**

<b>Buyer</b>	<b>Willingness to Pay</b>
John	\$100
Paul	80
George	70
Ringo	50

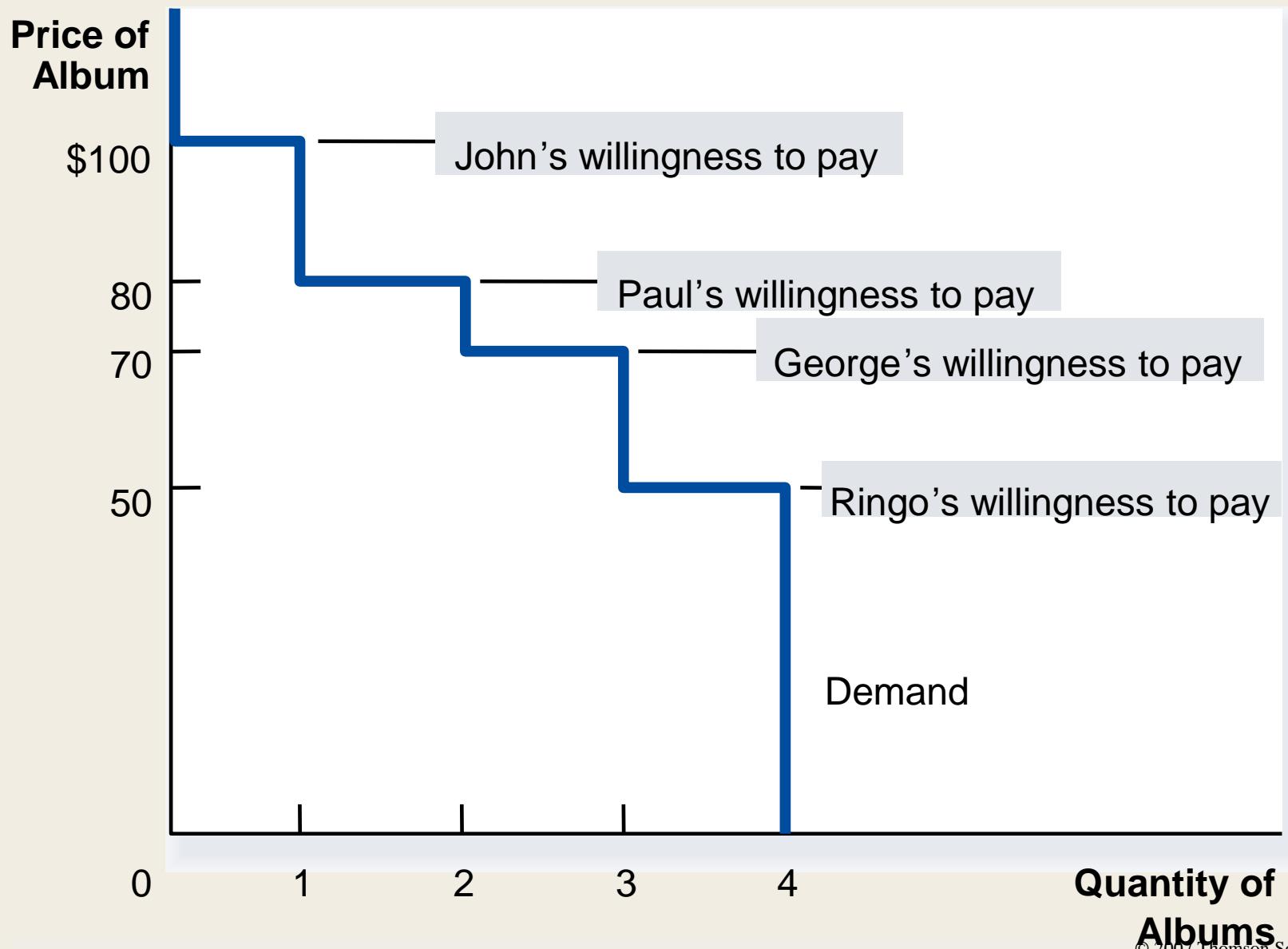
# Using the Demand Curve to Measure Consumer Surplus

- The market demand curve depicts the various quantities that buyers would be willing and able to purchase at different prices.

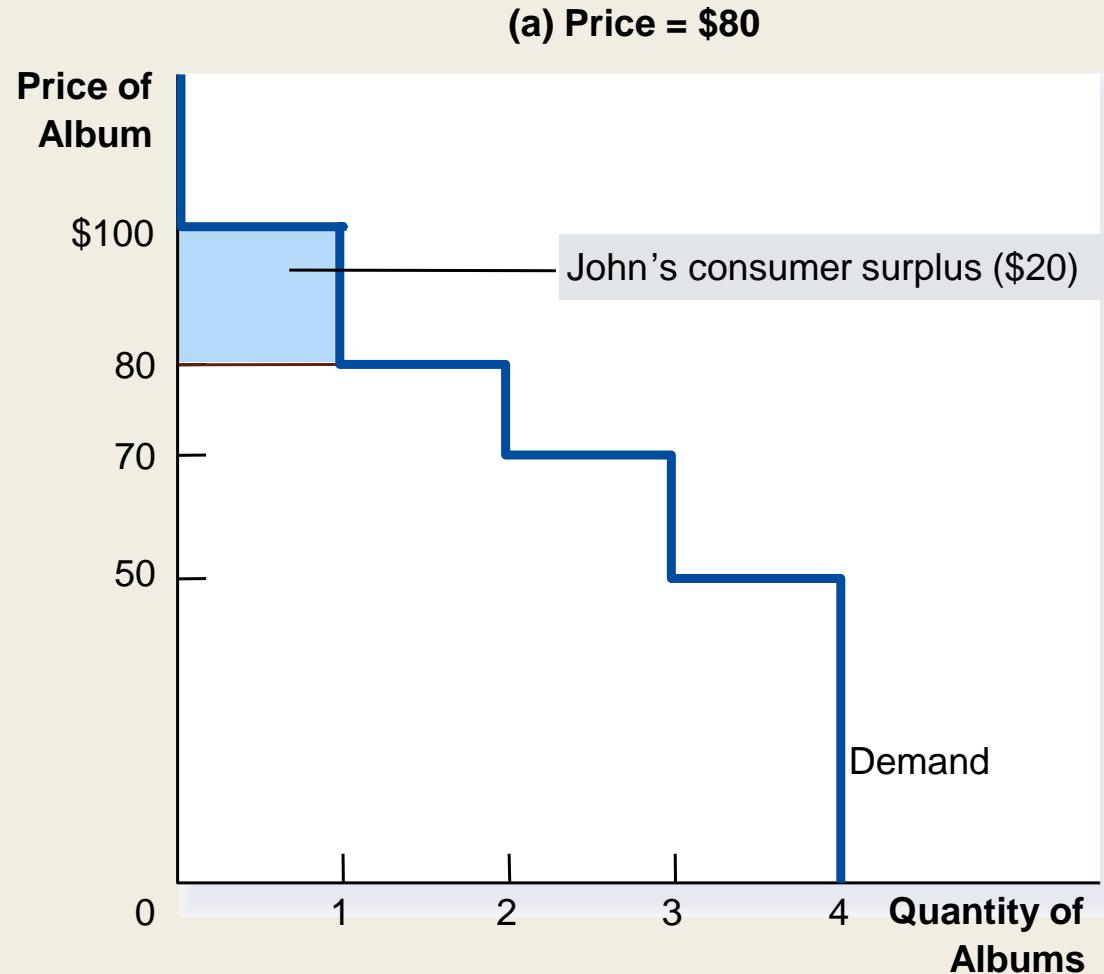
## The Demand Schedule and the Demand Curve

Price	Buyers	Quantity Demanded
More than \$100	None	0
\$80 to \$100	John	1
\$70 to \$80	John, Paul	2
\$50 to \$70	John, Paul, George	3
\$50 or less	John, Paul, George, Ringo	4

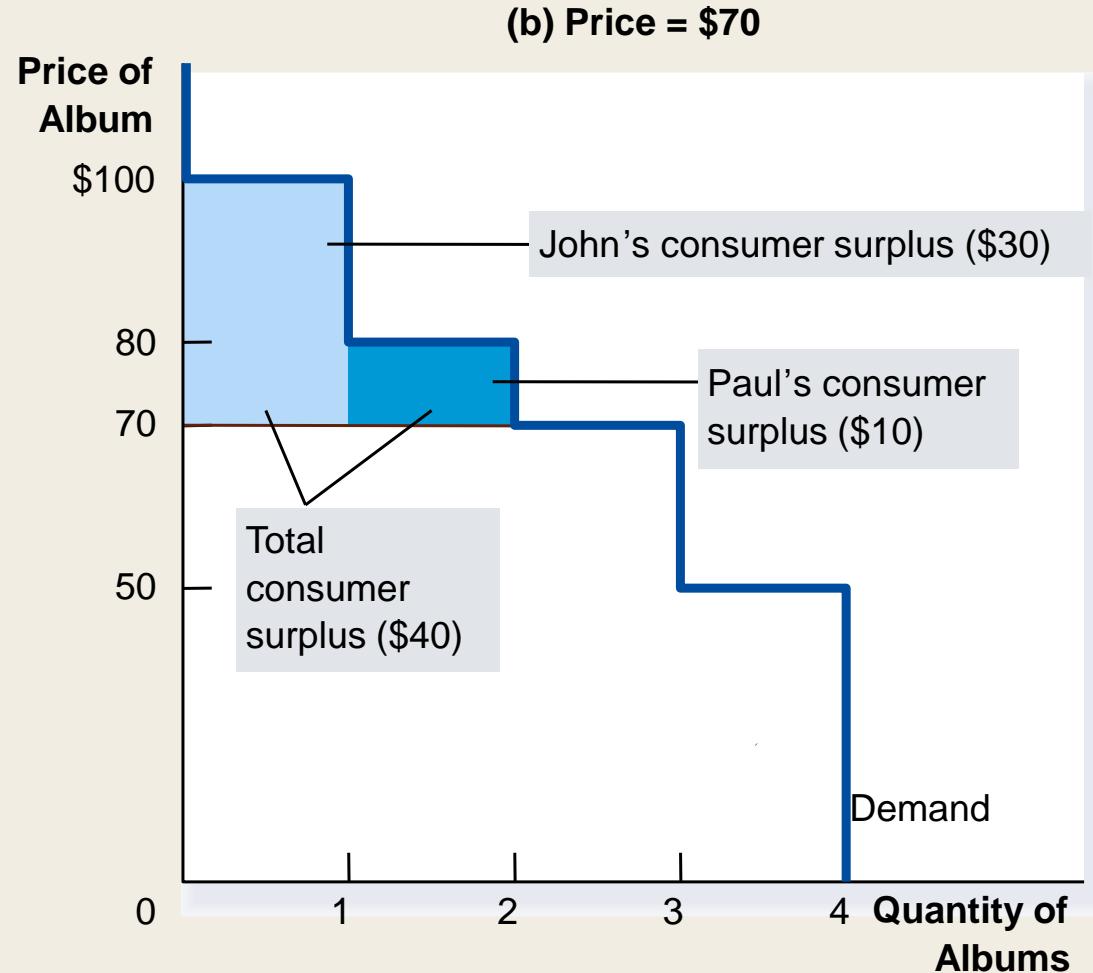
## Figure 1 The Demand Schedule and the Demand Curve



## Figure 2 Measuring Consumer Surplus with the Demand Curve



## Figure 2 Measuring Consumer Surplus with the Demand Curve

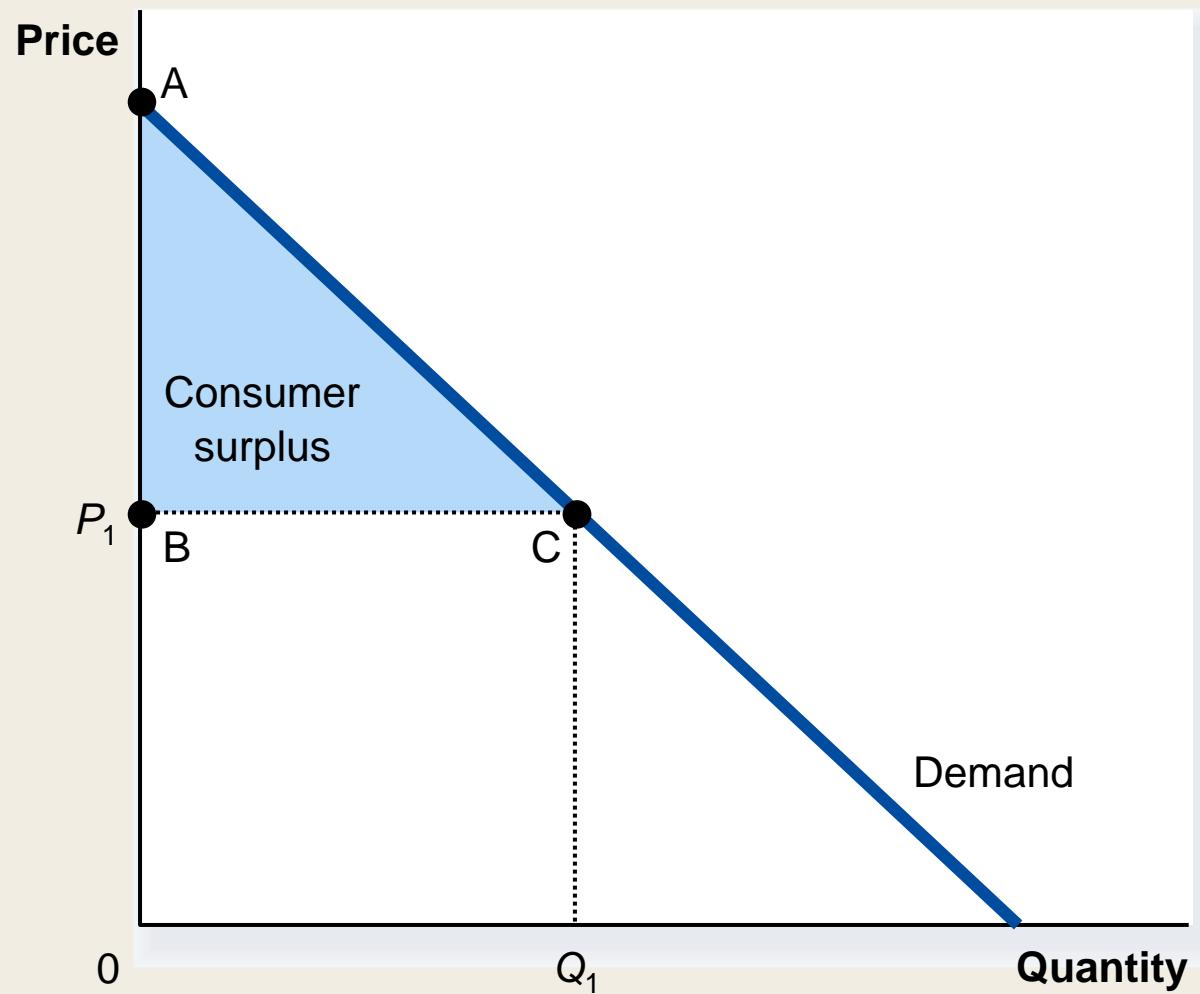


# Using the Demand Curve to Measure Consumer Surplus

- The area below the demand curve and above the price measures the consumer surplus in the market.

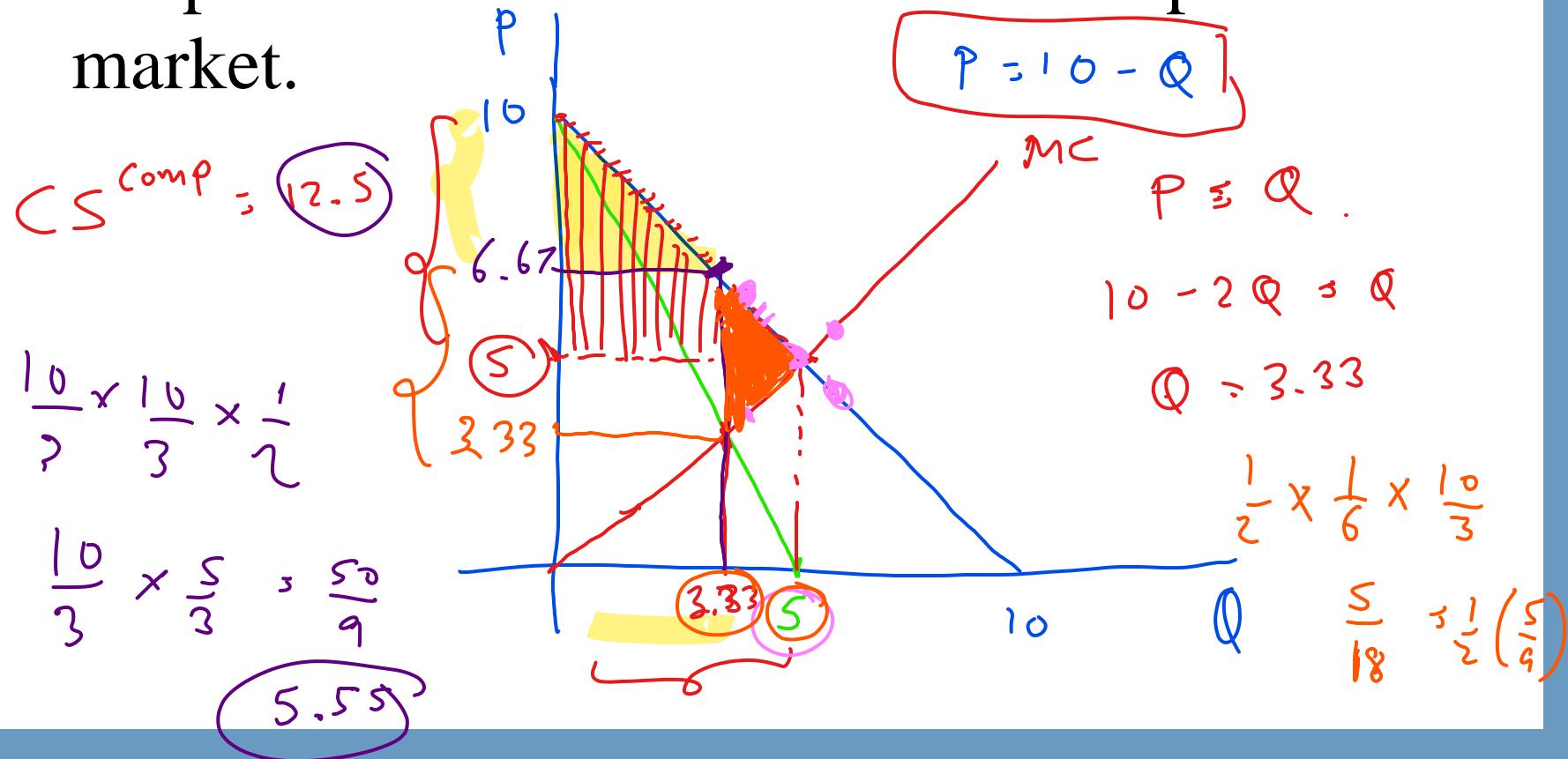
# Figure 3 How the Price Affects Consumer Surplus

(a) Consumer Surplus at Price  $P_1$



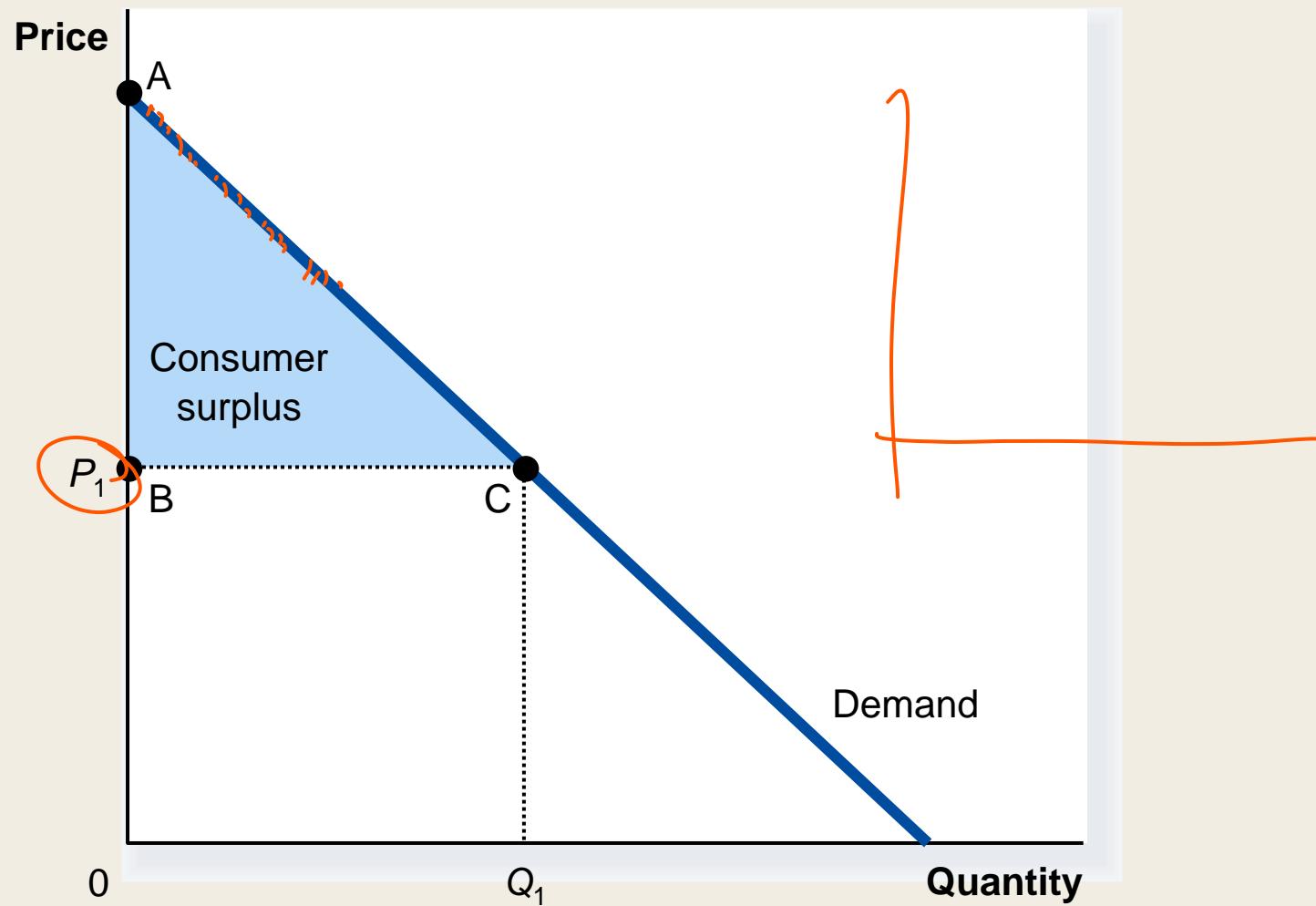
# Using the Demand Curve to Measure Consumer Surplus

- The area below the demand curve and above the price measures the consumer surplus in the market.



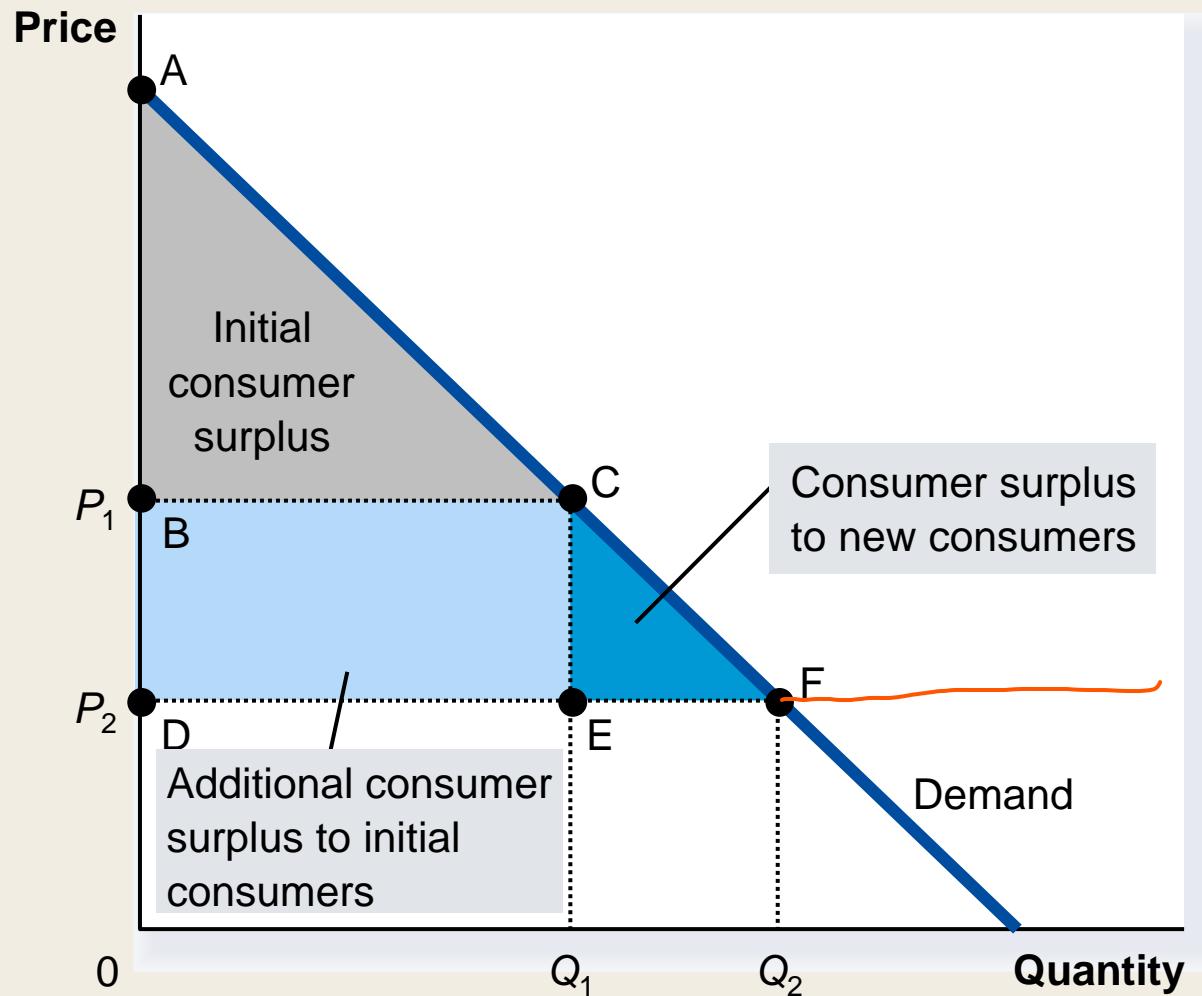
# Figure 3 How the Price Affects Consumer Surplus

(a) Consumer Surplus at Price  $P_1$



# Figure 3 How the Price Affects Consumer Surplus

## (b) Consumer Surplus at Price $P_2$



# What Does Consumer Surplus Measure?

- Consumer surplus, the amount that buyers are willing to pay for a good minus the amount they actually pay for it, measures the benefit that buyers receive from a good as the buyers themselves perceive it.



# PRODUCER SURPLUS

- *Producer surplus* is the amount a seller is paid for a good minus the seller's *cost*.
- It measures the benefit to sellers participating in a market.

**Table 2: The Costs of Four Possible Sellers**

Seller	Cost
Mary	\$900
Frida	800
Georgia	600
Grandma	500

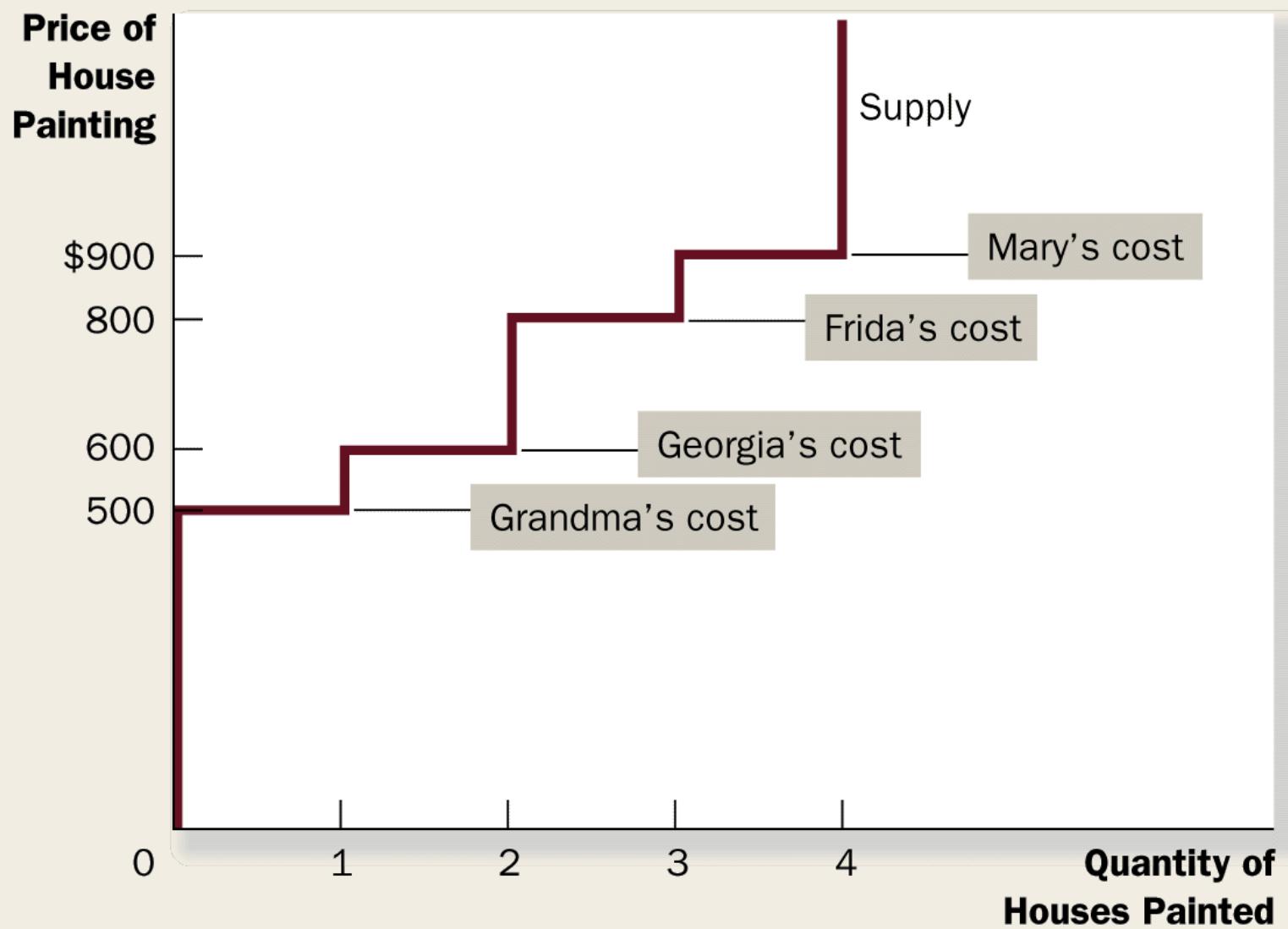
# Using the Supply Curve to Measure Producer Surplus

- Just as consumer surplus is related to the demand curve, producer surplus is closely related to the supply curve.

## The Supply Schedule and the Supply Curve

Price	Sellers	Quantity Supplied
\$900 or more	Mary, Frida, Georgia, Grandma	4
\$800 to \$900	Frida, Georgia, Grandma	3
\$600 to \$800	Georgia, Grandma	2
\$500 to \$600	Grandma	1
Less than \$500	None	0

## Figure 4 The Supply Schedule and the Supply Curve

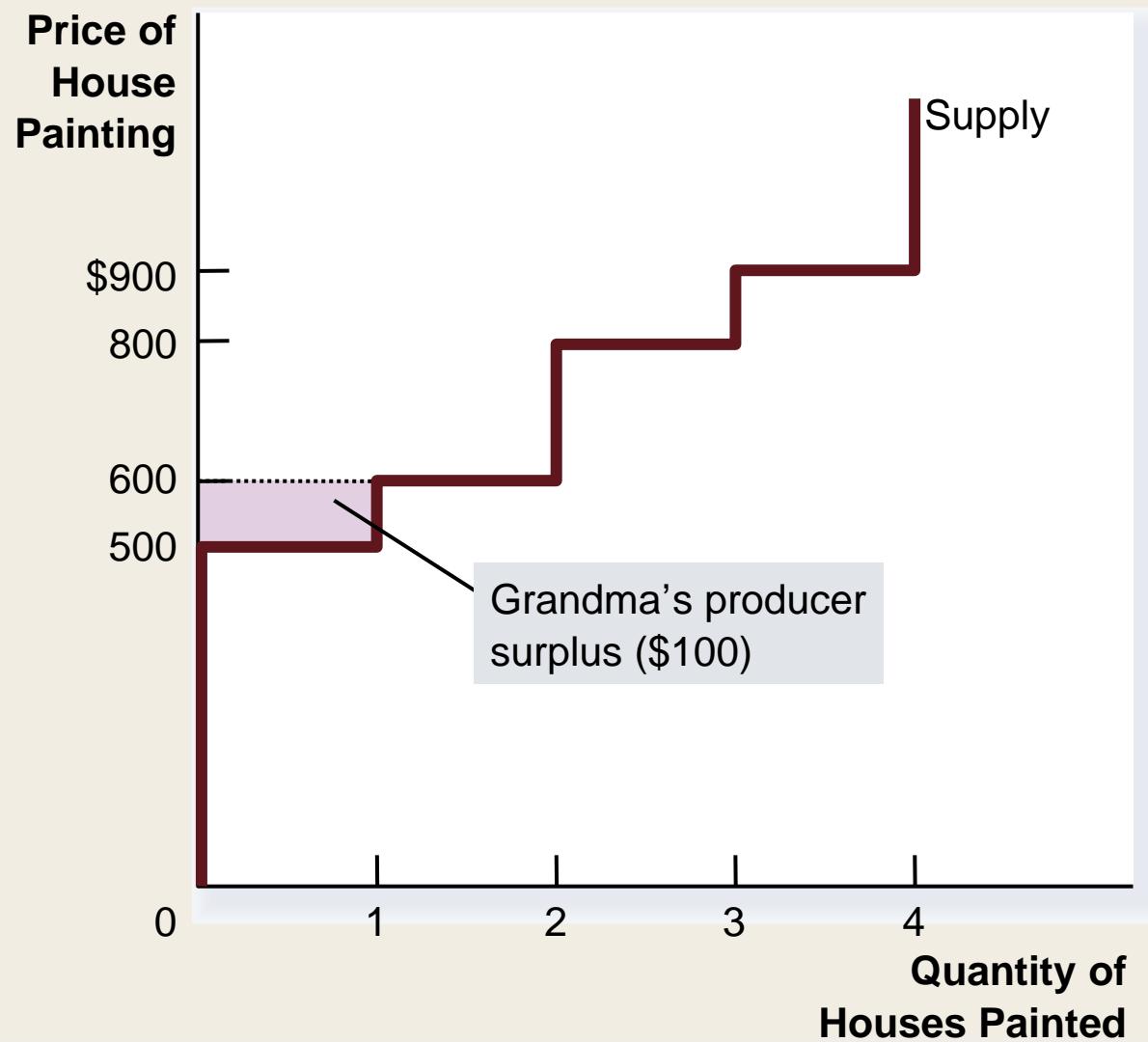


# Using the Supply Curve to Measure Producer Surplus

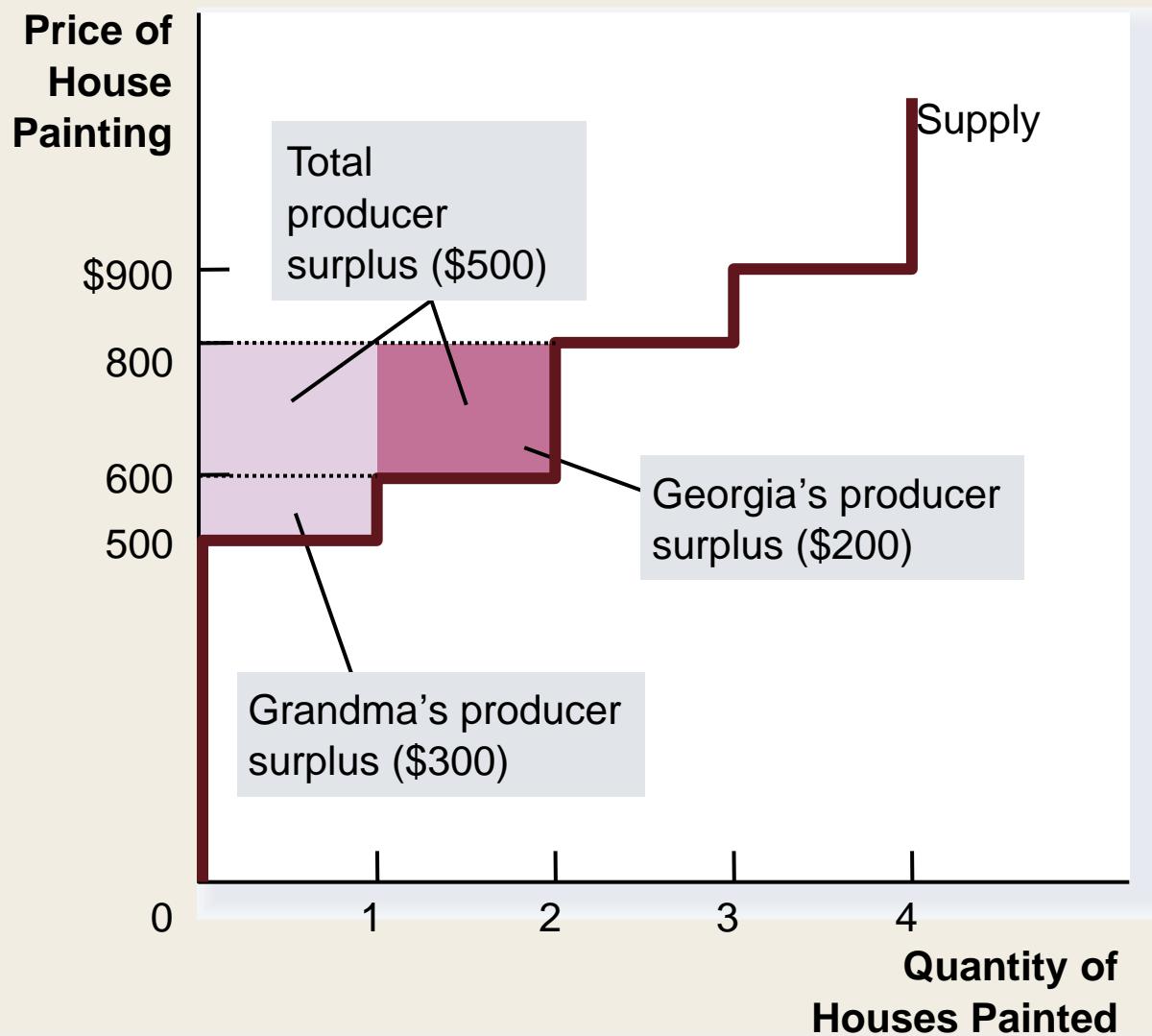
- The area below the price and above the supply curve measures the producer surplus in a market.

## Figure 5 Measuring Producer Surplus with the Supply Curve

(a) Price = \$600

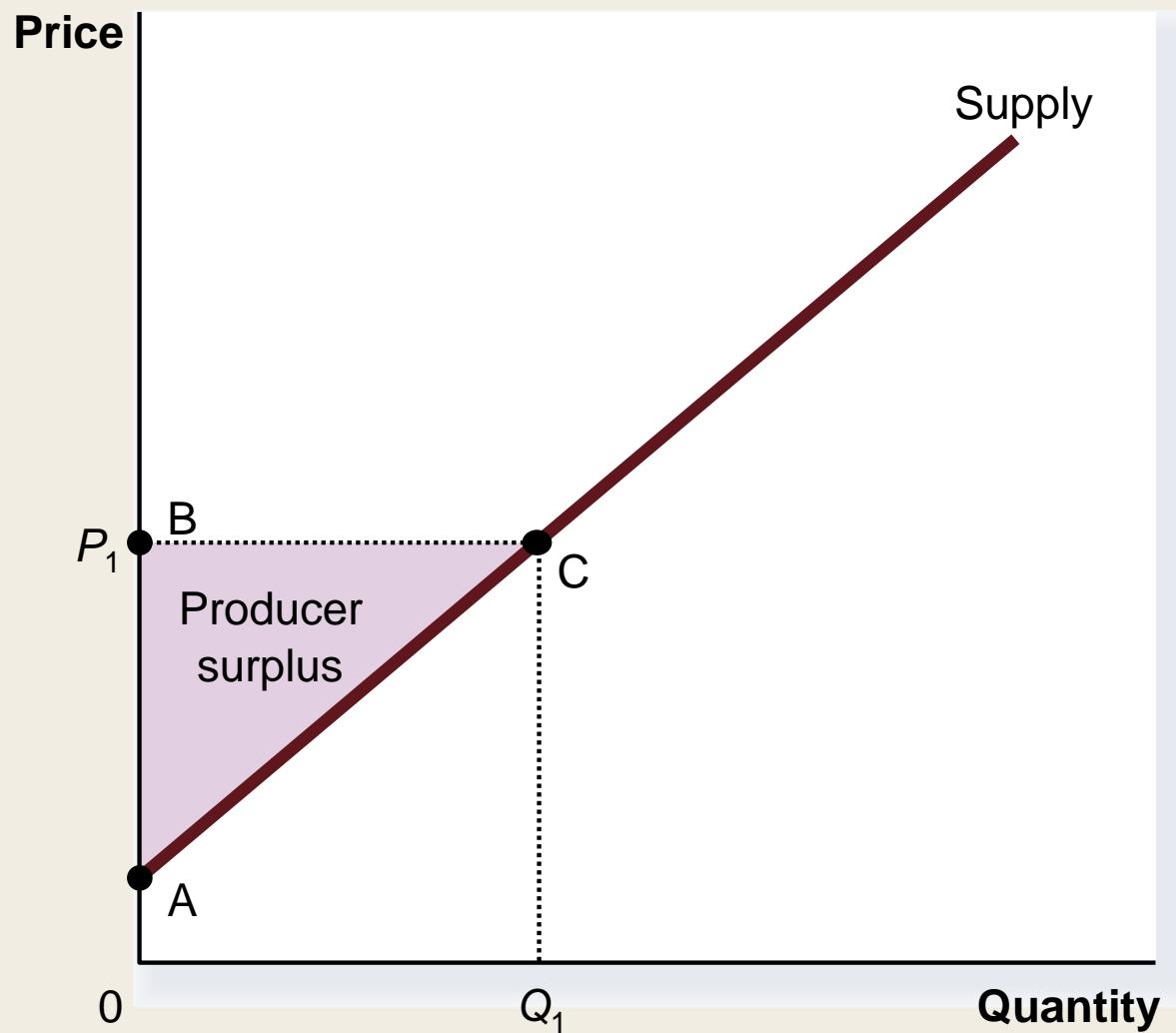


**Figure 5 Measuring Producer Surplus with the Supply Curve**  
**(b) Price = \$800**



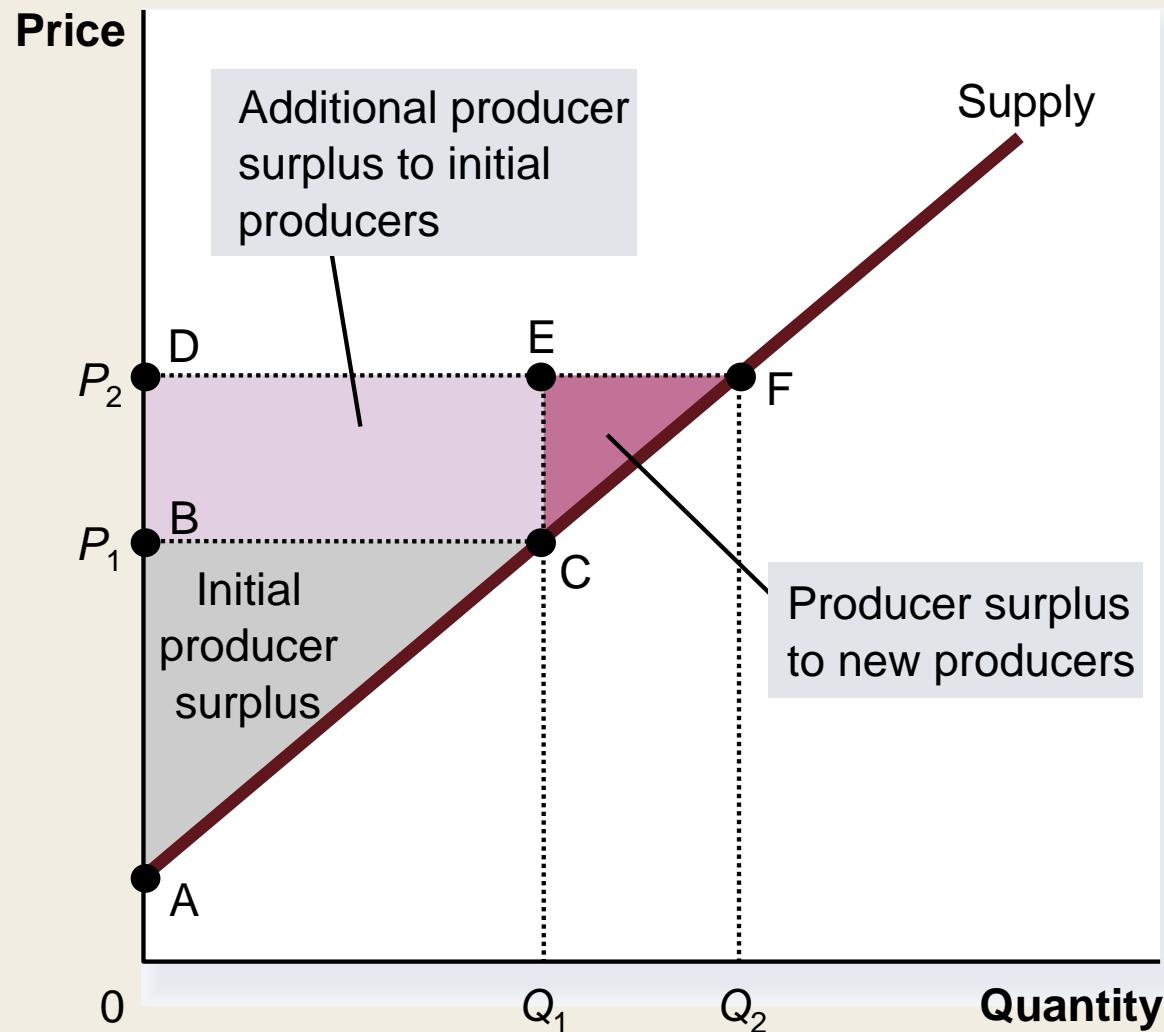
# Figure 6 How the Price Affects Producer Surplus

## (a) Producer Surplus at Price $P_1$



# Figure 6 How the Price Affects Producer Surplus

## (b) Producer Surplus at Price $P_2$





# MARKET EFFICIENCY

- Consumer surplus and producer surplus may be used to address the following question:
  - Is the allocation of resources determined by free markets in any way desirable?

# The Benevolent Social Planner

Consumer Surplus

= Value to buyers – Amount paid by buyers

and

Producer Surplus

= Amount received by sellers – Cost to sellers

# The Benevolent Social Planner

Total surplus

= Consumer surplus + Producer surplus

or

Total surplus

= Value to buyers – Cost to sellers

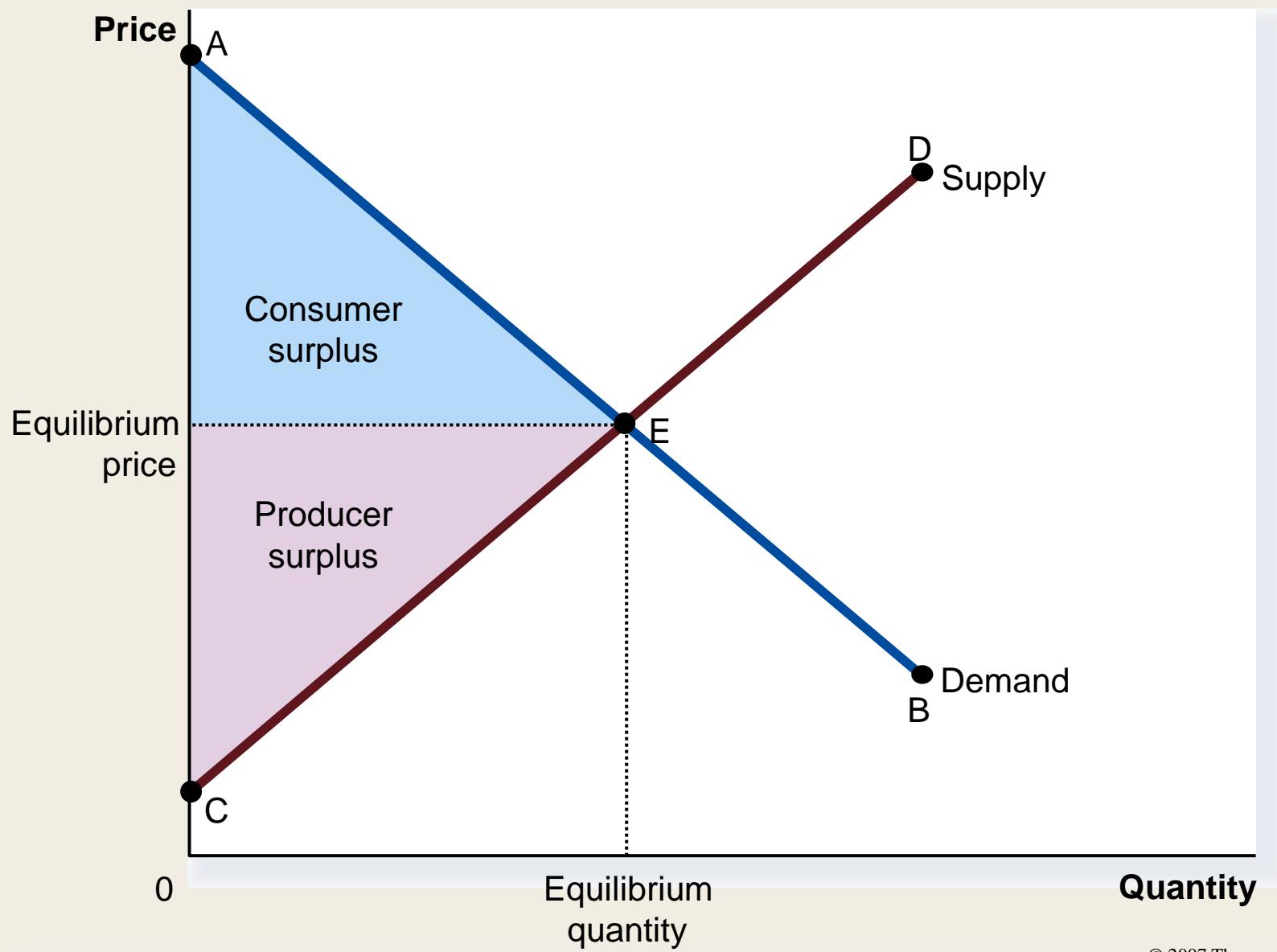
# The Benevolent Social Planner

- *Efficiency* is the property of a resource allocation of maximizing the total surplus received by all members of society.

# The Benevolent Social Planner

- In addition to market efficiency, a social planner might also care about *equity* – the fairness of the distribution of well-being among the various buyers and sellers.

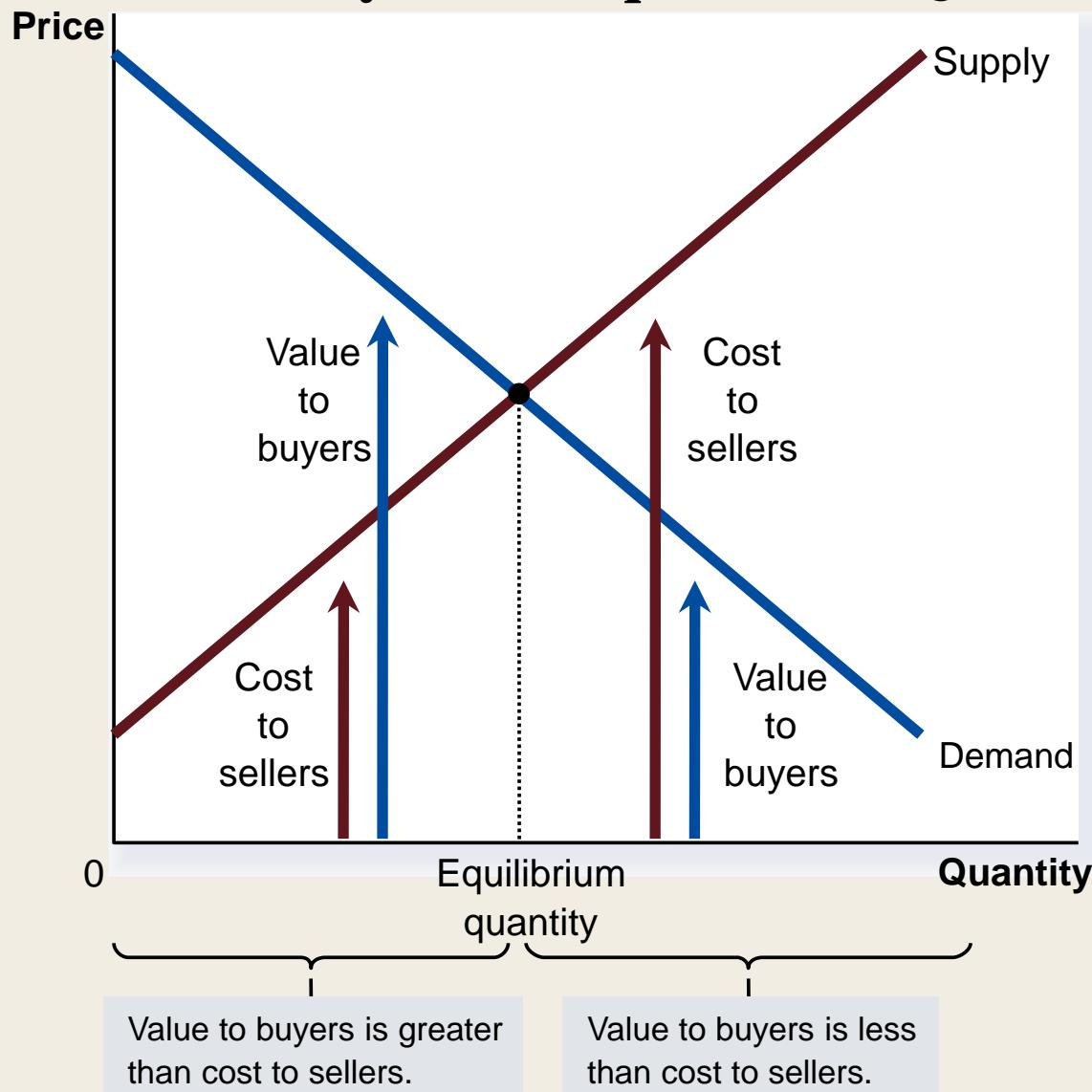
## Figure 7 Consumer and Producer Surplus in the Market Equilibrium



# Evaluating the Market Equilibrium

- Three Insights Concerning Market Outcomes
  - By “Free markets” we mean Perfect Competition, where there is free entry and exit of firms in long run.
  - Free markets allocate the supply of goods to the buyers who value them most highly, as measured by their willingness to pay.
  - Free markets allocate the demand for goods to the sellers who can produce them at least cost.
  - Free markets produce the quantity of goods that maximizes the sum of consumer and producer surplus.

## Figure 8 The Efficiency of the Equilibrium Quantity



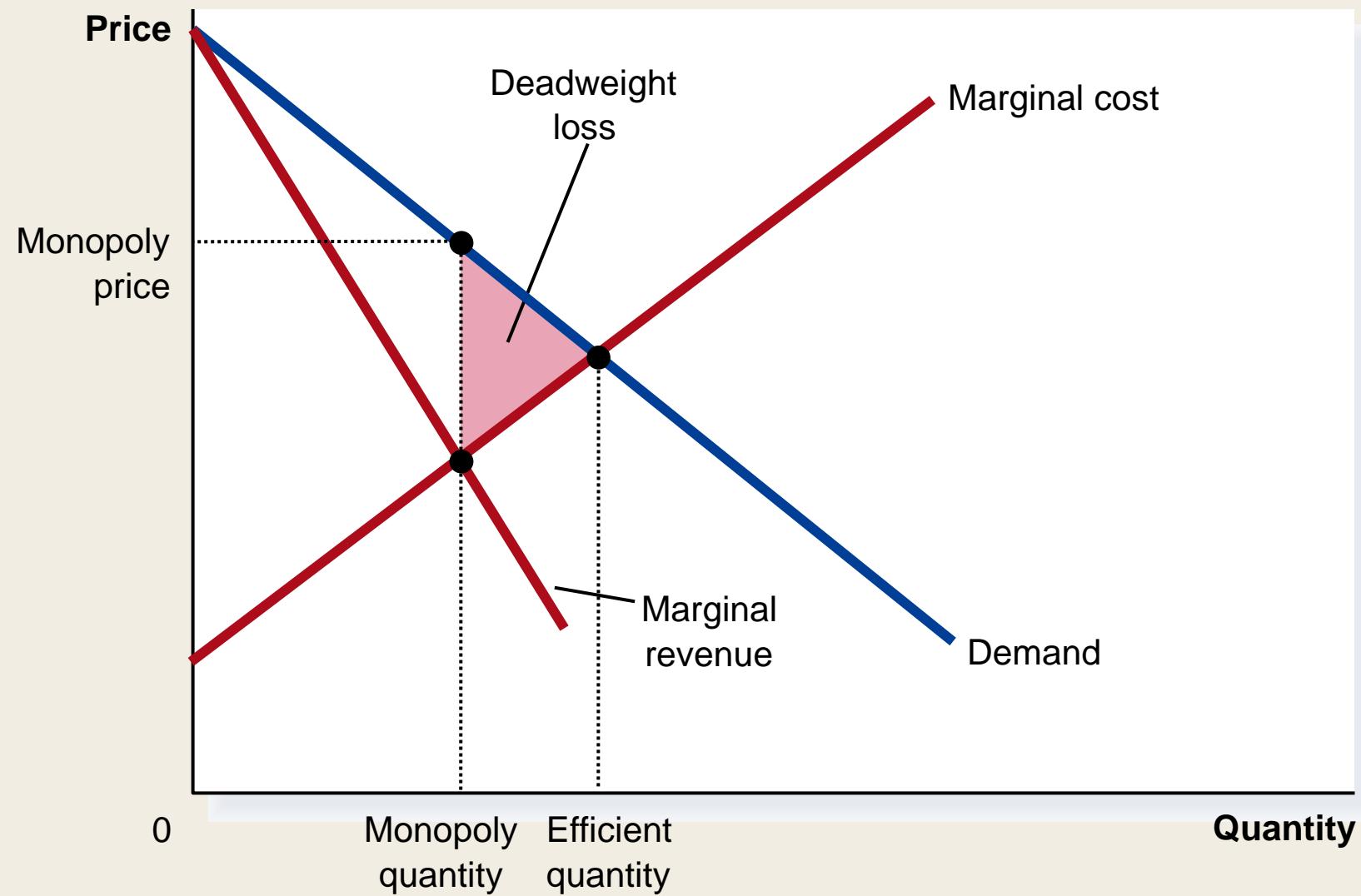
# Evaluating the Market Equilibrium

- Because the equilibrium outcome is an efficient allocation of resources, the social planner can leave the market outcome as he/she finds it.
- This policy of leaving well enough alone goes by the French expression *laissez faire*.

# Evaluating the Market Equilibrium

- Market Power
  - If a market system is not perfectly competitive, market power may result.
    - Market power is the ability to influence prices.
    - Market power can cause markets to be inefficient because it keeps price and quantity from the equilibrium of supply and demand.

## Figure 8 The Inefficiency of Monopoly



# Evaluating the Market Equilibrium

- Externalities
  - created when a market outcome affects individuals other than buyers and sellers in that market.
  - cause welfare in a market to depend on more than just the value to the buyers and cost to the sellers.
- When buyers and sellers do not take externalities into account when deciding how much to consume and produce, the equilibrium in the market can be inefficient.

# Summary

---

- Consumer surplus equals buyers' willingness to pay for a good minus the amount they actually pay for it.
- Consumer surplus measures the benefit buyers get from participating in a market.
- Consumer surplus can be computed by finding the area below the demand curve and above the price.

# Summary

---

- Producer surplus equals the amount sellers receive for their goods minus their costs of production.
- Producer surplus measures the benefit sellers get from participating in a market.
- Producer surplus can be computed by finding the area below the price and above the supply curve.

# Summary

---

- An allocation of resources that maximizes the sum of consumer and producer surplus is said to be efficient.
- Policymakers are often concerned with the efficiency, as well as the equity, of economic outcomes.

# Summary

---

- The equilibrium of demand and supply maximizes the sum of consumer and producer surplus.
- This is as if the invisible hand of the marketplace leads buyers and sellers to allocate resources efficiently.
- Markets do not allocate resources efficiently in the presence of market failures.



21

## The Theory of Consumer Choice



# The Theory of Consumer Choice

- The theory of consumer choice addresses the following questions:
  - Do all demand curves slope downward?
  - How do wages affect labor supply?
  - How do interest rates affect household saving?



# THE BUDGET CONSTRAINT: WHAT THE CONSUMER CAN AFFORD

- The *budget constraint* depicts the limit on the consumption “bundles” that a consumer can afford.
  - People consume less than they desire because their spending is constrained, or limited, by their income.



# THE BUDGET CONSTRAINT: WHAT THE CONSUMER CAN AFFORD

- The budget constraint shows the various combinations of goods the consumer can afford given his or her income and the prices of the two goods.
- Suppose there are two goods, Pizza ( $x$ ) and Pepsi ( $y$ ).
- Let Income of consumer is 1000 dollars, price of Pizza is 10 dollars per unit and price of Pepsi is 2 dollars per unit.

- The Budget Constraint in this case is given by
- $10x+2y=1000$

## Figure 1 The Consumer's Budget Constraint: Let Pizza price is 10 dollars per unit, and Pepsi price is 2 dollars per unit

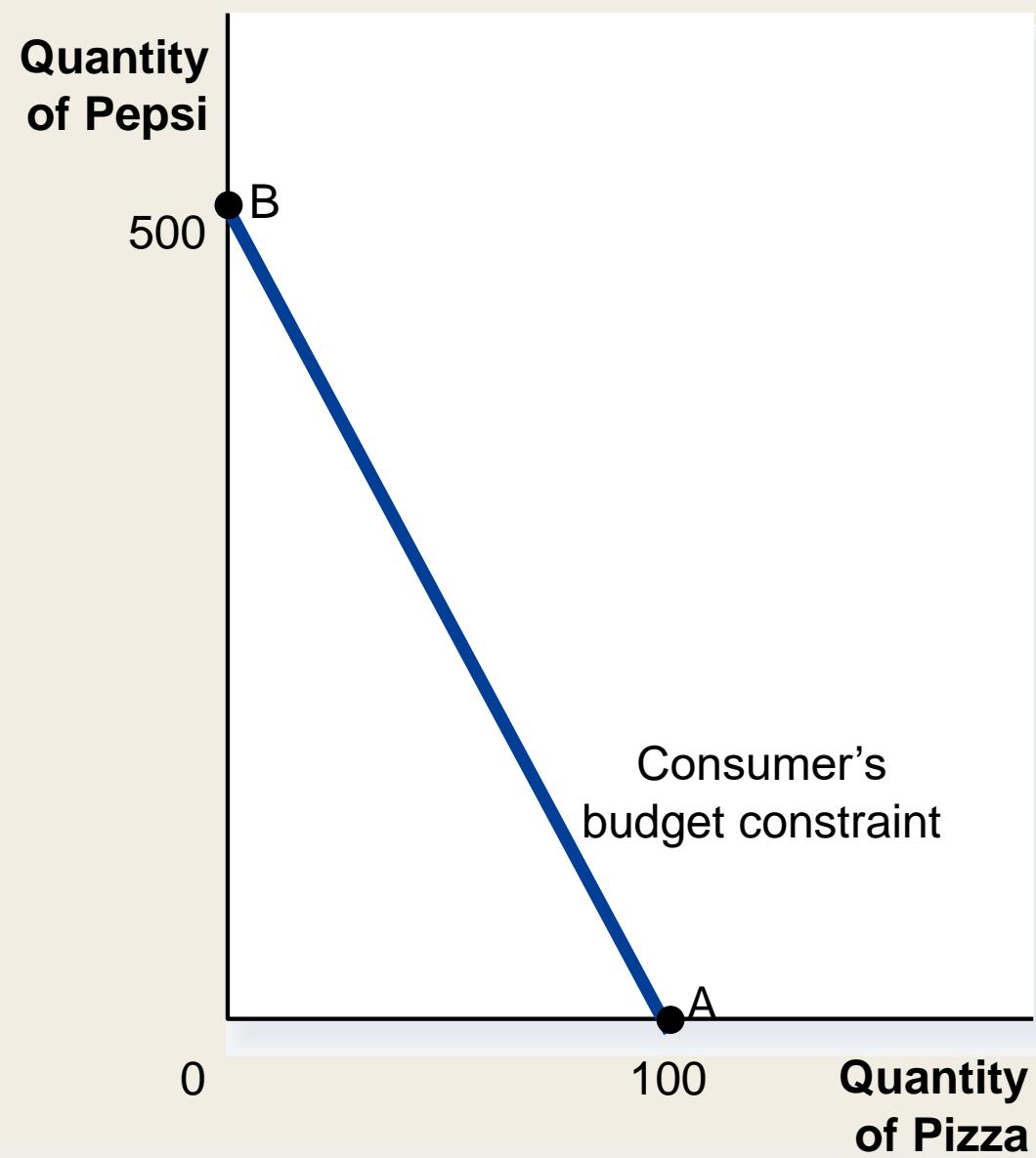
Pints of Pepsi	Number of Pizzas	Spending on Pepsi	Spending on Pizza	Total Spending
0	100	\$ 0	\$1,000	\$1,000
50	90	100	900	1,000
100	80	200	800	1,000
150	70	300	700	1,000
200	60	400	600	1,000
250	50	500	500	1,000
300	40	600	400	1,000
350	30	700	300	1,000
400	20	800	200	1,000
450	10	900	100	1,000
500	0	1,000	0	1,000



# THE BUDGET CONSTRAINT: WHAT THE CONSUMER CAN AFFORD

- The Consumer's Budget Constraint
  - Any point on the budget constraint line indicates the consumer's combination or trade-off between two goods.
  - For example, if the consumer buys no pizzas, he can afford 500 pints of Pepsi (point B). If he buys no Pepsi, he can afford 100 pizzas (point A).

## Figure 1 The Consumer's Budget Constraint

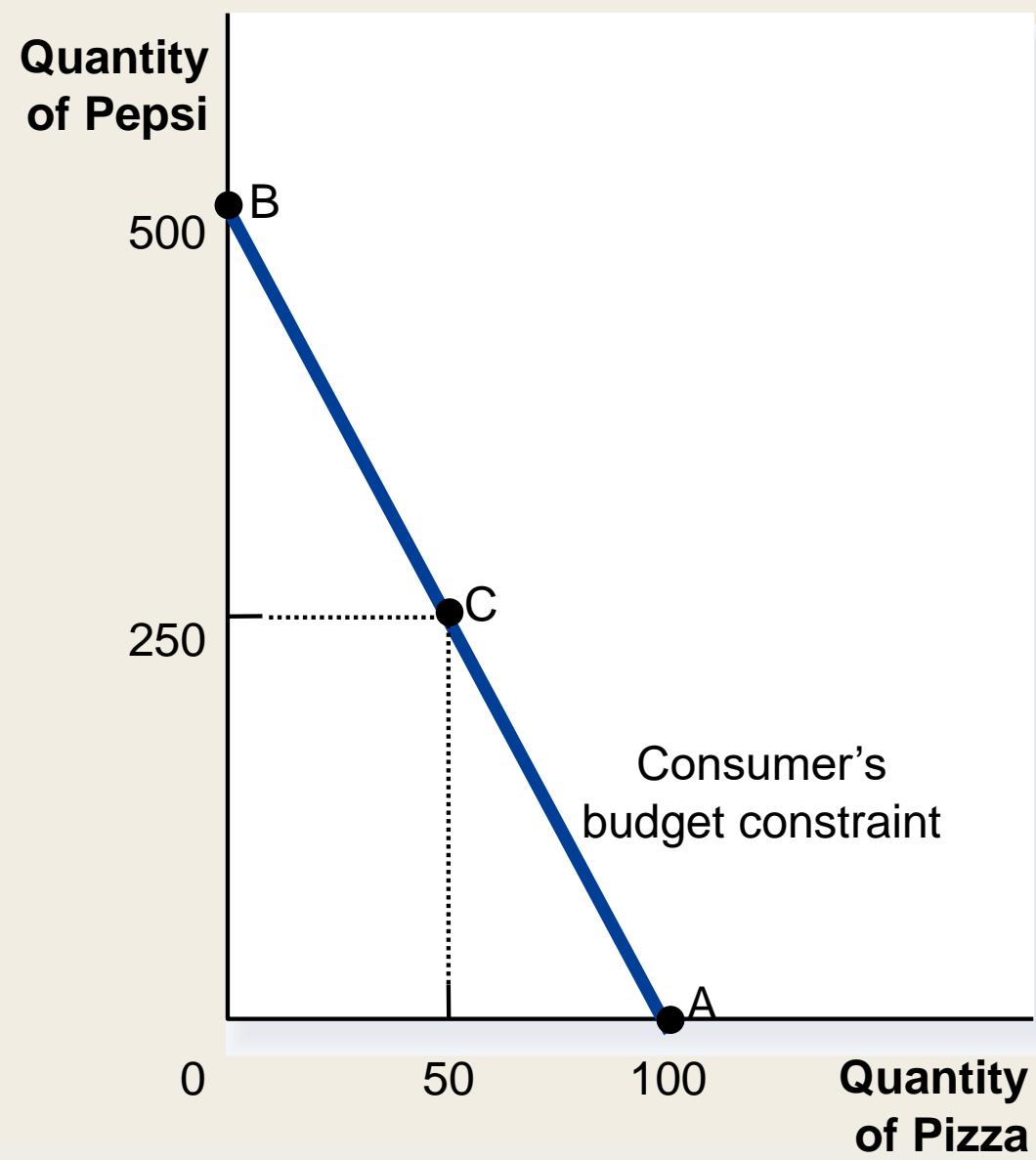




# THE BUDGET CONSTRAINT: WHAT THE CONSUMER CAN AFFORD

- The Consumer's Budget Constraint
  - Alternately, the consumer can buy 50 pizzas and 250 pints of Pepsi.

## Figure 1 The Consumer's Budget Constraint





# THE BUDGET CONSTRAINT: WHAT THE CONSUMER CAN AFFORD

- The *slope* of the budget constraint line equals the relative price of the two goods, that is, *the price of one good compared to the price of the other.*
- It measures the rate at which the consumer can trade one good for the other.



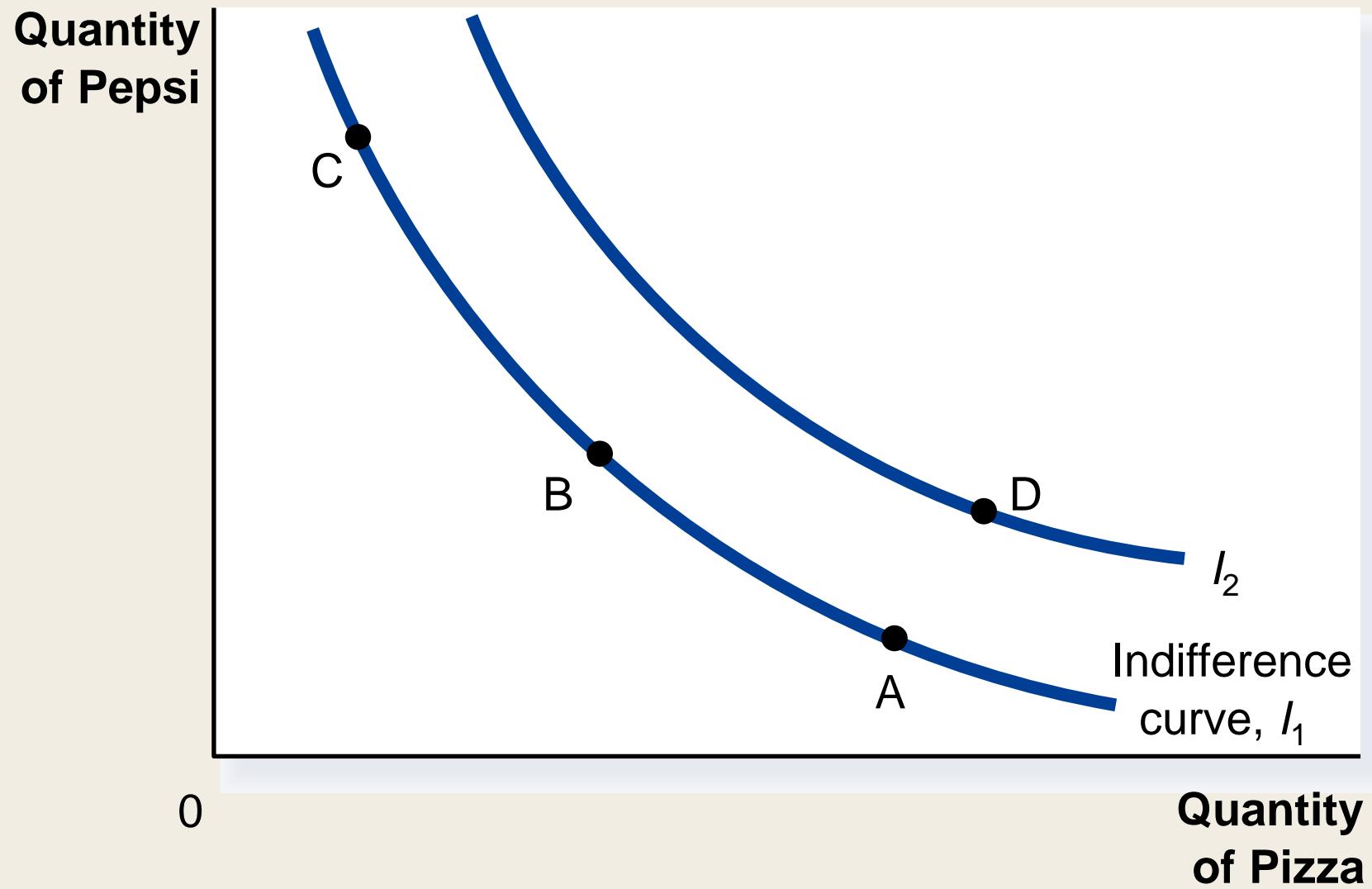
# PREFERENCES: WHAT THE CONSUMER WANTS

- A consumer's preference among consumption bundles may be illustrated with indifference curves.

# Representing Preferences with Indifference Curves

- An *indifference curve* is a curve that shows consumption bundles that give the consumer the same level of satisfaction.

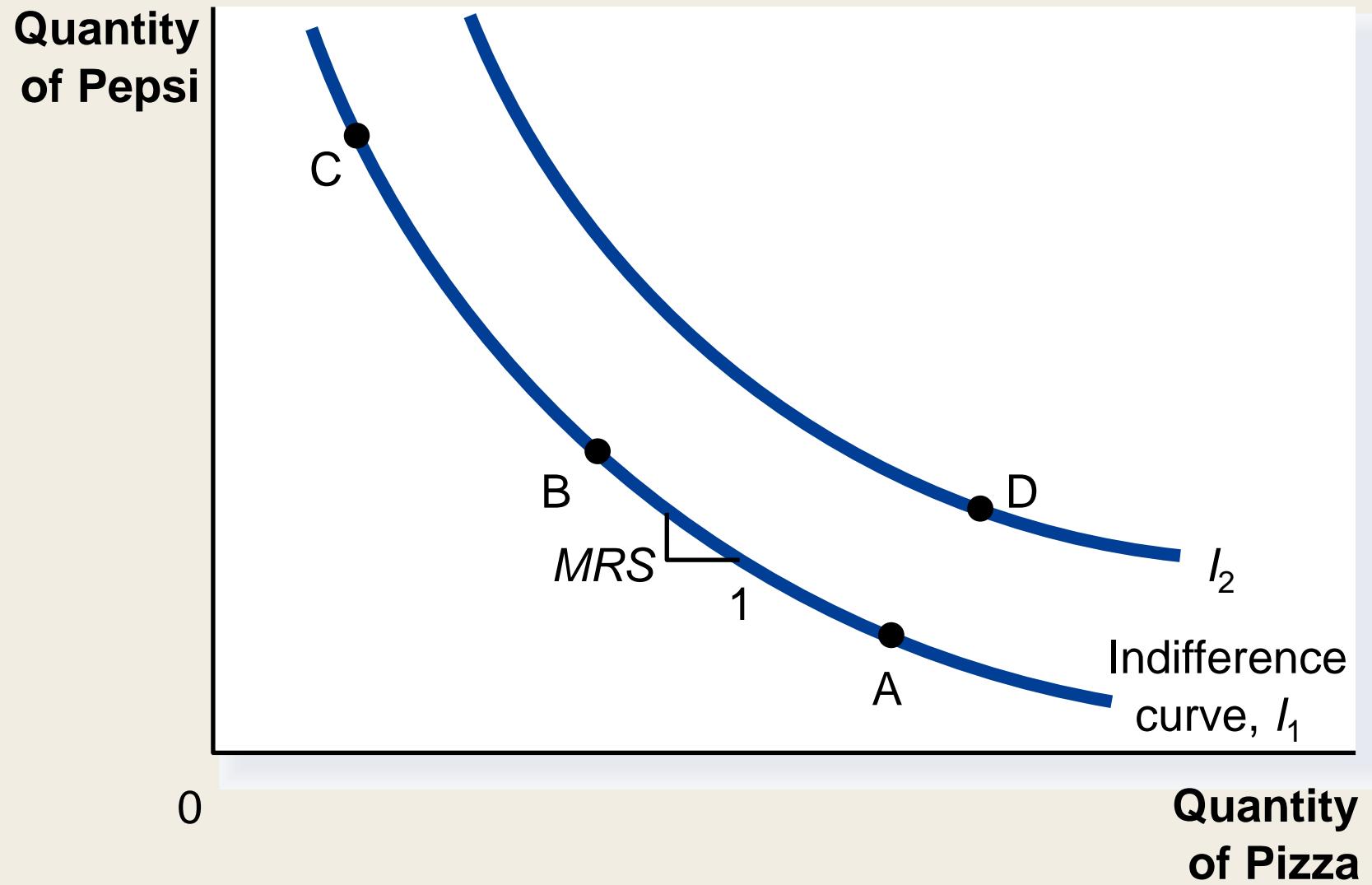
## Figure 2 The Consumer's Preferences



# Representing Preferences with Indifference Curves

- The Consumer's Preferences
  - The consumer is indifferent, or equally happy, with the combinations shown at points A, B, and C because they are all on the same curve.
- The Marginal Rate of Substitution
  - The slope at any point on an indifference curve is the *marginal rate of substitution*.
    - It is the rate at which a consumer is willing to trade one good for another.
    - It is the amount of one good that a consumer requires as compensation to give up one unit of the other good.

Figure 2 The Consumer's Preferences

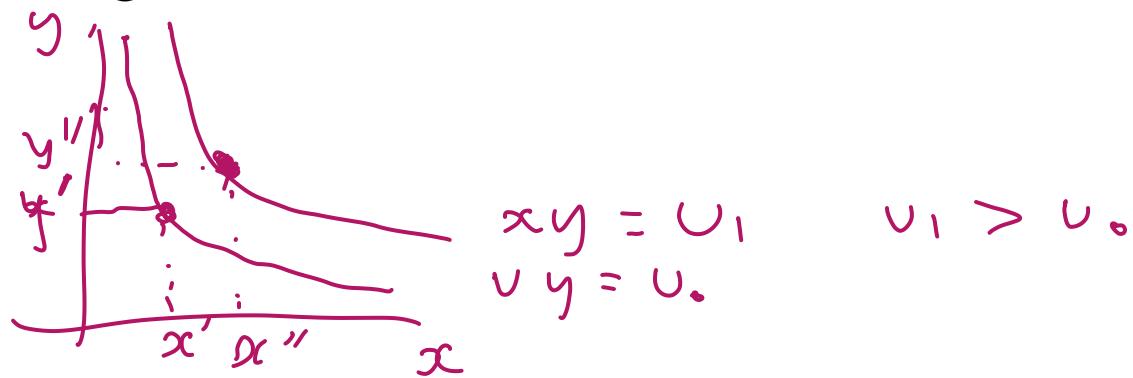


# Four Properties of Indifference Curves

- Higher indifference curves are preferred to lower ones.
- Indifference curves are downward sloping.
- Indifference curves do not cross.
- Indifference curves are bowed inward.

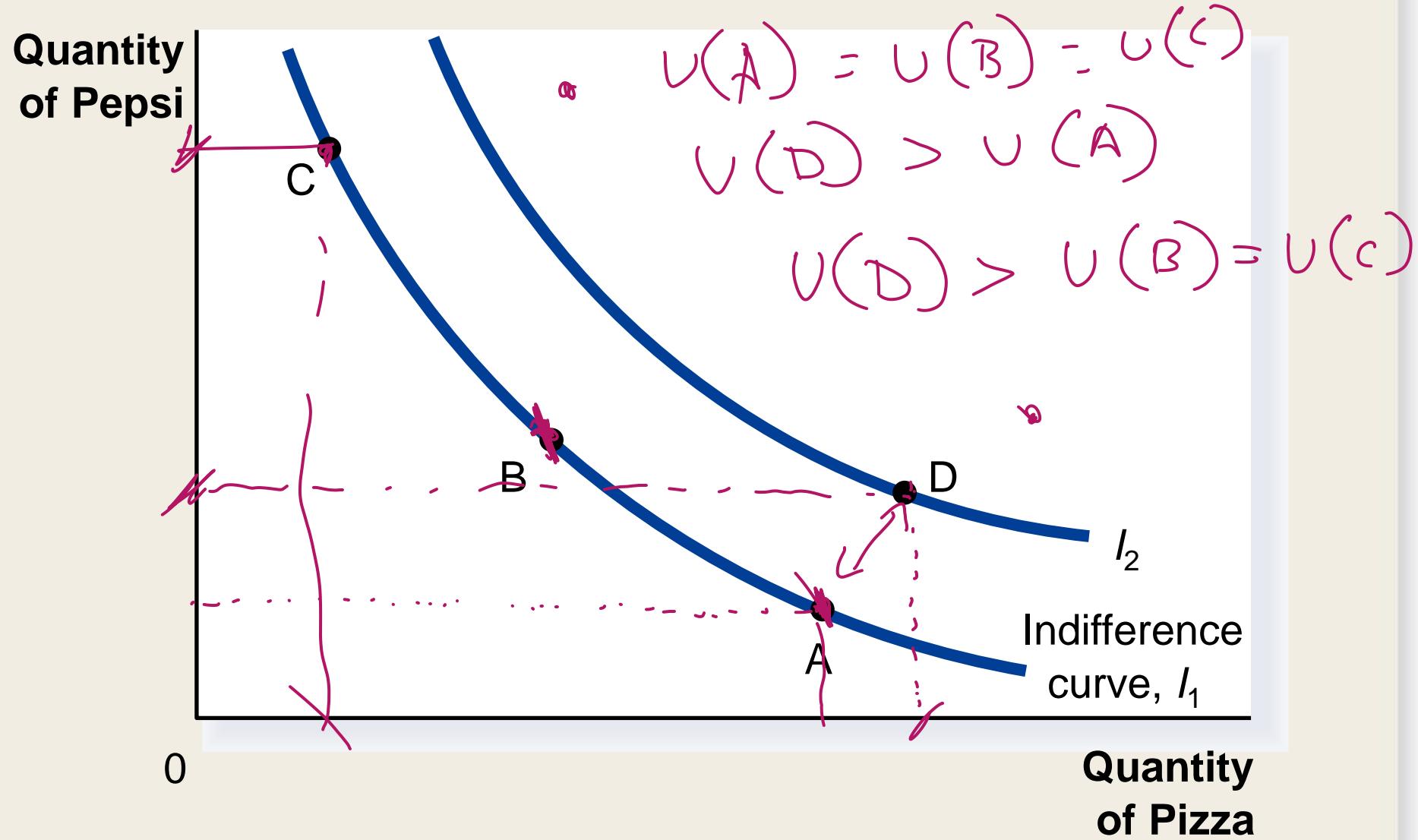
# Four Properties of Indifference Curves

- Property 1: Higher indifference curves are preferred to lower ones.
  - Consumers usually prefer more of something to less of it.
  - Higher indifference curves represent larger quantities of goods than do lower indifference curves.



$$U(x) > U(y) > U(z)$$

Figure 2 The Consumer's Preferences

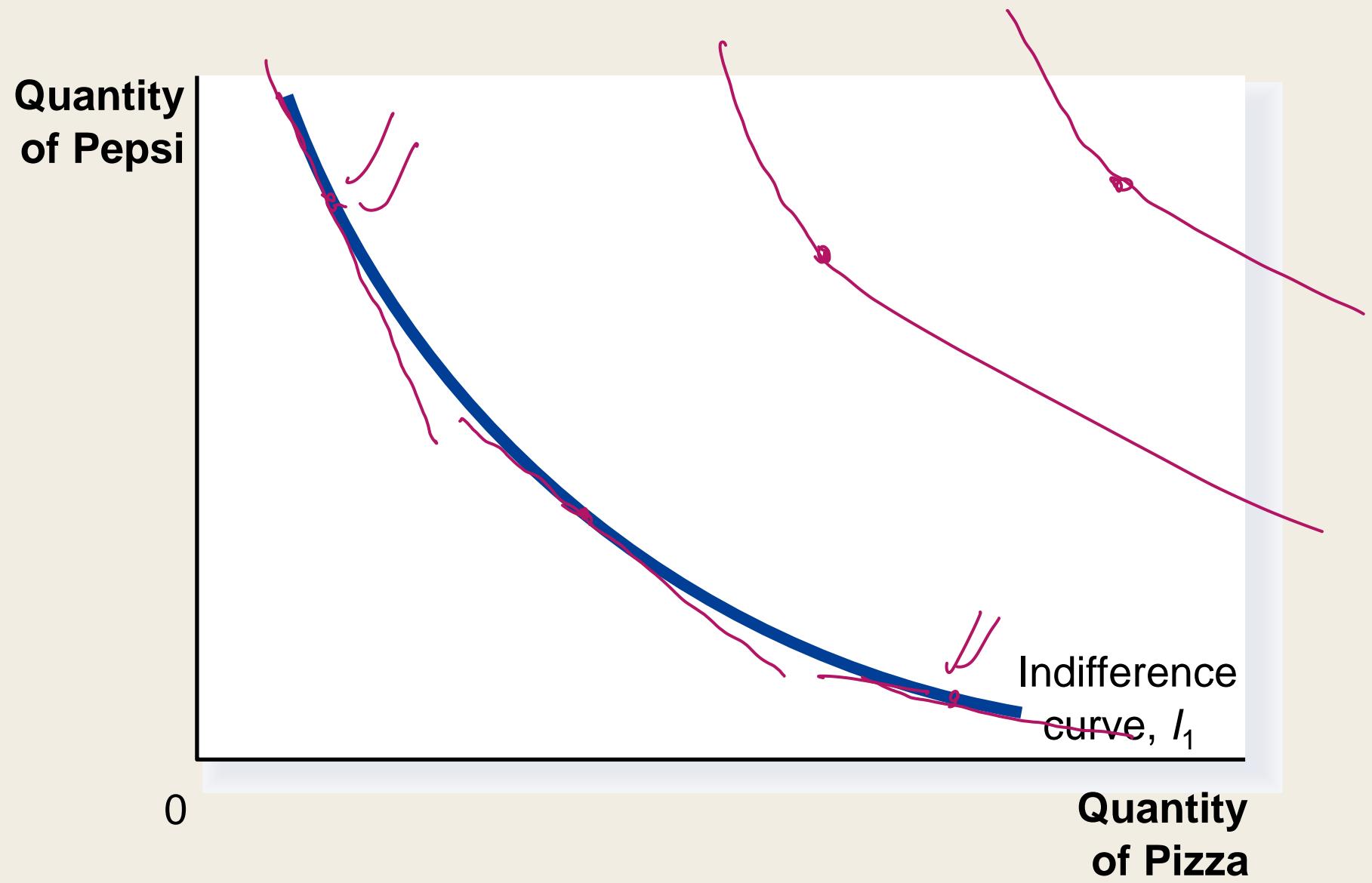


# Four Properties of Indifference Curves



- Property 2: Indifference curves are downward sloping.
  - A consumer is willing to give up one good only if he or she gets more of the other good in order to remain equally happy.
  - If the quantity of one good is reduced, the quantity of the other good must increase.
  - For this reason, most indifference curves slope downward.
  - Remember, a consumer is equally happy at all points along a given indifference curve.

## Figure 2 The Consumer's Preferences



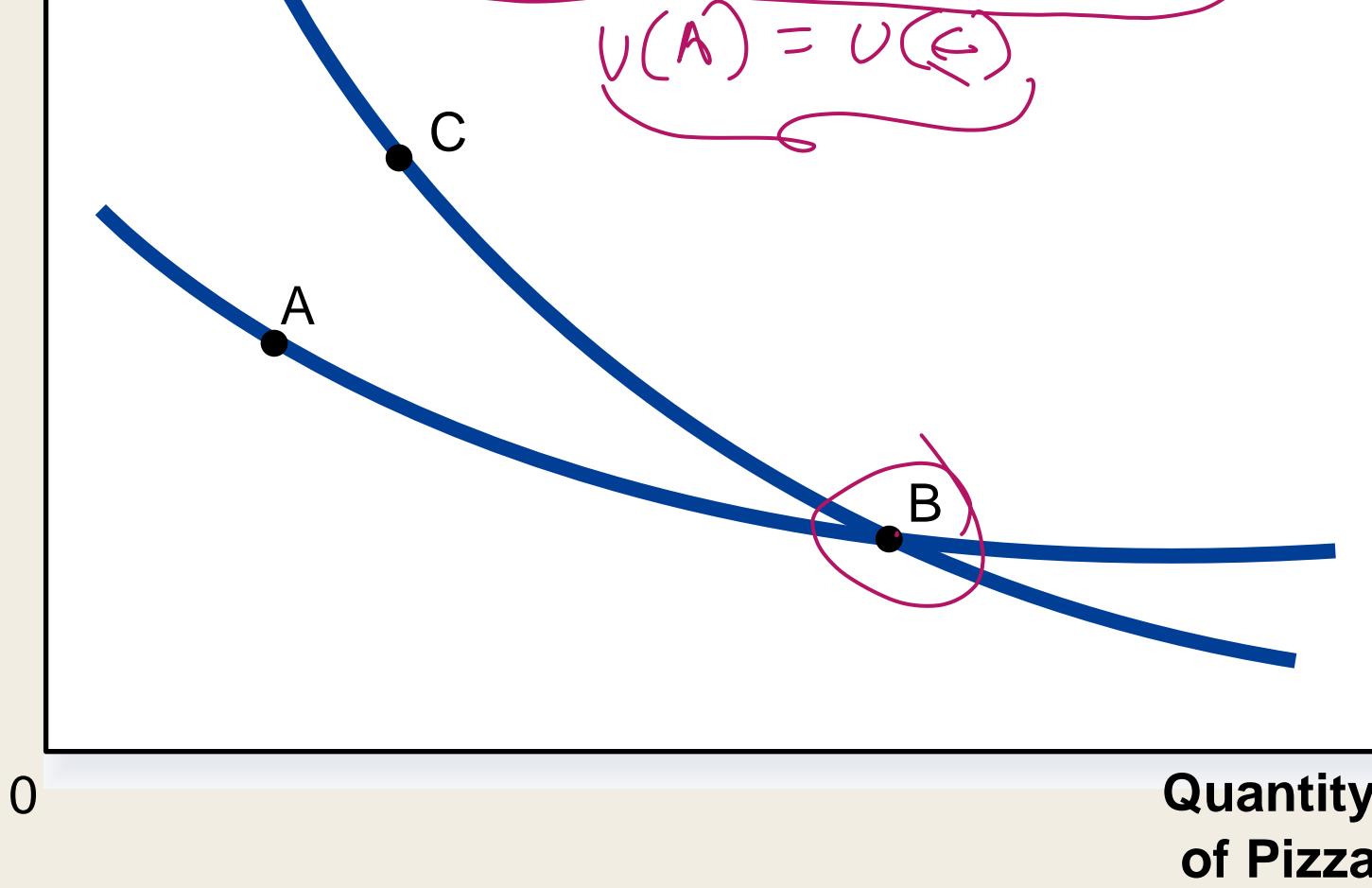
# Four Properties of Indifference Curves

- Property 3: Indifference curves do not cross.
  - Points A and B should make the consumer equally happy.
  - Points B and C should make the consumer equally happy.
  - This implies that A and C would make the consumer equally happy.
  - But C has more of both goods compared to A.

**Figure 3 The Impossibility of Intersecting Indifference Curves**

Quantity  
of Pepsi

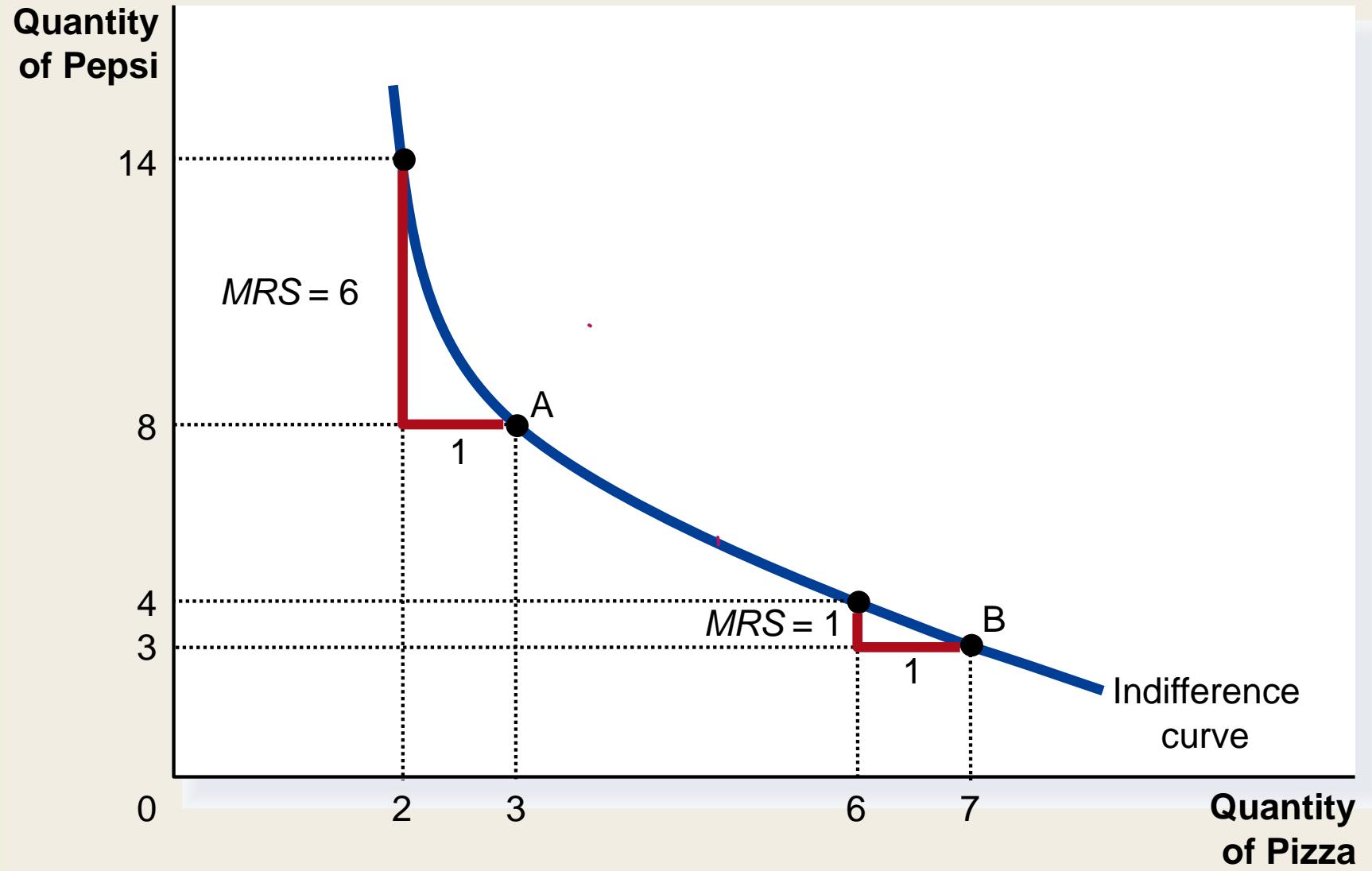
$$\begin{aligned} U(C) &> U(A) \\ U(A) &= U(B) = U(C) \\ U(A) &= U(C) \end{aligned}$$



# Four Properties of Indifference Curves

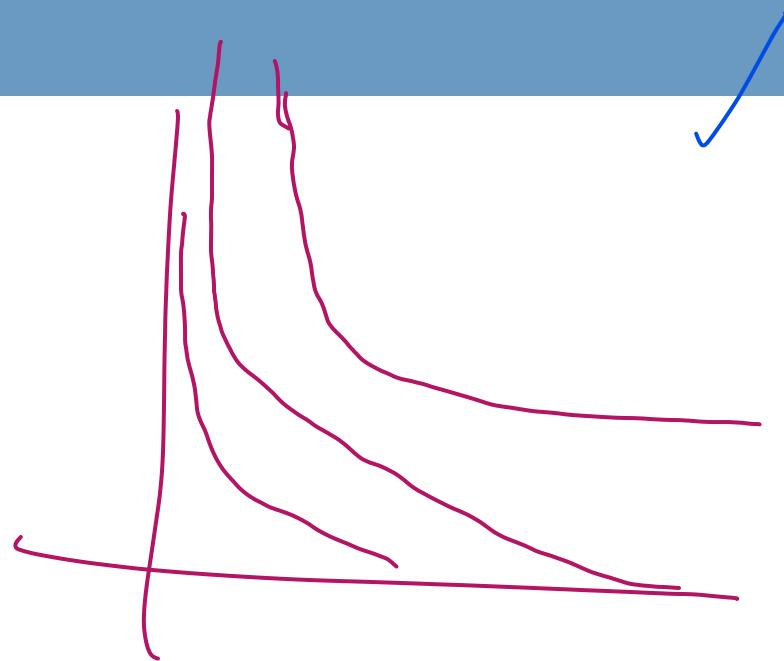
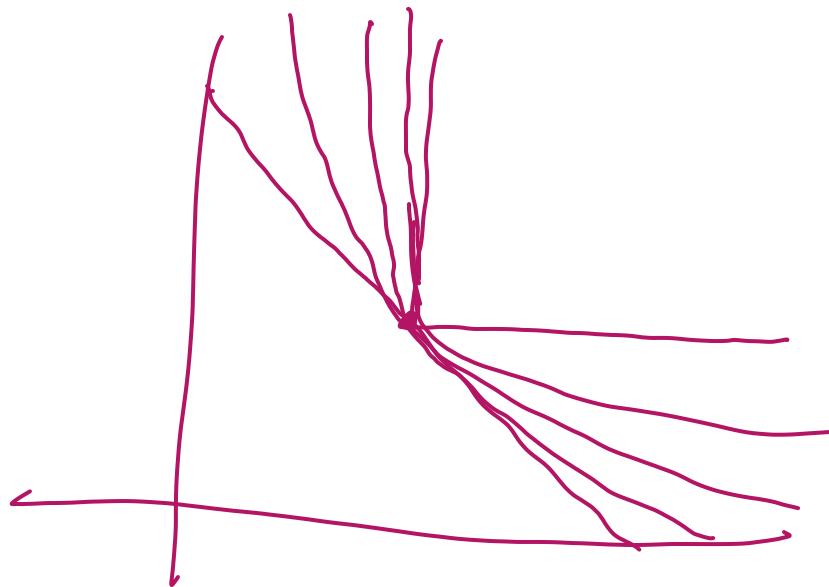
- Property 4: Indifference curves are bowed inward.
  - People are more willing to trade away goods that they have in abundance and less willing to trade away goods of which they have little.
  - These differences in a consumer's marginal substitution rates cause his or her indifference curve to bow inward.

## Figure 4 Bowed Indifference Curves



# Two Extreme Examples of Indifference Curves

- Perfect substitutes
- Perfect complements



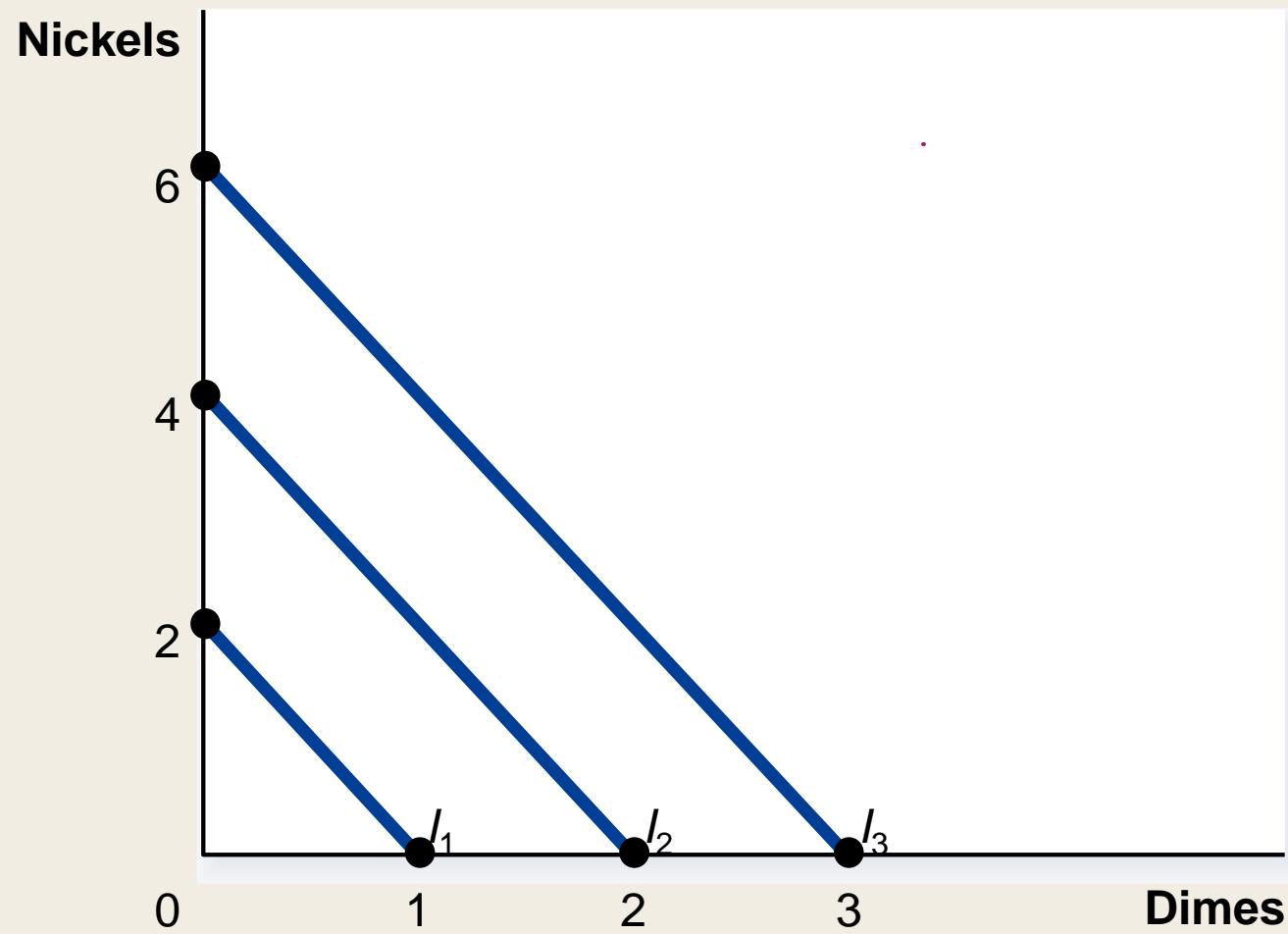
# Two Extreme Examples of Indifference Curves

- Perfect Substitutes
  - Two goods with straight-line indifference curves are *perfect substitutes*.
  - The marginal rate of substitution is a fixed number.



## Figure 5 Perfect Substitutes and Perfect Complements

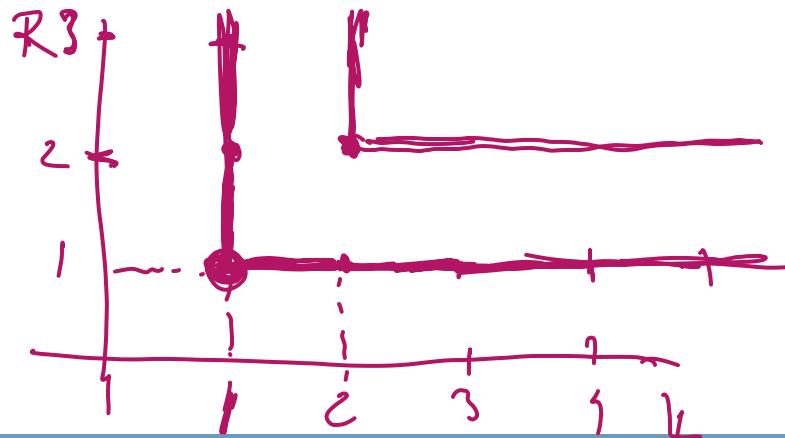
(a) Perfect Substitutes



# Two Extreme Examples of Indifference Curves

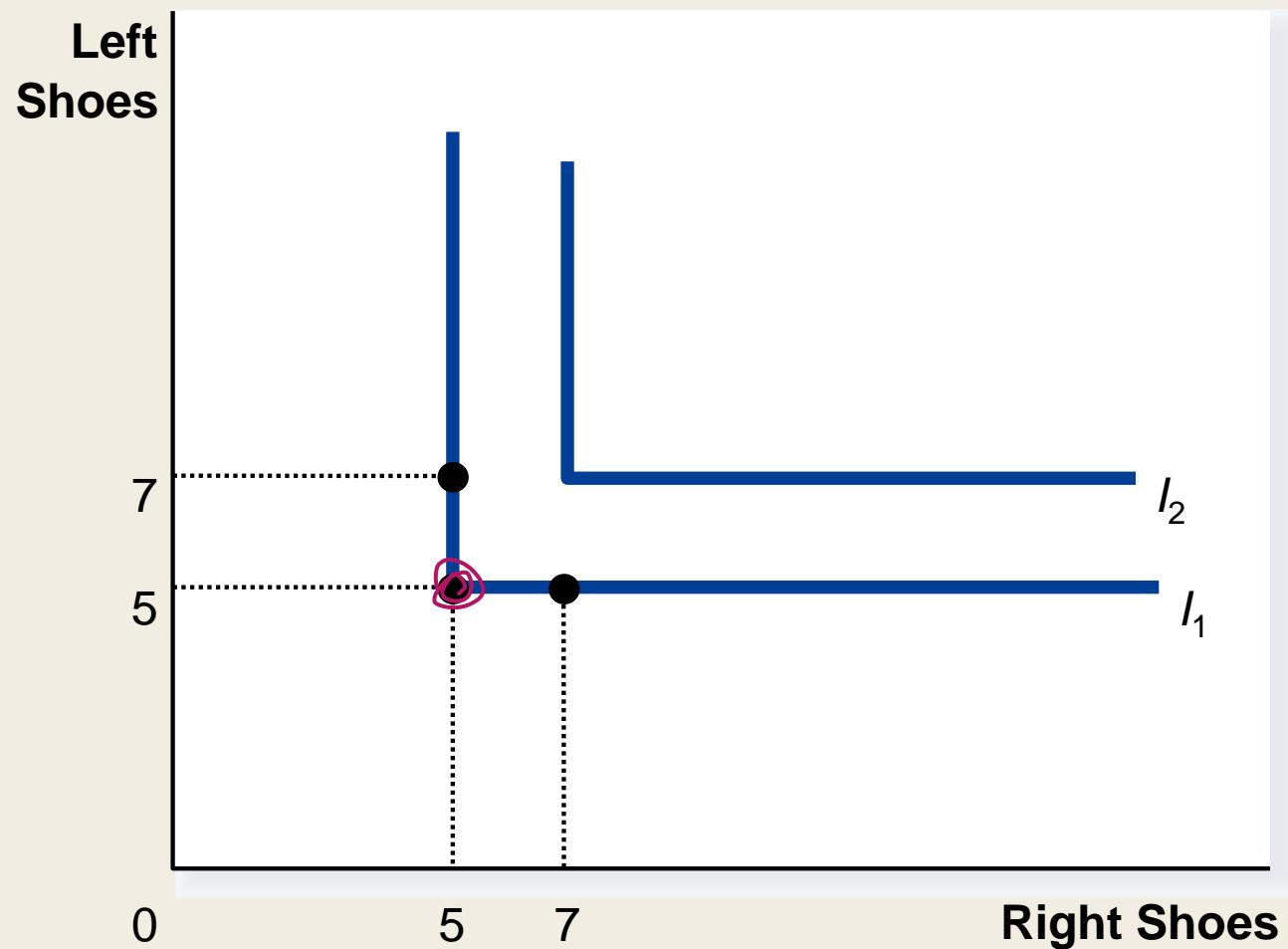
- Perfect Complements

- Two goods with right-angle indifference curves are *perfect complements*.
- Since these goods are always used together, extra units of one good, outside the desired consumption ratio, add no additional satisfaction.



## Figure 5 Perfect Substitutes and Perfect Complements

(b) Perfect Complements



# OPTIMIZATION: WHAT THE CONSUMER CHOOSES

- Consumers want to get the combination of goods on the highest possible indifference curve.
- However, the consumer must also end up on or below his budget constraint.

$$\mathcal{L} = xy + \lambda(c - x - y)$$

$$\frac{\partial \mathcal{L}}{\partial x} = 0 \Rightarrow y - \lambda = 0$$

$$\frac{\partial \mathcal{L}}{\partial y} = 0 \Rightarrow x - \lambda = 0$$

$$x = y$$

$$xy$$

$$x(1-x)$$

$$x+y = c$$

$$\frac{\partial \mathcal{L}}{\partial \lambda} = 0$$

$$1 - x - y > 0$$

# The Consumer's Optimal Choices

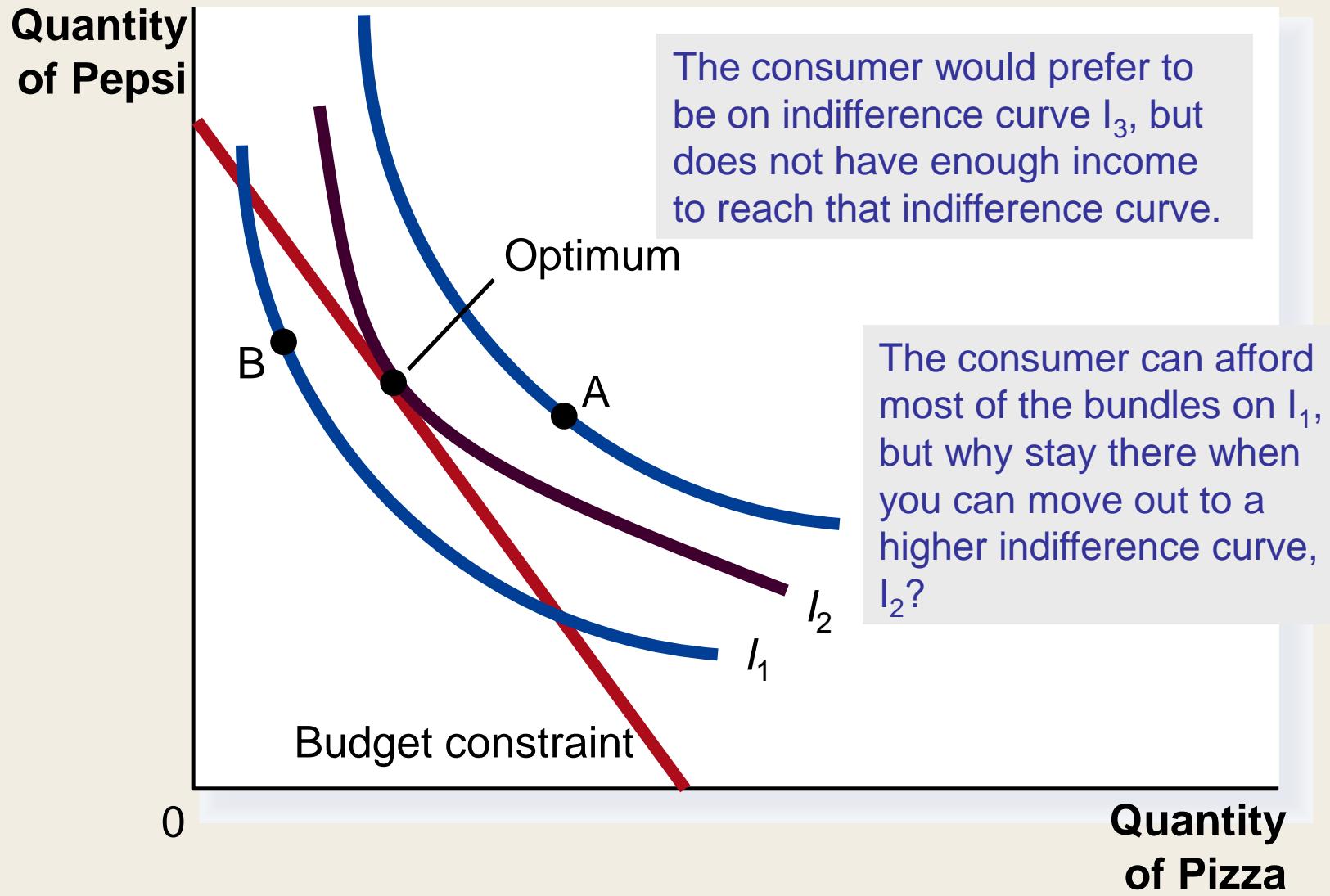
- Combining the indifference curve and the budget constraint determines the consumer's optimal choice.
- Consider a well-behaved indifference curve that is bowed inward.
- Consumer optimum occurs at the point where the highest indifference curve and the budget constraint are tangent.

# The Consumer's Optimal Choice

- The consumer chooses consumption of the two goods so that the marginal rate of substitution equals the relative price.
- At the consumer's optimum, the consumer's valuation of the two goods equals the market's valuation.

$$\mathcal{L} = \underbrace{U(x, y)}_{\lambda} + \lambda [I - P_x x - P_y y]$$
$$\frac{\partial \mathcal{L}}{\partial x} = 0 \Rightarrow \frac{MU_x}{P_x} = \lambda$$
$$\frac{\partial \mathcal{L}}{\partial y} = 0 \Rightarrow \frac{MU_y}{P_y} = \lambda$$
$$\frac{\partial \mathcal{L}}{\partial \lambda} = 0 \Rightarrow P_x x + P_y y = I$$
$$\frac{MU_x}{P_x} = \frac{MU_y}{P_y} \Rightarrow \boxed{\frac{MU_x}{P_x}} = \boxed{\frac{MU_y}{P_y}}$$

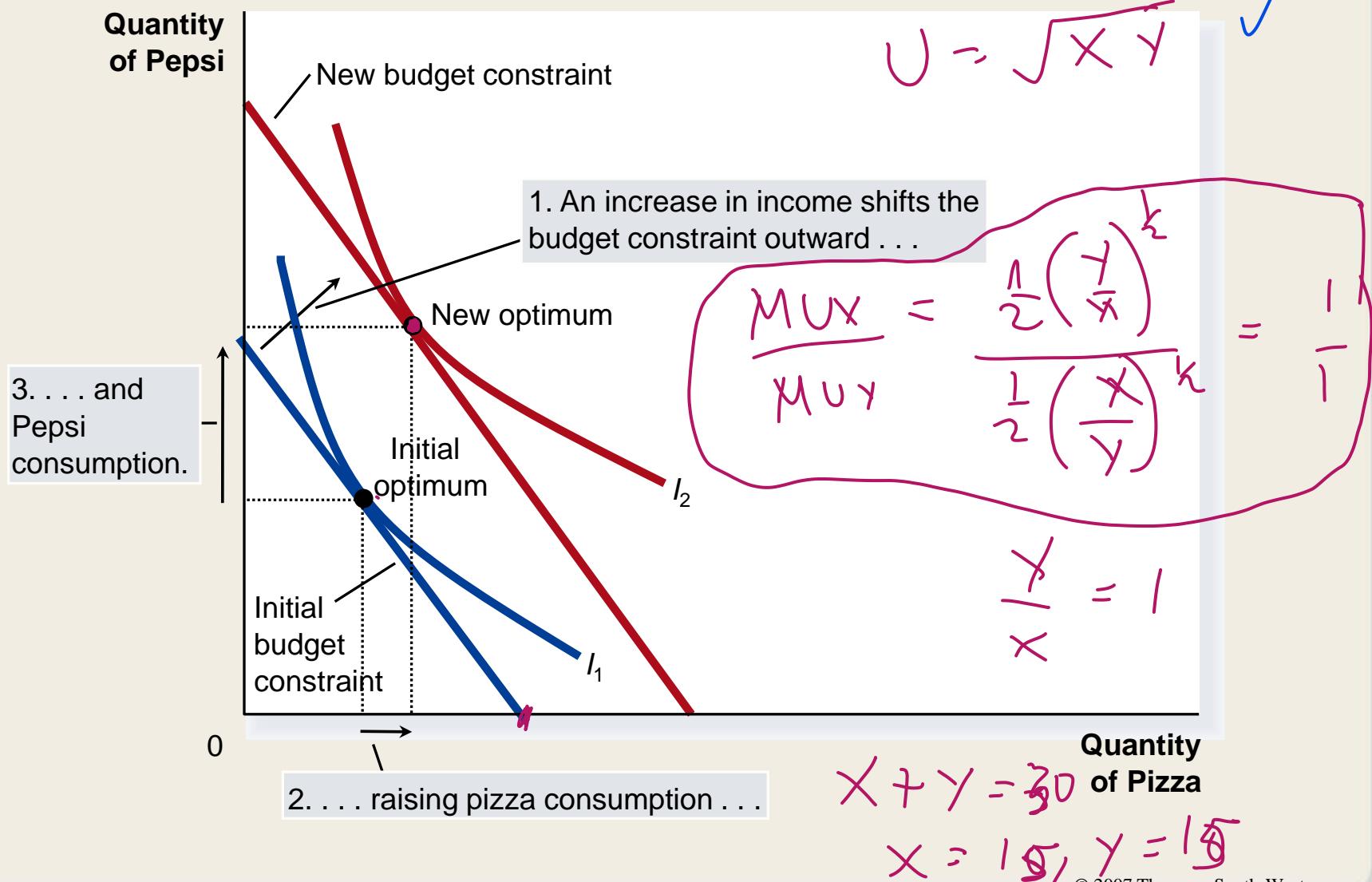
## Figure 6 The Consumer's Optimum



# How Changes in Income Affect the Consumer's Choices

- An increase in income shifts the budget constraint outward.
  - The consumer is able to choose a better combination of goods on a higher indifference curve.

# Figure 7 An Increase in Income

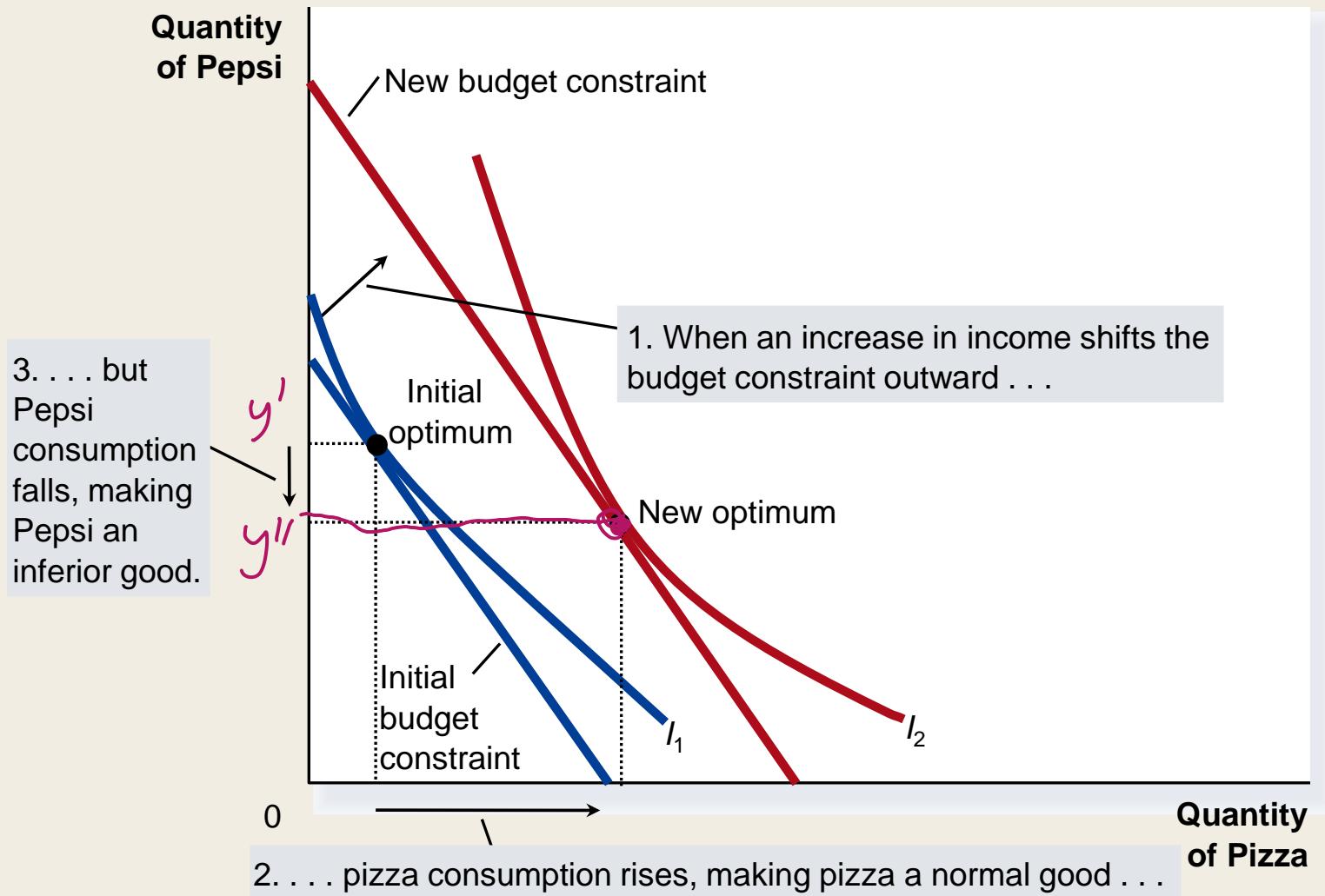


# How Changes in Income Affect the Consumer's Choices



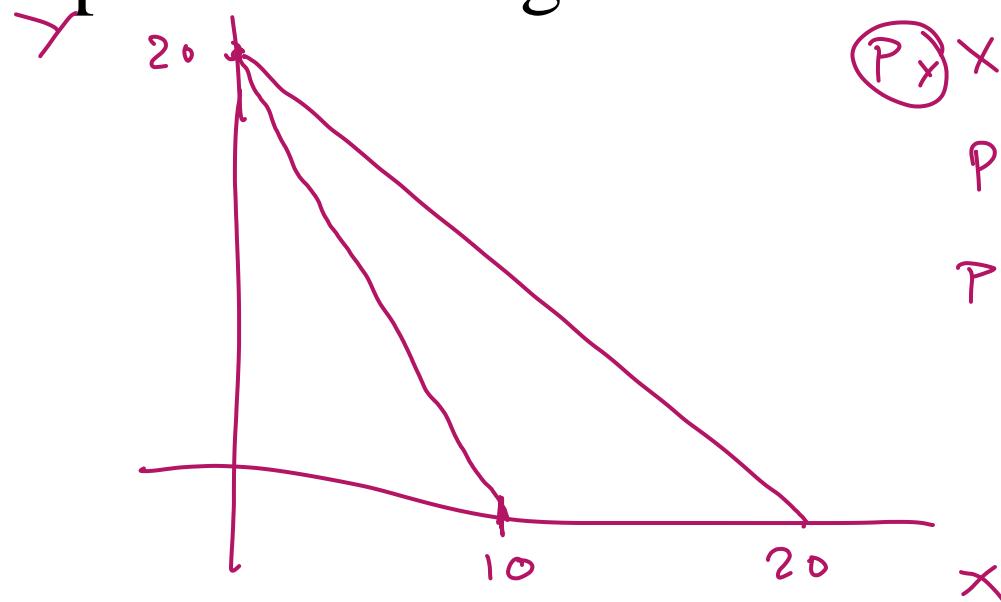
- Normal versus Inferior Goods
  - If a consumer buys more of a good when his or her income rises, the good is called a *normal good.*
  - If a consumer buys less of a good when his or her income rises, the good is called an *inferior good.*

## Figure 8 An Inferior Good



# How Changes in Prices Affect Consumer's Choices

- A fall in the price of any good rotates the budget constraint outward and changes the slope of the budget constraint.



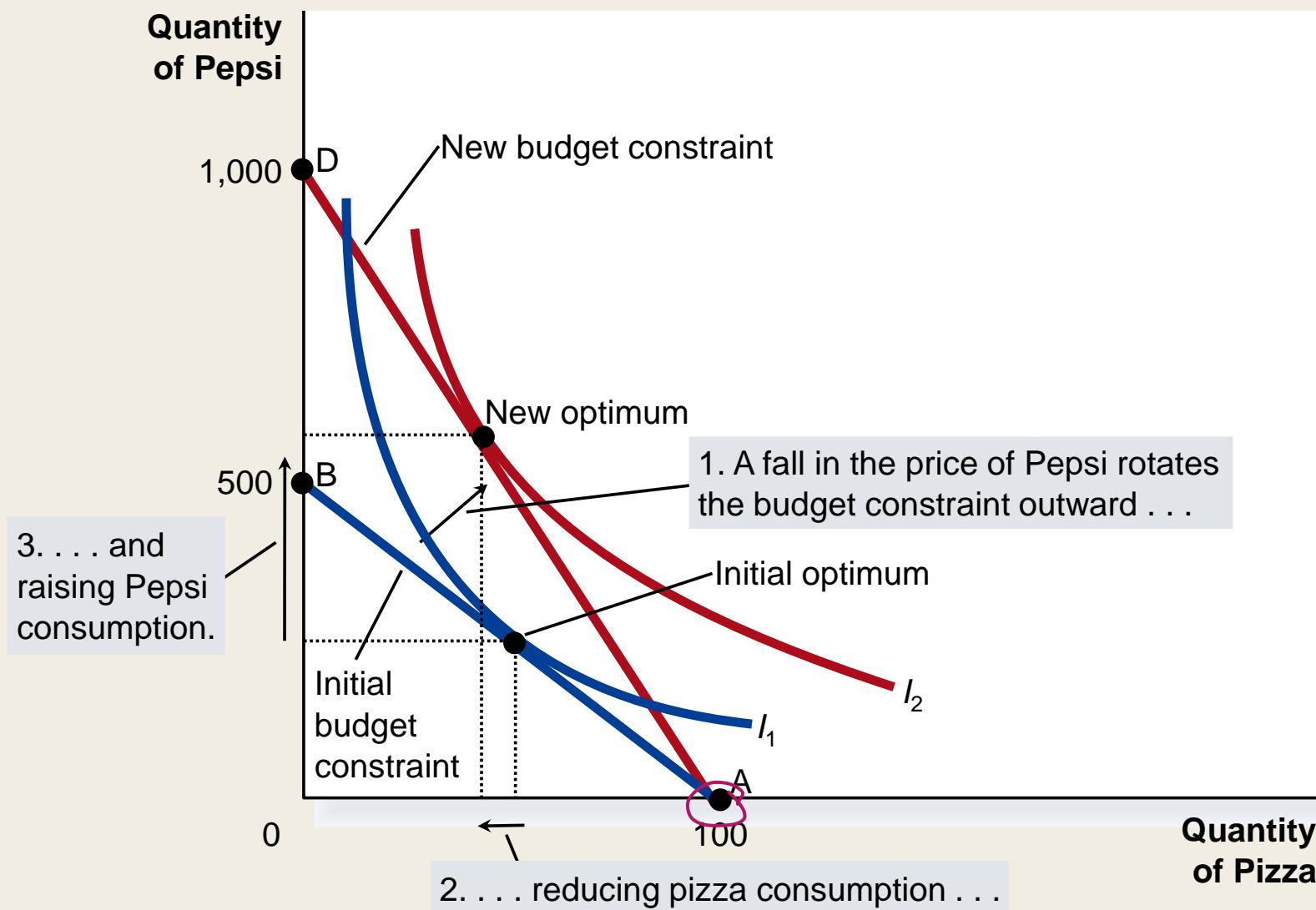
$$(P_x)X + (P_y)Y = I_0 = 20$$

$$P_x = P_y = 1$$

$$P'_x = 2$$

$$\frac{P_x}{P'_x} = \frac{1}{2} \Rightarrow 2$$

## Figure 9 A Change in Price



# Income and Substitution Effects

- A price change has two effects on consumption.
  - An income effect
  - A substitution effect

# Income and Substitution Effects

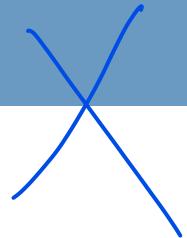
- The Substitution Effect
  - The *substitution effect* is the change in consumption that results when a price change moves the consumer along an indifference curve to a point with a different marginal rate of substitution.
- The Income Effect
  - The *income effect* is the change in consumption that results when a price change moves the consumer to a higher or lower indifference curve.



21

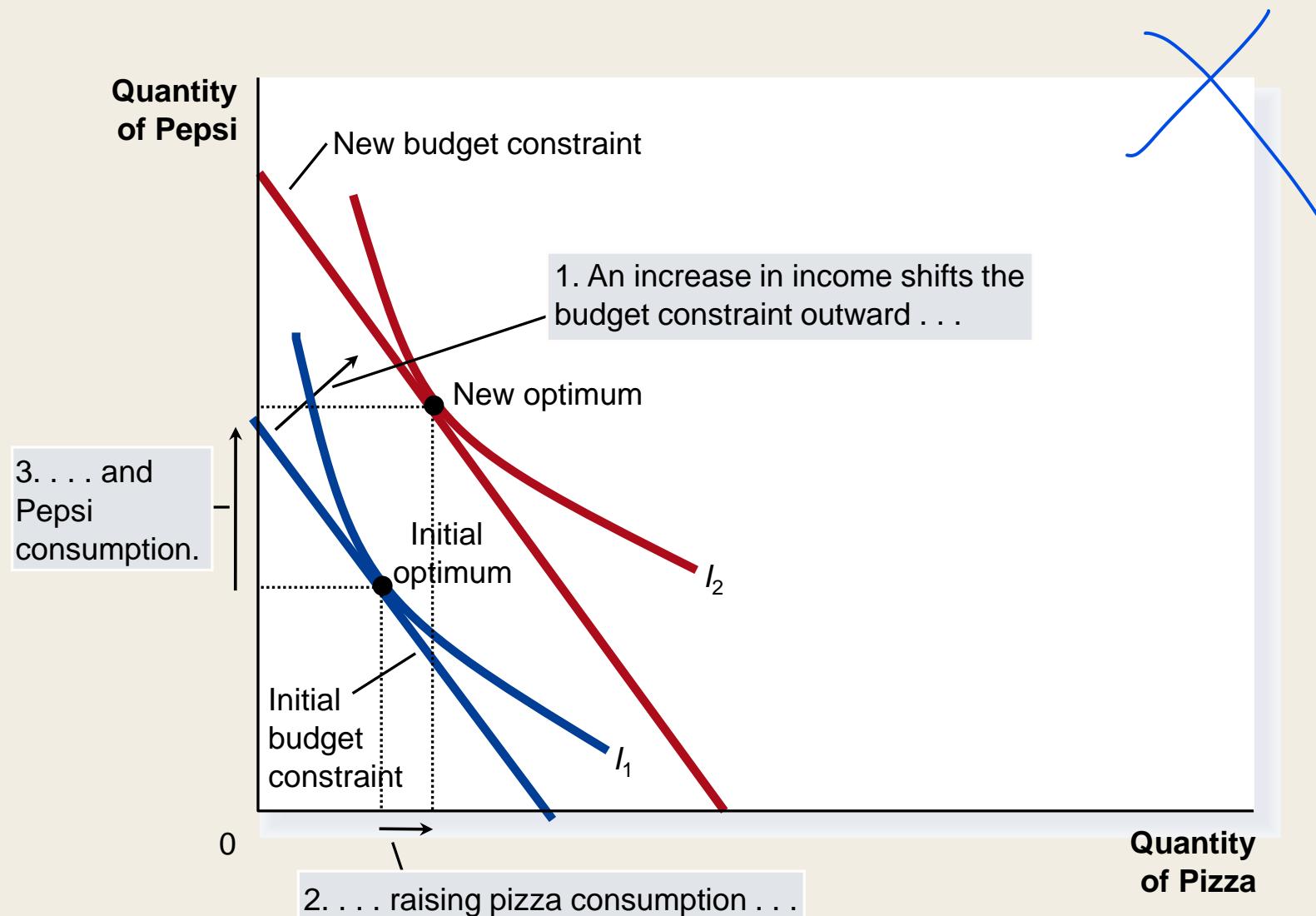
## The Theory of Consumer Choice

# How Changes in Income Affect the Consumer's Choices



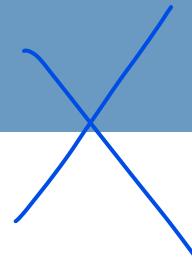
- An increase in income shifts the budget constraint outward.
  - The consumer is able to choose a better combination of goods on a higher indifference curve.

## Figure 7 An Increase in Income

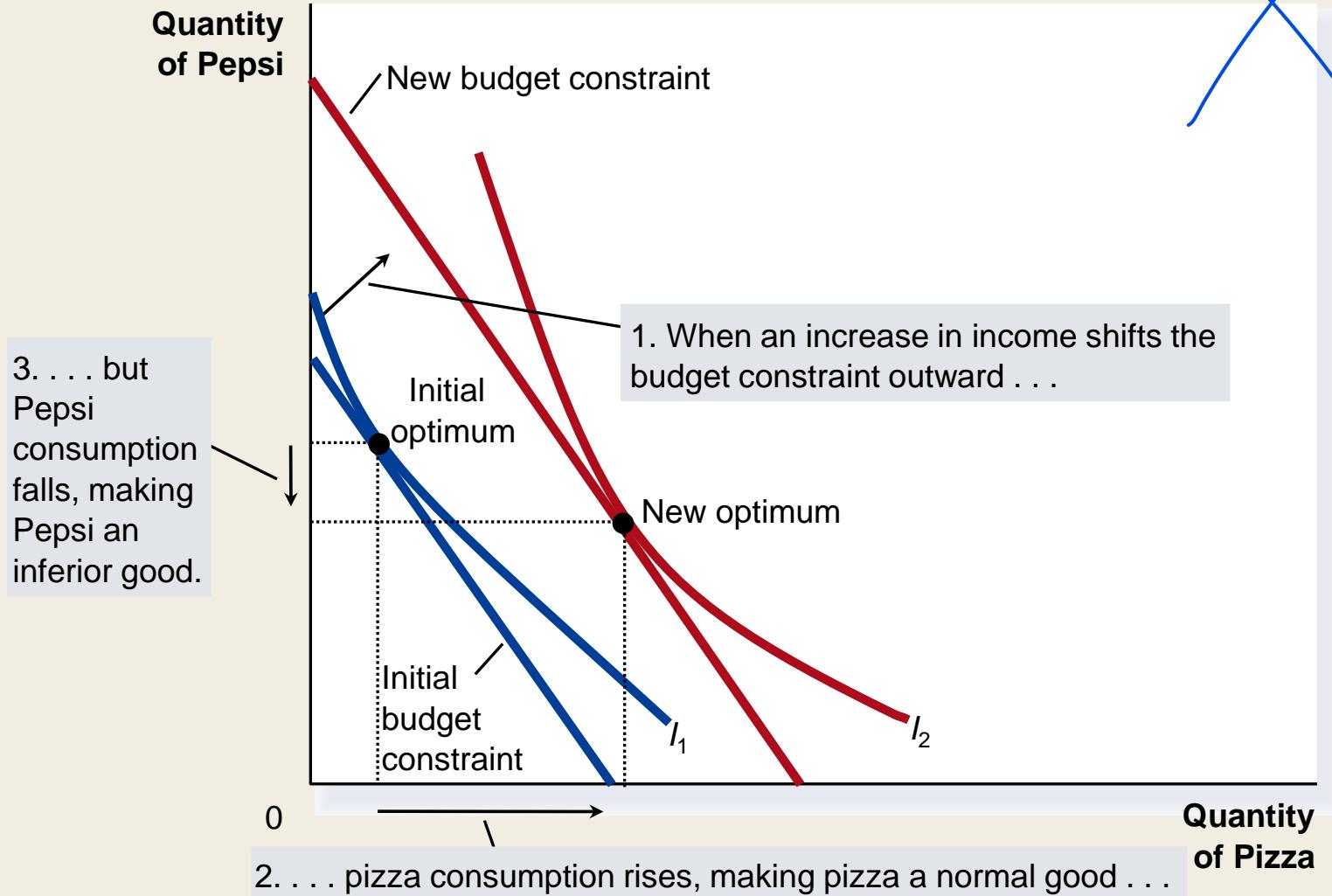


# How Changes in Income Affect the Consumer's Choices

- Normal versus Inferior Goods
  - If a consumer buys more of a good when his or her income rises, the good is called a *normal good*.
  - If a consumer buys less of a good when his or her income rises, the good is called an *inferior good*.



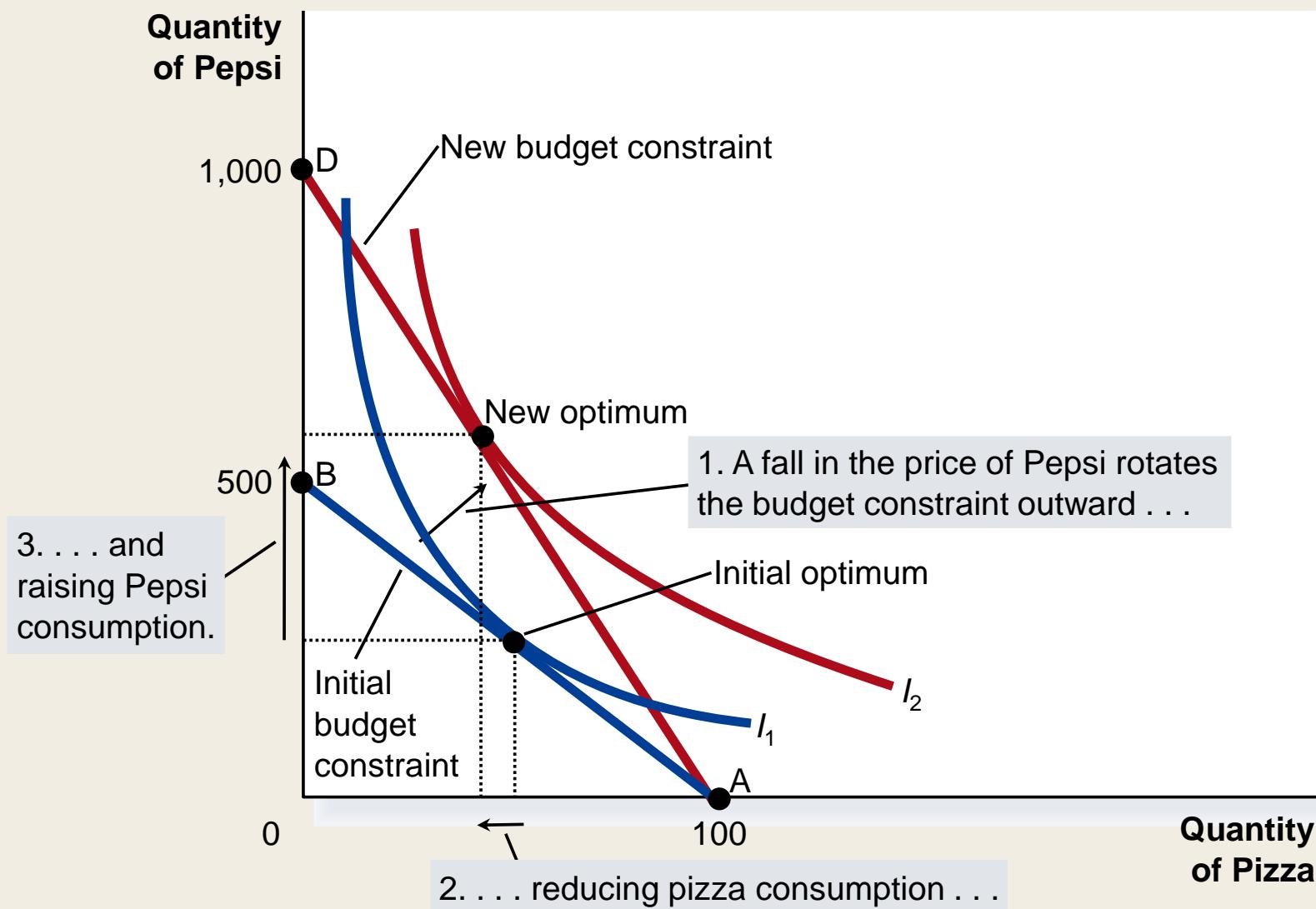
## Figure 8 An Inferior Good



# How Changes in Prices Affect Consumer's Choices

- A fall in the price of any good rotates the budget constraint outward and changes the slope of the budget constraint.

## Figure 9 A Change in Price



# Income and Substitution Effects

- A price change has two effects on consumption.
  - An income effect
  - A substitution effect

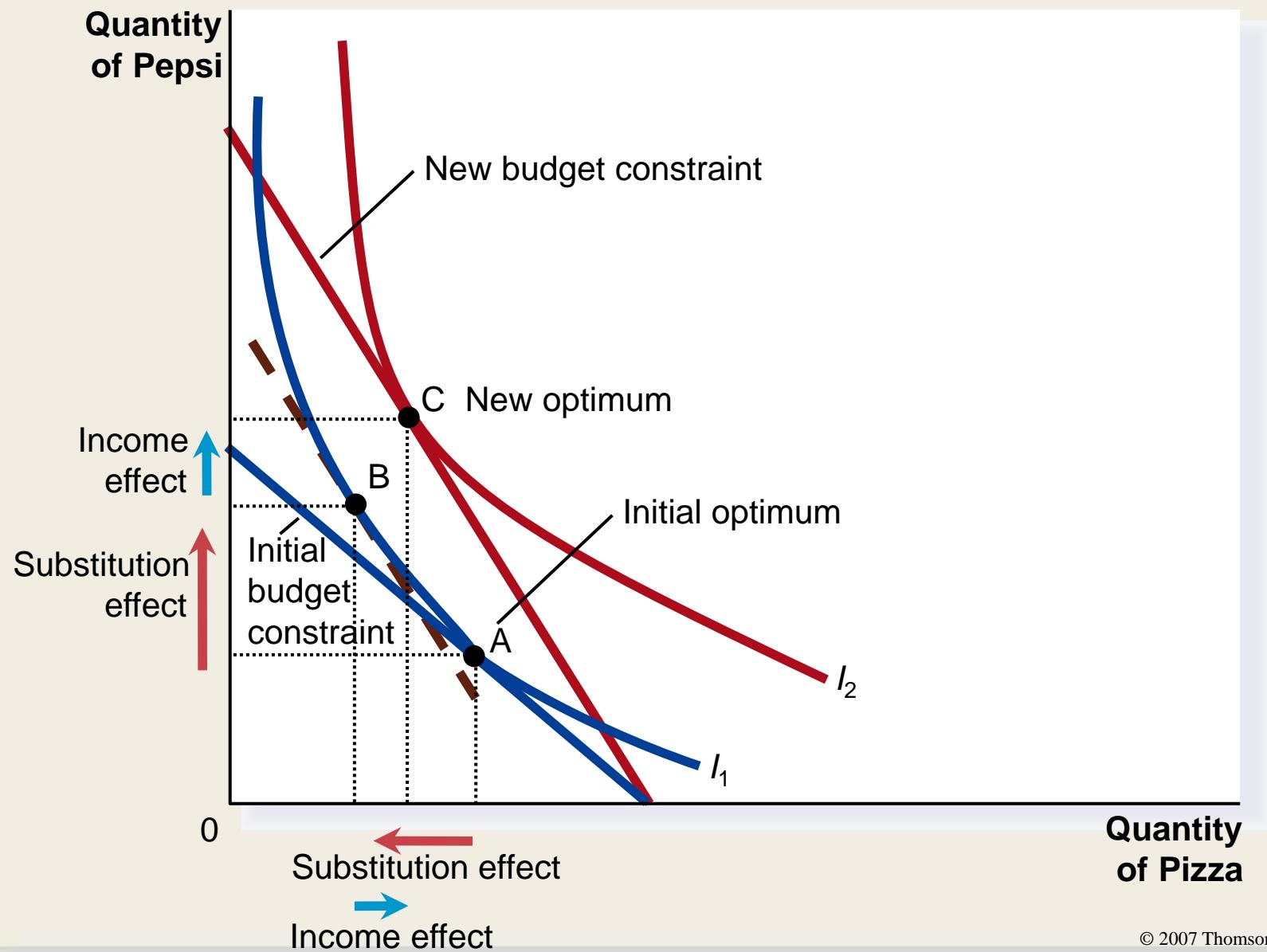
# Income and Substitution Effects

- The Substitution Effect
  - The *substitution effect* is the change in consumption that results when a price change moves the consumer along an indifference curve to a point with a different marginal rate of substitution.
- The Income Effect
  - The *income effect* is the change in consumption that results when a price change moves the consumer to a higher or lower indifference curve.

# Income and Substitution Effects

- A Change in Price: Substitution Effect
  - A price change first causes the consumer to move from one point on an indifference curve to another on the same curve.
    - Illustrated by movement from point A to point B.
- A Change in Price: Income Effect
  - After moving from one point to another on the same curve, the consumer will move to another indifference curve.
    - Illustrated by movement from point B to point C.

## Figure 10 Income and Substitution Effects



## Table 1 Income and Substitution Effects When the Price of Pepsi Falls

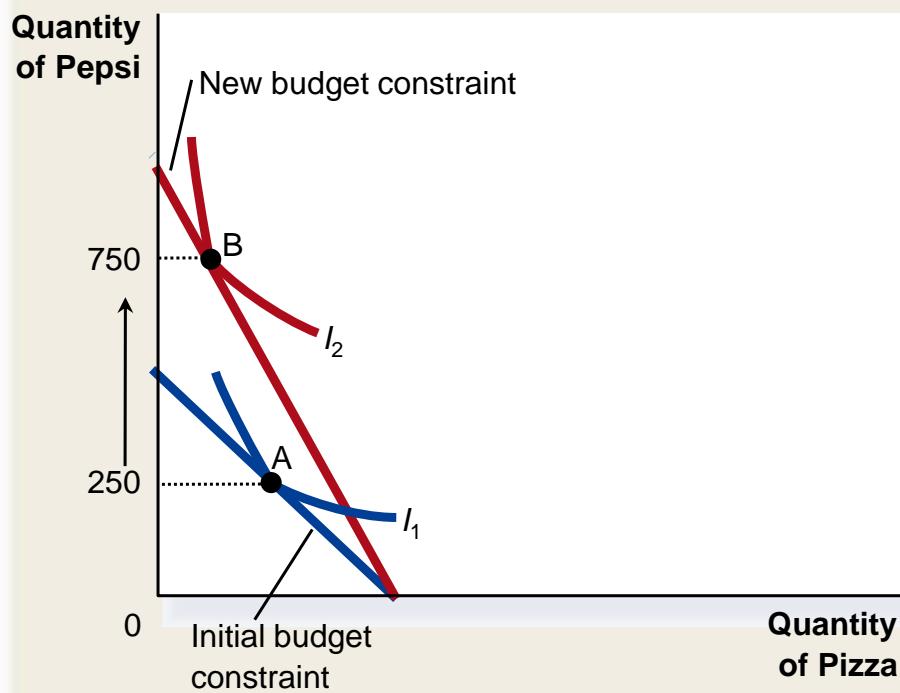
Good	Income Effect	Substitution Effect	Total Effect
Pepsi	Consumer is richer, so he buys more Pepsi.	Pepsi is relatively cheaper, so consumer buys more Pepsi.	Income and substitution effects act in same direction, so consumer buys more Pepsi.
Pizza	Consumer is richer, so he buys more pizza.	Pizza is relatively more expensive, so consumer buys less pizza.	Income and substitution effects act in opposite directions, so the total effect on pizza consumption is ambiguous.

# Deriving the Demand Curve

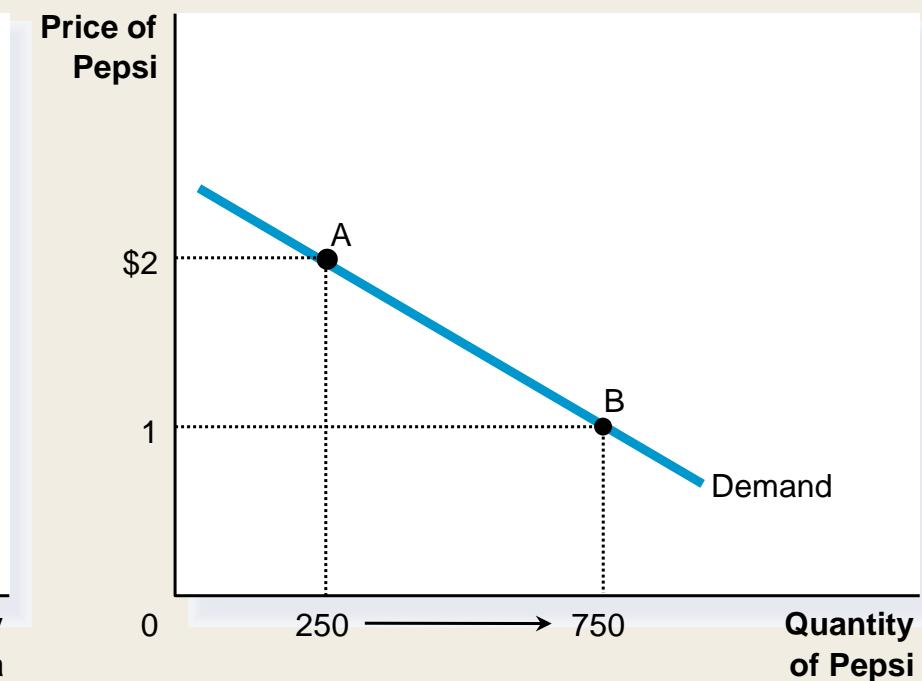
- A consumer's demand curve can be viewed as a summary of the optimal decisions that arise from his or her budget constraint and indifference curves.

# Figure 11 Deriving the Demand Curve

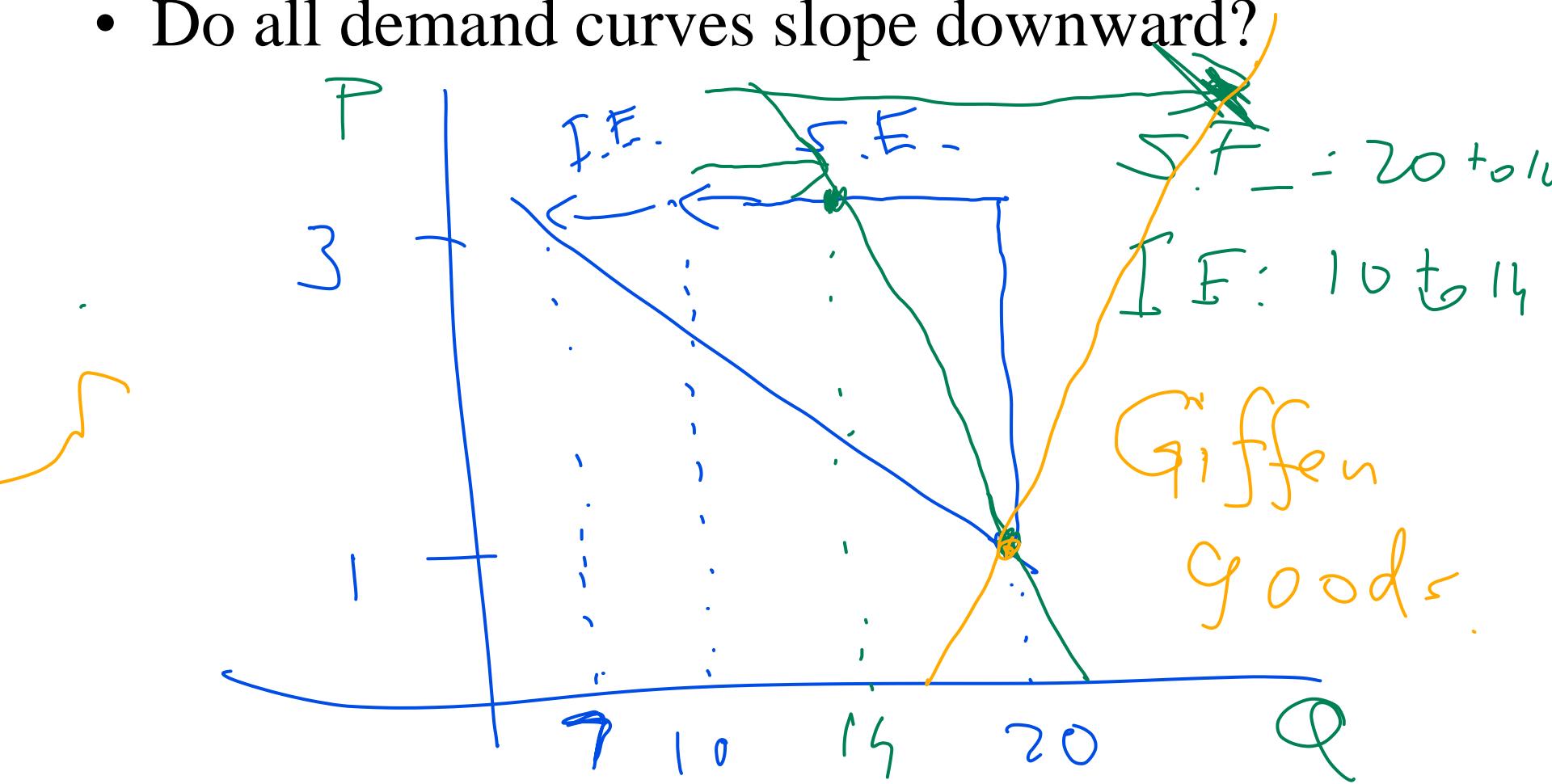
(a) The Consumer's Optimum



(b) The Demand Curve for Pepsi



- Do all demand curves slope downward?



# Do All Demand Curves Slope Downward?

- Demand curves can sometimes slope upward.
- This happens when a consumer buys more of a good when its price rises.
- Suppose there is a commodity  $x$  and its price is denoted by  $P$ .
- When  $P$  falls,  $x$  becomes relatively cheaper in relation to the other good  $y$ .

- Substitution effect entails the consumer will consume more of  $x$  even though he is confined to the same indifference curve of the pre price change level. This holds for both normal and inferior goods.
- For normal goods, income effect will entail an increase in consumption of  $x$ .
- For inferior goods, income effect will entail a decrease in consumption of  $x$ .

- For normal goods, both SE and IE work in the same direction and consumption of  $x$  is increased.
- As a result, the demand curve for normal goods is always downward sloping.

- For inferior goods, SE and IE work in opposite directions. According to SE,  $x$  is raised. But according to IE,  $x$  is decreased.
- If SE dominates IE, then for such inferior goods, the demand curve is still downward sloping.
- If IE dominates SE, then for such inferior goods, the demand curve is upward sloping.

- *Giffen goods*

- Economists use the term Giffen good to describe an inferior good that violates the law of demand, where the demand curve is upward sloping.
- Giffen goods are goods for which an increase in the price raises the quantity demanded.