

## **CHAPTER 2 SUPPLY AND DEMAND**

### **Answers to Review Questions**

1. Under the horizontal interpretation, we begin with a price for the good and then use the demand curve to read the quantity demanded at that price on the horizontal axis. Under the vertical interpretation, we start with a quantity produced and use the demand curve to read the marginal buyer's reservation price for the product on the vertical axis.

Learning Objective: 02-01

AACSB: Reflective Thinking

Bloom's: Understand

2. The equilibrium price of a good is determined by the intersection of its supply and demand curves. We can know everything about a good's cost of production (that is we can know its supply curve exactly) but without the demand curve we will not know the quantity people will want to purchase and therefore we will not know what price must be charged to cover the cost.

Learning Objective: 02-02

AACSB: Reflective Thinking

Bloom's: Understand

3. If price control regulation prevented the price of gasoline from rising to its equilibrium level, we would expect to see symptoms of excess demand for gasoline such as lines of cars waiting at the pumps to buy gas.

Learning Objective: 02-02

AACSB: Analytic

Bloom's: Apply

4. A change in demand means a shift of the entire demand curve, whereas a change in the quantity demanded means a movement along the demand curve in response to a change in price of that specific good.

Learning Objective: 02-03

AACSB: Analytic

Bloom's: Analyze

5. It is smart for each individual at a sporting event to stand up in order to get a better view of the game. However, it is dumb for all to stand up since no one sees any better than if all had remained seated.

Learning Objective: 02-04  
AACSB: Reflective Thinking  
Bloom's: Understand

## Answers to Problems

1. a. The supply curve shifts to the right. The discovery is a technological improvement, so the improved technique would allow a farmer to use the same inputs to produce more corn.
- b. The supply curve shifts to the right. Fertilizer is an input into the production of corn, so this is an example of a decrease in an input price. A decrease in input prices shifts the supply curve to the right.
- c. The supply curve shifts to the right. New tax breaks make farming relatively more profitable than before, so those who were earning an income from a non-farming job that paid just a little bit more than farming would switch to farming if the tax break is big enough.
- d. The supply curve shifts to the left. A tornado would destroy corn fields along with infrastructure used to harvest and store it. Thus, at every given price the quantity of corn supplied would be lower and the supply curve shifts to the left.

Learning Objective: 02-01  
AACSB: Reflective Thinking  
Bloom's: Understand

2. a. The demand curve shifts to the right. Buyer income has risen and vacations are a normal good, so this increases the quantity demanded at every given price.
- b. The demand curve shifts to the left. Buyer preference will probably change because most people want to avoid foods that cause heart disease, so buyers will purchase fewer pizzas with pepperoni.
- c. The demand curve shifts to the right. Since these goods are substitutes, an increase in the price of MP3s would result in an increased demand for CDs.
- d. The demand curve remains unchanged. An increase in the price of CDs decreases the quantity demanded of CDs, which causes movement *along* the demand curve.

Learning Objective: 02-01  
AACSB: Reflective Thinking  
Bloom's: Understand

3. The supply of binoculars will not be affected. The demand for binoculars might increase due to more people wanting to spot UFOs. This will lead to an increase in the equilibrium price of binoculars and the quantity of binoculars supplied. However, no change in the supply of binoculars should occur since nothing has changed with regard to input prices, technology, or any of the factors that determine supply.

Learning Objective: 02-01  
AACSB: Analytic  
Bloom's: Analyze

4. Two goods are complements if an increase in the price of one causes a leftward shift in the demand curve for the other (or if a decrease in the price of one causes a rightward shift in the demand curve for the other). The opposite holds true for a substitute, where an increase in the price of one causes a rightward shift in the demand for the other (or a decrease in the price of one causes a leftward shift in the demand curve for the other).
  - a. Since washing machines and dryers are typically used together, we would expect them to be complements.
  - b. Since tennis rackets and tennis balls are typically used together, we would expect them to be complements.
  - c. Ice cream and chocolate would be substitutes for someone who consumes either one or the other for dessert, and they would be complements for someone who likes to consume ice cream and chocolate together.
  - d. Since cloth diapers and disposable diapers are generally consumed in place of one another, we would expect them to be substitutes.

Learning Objective: 02-03  
AACSB: Reflective Thinking  
Bloom's: Understand

5. An increase in the birth rate will increase the population of potential buyers of land. This will shift the demand curve for land to the right and increase the equilibrium price of land.

Learning Objective: 02-03

AACSB: Analytic  
Bloom's: Analyze

6. An increase in the price of chicken feed shifts the supply curve of chickens to the left, resulting in an increase in the equilibrium price of chickens. Assuming that chicken is a substitute for beef, the increase in the price of chickens will shift the demand curve for beef to the right, increasing both the equilibrium price and the equilibrium quantity of beef.

Learning Objective: 02-03  
AACSB: Analytic  
Bloom's: Analyze

7. Automobile insurance and automobiles are complements, so an increase in automobile insurance rates will thus shift the demand curve for automobiles to the left. Some people who would have bought new automobiles with the lower insurance rates will choose instead to purchase a used car, use public transportation, or perhaps continue driving their current vehicle.

Learning Objective: 02-03  
AACSB: Analytic  
Bloom's: Analyze

8.
  - a. The discovery will shift the demand curve for oranges to the right. As a result, both the equilibrium price and the equilibrium quantity of oranges will increase.
  - b. Since grapefruit can be assumed to be a substitute for oranges for most consumers, a drastic decrease in the price of grapefruit will make some of the current orange consumers buy grapefruit instead. This will shift the demand curve of oranges to the left. As a result, both the equilibrium price and equilibrium quantity of oranges will decrease.
  - c. Since labor is an input to orange production, an increase in the wage is an increase in the cost of an input. This will shift the supply curve of oranges to the left. As a result, the equilibrium price of oranges will increase and the equilibrium quantity will decrease. Note that an increase in wages does not automatically mean an increase in the productivity of the workers, which would have affected supply in the opposite direction.
  - d. A better than expected harvest means that supply will be greater, shown graphically as a shift of the supply curve to the right. As result, the equilibrium price of oranges will decrease and the equilibrium quantity of oranges will increase.

Learning Objective: 02-03

AACSB: Analytic

Bloom's: Analyze

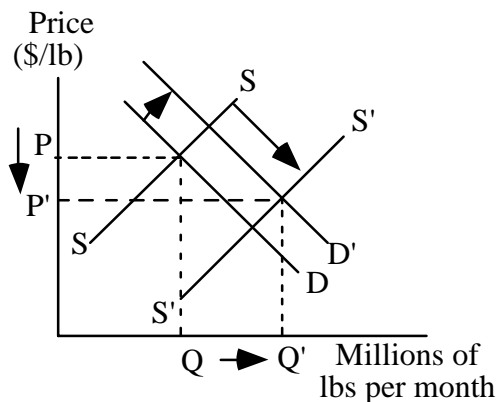
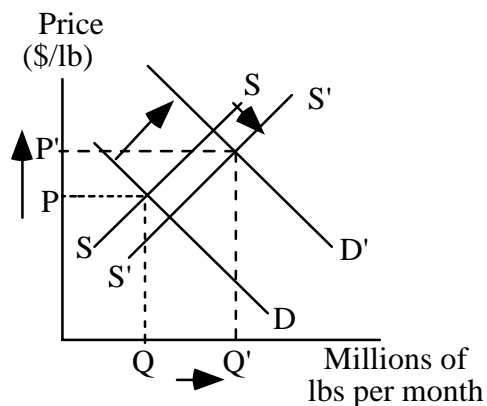
9. The mad cow disease announcement is likely to cause many consumers to substitute chicken for beef; this will cause the demand curve for chicken to shift to the right. The discovery of the new chicken breed will cause a rightward shift in the supply curve of chicken. The two developments together will increase the equilibrium quantity of chicken sold in the United States, but we cannot determine the net effect on equilibrium price from the information given.

Learning Objective: 02-03

AACSB: Analytic

Bloom's: Analyze

10. Since both the demand and supply curves for tofu have shifted outward, the equilibrium quantity of tofu sold is higher than before. The equilibrium price could be higher (left panel), or lower (right panel), or it could remain the same, depending on the size of the shifts in supply and demand. If the increase in supply is small relative to the price increase in demand, price will rise. If the increase in supply and the increase in demand exactly offset each other, price will not change.



Learning Objective: 02-03

AACSB: Analytic

Bloom's: Analyze



# Supply and Demand

## Chapter 2

# Learning Objectives

1. Describe how the demand and supply curves summarize the behavior of buyers and sellers in the marketplace.
2. Discuss how the supply and demand curves interact to determine equilibrium price and quantity.
3. Illustrate how shifts in supply and demand curves cause prices and quantities to change
4. Explain why markets in equilibrium tend to leave no unexploited opportunities available to individuals.

# What, How, and For Whom?

- Every society answers three basic questions

## **WHAT**

- Which goods will be produced?
- How much of each?

## **HOW**

- Which technology?
- Which resources are used?

## **FOR WHOM**

- How are outputs distributed?
  - Need?
  - Income?



# Central Planning versus the Market

## Central Planning

- **Decisions by individuals or small groups**

Agrarian societies

Government programs

- Sets prices and goals for the group

Individual influence is limited

## The Market

- **Buyers and sellers signal wants and costs**

Resources and goods are allocated accordingly

- Interaction of supply and demand answer the three basic questions

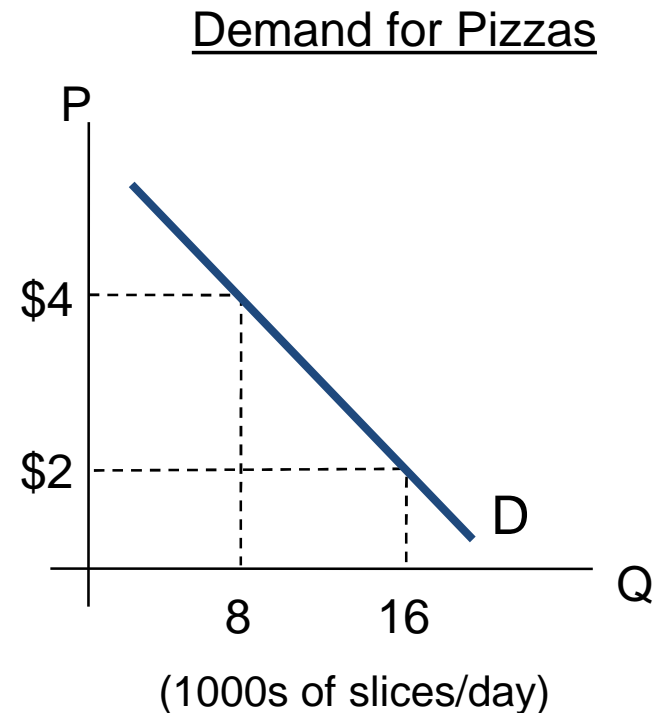
**Mixed economies use both the market and central planning**

# Buyers and Sellers in the Market

- The **market** for any good consists of all the buyers and sellers of the good
- Buyers and sellers have different motivations
  - Buyers want to benefit from the good
  - Sellers want to make a profit
- Market price balances two forces
  - Value buyers derive from the good
  - Cost to produce one more unit of the good

# Demand

- A **demand curve** illustrates the quantity buyers would purchase at each possible price
- Demand curves have a negative slope
  - Consumers buy less at higher prices
  - Consumers buy more at lower prices



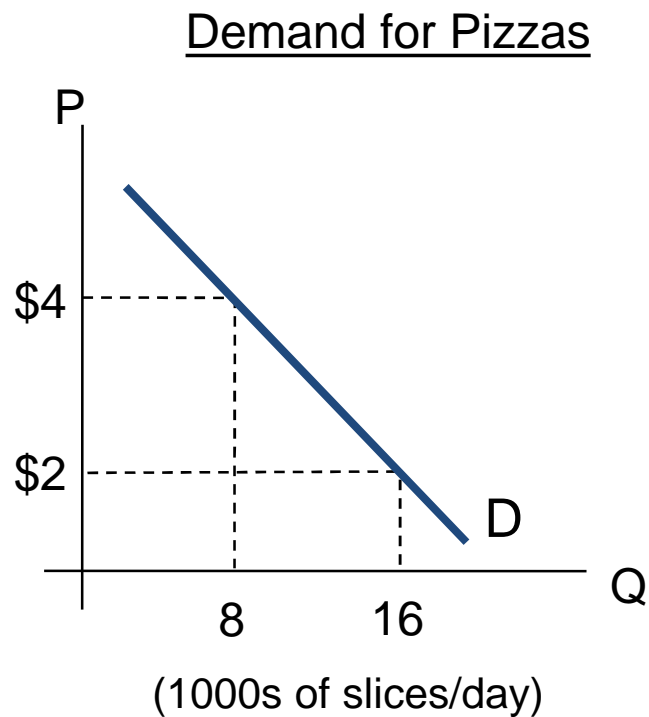
# Demand Slopes Downward

- Buyers value goods differently
  - The **buyer's reservation price** is the highest price an individual is willing to pay for a good
- Demand reflects the entire market, not one consumer
  - Lower prices bring more buyers into the market
  - Lower prices cause existing buyers to buy more

# Income and Substitution Effects

- Buyers buy more at lower prices and buy less at higher prices
- What happens when price goes up?
  - The **substitution effect**: Buyers switch to substitutes when price goes up
  - The **income effect**: Buyers' overall purchasing power goes down

# Interpreting the Demand Curve



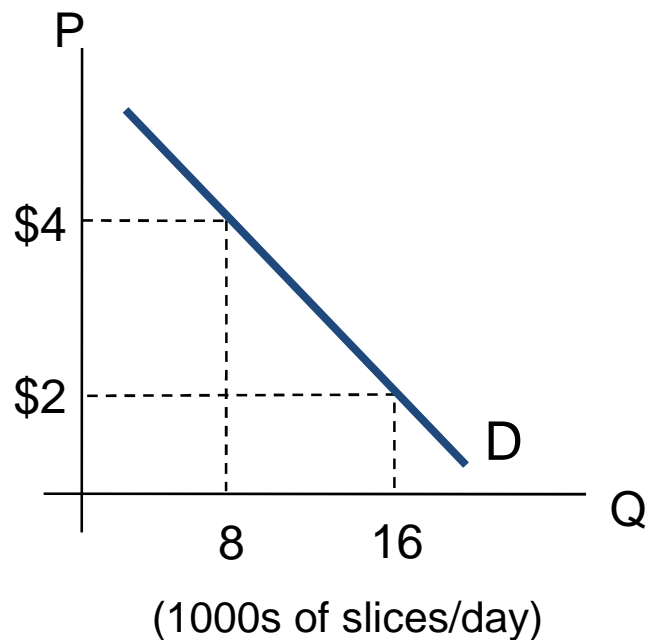
- Horizontal interpretation of demand:

Given price, how much will buyers buy?

At a price of \$4, the quantity demanded is 8,000 slices/day.

# Interpreting the Demand Curve

Demand for Pizzas



- Vertical interpretation of demand:

Given the quantity to be sold, what price is the marginal consumer willing to pay?

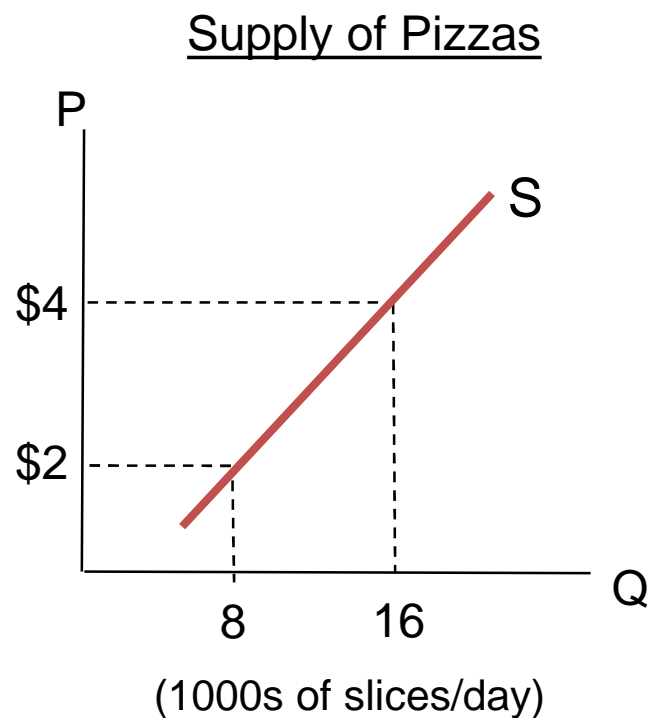
If 8,000 slices are sold the marginal consumer is willing to pay \$4 per slice.

# The Supply Curve

- The **supply curve** illustrates the quantity of a good that sellers are willing to offer at each price
  - If the price is less than opportunity cost, offer more
- Opportunity cost differs among sellers due to:
  - Technology
  - Skills
  - Different costs such as rent
  - Expectations
- The **Low-Hanging Fruit Principle** explains the upward sloping supply curve
- The **seller's reservation price** is the lowest price the seller would be willing to sell for
  - Equal to marginal cost



# Interpreting the Supply Curve

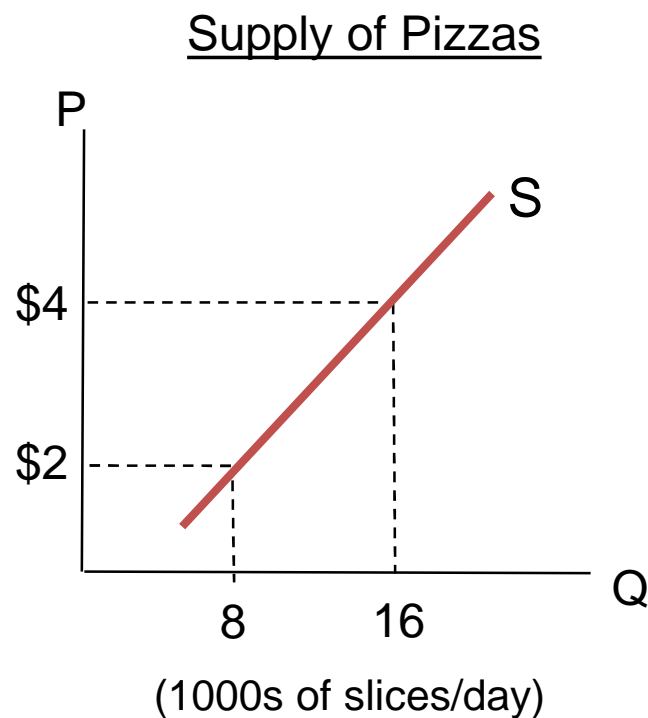


- Horizontal interpretation of supply:

Given price, how much will suppliers offer?

At a price of \$2, suppliers are willing to sell 8,000 slices/day.

# Interpreting the Supply Curve



- Vertical interpretation of supply:

Given the quantity to be sold, what is the opportunity cost of the marginal seller?

If 8,000 slices are sold, the marginal cost of producing the 8,000<sup>th</sup> slice is \$2.

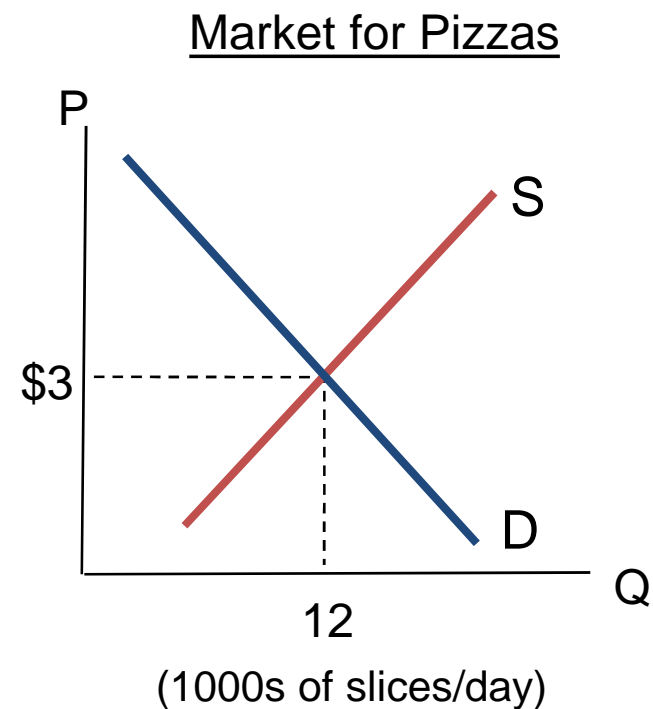
# Market Equilibrium

- A system is in **equilibrium** when there is no tendency for it to change
- The **equilibrium price** is the price at which the supply and demand curves intersect
- The **equilibrium quantity** is the quantity at which the supply and demand curves intersect
- The **market equilibrium** occurs when all buyers and sellers are satisfied with their respective quantities at the market price
  - At the equilibrium price, quantity supplied equals quantity demanded

# Market Equilibrium

- Quantity supplied equals quantity demanded AND
- Price is on supply and demand curves
- No tendency to change P or Q

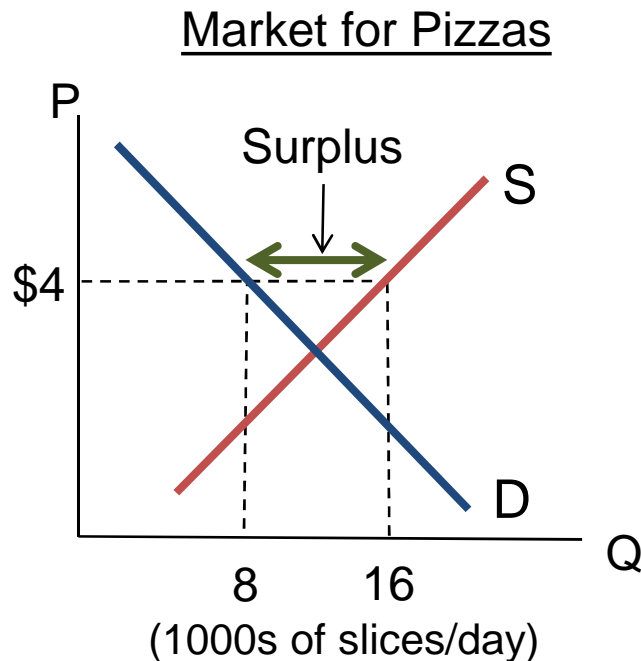
Buyers are on their demand curve  
Sellers are on their supply curve



# Excess Supply and Excess Demand

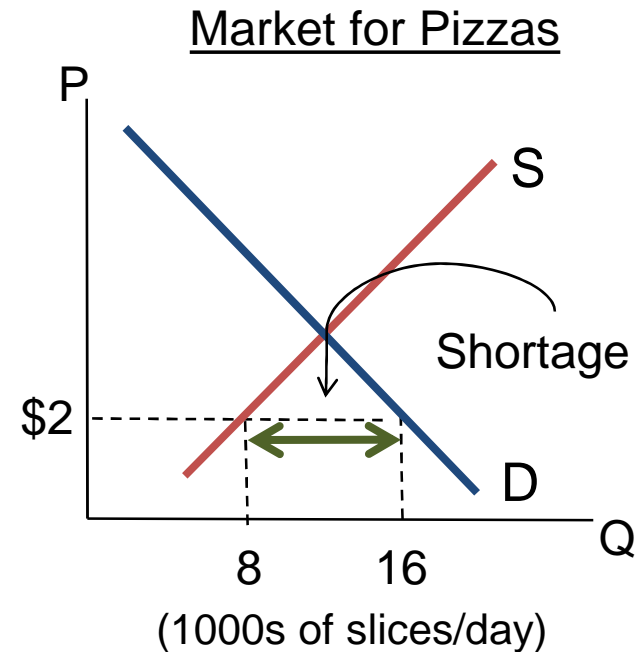
## Excess Supply

- At \$4, 16,000 slices supplied and 8,000 slices demanded



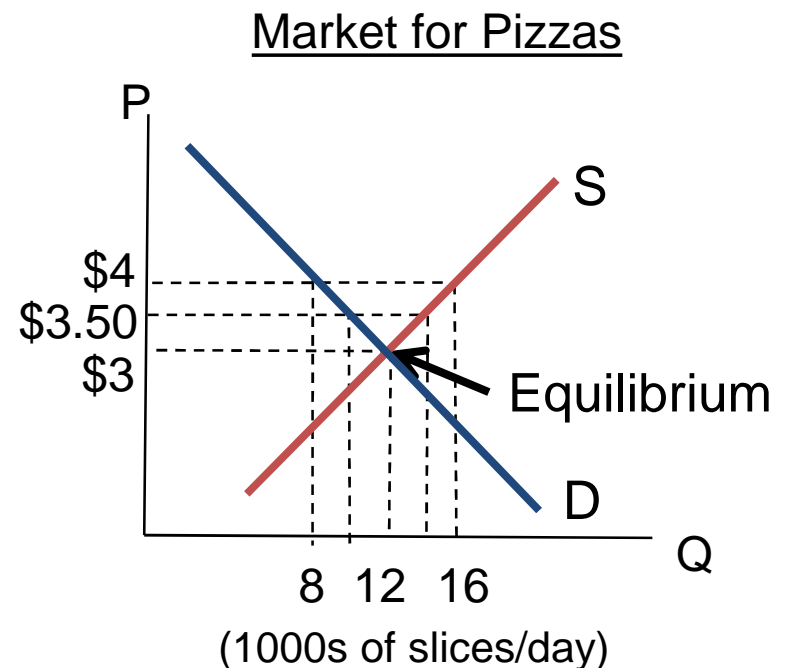
## Excess Demand

- At \$2, 8,000 slices supplied and 16,000 slices demanded

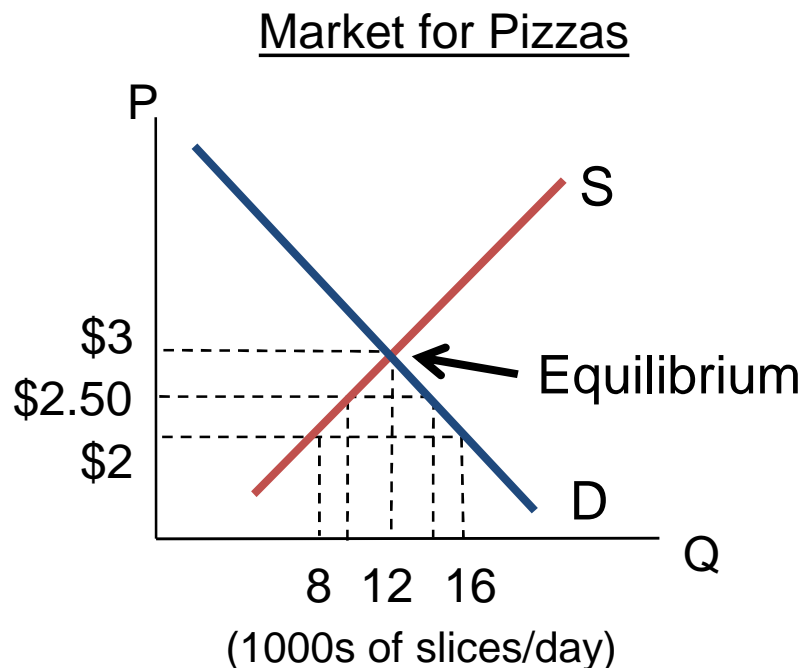


# Incentive Principle: Excess Supply at \$4

- Each supplier has an incentive to decrease the price in order to sell more
- Lower prices decrease the surplus
- As price decreases:
  - the quantity offered for sale decreases along the supply curve
  - the quantity demanded increases along the demand curve



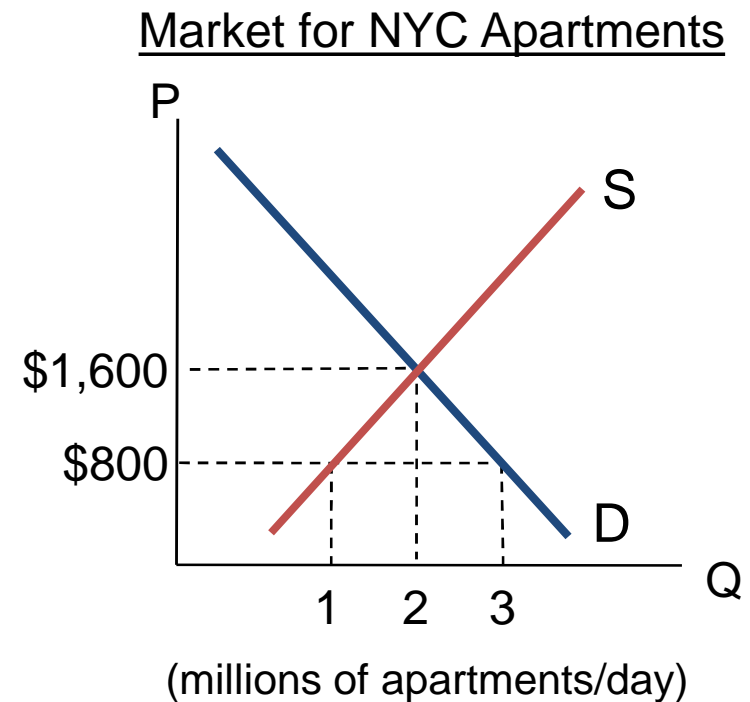
# Incentive Principle: Excess Demand at \$2



- Each supplier has an incentive to increase the price in order to sell more
- Higher prices decrease the shortage
- As price increases
  - the quantity offered for sale increases along the supply curve
  - As price increases, the quantity demanded decreases along the demand curve.

# Rent Controls Are Price Ceilings

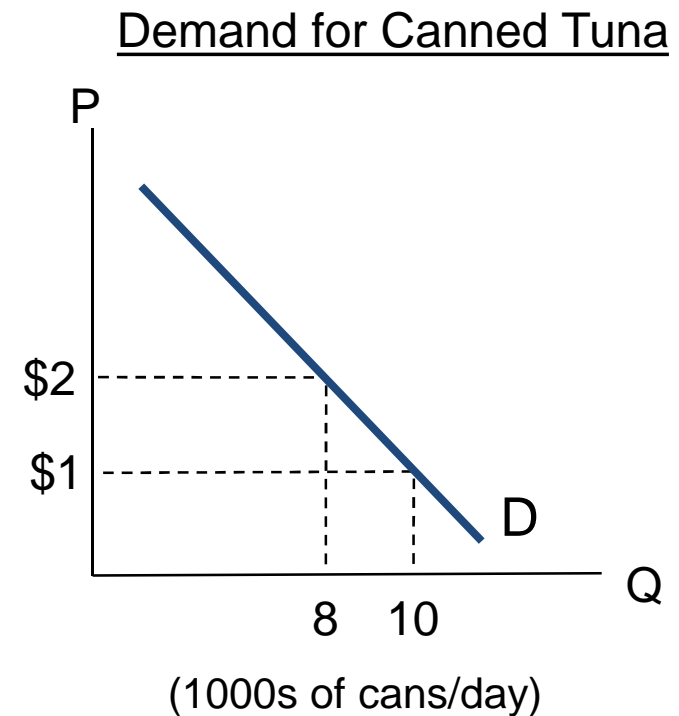
- A **price ceiling** is a maximum allowable price, set by law
- Rent controls set a maximum price that can be charged for a given apartment
- If the controlled price is below equilibrium, then:
  - Quantity demanded increases
  - Quantity supplied decreases
  - A shortage results





# Movement along the Demand Curve

- When price goes up, quantity demanded goes down
- When price goes down, buyers move to a new, higher quantity demanded
- A **change in quantity demanded** results from a change in the price of a good.



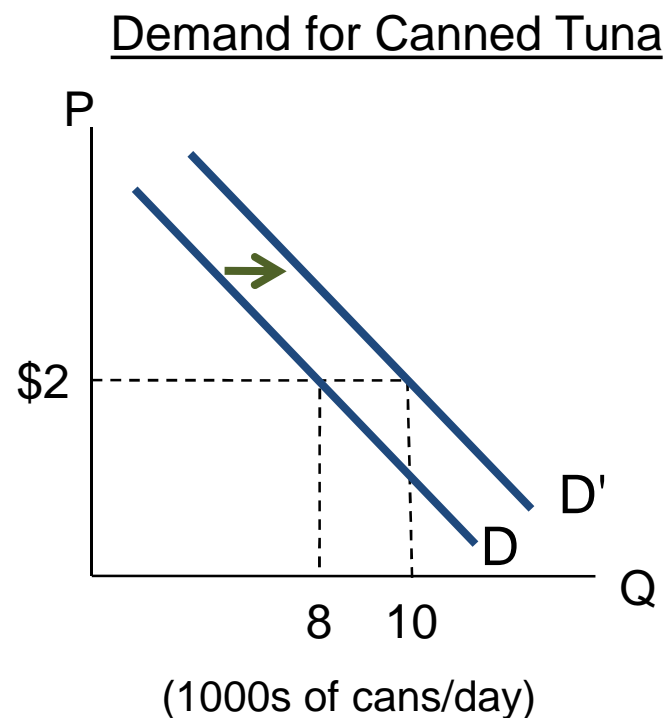
# Shift in Demand

- If buyers are willing to buy more at each price, then demand has increased

Move the entire demand curve to the right

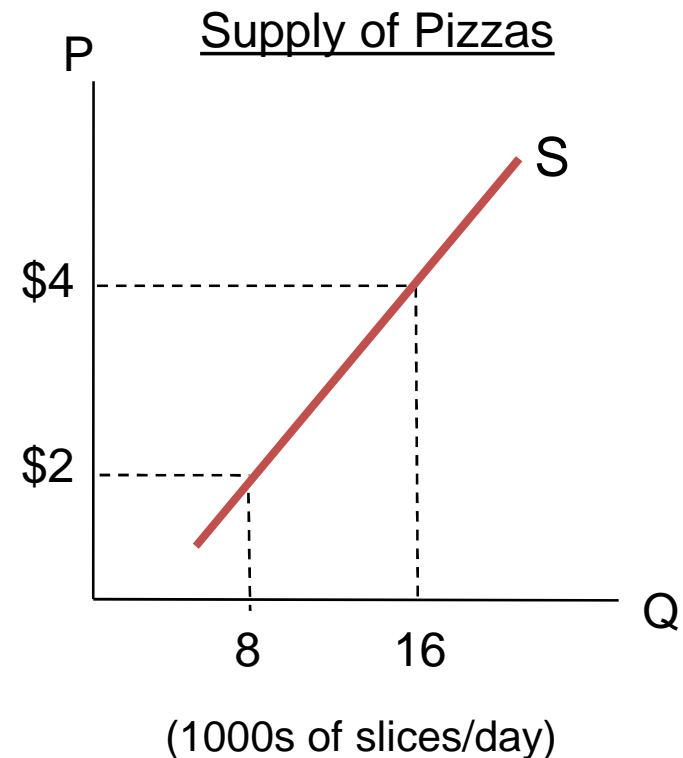
## Change in demand

- If buyers are willing to buy less at each price, then demand has decreased



# Movement Along the Supply Curve

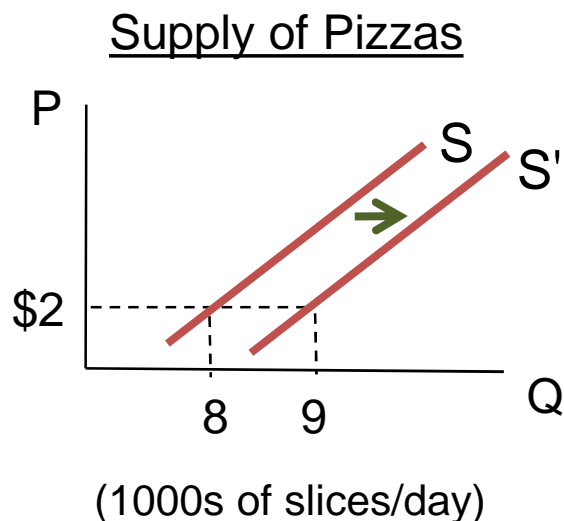
- When price goes up, quantity supplied goes up
- When price goes up, sellers move to a new, higher quantity supplied
- A **change in quantity supplied** results from a change in the price of a good.



# Shift in Supply

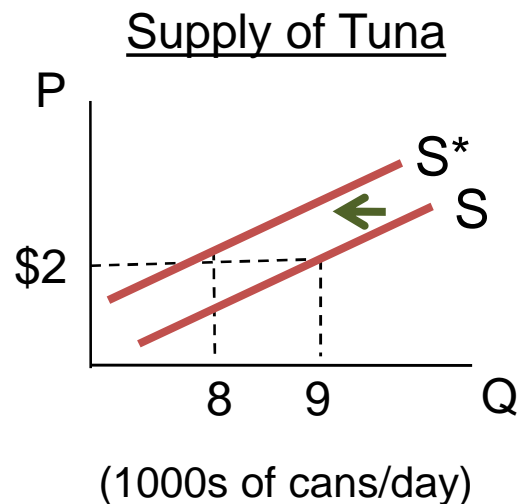
**Supply increases** when sellers are willing to offer more for sale at each possible price

Moves the entire supply curve to the right



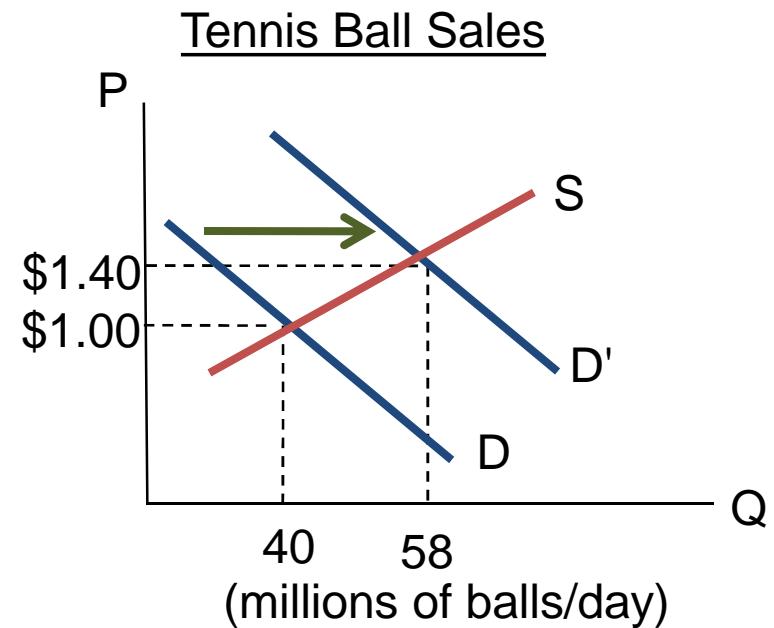
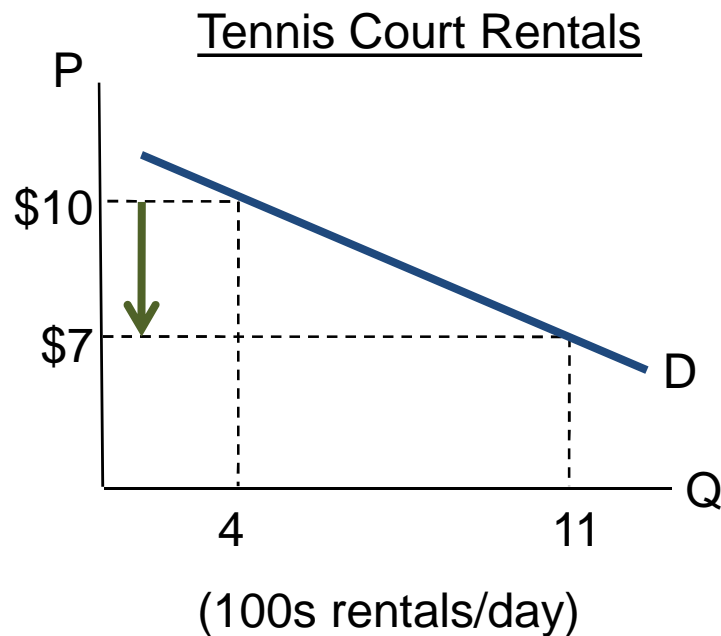
**Supply decreases** when sellers are willing to offer less for sale at each possible price

Moves the entire supply curve to the left



# Tennis Market

- If rent for tennis court decreases, demand for tennis balls increases
  - Tennis courts and tennis balls are **complements**

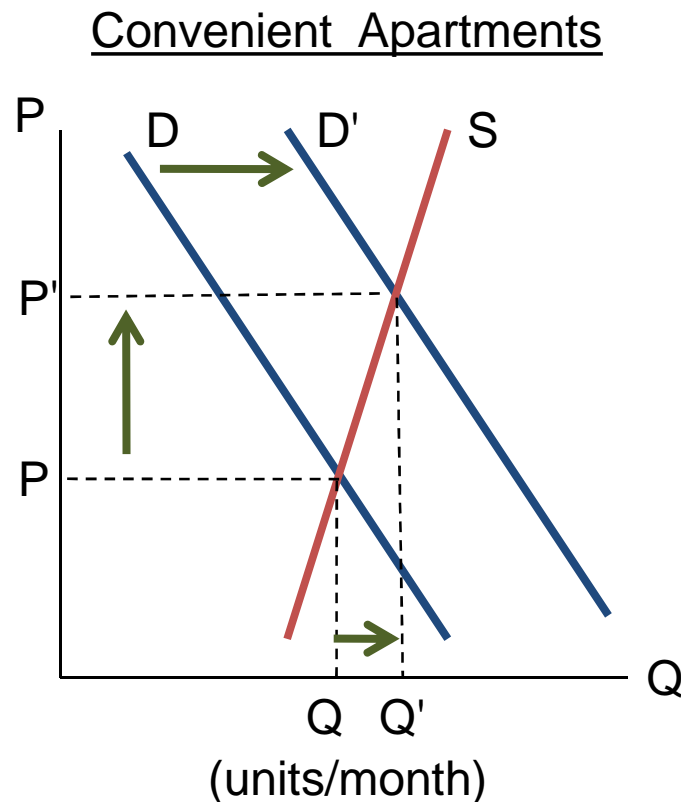


# Causes of Shifts in Demand

- Price of complementary goods
  - Tennis courts and tennis balls
- Price of substitute goods
  - Internet and overnight delivery are **substitutes**
- Income: normal or inferior goods?
- Preferences
  - Dinosaur toys after *Jurassic Park* movie
- Number of buyers in the market
- Expectations about the future

Price changes never cause a shift in demand

# Apartments Near DC Metro



- If government wages rise, demand for apartments near Metro stations increases
  - Demand increases
  - Price increases
  - Quantity increases
- Demand for a **normal good** increases when income increases
  - Demand for an **inferior good** increases when income decreases

# Causes of Shifts in Supply

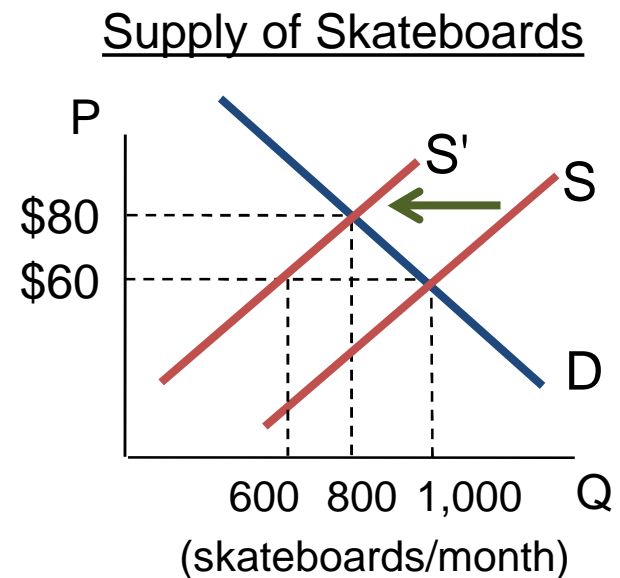
- A change in the price of an input
  - Fiberglass for skateboards, construction wages
- A change in technology
  - Desktop publishing and term papers
  - Internet distribution of products (e-commerce)
- Weather (agricultural commodities and outdoor entertainment)
- Number of sellers in the market
- Expectation of future price changes

Price changes never cause a shift in supply



# Shifts in Supply: Skateboards

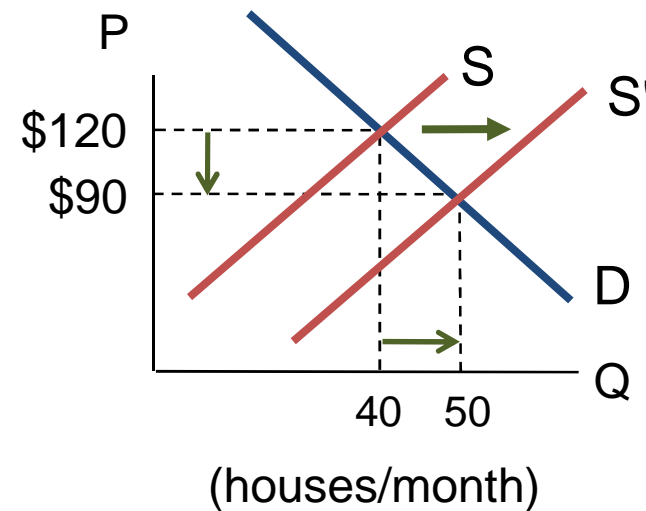
- Costs of production affect the supply of a product
- Cost of fiberglass for skateboards increases
  - Supply decreases
- With no change in demand, the price of skateboards increases to \$80 and quantity decreases to 800



# Shift in Supply: Home Construction

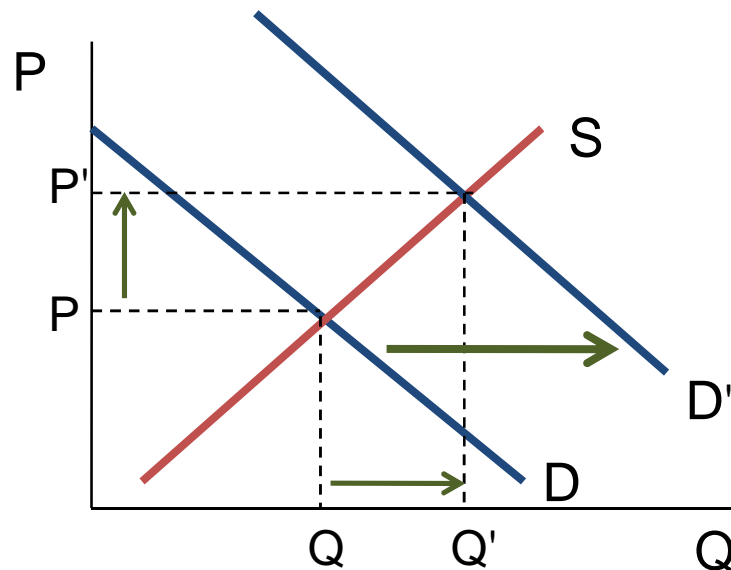
- Cost of labor used to produce houses decreases
  - Supply increases
- Demand is constant
- The price of houses decreases to \$90,000 per house
- Quantity increases to 50

The Market for New Houses



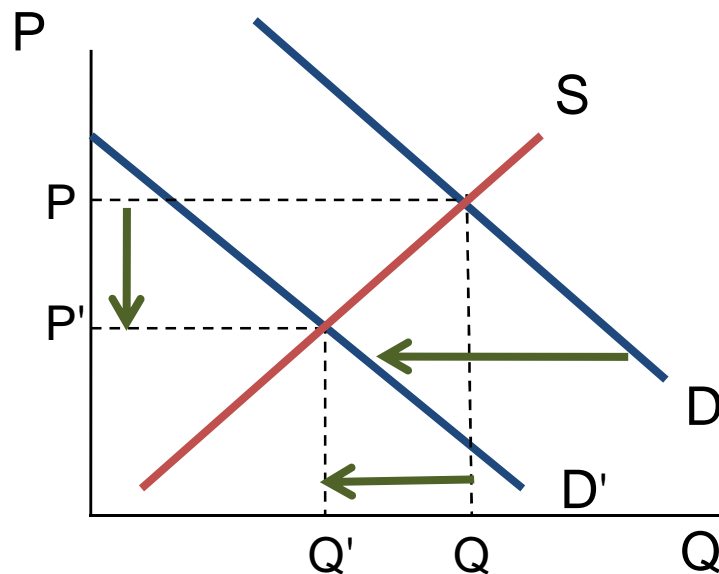
# Supply and Demand Shifts: Four Rules

1. An increase in demand will lead to an increase in both equilibrium price and quantity



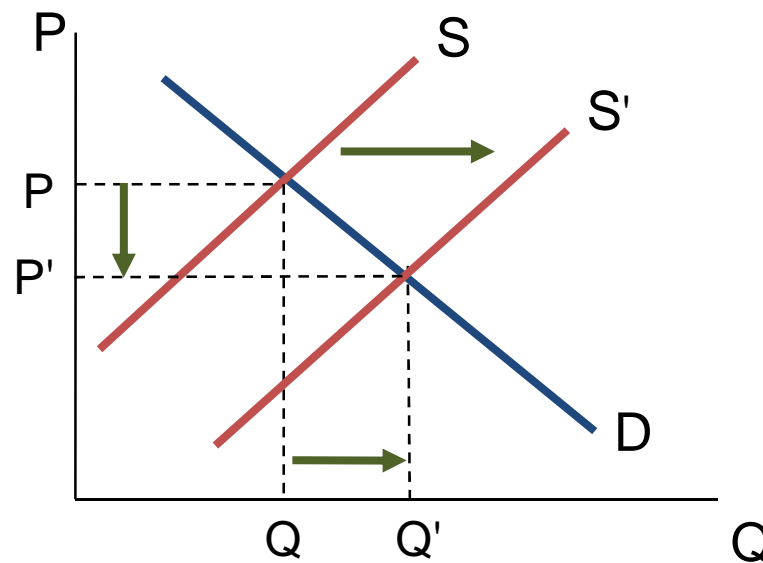
# Supply and Demand Shifts: Four Rules

2. An decrease in demand will lead to a decrease in both equilibrium price and quantity



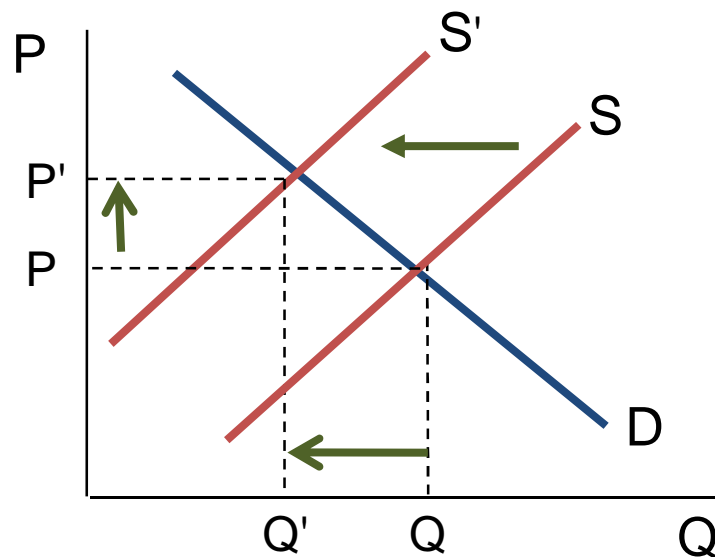
# Supply and Demand Shifts: Four Rules

3. An increase in supply will lead to a decrease in the equilibrium price and an increase in the equilibrium quantity.



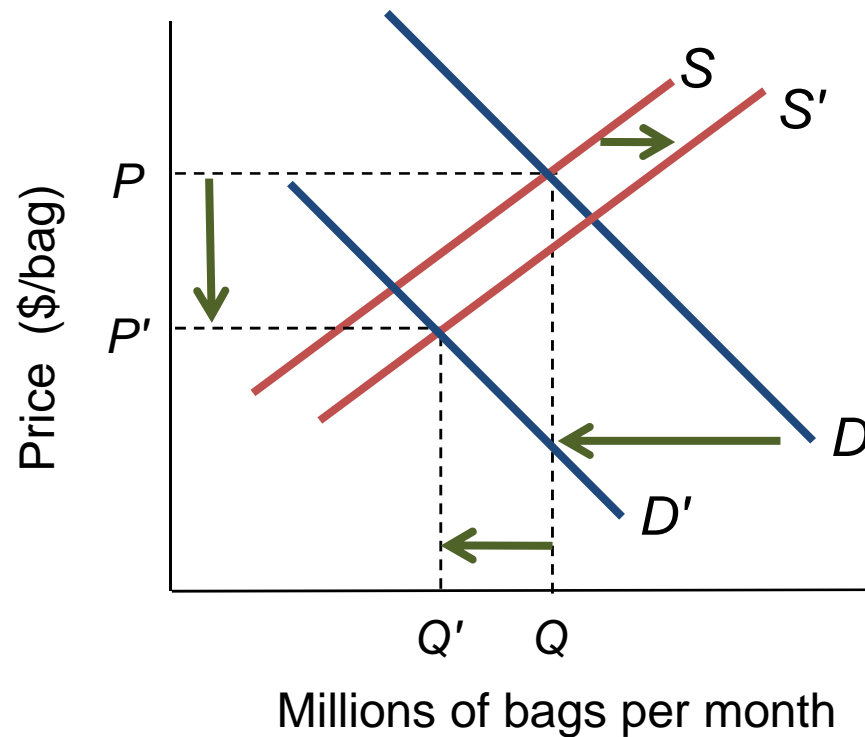
# Supply and Demand Shifts: Four Rules

4. An decrease in supply will lead to an increase in the equilibrium price and a decrease in the equilibrium quantity.



# Supply and Demand Both Change: Tortilla Chips

Oils used for frying are harmful AND the price of harvesting equipment decreases



# Changes in Supply and Demand

|               | <u>Supply</u>            |                          |
|---------------|--------------------------|--------------------------|
| <u>Demand</u> | Increases                | Decreases                |
| Increases     | P Depends<br>Q Increases | P Increases<br>Q Depends |
| Decreases     | P Decreases<br>Q Depends | P Depends<br>Q Decreases |



# Efficiency and Equilibrium

- Markets communicate information effectively
  - Value buyers place on the product
  - Opportunity cost of producing the product
- Markets maximize the difference between benefits and costs
- Market outcomes are the best provided that
  - The market is in equilibrium AND
  - No costs or benefits are shared with the public

# Cash on the Table

**Buyer's surplus:** buyer's reservation price minus the market price

**Seller's surplus:** market price minus the seller's reservation price

**Total surplus** = buyer's surplus + seller's surplus

Total surplus is buyer's reservation price – seller's reservation price

**No cash on the table** when surplus is maximized

- No opportunity to gain from additional sales or purchases

# Efficiency Principle

- The **socially optimal quantity** maximizes total surplus for the economy from producing and selling a good
  - Economic efficiency** – all goods are produced at their socially optimal level
- **Efficiency Principle:** equilibrium price and quantity are efficient if:
  - Sellers pay all the costs of production
  - Buyers receive all the benefits of their purchase
- **Efficiency:** marginal cost equals marginal benefit
  - Production is efficient if total surplus is maximized

# Smart for One, Dumb for All

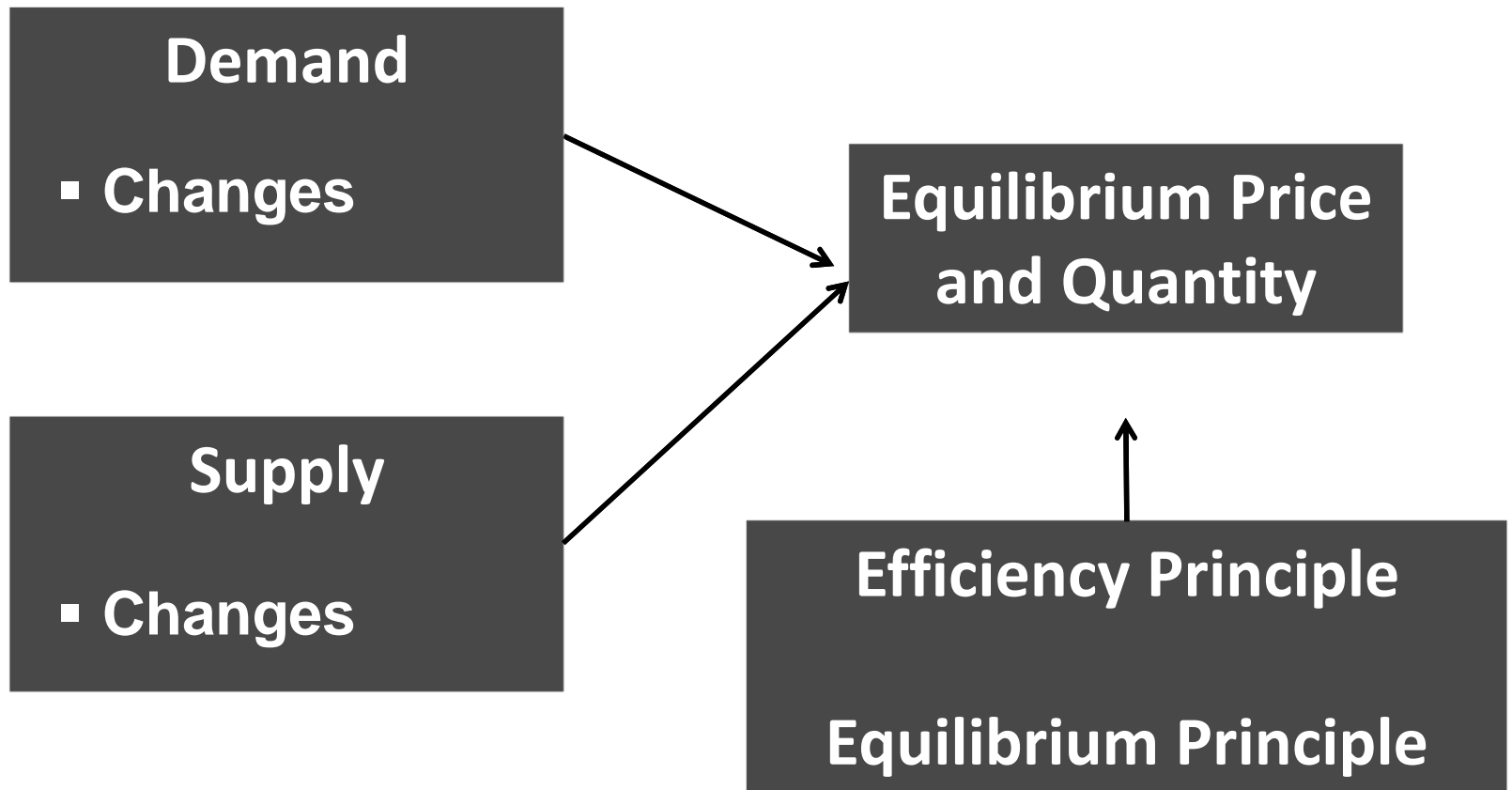
- Producers sometimes shift costs to others
  - Pollution is like getting free waste disposal services
  - Total marginal cost = seller's marginal cost plus marginal cost of pollution
  - When costs are shifted, supply is greater than socially optimal
- Buyers may create benefits for others
  - Marginal benefit is less than the full social benefit
  - Vaccinations, my neighbor's landscaping
  - The demand for these goods is less than socially optimal

# Economic Efficiency

**Efficiency:** occurs when all goods and services are produced and consumed at their respective socially optimal levels.

- Failure to achieve efficiency means that total economic surplus is smaller than it could have been

# Supply and Demand





# The Algebra of Supply and Demand

## Chapter 2 Appendix

# From Graphs to Equations ...

- Sample equations

$$P = 16 - 2 Q^d$$

is a straight-line demand curve with intercept 16 on the vertical (P) axis and a slope of  $-2$

$$P = 4 + 4 Q^s$$

is a straight-line supply curve with intercept 4 and a slope of 4



## ... To Equilibrium P and Q

- Equilibrium is where P and Q are the same for demand and supply
  - Set the two equations equal to each other ( $P = P$ ) and solve for Q ( $Q^s = Q^d = Q^*$ )

$$16 - 2 Q^* = 4 + 4 Q^*$$

$$6 Q^* = 12$$

$$Q^* = 2$$

- Use either the supply or demand curve and  $Q^* = 2$  to find price

$$P = 16 - 2 Q^*$$

$$P = \$12$$