

# *Managerial Economics & Business Strategy*

## **Chapter 2**

### **Market Forces: Demand and Supply**



# Overview

## I. Market Demand Curve

- The Demand Function
- Determinants of Demand
- Consumer Surplus

## II. Market Supply Curve

- The Supply Function
- Supply Shifters
- Producer Surplus

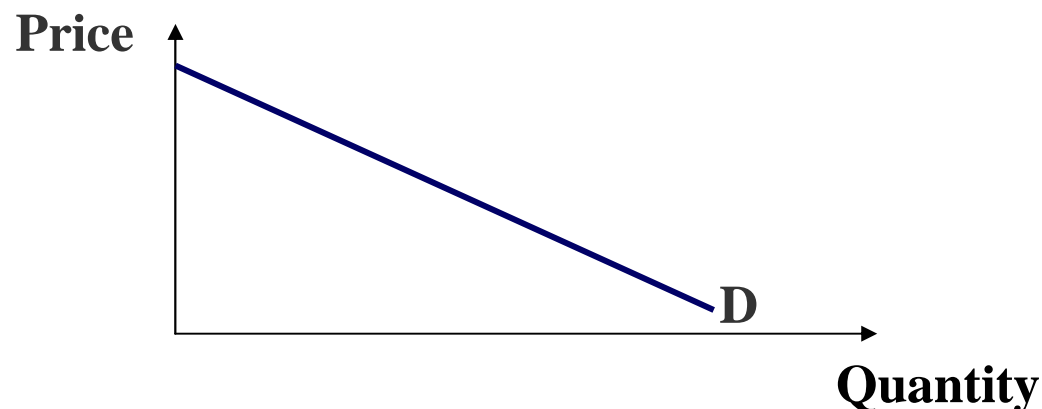
## III. Market Equilibrium

## IV. Price Restrictions

## V. Comparative Statics

# Market Demand Curve

- Shows the amount of a good that will be purchased at alternative prices, holding other factors constant.
- *Law of Demand*
  - The inverse relationship between price and the quantity demanded of a good or service is called the **Law of Demand**..



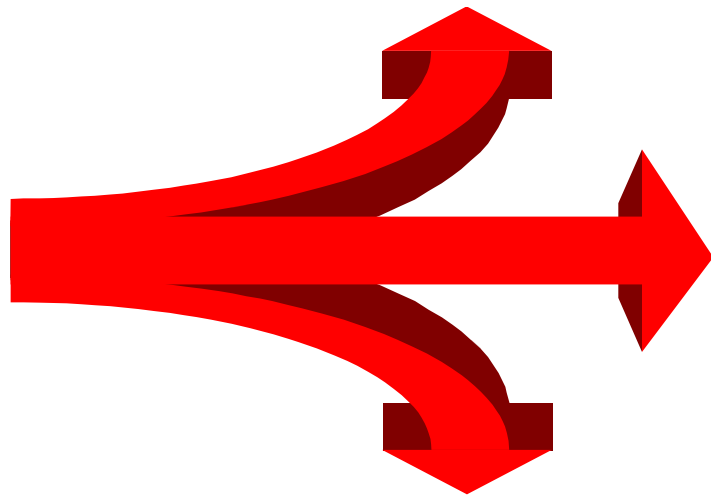
# Market Demand Curve

- **Market demand** is the sum of all the individual demands.

Example: demand for pizza:

PRICE (PER SLICE)	$Q_{D1}$	$Q_{D2}$	$Q_{D3}$	$Q_{DM}$
\$2.00	0	2	3	5
1.50	1	2	5	8
1.00	2	2	8	12
0.50	3	3	10	16
0.05	4	4	12	20

# Determinants of Demand



- Income
  - Normal good
  - Inferior good
- Prices of Related Goods
  - Prices of substitutes
  - Prices of complements
- Advertising and consumer tastes
- Population
- Consumer expectations

# The Demand Function

- A general equation representing the demand curve

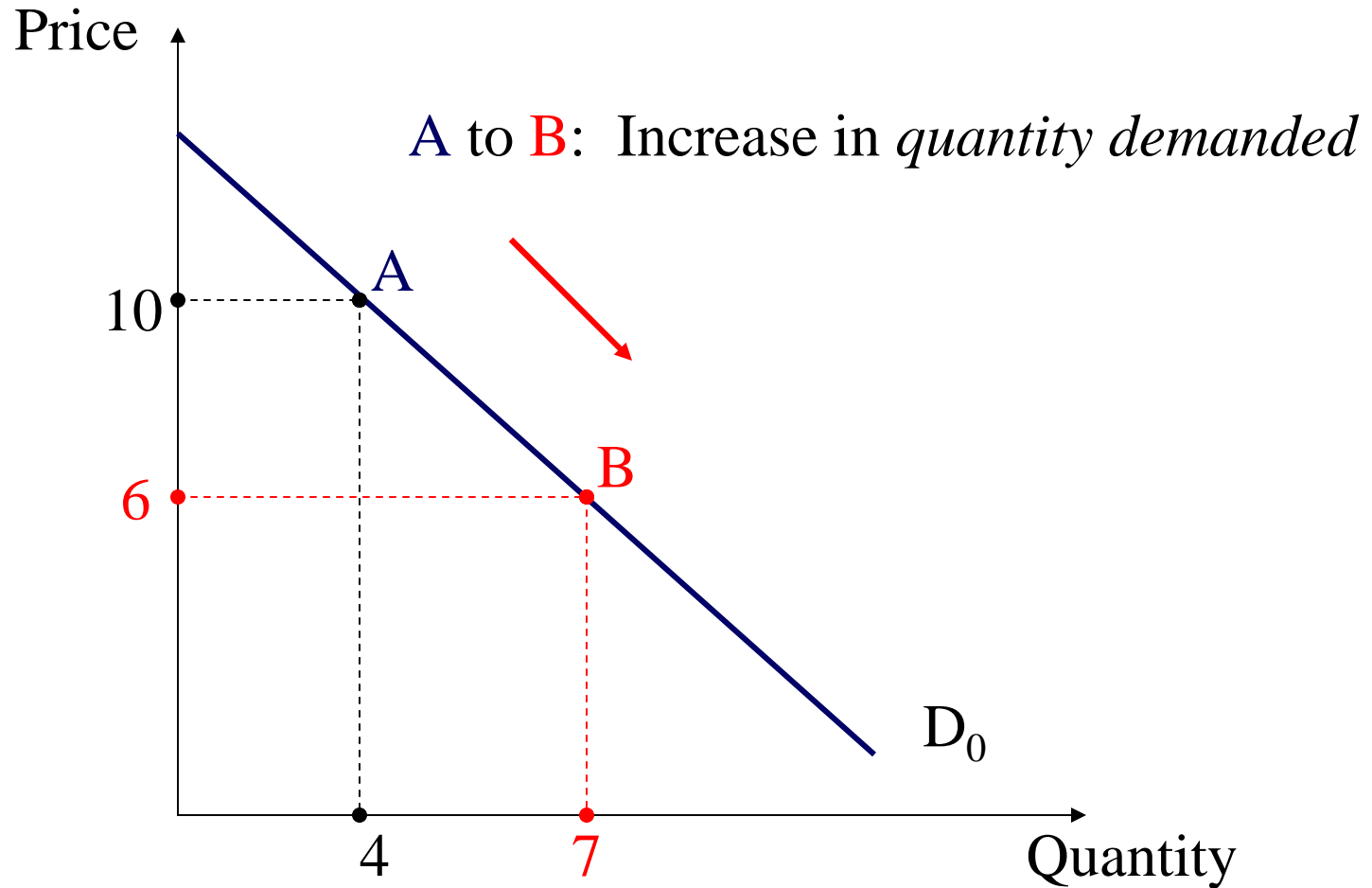
$$Q_x^d = f(P_x, P_Y, M, H,)$$

- $Q_x^d$  = quantity demand of good X.
- $P_x$  = price of good X.
- $P_Y$  = price of a related good Y.
  - Substitute good.
  - Complement good.
- $M$  = income.
  - Normal good.
  - Inferior good.
- $H$  = any other variable affecting demand.

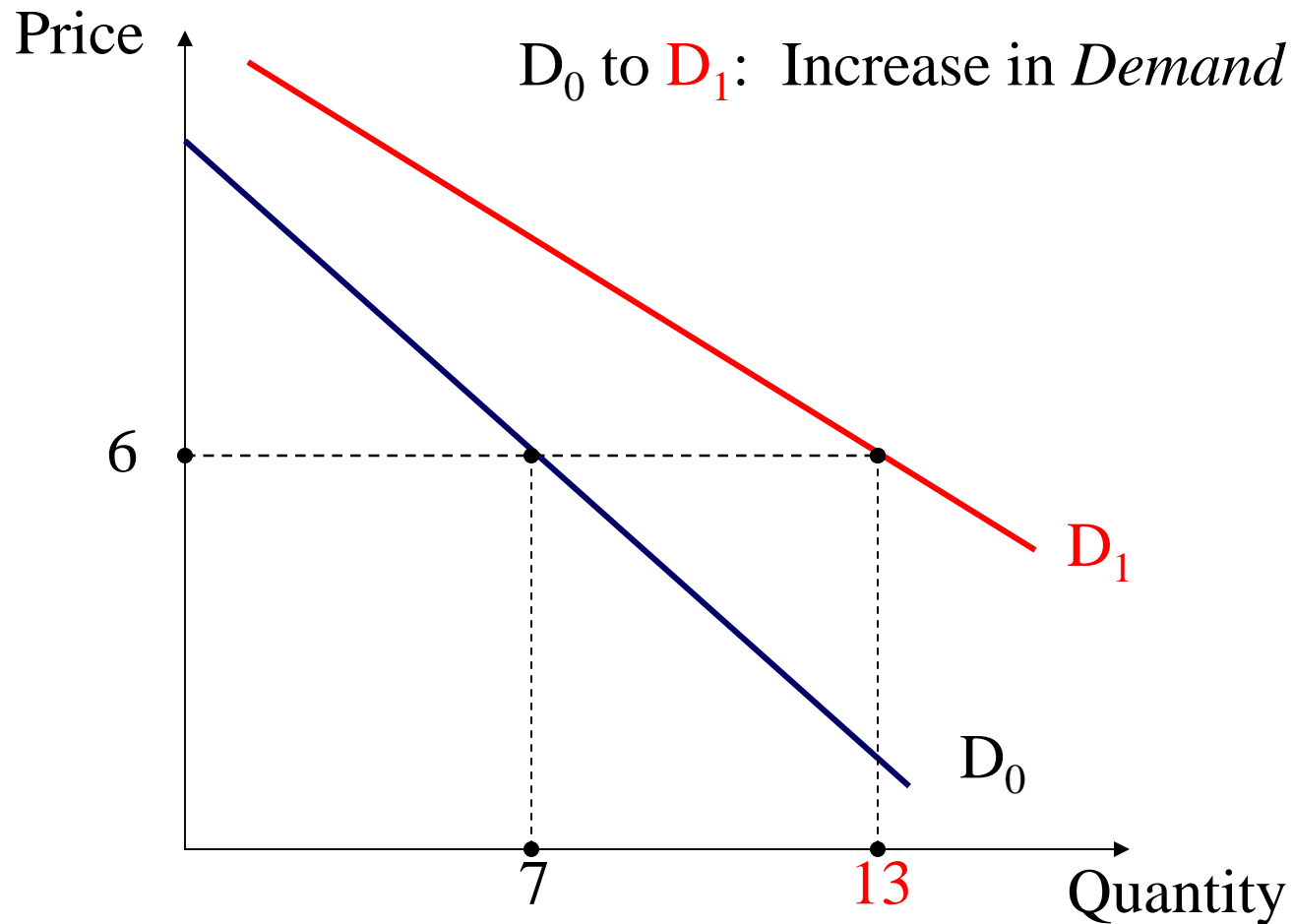
# Inverse Demand Function

- Price as a function of quantity demanded.
- Example:
  - Demand Function
    - $Q_x^d = 10 - 2P_x$
  - Inverse Demand Function:
    - $2P_x = 10 - Q_x^d$
    - $P_x = 5 - 0.5Q_x^d$

# Change in Quantity Demanded



# Change in Demand



# Demand Function

The demand for good X is given by

$$Q_x^d = 1200 - \frac{1}{2}P_x + \frac{1}{4}P_y - 8P_z + \frac{1}{10}M$$

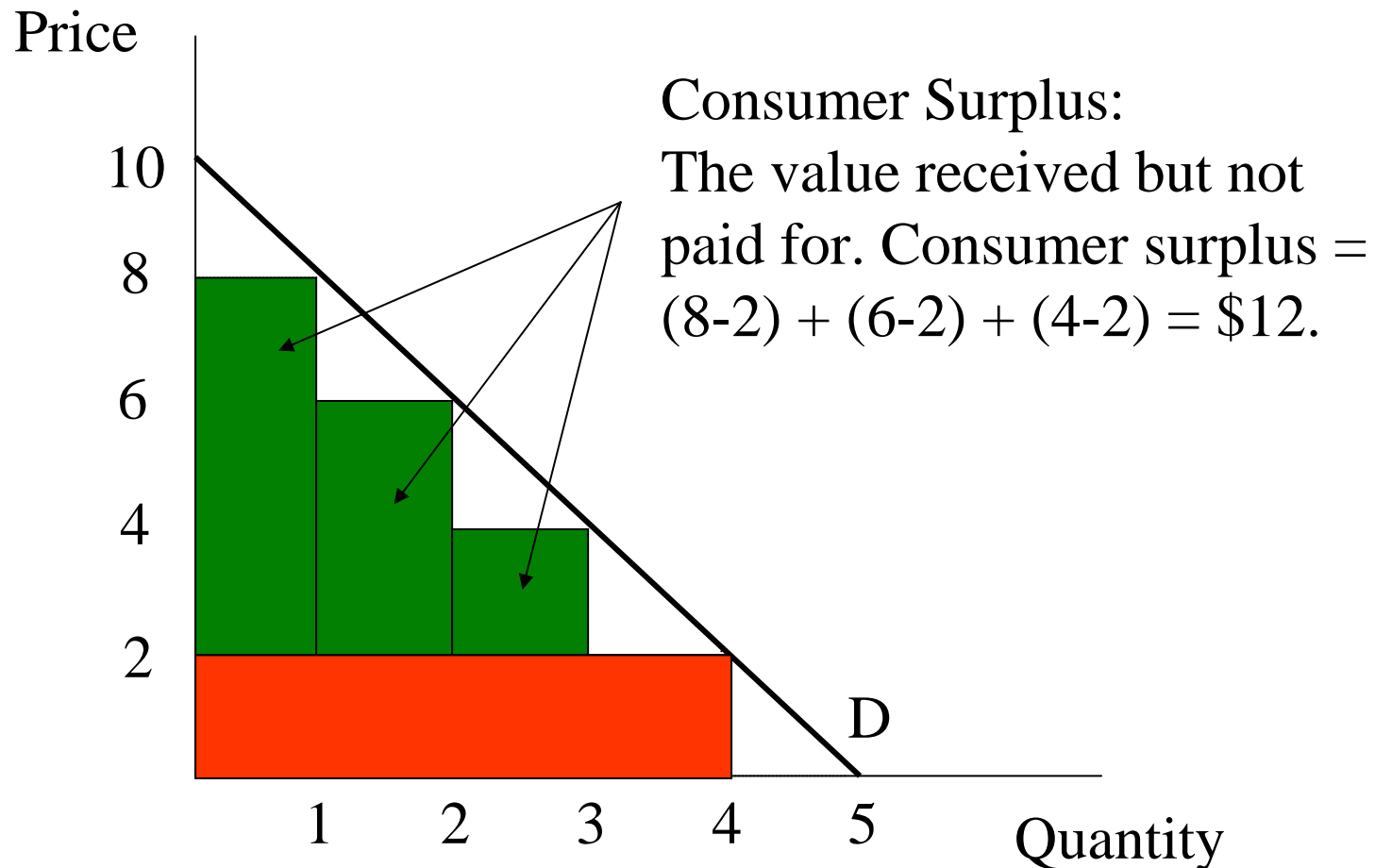
Research shows that the prices of related goods are given by  $P_y = \$5900$  and  $P_z = \$90$  while the average income of individuals consuming this product is  $M = \$55000$

- a. Indicate whether Y and Z are substitutes or complements for good X?
- b. Is X an inferior or a normal good?
- c. How many units of good X will be purchased when  $P_x = \$4910$ ?
- d. Determine the demand function and inverse demand function for good X.

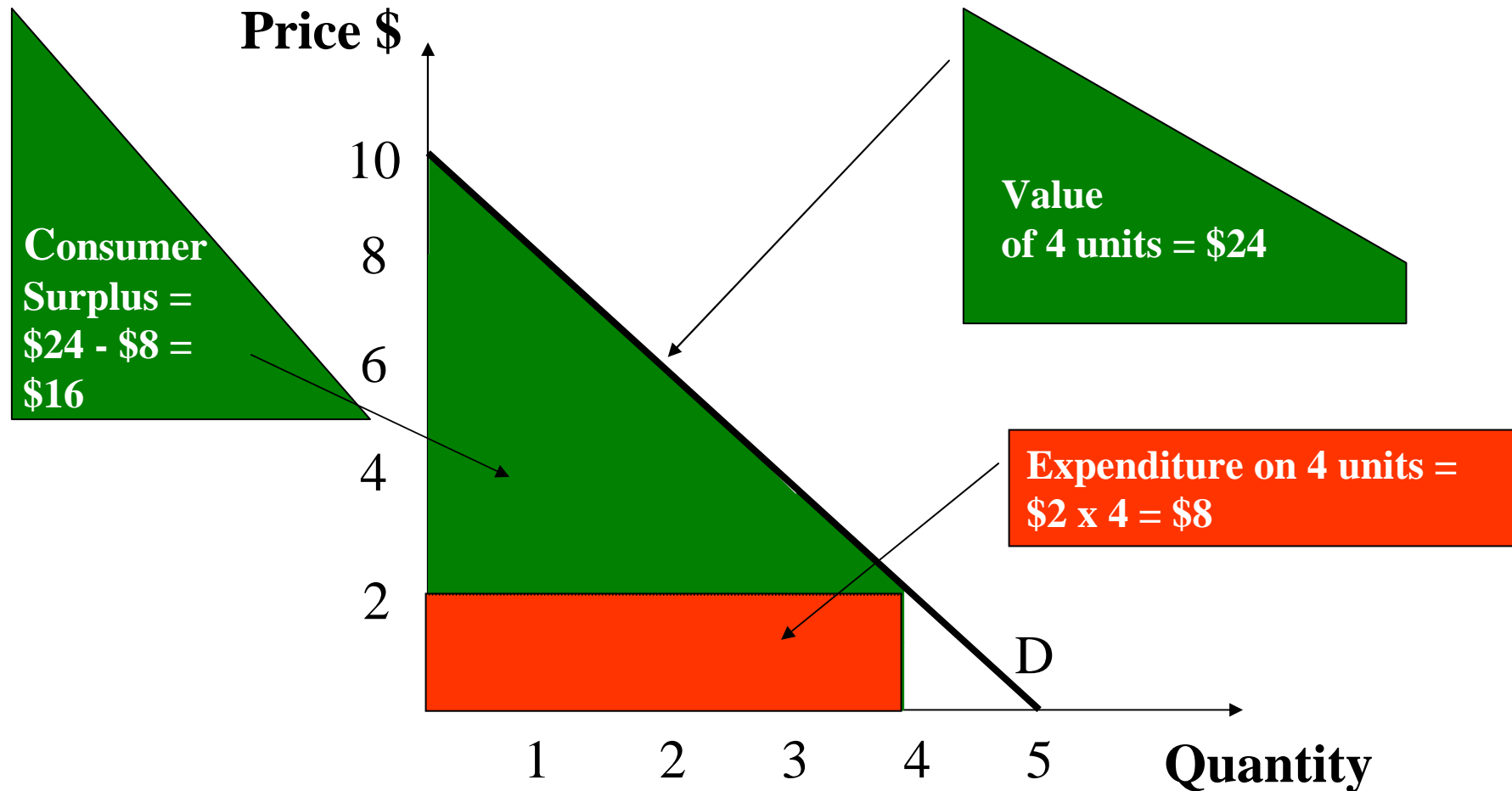
# Consumer Surplus:

- The value consumers get from a good but do not have to pay for.

# Consumer Surplus: The Discrete Case

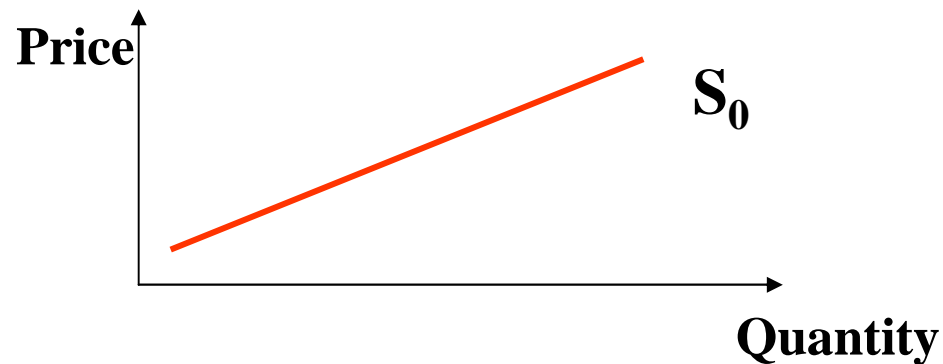


# Consumer Surplus: The Continuous Case

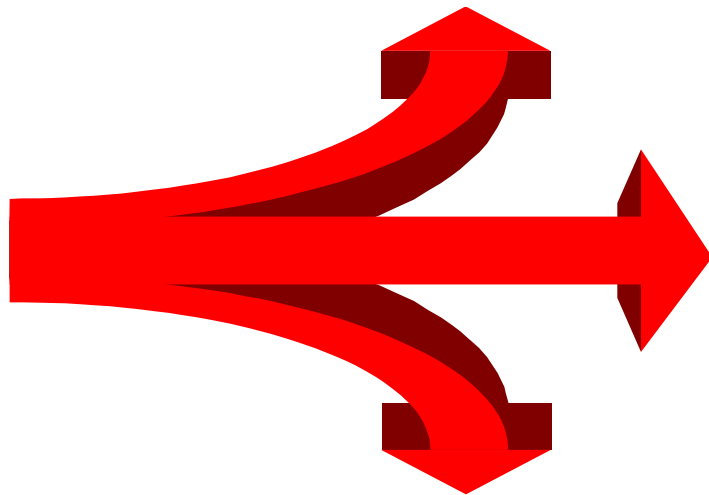


# Market Supply Curve

- The supply curve shows the amount of a good that will be produced at alternative prices.
- *Law of Supply*
  - The supply curve is upward sloping.



# Supply Shifters



- Input prices
- Technology or government regulations
- Number of firms
  - Entry
  - Exit
- Substitutes in production
- Taxes
  - Excise tax
  - Ad valorem tax
- Producer expectations

# The Supply Function

- An equation representing the supply curve:

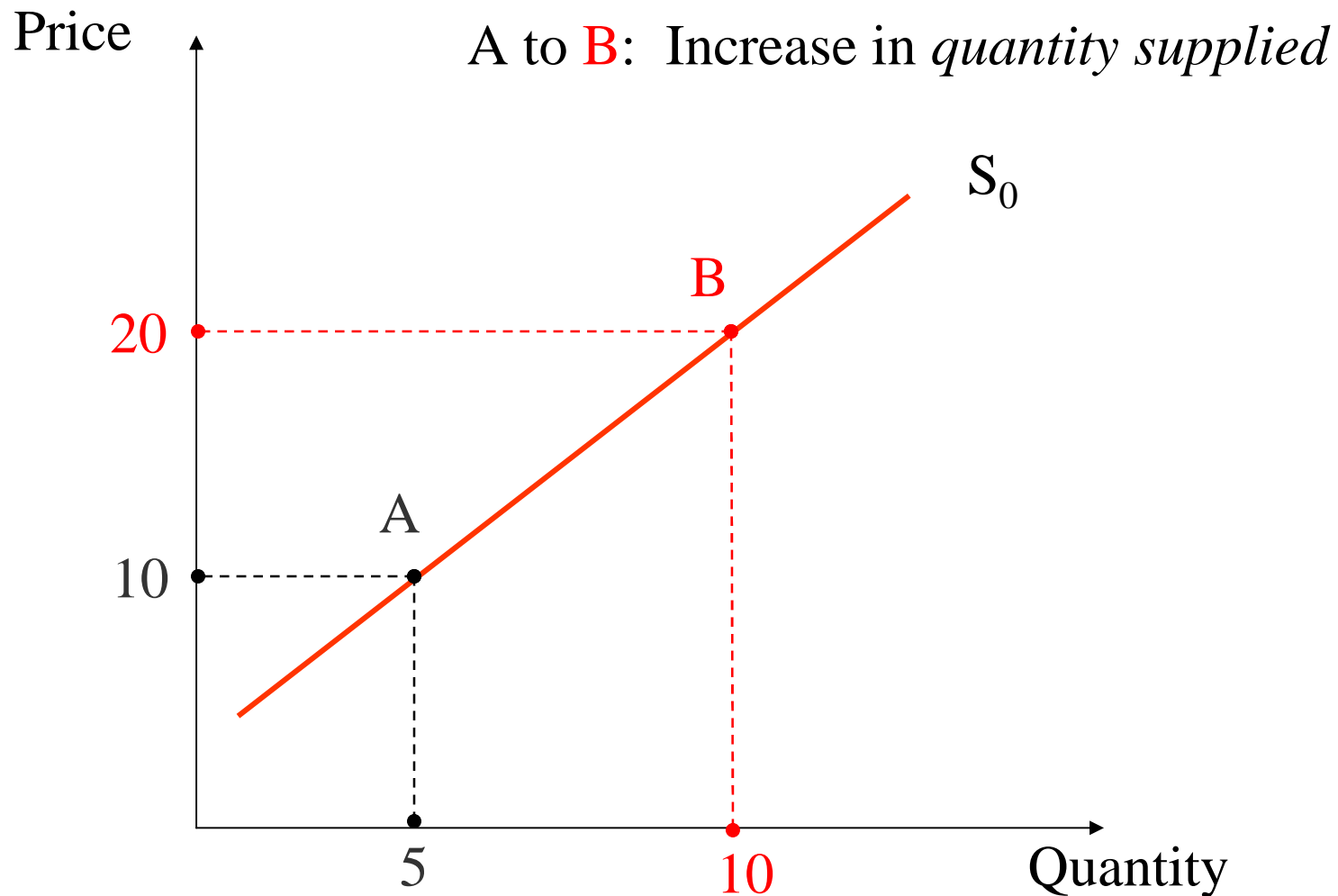
$$Q_X^S = f(P_X, P_R, W, H,)$$

- $Q_X^S$  = quantity supplied of good X.
- $P_X$  = price of good X.
- $P_R$  = price of a production substitute.
- $W$  = price of inputs (e.g., wages).
- $H$  = other variable affecting supply.

# Inverse Supply Function

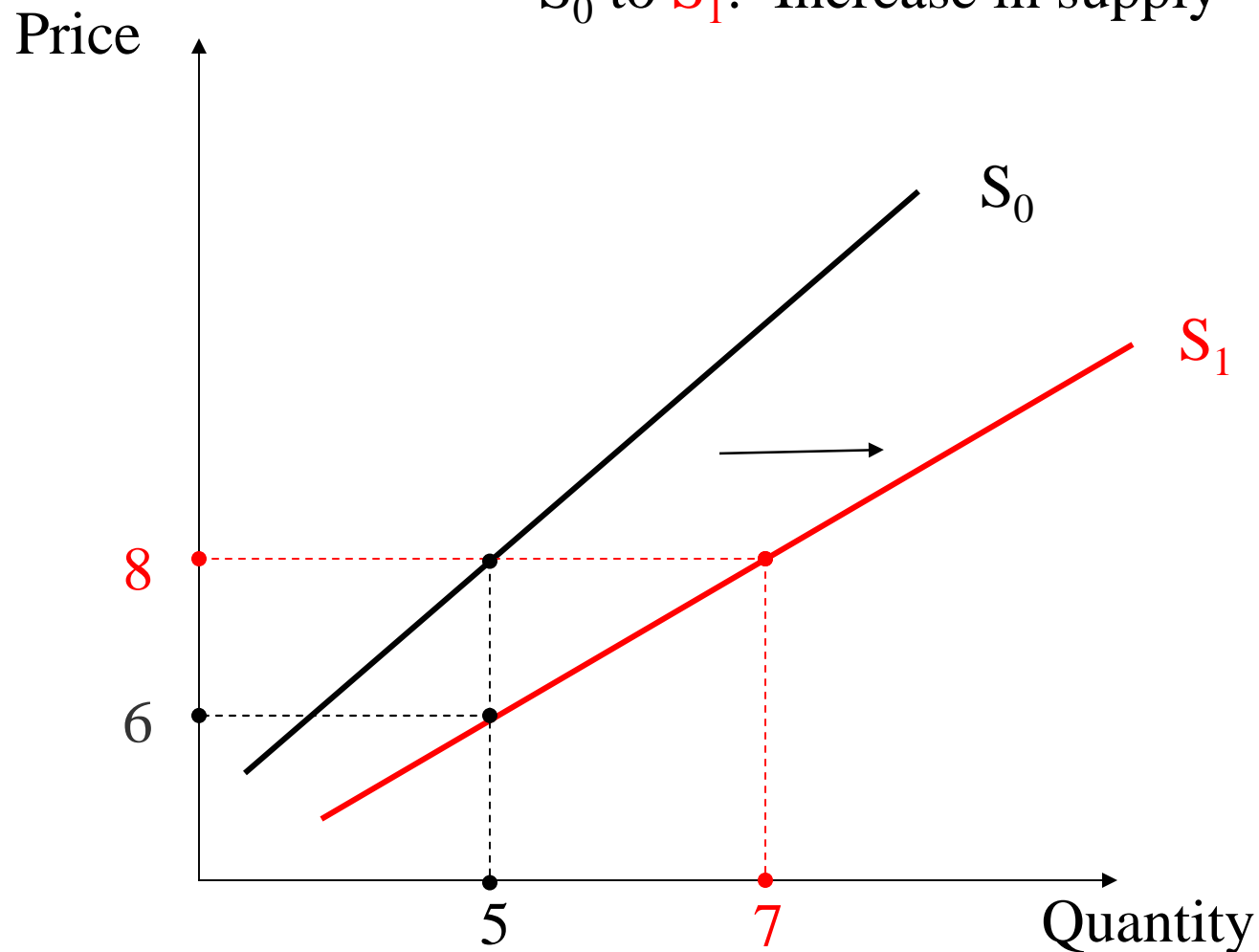
- Price as a function of quantity supplied.
- Example:
  - Supply Function
    - $Q_x^s = 10 + 2P_x$
  - Inverse Supply Function:
    - $2P_x = 10 + Q_x^s$
    - $P_x = 5 + 0.5Q_x^s$

# Change in Quantity Supplied



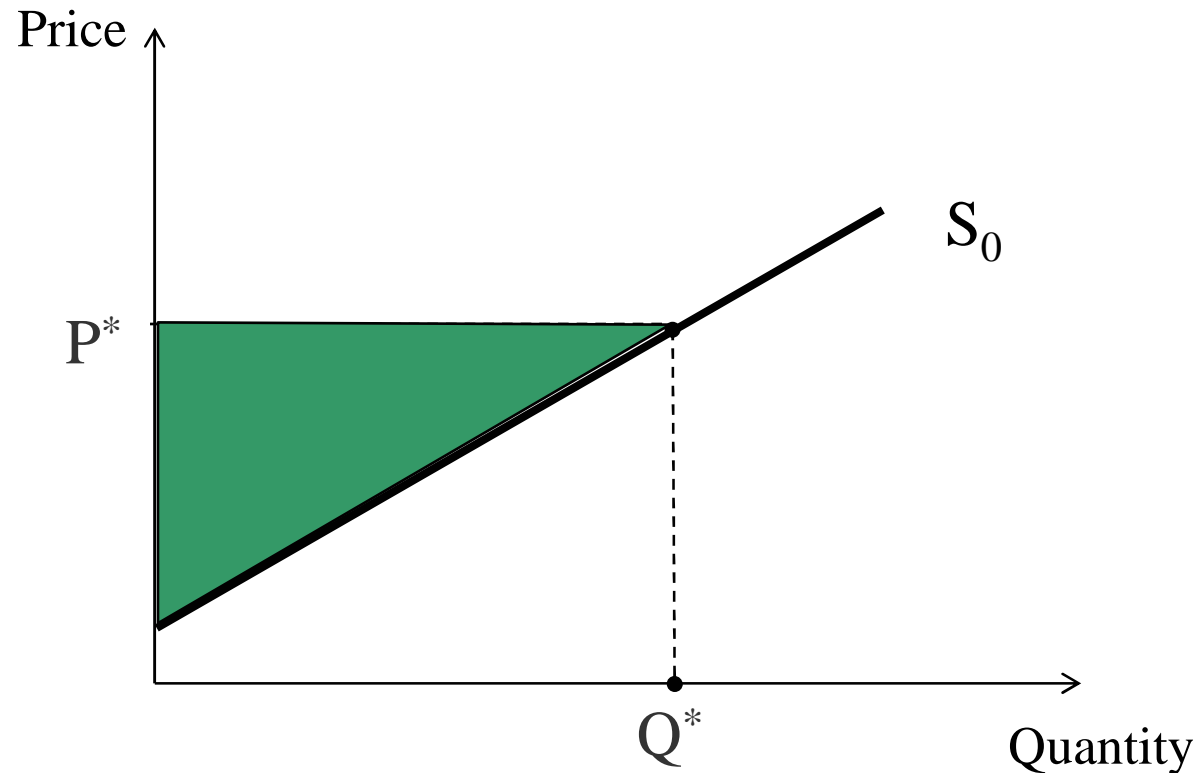
# Change in Supply

$S_0$  to  $S_1$ : Increase in supply



# Producer Surplus

- The amount producers receive in excess of the amount necessary to induce them to produce the good.



# Supply Function

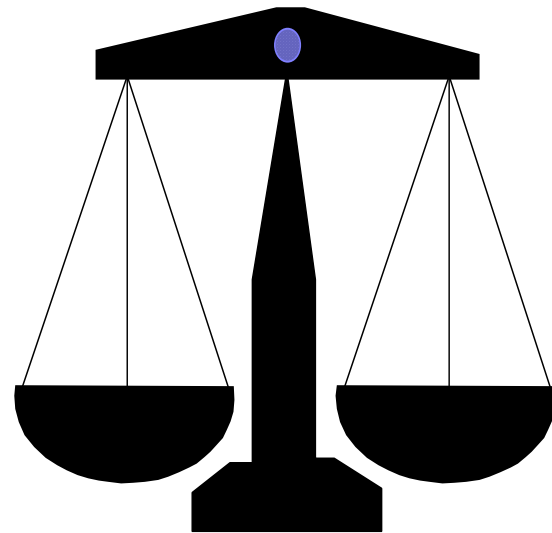
Suppose the supply function for product is given by

$$Q_x^s = -50 + 1/2P_x - 5P_z$$

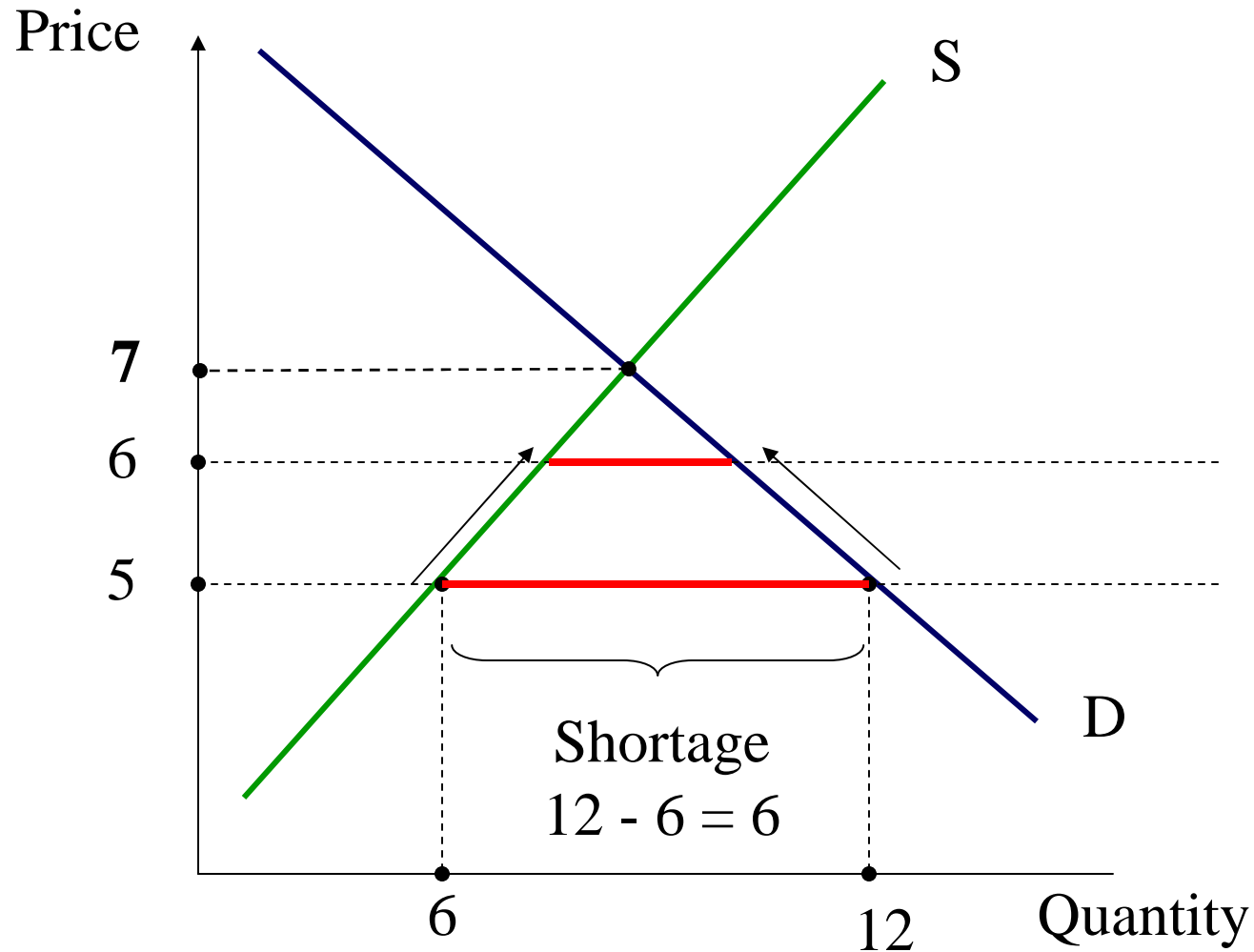
- How much of product X is produced when  $P_x = \$500$  and  $P_z = \$30$ ?
- Suppose  $P_z = \$30$ . Determine the supply function and inverse supply function for good X.

# Market Equilibrium

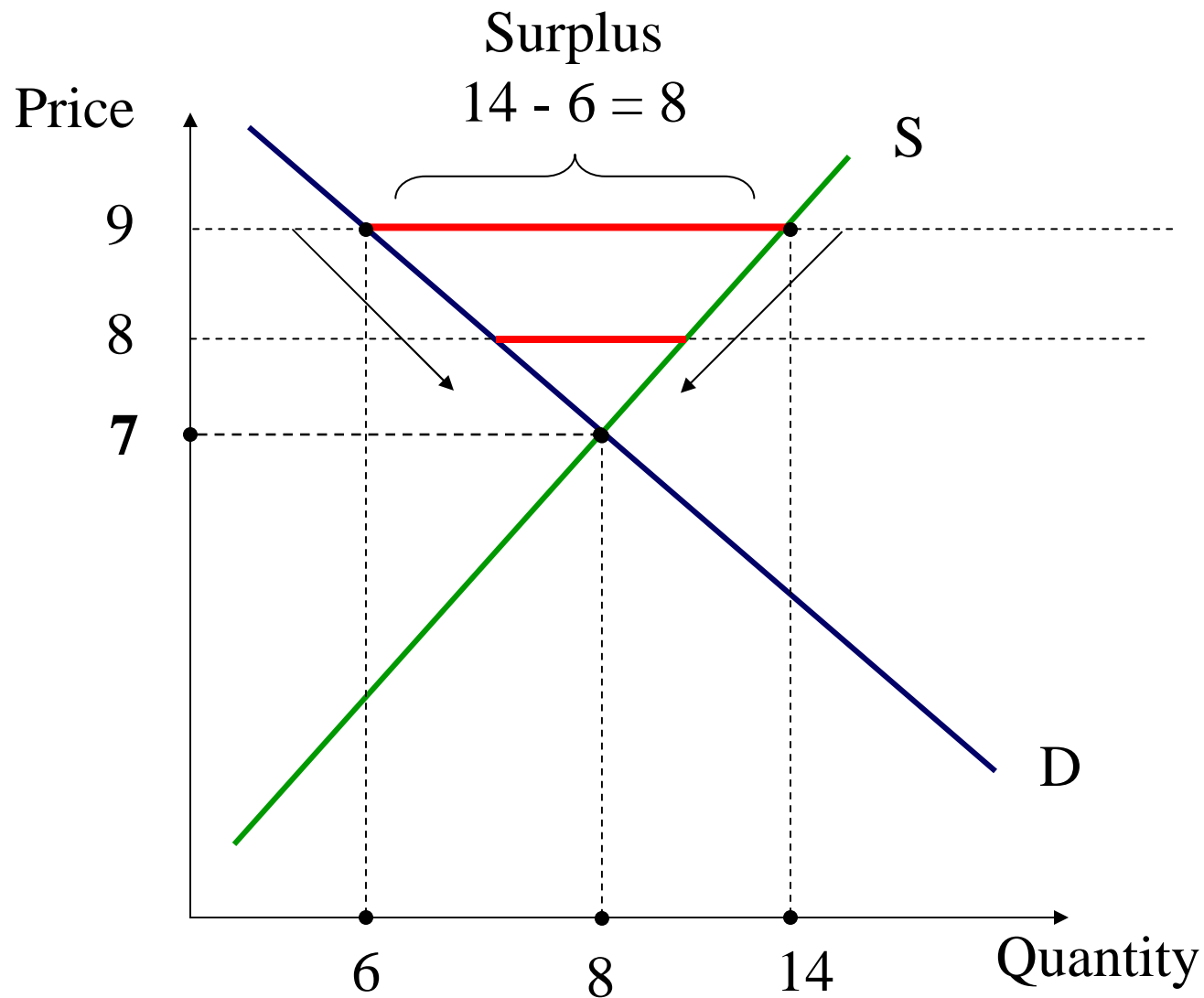
- Balancing supply and demand
  - $Q_x^S = Q_x^D$
- Steady-state



# If price is too low...



# If price is too high...



# Price Restrictions

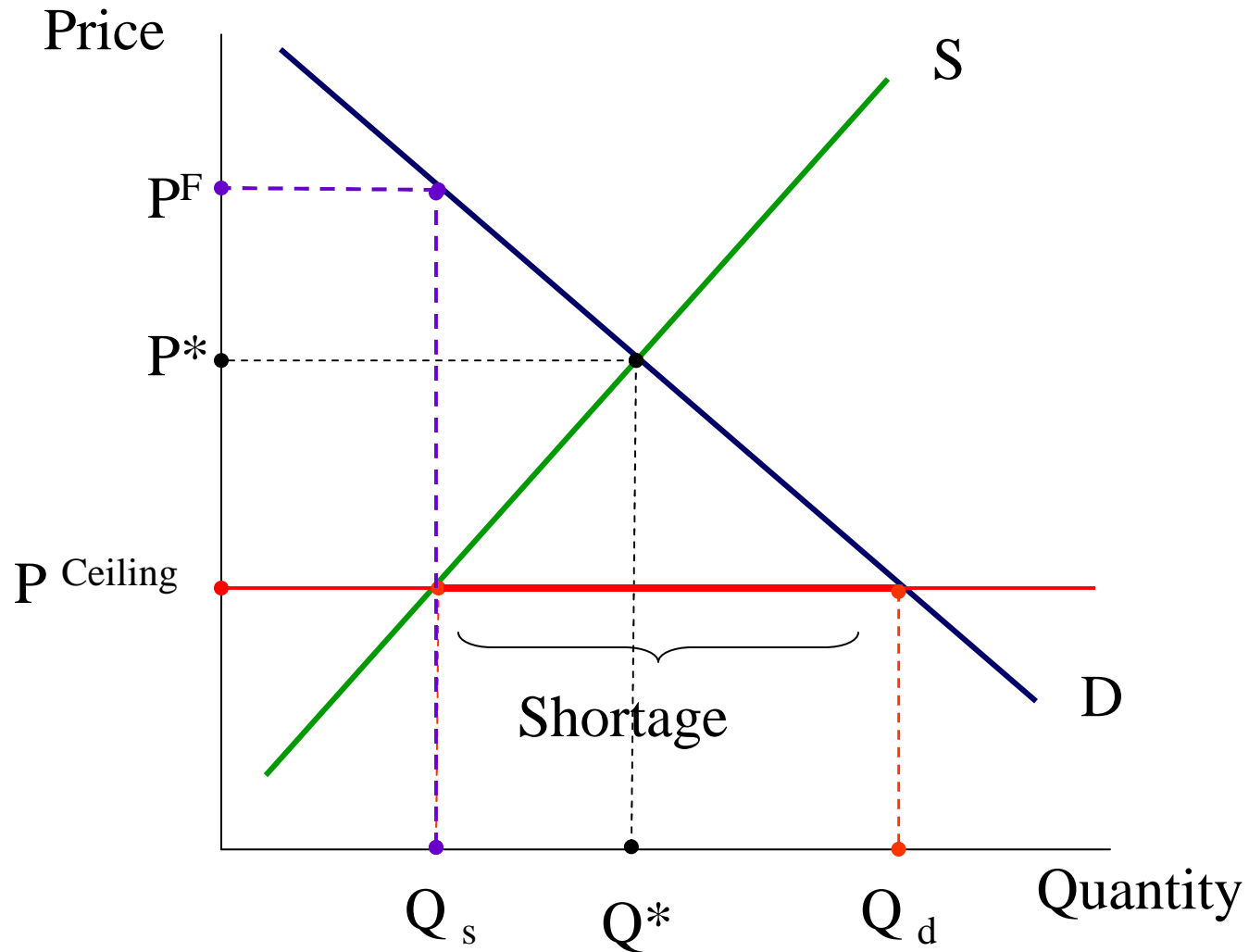
- Price Ceilings

- The *maximum* legal price that can be charged.
- Examples:
  - Gasoline prices in the 1970s.
  - Housing in New York City.
  - Proposed restrictions on ATM fees.

- Price Floors

- The *minimum* legal price that can be charged.
- Examples:
  - Minimum wage.
  - Agricultural price supports.

# Impact of a Price Ceiling



# Full Economic Price

- The dollar amount paid to a firm under a price ceiling, plus the nonpecuniary price.

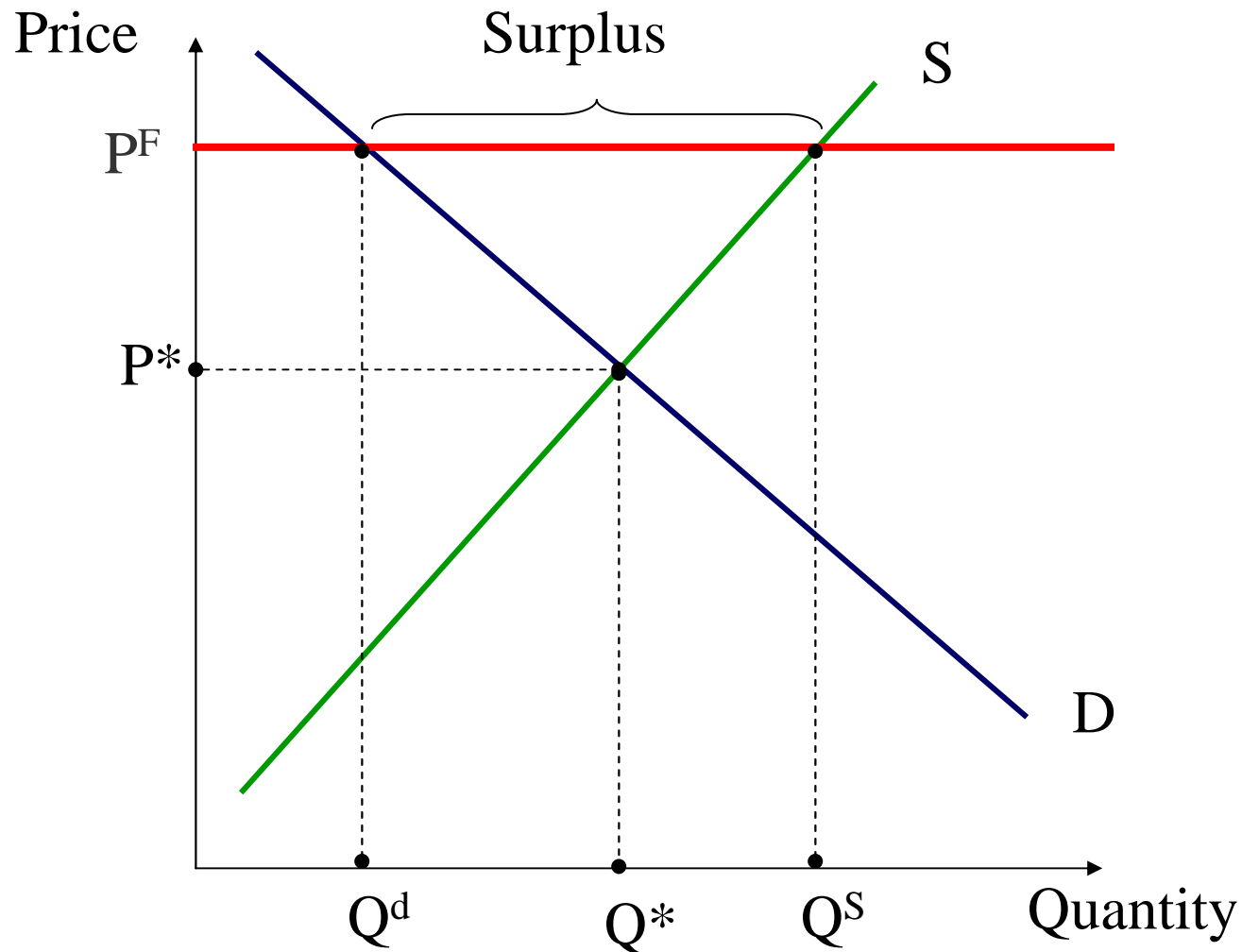
$$P^F = P^c + (P^F - P^C)$$

- $P^F$  = full economic price
- $P^C$  = price ceiling
- $P^F - P^C$  = nonpecuniary price

# An Example from the 1970s

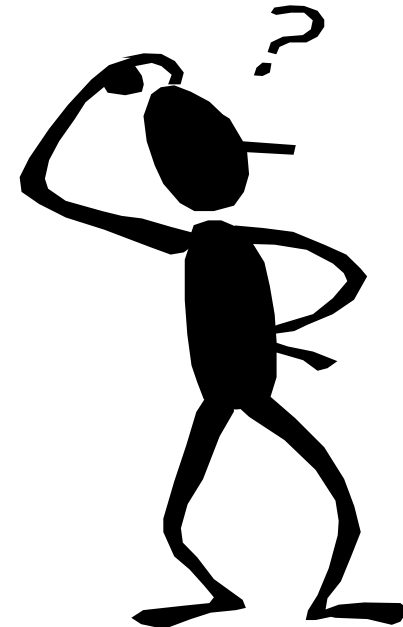
- Ceiling price of gasoline: \$1.
- 3 hours in line to buy 15 gallons of gasoline
  - Opportunity cost: \$5/hr.
  - Total value of time spent in line:  $3 \times \$5 = \$15$ .
  - Non-pecuniary price per gallon:  $\$15/15 = \$1$ .
- Full economic price of a gallon of gasoline:  
 $\$1 + \$1 = 2$ .

# Impact of a Price Floor



# Comparative Static Analysis

- How do the equilibrium price and quantity change when a determinant of supply and/or demand change?



# Applications of Demand and Supply Analysis

- Event: The *WSJ* reports that the prices of PC components are expected to fall by 5-8 percent over the next six months.
- Scenario 1: You manage a small firm that manufactures PCs.
- Scenario 2: You manage a small software company.

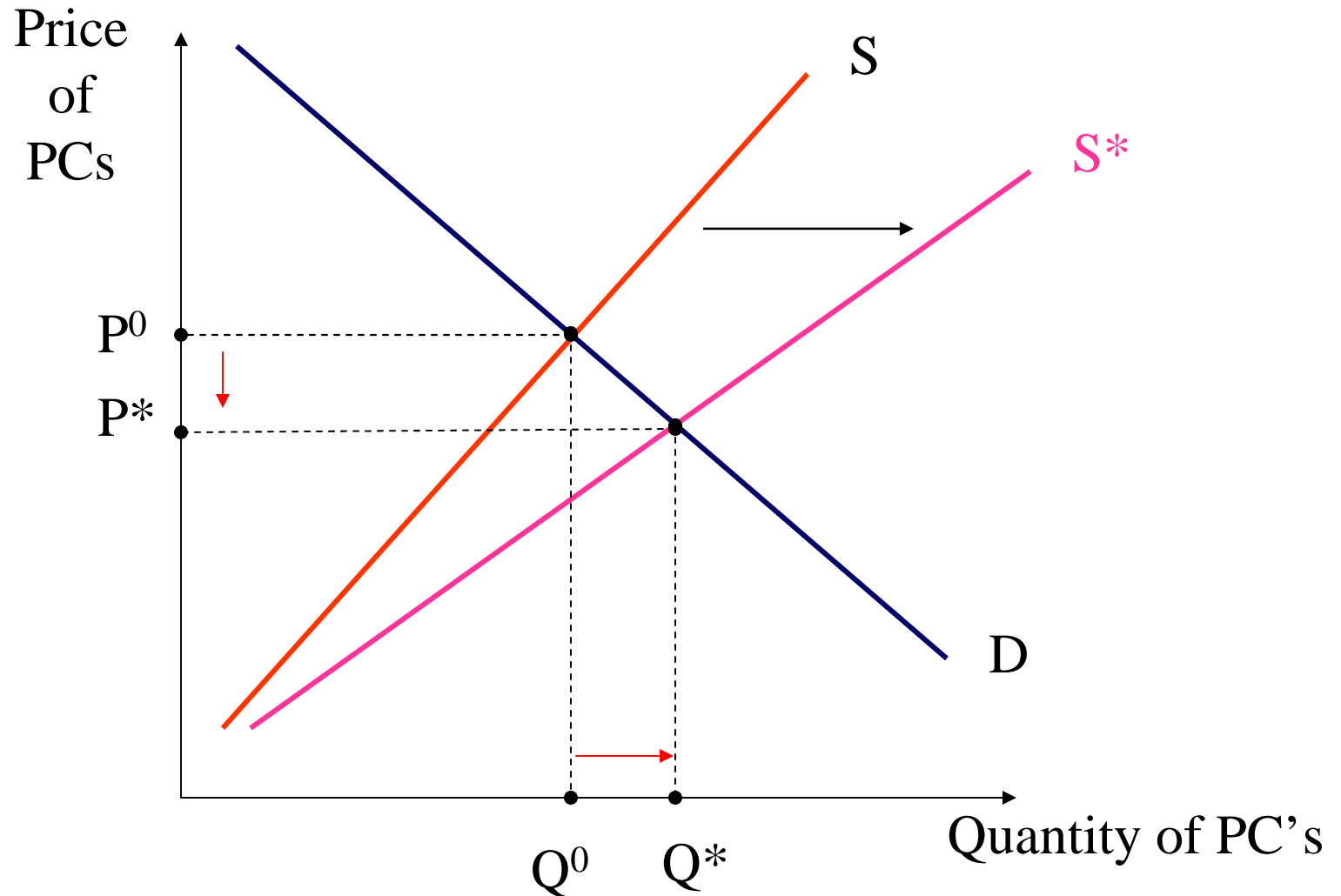
# Use Comparative Static Analysis to see the Big Picture!

- *Comparative static analysis* shows how the equilibrium price and quantity will change when a determinant of supply or demand changes.

# Scenario 1: Implications for a Small PC Maker

- Step 1: Look for the “Big Picture.”
- Step 2: Organize an action plan (worry about details).

# Big Picture: Impact of decline in component prices on PC market



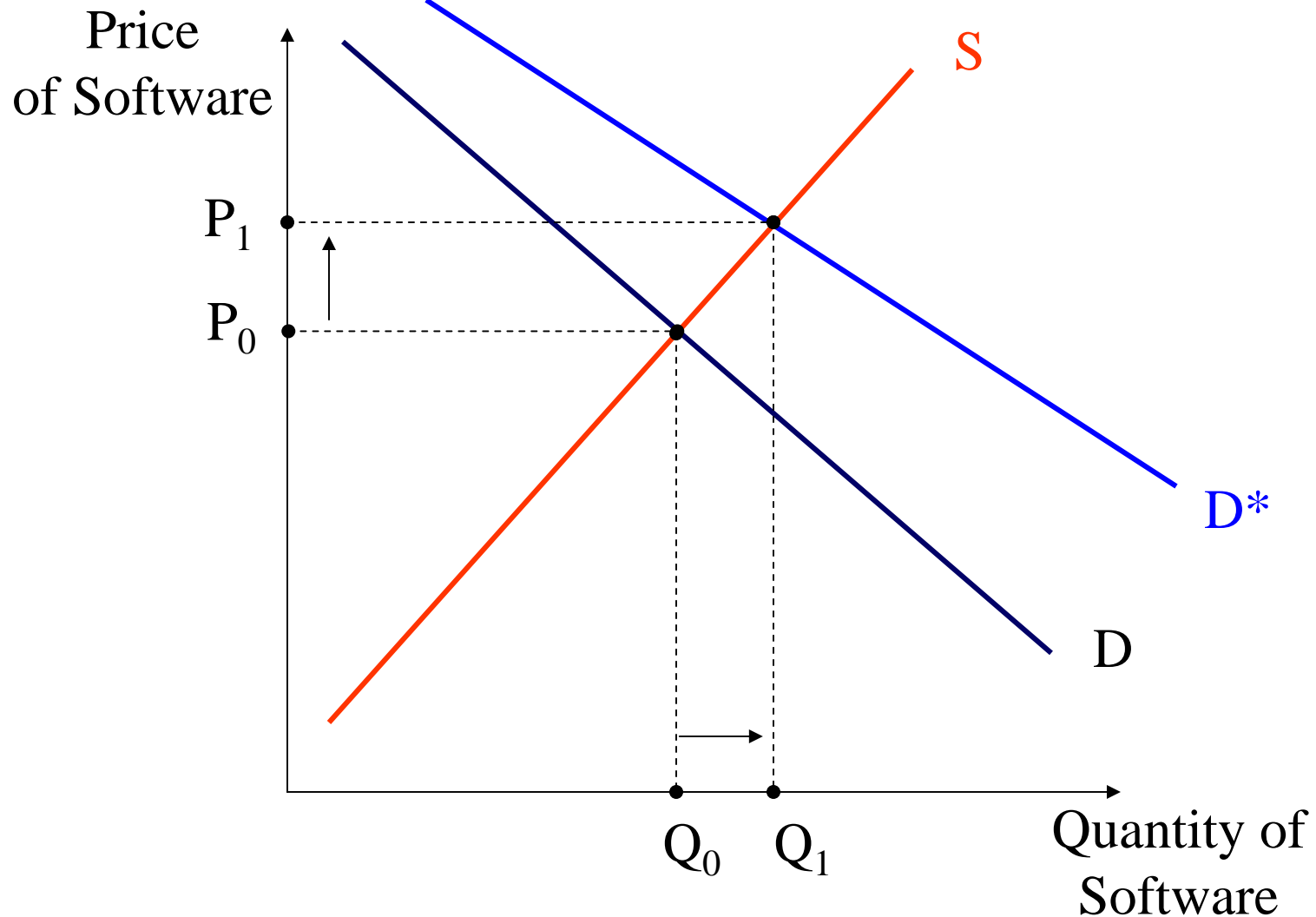
# Big Picture Analysis: PC Market

- Equilibrium price of PCs will fall, and equilibrium quantity of computers sold will increase.
- Use this to organize an action plan
  - contracts/suppliers?
  - inventories?
  - human resources?
  - marketing?
  - do I need quantitative estimates?

# Scenario 2: Software Maker

- More complicated chain of reasoning to arrive at the “Big Picture.”
- Step 1: Use analysis like that in Scenario 1 to deduce that lower component prices will lead to
  - a lower equilibrium price for computers.
  - a greater number of computers sold.
- Step 2: How will these changes affect the “Big Picture” in the software market?

# Big Picture: Impact of lower PC prices on the software market



# Big Picture Analysis: Software Market

- Software prices are likely to rise, and more software will be sold.
- Use this to organize an action plan.

# Equilibrium

Suppose demand and supply are given by

$$Q_x^d = 7 - \frac{1}{2}P_x \text{ and } Q_x^s = \frac{1}{4}P_x - \frac{1}{2}$$

- Determine the equilibrium price and quantity
- Suppose a \$6 excise tax is imposed on the good. Determine the new equilibrium price and quantity
- How much tax revenue does the government earn with \$6 tax.
- Find the consumer and producer surplus in equilibrium.
- Determine the quantity demanded, quantity supplied if a price floor \$12 is imposed in this market
- Determine the quantity demanded, quantity supplied if a price ceiling \$8 is imposed in this market

# Conclusion

- Use supply and demand analysis to
  - clarify the “big picture” (the general impact of a current event on equilibrium prices and quantities).
  - organize an action plan (needed changes in production, inventories, raw materials, human resources, marketing plans, etc.).

# Additional Review

- Baye's Text, pages 66-71  
Question #5, 6, 8, 9, 12, 14, 16, 18, 19
- Chapter 2  
Demonstration Problem 2- 3, 4, 5, 6
- Math Review  
Graphical Analysis  
Area finding. Area of a triangle  
Simple Algebra