

MICROECONOMICS: Theory & Applications

Chapter 2: Supply and Demand

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- PowerPoint prepared by Della L. Sue, Marist College

Learning Objectives

- Understand how the behavior of buyers and sellers can be characterized through demand and supply curves.
- Explain how equilibrium price and quantity are determined in a market for a good or service.
- Analyze how a market equilibrium is affected by changes in demand or supply.
- Explore the effects of government intervention in markets and how a price ceiling impacts price, quantity supplied, quantity demanded, and the welfare of buyers and sellers.
- Show how elasticities provide a quantitative measure of the responsiveness of quantity demanded or supplied to a change in some other variable such as price or income.

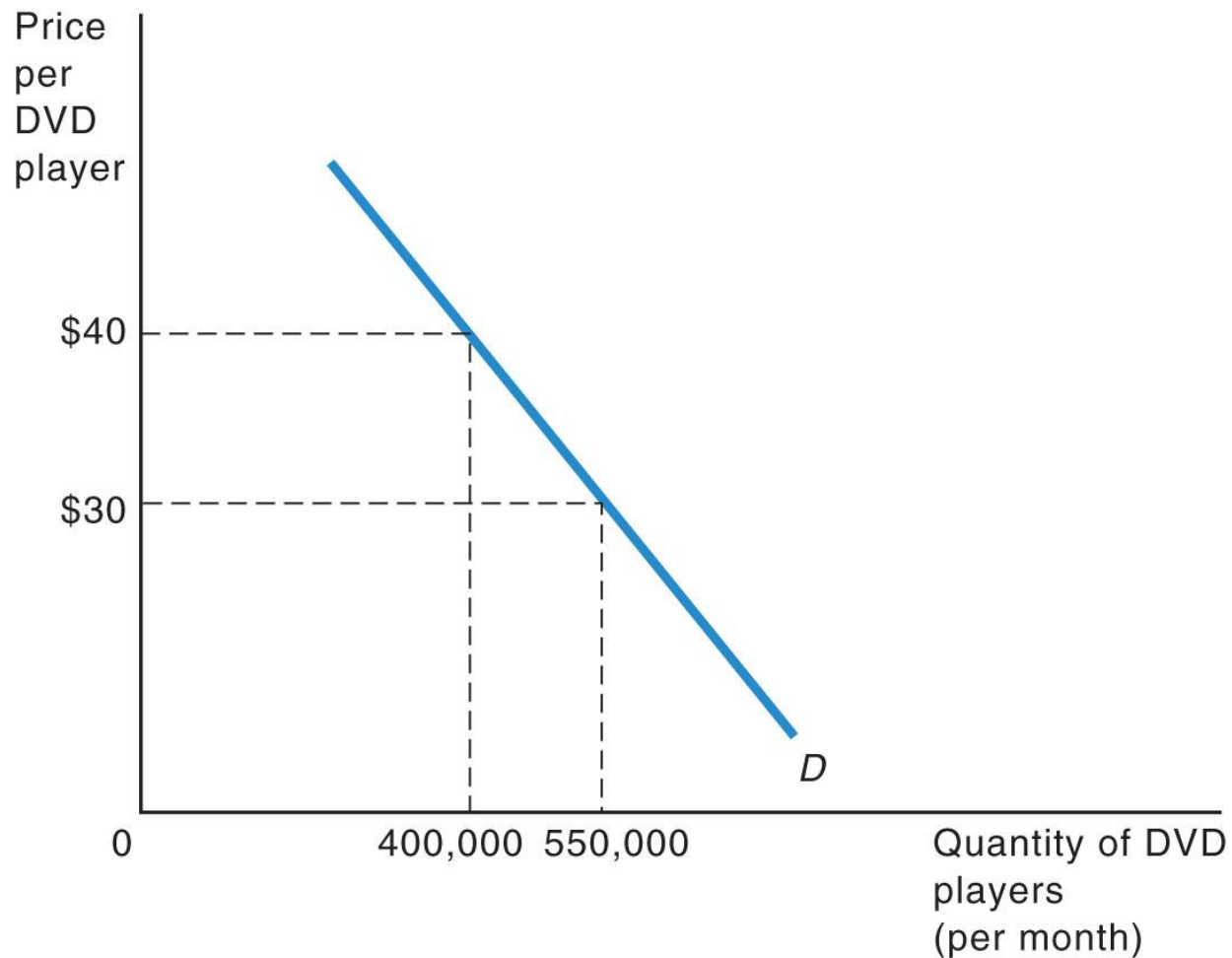
Demand and Supply Curves

- Supply-demand model: competitive interaction of sellers and buyers
- Determination of market price and quantity
- Response to changes in other economic variables
- Incorporate forms of government intervention, such as price controls
- Quantitative as well as qualitative market changes

The Demand Curve

- **LAW OF DEMAND:** the lower the price of a good, the larger the quantity consumers wish to purchase
- Negatively slope
- Assumption: all other factors remain constant

Figure 2.1 -The Demand Curve



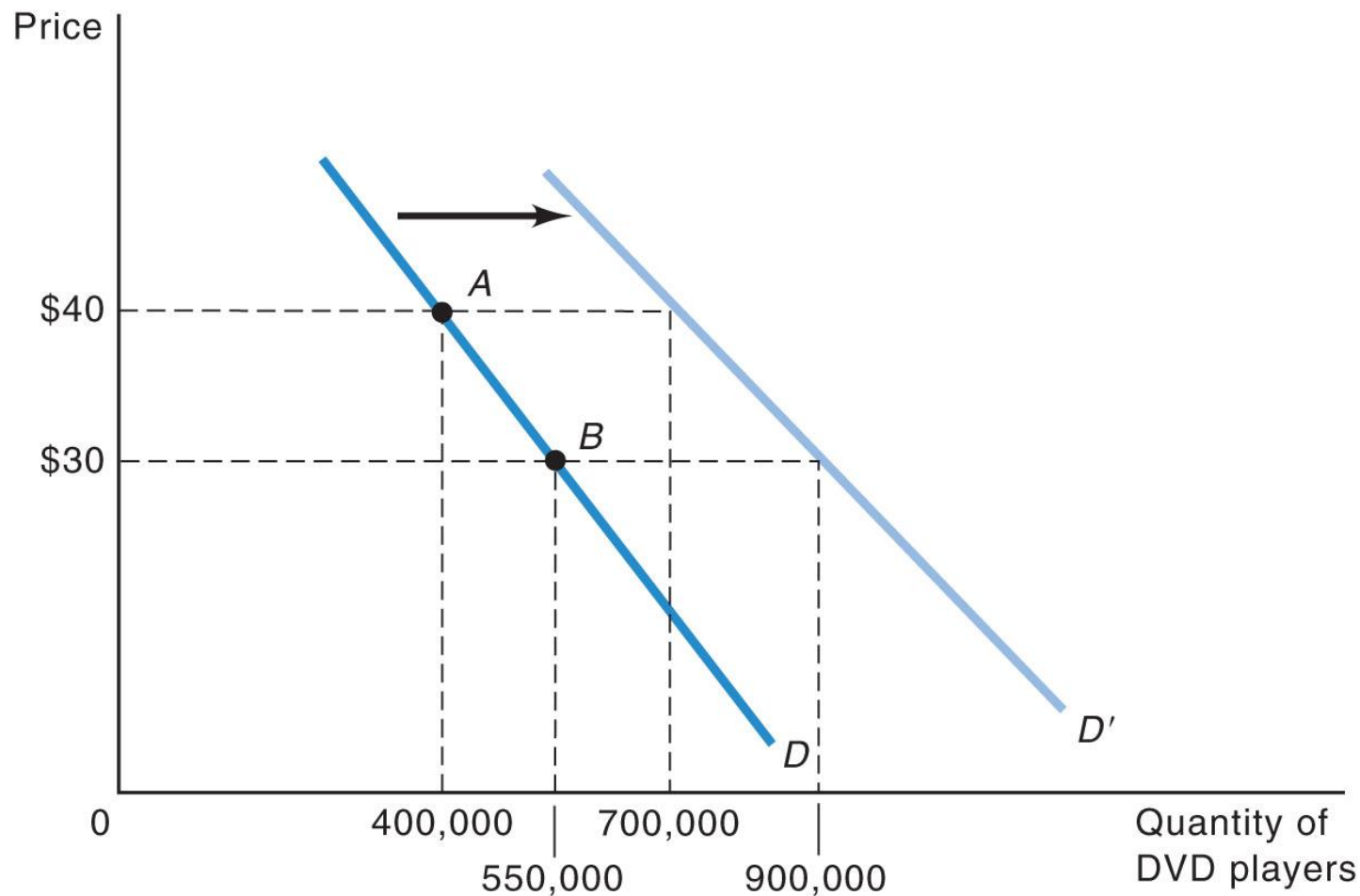
Determinants of Demand Other Than Price

- Income
 - Normal goods
 - Inferior goods
- Prices of related good
 - Complements
 - Substitutes
- Tastes or preferences

Shifts in versus Movements along a Demand Curve

- Movement along a demand curve: reflects a change in the good's own price
 - Movement up curve: increase in good's own price
 - Movement down curve: decrease in good's own price
- Shift of a demand curve: reflects a change in income, prices of related goods, or preferences
 - Rightward shift: increase in demand
 - Leftward shift: decrease in demand

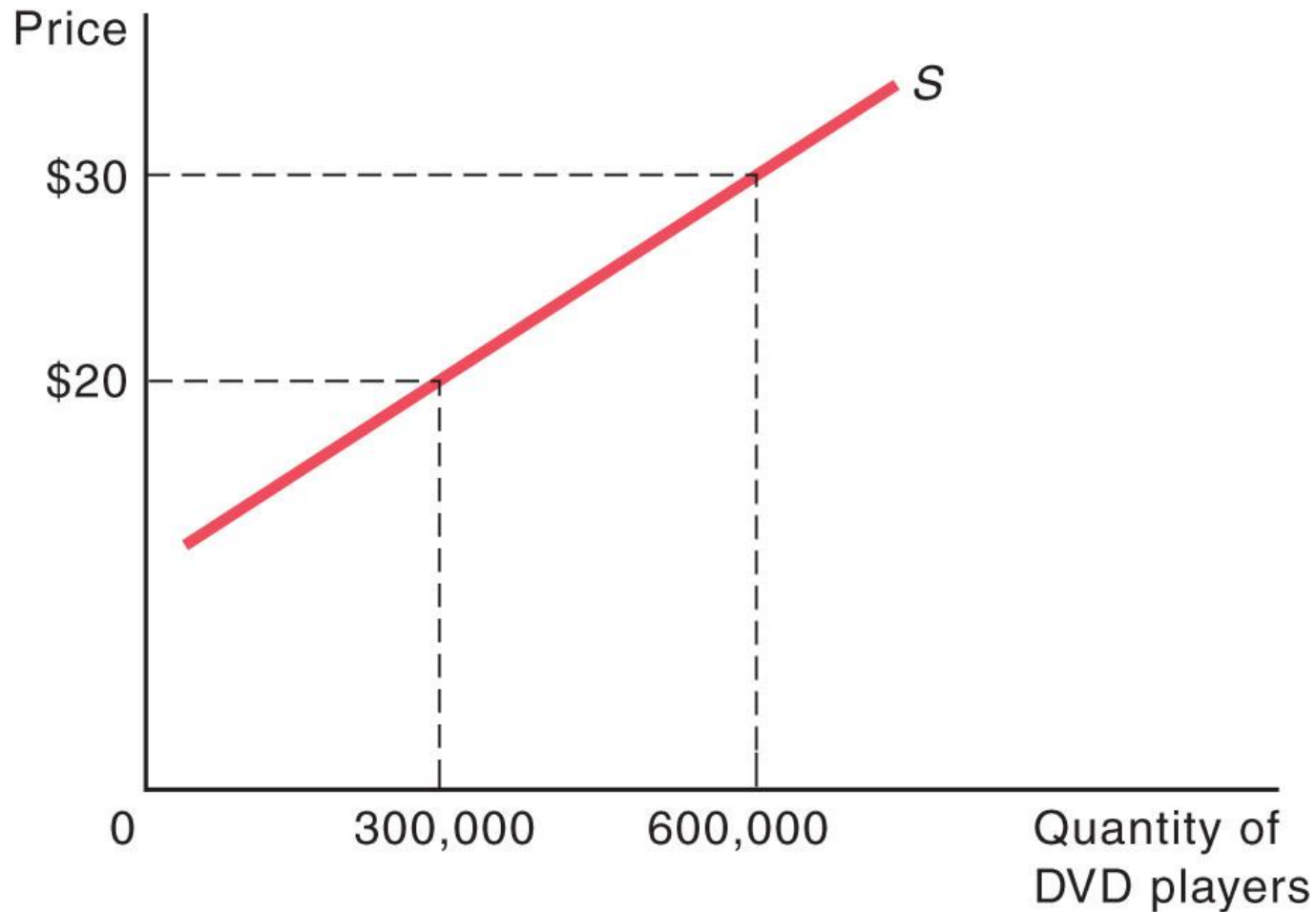
Figure 2.2 - An Increase in Demand



The Supply Curve

- **LAW OF SUPPLY:** the higher the price of a good, the larger the quantity firms want to produce
- Upward slope
- Assumption: all other factors remain constant

Figure 2.3 - Supply Curve



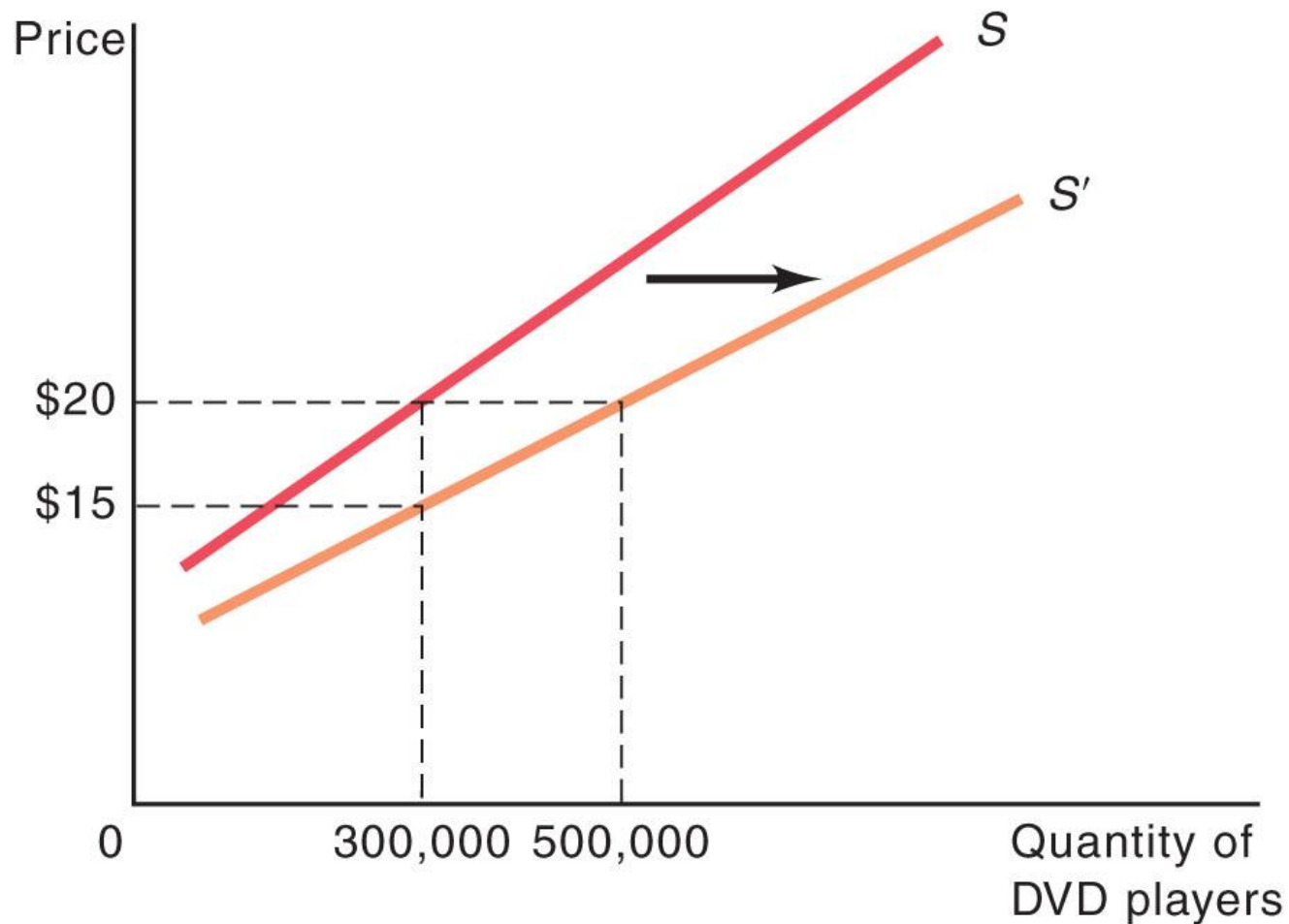
Determinants of Supply Other Than Price

- Technological knowledge
- Cost and productivity of inputs
- Expectations
- Employee-management relations
- Goals of firms' owners
- Government taxes or subsidies

Shifts in versus Movement along a Supply Curve

- Movement along a supply curve: reflects a change in the good's selling price
 - Movement up curve: increase in good's selling price
 - Movement down curve: decrease in good's selling price
- Shift in the supply curve: reflects a change in the state of technological knowledge or the conditions of supply of inputs
 - Rightward shift: increase in supply
 - Leftward shift: decrease in supply

Figure 2.4 - An Increase in Supply

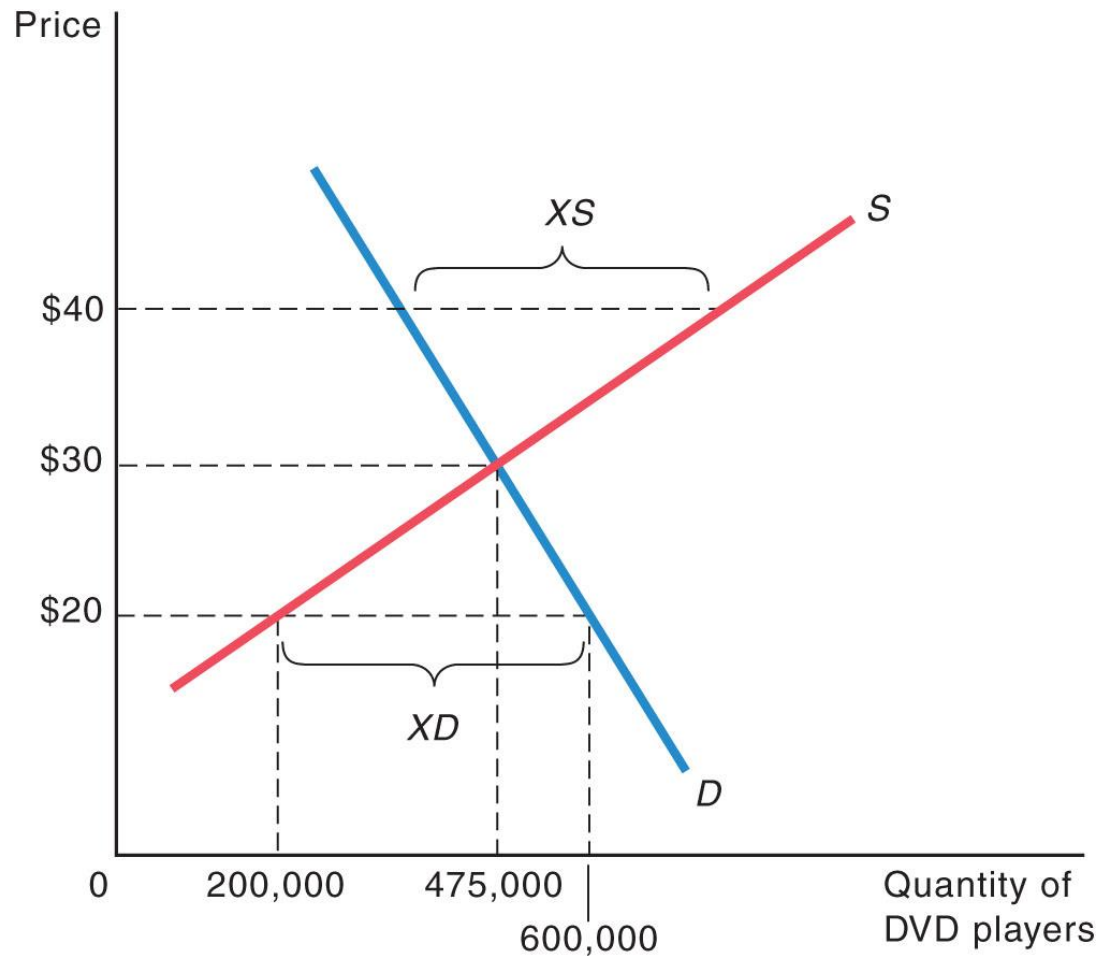


Determination of Equilibrium Price and Quantity

- **Equilibrium**

- a situation in which quantity demanded equals quantity supplied at the prevailing price
- occurs at the intersection between the supply and demand curves
- equilibrium price, equilibrium quantity

Figure 2.5 - Determination of Equilibrium Price and Quantity



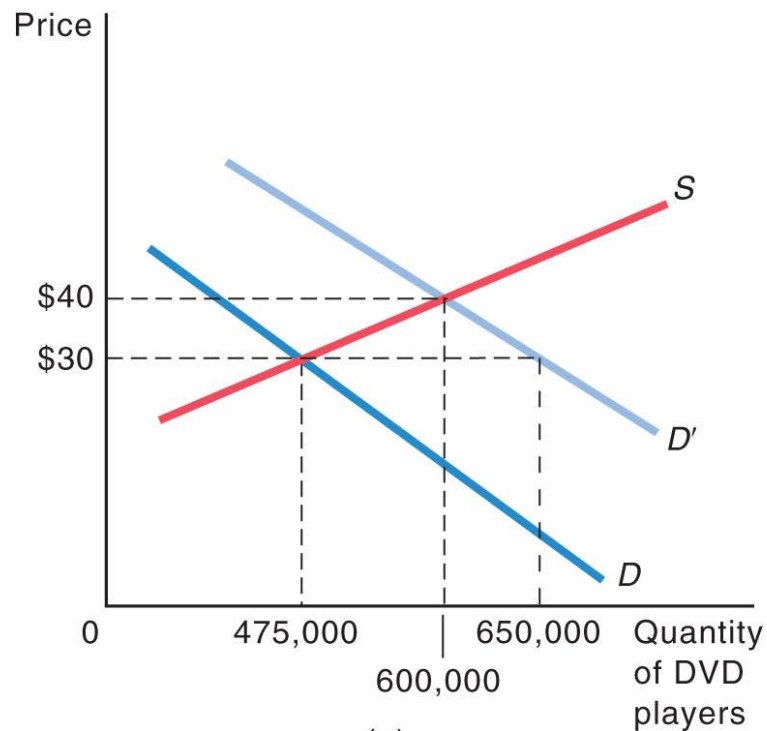
Disequilibrium

- Disequilibrium – a situation in which the quantity demanded and the quantity supplied are not in balance
 - Shortage
 - excess demand for a good
 - market forces tend to exert upward pressure on price
 - Surplus
 - excess supply of a good
 - market forces tend to exert downward pressure on price

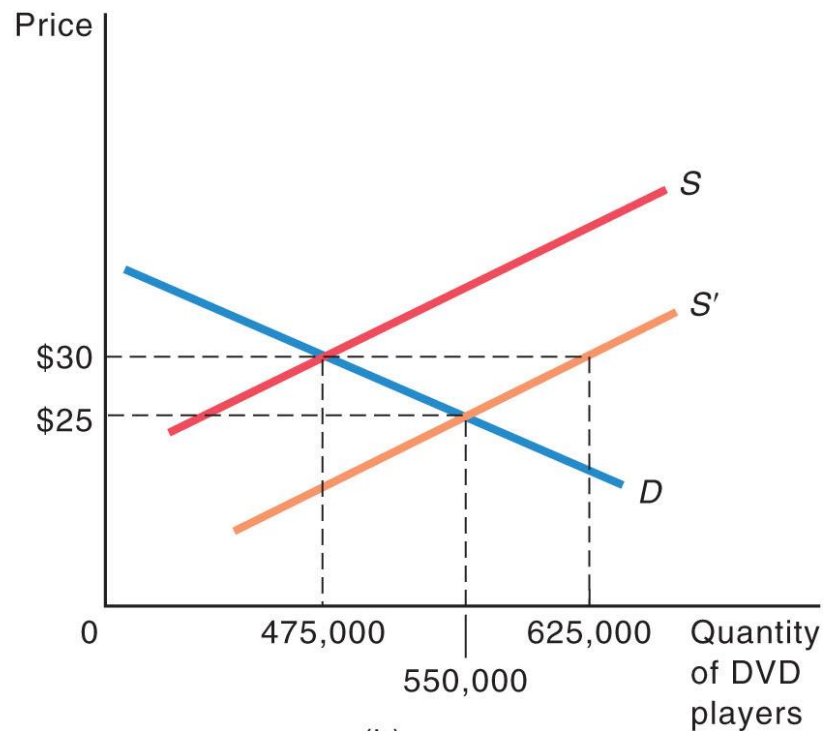
Adjustment to Changes in Demand or Supply

- application of the supply and demand model
- explain or predict how a change in market conditions affects equilibrium price and output

Figure 2.6 - Adjustment to Changes in Demand or Supply

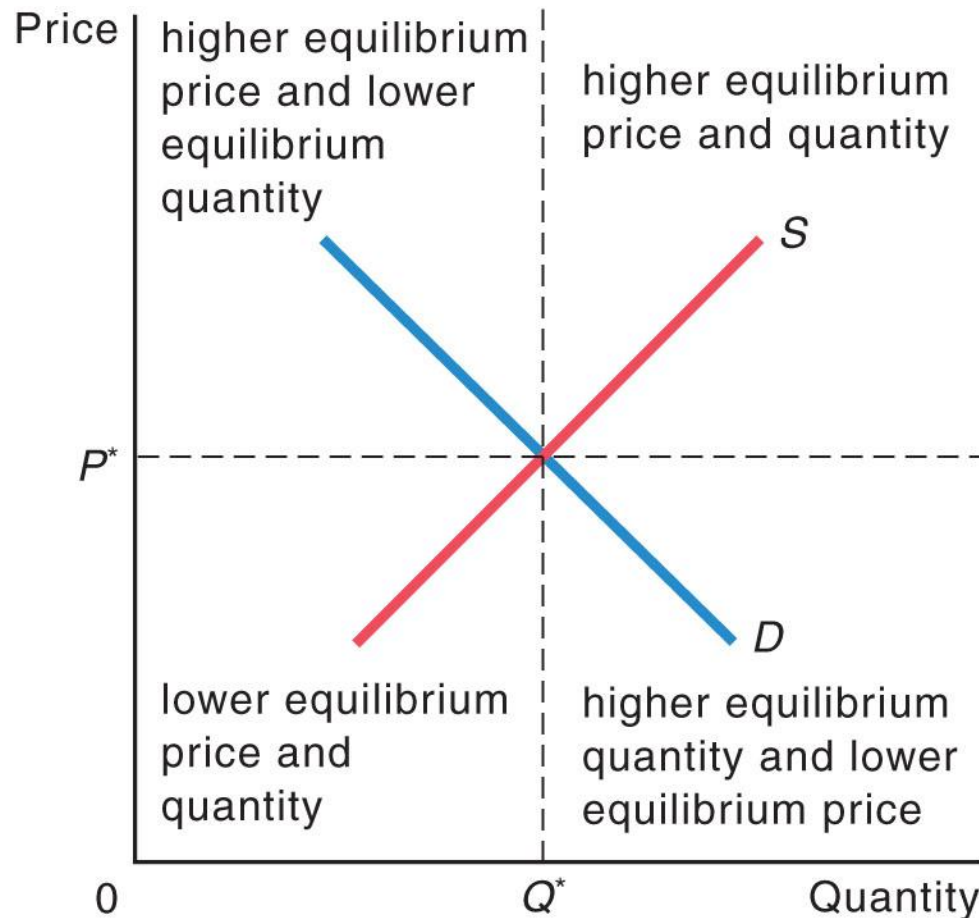


(a)



(b)

Figure 2.7 - Using the Supply-Demand Model to Explain Market Outcomes



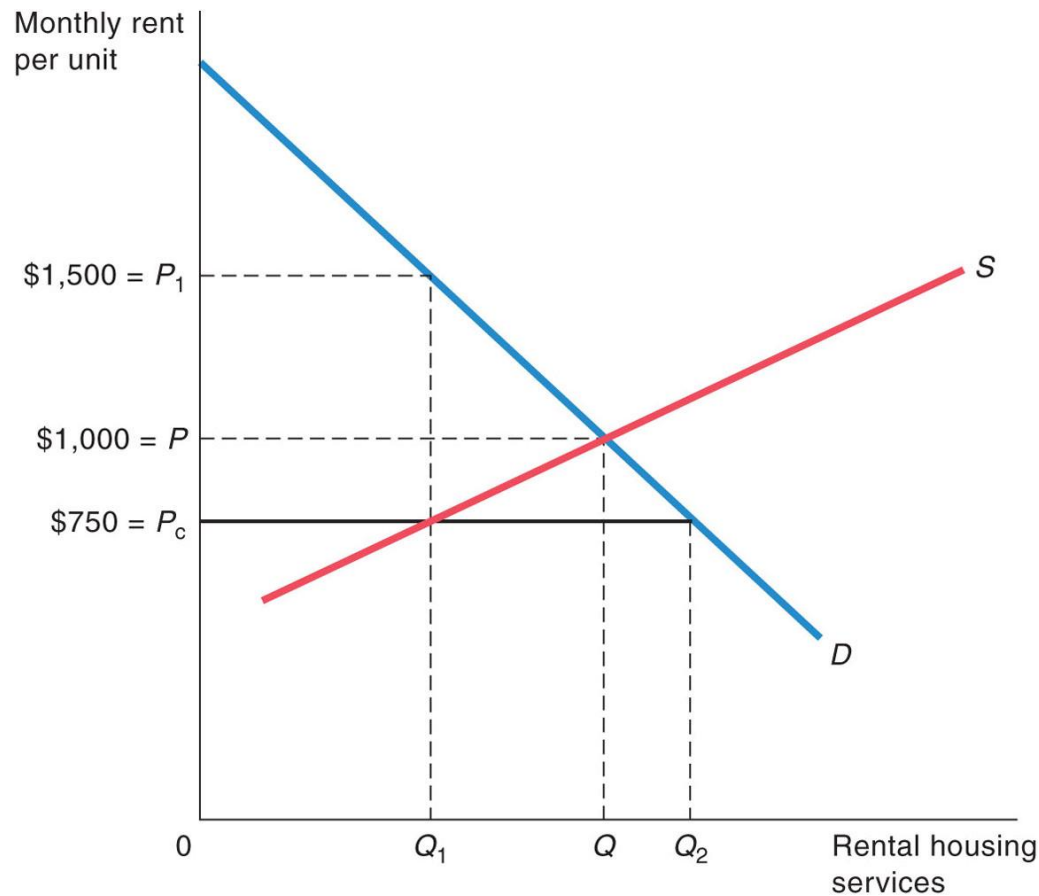
Government Intervention in Markets: Price Controls

- Markets are self-adjusting mechanisms
- Government intervention:
 - Price ceiling – a legislated maximum price for a good
 - Price floor – a legislated minimum price for a good

Rent Control – example of a price ceiling in the rental housing market

- Rent is below market rent so tenants with rent controlled housing benefit
- Shortage of rent controlled housing; need for non price rationing mechanism
- Negative impact on quality of housing
- Emergence of black markets

Figure 2.8 - Rent Control – example of a price ceiling in the rental housing market



Elasticities

- Measures the magnitude of the responsiveness of quantity demanded (or quantity supplied) to a change in a particular determinant (price, income, or the price of a related good or input)
- Quantitative measure of sensitivity

Price Elasticity of Demand

- A measure of how sensitive quantity demanded is to a change in a product's price
- Defined as the percentage change in quantity demanded divided by the percentage change in price

Calculating Price Elasticity of Demand

- Point elasticity formula

$$\eta = \frac{(\Delta Q_d / Q_d)}{(\Delta P / P)} .$$

- Arc elasticity formula

$$\eta = \frac{\left[\frac{\Delta Q_d}{(1/2)(Q_{d1} + Q_{d2})} \right]}{\left[\frac{\Delta P}{(1/2)(P_1 + P_2)} \right]} .$$

Example: Small Differences

Point Elasticity Formula

$$P_1 = \$3.00 \quad P_2 = \$2.97$$
$$Q_{d1} = 1,000 \quad Q_{d2} = 1,005.$$

Using P_1 and Q_{d1} :

$$\frac{(\Delta Q_d / Q_{d1})}{(\Delta P / P_1)} = \frac{(5 / 1,000)}{(\$0.03 / \$3.00)} = 0.50.$$

Using P_2 and Q_{d2} :

$$\frac{(\Delta Q_d / Q_{d2})}{(\Delta P / P_2)} = \frac{(5 / 1,005)}{(\$0.03 / \$2.97)} = 0.49.$$

Example: Large Differences

Point Elasticity Formula

$$P_1 = \$3.00 \quad P_2 = \$1.50$$
$$Q_{d1} = 1,000 \quad Q_{d2} = 2,000.$$

a. Using P_1 and Q_{d1} (top line)

b. Using P_2 and Q_{d2} (bottom line)

$$(\Delta Q_d / Q_{d1}) / (\Delta P / P_1) = (1,000 / 1,000) / (\$1.50 / \$3.00) = 2.0 \text{ and}$$

$$(\Delta Q_d / Q_{d2}) / (\Delta P / P_2) = (1,000 / 2,000) / (\$1.50 / \$1.50) = 0.5.$$

Example: Large Differences

Arc Elasticity Formula

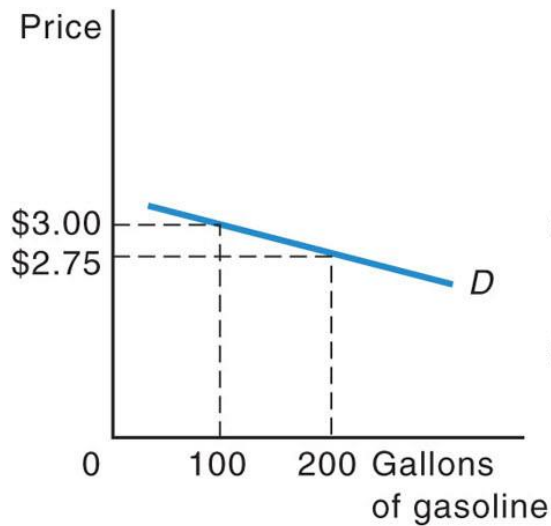
$$P_1 = \$3.00 \quad P_2 = \$1.50$$
$$Q_{d1} = 1,000 \quad Q_{d2} = 2,000.$$

$$\frac{\left[\frac{\Delta Q_d}{(1/2)(Q_{d1} + Q_{d2})} \right]}{\left[\frac{\Delta P}{(1/2)(P_1 + P_2)} \right]} = \frac{\left[\frac{1,000}{(1/2)(1,000 + 2,000)} \right]}{\left[\frac{\$1.50}{(1/2)(\$1.50 + \$3.00)} \right]} = 1.0.$$

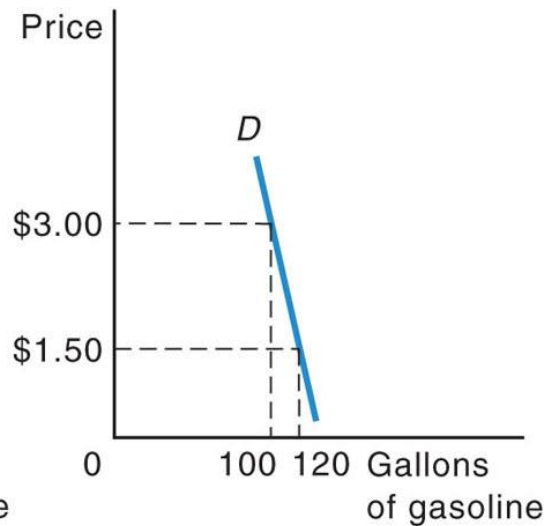
Ranges of Price Elasticity of Demand

- Elastic: $\eta > 1$
 - Percentage change in quantity demanded is greater than the percentage change in price
- Unit elastic: $\eta = 1$
 - Percentage change in quantity demanded is equal to the percentage change in price
- Inelastic: $\eta < 1$
 - Percentage change in quantity demanded is less than the percentage change in price

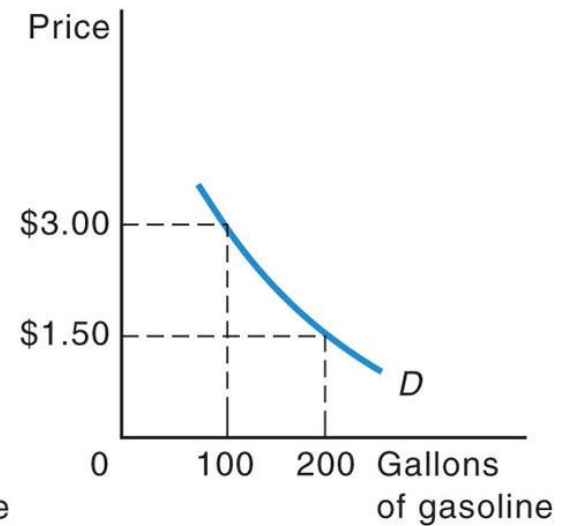
Figure 2.9 - Price Elasticity of Demand and Total Expenditure



(a)



(b)



(c)

Demand Elasticities Vary among Goods

- Factors affecting price elasticity of demand
 - availability of substitutes
 - closeness of substitutes
 - time period over which consumers adjust to a price change

Table 2.1

Selected Estimates of Demand Elasticities		
	Short Run	Long Run
Cigarettes	—	0.35
Water	—	0.4
Beer	—	0.8
Physicians' services	0.6	—
Gasoline	0.2	0.5–1.5
Automobiles	—	1.5
Chevrolets	—	4.0
Electricity (household utility)	0.1	1.9
Air travel	0.1	2.4

Sources: Hendrik S. Houthakker and Lester D. Taylor, *Consumer Demand in the United States, 1929–1970* (Cambridge, MA: Harvard University Press, 1966 and 1970 editions); Kenneth G. Elzinga, “The Beer Industry,” in *The Structure of American Industry*, edited by Walter Adams (New York: Macmillan, 1977); and James L. Sweeney, “The Response of Energy Demand to Higher Prices: What Have We Learned?” *American Economic Review*, 74, No. 2 (May 1984), pp. 31–37.

Three Other Elasticities

- Income elasticity of demand
 - a measure of how responsive consumption of some item is to a change in income, assuming the price of the good itself remains unchanged
 - defined as the percentage change in consumption divided by the percentage change in income
 - formula:

$$(\Delta Q_d / Q_d) / (\Delta I / I)$$

(continued)

- Cross price elasticity of demand

- a measure of how responsive consumption of one good is to a change in the price of a related good
- defined as the percentage change in consumption of one good divided by the percentage change in the price of a different good
- formula:

$$(\Delta Q_{dX}/Q_{dX}) / (\Delta P_Y/P_Y)$$

(continued)

- Price elasticity of supply
 - a measure of the responsiveness of the quantity supplied of a commodity to a change in the commodity's own price
 - defined as the percentage change in quantity supplied divided by the percentage change in price
 - formula:

$$\epsilon = (\Delta Q_s / Q_s) / (\Delta P / P)$$

The Mathematics Associated with Elasticities

- The calculation of elasticity of demand is a negative number.
- The calculation of elasticity of supply is a positive number.
- Price elasticity varies along a linear demand curve:
 - elasticity increases (in absolute value) as price increases (i.e., move up a demand curve)

(continued)

The Mathematics Associated with Elasticities

(continued)

- When a demand curve has the shape of a rectangular hyperbola:
 - the price elasticity of demand is the same as every point on the curve.
 - total expenditure does not change as price changes.
- When price elasticity is greater than 1, an increase in price causes total expenditure to fall.
- When price elasticity is less than 1, an increase in price causes total expenditure to rise.

Mathematical Equations

$$\eta = \frac{dQ/Q}{dP/P} = \frac{dQ}{dP} \frac{P}{Q}, \quad (1)$$

$$Q = a - bP, \quad (2)$$

$$\eta = -b \frac{P}{Q}. \quad (3)$$

$$Q = kP^{-\alpha}, \quad (4)$$

$$\frac{dQ}{dP} = -\alpha k P^{-\alpha-1}. \quad (5)$$

(continued)

Mathematical Equations (continued)

$$\eta = -\alpha k P^{-\alpha-1} \frac{P}{Q} = -\frac{\alpha k P^{-\alpha}}{Q} = -\alpha; \quad (6)$$

$$E = PQ. \quad (7)$$

$$\begin{aligned} \frac{dE}{dP} &= Q + P \frac{dQ}{dP} \\ &= Q \left(1 + \frac{P}{Q} \frac{dQ}{dP} \right) \\ &= Q(1 - \eta). \end{aligned} \quad (8)$$

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