In the supply curve of usable organs would take on the normal upward slope of typical supply curves. The higher the expected value of an organ, the greater the number of people who would be willing to have their organs sold at death. Suppose that the supply curve is $S_2$ in the figure. At the equilibrium price $P_1$, the number of organs made available for implant ($Q_1$) would equal the number purchased for transplant ($Q_2$). In this generalized case, the shortage of organs would be eliminated and, of particular importance, the number of organs available for implanting would rise to $Q_2$. This means more lives could be saved and enhanced under the present donor law.

Objections In view of this drive outcome, why is there such market for human organs? Critics of market-based solutions have two main objections. The first is a moral objection. Critics feel that turning human organs into commodities commercializes human beings and diminishes the special nature of human life. They say there is nothing unseemly about selling and buying body organs as if they were bushels of wheat or ounces of gold. (There is, however, market for blood!) Moreover, critics note that the market would ration the available organs (as represented by $Q_2$ in the figure) to people who either can afford them (at $P_1$) or have health insurance for transplants. The poor and uninsured would be left out.

Second, a health-cost objection suggests that a market for body organs would greatly increase the cost of health care. Rather than obtaining freely donated (although “too few”) body organs, patients or their insurance companies would have to pay market prices for them, further increasing the cost of medical care.

Rebuttal Supporters of market-based solutions to organ shortages point out that the laws against selling organs are simply driving the market underground. Worldwide, an estimated $1 billion-per-year illegal market in human organs has emerged. As in other illegal markets, the unscrupulous tend to thrive. This fact is dramatized by the accompanying photo, in which four Pakistani villagers show off their scars after they each sold a kidney to pay off debts. Supporters say that legalization of the market for human organs would increase organ supply from legal sources, drive down the price of organs, and reduce the abuses such as those now taking place in illegal markets.

What have been the actual economic effects? On the one hand, the below-equilibrium rents attract a larger share of renters. Some are locals seeking to move into their own places after sharing housing with friends or family. Others are outsiders attracted to the area by the artificially low rents. But a large problem occurs on the supply side. Rent controls make it less attractive for landlords to offer units on the rental market. In the short run, owners may sublet their rental units or convert them to condominiums. In the long run, low rents make it unprofitable for owners to sell or renovate their rental units. (Rent controls are one cause of the many abandoned apartment buildings found in larger cities.) Also, insurance companies, pension funds, and other potential new investors in housing will find it more profitable to invest in office buildings, shopping malls, or hotels, where rents are not controlled.

In brief, rent controls distort market signals and thus resources are misallocated. Too few resources are allocated to rental housing and too many to alternative uses.

Ironically, although rent controls are often legislated to lessen the effects of perceived housing shortages, controls in fact are a primary cause of such shortages. For that reason, most American cities either have abandoned or are in the process of dismantling rent controls.

Price Floors on Wheat

A price floor is a minimum price fixed by the government. A price at or above the price floor is legal; a price below it is not. Price floors above equilibrium prices are usually invoked when society feels that the free functioning of the market system has not provided a sufficient income for certain groups of resource suppliers or producers. Supported prices for agricultural products and current minimum wages are two examples of price (or wage) floors. Let's look at the former.

Suppose that many farmers have extremely low incomes when the price of wheat is at its equilibrium value of $2 per bushel. The government decides to help out by establishing a legal price floor or price support of $3 per bushel.
FIGURE 3.9 A price floor. A price floor is a minimum legal price such as $P_f$. When the price floor is above the equilibrium price, a persistent product surplus results. Here that surplus is shown by the horizontal distance between $Q_s$ and $Q_d$.

What will be the effects? At any price above the equilibrium price, quantity supplied will exceed quantity demanded—that is, there will be a persistent excess supply or surplus of the product. Farmers will be willing to produce and offer for sale more than private buyers are willing to purchase at the price floor. As we saw with a price ceiling, an imposed legal price disrupts the rationing ability of the free market.

Graphical Analysis Figure 3.9 illustrates the effect of a price floor graphically. Suppose that $S$ and $D$ are the supply and demand curves for wheat. Equilibrium price and quantity are $P_0$ and $Q_0$, respectively. If the government imposes a price floor of $P_f$, farmers will produce $Q_s$ but private buyers will purchase only $Q_d$. The surplus is the excess of $Q_s$ over $Q_d$.

The government may cope with the surplus resulting from a price floor in two ways:

- It can restrict supply (for example, by instituting acreage allotments by which farmers agree to take a certain amount of land out of production) or increase demand (for example, by researching new uses for the product involved). These actions may reduce the difference between the equilibrium price and the price floor and that way reduce the size of the resulting surplus.

- If these efforts are not wholly successful, then the government must purchase the surplus output at the $P_f$ price (thereby subsidizing farmers) and store or otherwise dispose of it.

Additional Consequences Price floors such as $P_f$ in Figure 3.9 not only disrupt the rationing ability of prices but distort resource allocation. Without the price floor, the $2$ equilibrium price of wheat would cause financial losses and force high-cost wheat producers to plant other crops or abandon farming altogether. But the $3$ price floor allows them to continue to grow wheat and remain farmers. So society devotes too many of its scarce resources to wheat production and too few to producing other, more valuable, goods and services. It fails to achieve allocative efficiency.

That's not all. Consumers of wheat-based products pay higher prices because of the price floor. Taxpayers pay higher taxes to finance the government's purchase of the surplus. Also, the price floor causes potential environmental damage by encouraging wheat farmers to bring hilly, erosion-prone “marginal land” into production. The higher price also prompts imports of wheat. But, since such imports would increase the quantity of wheat supplied and thus undermine the price floor, the government needs to erect tariffs (taxes on imports) to keep the foreign wheat out. Such tariffs usually prompt other countries to retaliate with their own tariffs against U.S. agricultural or manufacturing exports.

So it is easy to see why economists "sound the alarm" when politicians advocate imposing price ceilings or price floors such as price controls, rent controls, interest-rate lids, or agricultural price supports. In all these cases, good intentions lead to bad economic outcomes. Government-controlled prices cause shortages or surpluses, distort resource allocation, and produce negative side effects.

QUICK REVIEW 3.3

- In competitive markets, prices adjust to the equilibrium level at which quantity demanded equals quantity supplied.
- The equilibrium price and quantity are those indicated by the intersection of the supply and demand curves for any product or resource.
- An increase in demand increases equilibrium price and quantity; a decrease in demand decreases equilibrium price and quantity.
- An increase in supply reduces equilibrium price but increases equilibrium quantity; a decrease in supply increases equilibrium price but reduces equilibrium quantity.
- Over time, equilibrium price and quantity may change in directions that seem at odds with the laws of demand and supply because the other-things-equal assumption is violated.
- Government-controlled prices in the form of ceilings and floors stifle the rationing function of prices, distort resource allocations, and cause negative side effects.
Summary

1. Demand is a schedule or curve representing the willingness of buyers in a specific period to purchase a particular product at each of various prices. The law of demand implies that consumers will buy more of a product at a low price than at a high price. So, other things equal, the relationship between price and quantity demanded is negative or inverse and is graphed as a downsloping curve.

2. Market demand curves are found by adding horizontally the demand curves of the many individual consumers in the market.

3. Changes in one or more of the determinants of demand (consumer tastes, the number of buyers in the market, the money incomes of consumers, the prices of related goods, and consumer expectations) shift the market demand curve. A shift to the right is an increase in demand; a shift to the left is a decrease in demand. A change in demand is different from a change in the quantity demanded, the latter being a movement from one point to another point on a fixed demand curve because of a change in the product's price.

4. Supply is a schedule or curve showing the amounts of a product that producers are willing to offer in the market at each possible price during a specific period. The law of supply states that, other things equal, producers will offer more of a product at a high price than at a low price. Thus, the relationship between price and quantity supplied is positive or direct, and supply is graphed as an upsloping curve.

5. The market supply curve is the horizontal summation of the supply curves of the individual producers of the product.

6. Changes in one or more of the determinants of supply (resource prices, production techniques, taxes or subsidies, the prices of other goods, producer expectations, or the number of sellers in the market) shift the supply curve of a product. A shift to the right is an increase in supply; a shift to the left is a decrease in supply. In contrast, a change in the price of the product being considered causes a change in the quantity supplied, which is shown as a movement from one point to another point on a fixed supply curve.

7. The equilibrium price and quantity are established at the intersection of the supply and demand curves. The interaction of market demand and market supply adjusts the price to the point at which the quantities demanded and supplied are equal. This is the equilibrium price. The corresponding quantity is the equilibrium quantity.

8. The ability of market forces to synchronize selling and buying decisions to eliminate potential surpluses and shortages is known as the rationing function of prices. The equilibrium quantity in competitive markets reflects both productive efficiency (least-cost production) and allocative efficiency (producing the right amount of the product relative to other products).

9. A change in either demand or supply changes the equilibrium price and quantity. Increases in demand raise both equilibrium price and equilibrium quantity; decreases in demand lower both equilibrium price and equilibrium quantity. Increases in supply lower equilibrium price and raise equilibrium quantity; decreases in supply raise equilibrium price and lower equilibrium quantity.

10. Simultaneous changes in demand and supply affect equilibrium price and quantity in various ways, depending on their direction and relative magnitudes (see Table 3.3).

11. A price ceiling is a maximum price set by government and is designed to help consumers. Effective price ceilings produce persistent product shortages, and if an equitable distribution of the product is sought, government must ration the product to consumers.

12. A price floor is a minimum price set by government and is designed to aid producers. Effective price floors lead to persistent product surpluses; the government must either purchase the product or eliminate the surplus by imposing restrictions on production or increasing private demand.

13. Legally fixed prices stifle the rationing function of prices and distort the allocation of resources.

Terms and Concepts

demand
demand schedule
law of demand
diminishing marginal utility
income effect
substitution effect
demand curve
determinants of demand
normal goods
inferior goods
substitute good
complementary good
change in demand
change in quantity demanded
change in quantity supplied
change in equilibrium price
change in equilibrium quantity
surplus
shortage
productive efficiency
allocative efficiency
price ceiling
price floor
Questions

1. Explain the law of demand. Why does a demand curve slope downward? How is a market demand curve derived from individual demand curves? LO1

2. What are the determinants of demand? What happens to the demand curve when any of these determinants change? Distinguish between a change in demand and a movement along a fixed demand curve, noting the cause(s) of each. LO1

3. What effect will each of the following have on the demand for small automobiles such as the Mini-Cooper and Smart car? LO1
   a. Small automobiles become more fashionable.
   b. The price of large automobiles rises (with the price of small autos remaining the same).
   c. Income declines and small autos are an inferior good.
   d. Consumers anticipate that the price of small autos will greatly come down in the near future.
   e. The price of gasoline substantially drops.

4. Explain the law of supply. Why does the supply curve slope upward? How is the market supply curve derived from the supply curves of individual producers? LO2

5. What are the determinants of supply? What happens to the supply curve when any of these determinants changes? Distinguish between a change in supply and a change in the quantity supplied, noting the cause(s) of each. LO2

6. What effect will each of the following have on the supply of auto tires? LO2
   a. A technological advance in the methods of producing tires.
   b. A decline in the number of firms in the tire industry.
   c. An increase in the prices of rubber used in the production of tires.
   d. The expectation that the equilibrium price of auto tires will be lower in the future than currently.
   e. A decline in the price of the large tires used for semi trucks and earth-hauling rigs (with no change in the price of auto tires).
   f. The levying of a per-unit tax on each auto tire sold.
   g. The granting of a 50-cent-per-unit subsidy for each auto tire produced.

7. “In the corn market, demand often exceeds supply and supply sometimes exceeds demand.” “The price of corn rises and falls in response to changes in supply and demand.” In which of these two statements are the terms “supply” and “demand” used correctly? Explain. LO2

8. In 2001 an outbreak of hoof-and-mouth disease in Europe led to the burning of millions of cattle carcasses. What impact do you think this had on the supply of cattle hides, hide prices, the supply of leather goods, and the price of leather goods? LO4

9. Critically evaluate: “In comparing the two equilibrium positions in Figure 3.7b, I note that a smaller amount is actually demanded at a lower price. This refutes the law of demand.” LO4

10. For each stock in the stock market, the number of shares sold daily equals the number of shares purchased. That is, the quantity of each firm’s shares demanded equals the quantity supplied. So, if this equality always occurs, why do the prices of stock shares ever change? LO4

11. Suppose the total demand for wheat and the total supply of wheat per month in the Kansas City grain market are as shown in the table below. Suppose that the government establishes a price ceiling of $3.70 for wheat. What might prompt the government to establish this price ceiling? Explain carefully the main effects. Demonstrate your answer graphically. Next, suppose that the government establishes a price floor of $4.60 for wheat. What will be the main effects of this price floor? Demonstrate your answer graphically. LO5

<table>
<thead>
<tr>
<th>Thousands of Bushels Demanded</th>
<th>Price per Bushel</th>
<th>Thousands of Bushels Supplied</th>
</tr>
</thead>
<tbody>
<tr>
<td>85</td>
<td>$3.40</td>
<td>72</td>
</tr>
<tr>
<td>80</td>
<td>$3.70</td>
<td>73</td>
</tr>
<tr>
<td>75</td>
<td>$4.00</td>
<td>75</td>
</tr>
<tr>
<td>70</td>
<td>$4.30</td>
<td>77</td>
</tr>
<tr>
<td>65</td>
<td>$4.60</td>
<td>79</td>
</tr>
<tr>
<td>60</td>
<td>$4.90</td>
<td>81</td>
</tr>
</tbody>
</table>

12. What do economists mean when they say “price floors and ceilings stifle the rationing function of prices and distort resource allocation”? LO5

13. LAST WORD In some countries, such as France, every corpse is available for doctors to “harvest” for organs unless the deceased, while still alive, signed a form forbidding the organs to be harvested. In the USA, it is the opposite: No harvesting is allowed unless the deceased had signed, while still alive, an organ donor form authorizing doctors to harvest any needed organs. Use supply and demand figures to show in which country organ shortages are likely to be less severe.

Problems

1. Suppose there are three buyers of candy in a market: Tex, Dex, and Rex. The market demand and the individual demands of Tex, Dex, and Rex are shown on the next page. LO1
   a. Fill in the table for the missing values.
   b. Which buyer demands the least at a price of $8? The most at a price of $7?
   c. Which buyer’s quantity demanded increases the most when the price is lowered from $7 to $6?
d. Which direction would the market demand curve shift if Tex withdrew from the market? What if Dex doubled his purchases at each possible price?
e. Suppose that at a price of $6, the total quantity demanded increases from 19 to 38. Is this a “change in the quantity demanded” or a “change in demand”?

<table>
<thead>
<tr>
<th>Price</th>
<th>Individual Quantities Demanded</th>
<th>Total Quantity Demanded</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Tex</td>
<td>Dex</td>
</tr>
<tr>
<td>$8</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>7</td>
<td>8</td>
<td>2</td>
</tr>
<tr>
<td>6</td>
<td>___</td>
<td>3</td>
</tr>
<tr>
<td>5</td>
<td>17</td>
<td>___</td>
</tr>
<tr>
<td>4</td>
<td>23</td>
<td>5</td>
</tr>
</tbody>
</table>

3. Refer to the expanded table below from question 11. LO3

a. What is the equilibrium price? At what price is there neither a shortage nor a surplus? Fill in the surplus-shortage column and use it to confirm your answers.
b. Graph the demand for wheat and the supply of wheat. Be sure to label the axes of your graph correctly. Label equilibrium price $P$ and equilibrium quantity $Q$.
c. How big is the surplus or shortage at $3.40? At $4.90? How big a surplus or shortage results if the price is 60 cents higher than the equilibrium price? 30 cents lower than the equilibrium price?

<table>
<thead>
<tr>
<th>Thousands of Bushels Demanded</th>
<th>Price per Bushel</th>
<th>Thousands of Bushels Supplied</th>
<th>Surplus (+) or Shortage (-)</th>
</tr>
</thead>
<tbody>
<tr>
<td>85</td>
<td>$3.40</td>
<td>72</td>
<td>___</td>
</tr>
<tr>
<td>80</td>
<td>3.70</td>
<td>73</td>
<td>___</td>
</tr>
<tr>
<td>75</td>
<td>4.00</td>
<td>75</td>
<td>___</td>
</tr>
<tr>
<td>70</td>
<td>4.30</td>
<td>77</td>
<td>___</td>
</tr>
<tr>
<td>65</td>
<td>4.60</td>
<td>79</td>
<td>___</td>
</tr>
<tr>
<td>60</td>
<td>4.90</td>
<td>81</td>
<td>___</td>
</tr>
</tbody>
</table>

4. How will each of the following changes in demand and/or supply affect equilibrium price and equilibrium quantity in a competitive market, that is, do price and quantity rise, fall, or remain unchanged, or are the answers indeterminate because they depend on the magnitudes of the shift? Use supply and demand to verify your answers. LO4

a. Supply decreases and demand is constant.
b. Demand decreases and supply is constant.
c. Supply increases and demand is constant.
d. Demand increases and supply increases.
e. Demand increases and supply is constant.
f. Supply increases and demand decreases.
g. Demand increases and supply decreases.
h. Demand decreases and supply decreases.

5. Use two market diagrams to explain how an increase in state subsidies to public colleges might affect tuition and enrollments in both public and private colleges. LO4

Advanced Analysis. Assume that demand for a commodity is represented by the equation $P = 10 - 0.2Q_d$ and supply by the equation $P = 2 + 0.2Q_s$, where $Q_d$ and $Q_s$ are quantity demanded and quantity supplied, respectively, and $P$ is price. Using the equilibrium condition $Q_e = Q_s$, solve the equations to determine equilibrium price. Now determine equilibrium quantity. LO4
7. Suppose that the demand and supply schedules for rental apartments in the city of Gotham are as given in the table below. LO5

<table>
<thead>
<tr>
<th>Monthly Rent</th>
<th>Apartments Demanded</th>
<th>Apartments Supplied</th>
</tr>
</thead>
<tbody>
<tr>
<td>$2500</td>
<td>10,000</td>
<td>15,000</td>
</tr>
<tr>
<td>2000</td>
<td>12,500</td>
<td>12,500</td>
</tr>
<tr>
<td>1500</td>
<td>15,000</td>
<td>10,000</td>
</tr>
<tr>
<td>1000</td>
<td>17,500</td>
<td>7500</td>
</tr>
<tr>
<td>500</td>
<td>20,000</td>
<td>5000</td>
</tr>
</tbody>
</table>

a. What is the market equilibrium rental price per month and the market equilibrium number of apartments demanded and supplied?

b. If the local government can enforce a rent-control law that sets the maximum monthly rent at $1500, will there be a surplus or a shortage? Of how many units? And how many units will actually be rented each month?

c. Suppose that a new government is elected that wants to keep out the poor. It declares that the minimum rent that can be charged is $2500 per month. If the government can enforce that price floor, will there be a surplus or a shortage? Of how many units? And how many units will actually be rented each month?

d. Suppose that the government wishes to decrease the market equilibrium monthly rent by increasing the supply of housing. Assuming that demand remains unchanged, by how many units of housing would the government have to increase the supply of housing in order to get the market equilibrium rental price to fall to $1500 per month? To $1000 per month? To $500 per month?

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