

TABLE 3.2 Impacts on Supply Arising from Changes in Supply Determinants

Determinant	Change	Supply shift
Resource prices, P_L	$\Delta \uparrow$	\leftarrow
	$\Delta \downarrow$	\rightarrow
Technology, E	$\Delta \uparrow$	\rightarrow
	$\Delta \downarrow$	\leftarrow
Taxes and subsidies, R	$\Delta \uparrow$	\leftarrow
	$\Delta \downarrow$	\rightarrow
Price of substitutes, P_s	$\Delta \uparrow$	\leftarrow
	$\Delta \downarrow$	\rightarrow
Price of complements, P_c	$\Delta \uparrow$	\rightarrow
	$\Delta \downarrow$	\leftarrow
Price expectations, P_e	$\Delta \uparrow$	\leftarrow
	$\Delta \downarrow$	\rightarrow
Number of firms, F	$\Delta \uparrow$	\rightarrow
	$\Delta \downarrow$	\leftarrow

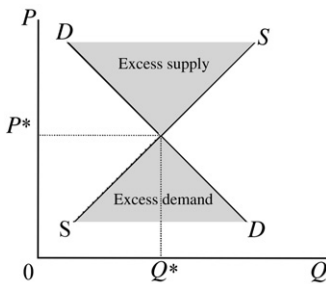


FIGURE 3.12 Market equilibrium.

THE MARKET MECHANISM: THE INTERACTION OF DEMAND AND SUPPLY

We can now use the concepts of demand and supply to explain the functioning of the market mechanism. Consider Figure 3.12, which brings together the market demand and supply curves. In our hypothetical market, the market equilibrium price is P^* . At that price, the quantity of a good or service that buyers are able and willing to buy is precisely equal to Q^* , the amount that firms are willing to supply. At a price below P^* , the quantity demanded exceeds the quantity supplied. In this situation, consumers will bid among themselves for the available supply of Q , which will drive up the selling price. Buyers who are unable or unwilling to pay the higher price will drop out of the bidding process. At the higher price, profit-maximizing producers will increase the quantity supplied. As long as the selling price is

below P^* , excess demand for the product will persist and the bidding process will continue. The bidding process will come to an end when, at the equilibrium price, excess demand is eliminated. In other words, at the equilibrium price, the quantity demanded by buyers is equal to the quantity supplied.

It is important to note that in the presence of excess demand, the adjustment toward equilibrium in the market emanates from the demand side. That is, prices are bid up by consumers eager to obtain a product that is in relatively short supply. Suppliers, on the other hand, are, in a sense, passive participants, taking their cue to increase production as prices rise.

On the other side of the market equilibrium price is the situation of excess supply. At a price above P^* , producers are supplying amounts of Q in excess of what consumers are willing to purchase. In this case, producers' inventories will rise above optimal levels as unwanted products go unsold. Since holding inventories is costly, producers will lower price in an effort to move their product. At the lower price, the number of consumers who are willing and able to purchase, say, hamburgers increases. Producers, on the other hand, will adjust their production schedules downward to reflect the reduced consumer demand.

In this case, where the quantity supplied exceeds the quantity demanded, producers become active players in the market adjustment process. That is, in the presence of excess supply, producers provide the impetus for lower product prices in an effort to avoid unwanted inventory accumulation. Consumers, on the other hand, are passive participants, taking their cue to increase consumption in response to lower prices initiated by the actions of producers but having no direct responsibility for the lower prices.

Problem 3.4. The market demand and supply equations for a product are

$$Q_D = 25 - 3P$$

$$Q_S = 10 + 2P$$

where Q is quantity and P is price. What are the equilibrium price and quantity for this product?

Solution. Equilibrium is characterized by the condition $Q_D = Q_S$. Substituting the demand and supply equations into the equilibrium condition, we obtain

$$25 - 3P = 10 + 2P$$

$$P^* = 3$$

$$Q^* = 25 - 3(3) = 10 + 2(3) = 16$$

Problem 3.5. Adam has an extensive collection of *Flash* and *Green Lantern* comic books. Adam is planning to attend a local community college

in the fall and wishes to sell his collection to raise money for textbooks. Three local comic book collectors have expressed an interest in buying Adam's collection. The individual demand equation for each of these three individuals is

$$Q_{D,1} = Q_{D,2} = Q_{D,3} = 550 - 2.5P$$

where P is measured in dollars per comic book.

- What is the market demand equation for Adam's comic books?
- How many more comic books can Adam sell for each dollar reduction in price?
- If Adam has 900 comic books in all, what price should he charge to sell his entire collection?

Solution

- The market demand for Adam's comic books is equal to the sum of the individual demands, that is,

$$\begin{aligned} Q_{D,M} &= Q_{D,1} + Q_{D,2} + Q_{D,3} = (55 - 2.5P) + (55 - 2.5P) + (55 - 2.5P) \\ &= 165 - 7.5P \end{aligned}$$

- Since price is measured in dollars, each one-dollar reduction in the price of comic books will result in an increase in quantity demanded of 7.5 comic books.
- Since Adam is offering his entire comic book collection for sale, the total quantity supplied of comic books is 90, that is,

$$Q_s = 90$$

To determine the price Adam must charge to sell his entire collection, equate market demand to market supply and solve:

$$\begin{aligned} Q_D &= Q_s \\ 165 - 7.5P &= 90 \\ P^* &= 75/7.5 = \$10 \end{aligned}$$

That is, in order for Adam to sell his entire collection, he should sell his comic books for \$10 each. Consider Figure 3.13.

Problem 3.6. Consider, again, the market demand curve in Figure 3.5.

- Suppose that the total market supply is given by the equation

$$Q_s = -16 + 2P$$

What are the market equilibrium price and quantity?

- Suppose that because of a decline in labor costs, market supply increases to

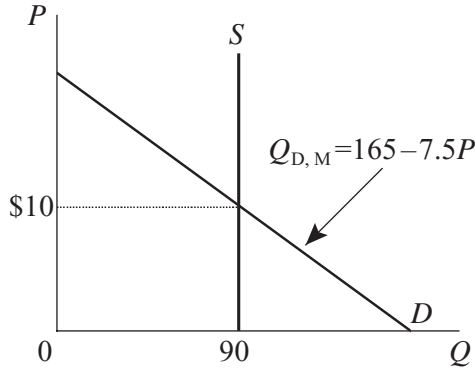


FIGURE 3.13 Diagrammatic solution to problem 3.5.

$$Q'_s = 6 + 2P$$

What are the new equilibrium price and quantity?

c. Diagram your answers to parts a and b.

Solution

a. Equilibrium is characterized by the condition $Q_D = Q_S$. Recall from Problem 3.2 that the market demand curve for $Q \leq 6$ is $Q_{D,1} = 20 - 2P$ and $Q_{D,M} = Q_{D,1} + Q_{D,2} = 60 - 7P$ for $Q \geq 4$. The equilibrium price and quantity are

$$-16 + 2P = 20 - 2P$$

$$P^* = 9$$

$$Q^* = 20 - 2(9) = -16 + 2(9) = 2$$

b. The new equilibrium price and quantity are

$$6 + 2P = 60 - 7P$$

$$P^* = 6$$

$$Q^* = 60 - 7(6) = 6 + 2(6) = 18$$

c. Figure 3.14 shows the old and new market equilibrium price and quantity.

Problem 3.7. Universal Exports has estimated the following monthly demand equation for its new brand of gourmet French pizza, Andrew's Appetizer:

$$Q_D = 500 - 100P + 50I + 20P_r + 30A$$

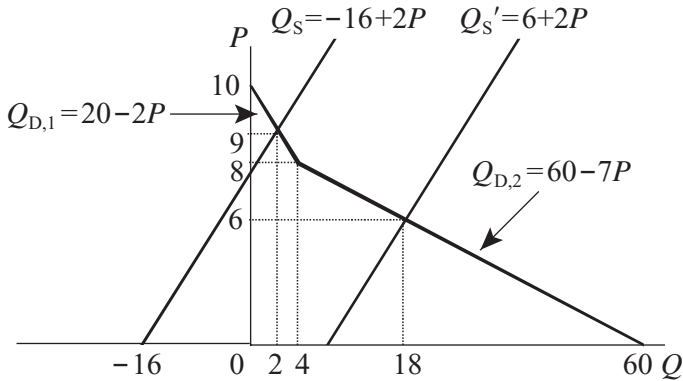


FIGURE 3.14 Diagrammatic solution to problem 3.6.

- where Q_D = quantity demanded per month
 P = price per unit
 I = per-capita income (thousands of dollars)
 P_r = price of another gourmet product, François's Frog Legs
 A = monthly advertising expenditures (thousands of dollars) of U niversal Exports

The supply equation for Andrew's Appetizer is

$$Q_S = 1,350 + 450P$$

- What is the relationship between Andrew's Appetizer and François's Frog Legs?
- Suppose that $I = 200$, $P_r = 80$, and $A = 100$. What are the equilibrium price and quantity for this product?
- Suppose that per-capita income increases by 55 (i.e., $I = 255$). What are the new equilibrium price and quantity for this product?

Solution

- By the law of demand, an increase in the price of a product will result in a decrease in the quantity demanded of that product, other things being equal. In this case, an increase in the price of François's Frog Legs would result in a decrease in the quantity demanded of frogs legs, other things equal. Since this results in an increase in the demand for Andrew's Appetizer, we would conclude that Andrew's Appetizer and François's Frog Legs are substitutes.
- Substituting the information from the problem statement into the demand equation yields

$$\begin{aligned} Q_D &= 500 - 100P + 50(200) + 20(80) + 30(100) \\ &= 500 - 100P + 10,000 + 1,600 + 3,000 = 15,100 - 100P \end{aligned}$$

Market equilibrium is defined as $Q_D = Q_S$. Substituting the supply and demand to equations into the equilibrium condition, we obtain

$$15,100 - 100P = 1,350 + 450P$$

$$P^* = \$25$$

$$Q^* = 15,100 - 100(25) = 12,600$$

c. Substituting the new information into the demand equation yields

$$\begin{aligned} Q_D &= 500 - 100P + 50(255) + 20(80) + 30(100) \\ &= 500 - 100P + 12,750 + 1,600 + 3,000 = 17,850 - 100P \end{aligned}$$

Substituting this into the equilibrium condition, we write

$$17,850 - 100P = 1,350 + 450P$$

$$P^* = \$30$$

$$Q^* = 17,850 - 100(30) = 14,850$$

It is interesting to note that the increase in per-capita income is represented diagrammatically as an increase in the intercept Q from 15,100 to 17,850, with no change in the slope of the demand curve. The student should verify diagrammatically that an increase in the Q intercept will result in right-shift of the demand curve, which is exactly what we would expect for a normal good given an increase in per capita income.

CHANGES IN SUPPLY AND DEMAND: THE ANALYSIS OF PRICE DETERMINATION

Now let us use the analytical tools of supply and demand to analyze the effects of a change in demand and/or a change in supply on the equilibrium price and quantity. Consider first the case of a change in demand.

DEMAND SHIFTS

Suppose, for example, that medical research finds that hamburgers have highly desirable health characteristics, triggering an increase in the public's preference for hamburgers. Other things remaining constant, this would result in a right-shift in the demand curve for hamburgers. This results in an increase in the equilibrium price and quantity demanded for hamburgers. Consider Figure 3.15.

If medical research, on the other hand had discovered that hamburgers exhibited highly undesirable health properties, one could have predicted a reduction in the demand for hamburgers, or a left-shift in the demand curve,