Demand, Supply, and Market Equilibrium

3

Chapters 1 and 2 introduced the discipline, methodology, and subject matter of economics. We now begin the task of analyzing how a market economy actually works. This chapter and the next present an overview of the way individual markets work, introducing concepts used in both microeconomics and macroeconomics.

In the simple island society discussed in Chapter 2, Bill and Colleen solved the economic problem directly. They allocated their time and used the island's resources to satisfy their wants. Exchange occurred in a relatively simple way. In larger societies, with people typically operating at some distance from one another, exchange can be more complex. *Markets* are the institutions through which exchange typically takes place.

This chapter begins to explore the basic forces at work in market systems. How do the individual decisions of households and firms together, without any central planning or direction, answer the three basic questions: What gets produced? How is it produced? Who consumes what is produced?

CHAPTER OUTLINE AND LEARNING OBJECTIVES

3.1 LEARNING OBJECTIVE

Understand the roles of firms, entrepreneurs, and households in the market.

Firms and Households: The Basic Decision-Making Units

Throughout this book, we discuss and analyze the behavior of two fundamental decision-making units: *firms*—the primary producing units in an economy—and *households*—the consuming units in an economy. Firms and households are made up of people performing different functions and playing different roles. Economics is concerned with how those people behave, and the interaction among them.

firm An organization that comes into being when a person or a group of people decides to produce a good or service to meet a perceived demand.

A **firm** exists when a person or a group of people decides to produce a product or products by transforming *inputs*—that is, resources in the broadest sense—*into outputs*, the products that are sold in the market. Some firms produce goods; others produce services. Some are large, many are small, and some are in between. All firms exist to transform resources into goods and services that people want. The Colorado Symphony Orchestra takes labor, land, a building, musically talented people, instruments, and other inputs and combines them to produce concerts. The production process can be extremely complicated. For example, the first flautist in the orchestra combines training, talent, previous performance experience, score, instrument, conductor's interpretation, and personal feelings about the music to produce just one contribution to an overall performance.

Most firms exist to make a profit for their owners, but some do not. Columbia University, for example, fits the description of a firm: It takes inputs in the form of labor, land, skills, books, and buildings and produces a service that we call *education*. Although the university sells that service for a price, it does not exist to make a profit; instead, it exists to provide education and research of the highest quality possible.

Still, most firms exist to make a profit. They engage in production because they can sell their product for more than it costs to produce it. The analysis of a firm's behavior that follows rests on the assumption that *firms make decisions to maximize profits*. Sometimes firms suffer losses instead of earning profits. When firms suffer losses, we will assume that they act to minimize those losses.

entrepreneur A person who organizes, manages, and assumes the risks of a firm, taking a new idea or a new product and turning it into a successful business.

When a new firm is created, someone must organize the new firm, arrange financing, hire employees, and take risks. That person is an **entrepreneur**. Sometimes existing firms introduce new products, and sometimes new firms develop or improve on an old idea, but at the root of it all is entrepreneurship.

households The consuming units in an economy.

The consuming units in an economy are **households**. A household may consist of any number of people: a single person living alone, a married couple with four children, or 15 unrelated people sharing a house. Household decisions are based on individual tastes and preferences. The household buys what it wants and can afford. In a large, heterogeneous, and open society such as the United States, wildly different tastes find expression in the marketplace. A six-block walk in any direction on any street in Manhattan or a drive from the Chicago Loop south into rural Illinois should be enough to convince anyone that it is difficult to generalize about what people do and do not like.

Even though households have wide-ranging preferences, they also have some things in common. All—even the very rich—have ultimately limited incomes, and all must pay in some way for the goods and services they consume. Although households may have some control over their incomes—they can work more hours or fewer hours—they are also constrained by the availability of jobs, current wages, their own abilities, and their accumulated and inherited wealth (or lack thereof).

3.2 LEARNING OBJECTIVE

Understand the role of households as both suppliers to firms and buyers of what firms produce.

Input Markets and Output Markets: The Circular Flow

Households and firms interact in two basic kinds of markets: product (or output) markets and input (or factor) markets. Goods and services that are intended for use by households are exchanged in **product *or* output markets**. In output markets, firms *supply* and households *demand*.

product *or* output markets The markets in which goods and services are exchanged.

To produce goods and services, firms must buy resources in **input *or* factor markets**. Firms buy inputs from households, which supply these inputs. When a firm decides how much to produce (supply) in output markets, it must simultaneously decide how much of each input it

needs to produce the desired level of output. To produce smartphones Samsung and Apple need many inputs, including hardware and software and a variety of types of labor, both skilled and unskilled.

Figure 3.1 shows the *circular flow* of economic activity through a simple market economy. Note that the flow reflects the direction in which goods and services flow through input and output markets. For example, real goods and services flow from firms to households through output—or product—markets. Labor services flow from households to firms through input markets. Payment (most often in money form) for goods and services flows in the opposite direction.

In input markets, households *supply* resources. Most households earn their incomes by working—they supply their labor in the **labor market** to firms that demand labor and pay workers for their time and skills. Households may also loan their accumulated or inherited savings to firms for interest or exchange those savings for claims to future profits, as when a household buys shares of stock in a corporation. In the **capital market**, households supply the funds that firms use to buy capital goods. Households may also supply land or other real property in exchange for rent in the **land market**.

Inputs into the production process are also called **factors of production**. Land, labor, and capital are the three key factors of production. Throughout this text, we use the terms *input* and *factor of production* interchangeably. Thus, input markets and factor markets mean the same thing.

The supply of inputs and their prices ultimately determine household income. Thus, the amount of income a household earns depends on the decisions it makes concerning what types of inputs it chooses to supply. Whether to stay in school, how much and what kind of training

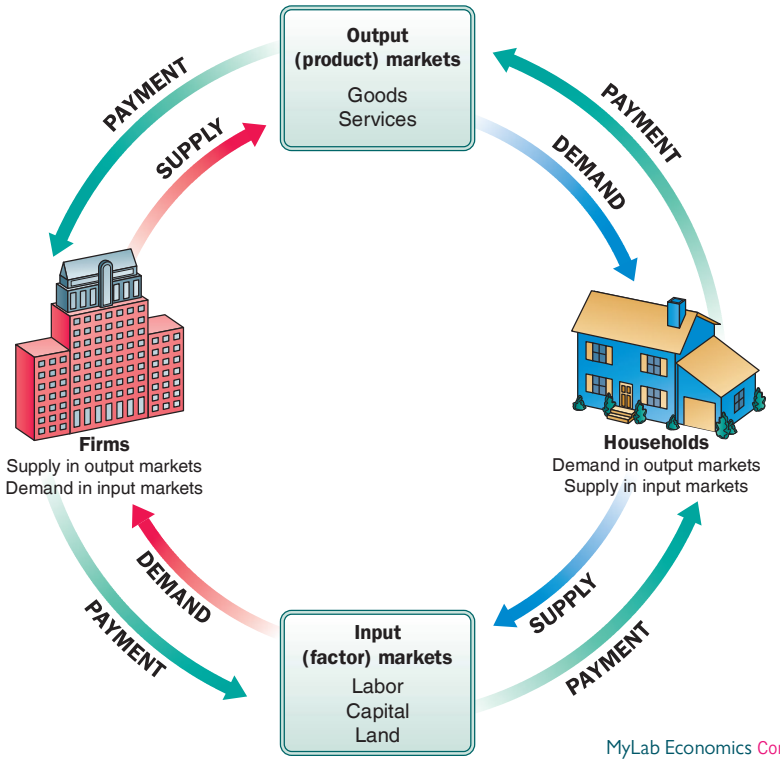
input *or* factor markets The markets in which the resources used to produce goods and services are exchanged.

labor market The input/factor market in which households supply work for wages to firms that demand labor.

capital market The input/factor market in which households supply their savings, for interest or for claims to future profits, to firms that demand funds to buy capital goods.

land market The input/factor market in which households supply land or other real property in exchange for rent.

factors of production The inputs into the production process. Land, labor, and capital are the three key factors of production.



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▲ FIGURE 3.1 The Circular Flow of Economic Activity

Diagrams like this one show the circular flow of economic activity, hence the name *circular flow diagram*. Here goods and services flow clockwise: Labor services supplied by households flow to firms, and goods and services produced by firms flow to households. Payment (usually money) flows in the opposite (counterclockwise) direction: Payment for goods and services flows from households to firms, and payment for labor services flows from firms to households.

Note: Color Guide–In Figure 3.1 households are depicted in *blue* and firms are depicted in *red*. From now on all diagrams relating to the behavior of households will be blue or shades of blue and all diagrams relating to the behavior of firms will be red or shades of red. The green color indicates a monetary flow.

to get, whether to start a business, how many hours to work, whether to work at all, and how to invest savings are all household decisions that affect income.

As you can see:

> Input and output markets are connected through the behavior of both firms and households. Firms determine the quantities and character of outputs produced and the types and quantities of inputs demanded. Households determine the types and quantities of products demanded and the quantities and types of inputs supplied.[1]

In 2018 a 12-pack of 12 oz. soda costs about $5, and many of you likely have one somewhere in your dormitory room. What determines the price of that soda? How can I explain how much soda you will buy in a given month or year? By the end of this chapter you will see the way in which prices in the market are determined by the interaction of buyers like you and suppliers like Coca-Cola and Pepsi. The model of supply and demand covered in this chapter is the most powerful tool of economics. By the time you finish this chapter we hope you will look at shopping in a different way.

3.3 LEARNING OBJECTIVE

Understand what determines the position and shape of the demand curve and what factors move you along a demand curve and what factors shift the demand curve.

Demand in Product/Output Markets

Every week you make hundreds of decisions about what to buy. Your choices likely look different from those of your friends or your parents. For all of you, however, the decision about what to buy and how much of it to buy ultimately depends on six factors:

- The *price of the product* in question.
- The *income available* to the household.
- The household's *amount of accumulated wealth.*
- The *prices of other products* available to the household.
- The household's *tastes and preferences.*
- The household's *expectations* about future income, wealth, and prices.

quantity demanded The amount (number of units) of a product that a household would buy in a given period if it could buy all it wanted at the current market price.

Quantity demanded is the amount (number of units) of a product that a household would buy in a given period *if it could buy all it wanted at the current market price.* Of course, the amount of a product that households finally purchase depends on the amount of product actually available in the market. The expression *if it could buy all it wanted* is critical to the definition of quantity demanded because it allows for the possibility that quantity supplied and quantity demanded are unequal.

Changes in Quantity Demanded versus Changes in Demand MyLab Economics Concept Check

In our list of what determines how much you buy of a product, the price of that product comes first. This is no accident. The most important relationship in individual markets is between market price and quantity demanded. So that is where we will start our work. In fact, we begin by looking at what happens to the quantity a typical individual demands of a product when all that changes is its price. Economists refer to this device as *ceteris paribus,* or "all else equal." We will be

[1]Our description of markets begins with the behavior of firms and households. Modern orthodox economic theory essentially combines two distinct but closely related theories of behavior. The "theory of household behavior," or "consumer behavior," has its roots in the works of nineteenth-century utilitarians such as Jeremy Bentham, William Jevons, Carl Menger, Leon Walras, Vilfredo Parcto, and F. Y. Edgeworth. The "theory of the firm" developed out of the earlier classical political economy of Adam Smith, David Ricardo, and Thomas Malthus. In 1890, Alfred Marshall published the first of many editions of his *Principles of Economics.* That volume pulled together the main themes of both the classical economists and the utilitarians into what is now called *neoclassical economics.* Although there have been many changes over the years, the basic structure of the model that we build can be found in Marshall's work.

looking at the relationship between quantity demanded of a good by an individual or household when its price changes, holding income, wealth, other prices, tastes, and expectations constant. If the price of that 12-pack of soda were cut in half, how many more cases would you buy in a given week?

In thinking about this question it is important to focus on the price change alone and to maintain the all else equal assumption. If next week you suddenly found yourself with more money than you expected (perhaps a windfall from an aunt), you might well find yourself buying an extra 12-pack of soda even if the price did not change at all. To be sure that we distinguish clearly between changes in price and other changes that affect demand, throughout the rest of the text we will be precise about terminology. Specifically:

Changes in the price of a product affect the *quantity demanded* per period. Changes in any other factor, such as income or preferences, affect *demand*. Thus, we say that an increase in the price of Coca-Cola is likely to cause a decrease in the *quantity of Coca-Cola demanded*. However, we say that an increase in income is likely to cause an increase in the *demand* for most goods.

Price and Quantity Demanded: The Law of Demand MyLab Economics Concept Check

demand schedule Shows how much of a given product a household would be willing to buy at different prices for a given time period.

A **demand schedule** shows how much of a product a person or household is willing to purchase per time period (each week or each month) at different prices. Clearly that decision is based on numerous interacting factors. Consider Alex who just graduated from college with an entry-level job at a local bank. During her senior year, Alex got a car loan and bought a used Mini Cooper. The Mini gets 25 miles per gallon of gasoline. Alex lives with several friends in a house 10 miles from her workplace and enjoys visiting her parents 50 miles away.

How often Alex will decide to drive herself to work and parties, visit her family, or even go joy riding depends on many things, including her income and whether she likes to drive. But the price of gasoline also plays an important role, and it is this relationship between price and quantity demanded that we focus on in the law of demand. With a gasoline price of $3.00 a gallon, Alex might decide to drive herself to work every day, visit her parents once a week, and drive another 50 miles a week for other activities. This driving pattern would add up to 250 miles a week, which would use 10 gallons of gasoline in her Mini. The demand schedule in Table 3.1 thus shows that at a price of $3.00 per gallon, Alex is willing to buy 10 gallons of gasoline. We can see that this demand schedule reflects a lot of information about Alex including where she lives and works and what she likes to do in her spare time.

Now suppose an international crisis in the Middle East causes the price of gasoline at the pump to rise to $5.00 per gallon. How does this affect Alex's demand for gasoline, assuming that everything else remains the same? Driving is now more expensive, and we would not be surprised if Alex decided to take the bus some mornings or share a ride with friends. She might visit her parents less

TABLE 3.1 Alex's Demand Schedule for Gasoline

Price (per Gallon)	Quantity Demanded (Gallons per Week)
$ 8.00	0
7.00	2
6.00	3
5.00	5
4.00	7
3.00	10
2.00	14
1.00	20
0.00	26

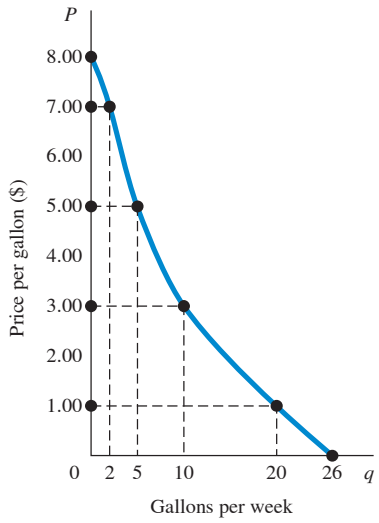

FIGURE 3.2 Alex's Demand Curve
The relationship between price (P) and quantity demanded (q) presented graphically is called a demand curve. Demand curves have a negative slope, indicating that lower prices cause quantity demanded to increase. Note that Alex's demand curve is blue; demand in product markets is determined by household choice.

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frequently as well. On the demand schedule given in Table 3.1, Alex cuts her desired consumption of gasoline by half to 5 gallons when the price goes to $5.00. If, instead, the price of gasoline fell substantially, Alex might spend more time driving, and that is in fact the pattern we see in the table. This same information presented graphically is called a **demand curve**. Alex's demand curve is presented in Figure 3.2. You will note in Figure 3.2 that *quantity* (q) is measured along the horizontal axis and *price* (P) is measured along the vertical axis. This is the convention we follow throughout this book.

demand curve A graph illustrating how much of a given product a household would be willing to buy at different prices.

Demand Curves Slope Downward The data in Table 3.1 show that at lower prices, Alex buys more gasoline; at higher prices, she buys less. Thus, there is a *negative, or inverse, relationship between quantity demanded and price*. When price rises, quantity demanded falls, and when price falls, quantity demanded rises. Thus, demand curves always slope downward. This negative relationship between price and quantity demanded is often referred to as the **law of demand**, a term first used by economist Alfred Marshall in his 1890 textbook.

law of demand The negative relationship between price and quantity demanded: *Ceteris paribus*, as price rises, quantity demanded decreases; as price falls, quantity demanded increases during a given period of time, all other things remaining constant.

Some people are put off by the abstraction of demand curves. Of course, we do not actually draw our own demand curves for products. When we want to make a purchase, we usually face only a single price and how much we would buy at other prices is irrelevant. However, demand curves help analysts understand the kind of behavior that households are *likely* to exhibit if they are actually faced with a higher or lower price. We know, for example, that if the price of a good rises enough, the quantity demanded must ultimately drop to zero. The demand curve is thus a tool that helps us explain economic behavior and predict reactions to possible price changes.

Marshall's definition of a social "law" captures the idea:

> The term "law" means nothing more than a general proposition or statement of tendencies, more or less certain, more or less definite…a *social law* is a statement of social tendencies; that is, that a certain course of action may be expected from the members of a social group under certain conditions.[2]

It seems reasonable to expect that consumers will demand more of a product at a lower price and less of it at a higher price. Households must divide their incomes over a wide range of goods and services. At $3.00 per gallon and 25 miles to a gallon, driving the 20 miles round trip to work costs Alex $2.40. It may look like a good deal relative to taking a bus. At $5.00 per gallon, the trip now costs $4.00. With the higher prices, Alex may have to give up her morning latte if she drives, and that may turn out to be too big a sacrifice for her. Now the bus may look better. As the price of gasoline rises, the opportunity cost of driving in terms of other types of consumption also rises and that is why Alex ends up driving less as the price of gasoline rises. Goods compete with one another for our spending.

[2]Alfred Marshall, *Principles of Economics*, 8th ed. (New York: Macmillan, 1948), p. 33. (The first edition was published in 1890.)

Economists use the concept of *utility* to explain the slope of the demand curve. We consume goods and services because they give us utility or satisfaction. As we consume more of a product within a given period of time, it is likely that each additional unit consumed will yield successively less satisfaction. The utility you gain from a second ice cream cone is likely to be less than the utility you gained from the first, the third is worth even less, and so on. This *law of diminishing marginal utility* is an important concept in economics. If each successive unit of a good is worth less to you, you are not going to be willing to pay as much for it. Thus, it is reasonable to expect a downward slope in the demand curve for that good.

Thinking about the ways that people are affected by price changes also helps us see what is behind the law of demand. Consider this example: Rosa lives and works in Mexico City. Her elderly mother lives in Santiago, Chile. Last year the airlines servicing South America got into a price war, and the price of flying between Mexico City and Santiago dropped from 20,000 pesos to 10,000 pesos. How might Rosa's behavior change?

First, she is better off. Last year Rosa flew home to Chile three times at a total cost of 60,000 pesos. This year she can fly to Chile the same number of times, buy exactly the same combination of other goods and services that she bought last year, and have 30,000 pesos left over. Because Rosa is better off—her income can buy more—she may fly home more frequently. Second, the opportunity cost of flying home has changed. Before the price war, Rosa had to sacrifice 20,000 pesos worth of other goods and services each time she flew to Chile. After the price war, she must sacrifice only 10,000 pesos worth of other goods and services for each trip. The trade-off has changed. Both of these effects are likely to lead to a higher quantity demanded in response to the lower price.

In sum:

It is reasonable to expect quantity demanded to fall when price rises, *ceteris paribus*, and to expect quantity demanded to rise when price falls, *ceteris paribus*. Demand curves have a negative slope.

Other Properties of Demand Curves Two additional things are notable about Alex's demand curve. First, it intersects the *Y*, or price, axis. This means that there is a price above which she buys no gasoline. In this case, Alex simply stops driving when the price reaches $8 per gallon. As long as households have limited incomes and wealth, all demand curves will intersect the price axis. For any commodity, there is always a price above which a household will not or cannot pay. Even if the good or service is important, all households are ultimately constrained, or limited, by income and wealth.

Second, Alex's demand curve intersects the *X*, or quantity, axis. Even at a zero price, there is a limit to how much she will drive. If gasoline were free, she would use 26 gallons, but not more. That demand curves intersect the quantity axis is a matter of common sense. Demand in a given period of time is limited, if only by time, even at a zero price.

To summarize what we know about the shape of demand curves:

1. They have a negative slope. An increase in price is likely to lead to a decrease in quantity demanded, and a decrease in price is likely to lead to an increase in quantity demanded.
2. They intersect the quantity (*X*) axis, a result of time limitations and diminishing marginal utility.
3. They intersect the price (*Y*) axis, a result of limited income and wealth.

That is all we can say; it is not possible to generalize further. The actual shape of an individual household demand curve—whether it is steep or flat, whether it is bowed in or bowed out—depends on the unique tastes and preferences of the household and other factors. Some households may be sensitive to price changes; other households may respond little to a change in price. In some cases, plentiful substitutes are available; in other cases, they are not. Thus, to fully understand the shape and position of demand curves, we must turn to the other determinants of household demand.

Other Determinants of Household Demand MyLab Economics Concept Check

Of the many factors likely to influence a household's demand for a specific product, we have considered only the price of the product. But household income and wealth, the prices of other goods and services, tastes and preferences, and expectations also matter to demand.

Income and Wealth Before we proceed, we need to define two terms that are often confused, *income* and *wealth*. A household's **income** is the sum of all the wages, salaries, profits, interest payments, rents, and other forms of earnings received by the household *in a given period of time*. Income is thus a *flow* measure: We must specify a time period for it—income *per month* or *per year*. You can spend or consume more or less than your income in any given period. If you consume less than your income, you save. To consume more than your income in a period, you must either borrow or draw on savings accumulated from previous periods.

income The sum of all a household's wages, salaries, profits, interest payments, rents, and other forms of earnings in a given period of time. It is a flow measure.

Wealth is the total value of what a household owns minus what it owes. Another word for wealth is **net worth**—the amount a household would have left if it sold all of its possessions and paid all of its debts. Wealth is a *stock* measure: It is measured at a given point in time. If, in a given period, you spend less than your income, you save; the amount that you save is added to your wealth. Saving is the flow that affects the stock of wealth. When you spend more than your income, you *dissave*—you reduce your wealth.

wealth *or* net worth The total value of what a household owns minus what it owes. It is a stock measure.

Households with higher incomes and higher accumulated savings or inherited wealth can afford to buy more goods and services. In general, we would expect higher demand at higher levels of income/wealth and lower demand at lower levels of income/wealth. Goods for which demand goes up when income is higher and for which demand goes down when income is lower are called **normal goods**. Movie tickets, restaurant meals, and shirts are all normal goods.

normal goods Goods for which demand goes up when income is higher and for which demand goes down when income is lower.

However, generalization in economics can be hazardous. Sometimes demand for a good falls when household income rises. When a household's income rises, it is likely to buy higher-quality meats—its demand for filet mignon is likely to rise—but its demand for lower-quality meats—chuck steak, for example—might fall. At higher incomes, people can afford to fly. People who can afford to fly are less likely to take the bus long distances. Thus, higher income may *reduce* the number of times someone takes a bus. Goods for which demand tends to fall when income rises are called **inferior goods**.

inferior goods Goods for which demand tends to fall when income rises.

Prices of Other Goods and Services No consumer decides in isolation on the amount of any one commodity to buy. Instead, each decision is part of a larger set of decisions that are made simultaneously. Households must apportion their incomes over many different goods and services. As a result, the price of any one good can and does affect the demand for other goods. This is most obviously the case when goods are substitutes for one another. For Alex the bus is an alternative that she uses when gasoline gets expensive.

When an *increase* in the price of one good causes demand for another good to *increase* (a positive relationship), we say that the goods are **substitutes**. A *fall* in the price of a good causes a *decline* in demand for its substitutes. Substitutes are goods that can serve as replacements for one another.

substitutes Goods that can serve as replacements for one another; when the price of one increases, demand for the other increases.

To be substitutes, two products do not need to be identical. Identical products are called **perfect substitutes**. Japanese cars are not identical to American cars. Nonetheless, all have four wheels, are capable of carrying people, and use fuel. Thus, significant changes in the price of one country's cars can be expected to influence demand for the other country's cars. Restaurant meals are substitutes for meals eaten at home, and flying from New York to Washington, D.C., is a substitute for taking the train. The *Economics in Practice* box describes substitution in the textbook market.

perfect substitutes Identical products.

Often two products "go together"—that is, they complement each other. Bacon and eggs are **complementary goods**, as are cars and gasoline. When two goods are **complements**, a *decrease* in the price of one results in an *increase* in demand for the other and vice versa. For iPads and Kindles, for example, the availability of content at low prices stimulates demand for the devices.

complements, complementary goods Goods that "go together"; a decrease in the price of one results in an increase in demand for the other and vice versa.

Tastes and Preferences Income, wealth, and prices of goods available are the three factors that determine the combinations of goods and services that a household is *able* to buy. You know that you cannot afford to rent an apartment at $1,200 per month if your monthly income is only

ECONOMICS IN PRACTICE

Have You Bought This Textbook?

As all of you know full well, college textbooks are expensive. At first, it may seem as though there are few substitutes available for the cash-strapped undergraduate. After *all*, if your professor assigns Smith's *Principles of Biology* to you, you cannot go out and see if Jones' *Principles of Chemistry* is perhaps cheaper and buy it instead. As it turns out, as some recent work by Judy Chevalier and Austan Goolsbee[1] discovered, even when instructors require particular texts, when prices are high students have found substitutes. Even in the textbook market student demand does slope down!

Chevalier and Goolsbee collected data on textbooks from more than 1600 colleges for the years 1997–2001 to do their research. For that period, the lion's share of both new and used college textbooks was sold in college bookstores. Next, they looked at class enrollments for each college in the large majors: economics, biology, and psychology. In each of those classes they were able to learn which textbook had been assigned. At first, one might think that the total number of textbooks, used plus new, should match the class enrollment. After all, the text is required! In fact, what they found was the higher the textbook price, the more text sales fell below class enrollments.

So what substitutes did students find for the required text? While the paper has no hard evidence on this, students themselves gave them lots of suggestions. Many decide to share books with roommates. Others use the library more. These solutions are not perfect, but when the price is high enough, students find it worth their while to walk to the library!

CRITICAL THINKING

1. If you were to construct a demand curve for a required text in a course, where would that demand curve intersect the horizontal axis?
2. And this much harder question: In the year before a new edition of a text is published, many college bookstores will not buy the older edition. Given this *fact*, what do you think happens to the gap between enrollments and new plus used book sales in the year before a new edition of a text is expected?

[1] Judith Chevalier and Austan Goolsbee, "Are Durable Goods Consumers Forward Looking? Evidence From College Textbooks," *Quarterly Journal of Economics*, 2009: 1853–1884.

$400, but within these constraints, you are more or less free to choose what to buy. Your final choice depends on your individual tastes and preferences.

Changes in preferences can and do manifest themselves in market behavior. Thirty years ago the major big-city marathons drew only a few hundred runners. Now tens of thousands enter and run. The demand for running shoes, running suits, stopwatches, and other running items has greatly increased.

Within the constraints of prices and incomes, preference shapes the demand curve, but it is difficult to generalize about tastes and preferences. First, they are volatile: Five years ago more people smoked cigarettes and fewer people had smartphones. Second, tastes are idiosyncratic: Some people like to text, whereas others still prefer to use e-mail; some people prefer dogs, whereas others are crazy about cats. The diversity of individual demands is almost infinite.

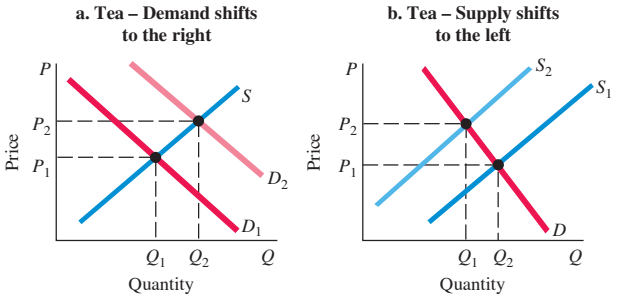
One of the interesting questions in economics is why, in some markets, diverse consumer tastes give rise to a variety of styles, whereas in other markets, despite a seeming diversity in tastes, we find only one or two varieties. All sidewalks in the United States are a similar gray color, yet houses are painted a rainbow of colors. Yet it is not obvious on the face of it that people would not prefer as much variety in their sidewalks as in their houses. To answer this type of question, we need to move beyond the demand curve. We will revisit this question in a later chapter.

ECONOMICS IN PRACTICE

People Drink Tea on Rainy Days

Tea is a popular beverage in many parts of the world, especially during rainy seasons. This is because tea, having curative properties like flavonoids and polyphenols for typical ailments like headaches, sore throat, fevers and colds, is associated with a "healthy" brand value.[1]

Changes in factors like awareness, income, and prices of other goods causes demand to change. Variations in cost of production, climatic conditions, technologies, or prices of related goods causes supply to change. As a result, any changes in demand or supply may cause a change in equilibrium price. As such, an increase in demand or a fall in supply can increase the equilibrium price. So how does an increase in demand cause an increase in the equilibrium price? The demand for tea increases through an increased awareness of its positive attributes, resulting in a rightward shift of the demand curve. At the initial equilibrium price, quantity demanded exceeds quantity supplied; hence, the price tends to rise. With rising prices, quantity demanded falls while quantity supplied increases, until a new equilibrium is reached, where quantity demanded equals quantity supplied (Figure a). A decrease in supply causes the equilibrium price to increase. Based on reports, supply may decrease due to adverse weather conditions, a decline in tea leaf production, increased costs of field and factory inputs, and other factors.[2] These determinants shift the supply curve to the left. At the initial equilibrium price, quantity demanded is higher than quantity supplied and price rises (Figure b).



While tea has become a common health drink, only the countries with suitable climatic conditions can grow tea leaves. Therefore, it is most likely that the fall in supply outweighs the increase in demand. This leads to an increase in equilibrium price but a decrease in equilibrium quantity.

CRITICAL THINKING

1. When demand and supply curves shift simultaneously, what are the factors that would determine the direction of the change in equilibrium price and quantity?

[1] Marcia Da Silva Pinto, "Tea: A New Perspective on Health Benefits," *Food Research International*, 558–567, October, 2013.
[2] BS reporter, "Tea Prices Set to Increase on Lower Production," *Business Standard*, June, 2014.

Expectations What you decide to buy today certainly depends on today's prices and your current income and wealth. You also have expectations about what your position will be in the future. You may have expectations about future changes in prices too, and these may affect your decisions today.

There are many examples of the ways expectations affect demand. When people buy a house or a car, they often must borrow part of the purchase price and repay it over a number of years. In deciding what kind of house or car to buy, they presumably must think about their income today, as well as what their income is likely to be in the future.

As another example, consider a student in the final year of medical school living on a scholarship of $25,000. Compare that student with another person earning $12 an hour at a full-time job, with no expectation of a significant change in income in the future. The two have virtually identical incomes. But even if they have the same tastes, the medical student is likely to demand different goods and services, simply because of the expectation of a major increase in income later on.

Increasingly, economic theory has come to recognize the importance of expectations. We will devote a good deal of time to discussing how expectations affect more than just demand. For the time being, however, it is important to understand that demand depends on more than just *current* incomes, prices, and tastes.

TABLE 3.2 Shift of Alex's Demand Schedule Resulting from an Increase in Income

Price (per Gallon)	Schedule D_0: Quantity Demanded (Gallons per Week at an Income of $500 per Week)	Schedule D_1: Quantity Demanded (Gallons per Week at an Income of $700 per Week)
$ 8.00	0	3
7.00	2	5
6.00	3	7
5.00	5	10
4.00	7	12
3.00	10	15
2.00	14	19
1.00	20	24
0.00	26	30

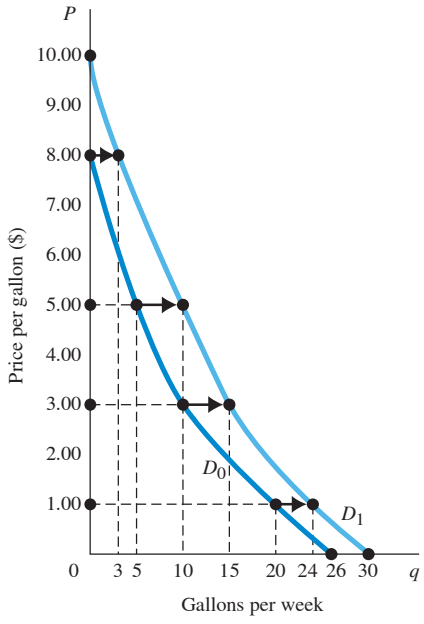
Shift of Demand versus Movement along a Demand Curve MyLab Economics Concept Check

Recall that a demand curve shows the relationship between quantity demanded and the price of a good. Demand curves are constructed while holding income, tastes, and other prices constant. If income, tastes, or other prices change, we would have to derive an entirely new relationship between price and quantity.

Let us return once again to Alex. (See Table 3.1 and Figure 3.2 on pp. 73 and 74.) Suppose that when we derived the demand curve in Figure 3.2 Alex was receiving a salary of $500 per week after taxes. If Alex faces a price of $3.00 per gallon and chooses to drive 250 miles per week, her total weekly expenditure works out to be $3.00 per gallon times 10 gallons or $30 per week. That amounts to 6.0 percent of her income.

Suppose now she were to receive a raise to $700 per week after taxes. Alex's higher income may well raise the amount of gasoline being used by Alex *regardless* of what she was using before. The new situation is listed in Table 3.2 and graphed in Figure 3.3. Notice in Figure 3.3 that Alex's entire curve has shifted to the right—at $3.00 a gallon the curve shows an increase in the quantity demanded from 10 to 15 gallons. At $5.00, the quantity demanded by Alex increases from 5 gallons to 10 gallons.

The fact that demand *increased* when income increased implies that gasoline is a *normal good* to Alex.



MyLab Economics Concept Check

FIGURE 3.3 Shift of a Demand Curve Following a Rise in Income
When the price of a good changes, we move *along* the demand curve for that good. When any other factor that influences demand changes (income, tastes, and so on), the demand curve shifts, in this case from D_0 to D_1. Gasoline is a normal good so an income increase shifts the curve to the right.

shift of a demand curve The change that takes place in a demand curve corresponding to a new relationship between quantity demanded of a good and price of that good. The shift is brought about by a change in the original conditions.

movement along a demand curve The change in quantity demanded brought about by a change in price.

The conditions under which we drew Alex's original demand curve have now changed. One of the factors affecting Alex's demand for gasoline (in this case, her income) has changed, creating a new relationship between price and quantity demanded. This is referred to as a **shift of a demand curve**.

It is important to distinguish between a change in quantity demanded—that is, some movement *along* a demand curve—and a shift of demand. Demand schedules and demand curves show the relationship between the price of a good or service and the quantity demanded per period, *ceteris paribus*. If price changes, quantity demanded will change—this is a **movement along a demand curve**. When any of the *other* factors that influence demand change, however, a new relationship between price and quantity demanded is established—this is a *shift of a demand curve*. The result, then, is a *new demand curve*. Changes in income, preferences, or prices of other goods cause a demand curve to shift:

Change in price of a good or service leads to
→ change in *quantity demanded* (**movement along a demand curve**).

Change in income, preferences, or prices of other goods or services leads to
→ change in *demand* (**shift of a demand curve**).

Figure 3.4 illustrates the differences between movement along a demand curve and shifting demand curves. In Figure 3.4(a), an increase in household income causes demand for hamburger (an inferior good) to decline, or shift to the left from D_0 to D_1. (Because quantity is measured on the horizontal axis, a decrease means a *shift to the left*.) In contrast, demand for steak (a normal good) increases, or *shifts to the right*, when income rises.

In Figure 3.4(b), an increase in the price of hamburger from $1.49 to $3.09 a pound causes a household to buy less hamburger each month. In other words, the higher price causes the *quantity demanded* to decline from 10 pounds to 5 pounds per month. This change represents a movement *along* the demand curve for hamburger. In place of hamburger, the household buys more chicken. The household's demand for chicken (a substitute for hamburger) rises—the demand curve shifts to the right. At the same time, the demand for ketchup (a good that complements hamburger) declines—its demand curve shifts to the left.

From Household Demand to Market Demand

MyLab Economics Concept Check

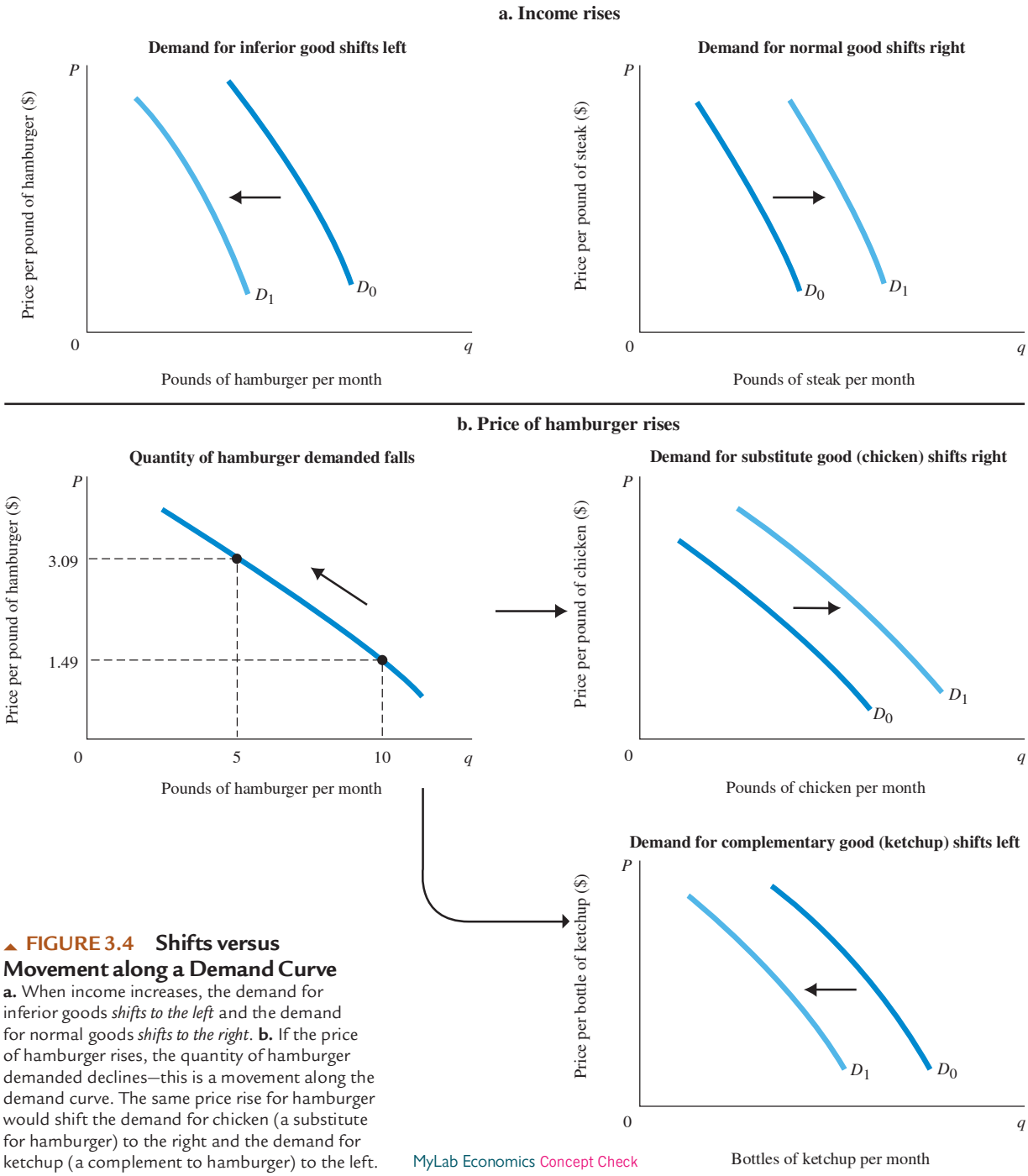
So far we have been talking about what determines an individual's demand for a product. We ask the question: How many 12-packs of soda are you willing to buy per week when the price of that 12-pack is $5. This is a question you answer often in your life, whenever you go to the local store. We see the answer depends on how much money you have, how much you like soda, and what else is available to you at what price. Next time you go to the store and see a price change, we hope you think a bit more about your buying reaction.

Individual reactions to price changes are interesting, especially to the individual. But for us to be able to say something more general about prices in the market, we need to know about market demand.

market demand The sum of all the quantities of a good or service demanded per period by all the households buying in the market for that good or service.

Market demand is simply the sum of all the quantities of a good or service demanded per period by all the households buying in the market for that good or service. Figure 3.5 shows the derivation of a market demand curve from three individual demand curves. (Although this market demand curve is derived from the behavior of only three people, most markets have thousands, or even millions of demanders.) As the table in Figure 3.5 shows, when the price of a pound of coffee is $3.50, both household A and household C would purchase 4 pounds per month, while household B would buy none. At that price, presumably, B drinks tea or water. Market demand at $3.50 would thus be a total of 4 + 4, or 8 pounds. At a price of $1.50 per pound, however, A would purchase 8 pounds per month; B, 3 pounds; and C, 9 pounds. Thus, at $1.50 per pound, market demand would be 8 + 3 + 9, or 20 pounds of coffee per month.

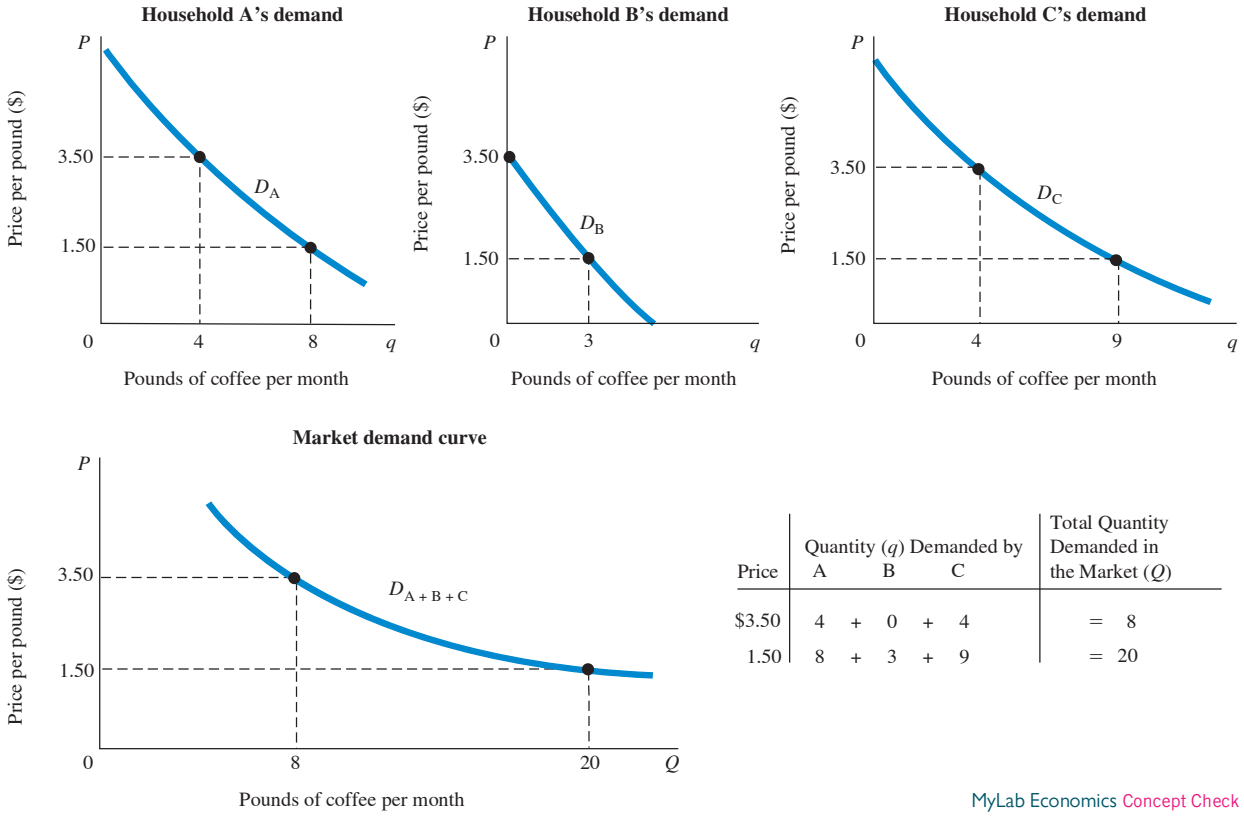
The total quantity demanded in the marketplace at a given price is the sum of all the quantities demanded by all the individual households shopping in the market *at that price*.



▲ **FIGURE 3.4 Shifts versus Movement along a Demand Curve**
a. When income increases, the demand for inferior goods *shifts to the left* and the demand for normal goods *shifts to the right*. **b.** If the price of hamburger rises, the quantity of hamburger demanded declines—this is a movement along the demand curve. The same price rise for hamburger would shift the demand for chicken (a substitute for hamburger) to the right and the demand for ketchup (a complement to hamburger) to the left.

MyLab Economics Concept Check

A market demand curve shows the total amount of a product that would be sold at each price if households could buy all they wanted at that price. As Figure 3.5 shows, the market demand curve is the sum of all the individual demand curves—that is, the sum of all the individual quantities demanded at each price. Thus, the market demand curve takes its shape and position from the shapes, positions, and number of individual demand curves. If more people are in a market, more demand curves must be added and the market demand curve will shift to the right. Market demand curves may also shift as a result of preference changes, income changes, or changes in the price of substitutes or complements.



Price	Quantity (q) Demanded by A	B	C	Total Quantity Demanded in the Market (Q)
$3.50	4	+ 0	+ 4	= 8
1.50	8	+ 3	+ 9	= 20

MyLab Economics Concept Check

▲ **FIGURE 3.5 Deriving Market Demand from Individual Demand Curves**
Total demand in the marketplace is simply the sum of the demands of all the households shopping in a particular market. It is the sum of all the individual demand curves—that is, the sum of all the individual quantities demanded at each price.

As a general rule throughout this book, capital letters refer to the entire market and lowercase letters refer to individual households or firms. Thus, in Figure 3.5, Q refers to total quantity demanded in the market, while q refers to the quantity demanded by individual households.

An interesting feature of the demand curve in Figure 3.5 is that at different prices, the *type* of people demanding the product may change. When Apple halved the price of its iPhone in fall 2007, it announced that it wanted to make the iPhone available to a broader group of people. When prices fall, people like those in household B in Figure 3.5 move into markets that are otherwise out of their reach. When Apple introduced a new, improved, but much more expensive iPhone in 2018, its first sales were likely made to people who both had more resources and were more tech-savvy than the average, older model iPhone user. Early adopters of products often look different from later users.

3.4 LEARNING OBJECTIVE

Be able to distinguish between forces that shift a supply curve and changes that cause a movement along a supply curve.

Supply in Product/Output Markets

We began our exploration of supply and demand some pages back with a simple question: Why is the average price of a 12-pack of soda $5 in 2018? So far we have seen one side of the answer: Given the tastes, incomes, and substitute products available in the United States, there are a lot of people willing to pay at least $5 for a 12-pack of soda! Now we turn to the other half of the market: How can we understand the behavior of the many firms selling that soda? What determines their willingness to sell soda? We refer to this as the supply side of the market.

Firms build factories, hire workers, and buy raw materials because they believe they can sell the products they make for more than it costs to produce them. In other words, firms supply goods and services like soda because they believe it will be profitable to do so. Supply decisions thus depend on profit potential. Because **profit** is the difference between revenues and costs, supply is likely to react to changes in revenues and changes in production costs. If the prices of soda are high, each 12-pack produces more revenue for suppliers because revenue is simply price per unit times units sold. So, just as in the case of buyers, the price will be important in explaining the behavior of suppliers in a market. It also typically costs suppliers something to produce whatever product they are bringing to market. They have to hire workers, build factories, and buy inputs. So the supply behavior of firms will also depend on costs of production.

profit The difference between total revenue and total cost.

In later chapters, we will focus on how firms decide *how* to produce their goods and services and explore the cost side of the picture more formally. For now, we will begin our examination of firm behavior by focusing on the output supply decision and the relationship between quantity supplied and output price, *ceteris paribus*.

Price and Quantity Supplied: The Law of Supply MyLab Economics Concept Check

Quantity supplied is the amount of a particular product that firms would be willing and able to offer for sale at a particular price during a given time period. A **supply schedule** shows how much of a product firms will sell at alternative prices.

quantity supplied The amount of a particular product that a firm would be willing and able to offer for sale at a particular price during a given time period.

supply schedule Shows how much of a product firms will sell at alternative prices.

Let us look at an agricultural market as an example. Table 3.3 itemizes the quantities of soybeans that an individual representative farmer such as Clarence Brown might sell at various prices. If the market paid $1.50 or less for a bushel for soybeans, Brown would not supply any soybeans: When Farmer Brown looks at the costs of growing soybeans, including the opportunity cost of his time and land, $1.50 per bushel will not compensate him for those costs. At $1.75 per bushel, however, at least some soybean production takes place on Brown's farm, and a price increase from $1.75 to $2.25 per bushel causes the quantity supplied by Brown to increase from 10,000 to 20,000 bushels per year. The higher price may justify shifting land from wheat to soybean production or putting previously fallow land into soybeans, or it may lead to more intensive farming of land already in soybeans, using expensive fertilizer or equipment that was not cost-justified at the lower price.

Generalizing from Farmer Brown's experience, we can reasonably expect an increase in market price, *ceteris paribus*, to lead to an increase in quantity supplied for Brown and farmers like him. In other words, there is a positive relationship between the quantity of a good supplied and price. This statement sums up the **law of supply**: An increase in market price will lead to an increase in quantity supplied, and a decrease in market price will lead to a decrease in quantity supplied.

law of supply The positive relationship between price and quantity of a good supplied: An increase in market price, *ceteris paribus*, will lead to an increase in quantity supplied, and a decrease in market price will lead to a decrease in quantity supplied.

The information in a supply schedule may be presented graphically in a **supply curve**. Supply curves slope upward. The upward, or positive, slope of Brown's curve in Figure 3.6 reflects this positive relationship between price and quantity supplied.

supply curve A graph illustrating how much of a product a firm will sell at different prices.

Note in Brown's supply schedule, however, that when price rises from $4 to $5, quantity supplied no longer increases. Often an individual firm's ability to respond to an increase in price is constrained by its existing scale of operations, or capacity, in the short run. For example, Brown's ability to produce more soybeans depends on the size of his farm, the fertility of his soil, and the types of equipment he has. The fact that output stays constant at 45,000 bushels per year suggests that he is running up against the limits imposed by the size of his farm, the quality of his soil, and his existing technology.

TABLE 3.3 Clarence Brown's Supply Schedule for Soybeans

Price (per Bushel)	Quantity Supplied (Bushels per Year)
$ 1.50	0
1.75	10,000
2.25	20,000
3.00	30,000
4.00	45,000
5.00	45,000

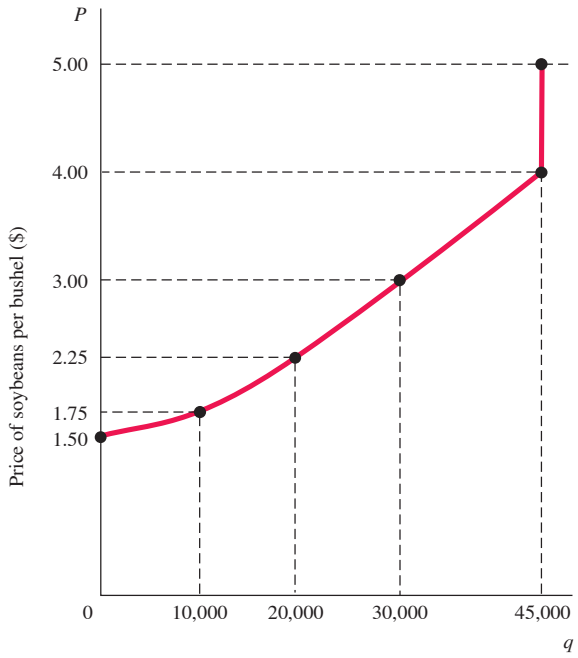


FIGURE 3.6 Clarence Brown's Individual Supply Curve
A producer will supply more when the price of output is higher. The slope of a supply curve is positive. Note that the supply curve is red: Supply is determined by choices made by firms.

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In the longer run, however, Brown may acquire more land or technology may change, allowing for more soybean production. The terms *short run and long run* have precise meanings in economics; we will discuss them in detail later. Here, it is important only to understand that time plays a critical role in supply decisions. When prices change, firms' immediate response may be different from what they are able to do after a month or a year. Short-run and long-run supply curves are often different.

Other Determinants of Supply MyLab Economics Concept Check

Of the factors we have listed that are likely to affect the quantity of output supplied by a given firm, we have thus far discussed only the price of output. Other factors that affect supply include the cost of producing the product and the prices of related products.

The Cost of Production For a firm to make a profit, its revenue must exceed its costs. As an individual producer, like Farmer Brown, thinks about how much to supply at a particular price, the producer will be looking at his or her costs. Brown's supply decision is likely to change in response to changes in the cost of production. Cost of production depends on a number of factors, including the available technologies and the prices and quantities of the inputs needed by the firm (labor, land, capital, energy, and so on).

Technological change can have an enormous impact on the cost of production over time. The introduction of fertilizers, the development of complex farm machinery, and the use of bioengineering to increase the yield of individual crops have all powerfully affected the cost of producing agricultural products. Technology has similarly decreased the costs of producing flat screen televisions. When a technological advance lowers the cost of production, output is likely to increase. When yield per acre increases, individual farmers can and do produce more. The production of electronic calculators, and later personal computers and smartphones, boomed with the development of inexpensive techniques to produce microprocessors.

Cost of production is also directly affected by the price of the factors of production. In the spring of 2008, the world price of oil rose to more than $100 per barrel from below $20 in 2002. As a result, cab drivers faced higher gasoline prices, airlines faced higher fuel costs, and manufacturing firms faced higher heating bills. The result: Cab drivers probably spent less time driving around looking for customers, airlines cut a few low-profit routes, and some manufacturing

plants stopped running extra shifts. The moral of this story: Increases in input prices raise costs of production and are likely to reduce supply. The reverse occurred in 2009–2010 when oil prices fell back to $75 per barrel and more recently in 2014–2015 when oil prices again fell.

The Prices of Related Products Firms often react to changes in the prices of related products. For example, if land can be used for either corn or soybean production, an increase in soybean prices may cause individual farmers to shift acreage out of corn production into soybeans. Thus, an increase in soybean prices actually affects the amount of corn supplied.

Similarly, if beef prices rise, producers may respond by raising more cattle. However, leather comes from cowhide. Thus, an increase in beef prices may actually increase the supply of leather.

To summarize:

Assuming that its objective is to maximize profits, a firm's decision about what quantity of output, or product, to supply depends on:

1. The price of the good or service.
2. The cost of producing the product, which in turn depends on:
   - the price of required inputs (labor, capital, and land), and
   - the technologies that can be used to produce the product.
3. The prices of related products.

Shift of Supply versus Movement along a Supply Curve MyLab Economics Concept Check

A supply curve shows the relationship between the quantity of a good or service supplied by a firm and the price that good or service brings in the market. Higher prices are likely to lead to an increase in quantity supplied, *ceteris paribus*. Remember: The supply curve is derived holding everything constant except price. When the price of a product changes *ceteris paribus*, a change in the quantity supplied follows—that is, a **movement along a supply curve** takes place. As you have seen, supply decisions are also influenced by factors other than price. New relationships between price and quantity supplied come about when factors other than price change, and the result is a **shift of a supply curve**. When factors other than price cause supply curves to shift, we say that there has been a *change in supply*.

movement along a supply curve The change in quantity supplied brought about by a change in price.

shift of a supply curve The change that takes place in a supply curve corresponding to a new relationship between quantity supplied of a good and the price of that good. The shift is brought about by a change in the original conditions.

Recall that the cost of production depends on the price of inputs and the technologies of production available. Now suppose that a major breakthrough in the production of soybeans has occurred: Genetic engineering has produced a superstrain of disease- and pest-resistant seed. Such a technological change would enable individual farmers to supply more soybeans at *any* market price. Table 3.4 and Figure 3.7 describe this change. At $3 a bushel, farmers would have produced 30,000 bushels from the old seed (schedule S_0 in Table 3.4); with the lower cost of production and higher yield resulting from the new seed, they produce 40,000 bushels (schedule S_1 in Table 3.4). At $1.75 per bushel, they would have produced 10,000 bushels from the old seed; but with the lower costs and higher yields, output rises to 23,000 bushels.

TABLE 3.4 Shift of Supply Schedule for Soybeans following Development of a New Disease-Resistant Seed Strain

	Schedule S_0	Schedule S_1
Price (per Bushel)	Quantity Supplied (Bushels per Year Using Old Seed)	Quantity Supplied (Bushels per Year Using New Seed)
$ 1.50	0	5,000
1.75	10,000	23,000
2.25	20,000	33,000
3.00	30,000	40,000
4.00	45,000	54,000
5.00	45,000	54,000

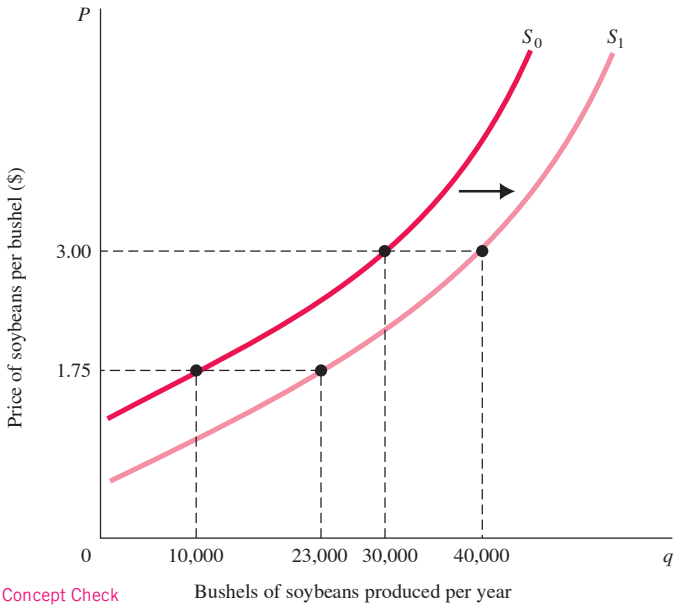

FIGURE 3.7 Shift of the Supply Curve for Soybeans Following Development of a New Seed Strain
When the price of a product changes, we move *along* the supply curve for that product; the quantity supplied rises or falls. When any other factor affecting supply changes, the supply curve *shifts*.

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Increases in input prices may also cause supply curves to shift. If Farmer Brown faces higher fuel costs, for example, his supply curve will shift to the left—that is, he will produce less at any given market price. As Brown's soybean supply curve shifts to the left, it intersects the price axis at a higher point, meaning that it would take a higher market price to induce Brown to produce any soybeans at all.

As with demand, it is important to distinguish between *movements along* supply curves (changes in quantity supplied) and *shifts in* supply curves (changes in supply):

Change in price of a good or service leads to
→ change in *quantity supplied* (**movement along a supply curve**).

Change in costs, input prices, technology, or prices of related goods and services leads to
→ change in *supply* (**shift of a supply curve**).

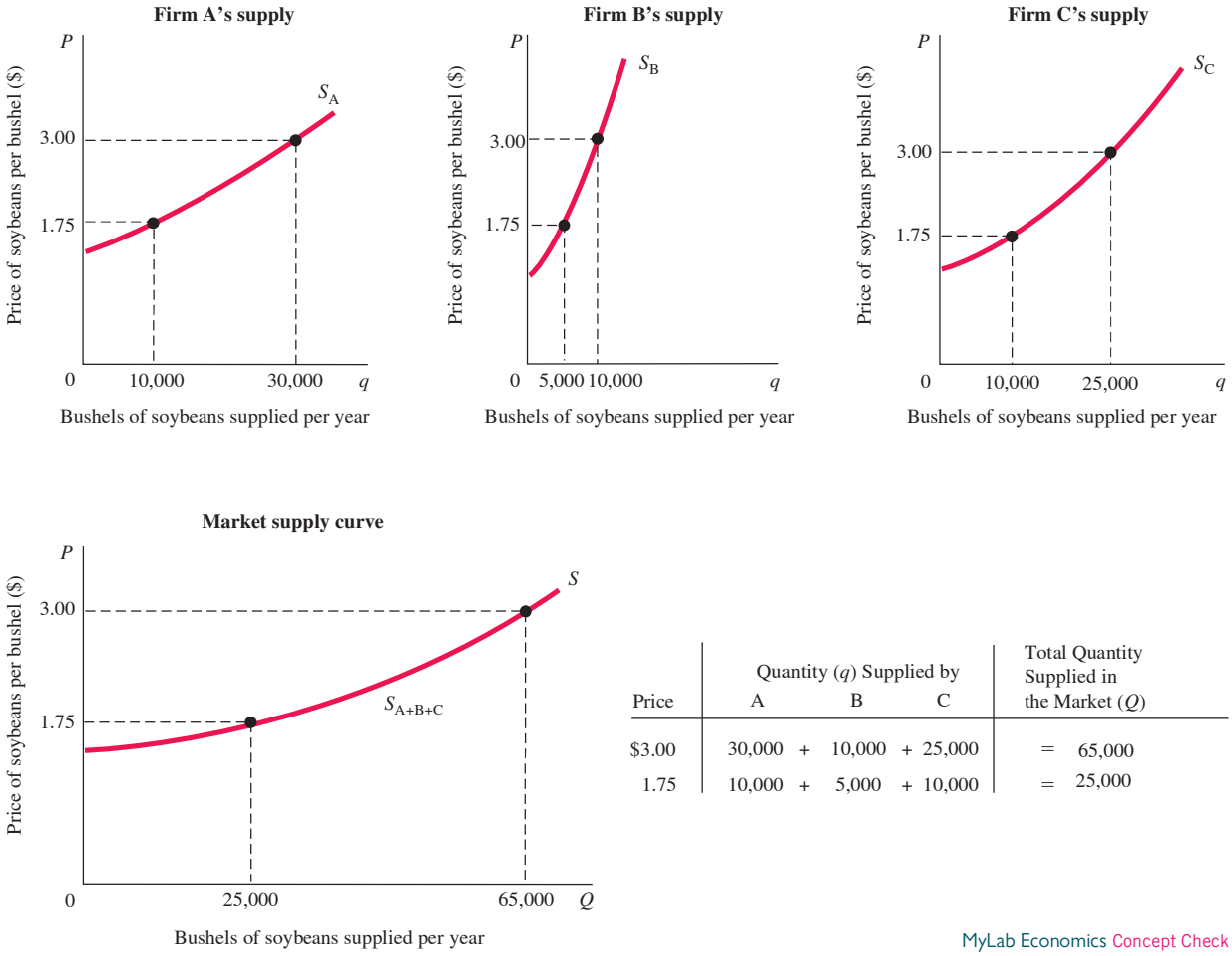
From Individual Supply to Market Supply MyLab Economics Concept Check

So far we have focused on the supply behavior of a single producer. For most markets many, many suppliers bring product to the consumer, and it is the behavior of all of those producers together that determines supply.

market supply The sum of all that is supplied each period by all producers of a single product.

Market supply is determined in the same fashion as market demand. It is simply the sum of all that is supplied each period by all producers of a single product. Figure 3.8 derives a market supply curve from the supply curves of three individual firms. (In a market with more firms, total market supply would be the sum of the amounts produced by each of the firms in that market.) As the table in Figure 3.8 shows, at a price of $3, farm A supplies 30,000 bushels of soybeans, farm B supplies 10,000 bushels, and farm C supplies 25,000 bushels. At this price, the total amount supplied in the market is 30,000 + 10,000 + 25,000, or 65,000 bushels. At a price of $1.75, however, the total amount supplied is only 25,000 bushels (10,000 + 5,000 + 10,000). Thus, the market supply curve is the simple addition of the individual supply curves of all the firms in a particular market—that is, the sum of all the individual quantities supplied at each price.

The position and shape of the market supply curve depends on the positions and shapes of the individual firms' supply curves from which it is derived. The market supply curve also depends on the number of firms that produce in that market. If firms that produce for a particular market are earning high profits, other firms may be tempted to go into that line of business. Think for a moment about the spread of brands of Greek yogurt in the last decade. When new firms enter an industry, the supply curve shifts to the right. When firms go out of business, or "exit" the market, the supply curve shifts to the left.



Price	Quantity (q) Supplied by A	B	C	Total Quantity Supplied in the Market (Q)
$3.00	30,000 +	10,000 +	25,000	= 65,000
1.75	10,000 +	5,000 +	10,000	= 25,000

MyLab Economics Concept Check

▲ **FIGURE 3.8 Deriving Market Supply from Individual Firm Supply Curves**
Total supply in the marketplace is the sum of all the amounts supplied by all the firms selling in the market. It is the sum of all the individual quantities supplied at each price.

Market Equilibrium

3.5 LEARNING OBJECTIVE
Be able to explain how a market that is not in equilibrium responds to restore an equilibrium.

So far, we have identified a number of factors that influence the amount that households demand and the amount that firms supply in product (output) markets. The discussion has emphasized the role of market price as a determinant of both quantity demanded and quantity supplied. We are now ready to see how supply and demand in the market interact to determine the final market price.

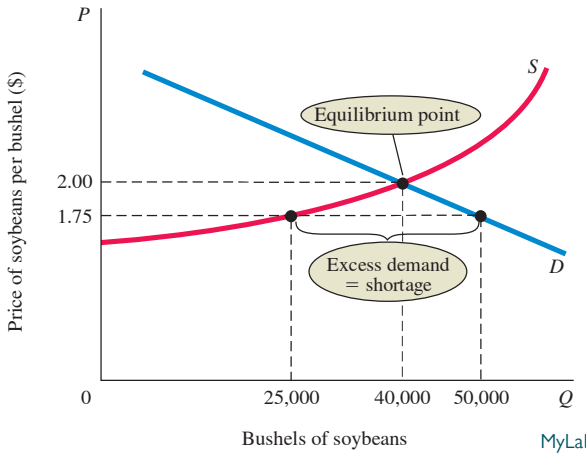
In our discussions, we have separated household decisions about how much to demand from firm decisions about how much to supply. The operation of the market, however, clearly depends on the interaction between suppliers and demanders. At any moment, one of three conditions prevails in every market: (1) The quantity demanded exceeds the quantity supplied at the current price, a situation called *excess demand*; (2) the quantity supplied exceeds the quantity demanded at the current price, a situation called *excess supply*; or (3) the quantity supplied equals the quantity demanded at the current price, a situation called **equilibrium**. At equilibrium, no tendency for price to change exists.

equilibrium The condition that exists when quantity supplied and quantity demanded are equal. At equilibrium, there is no tendency for price to change.

Excess Demand MyLab Economics Concept Check

Excess demand, or a shortage, exists when quantity demanded is greater than quantity supplied at the current price. Figure 3.9, which plots both a supply curve and a demand curve on the same graph, illustrates such a situation. As you can see, market demand at $1.75 per bushel (50,000 bushels) exceeds the amount that farmers are currently supplying (25,000 bushels).

excess demand or shortage The condition that exists when quantity demanded exceeds quantity supplied at the current price.



MyLab Economics Concept Check

▲ **FIGURE 3.9 Excess Demand, or Shortage**
At a price of $1.75 per bushel, quantity demanded exceeds quantity supplied. When *excess demand* exists, there is a tendency for price to rise. When quantity demanded equals quantity supplied, excess demand is eliminated and the market is in equilibrium. Here the equilibrium price is $2.00 and the equilibrium quantity is 40,000 bushels.

When excess demand occurs in an unregulated market, there is a tendency for price to rise as demanders compete against each other for the limited supply. The adjustment mechanisms may differ, but the outcome is always the same. For example, consider the mechanism of an auction. In an auction, items are sold directly to the highest bidder. When the auctioneer starts the bidding at a low price, many people bid for the item. At first, there is a shortage: Quantity demanded exceeds quantity supplied. As would-be buyers offer higher and higher prices, bidders drop out until the one who offers the most ends up with the item being auctioned. Price rises until quantity demanded and quantity supplied are equal.

At a price of $1.75 (see Figure 3.9 again), farmers produce soybeans at a rate of 25,000 bushels per year, but at that price, the demand is for 50,000 bushels. Most farm products are sold to local dealers who in turn sell large quantities in major market centers, where bidding would push prices up if quantity demanded exceeded quantity supplied. As price rises above $1.75, two things happen: (1) The quantity demanded falls as buyers drop out of the market and perhaps choose a substitute, and (2) the quantity supplied increases as farmers find themselves receiving a higher price for their product and shift additional acres into soybean production.[3]

This process continues until the shortage is eliminated. In Figure 3.9, this occurs at $2.00, where quantity demanded has fallen from 50,000 to 40,000 bushels per year and quantity supplied has increased from 25,000 to 40,000 bushels per year. When quantity demanded and quantity supplied are equal and there is no further bidding, the process has achieved an equilibrium, a situation in which *there is no natural tendency for further adjustment.* Graphically, the point of equilibrium is the point at which the supply curve and the demand curve intersect.

Increasingly, items are auctioned over the Internet. Companies such as eBay connect buyers and sellers of everything from automobiles to wine and from computers to airline tickets. Auctions are occurring simultaneously with participants located across the globe. The principles through which prices are determined in these auctions are the same: When excess demand

[3]Once farmers have produced in any given season, they cannot change their minds and produce more, of course. When we derived Clarence Brown's supply schedule in Table 3.3, we imagined him reacting to prices that existed at the time he decided how much land to plant in soybeans. In Figure 3.9, the upward slope shows that higher prices justify shifting land from other crops. Final price may not be determined until final production figures are in. For our purposes here, however, we have ignored this timing problem. The best way to think about it is that demand and supply are *flows*, or *rates*, of production—that is, we are talking about the number of bushels produced *per production period*. Adjustments in the rate of production may take place over a number of production periods.

exists, prices rise. Companies like Uber hire economists to help them calculate "surge" prices to use in times of high demand.

When quantity demanded exceeds quantity supplied, price tends to rise. When the price in a market rises, quantity demanded falls and quantity supplied rises until an equilibrium is reached at which quantity demanded and quantity supplied are equal.

This process is called *price rationing*. When the market operates without interference, price increases will distribute what is available to those who are willing and able to pay the most. As long as there is a way for buyers and sellers to interact, those who are willing to pay more will make that fact known somehow. (We discuss the nature of the price system as a rationing device in detail in Chapter 4.)

Excess Supply MyLab Economics Concept Check

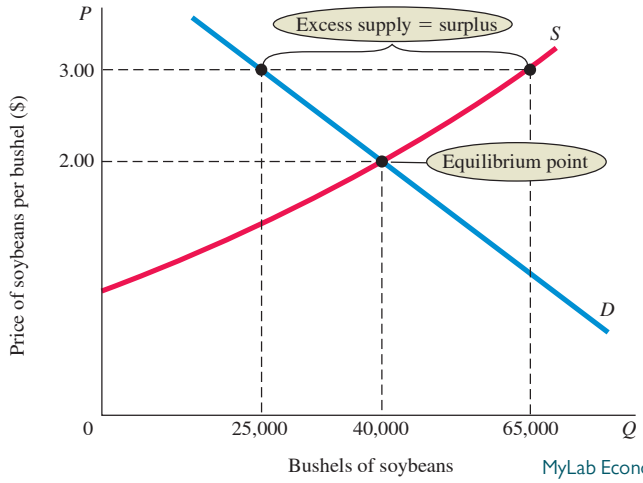
Excess supply, *or* a surplus, exists when the quantity supplied exceeds the quantity demanded at the current price. As with a shortage, the mechanics of price adjustment in the face of a surplus can differ from market to market. For example, if automobile dealers find themselves with unsold cars in the fall when the new models are coming in, you can expect to see price cuts. Sometimes dealers offer discounts to encourage buyers; sometimes buyers themselves simply offer less than the price initially asked. After Christmas, most stores have big sales during which they lower the prices of overstocked items. Quantities supplied exceeded quantities demanded at the current prices, so stores cut prices. Many Web sites exist that do little more than sell at a discount clothing and other goods that failed to sell at full price during the past season.

excess supply *or* surplus
The condition that exists when quantity supplied exceeds quantity demanded at the current price.

Figure 3.10 illustrates another excess supply/surplus situation. At a price of $3 per bushel, suppose farmers are supplying soybeans at a rate of 65,000 bushels per year, but buyers are demanding only 25,000. With 40,000 bushels of soybeans going unsold, the market price falls. As price falls from $3.00 to $2.00, quantity supplied decreases from 65,000 bushels per year to 40,000. The lower price causes quantity demanded to rise from 25,000 to 40,000. At $2.00, quantity demanded and quantity supplied are equal. For the data shown here, $2.00 and 40,000 bushels are the equilibrium price and quantity, respectively.

Although the mechanism by which price is adjusted differs across markets, the outcome is the same:

> When quantity supplied exceeds quantity demanded at the current price, the price tends to fall. When price falls, quantity supplied is likely to decrease and quantity demanded is likely to increase until an equilibrium price is reached where quantity supplied and quantity demanded are equal.



MyLab Economics Concept Check

FIGURE 3.10 Excess Supply (Surplus)
At a price of $3.00, quantity supplied exceeds quantity demanded by 40,000 bushels. This excess supply will cause the price to fall.

Market Equilibrium with Equations MyLab Economics Concept Check

So far we have represented demand and supply using schedules and graphs. Economists also use equations when they work with demand and supply. In empirical work, when we begin to measure the quantitative size of markets, equations prove very useful.

In order to simplify our work, we can assume that both demand and supply curves are linear (straight) lines.

In the demand graph we have been working with, price is generally put on the y axis and quantity on the x axis. This has long been the convention in economics. But in most of our discussions of demand, we think of quantity as the dependent variable and price as the independent variable. That is, we ask: "How many units will the market demand at a given price?," rather than "What is the price when the demand is Q?" Given that we are working with straight lines, it is a simple matter to move between an equation with price on the right hand side and quantity on the left (formally the demand curve), and one with quantity on the right hand side and price on the left (the inverse demand curve). In their work, economists use both forms.

We know already from our graphs that a demand curve intersects the y axis, or the price axis, and that it has a negative slope. If we assume demand is a straight line, then the equation of the inverse demand curve will be of the form

$$P = a - bQ_d$$

where Q_d is the quantity demanded in units and P is the price. "a" is the y intercept, or the price at which quantity demanded is 0, and b is the slope of the demand curve.

The demand curve will then be

$$Q_d = a/b - (1/b)P$$

What about the supply curve? We already know that supply curves have a positive slope, telling us that producers bring more of a good to the market when the price is higher. A supply curve may or may not intersect the y axis (more on this will be in a later chapter), but if it does, and if it is also a straight line, the inverse supply curve will have the form

$$P = c + dQ_s$$

Again, P is price in dollars and Q_s is the quantity supplied in units. "c" is the y intercept and d the (positive) slope. Every unit increase in quantity brings with it a d unit increase in price.

The supply curve is then

$$Q_s = c/d + (1/d)P$$

In our graphs, we found the equilibrium price and quantity by finding the point of intersection of the supply and demand curves. At what price is the quantity demanded equal to the quantity supplied? To find this, we can simply set Qd equal to Qs (and call it Q), which gives us two equations in two unknowns, Q and P, which we can then solve.

It is easier to proceed at this point using numbers for our intercepts and slopes. Assume that the demand and supply curves can be represented mathematically as:

$$Q_d = 14 - 2P$$

$$Q_s = 2 + 4P$$

Setting the quantity demanded equal to the quantity supplied, we have

$$14 - 2P = 2 + 4P$$

which gives us a price of $2. Substituting back into either the supply or demand equation in turn gives us an equilibrium quantity demanded and supplied of 10 units.

Changes in Equilibrium MyLab Economics Concept Check

When supply and demand curves shift, the equilibrium price and quantity change. The following example will help to illustrate this point and show us how equilibrium is restored in markets in which either demand or supply changes.

South America is a major producer of coffee beans. In the mid-1990s, a major freeze hit Brazil and Colombia and drove up the price of coffee on world markets to a record $2.40 per pound. Bad weather in Colombia in 2005 and more recently in 2012 caused similar shifts in supply.

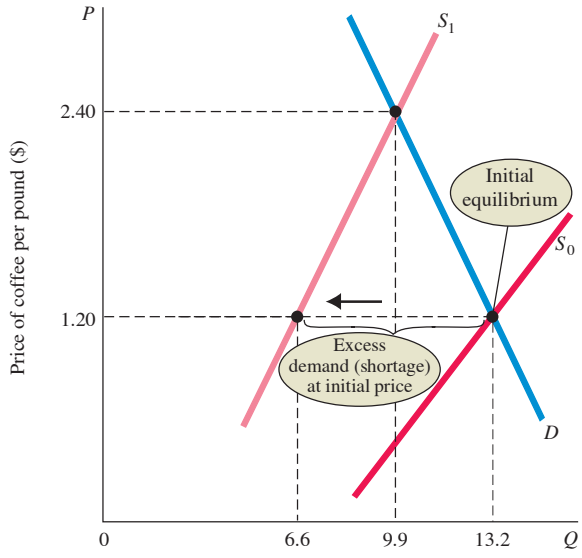
Figure 3.11 illustrates how the freezes pushed up coffee prices. Initially, the market was in equilibrium at a price of $1.20. At that price, the quantity demanded was equal to quantity supplied (13.2 billion pounds). At a price of $1.20 and a quantity of 13.2 billion pounds, the demand curve (labeled D) intersected the initial supply curve (labeled S_0). (Remember that equilibrium exists when quantity demanded equals quantity supplied—the point at which the supply and demand curves intersect.)

The freeze caused a decrease in the supply of coffee beans. That is, the freeze caused the supply curve to shift to the left. In Figure 3.11, the new supply curve (the supply curve that shows the relationship between price and quantity supplied after the freeze) is labeled S_1.

At the initial equilibrium price, $1.20, there is now a shortage of coffee. If the price were to remain at $1.20, quantity demanded would not change; it would remain at 13.2 billion pounds. However, at that price, quantity supplied would drop to 6.6 billion pounds. At a price of $1.20, quantity demanded is greater than quantity supplied.

When excess demand exists in a market, price can be expected to rise, and rise it did. As the figure shows, price rose to a new equilibrium at $2.40. At $2.40, quantity demanded is again equal to quantity supplied, this time at 9.9 billion pounds—the point at which the new supply curve (S_1) intersects the demand curve.

Notice that as the price of coffee rose from $1.20 to $2.40, two things happened. First, the quantity demanded declined (a movement along the demand curve) as people shifted to substitutes such as tea and hot cocoa. Second, the quantity supplied began to rise, but within the limits imposed by the damage from the freeze. (It might also be that some countries or areas with high costs of production, previously unprofitable, came into production and shipped to the world market at the higher price.)



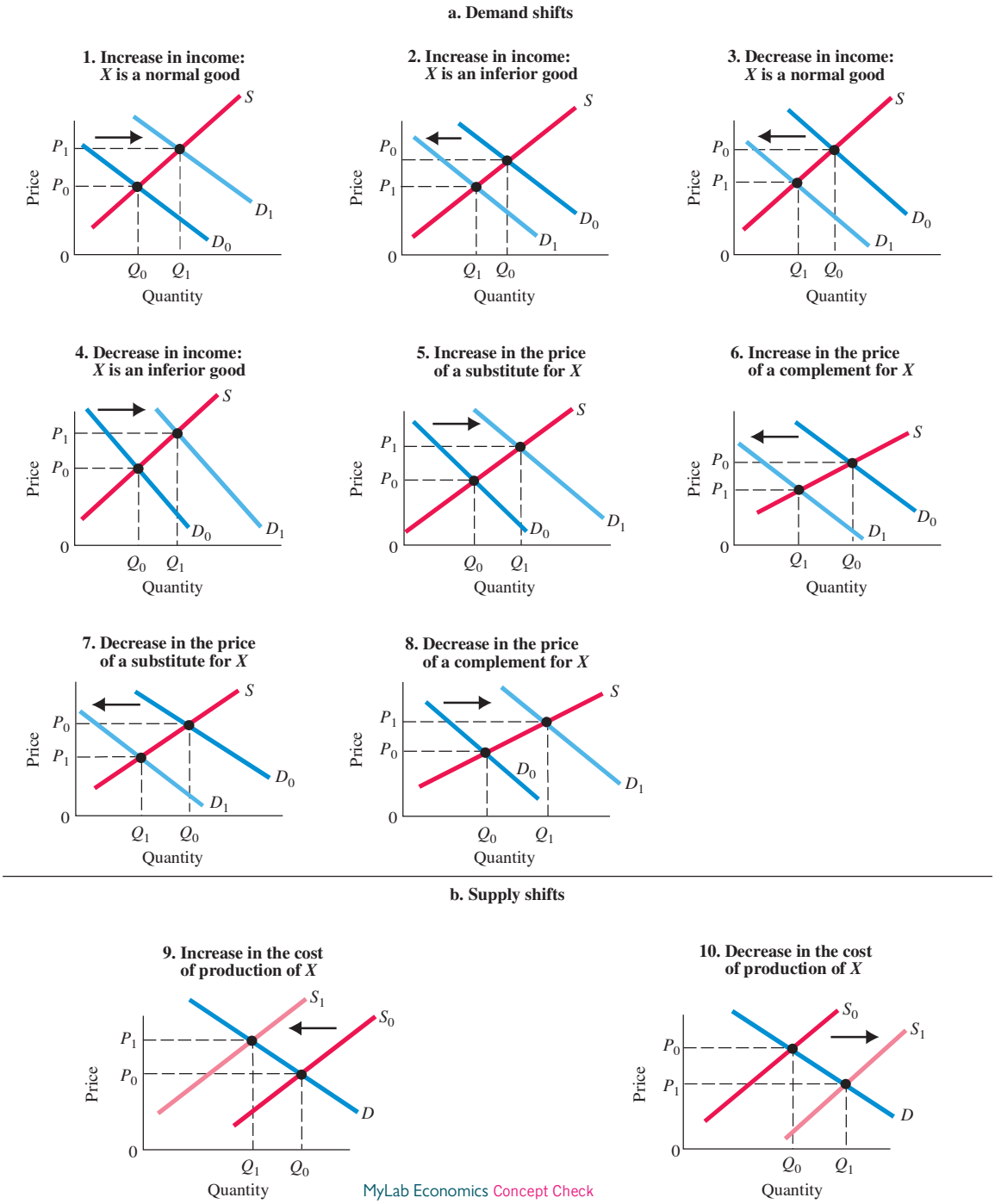
MyLab Economics Concept Check

▲ **FIGURE 3.11 The Coffee Market: A Shift of Supply and Subsequent Price Adjustment**

Before the freeze, the coffee market was in equilibrium at a price of $1.20 per pound. At that price, quantity demanded equaled quantity supplied. The freeze shifted the supply curve to the left (from S_0 to S_1), increasing the equilibrium price to $2.40.

That is, the quantity supplied increased in response to the higher price *along* the new supply curve, which lies to the left of the old supply curve. The final result was a higher price ($2.40), a smaller quantity finally exchanged in the market (9.9 billion pounds), and coffee bought only by those willing to pay $2.40 per pound.

Figure 3.12 summarizes the possible supply and demand shifts that have been discussed and the resulting changes in equilibrium price and quantity. Study the graphs carefully to ensure that you understand them.



▲ FIGURE 3.12 **Examples of Supply and Demand Shifts for Product X**

ECONOMICS IN PRACTICE

Quinoa

Those of you who follow a vegetarian diet, or even those of you who are foodies, likely have had quinoa sometime within the last few months. Once eaten mostly by people in Peru and Bolivia, and a reputed favorite of the Incas, quinoa, a high-protein grain, has found a large market among food aficionados. Growth in vegetarianism effectively shifted the demand curve for quinoa to the right.

With an upward sloping supply curve, this shift in demand resulted in increased prices. Farmers grew richer, whereas some local consumers found themselves facing higher prices for a staple product. Over time, these higher prices encouraged more farmers to enter the quinoa market. This shifted the supply curve to the right, helping to moderate the price increases. But quinoa growing turns out to be a tricky affair. Quinoa grows best in high altitudes with cold climates. It thrives on soil fertilized by the dung of herds of llama and sheep. Thus, while supply clearly shifted with new farmer entry, the particular nature of the production process limited that shift and in the end, despite the supply response, prices increased.

CRITICAL THINKING

1. Use a graph to show the movement in prices and quantities described in the quinoa market.

Demand and Supply in Product Markets: A Review

As you continue your study of economics, you will discover that it is a discipline full of controversy and debate. There is, however, little disagreement about the basic way that the forces of supply and demand operate in free markets. If you hear that a freeze in Florida has destroyed a good portion of the citrus crop, you can bet that the price of oranges will rise. If you read that the weather in the Midwest has been good and a record corn crop is expected, you can bet that corn prices will fall. When fishers in Massachusetts go on strike and stop bringing in the daily catch, you can bet that the price of local fish will go up.

Here are some important points to remember about the mechanics of supply and demand in product markets:

1. A demand curve shows how much of a product a household would buy if it could buy all it wanted at the given price. A supply curve shows how much of a product a firm would supply if it could sell all it wanted at the given price.
2. Demand and supply can also be represented by equations.
3. Quantity demanded and quantity supplied are always per time period—that is, per day, per month, or per year.
4. The demand for a good is determined by price, household income and wealth, prices of other goods and services, tastes and preferences, and expectations.
5. The supply of a good is determined by price, costs of production, and prices of related products. Costs of production are determined by available technologies of production and input prices.
6. Be careful to distinguish between movements along supply and demand curves and shifts of these curves. When the price of a good changes, the quantity of that good demanded or supplied changes—that is, a movement occurs along the curve. When any other factor that affects supply or demand changes, the curve shifts, or changes position.
7. Market equilibrium exists only when quantity supplied equals quantity demanded at the current price. The equilibrium price is one for which the supply and demand curves intersect, where the quantity supplied is equal to the quantity demanded.

ECONOMICS IN PRACTICE

"Shrinkflation" during Festive Seasons

During festive seasons, such as Christmas, food prices usually rise. The 2017 Christmas was particularly expensive for Britons. The British Retail Consortium reported that Christmas dinner was 16 percent more expensive in 2017 compared to the previous year. While the overall price level in the United Kingdom rose by 3 percent in December 2017, food prices increased by 4.2 percent. Among the sharpest increases was a 40 percent rise in the price of butter, an 8.5 percent rise in the price of fish, an 8.5 percent rise in the prices of beverages, a 5.7 percent rise in vegetable prices, and a 5.6 percent rise in dairy prices. The Office for National Statistics (ONS), the official statistical agency in the United Kingdom, reports that this was the highest level of food prices since 2013. Moreover, the ONS cautioned that food inflation is higher than 4.2 percent due to "shrinkflation," which means that instead of raising prices during the festive season, producers reduced the weight and size of 2,500 products, out of which 80 percent were food items.[1]

Changes in tastes, income, wealth, expectations, or prices of other goods and services causes demand to change, while changes in costs, input prices, technology, or prices of related goods and services causes supply to change. Hence, any changes in equilibrium price can be caused either by changes in demand or in supply. As such, an increase in equilibrium price can be caused by either an increase in demand or a fall in supply.

The surge in United Kingdom's food prices is due to the increase in the demand for food items as families stock up food items and other products for the Christmas Eve dinner. This shifts the demand curve to the right, increasing the equilibrium price and quantity demanded as shown in Figure (a). But there could be factors other than the rise in demand that affect prices. On the supply side, the increase in food prices is mainly due to the depreciation of the British pound since the Brexit referendum on June 23, 2016. A weaker pound has increased the cost of imported food items, shifting the supply curve to the left, further raising the equilibrium price level and reducing the equilibrium quantity as shown in Figure (b). Both forces put together have resulted in a simultaneous rise in prices, but what about the net effect on equilibrium quantity?

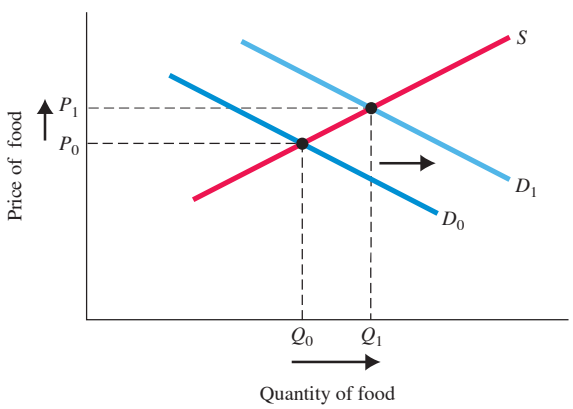
Recent market research shows that during the festive season of 2017, British consumers spent £1 billion more on food in comparison to the 2016 Christmas. The report explains that the higher food prices left people with less money for other items, so the prices of non-food items have also risen. As higher food prices squeezed the wages of lower income groups, consumer purchases of non-food products fell by 0.1 percent in December 2017 in comparison to the previous month. This was despite discounts on non-food goods such as furniture and clothing.[2] Thus, the rightward shift in the demand curve outweighed the leftward shift in the supply curve, causing an overall increase in equilibrium quantity.

CRITICAL THINKING

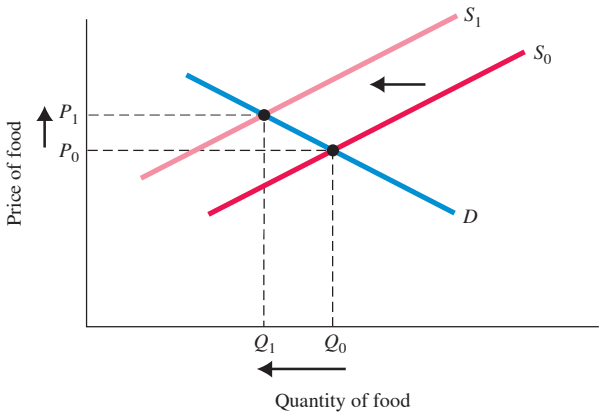
1. Using diagrams, explain what happens to equilibrium price and quantity if the shift in the supply curve outweighs that of the demand curve due to British producers getting bulk export orders.

[1] ONS, 2018. *Statistical Bulletin: Consumer Price Inflation, UK: January* 2018. Office for National Statistics.
[2] Fraser McKevitt, 2018. "Bumper Christmas as UK Shoppers Spend £1 Billion More Than Last Year," *Kantar Worldpanel*.

a. Increase in quantity demanded



b. Decrease in quantity demanded



Looking Ahead: Markets and the Allocation of Resources

You can already begin to see how markets answer the basic economic questions of what is produced, how it is produced, and who gets what is produced. A firm will produce what is profitable to produce. If the firm can sell a product at a price that is sufficient to ensure a profit after production costs are paid, it will in all likelihood produce that product. Resources will flow in the direction of profit opportunities.

- Demand curves reflect what people are willing and able to pay for products; demand curves are influenced by incomes, wealth, preferences, prices of other goods, and expectations. Because product prices are determined by the interaction of supply and demand, prices reflect what people are willing to pay. If people's preferences or incomes change, resources will be allocated differently. Consider, for example, an increase in demand—a shift in the market demand curve. Beginning at an equilibrium, households simply begin buying more. At the equilibrium price, quantity demanded becomes greater than quantity supplied. When there is excess demand, prices will rise, and higher prices mean higher profits for firms in the industry. Higher profits, in turn, provide existing firms with an incentive to expand and new firms with an incentive to enter the industry. Thus, the decisions of independent private firms responding to prices and profit opportunities determine *what* will be *produced*. No central direction is necessary.

  Adam Smith saw this self-regulating feature of markets more than 200 years ago:

  > Every individual…by pursuing his own interest…promotes that of society. He is led…by an invisible hand to promote an end, which was no part of his intention.[4]

  The term Smith coined, the *invisible hand*, has passed into common parlance and is still used by economists to refer to the self-regulation of markets.
- Firms in business to make a profit have a good reason to choose the best available technology—lower costs mean higher profits. Thus, individual firms determine *how* to produce their products, again with no central direction.
- So far, we have barely touched on the question of distribution—*who* gets what is produced? You can see part of the answer in the simple supply and demand diagrams. When a good is in short supply, price rises. As they do, those who are willing and able to continue buying do so; others stop buying.

The next chapter begins with a more detailed discussion of these topics. How, exactly, is the final allocation of resources (the mix of output and the distribution of output) determined in a market system?

[4]Adam Smith, *The Wealth of Nations*, Modern Library Edition (New York: Random House, 1937), p. 456 (1st ed., 1776).

SUMMARY

1. In societies with many people, production must satisfy wide-ranging tastes and preferences, and producers must therefore specialize.

3.1 FIRMS AND HOUSEHOLDS: THE BASIC DECISION-MAKING UNITS *p. 70*

2. A *firm* exists when a person or a group of people decides to produce a product or products by transforming resources, or *inputs*, into *outputs*—the products that are sold in the market. Firms are the primary producing units in a market economy. We assume that firms make decisions to try to maximize profits.
3. *Households* are the primary consuming units in an economy. All households' incomes are subject to constraints.

3.2 INPUT MARKETS AND OUTPUT MARKETS: THE CIRCULAR FLOW *p. 70*

4. Households and firms interact in two basic kinds of markets: *product or output markets* and *input or factor markets*. Goods and services intended for use by households are exchanged in output markets. In output markets, competing firms supply and competing households demand. In input markets, competing firms demand and competing households supply.

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5. Ultimately, firms choose the quantities and character of outputs produced, the types and quantities of inputs demanded, and the technologies used in production. Households choose the types and quantities of products demanded and the types and quantities of inputs supplied.

3.3 DEMAND IN PRODUCT/OUTPUT MARKETS *p. 72*

6. The quantity demanded of an individual product by an individual household depends on (1) price, (2) income, (3) wealth, (4) prices of other products, (5) tastes and preferences, and (6) expectations about the future.
7. *Quantity demanded* is the amount of a product that an individual household would buy in a given period if it could buy all that it wanted at the current price.
8. A *demand schedule* shows the quantities of a product that a household would buy at different prices. The same information can be presented graphically in a *demand curve*.
9. The *law of demand* states that there is a negative relationship between price and quantity demanded *ceteris paribus*: As price rises, quantity demanded decreases and vice versa. Demand curves slope downward.
10. All demand curves eventually intersect the price axis because there is always a price above which a household cannot or will not pay. Also, all demand curves eventually intersect the quantity axis because demand for most goods is limited, if only by time, even at a zero price.
11. When an increase in income causes demand for a good to rise, that good is a *normal good*. When an increase in income causes demand for a good to fall, that good is an *inferior good*.
12. If a rise in the price of good X causes demand for good Y to increase, the goods are *substitutes*. If a rise in the price of X causes demand for Y to fall, the goods are *complements*.
13. *Market demand* is simply the sum of all the quantities of a good or service demanded per period by all the households buying in the market for that good or service. It is the sum of all the individual quantities demanded at each price.

3.4 SUPPLY IN PRODUCT/OUTPUT MARKETS *p. 82*

14. *Quantity supplied* by a firm depends on (1) the price of the good or service; (2) the cost of producing the product, which includes the prices of required inputs and the technologies that can be used to produce the product; and (3) the prices of related products.
15. *Market supply* is the sum of all that is supplied in each period by all producers of a single product. It is the sum of all the individual quantities supplied at each price.
16. It is important to distinguish between *movements* along demand and supply curves and *shifts* of demand and supply curves. The demand curve shows the relationship between price and quantity demanded. The supply curve shows the relationship between price and quantity supplied. A change in price is a movement along the curve. Changes in tastes, income, wealth, expectations, or prices of other goods and services cause demand curves to shift; changes in costs, input prices, technology, or prices of related goods and services cause supply curves to shift.

3.5 MARKET EQUILIBRIUM *p. 87*

17. When quantity demanded exceeds quantity supplied at the current price, *excess demand* (or a *shortage*) exists and the price tends to rise. When prices in a market rise, quantity demanded falls and quantity supplied rises until an equilibrium is reached at which quantity supplied and quantity demanded are equal. At *equilibrium*, there is no further tendency for price to change.
18. When quantity supplied exceeds quantity demanded at the current price, *excess supply* (or a *surplus*) exists and the price tends to fall. When price falls, quantity supplied decreases and quantity demanded increases until an equilibrium price is reached where quantity supplied and quantity demanded are equal.

REVIEW TERMS AND CONCEPTS

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complements, complementary goods, *p. 76*
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