CHAPTER

3 SUPPLY AND DEMAND

CHAPTER OUTLINE

Father Guido Sarducci, a character on the early *Saturday Night Live* shows, once observed that the average person remembers only about five minutes worth of material from college. He therefore proposed the "Five Minute University," where you'd learn only the five minutes of material you'd actually remember and dispense with the rest. The economics course would last only 10 seconds, just enough time for students to learn to recite three words: "supply and demand."

Of course, there is much more to economics than these three words. Still, Sarducci's observation had some truth. Many people *do* regard the phrase "supply and demand" as synonymous with economics. But surprisingly few people actually understand what the phrase means. In a debate about health care, poverty, recent events in the stock market, or the high price of housing, you might hear someone say, "Well, it's just a matter of supply and demand," as a way of dismissing the issue entirely. Others use the phrase with an exaggerated reverence, as if supply and demand were an inviolable physical law, like gravity, about which nothing can be done. So what does this oft-repeated phrase really mean?

First, supply and demand is just an economic model—nothing more and nothing less. It's a model designed to explain *how prices are determined in a market system*. Why has this model taken on such an exalted role in the field of economics? Because prices themselves play such an exalted role in the economy. In a market system, once the price of something has been determined, only those willing to pay that price will get it. Thus, prices determine which households will get which goods and services and which firms will get which resources. If you want to know why the cell phone industry is expanding while the video rental industry is shrinking, or why homelessness is a more pervasive problem in the United States than hunger, you need to understand how prices are determined. In this chapter, you will learn how the model of supply and demand works and how to use it. You will also learn about the strengths and limitations of the model. It will take more time than Guido Sarducci's 10-second economics course, but in the end you will know much more than just three little words.

MARKETS

Put any compound in front of a chemist, ask him what it is and what it can be used for, and he will immediately think of the basic elements—carbon, hydrogen, oxygen, and so on. These elements are the basic building blocks of the materials we see in our world, and they help chemists make sense of what would otherwise appear rather chaotic.

Similarly, ask an economist almost any question about the economy, and he will immediately think about *markets*. As you learned in the last Chapter, the word *market* has a special meaning in economics.

A market is a group of buyers and sellers with the potential to trade.

Economists think of the economy as a collection of markets. In each one, the buyers and sellers will be different, depending on what is being traded. There is a market for oranges, another for automobiles, another for real estate, and still others for corporate stocks, euros, and anything else that is bought and sold.

And this is where the choices begin. A market, as you'll soon see, is an important part of a supply and demand model, like a wing is an important part of a model airplane. And just as we can choose to make a wing out of balsa wood or plastic or metal—depending on our purpose—so, too, we have many choices when we define a market.

DEFINING THE GOOD OR SERVICE

Suppose we're interested in analyzing the computer industry in the United States. Should we define our market very broadly ("the market for computers"), very narrowly ("laptops under four pounds") or something in between ("portable personal computers")? Our choice will depend on the specific question we are trying to answer.

For example, if our goal is to predict how many households will be connected to the Internet by the year 2005, it would be best to combine all computers into one broad category, treating them all as if they were a single good. Economists call this process **aggregation**—combining a group of distinct things into a single whole. It would not do us much good to *disaggregate* computers into different types—desktops, laptops, handheld, faster than 800 Mhz, etc.—because such distinctions have little to do with Internet access and would only get in the way.

Aggregation The process of combining distinct things into a single whole.

But suppose instead we are asking a different question: Why do laptops always cost more than desktops with similar computing power? Then we should use a slightly narrower definition of the product, aggregating all *laptops* together into one good, and all desktops together into another, and then looking at the markets for *each* of these more narrowly defined goods.

How broadly or narrowly we define a good or service is one of the choices that distinguishes *macro*economics from *micro*economics. In macroeconomics, goods and services are aggregated to the highest levels. Macro models even lump all consumer goods—dishwashers, cell phones, blue jeans, and so forth—into the single category "consumption goods" and view them as if they are traded in a single, broadly defined market, "the market for consumption goods." Similarly, instead of recognizing different markets for shovels, bulldozers, computers, and factory buildings, macro models analyze the market for "capital goods." Defining goods in this very broad way allows macroeconomists to take an overall view of the economy without getting bogged down in the details.

In microeconomics, by contrast, we are interested in more disaggregated goods. Instead of asking how much we'll spend on *consumer goods*, a microeconomist might ask how much we'll spend on *health care* or *video games*. Although microeconomics always involves some aggregation—combining different brands of laptop computers into one category, for example—in microeconomics, the process stops before it reaches the highest level of generality.

BUYERS AND SELLERS

A market is composed of the buyers and sellers that trade in it. But who, exactly, *are* these buyers and sellers?

When you think of a seller, your first image might be of a business. Indeed, in many markets, you'd be right: The sellers *are* business firms. Examples are markets for restaurant meals, airline travel, clothing, banking services, and video rentals. But businesses aren't the only sellers in the economy. In many markets, *households* are important sellers. For example, households are the primary sellers in labor markets, such as the markets for Web page designers, for accountants, and for factory workers. Households are also important sellers in markets for used cars, residential homes, and rare artworks. Governments, too, are sometimes important sellers. For example, state governments are major sellers in the market for education through state colleges and universities (such as the University of California, the University of Minnesota, and St. Louis Community College).

What about the other side of the market? When you think of *buyers*, your first thought may be "people" like yourself, or "households." Indeed, many goods and services are bought primarily by households: college education, movies, housing, clothing, and so on. But here, too, the stereotype doesn't always fit. In labor markets, businesses and government agencies are the primary buyers. Businesses and government are also important buyers of personal computers, automobiles, and airline transportation.

As you can see, the buyers in a market can be households, business firms, or government agencies. And the same is true of sellers. Sometimes, it's important to recognize that all three groups are on both sides of a market. But not always. Once again, it depends on our purpose.

When the purpose is largely educational, greater simplification is permitted. For example, to understand *how* the price of paperback books is determined, we would in most cases assume that households are the only buyers. True, business firms and government libraries also buy paperback books. But including these buyers would only complicate our model, without changing any of our conclusions about price. On the other hand, if we wanted to precisely forecast the revenues of booksellers from paperback books, it would be dangerous to ignore orders from businesses and government libraries.

THE GEOGRAPHY OF THE MARKET

While a market itself is not an actual location, the participants in a market *do* live within some geographic area. When we speak of the geography of a market, we mean the geographic area within which the buyers and sellers are located.

It might appear that our choice of geography follows logically from the particular good or service we are analyzing. For example, think about crude oil. It is routinely transported across international waters and is freely traded among buyers and sellers in many different countries. So the market for oil should be a market of *global* buyers and sellers, right?

Not necessarily. Suppose we want to explain why oil is cheaper in the United States than in France? Then we'd need to define a *pair* of markets for oil and see how the price is determined in each one. In one market, global oil producers sell to buyers in France, and in another, the same producers sell to buyers in the United States. In each of these markets, global sellers trade with *national* buyers.

On the other hand, if we want to explain and forecast *world oil prices*, we'd gain little by distinguishing between French and American buyers. In this case, both sellers and buyers would be global.

In defining a market, we must choose the geographic area within which buyers and sellers are located. The buyers can be spread around the globe, or they can be a national, regional, or local group. The same is true of sellers. The geographic definition we choose depends on the specific question we are trying to answer.

The Inomics search engine is devoted solely to economics (http://www.inomics.com/query/show?what=welcome). Use it to investigate topics related to supply and demand.

COMPETITION IN MARKETS

A final issue in defining a market is how individual buyers and sellers view the price of the product. In many cases, individual buyers or sellers have an important influence over the market price. For example, in the market for corn flakes, Kellogg's—an individual *seller*—simply sets its price every few months. It can raise the price and sell fewer boxes of cereal, or lower the price and sell more. In the market for windshield wiper motors, Ford Motor Company—an individual *buyer*—can influence the price by negotiating special deals, or merely changing the number of motors it buys. The market for breakfast cereals and the market for windshield wiper motors are examples of *imperfectly competitive* markets.

*In **imperfectly competitive markets**, individual buyers or sellers have some influence over the price of the product.*

Imperfectly competitive market A market in which a single buyer or seller has the power to influence the price of the product.

But now think about the national market for wheat. Can an individual seller have any impact on the market price? Not really. On any given day, there is a going price for wheat—say, $5.80 per bushel. If a farmer tries to charge more than that—say, $5.85 per bushel—he won't sell any wheat at all! His customers will instead go to one of his many competitors and buy the identical product from them. Each wheat farmer must take the price of wheat as a "given."

The same is true of wheat *buyers*: If one tries to negotiate a lower price with a producer, he'd be laughed off the farm. "Why should I sell my wheat to you for $5.75 per bushel, when there are others who will pay me $5.80?" Accordingly, each buyer must take the market price as a given.

The market for wheat is an example of a *perfectly competitive market*.

*In **perfectly competitive markets** (or just **competitive markets**), each buyer and seller takes the market price as a given.*

Perfectly competitive market A market in which no buyer or seller has the power to influence the price.

What makes some markets imperfectly competitive and others perfectly competitive? You'll learn the complete answer when you are well into your study of *microeconomics*. One hint is that in perfectly competitive markets, there are many small buyers and sellers, and the product is standardized, like wheat. Imperfectly competitive markets, by contrast, have either a few large buyers or sellers, or else the product differs in important ways among different sellers.

In the real world, perfectly competitive markets are rare. However, many markets come *close enough* that we can choose to view them as perfectly competitive. Think of the market for fast-food hot dogs in a big city. On the one hand, every hot dog stand is slightly different from every other. And each might be able to raise its price a bit above its competitors without losing all of its customers. For example, if his competitors are charging $1.50 for a hot dog, the individual vendor might be able to charge $1.60 or $1.70. In these ways, the market for sidewalk hot dogs resembles *imperfect* competition.

But because there are so many other hot dog vendors in a big city, and because they are not *that* different from one another, no vendor can deviate too much from the going price of $1.50. A vendor that charges $1.80 or $1.90, for example, might soon find himself without a business. So in some ways, the market is close to perfect competition.

How, then, do we decide whether to consider a market—such as the market for big-city hot dogs—as perfectly or imperfectly competitive? You won't be surprised to hear that it depends on the question we want to answer. If we want to explain why there are occasional price wars among hot dog vendors, or why some of them routinely charge higher prices than others, viewing the market as perfectly competitive would not work. To answer *these* questions, an individual seller's influence over his or her own price is important.

But if we want to know why hot dogs are cheaper than most other types of fast foods, the simplest approach is to view the market for hot dogs as perfectly competitive. True, each hot dog vendor does have *some* influence over the price. But that influence is so small, and the prices of different sellers are so similar, that our assumption of perfect competition works pretty well.

SUPPLY, DEMAND, AND MARKET DEFINITION

The supply and demand model—which explains how prices are determined in a market system—is a very versatile model. It can be applied to very broadly defined goods (the market for food) or very narrowly defined goods (the market for Granny Smith apples). Households, business firms, or government agencies can appear in any combination on the buying side or the selling side. The buyers and sellers can reside within a small geographic area or be dispersed around the world.

But there is only one restriction that is always implicit in any supply and demand analysis: We must always assume that the market is perfectly competitive.

> *The supply and demand model is designed to explain how prices are determined in perfectly competitive markets.*

Does this mean we can only use the model when sellers and buyers have *no influence at all* over their price? Not really. As you've seen, perfect competition is a matter of degree, rather than an all-or-nothing characteristic. While there are very few markets in which sellers and buyers take the price as completely given, there are many markets in which a *narrow range* of prices is treated as a given (as in the market for hot dogs). In these markets, supply and demand often provides a good approximation to what is going on. This is why it has proven to be the most versatile and widely used model in the economist's tool kit. Neither laptop computers nor orange juice is traded in a perfectly competitive market. But ask an economist to tell you why the cost of laptops decreases every year, or why the price of orange juice rises after a freeze in Florida, and he or she will invariably reach for supply and demand to find the answer.

Supply and demand are like two blades of a scissors: The demand blade tells us how much of something buyers want to buy, and the supply blade tells us how much sellers want to sell. To analyze a market, we need both blades—and they must both be sharp. In this and the next section, we will be sharpening those blades, learning separately about supply and demand. Then, when we have a thorough understanding of each one, we'll put them together—and put them to use. Let's start with demand.

DEMAND

When you come to a market as a buyer, what is your goal? In the most general terms, it's to make yourself as well-off as possible. Then why don't you try to buy up everything you can in every possible market? After all, you'd be better off if you had more clothes, more airline travel, a bigger home or apartment, a faster Internet connection. . . . If your goal is to make yourself as well-off as possible, you should try to grab up all these things. Right?

Not really. Because in addition to having a goal, you also face *constraints*. First, everything you want to buy has a *price*. Second, you have a limited income with which to buy things. As a result of these two constraints—prices and your limited income—whenever you decide to buy something, you must give up something else that you *could have bought* instead. That is, every purchase carries an opportunity cost. (Even if you have more income each year than you spend, you still pay an opportunity cost when you buy something because you will *save* less that year.)

Both the goals and the constraints of buyers like you play a role in determining the demand side of a market. That is why we do *not* define the quantity of a product demanded as how much a buyer would *like* to have if he could snap his fingers and just have it. Rather, it's how much he would actually *choose* to buy given the constraints that he faces.

*An **individual's quantity demanded** of any good is the total amount that individual would choose to buy at a particular price.*

Individual's quantity demanded The total amount of a good an individual would choose to purchase at a given price.

When we turn our attention to demand in the market as a whole, we define a similar concept.

*The **market quantity demanded** of any good is the total amount that all buyers in the market would decide to buy at a particular price.*

Market quantity demanded The total amount of a good that all buyers in the market would choose to purchase at a given price.

Notice two very important things about this definition. First, it refers to buyers' *choices*, not to the amount that buyers will *actually* buy. Will buyers, in fact, be *able* to buy what they decide to buy? Or will they be frustrated in their attempts because sellers are not supplying enough? This is a very important question but one that can't be answered until buyers and sellers—demand *and* supply—come together in the market. That will happen a little later in this chapter.

Second, notice that the influence of price is stressed in the definition of quantity demanded. This is for a good reason. The supply and demand model, you recall, is designed to explain how *prices* are determined in perfectly competitive markets. It seems natural, then, to begin our exploration of demand with the influence of prices.

THE LAW OF DEMAND

How does a change in price affect quantity demanded? You probably know the answer to this already: When something is more expensive, people buy less of it.

This common observation applies to walnuts, air travel, magazines, education, and virtually everything else that people buy. For all of these goods and services, price and quantity are *negatively related*—that is, when price rises, quantity demanded falls; when price falls, quantity demanded rises. This negative relationship is observed so regularly in markets that economists call it the *law of demand*.

Law of demand As the price of a good increases, the quantity demanded decreases.

The ***law of demand*** *states that when the price of a good rises and everything else remains the same, the quantity of the good demanded will fall.*

Read that definition again, and notice the very important words "everything else remains the same." The law of demand tells us what would happen *if* all the other influences on buyers' choices remained unchanged, and only one influence—the price of the good—changed.

This is an example of a common practice in economics. In the real world, many variables change *simultaneously*. But to understand the economy, we must understand the effect of each variable *separately*. Imagine that you were trying to discover which headache remedy works best for you. You wouldn't gain much information if you took an Advil, a Tylenol, and an aspirin tablet all at the same time. Instead, you should take just *one* of these pills the next time you get a headache and observe its effects. To understand the economy, we go through the same process—conducting mental experiments in which only one thing changes at a time. The law of demand tells us what happens when we change *just* the price of the good and assume that all other influences on buyers' choices remain constant.

THE DEMAND SCHEDULE AND THE DEMAND CURVE

To make our discussion more concrete, let's look at a specific market: the market for real maple syrup in Wichita, Kansas. In this market, the buyers are all residents of Wichita, whereas the sellers (to be considered later) are maple syrup producers in the United States or Canada.

Demand schedule A list showing the quantities of a good that consumers would choose to purchase at different prices, with all other variables held constant.

Table 1 shows a hypothetical **demand schedule** for maple syrup in this market. This is *a list of different quantities demanded at different prices, with all other variables that affect the demand decision assumed constant*. For example, the demand schedule tells us that when the price of maple syrup is $2.00 per bottle, the quantity demanded will be 6,000 bottles per month. Notice that the demand schedule obeys the law of demand: As the price of maple syrup increases, the quantity demanded falls.

Now look at Figure 1. It shows a diagram that will appear again and again in your study of economics. In the figure, each price-and-quantity combination in Table 1 is represented by a point. For example, point *A* represents the price $4.00 and quantity 4,000, while point *B* represents the pair $2.00 and 6,000. When we

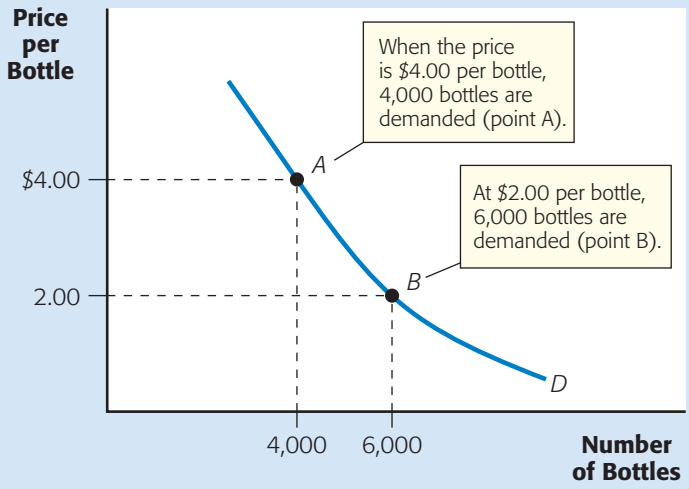
TABLE 1

DEMAND SCHEDULE FOR MAPLE SYRUP IN WICHITA

Price (per Bottle)	Quantity Demanded (Bottles per Month)
$1.00	7,500
2.00	6,000
3.00	5,000
4.00	4,000
5.00	3,500

FIGURE 1

THE DEMAND CURVE



connect all of these points with a line, we obtain the famous *demand curve*, labeled with a *D* in the figure.

The ***market demand curve*** *(or just* ***demand curve****) shows the relationship between the price of a good and the quantity demanded, holding constant all other variables that affect demand. Each point on the curve shows the total quantity that buyers would choose to buy at a specific price.*

Market demand curve The graphical depiction of a demand schedule; a curve showing the quantity of a good or service demanded at various prices, with all other variables held constant.

The demand curve for maple syrup in Figure 1—like virtually all demand curves we might observe—follows the law of demand: A rise in the price of the good causes a decrease in the quantity demanded. Graphically, the law of demand tells us that demand curves slope downward.

CHANGES IN QUANTITY DEMANDED

Markets are affected by a variety of different events. Some events will cause us to *move along* the demand curve for a good. Other events will cause the entire demand curve to *shift*. It is crucial to distinguish between these two very different effects on demand, and economists have adopted a language convention that helps us keep track of the distinction.

Let's go back to Figure 1. There, you can see that if the price of maple syrup rises from $2.00 to $4.00 per bottle, the number of bottles demanded falls from 6,000 to 4,000. This is a movement *along* the demand curve, from point *B* to point *A*, and we call it a *decrease in quantity demanded*. More generally,

a change in a good's price causes us to move along the demand curve. We call this a ***change in quantity demanded****. A rise in price causes a leftward movement along the demand curve—*a decrease in quantity demanded. *A fall in price causes a rightward movement along the demand curve—an* increase in quantity demanded.

Change in quantity demanded A movement along a demand curve in response to a change in price.

TABLE 2

INCREASE IN DEMAND FOR MAPLE SYRUP IN WICHITA

Price (per Bottle)	Original Quantity Demanded (Bottles per Month)	New Quantity Demanded After Increase in Income (Bottles per Month)
$1.00	7,500	9,500
2.00	6,000	8,000
3.00	5,000	7,000
4.00	4,000	6,000
5.00	3,500	5,500

CHANGES IN DEMAND

Whenever we draw a demand curve, we are always assuming something about the other variables that affect buyers' choices. For example, the demand curve in Figure 1 might tell us the quantity demanded at each price, *assuming* that average household income in Wichita is $40,000. In the real world, of course, the average household income in Wichita might change—say, from $40,000 to $45,000. What would happen? With more income, we would expect households to buy more of *most* things, including maple syrup. This is illustrated in Table 2. At the original income level, households would choose to buy 6,000 bottles of maple syrup if the price is $2.00 per bottle. But after income rises, they would choose to buy 8,000 bottles at that same price. The same holds for any other price for maple syrup: after income rises, households will choose to buy more than before. In other words, *the entire relationship between price and quantity demanded has changed.*

Figure 2 plots the new demand curve from the quantities in the third column of Table 2. The new demand curve lies to the *right* of the old curve. For example, at a price of $2.00, the old demand curve told us that the quantity demanded was 6,000 bottles (point *B*). But after the increase in income, buyers would want to buy 8,000 bottles at that price (point *C*). Notice that the rise in household income has *shifted the demand curve to the right*. We call this an *increase in demand,* because the word *demand* means the entire relationship between price and quantity demanded.

More generally,

Change in demand A shift of a demand curve in response to a change in some variable other than price.

a change in any determinant of demand—except for *the good's price—causes the demand curve to shift. We call this a* ***change in demand****. If buyers choose to purchase more at any price, the demand curve shifts rightward—an* increase in demand. *If buyers choose to purchase less at any price, the demand curve shifts leftward—a* decrease in demand.

DANGEROUS CURVES

"Demand" vs. "Quantity Demanded" Language is important when speaking about demand. If you say, "People demand more maple syrup," you might mean that we are moving along the demand curve, like the move from point *A* to point *B* in Figure 1. Or you might mean that the entire demand curve has shifted, like the shift from D_1 to D_2 in Figure 2.

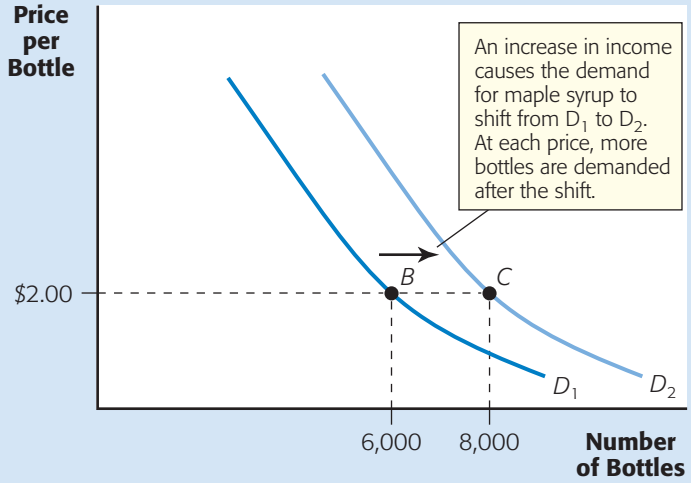
To avoid confusion (and mistakes on exams!), always use the special language that distinguishes between these two cases. When we *move along* the demand curve, we call it a *change in quantity demanded*. A change in quantity demanded is always caused by a change in the good's price. But when the entire demand curve shifts, we call it a *change in demand.* A change in demand is always caused by a change in something *other* than the good's price.

Now let's look at the different variables that can cause demand to change and shift the demand curve.

Income and Wealth. Your **income** is what you earn over a period of time—say, $3,000 per month or $36,000 per year. Your **wealth**—if you are fortunate enough to have some—is

FIGURE 2

A SHIFT OF THE DEMAND CURVE



the total value of everything you own (cash, bank accounts, stocks, bonds, real estate, valuable artwork, or any other valuable property) minus everything you owe (home mortgage, credit card debt, auto loan, student loans, and so on).

Income The amount that a person or firm earns over a particular period.

Wealth The total value of everything a person or firm owns, at a point in time, minus the total value of everything owed.

You've already seen (in Table 2 and Figure 2) how an increase in income would increase the demand for maple syrup. And while income and wealth are different things, they have similar effects on demand. If people's wealth increases—say, through inheritance or an increase in the value of their stocks or bonds—they tend to respond just as if their income had increased, even if their income remains unchanged.

A rise in either income or wealth increases the demand for most goods. We call these **normal goods.** Housing, airline travel, health club memberships and maple syrup are all examples of normal goods.

Normal good A good that people demand more of as their income rises.

The demand for most goods (normal goods) is positively related to income or wealth. A rise in either income or wealth will increase demand for these goods and shift the demand curve to the right.

But not all goods' demand curves behave this way. For some goods—called **inferior goods**—a rise in income or wealth will *decrease* demand. Ground chuck is one example. It's a cheap source of protein, but not most people's idea of a fine dining experience. Higher income or wealth would enable consumers of ground chuck to afford more steaks, decreasing their demand for ground chuck. For similar reasons, Greyhound bus tickets, low-rent housing units, and single-ply paper towels are probably inferior goods. For all of these goods, an increase in consumers' income or wealth would decrease demand, shifting the demand curve to the left.

Inferior good A good that people demand less of as their income rises.

Prices of Related Goods. A **substitute** is a good that can be used in place of another good and that fulfills more or less the same purpose. For example, many people use maple syrup to sweeten their pancakes, but they could use a number of other

Substitute A good that can be used in place of some other good and that fulfills more or less the same purpose.

things instead: honey, sugar, fruit, or jam. Each of these can be considered a substitute for maple syrup.

When the price of a substitute rises, people will choose to buy *more* of the good itself. For example, when the price of jam rises, some jam users will switch to maple syrup, and the demand for maple syrup will increase. In general,

> *when the price of a substitute rises, the demand for a good will increase, shifting the demand curve to the right.*

Of course, if the price of a substitute falls, we have the opposite result: Demand for the original good decreases, shifting its demand curve to the left.

There are countless examples in which a change in a substitute's price affects demand for a good. A rise in the price of postage stamps would increase the demand for electronic mail. A drop in the rental price of videos would decrease the demand for movies at theaters. In each of these cases, we assume that the price of the substitute is the only price that is changing.

Complement A good that is used *together with* some other good.

A **complement** is the opposite of a substitute: It's used *together with* the good we are interested in. Pancake mix is a complement to maple syrup, since these two goods are used frequently in combination. If the price of pancake mix rises, some consumers will switch to other breakfasts—bacon and eggs, for example—that *don't* include maple syrup. The demand for maple syrup will decrease.

> *A rise in the price of a complement decreases the demand for a good, shifting the demand curve to the left.*

This is why we expect a higher price for automobiles to decrease the demand for gasoline and a lower price for movie tickets to increase the demand for movie theater popcorn.

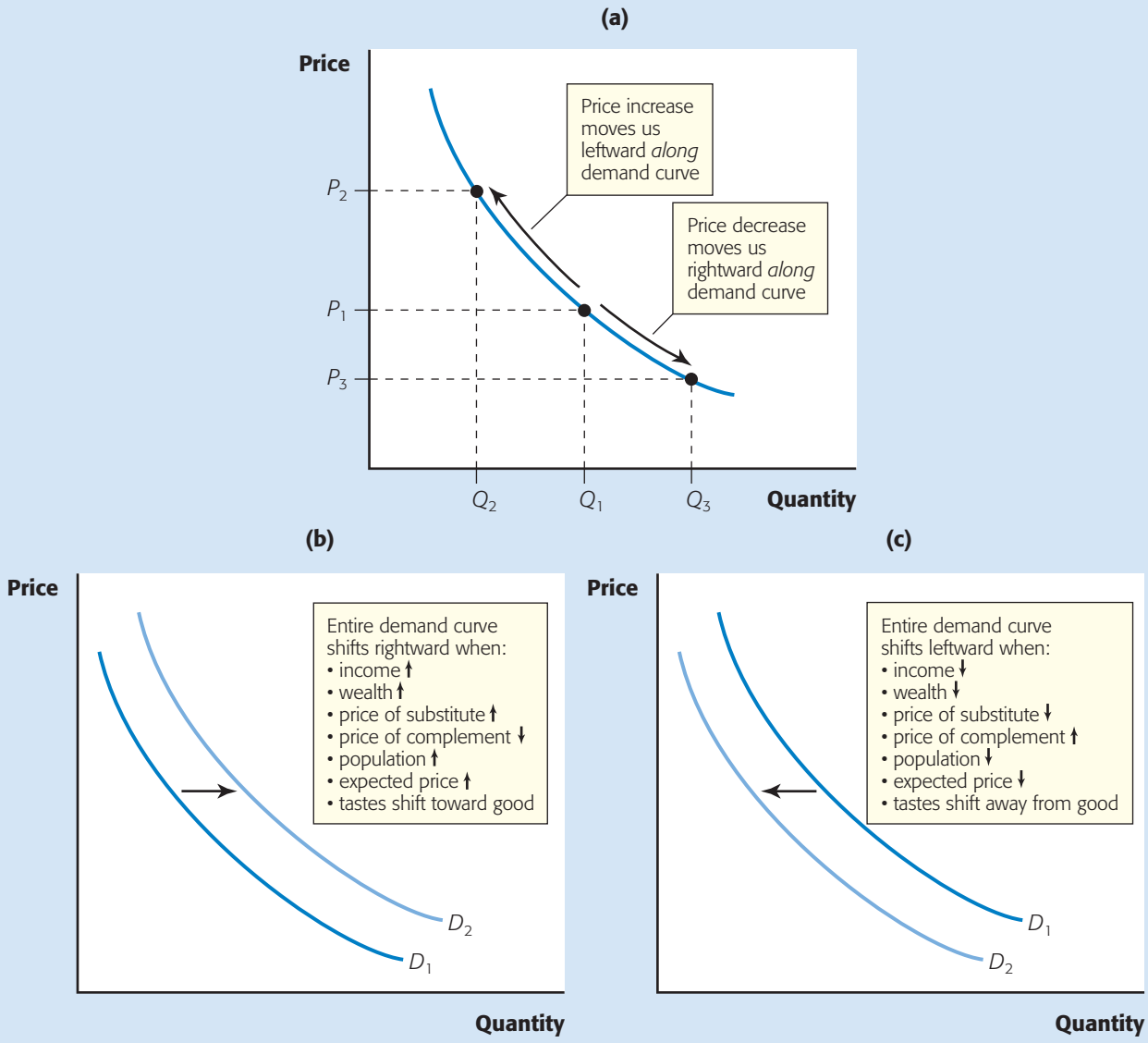
Population. As the population increases in an area, the number of buyers will ordinarily increase as well, and the demand for a good will increase. The growth of the U.S. population over the last 50 years has been an important reason (but not the only reason) for rightward shifts in the demand curves for food, rental apartments, telephones, and many other goods and services.

Expectations. Expectations of future events—especially future changes in a good's price—can affect demand. For example, if buyers expect the price of maple syrup to rise next month, they may choose to purchase more *now* to stock up before the price hike. The demand curve would shift to the right. If people expect the price to drop, they may postpone buying, hoping to take advantage of the lower price later. This would shift the demand curve leftward.

Expectations are particularly important in the markets for financial assets such as stocks and bonds and in the market for real estate. People want to buy more stocks, bonds, and real estate when they think their prices will rise in the near future. This shifts the demand curves for these items to the right.

Tastes. Suppose we know the number of buyers in Wichita, their expectations about the future price of maple syrup, the prices of all related goods, and the average levels of income and wealth. Do we have all the information we need to draw the demand curve for maple syrup in Wichita? Not really. Because we do not yet know how consumers there *feel* about maple syrup. How many of them eat break-

CHANGES IN DEMAND AND IN QUANTITY DEMANDED FIGURE 3



fast? Of these, how many eat pancakes or waffles? How often? How many of them *like* maple syrup, and how much do they like it? And what about all of the other goods and services competing for Wichita consumers' dollars: How do buyers feel about *them*?

The questions could go on and on, pinpointing various characteristics about buyers that influence their attitudes toward maple syrup. The approach of economics is to lump all of these characteristics of buyers together and call them, simply, *tastes*. Economists are sometimes interested in where these tastes come from or what makes them change. But for the most part, economists concern themselves with the *consequences* of a change in tastes, whatever the reason for its occurrence.

Does Supply Affect Demand? A troubling thought may have occurred to you. Among the variables that shift the demand curve in Figure 3, shouldn't we include the amount supplied by sellers? Or to put the question another way, doesn't supply influence demand?

The answer is no—at least, not directly. The demand curve tells us how much buyers *would choose* to buy at different prices. It provides answers to a series of hypothetical questions: How much maple syrup *would* consumers choose to buy if the price were $3.00 per bottle? If the price were $3.50 per bottle? and so on. Sellers' decisions have no effect on the demand curve, since they do not affect the answers to these hypothetical questions.

When tastes change *toward* a good (people favor it more), demand increases, and the demand curve shifts to the right. When tastes change *away* from a good, demand decreases, and the demand curve shifts to the left. An example of this is the change in tastes away from cigarettes over the past several decades. The cause may have been an aging population, a greater concern about health among people of *all* ages, or successful antismoking advertising. But regardless of the cause, the effect has been to decrease the demand for cigarettes, shifting the demand curve to the left.

Figure 3 summarizes the important variables that affect the demand side of the market, and how their effects are represented with a demand curve. Notice the important distinction between movements *along* the demand curve and *shifts* of the entire curve.

SUPPLY

Now we switch our focus from the buying side to the selling side of the market. When we discussed demand, we noted that each buyer comes to a market with a goal—to make himself as well-off as possible. But the buyer also faces a constraint: He must pay for purchases out of a limited income.

A seller, too, comes to a market with a goal—to make as much profit as possible. And if the seller is a business firm (which we'll assume for most of this chapter), it faces an important constraint: Producing output (goods and services) requires the use of inputs. The quantities of those inputs needed are determined by the firm's *production technology*.

Technology The set of methods a firm can use to turn inputs into outputs

A firm's ***production technology*** *(or just* ***technology****) is the set of methods it can use to turn inputs (resources and raw materials) into outputs (goods or services).*

Continuing with our example, there are many different ways for a maple syrup farm to produce its output (maple syrup) from its inputs (land, maple trees, labor, capital, fuel, transportation, glass bottles, etc.). The sap can be collected with buckets, bags, plastic tubing, or some combination of these. Syrup evaporators can be fueled with wood, oil, or natural gas, and they can include accessories such as preheaters, reverse osmosis, steam hoods, automatic draw-offs, and more. The syrup can be packaged in glass bottles or plastic bottles or metal tins, and it can be shipped across the country by train, truck, or aircraft. As you can see, there are hundreds if not thousands of different ways to combine inputs to produce a given quantity of maple syrup. Each of these production methods is a part of the known technology of this industry.

A firm's production technology tells us not only what the firm *can* do, it also tells us what it *cannot* do. For example, a firm cannot produce a thousand gallons of maple syrup per year with only 10 trees, no matter how much labor or equipment it uses, and it cannot produce *any* maple syrup at all using iron ore instead of maple trees.

The known technology in an industry is an important constraint on the firm. Another constraint is that it must *pay a price* for its inputs. Together, the technology of production and the prices of its inputs determine how much it will *cost* the firm to produce different quantities of output.

Finally, every competitive firm faces one more constraint: the market price. The firm is not free to set any price it wants for its output. Rather, it must accept the market price as a given.

In sum,

when a competitive firm comes to a market as a seller, it wants to make the highest possible profit. The firm can choose the level of output it wants to produce, but it faces three constraints: (1) its production technology, (2) the prices it must pay for its inputs, and (3) the market price of its output.

Together, the firm's goal of earning the highest possible profit and the constraints that it faces determine the quantity that it will supply in the market.

More specifically,

*a **firm's quantity supplied** of any good is the amount it would choose to produce and sell at a particular price.*

Firm's quantity supplied The total amount of a good or service that an individual firm would choose to produce and sell at a given price.

And when we turn to the market as a whole:

*The **market quantity supplied** of any good is the amount that all firms in the market would like to produce and sell at a particular price, given the prices they must pay for their inputs, and given any other influences on their selling decisions.*

Market quantity supplied The total amount of a good or service that all producers in a market would choose to produce and sell at a given price.

Notice that quantity supplied—like quantity demanded—tells us about sellers' *choices*. The amount that will *actually* be sold will be discussed later, when we put demand and supply together.

THE LAW OF SUPPLY

How does a change in price affect quantity supplied? When a seller can get a higher price for a good, producing and selling it become more profitable. Producers will devote more resources toward its production—perhaps even pulling resources out of other types of production—and increase the quantity of the good they would like to sell. For example, a rise in the price of laptop computers will encourage computer makers to shift resources out of the production of other things (such as desktop computers) and toward the production of laptops.

In general, price and quantity supplied are *positively related:* When the price of a good rises, the quantity supplied will rise as well. This relationship between price and quantity supplied is called the law of supply, the counterpart to the law of demand we discussed earlier.

*The **law of supply** states that when the price of a good rises, and everything else remains the same, the quantity of the good supplied will rise.*

Law of supply As the price of a good increases, the quantity supplied increases.

Once again, notice the very important words "everything else remains the same." Although many other variables influence the quantity of a good supplied, the law of supply tells us what would happen if all of them remained unchanged as the price of the good changed.

THE SUPPLY SCHEDULE AND THE SUPPLY CURVE

Let's continue with our example of the market for maple syrup in Wichita. Who are the suppliers in this market? Since maple syrup is easy to transport, any producer on the continent can sell in Wichita. In practice, these producers are located mostly in the forests of Vermont, upstate New York, and Canada. The market quantity supplied is the amount of maple syrup all of these producers together would offer for sale in Wichita at each price for maple syrup.

Supply schedule A list showing the quantities of a good or service that firms would choose to produce and sell at different prices, with all other variables held constant.

Table 3 shows the **supply schedule** for maple syrup in Wichita—a *list of different quantities supplied at different prices, with all other variables held constant*. As you can see, the supply schedule obeys the law of supply: As the price of maple syrup in Wichita rises, the quantity supplied rises along with it. But how can this be? After all, maple trees must be about 40 years old before they can be tapped for syrup, so any rise in quantity supplied now or in the near future cannot come from an increase in planting. What, then, causes quantity supplied to rise as price rises?

Many things. First, with higher prices, firms will find it profitable to tap existing trees more intensively. Second, evaporating and bottling can be done more carefully, so that less maple syrup is spilled and more is available for shipping. Finally, the product can be diverted from other areas and shipped to Wichita instead. For example, if the price of maple syrup rises in Wichita but not in Kansas City, producers would shift deliveries away from Kansas City and toward Wichita.

Now look at Figure 4, which shows a very important curve—the counterpart to the demand curve we drew earlier. In Figure 4, each point represents a price-quantity pair taken from Table 3. For example, point *F* in the figure corresponds to a price of $2.00 per bottle and a quantity of 4,000 bottles per month, while point *G* represents the price-quantity pair $4.00 and 6,000 bottles. Connecting all of these points with a solid line gives us the *supply curve* for maple syrup, labeled with an *S* in the figure.

Supply curve A graphical depiction of a supply schedule; a curve showing the quantity of a good or service supplied at various prices, with all other variables held constant.

*The **supply curve** shows the relationship between the price of a good and the quantity supplied, holding constant the values of all other variables that affect supply. Each point on the curve shows the quantity that sellers would choose to sell at a specific price.*

Notice that the supply curve in Figure 4—like all supply curves for goods and services—is *upward sloping*. This is the graphical representation of the law of supply.

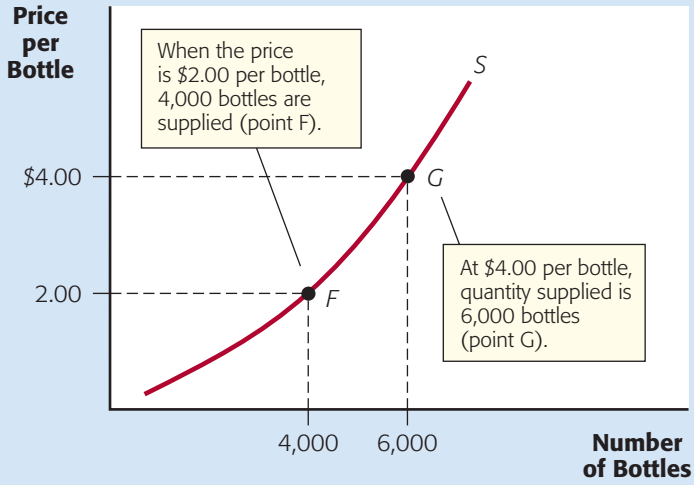
TABLE 3

SUPPLY SCHEDULE FOR MAPLE SYRUP IN WICHITA

Price (per Bottle)	Quantity Supplied (Bottles per Month)
$1.00	2,500
2.00	4,000
3.00	5,000
4.00	6,000
5.00	6,500

FIGURE 4

THE SUPPLY CURVE



The law of supply tells us that supply curves slope upward.

CHANGES IN QUANTITY SUPPLIED

Sellers' choices about how much to sell are affected by many different variables. One of these variables—the price of the good—causes sellers to *move along* a given supply curve. The other variables cause the entire supply curve to *shift*. Economists use the same language convention for supply that we discussed earlier for demand. Look once again at Figure 4. Notice that when the price of maple syrup rises from $2.00 to $4.00, the number of bottles supplied rises from 4,000 to 6,000. This is a movement *along* the supply curve, from point *F* to point *G*, and we call it an *increase in quantity supplied*.

More generally,

a change in a good's price causes us to move along *the supply curve. We call this a* ***change in quantity supplied****. A rise in price causes a rightward movement along the supply curve—an increase in quantity supplied. A fall in price causes a leftward movement along the supply curve—a decrease in quantity supplied.*

Change in quantity supplied A movement along a supply curve in response to a change in price.

CHANGES IN SUPPLY

Both the supply schedule in Table 3 and the supply curve in Figure 4 assume given values for all other variables that might affect supply. For example, the supply curve in Figure 4 might tell us the quantity supplied at each price, *assuming* that maple syrup workers are paid $10 per hour. But what would happen if these workers' wages fell to $7 per hour? Then, at any given price for maple syrup, firms would find it more profitable to produce and sell maple syrup, and they would no doubt choose to sell more. This is illustrated in Table 4. For example, at the original wage of $10, maple syrup producers would choose to sell 6,000 bottles when the price is

TABLE 4

INCREASE IN SUPPLY OF MAPLE SYRUP IN WICHITA

Price (per Bottle)	Quantity Supplied (Bottles/Month)	Quantity Supplied After Increase in Supply
$1.00	2,500	4,500
2.00	4,000	6,000
3.00	5,000	7,000
4.00	6,000	8,000
5.00	6,500	8,500

$4.00. But if they could pay the lower wage of $7, they would choose to sell 8,000 bottles at that same price of $4.00 per bottle. The same holds for any other price for maple syrup: After the wage falls, sellers would choose to sell more than before. In other words, *the entire relationship between price and quantity supplied has changed*.

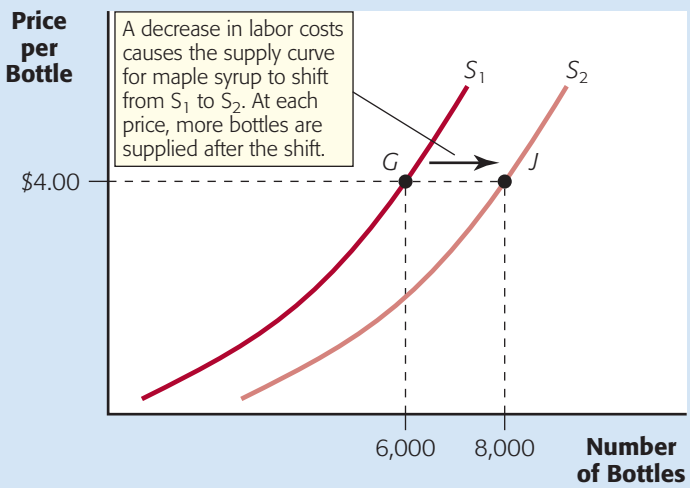
Figure 5 plots the new supply curve from the quantities in the third column of Table 4. The new supply curve lies to the *right* of the old curve. For example, at a price of $4.00, the old supply curve told us that quantity supplied was 6,000 bottles (point *G*). But after the decrease in the wage, sellers would choose to supply 8,000 bottles at $4.00 each (point *J*). The decrease in maple syrup workers' wages has *shifted the supply curve to the right*. We call this an *increase in supply*.

Change in supply A shift of a supply curve in response to some variable other than price.

A change in any influence on supply—except for the good's price—causes the supply curve to shift. We call this a ***change in supply****. When sellers choose to sell more at any price, the supply curve shifts rightward—an* increase *in supply. When sellers choose to sell less at any price, the supply curve shifts leftward—a* decrease *in supply.*

FIGURE 5

A SHIFT OF THE SUPPLY CURVE



Now let's take a look at the different variables that can cause a change in supply and shift the supply curve.

"Supply" vs. "Quantity Supplied" To avoid confusion, always apply the same language convention for supply that we discussed earlier for demand. When we *move along* the supply curve, we call it a *change in quantity supplied*. A change in quantity supplied is always caused by a change in the good's price. When the entire supply curve shifts, we call it a *change in supply.* A change in supply is caused by a change in something *other* than the good's price.

Prices of Inputs. Producers of maple syrup use a variety of inputs: land, maple trees, evaporators, sap pans, labor, glass bottles, bottling machinery, transportation, and more. A higher price for any of these means a higher cost of producing and selling maple syrup, making it less profitable. As a result, we would expect producers to shift some resources out of maple syrup production, causing a decrease in supply.

In general,

a rise in the price of an input causes a decrease in supply, shifting the supply curve to the left. A fall in the price of an input causes an increase in supply, shifting the supply curve to the right.

Figure 5 has already illustrated one example of this: The supply curve shifted rightward when the wage rate paid to maple syrup workers fell. Now we can see that maple syrup workers are just *one* type of input among many for syrup producers. If the price of bottles, transportation, or any other input were to decrease, it would also shift the supply curve for maple syrup rightward, just as in Figure 5.

Profitability of Alternate Goods. Many firms can switch their production rather easily among several different goods or services, all of which require more or less the same inputs. For example, a dermatology practice can rather easily switch its specialty from acne treatments for the young to wrinkle treatments for the elderly. An automobile producer can—without too much adjustment—switch to producing light trucks. And a maple syrup producer could dry its maple syrup and produce maple *sugar* instead. Or it could even cut down its maple trees and sell maple wood as lumber. These other goods that firms *could* produce are called **alternate goods.**

Alternate goods Other goods that a firm could produce, using some of the same types of inputs as the good in question.

When an alternate good becomes more profitable to produce—because its price rises, or the cost of producing it falls—the supply curve for the good in question will shift leftward.

In our example, if the price of maple *sugar* rises, and nothing else changes, maple sugar will become more profitable. Producers will devote more of their output to maple sugar, *decreasing* the supply of maple syrup.

Technology. A *technological advance* in production occurs whenever a firm can produce a given level of output in a new and cheaper way than before. For example, the discovery of a surgical procedure called Lasik—in which a laser is used to reshape the interior of the cornea rather than the outer surface—has enabled eye surgeons to correct their patients' vision with fewer follow-up visits and smaller quantities of medication than were used with previous procedures. Similarly, in the late 1990s, several firms—including eBay, Amazon.com, and Priceline.com—developed new software that enabled people and firms to trade used goods more cheaply

Does Demand Affect Supply? The list of variables that shift the supply curve in Figure 6 does not include the amount that buyers want to buy. Is this a mistake? Doesn't demand affect supply?

The answer is no—at least, not directly. The supply curve tells us how much sellers *would choose* to sell at alternative prices. It provides answers to a series of hypothetical questions, such as How much maple syrup would firms choose to sell if the price were $4.00 per bottle? If the price were $3.50 per bottle? and so on. Buyers' decisions don't affect the answers to these questions, so they cannot shift the supply curve.

over the Internet (compared to the previous method of running and searching through classified ads). These examples are technological advances because they enable firms to produce the same output (eye surgeries, used goods sales) more cheaply than before.

In maple syrup production, a technological advance might be a new, more efficient tap that draws more maple syrup from each tree, or a new bottling method that reduces spillage. Advances like this would reduce the cost of producing maple syrup, and producers would want to make and sell more of it at any price.

In general,

cost-saving technological advances increase the supply of a good, shifting the supply curve to the right.

Productive Capacity. A market's productive capacity is determined by the number of producers in the market, and the plant and equipment possessed by each firm. Whenever productive capacity increases, the supply curve shifts rightward, since sellers would choose to sell a greater total quantity at each price. Similarly, a decrease in productive capacity will shift the supply curve leftward. For example, if a sudden blight destroyed maple trees in Vermont, the total productive capacity of maple syrup suppliers would shrink, decreasing the supply of maple syrup to any market. On the other hand, if—over time—more firms moved into the market and started their own maple syrup farms, supply would increase.

Changes in weather can cause sudden changes in productive capacity in many agricultural markets. Good weather increases the productive capacity of all farms in a region, shifting supply curves for their crops to the right. Bad weather destroys crops and decreases productive capacity, shifting supply curves to the left. Natural disasters such as fires, hurricanes, and earthquakes can destroy the productive capacity of *all* industries in a region, thereby causing sudden, dramatic leftward shifts in supply curves.

An increase in sellers' productive capacity—caused by, say, good weather or an increase in the number of firms—shifts the supply curve rightward. A decrease in sellers' productive capacity shifts the supply curve leftward.

Expectations of Future Prices. Imagine that you are the president of Sticky's Maple Syrup, Inc., and your research staff has just determined that the price of maple syrup will soon rise dramatically. What would you do? You should *postpone* producing—or at least selling—your output until later, when the price will be higher and profits will be greater. Applying this logic more generally,

a rise in the expected price of a good will decrease supply, shifting the supply curve leftward.

CHANGES IN SUPPLY AND IN QUANTITY SUPPLIED FIGURE 6

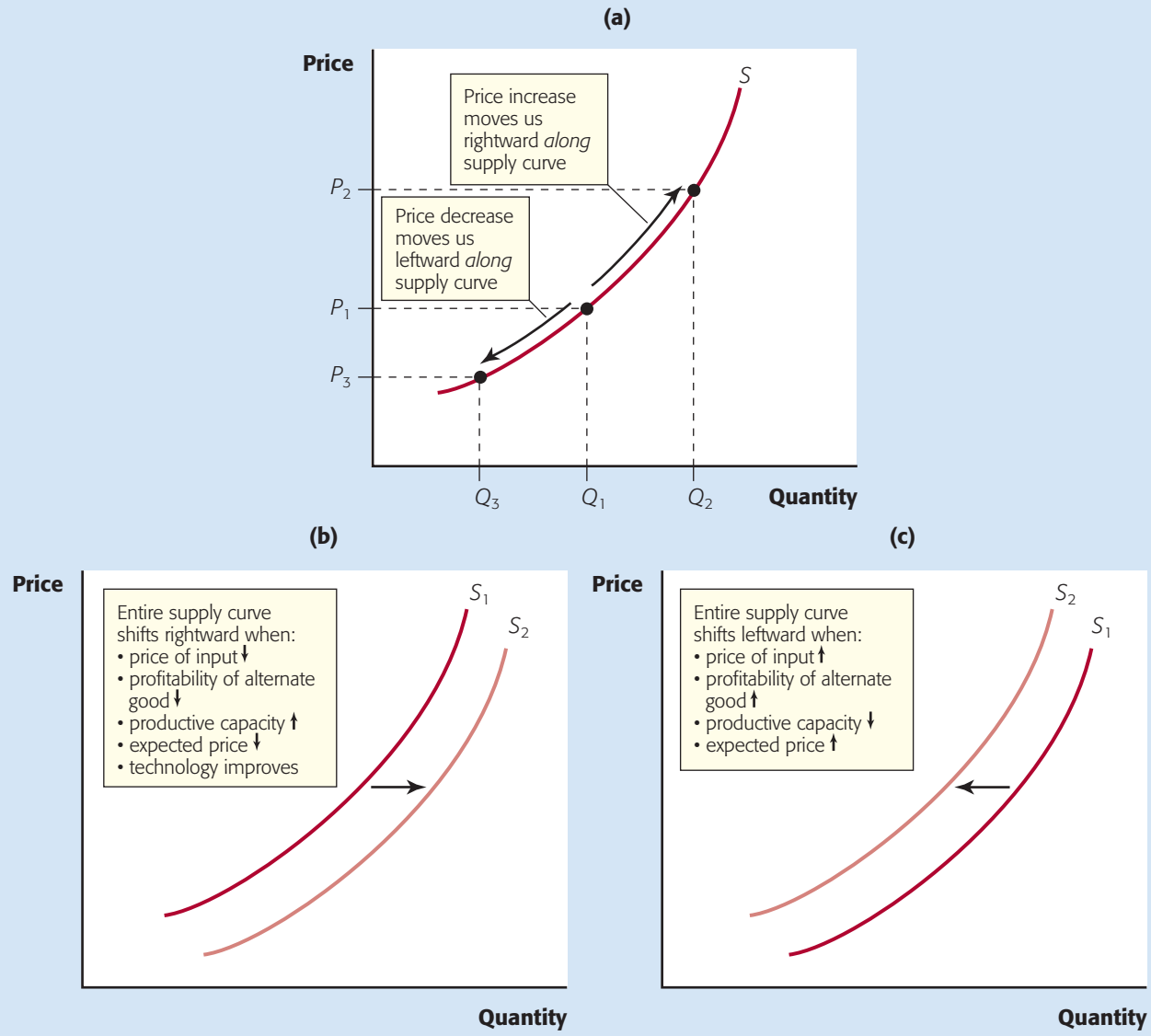


Figure 6 summarizes the different variables that change the supply of a good and shift the supply curve.

PUTTING SUPPLY AND DEMAND TOGETHER

What happens when buyers and sellers, each having the desire and the ability to trade, come together in a market? The two sides of the market certainly have different agendas. Buyers would like to pay the lowest possible price, while sellers would like to charge the highest possible price. Is there chaos when they meet, with

Try your hand at a Java-based supply and demand simulation. You can find it at http://openteach.com/economics/microeconomics.html.

buyers and sellers endlessly chasing after each other or endlessly bargaining for advantage, so that trade never takes place? A casual look at the real world suggests not. In most markets, most of the time, there is order and stability in the encounters between buyers and sellers. In most cases, prices do not fluctuate wildly from moment to moment, but seem to hover around a stable value. This stability may be short lived—lasting only a day, an hour, or even a minute in some markets—but still, for this short time, the market seems to be at rest. Whenever we study a market, therefore, we look for this state of rest—a price and quantity at which the market will settle, at least for a while.

Economists use the word *equilibrium* when referring to a state of rest. More formally,

Equilibrium A state of rest; a situation that, once achieved, will not change unless some external factor, previously held constant, changes.

*an **equilibrium** is a situation that, once achieved, will not change unless there is a change in something we have been assuming to be constant.*

What will be the price of maple syrup in Wichita? And how much will people actually buy each month? We can rephrase these questions as follows: What is the *equilibrium* price of maple syrup in Wichita, and what is the *equilibrium* quantity of maple syrup that will be bought and sold? These are precisely the questions that the supply-and-demand model is designed to answer.

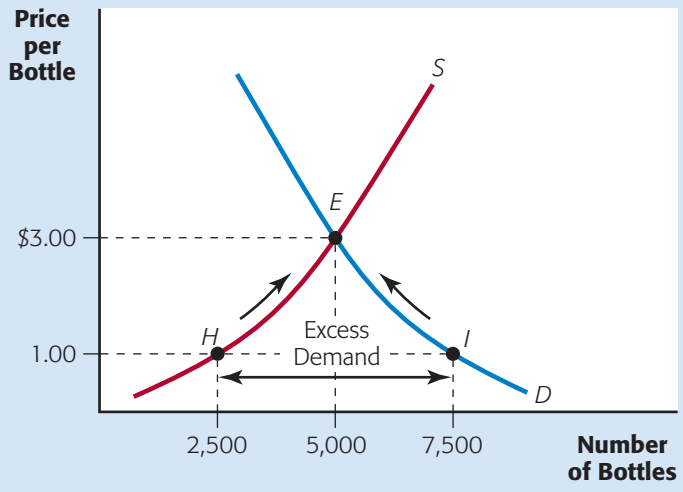
Look at Figure 7, which combines the supply and demand curves for maple syrup in Wichita. We'll use Figure 7 to find the equilibrium in this market through the process of elimination. Let's first ask what would happen if the price of maple syrup in Wichita were $1.00 per bottle. At this price, we see that buyers would choose to buy 7,500 bottles each week, while sellers would offer to sell only 2,500 per week. There is an **excess demand** of 5,000 bottles. What will happen? Buyers will compete with each other to get more maple syrup than is available, offering to pay a higher price rather than do without. The price will then rise. You can see that $1.00 per bottle is *not* the equilibrium price, since—if the price *were* $1.00—it would automatically tend to rise.

Excess demand At a given price, the excess of quantity demanded over quantity supplied.

FIGURE 7

The intersection of the supply and demand curves at point *E* determines the market price of maple syrup ($3.00 per bottle) and the number of bottles exchanged (5,000). At a lower price, such as $1.00 per bottle, buyers would like to purchase more bottles (7,500) than producers are willing to supply (2,500). The resulting excess demand of 5,000 bottles causes the price to rise.

MARKET EQUILIBRIUM



Before we consider other possible prices, let's look more closely at the changes we would see in this market as the price rose. First, there would be a decrease in quantity demanded—a movement along the demand curve leftward from point *I*. At the same time, we would see an increase in quantity supplied—a movement along the supply curve rightward from point *H*. As these movements continued, the excess demand for maple syrup would shrink and, finally—at a price of $3.00—disappear entirely. At this price, there would be no reason for any further price change, since quantity supplied and quantity demanded would both equal 5,000 bottles per month. There would be no disappointed buyers to offer higher prices. In sum, if the price happens to be below $3.00, it will rise to $3.00 and then stay put.

Now let's see what would happen if, for some reason, the price of maple syrup were $5.00 per bottle. Figure 8 shows us that, at this price, quantity supplied would be 6,500 bottles per month, while quantity demanded would be only 3,500 bottles—an **excess supply** of 3,000 bottles. Sellers would compete with each other to sell more maple syrup than buyers wanted to buy, and the price would fall. Thus, $5.00 cannot be the equilibrium price.

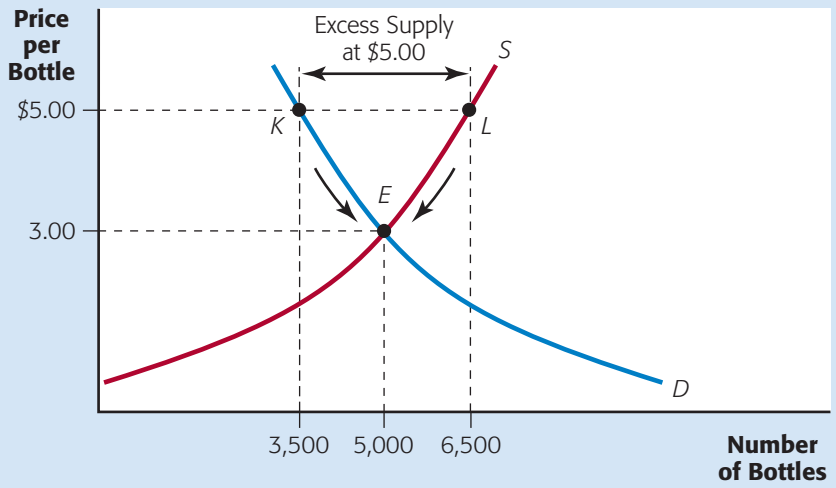
Excess supply At a given price, the excess of quantity supplied over quantity demanded.

Moreover, the decrease in price would move us along both the supply curve (leftward) and the demand curve (rightward). As these movements continued, the excess supply of maple syrup would shrink until it disappeared, once again, at a price of $3.00 per bottle. Our conclusion: If the price happens to be above $3.00, it will fall to $3.00 and then stop changing.

You can see that any price higher or lower than $3.00 is *not* the equilibrium price. If the price is higher than $3.00, it will tend to drop, and if it is lower, it will tend to rise. You can also see—in Figures 7 and 8—that if the price were exactly $3.00, there would be neither an excess supply nor an excess demand. Sellers would choose to sell 5,000 bottles per week, and this is exactly the quantity buyers would choose to buy. There would be no reason for the price to change. Thus, $3.00 must be our sought-after equilibrium price and 5,000 our equilibrium quantity.

FIGURE 8

EXCESS SUPPLY AND PRICE ADJUSTMENT



At any price above $3.00 per bottle, the market for maple syrup in Wichita will be out of equilibrium. The excess supply of 3,000 bottles at a price of $5.00 causes the market price to fall. As the price falls, quantity supplied decreases and quantity demanded increases. At point *E*, the market is back in equilibrium.

No doubt, you have noticed that $3.00 happens to be the price at which the supply and demand curves cross. This leads us to an easy, graphical technique for locating our equilibrium:

To find the equilibrium price and quantity in a competitive market, draw the supply and demand curves. The equilibrium is the point where the two curves intersect.

The intersection of the supply and demand curves helps us to understand the concept of equilibrium even more clearly. At the intersection, the market is operating on *both* the demand and the supply curves. When the price is $3.00, buyers and sellers can *actually* buy and sell the quantities they would *choose* to buy and sell at $3.00. There are no dissatisfied buyers unable to find the goods they want to purchase, nor are there unhappy sellers, unable to find buyers for the products they have brought to the market. This is why $3.00 is the equilibrium price. In this state of rest, there is a balance between the quantity supplied and the quantity demanded.

But that point of rest will not necessarily be a lasting one, as you are about to see.

WHAT HAPPENS WHEN THINGS CHANGE?

Remember that in order to draw the supply and demand curves in the first place, we had to assume particular values for all the other variables—besides price—that affect demand and supply. If any one of these variables changes, then either the supply curve or the demand curve will shift, and our equilibrium will change as well. Economists are very interested in how and why an equilibrium changes in a market. Let's look at some examples.

AN ICE STORM HITS THE NORTHEAST: A DECREASE IN SUPPLY

In January 1998, New England and Quebec were struck by a severe ice storm. Hundreds of thousands of maple trees were downed, and many more were damaged. In Vermont alone, 10% of the maple trees were destroyed. How did this affect the market for maple syrup in faraway Wichita?

Maple trees are part of the productive capacity of a maple syrup firm, just as factory buildings are part of the productive capacity of a toy manufacturer. And as you learned in this chapter (see Figure 6), a decrease in productive capacity causes a leftward shift of the supply curve in any market in which maple syrup is sold—including the local market in Wichita.

Figure 9 shows how the ice storm affected this market. Initially, the supply curve for maple syrup in Wichita was S_1, with the market in equilibrium at Point E. After the ice storm, and the resulting decrease in productive capacity, the supply curve shifted leftward—say, to S_2. The result: a

Do Curves Shift Up and Down? Or Right and Left? It's tempting to use *upward* and *rightward* interchangeably when describing an increase in demand or supply and to use *downward* and *leftward* when describing a decrease in demand or supply. But be careful! While this interchangeable language works for the demand curve, it does *not* work for the supply curve. To prove this to yourself, look at Figure 6. There you can see that a rightward shift of the supply curve (an increase in supply) is also a *downward* shift of the curve. In later chapters, it will sometimes make sense to describe shifts as upward or downward. For now, it's best to avoid these terms, and stick with *rightward* and *leftward*.