

# Demand and Supply

## ■ 5.1 Introduction

In late 2005, a new album release made a big splash in the music world—and sent a small ripple through the economy. The release was *Some Hearts*, country singer Carrie Underwood's first CD. *Some Hearts* was reported to be the fastest-selling debut country album in history. It started out at number 2 on *Billboard's* chart of the top-selling 200 albums. Within three weeks of its appearance in stores, fans had bought nearly 315,000 copies. For the next three years, *Some Hearts* would be the best-selling country music album by a female singer. By 2008, Underwood had sold more than 6 million *Some Hearts* CDs in the United States alone.

For Underwood, the rise to stardom came suddenly. In high school she had dreamed of becoming a singer but set that dream aside to go to college. She continued to sing for family and friends, and performed during summers in a country music show. But demand for her talents was limited to a small, local market.

In her senior year, Underwood read a news story about upcoming auditions for *American Idol*, a television show in which singers compete to become the next big music star. She was chosen to be a contestant in the summer of 2004 and, in 2005, won the competition.

In a matter of months, Underwood went from being an unknown to being a star. After completing her college degree and releasing her first album, she began a concert tour. In 2006, she performed in more than 150 shows, including holiday shows for U.S. troops in Kuwait and Iraq. The following year, she released her second best-selling album, *Carnival Ride*.

As avid consumers of music, teenagers contribute to the demand for new musical groups and CDs.

## Speaking of Economics

### **demand**

The quantity of a good or service that consumers are both willing and able to buy at various prices.

### **law of demand**

An economic law stating that as the price of a good or service increases, the quantity demanded decreases, and vice versa. Generally, consumers are happier to buy goods and services at lower prices than at higher prices.

### **substitute good**

A product that satisfies the same basic want as another product. Substitute goods may be used in place of one another.

### **complementary good**

A product that is used or consumed jointly with another product. Such a good usually has more value when paired with its complement than when used separately.

### **supply**

The quantity of a good or service that producers are willing and able to offer for sale at various prices.

### **law of supply**

An economic law stating that as the price of a good or service increases, the quantity supplied increases, and vice versa. Generally, producers are happier to offer goods and services at higher prices than at lower prices.

### **revenue**

The amount of money a firm receives in the course of doing business. Revenue is calculated by multiplying the quantity sold by the price.

### **elasticity**

A measure of the degree to which the quantity demanded or supplied of a good or service changes in response to a change in price.



Millions of Americans watched as country singer Carrie Underwood learned she had won the *American Idol* competition in 2005. After that win, demand for her vocal talents soared. Fans flocked to her concerts and bought millions of her CDs.



How much would you have been willing to pay to see Carrie Underwood perform when she was still an unknown? Not a lot, certainly. Perhaps \$5 if a friend had given her show a rave review.

Now assume that after her appearances on *American Idol*, you became a fan. How much would you have been willing to pay then? In 2008, tickets to Carrie Underwood concerts cost around \$45 and up. Thousands of people paid this much and more to see her perform. The demand for Underwood's singing had clearly increased since her *American Idol* victory.

Carrie Underwood's rise to stardom is more than just a country music success story. From an economist's point of view, it is also an illustration of demand and of how demand can change. In this chapter, you will read more about demand and its partner, supply. You will explore how price and other factors influence what consumers demand and what producers are willing to supply.

## ■ 5.2 How Do Demand and Price Interact?

Most people's understanding of demand comes from their own experience as consumers. Consumers, after all, are the ones who decide what to buy and how much to spend. Demand, in this everyday sense, is whatever consumers decide they want. But how do consumers—how do *we*—make those decisions?

Consider this scenario. You are shopping for CDs.

You see *Some Hearts* for sale for \$15. Do you buy it? Would you be more likely to buy it if it were priced at \$11? What about if it were priced at \$18? If you respond the way economists expect you to, the lower the price, the more likely you would be to buy the CD. This is a key idea in understanding the relationship between demand and price.

### **Demand: What We Are Willing and Able to Buy at Various Prices**

Anyone who has ever gone shopping knows that making a purchase depends on two things. You have to be willing to buy the item in question, and you have to be able to pay for it.

Those two characteristics of consumers—willingness and ability—both matter to economists. You may want the Underwood CD, for example, but if you don't have \$15, you can't buy it. You see a Rolling Stones CD priced at \$9, but you don't like the Rolling Stones enough to spend the money. For you to contribute to the demand for either CD, you have to be both willing and able to buy.

What does it mean to contribute to the demand for something? Let's say that you do, after all, buy a copy of *Some Hearts* for \$15. That one copy, at that one price, is what an economist would call your quantity demanded. **Quantity demanded** is the amount of a good or service that consumers are willing and able to buy at a specific price. If a different store were to charge \$11 for *Some Hearts*, and consumers bought



30 copies, then that amount at that price—30 copies at \$11—would be the quantity demanded.

When the quantities demanded at all the various prices at which a good is sold are added together, the result is demand. **Demand** is the amount of a good or service that consumers are willing and able to buy at all prices in a given period.

Demand is expressed in terms of a time frame, such as “per day” or “per week.” To say that consumers bought 315,000 copies of *Some Hearts* does not, to an economist, convey demand. But 315,000 copies purchased in three weeks is demand. Enormous demand, in fact. And every consumer who bought *Some Hearts* during that period, at any price, contributed to it.

### Using a Demand Schedule to Determine One Consumer’s Willingness and Ability to Buy

Price is obviously important to consumers. How important? A simplified model of a market can show us how prices influence consumers’ buying decisions.

Suppose that Tyler is the sole consumer in a market with one product, tacos. Assume that the tacos sold in this market are all exactly alike. This is the *ceteris paribus*, or other-things-being-equal, assumption. Also assume that price is Tyler’s only consideration. All other influences on Tyler’s buying—and there could be many—are held constant.

Tyler eats tacos several times a week at a taqueria owned by Jasmine. One day Jasmine conducts a

customer survey to find out how Tyler might react to a price change. The survey asks how many tacos per week Tyler would be willing and able to buy at various prices.

The results of Jasmine’s survey are shown in the table in Figure 5.2A. Economists call this kind of table a **demand schedule**. An individual demand schedule lists the quantities of a good that one person will buy at various prices. Tyler’s demand schedule shows that at a price of \$1.00, his quantity demanded is nine tacos. That is, he can be expected to buy nine tacos per week when the price is \$1.00. Notice that as the price increases, the quantity of tacos that Tyler is willing and able to buy decreases.

The data from Tyler’s demand schedule are plotted on the graph in Figure 5.2A. Each pair of variables in the demand schedule—quantity and price—is a pair of coordinates marking a point on the graph. The line that is formed by connecting the points is called a **demand curve**. A **demand curve** shows the relationship between price and the quantity that buyers are willing and able to buy. Put another way, it shows how price influences the quantity demanded. As the price changes, the quantity demanded moves up or down along the demand curve.

Notice that this demand curve happens to be a straight line. Demand curves can be straight or curved. As you might expect, this demand curve shows that Tyler is able and willing to buy a lot more tacos at \$0.50 apiece than at \$3.00 apiece.

Figure 5.2A

#### Graphing Individual Demand

A demand schedule and graph show how much of something consumers in a market are able and willing to buy at various prices. In this case, the market has just one consumer, Tyler.

- When plotted on a graph, the data from Tyler’s demand schedule form a demand curve.
- Each point on the curve shows the relationship between price (on the vertical axis) and quantity demanded (on the horizontal axis).

#### Tyler’s Demand Schedule

| Price<br>(per taco) | Quantity<br>(tacos per week) |
|---------------------|------------------------------|
| \$0.50              | 11                           |
| 1.00                | 9                            |
| 1.50                | 7                            |
| 2.00                | 5                            |
| 2.50                | 3                            |
| 3.00                | 1                            |

#### Tyler’s Demand Curve

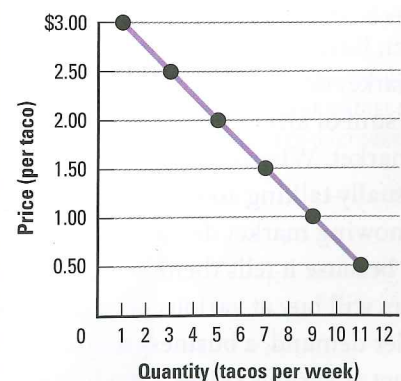


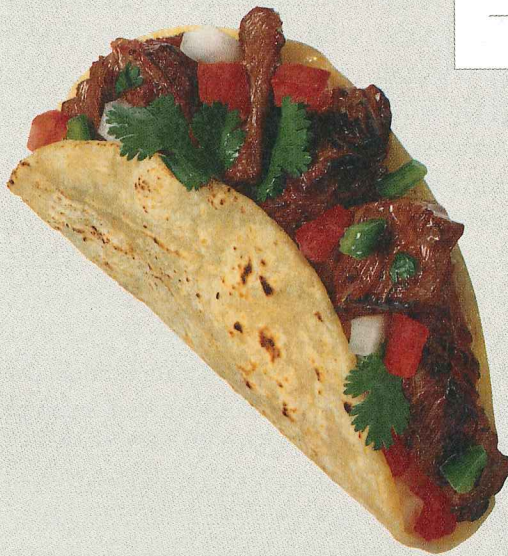


Figure 5.2B

### Graphing Market Demand

Market demand is the sum of the individual quantities demanded in a market. In this case, the market is made up of the four consumers listed on the demand schedule.

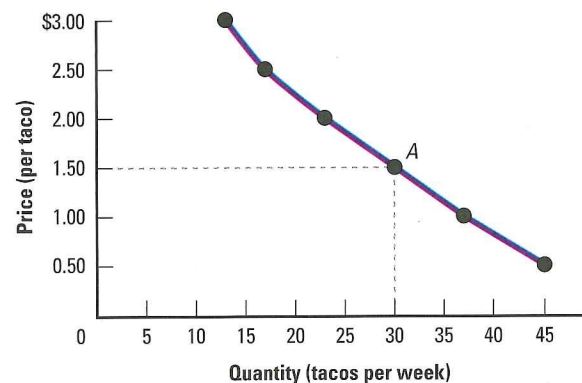
- When plotted on a graph, the data from the schedule form a demand curve for Jasmine's tacos.
- Point A on the curve represents 30 tacos ( $7 + 7 + 6 + 10$ ) demanded at \$1.50 per taco. At this price, Jasmine can expect to sell 30 tacos a week.



Market Demand Schedule

| Price (per taco) | Quantity (tacos per week) |   |       |   |       |   |      |   | MARKET |
|------------------|---------------------------|---|-------|---|-------|---|------|---|--------|
|                  | Tyler                     |   | Amber |   | Kayla |   | Luis |   |        |
| \$0.50           | 11                        | + | 10    | + | 11    | + | 13   | = | 45     |
| 1.00             | 9                         |   | 9     |   | 8     |   | 11   |   | 37     |
| 1.50             | 7                         |   | 7     |   | 6     |   | 10   |   | 30     |
| 2.00             | 5                         |   | 6     |   | 5     |   | 7    |   | 23     |
| 2.50             | 3                         |   | 4     |   | 4     |   | 6    |   | 17     |
| 3.00             | 1                         |   | 3     |   | 4     |   | 5    |   | 13     |

Market Demand Curve



### Market Demand: The Sum of All Consumers' Willingness and Ability to Buy

In the real world, of course, Jasmine would need more than one customer to stay in business. Suppose she opens the doors of her taco stand to the general public, a move that gains her three more customers: Amber, Kayla, and Luis. She now needs to consider the market demand for her tacos. **Market demand** is the sum of all the individual quantities demanded in a market. When economists refer to demand, they are usually talking about market demand.

Knowing market demand helps businesses make plans because it tells them how many goods all consumers will buy at various prices. To determine that broader demand, a business might track sales of a product at various prices. Or a business owner might conduct a survey.

Jasmine again uses a survey to determine the demand for her tacos. A schedule of the data is shown in Figure 5.2B. It shows the sum of the quantities demanded at each price by each of the four consumers. This sum is the market demand for Jasmine's tacos.

The accompanying graph shows the same market demand data. Each point on the curve represents the quantity of tacos demanded at a particular price. As you might expect, there is a clear relationship between price and demand for Jasmine's tacos.

### The Law of Demand: As Price Increases, Quantity Demanded Decreases

One thing is clear from both of the demand graphs you just looked at. As the price of tacos increases, the quantity demanded decreases. As the price decreases, the quantity demanded increases. Price



and quantity demanded move in opposite directions. This inverse relationship between price and quantity demanded is so strong that economists refer to it as the **law of demand**. Economist David Henderson calls the law of demand the “most famous law in economics, and the one that economists are most sure of.”

Why do price and quantity demanded move in opposite directions? The answer can be found in three factors that affect consumers’ spending behavior.

**The law of diminishing marginal utility.** Sometimes a consumer has to decide whether or not to buy something, like a music CD at a particular price. Other times, however, as the thinking-at-the-margin principle tells us, consumers are faced with the choice not of whether to buy, but of how much to buy. This raises the question of marginal utility.

How much utility, or satisfaction, is there in consuming “just one more”? The law of diminishing marginal utility tells us that with most goods and services, the more we have already consumed, the less satisfaction we are likely to get from consuming yet another additional unit. This explains why each helping of food you eat at an all-you-can-eat buffet is less enjoyable than the one before. Does this mean that people will not buy ever-larger quantities of a good or service? No. But it does imply that they will do so only if the price is low enough.

**The income effect.** Because of scarcity, people’s incomes are limited. They have only so much money to spend. If the price of a good or service increases, they will not be able to continue to buy the same quantity as they did at the original price.

**The substitution effect.** Sometimes two different goods can satisfy the same want. Such products are called **substitute goods**. Rubber flip-flops, for example, can satisfy the same want as leather sandals for many people. What happens if the price of sandals increases relative to the price of flip-flops? At some point, people will substitute the cheaper good for the relatively more expensive one.

All three factors cause consumers to react in predictable ways to a change in the price of a good or service. As consumers buy more in response to a decrease in price—or less in response to an increase in price—the quantity demanded is said to “move along the demand curve.” Economists call this movement along the curve a **change in quantity demanded**. Only a change in price causes a change in quantity demanded.

### ■ 5.3 What Can Cause Demand to Change?

As the law of demand recognizes, price is key when people are deciding what and how much to buy. But other factors can influence demand as well. Suppose, for example, that a street fair were held on the block where Jasmine’s taqueria is located. She might be mobbed with customers. The demand for her tacos would certainly increase. Or suppose a blizzard brought the city to a halt. Jasmine would have very few customers for a day or two, and the demand for tacos at all prices would decrease. How would these changes in demand be reflected on a graph?



If the price of leather sandals were to rise, consumers might decide they don’t need them after all if a cheaper substitute is available. This would cause the quantity of leather sandals demanded to decrease.



### Graphing Changes in Demand: Shifting Demand Curves

Movement along a demand curve shows how the quantity demanded changes as the price of a good or service changes. But sometimes a factor other than price—such as a spike or a drop in the number of customers—causes an entire demand curve to shift to a new position on the graph. Economists call this shift a **change in demand**. A change in demand occurs when quantities demanded increase or decrease at all prices.

The market demand schedule in Figure 5.3 shows the changed demand for tacos. The original market demand schedule for Jasmine's tacos appears in the middle column. The column to the left shows the decrease in market demand for the week of the blizzard. The column to the right shows the increase for the week of the street fair.

Each demand curve on the accompanying graph corresponds to one of the three demand schedules. The demand curve in the middle shows the original market demand for tacos. The curve to the right shows an increase in quantity demanded at every price. And

the curve to the left shows a decrease in quantity demanded at every price.

Both the decrease and the increase in market demand have caused the entire demand curve to move. When this happens—when a factor other than price alters demand—economists say the demand curve has shifted. An increase in demand shifts the demand curve to the right. A decrease in demand shifts the demand curve to the left.

### Demand Shifters: Factors that Cause a Change in Demand

Economists have identified several **demand shifters** that can cause a change in demand for a good or service. We will consider each demand shifter as if it were independent of all the rest—*ceteris paribus*. But in fact, as any economist will tell you, everything is interconnected.

**Changes in income.** Generally, an increase in income increases people's demand for goods and services, and vice versa. This makes sense. If you like movies, for

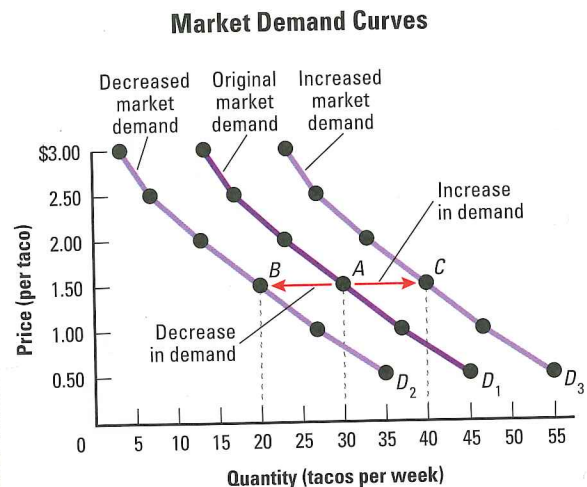
Figure 5.3

### Graphing Changes in Market Demand

An increase or decrease in market demand can cause the entire demand curve to shift to the right or the left. The original market demand for Jasmine's tacos is shown by the dark purple demand curve labeled  $D_1$ . The light purple curves labeled  $D_2$  and  $D_3$  represent changes in demand.

- Follow the dashed lines from Points A and B to the x-axis. Note that the quantity demanded at Point B and every other point on  $D_2$  has decreased by 10 tacos.
- Do the same for Points A and C. What change in demand do you see between  $D_1$  and  $D_3$ ?

| Price<br>(per taco) | Quantity (tacos per week)     |                              |                               |
|---------------------|-------------------------------|------------------------------|-------------------------------|
|                     | Decreased<br>Market<br>Demand | Original<br>Market<br>Demand | Increased<br>Market<br>Demand |
| \$0.50              | 35                            | 45                           | 55                            |
| 1.00                | 27                            | 37                           | 47                            |
| 1.50                | 20                            | 30                           | 40                            |
| 2.00                | 13                            | 23                           | 33                            |
| 2.50                | 7                             | 17                           | 27                            |
| 3.00                | 3                             | 13                           | 23                            |





## Key Concept

### Demand Shifters

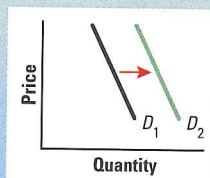
All but one of the factors listed here are demand shifters. These shifters can cause an increase or a decrease in demand at every point along a demand curve.

#### A change in ...

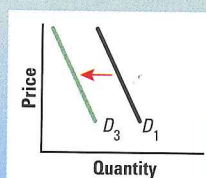
Consumer income  
The number of consumers  
Consumer tastes and preferences  
Consumer expectations  
The price of substitute goods  
The price of complementary goods

#### Can lead to ...

A shift in the demand curve



or

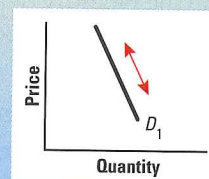


#### A change in ...

Price

#### Can lead to ...

Movement along the demand curve



example, you probably go to more movies when you are working and earning money than when you are not.

When the economy is growing and jobs are being created, more people earn more income. The demand for many goods and services increases at all prices. That is, their demand curves shift to the right. The opposite also holds true. In an economic downturn, incomes—and demand—can decrease. The demand curves for many goods and services shift to the left.

**Changes in the number of consumers.** A change in the number of consumers can cause market demand to shift. You saw this effect in the taco stand scenario, when the street fair brought in more customers and the blizzard prevented customers from coming. In some markets, this effect is seasonal. In a summer resort town, for example, market demand for hotels and restaurants increases when summer brings an influx of consumers. When summer ends and the tourists leave town, demand decreases sharply.

**Changes in consumer tastes and preferences.** Consumers do not necessarily buy the same products year after year. Thirty years ago, only a small number of Americans ate sushi, and they did so mainly at Japanese restaurants. Today sushi is so popular that it is sold in many supermarkets. This change in consumer tastes has caused an increase in demand for sushi. The demand curve for sushi has steadily shifted to the right.

Advertising can play a powerful role in shaping consumer preferences. Suppose, for example, that a producer of sunglasses were to launch an advertising campaign with celebrity endorsements. At all price levels, quantity demanded would likely increase. The demand curve would shift to the right.

**Changes in consumer expectations.** Prices don't actually have to rise or fall to cause consumers to change their behavior. Consumers may decide to buy or not to buy based on the *expectation* of a price change. Let's say you go into a store with the intention of buying a particular video game. You find the game, which is priced at \$39.99. A salesperson informs you that this game will go on sale next week for \$29.99. You put the video game back. The expectation that the price will soon go down has, for the moment, lessened your demand.

**Changes in the price of substitute goods.** A change in the price of one product in a pair of substitute goods can cause the demand curve for the other good to shift. Take burritos and tacos, for example. If the price of burritos were to increase, the law of demand tells us that people would buy fewer burritos. (This would cause movement along the demand curve for burritos.) At the same time, assuming that the price of tacos did not change, consumers would tend to buy more tacos. Market demand for tacos would increase, and the demand curve for tacos would shift



to the right. Other pairs of substitute goods include fish and chicken, sweatshirts and jackets, and movie tickets and DVD rentals.

**Changes in the price of complementary goods.** A **complementary good** is a product that is consumed along with some other product. Tennis rackets and tennis balls are complementary goods. So are hamburgers and buns. Demand for one complementary good increases and decreases along with demand for the other. So, for example, if the price of printers were to decrease, the quantity of printers demanded would increase. As a result, demand for the ink cartridges that go with the printers would also increase. Assuming the price of the cartridges remains unchanged, the demand curve for cartridges would shift to the right.

## ■ 5.4 How Do Supply and Price Interact?

Opposite every consumer in a market exchange is a producer. Producers supply the goods and services that consumers demand. They decide what to sup-

ply and how much to produce. How do they make those decisions?

Price plays a critical role for producers, just as it does for consumers. Jasmine, for example, might be willing to sell a certain quantity of tacos for \$2.00 apiece. But would she be willing to sell the same quantity at \$1.00 apiece? Economists can safely predict that her answer would be no. The lower the price, the fewer tacos Jasmine would be willing to sell. This is a key idea in understanding the interaction between supply and price.

### Supply: What Producers Are Willing and Able to Sell at Various Prices

When we look at the supply side of the market, we find that the same concepts and terms that apply to consumers also apply to producers. The same *ceteris paribus* assumptions apply as well. All tacos are the same—and price, for now, is Jasmine's only consideration. All other variables that might influence supply, including the cost of ingredients, are held constant.

Suppose, then, that a customer wants to buy as many tacos as Jasmine is willing to supply in a week

Figure 5.4A

#### Graphing Individual Supply

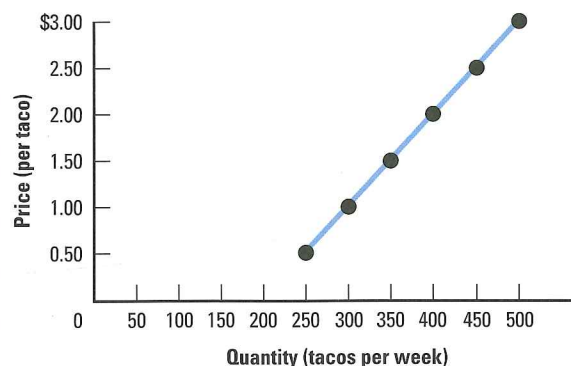
A supply schedule and graph show how much producers of a good or service are able and willing to supply at various prices. In this case, the market has just one producer, Jasmine. When plotted on a graph, the data from Jasmine's supply schedule form a supply curve.

- Each point on the supply curve shows the relationship between price (on the vertical axis) and quantity supplied (on the horizontal axis).
- At any point below the supply curve, Jasmine's profit is so low that she has little motivation to increase her production.

Jasmine's Supply Schedule

| Price<br>(per taco) | Quantity<br>(tacos per week) |
|---------------------|------------------------------|
| \$0.50              | 250                          |
| 1.00                | 300                          |
| 1.50                | 350                          |
| 2.00                | 400                          |
| 2.50                | 450                          |
| 3.00                | 500                          |

Jasmine's Supply Curve

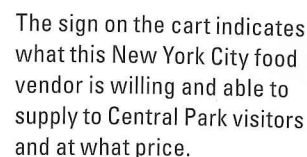




...just as it  
...might be  
...for \$2.00  
...the same  
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...for the price,  
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When we add up the quantities that Jasmine and all other taco producers are willing and able to sell at all prices, the result is supply. **Supply** is the amount of a good or service that producers are willing and able to offer for sale at all prices in a given period. Like demand, supply is always expressed in terms of a specific time period, such as weeks or months.

A look at Jasmine's supply schedule can help us understand how price and supply interact. A **supply schedule** is a table that shows the quantities supplied at different prices in a market. The individual supply schedule in Figure 5.4A shows the quantities that Jasmine will supply at different prices. At a price of \$2.00, for example, Jasmine's quantity supplied is 400 tacos. In other words, she is willing and able to offer 400 tacos for sale per week at that price. Notice that as

The data from Jasmine's supply schedule are plotted on the accompanying graph. Each pair of variables from the schedule—quantity and price—is a pair of coordinates marking a point on the graph. The line formed by connecting the points is a supply curve. A **supply curve** shows the relationship between the price and the quantity that producers are willing and able to supply. This supply curve shows that Jasmine will offer many more tacos for sale at a price of \$3.00 each than she will at a price of \$0.50 each.

Jasmine's taqueria has thus far been operating in an imaginary one-producer market. A more realistic scenario would be a market with multiple producers, each one contributing to the market supply of tacos. **Market supply** is the sum of all the individual quantities supplied. When economists refer to supply, they are usually talking about market supply.

Economists studying markets have several methods of determining market supply. One is to keep track of production figures—how many goods each firm in a market is producing. Another is to survey firms to find out their quantities supplied at different prices.



**Figure 5.4B**

### Graphing Market Supply

Market supply is the sum of the individual quantities supplied in a market. In this case, the market is made up of the three producers listed on the supply schedule. When plotted on a graph, the data from the schedule form a market supply curve for tacos.

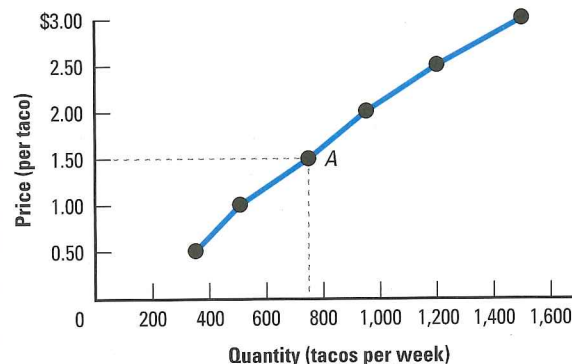
- Point A on the curve represents 750 tacos ( $350 + 125 + 275$ ) supplied at a price of \$1.50. That is how many tacos the market is willing and able to supply per week at that price.
- As the price increases, the three producers' profits rise. This increase in profit makes the producers willing to supply more tacos at higher prices.



**Market Supply Schedule**

| Price<br>(per taco) | Quantity (tacos per week) |   |                     |   |                      |   | MARKET |
|---------------------|---------------------------|---|---------------------|---|----------------------|---|--------|
|                     | Jasmine's<br>Taqueria     |   | Aleta's<br>Taqueria |   | Joshua's<br>Taqueria |   |        |
| \$0.50              | 250                       | + | 0                   | + | 100                  | = | 350    |
| 1.00                | 300                       |   | 50                  |   | 150                  |   | 500    |
| 1.50                | 350                       |   | 125                 |   | 275                  |   | 750    |
| 2.00                | 400                       |   | 175                 |   | 375                  |   | 950    |
| 2.50                | 450                       |   | 275                 |   | 475                  |   | 1,200  |
| 3.00                | 500                       |   | 400                 |   | 600                  |   | 1,500  |

**Market Supply Curve**



Suppose that Jasmine now has two competitors in the taco market: Aleta and Joshua. A survey of these three producers might result in the supply schedule shown in Figure 5.4B. The schedule shows each producer's individual supply per week and the resulting total market supply.

The accompanying graph shows the same data as a market supply curve. Each point on the curve represents a quantity of tacos supplied at a given price. As you might expect, the graph shows a clear relationship between price and supply of tacos.

### The Law of Supply: As Price Increases, Quantity Supplied Increases

Jasmine's supply curve and the market supply curve share an important similarity. In both, the quantity of tacos supplied increases as the price of tacos increases.

As the price decreases, the quantity supplied decreases. Price and quantity move in the same direction. Economists refer to this direct relationship between price and quantity as the **law of supply**. The law of supply holds true as long as all other influences on supply remain constant.

Why do price and quantity supplied move in the same direction? Economists cite two main reasons: production decisions by existing producers, and market entries and exits.

*Production decisions by existing producers.* In a market-based economy, every producer's primary goal is to maximize profits. Firms earn profits based partly on **revenue**, the amount of money received in the course of doing business. Bringing in more revenue is likely to increase profits. So when prices increase, the desire to make a profit leads producers



to increase their production of goods. They expect their profits to increase as a result. Likewise, when prices fall, producers are likely to cut production.

**Market entries and exits.** When the price of a good or service increases, new firms may enter a market because they see the potential for profit. For example, a building firm might enter the housing construction market to take advantage of rising home prices. Suppose the firm were to build 20 new homes and offer them for sale at \$500,000 each. This would increase the quantity of houses supplied at that price. The reverse can also happen when prices drop. Producers may exit the market, decreasing the quantities supplied at certain prices.

The law of supply tells us that producers react in predictable ways to a change in the price of a good or service. As producers supply more at higher prices, and less at lower prices, the quantity supplied is said to “move along the supply curve.” Economists call this movement along the curve a **change in quantity supplied**. The only factor that causes a change in quantity supplied is price.

## 5.5 What Can Cause Supply to Change?

As the law of supply recognizes, price is important to producers when they are deciding how much of a good or service to offer for sale. But factors other than price can also influence supply. Think about what would happen if Jasmine were to close her taqueria. The market supply of tacos would decrease at all prices. Likewise, if a new taqueria were to open, the market supply of tacos would increase at all prices. What would these changes in supply look like on a graph?

### Graphing Changes in Supply: Shifting Supply Curves

When the price of a product changes, the quantity supplied moves along the supply curve. But often a variable other than price—such as a change in the number of producers—can cause market supply at all prices to increase or decrease. Economists call this a **change in supply**. A change in supply causes the entire supply curve to shift to a new position. The graph in Figure 5.5 illustrates this effect.

Figure 5.5

### Graphing Changes in Market Supply

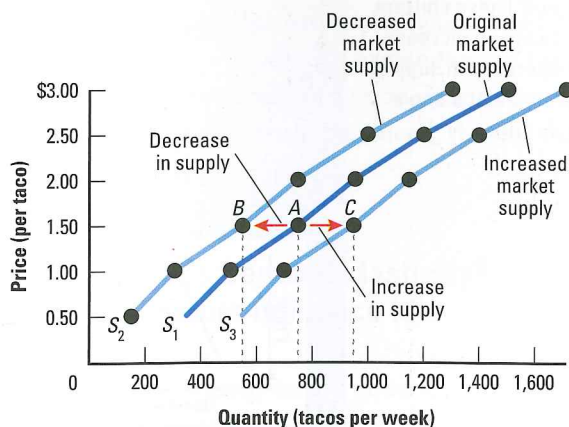
An increase or decrease in market supply can cause the entire supply curve to shift to the right or the left. The original market supply for tacos is shown by the dark blue supply curve labeled  $S_1$ . The light blue curves labeled  $S_2$  and  $S_3$  represent changes in demand.

- Follow the dashed lines from Points A and B to the x-axis. Note that the quantity supplied at Point B and every other point on  $S_2$  has decreased by 200 tacos.
- Do the same for Points A and C. What change in supply do you see between  $S_1$  and  $S_3$ ?

#### Market Supply Schedules

| Price<br>(per taco) | Quantity (tacos per week)     |                              |                               |
|---------------------|-------------------------------|------------------------------|-------------------------------|
|                     | Decreased<br>Market<br>Supply | Original<br>Market<br>Supply | Increased<br>Market<br>Supply |
| \$0.50              | 150                           | 350                          | 550                           |
| 1.00                | 300                           | 500                          | 700                           |
| 1.50                | 550                           | 750                          | 950                           |
| 2.00                | 750                           | 950                          | 1,150                         |
| 2.50                | 1,000                         | 1,200                        | 1,400                         |
| 3.00                | 1,300                         | 1,500                        | 1,700                         |

#### Market Supply Curves





The schedule in Figure 5.5 contains market supply data for our imaginary taco market. The original market supply of tacos is shown in the middle column. The decrease and increase in market supply are shown in the columns to the left and right.

The three supply curves on the graph correspond to the three market supply schedules. The original market supply data were used to plot the supply curve in the middle. The supply curve on the left shows the decrease in quantity supplied at every price. And the supply curve on the right shows the increase in quantity supplied at every price.

These changes in supply caused the entire supply curve to move. When this happens—when a factor *other* than price causes the quantities supplied at every price to change—economists say that the supply curve has shifted. When supply increases, the supply curve shifts to the right. When supply decreases, the supply curve shifts to the left.

### Supply Shifters: Factors that Cause a Change in Supply

Economists point to several factors that can cause a change in supply of a good or service. Six of these **supply shifters** are listed below.

**Changes in the cost of inputs.** Any change in the cost of a factor of production—land, labor, or capital—will

result in a change in the market supply of a product. Profit is the key to this process. Lower production costs increase profits. Higher profits are an incentive to produce more. Thus a decrease in production costs causes an increase in supply. The supply curve shifts to the right.

In the same way, an increase in production costs causes a decrease in supply. For example, an increase in the price of coltan, a metallic ore used in the manufacture of electronic devices, would cause cell phone production costs to increase. Profits would go down. The quantity of cell phones that producers would be willing and able to supply at all prices would likely decrease. The supply curve would shift to the left.

**Changes in the number of producers.** Another factor that affects supply is the number of producers in a market. Producers enter a market when they think there is a profit to be made. This happened with the lightweight, handheld computers known as PDAs. The PalmPilot, introduced in 1996, was not the first PDA, but it was the first one to enjoy robust sales. Its success attracted many other producers into the PDA market. The market supply of PDAs increased dramatically.

**Changes in conditions due to natural disasters or international events.** Natural disasters such as hurricanes, floods, and wildfires can decrease supply. Consider what would happen to the supply of orange juice

### Key Concept

#### Supply Shifters

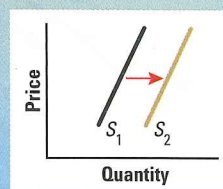
All but one of the factors listed here are supply shifters. These shifters can cause an increase or a decrease in supply at every point along a supply curve.

#### A change in ...

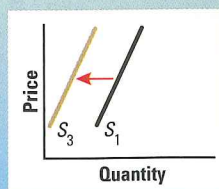
The cost of inputs  
The number of producers  
Conditions due to disasters or crises  
Technology  
Producer expectations  
Government policy

#### Can lead to ...

A shift in the supply curve



or

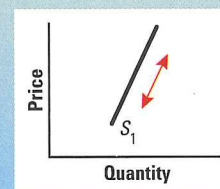


#### A change in ...

Price

#### Can lead to ...

Movement along the supply curve





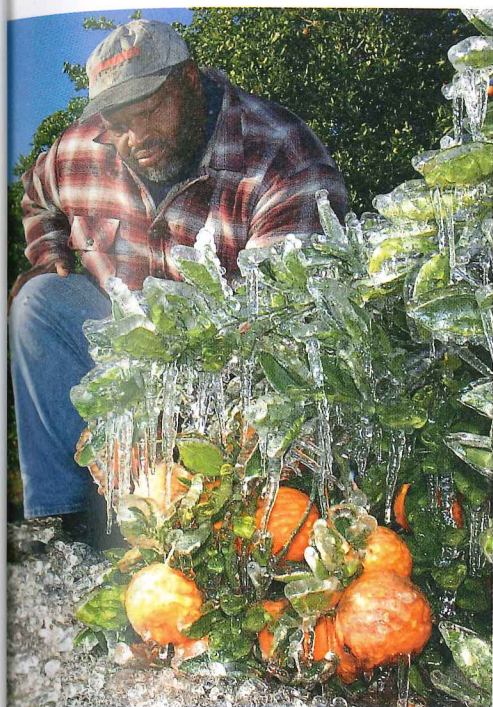
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Factors as diverse as natural disasters and new technology can cause a shift in supply. A frost, for example, can decrease the supply of Florida orange juice by destroying much of the state's citrus crop. In contrast, a technological advance, such as the use of industrial robots to assemble automobiles, can increase supply by improving productivity.

if a sudden cold snap were to wipe out half the Florida orange crop. Supply would decrease—producers of orange juice would supply fewer cartons of juice at every price.

International crises such as wars and revolutions can have a similar effect. For example, what if a rebel group were to block the main port of a major copper-producing country? Firms producing copper wire and copper pipes would supply smaller quantities at every price.

**Changes in technology.** Technological advances can reduce the amount of labor needed to produce a good, thereby lowering costs and increasing productivity. A prime example of this kind of technology is the robot. Automobile manufacturers today use thousands of robots for spot welding, painting, assembly, and other tasks. This technology allows automakers to produce more vehicles with the same amount of human labor. This, in turn, lowers the cost of production, which leads to an increase in supply.

**Changes in producer expectations.** Producers often make supply decisions based on the expectation that prices will rise or fall. For example, what if wheat farmers were offered a low price for their crop? Farmers might take part of their crop off the market and put it into storage. Expecting higher prices in the

future, wheat farmers would supply less to the market today. The supply curve for wheat would shift to the left. Expectations that future prices will fall leads to the opposite effect—producers supply more to the market in the short term, hoping to make a profit before prices decrease.

**Changes in government policy.** Governments can directly affect supply in two ways. One is by offering producers a **subsidy**—a cash payment aimed at helping a producer to continue to operate. The U.S. government, for example, pays large subsidies to farmers. Farm subsidies do not necessarily increase supply, however. Sometimes farmers are paid *not* to farm their land to keep supply low and prices high.

Governments also use excise taxes to reduce the supply of certain goods. An **excise tax** is a tax on the manufacture or sale of a good. It adds to the production cost of every unit produced, thereby causing supply to decrease.

## ■ 5.6 What Is Demand Elasticity? What Factors Influence It?

You no doubt already have a good idea of what elasticity means in the everyday world—rubber bands and bungee cords come immediately to mind. In



the world of economics, elasticity retains this idea of “stretchiness.” Economists define **elasticity** as the degree to which a quantity demanded or a quantity supplied changes in response to a change in price. The degree of elasticity tells economists how responsive consumers and producers will be to a change in the price of a good or service.

### Elasticity of Demand: A Measure of Consumer Sensitivity to Price Changes

The economist Alfred Marshall first developed the idea that demand is elastic more than a century ago. He introduced the term *elasticity* to describe the way quantity demanded responds to changes in price. Economists since Marshall have referred to **elasticity of demand** as a measure of consumers’ sensitivity to a change in price.

How sensitive are you to price changes? The answer most likely depends on what you want to buy. If the price of toothpaste were to increase by 50 percent, for example, you would probably buy it anyway. The demand for necessities like toothpaste tends to be **inelastic**, meaning that it responds slightly or not at all to a change in price.



How sensitive would you be to changes in prices for these goods? Probably not very. Demand for goods that seem essential to daily life (such as salt), or for which there are few good substitutes (such as toothpicks), tends to be relatively inelastic.

In contrast, if your favorite energy bars were marked up by 50 percent, you might decide to buy something else instead. Your demand in this case would be **elastic**, or responsive to a change in price.

### Calculating and Graphing Elasticity of Demand

To an economist, the terms *elastic* and *inelastic* have precise mathematical definitions. To calculate the degree of elasticity of demand, economists use the following formula:

$$\text{demand elasticity} = \frac{\text{percentage change in quantity demanded}}{\text{percentage change in price}}$$

If the result of this calculation is greater than 1, demand is said to be elastic. If the result is less than 1, demand is inelastic. In Figure 5.6, you can see how these calculations work out for the toothpaste and energy bar examples you read about above.

Figure 5.6 also illustrates how elasticity can be graphed using a demand curve. The first graph shows a demand curve for toothpaste. A 50 percent increase in the price of toothpaste produces only a 10 percent decrease in the quantity demanded. The result is a demand curve with a steep slope. The quantity of toothpaste demanded moves only slightly along this steep curve when the price increases or decreases.

The second graph shows a demand curve for energy bars. Here, a 50 percent increase in price produces a 80 percent decrease in the quantity demanded. The result is demand curve with a flatter slope. The quantity of bars demanded moves much farther along this curve in response to price changes than is the case with toothpaste.

Economists use several terms to describe degrees of elasticity. In addition to elastic and inelastic, they speak of perfectly elastic, perfectly inelastic, and unitary elastic. **Unitary elastic demand** occurs when the percentage change in price exactly equals the percentage change in quantity demanded. The result of the elasticity calculation in such instances is exactly 1.

The only way to know for certain whether a demand curve is elastic or inelastic is to plug the percentages into the formula and do the math. But as a general rule of thumb, the flatter the curve, the more likely it is that demand is elastic. The steeper the curve, the more likely it is that demand is inelastic.



Figure 5.6

### Exploring Elasticity of Demand

Elasticity of demand measures how sensitive consumers are to a change in price. The degree of elasticity can be graphed by looking at how quantity demanded changes as price changes. It can also be calculated using this formula:

$$\text{demand elasticity} = \frac{\text{percentage change in quantity demanded}}{\text{percentage change in price}}$$

A result of greater than 1 is elastic. A result of less than 1 is inelastic.

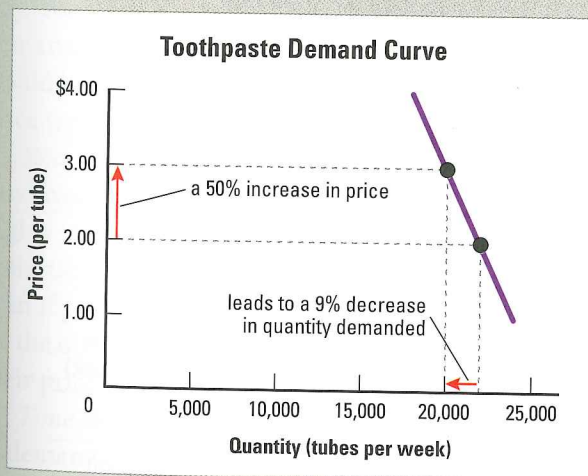
#### Example 1: Inelastic Demand



Suppose the price of toothpaste were to rise from \$2.00 to \$3.00. This is a 50 percent increase in price. Also suppose consumers reacted to this price rise by buying 9 percent fewer tubes of toothpaste. The elasticity calculation would look like this:

$$\text{demand elasticity} = \frac{9\%}{50\%} = 0.18$$

The result is less than 1. This means demand for toothpaste in this market is relatively inelastic. The relatively steep slope of the demand curve for toothpaste confirms this finding.



Notice that we follow the practice of dropping the negative sign that would be used to indicate a decrease. So the price change of negative 9 percent (−9%) becomes simply 9 percent. Elasticity is therefore always expressed as a positive number.

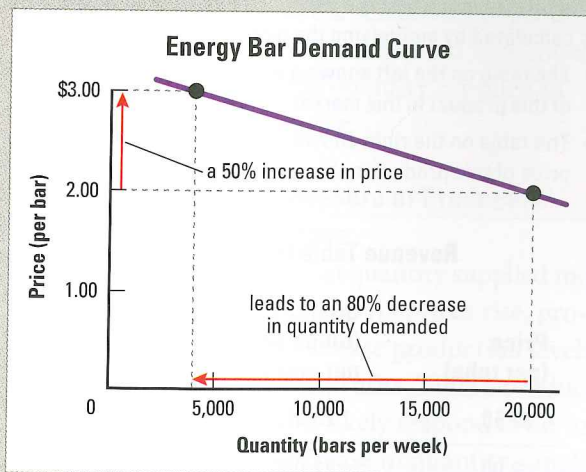
#### Example 2: Elastic Demand



Now suppose the price of energy bars rose 50 percent, from \$2.00 to \$3.00. And suppose consumers reacted to this price increase by buying 80 percent fewer bars. The elasticity calculation would look like this:

$$\text{demand elasticity} = \frac{80\%}{50\%} = 1.6$$

The result is greater than 1. This means demand for energy bars in this market is relatively elastic. The flatter slope of the demand curve for energy bars confirms this finding.





### Measuring Elasticity of Demand with the Total Revenue Test

Knowing how elastic demand is for various goods can help producers price their products at a level that maximizes their revenue. To gauge the impact of prices on their revenue, producers use a business tool known as the **total revenue test**.

To measure the elasticity of demand for toothpaste, for example, a producer using the total revenue test would create a revenue table like those shown below. Like a market demand schedule, a **revenue table** lists the possible prices for a given product and the market demand at each price. But it has an additional column for total revenue at each price level. **Total revenue** is calculated by multiplying the quantity of a good sold by the price of the good. For example, a toothpaste producer who sells 22,000 tubes of toothpaste per week at \$2.00 per tube earns a total revenue of \$44,000 per week.

The revenue table for toothpaste shows that as the price of toothpaste increases, total revenue also increases. This response to price changes tells us that demand for toothpaste in this market is inelastic. Even a large change in price leads to a relatively

small change in the quantity demanded. In this case, toothpaste producers can maximize their total revenue by selling fewer units at higher prices.

The revenue table for energy bars tells a different story. It shows that as the price of the bars increases, total revenue decreases. The demand for energy bars in this market is very elastic—a small change in price leads to a large change in the quantity demanded. This producer will earn a higher total revenue by selling more energy bars at lower prices.

Any producer thinking about changing the price of a product needs to know whether demand for that product is inelastic or elastic. When demand is inelastic, price and total revenue move in the same direction. When demand is elastic, price and total revenue move in opposite directions.

### Factors that Influence Elasticity of Demand

Why is consumer demand more elastic for some goods than for others? The following factors help economists predict the elasticity of demand for a good or service.

*Availability of substitutes.* Demand for products that have close substitutes tends to be elastic. If the price of a sports drink goes up, for example, many

### Key Concept

#### Elasticity of Demand and the Total Revenue Test

The total revenue test is a way to calculate elasticity of demand. The total revenue of a good or service is calculated by multiplying the quantity sold by the price.

- The table on the left shows a product with relatively inelastic demand: toothpaste. Raising the price of this product in this market will likely have a small effect on sales and increase total revenue.
- The table on the right shows a product with relatively elastic demand: energy bars. Lowering the price of this product in this market will likely increase sales and total revenue.

Revenue Table for Toothpaste

| Price<br>(per tube) | × | Quantity<br>(tubes sold<br>per week) | = | Total<br>Revenue<br>(per week) |
|---------------------|---|--------------------------------------|---|--------------------------------|
| \$1.50              |   | 23,000                               |   | \$34,500                       |
| 2.00                |   | 22,000                               |   | 44,000                         |
| 2.50                |   | 21,000                               |   | 52,500                         |
| 3.00                |   | 20,000                               |   | 60,000                         |
| 3.50                |   | 19,000                               |   | 66,500                         |

Revenue Table for Energy Bars

| Price<br>(per bar) | × | Quantity<br>(bars sold<br>per week) | = | Total<br>Revenue<br>(per week) |
|--------------------|---|-------------------------------------|---|--------------------------------|
| \$2.00             |   | 20,000                              |   | \$40,000                       |
| 2.25               |   | 16,000                              |   | 36,000                         |
| 2.50               |   | 12,000                              |   | 30,000                         |
| 2.75               |   | 8,000                               |   | 22,000                         |
| 3.00               |   | 4,000                               |   | 12,000                         |



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Sports drinks, fruit juices, and bottled water are all satisfactory substitutes for each other. If the price of one thirst quencher goes up, consumers can easily switch to another. Because of the availability of so many substitutes, the demand for any one of these drinks is relatively elastic.

consumers will switch to bottled juice or water. Milk, however, has no close substitutes. When its price increases, most consumers of milk continue to buy it. Demand for milk is inelastic.

*Price relative to income.* Consumers are more responsive to changes in price when buying “big ticket” items, which eat up more income, than when making minor purchases. If you were considering buying a laptop computer, for example, a price decrease of 20 percent might very well motivate you to buy. Your demand in this case would be elastic. Your demand for an inexpensive item like soap, however, would be inelastic. You might not even notice if its price were to increase or decrease 20 percent.

*Necessities versus luxuries.* When a product is perceived as a necessity, demand for it tends to be highly inelastic. Demand for luxuries, in contrast, is elastic. People will always buy food, a necessity, even if prices increase. Luxuries like fancy watches, on the other hand, are goods we can live without. If their price goes up, we can easily stop buying them.

*Time needed to adjust to a price change.* Elasticity of demand can change over time. When gas prices increased sharply in 2008, many people found it difficult to reduce their gas consumption in response. They still needed gas to drive to work, shop, and get around. Nor could they instantly exchange their big gas guzzlers for more fuel-efficient vehicles. Over time, however, people adjusted to the price rise. They formed

carpools, began using public transportation, and bought smaller cars that used less fuel. As they did so, the demand for gas gradually became more elastic.

## 5.7 What Is Supply Elasticity? What Factors Influence It?

Economists apply the principle of elasticity to supply in the same way they apply it to demand. **Elasticity of supply** is a measure of the sensitivity of producers to a change in price. It tells economists how much a producer will change the quantity supplied in response to a change in price.

## Elasticity of Supply: A Measure of Producers' Sensitivity to Price Changes

The law of supply tells us that quantity supplied moves in the same direction as price. As prices rise, producers are motivated to increase production levels in the hope of making higher profits. Thus a producer whose supply is elastic will likely respond to an increase in price with an increase in quantity supplied.

Yogurt makers, for example, are flexible producers. They can churn out more yogurt fairly easily in response to even a small increase in price. They can also slow production just as quickly if the price of yogurt decreases. The supply of yogurt, in this case, is relatively elastic.



Not so for antiques. The supply of genuine antiques is limited, and their numbers do not increase much over time. An antiques dealer cannot simply create more antiques to take advantage of increasing prices. Antiques dealers, therefore, are not very responsive to changes in price because their supply of antiques is inelastic.

The supply of bananas may be equally inelastic, but for different reasons. Growers can increase the quantity supplied by expanding their banana plantations. But there will be a lag time between planting new banana trees and harvesting more fruit. Until the new plantations begin to produce, the supply of bananas will remain relatively inelastic.

### Calculating and Graphing Elasticity of Supply

Economists calculate elasticity of supply the same way they do demand, using the following formula:

$$\text{supply elasticity} = \frac{\text{percentage change in quantity supplied}}{\text{percentage change in price}}$$

If the result is greater than 1, supply is said to be elastic. If the result is less than 1, it is inelastic. If the result is exactly 1—the percentage change in price equals the percentage change in quantity supplied—the result is **unitary elastic supply**. In Figure 5.7, you can see how these calculations work out for yogurt and bananas.

Figure 5.7 also illustrates how elasticity of supply can be graphed using a supply curve. The first graph shows a supply curve for bananas. You can see that even a 50 percent rise in the price of bananas yields a relatively small change in the quantity supplied. The result is a supply curve with a steep slope. The quantity of bananas supplied moves only slightly along this steep curve when the price increases or decreases.

The second graph shows a supply curve for yogurt. Here a 50 percent change in price causes a relatively large change in the quantity supplied. The result is a supply curve with a flatter slope. The quantity of yogurt supplied moves much farther along this curve in response to price changes than is the case with bananas.

As with demand curves, economists classify supply curves according to their degree of elasticity. The only way to know for certain whether a supply

curve is elastic or inelastic is to run the numbers. But as a general rule, we can say that the flatter the supply curve, the more likely it is that supply is elastic. The steeper the curve, the more likely it is that supply is inelastic.

### Factors that Influence Elasticity of Supply

Why is the supply of some goods elastic and other goods inelastic? Several things can influence the elasticity of supply at different points in the **supply chain**. The supply chain is the network of people, organizations, and activities involved in supplying goods and services to consumers. The supply chain begins with the delivery of needed inputs to the producer, continues through the production process, and ends with the distribution of the finished product to consumers. Along the way, supply can be affected by any or all of the following factors.

*Availability of inputs.* Are the inputs needed at the beginning of the supply chain readily available? If the answer is yes, then supply of the product based on those inputs will probably be elastic. Suppliers can offer more or less of the good or service in response to a price change without too much trouble.

If key raw materials or other essential inputs are less available, supply is likely to be inelastic. The supply of medical care is a good example. The most important input for good medical care is a trained physician. Medical schools turn out only so many new doctors each year. Producing more in response to a sudden rise in fees for medical services would be difficult.

*Mobility of inputs.* The ease with which inputs and products move through the supply chain also affects elasticity. A new highway, for example, might cut the time needed to ship oats, soybeans, and other inputs from farmers to the manufacturing plants where energy bars are produced. As a result, energy bar producers would be able to respond more quickly to changes in the price of energy bars.

*Storage capacity.* How easy it is to store products as they move through the supply chain has an impact on elasticity as well. Toothpaste, for example, can easily be stored in distribution-center warehouses. Producers can readily hold back or supply more tubes in response to price changes. Bananas, in contrast, are perishable. This makes it harder for producers to adjust their supply as prices change.



Figure 5.7

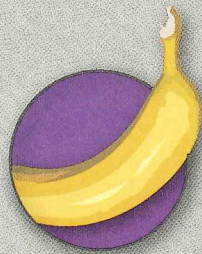
### Exploring Elasticity of Supply

Elasticity of demand measures how sensitive producers are to a change in price. The degree of elasticity can be graphed by looking at how quantity supplied changes as the price changes. It can also be calculated using this formula:

$$\text{supply elasticity} = \frac{\text{percentage change in quantity supplied}}{\text{percentage change in price}}$$

A result of 1 or greater is elastic. A result of less than 1 is inelastic.

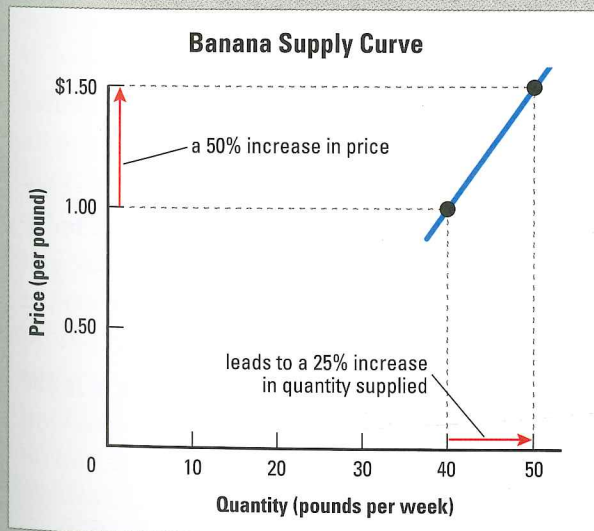
#### Example 1: Inelastic Supply



Suppose banana growers react to a 50 percent rise in the price of bananas by supplying only 25 percent more fruit to consumers. The elasticity calculation would look like this:

$$\text{supply elasticity} = \frac{25\%}{50\%} = 0.5$$

The result is less than 1. This means supply is relatively inelastic. The steep slope of the supply curve for bananas confirms this finding.



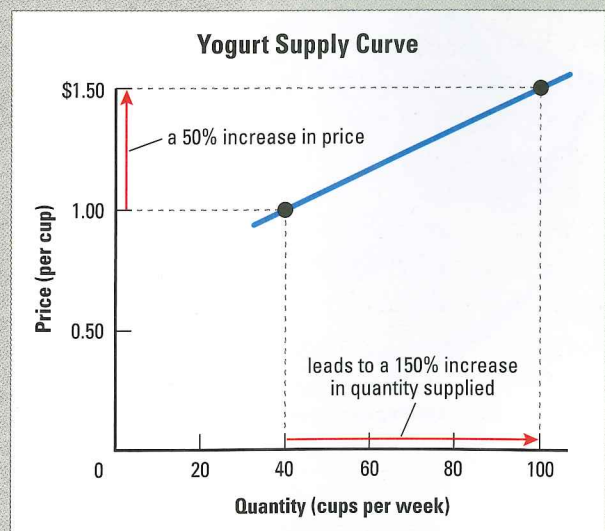
#### Example 2: Elastic Supply



Suppose yogurt producers react to a 50 percent rise in the price of yogurt by increasing their supply by 150 percent. The elasticity calculation would look like this:

$$\text{supply elasticity} = \frac{150\%}{50\%} = 3$$

The result is greater than 1. This means supply is elastic. The flatter slope of the yogurt supply curve bears out this result.

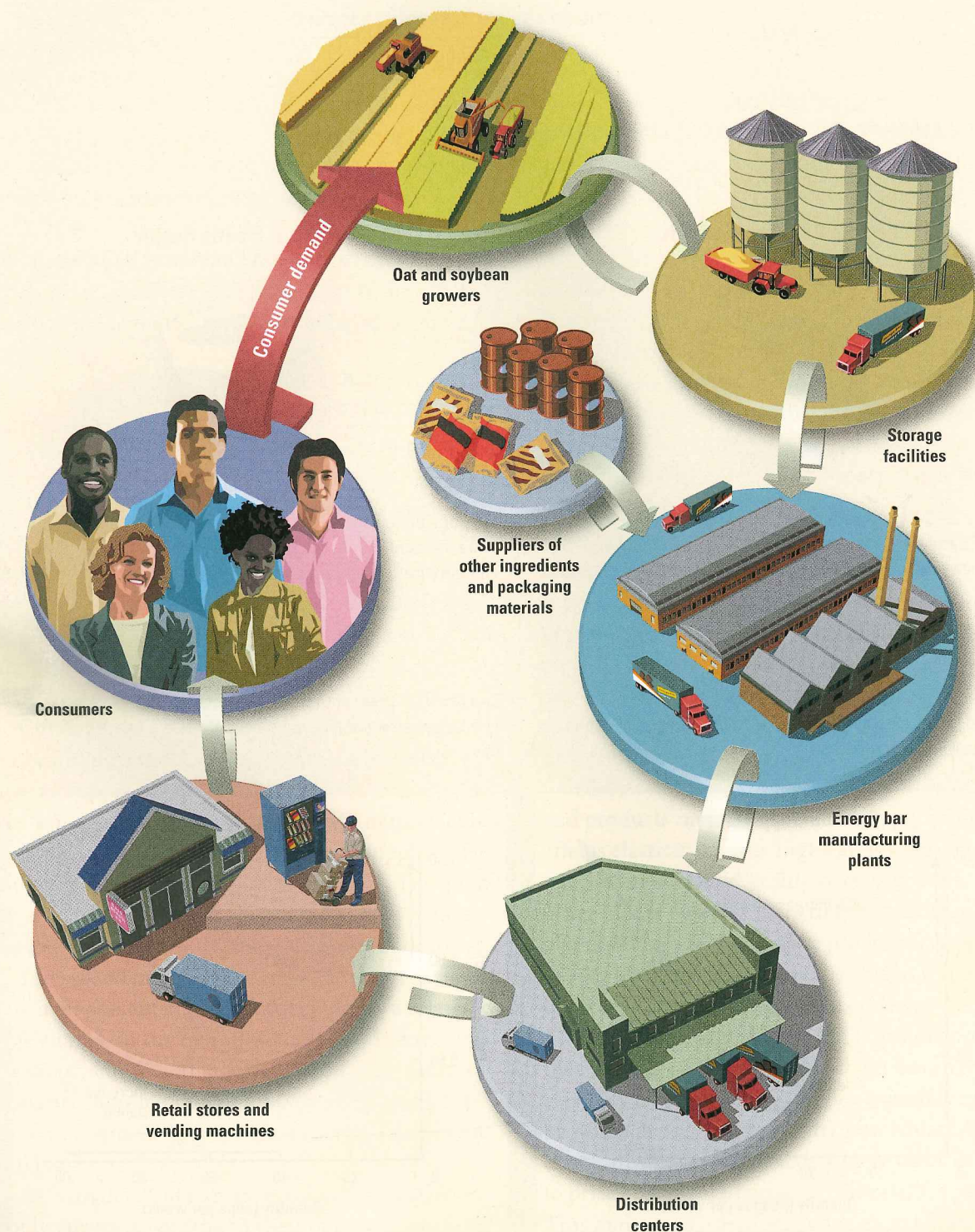




## Key Concept

### Supply Chains

A supply chain is made up of the people, organizations, and activities that create and distribute goods and services. A supply chain begins with consumer demand for a product. It ends with the delivery of that product to consumers. The diagram shows a simplified supply chain for energy bars.





*Time needed to adjust to a price change.* The supply of many products is inelastic when the price actually changes, but it may become more elastic with the passage of time. The supply of bananas, for example, may be inelastic in the short run. But given enough time, banana producers will either increase or decrease their production to adjust to changes in the price of bananas.

At this point in your life, you probably do not have to worry about such factors as the mobility of

inputs or storage capacity. The key thing to remember now is that the two most important forces in a market economy are demand and supply. Consumers, always looking for a bargain, are generally willing to demand more when the price goes down. Producers, always looking to increase profits, are generally willing to supply more when the price goes up. In the next chapter, you will see how demand interacts with supply to determine what you pay for the goods and services you most want.

## Summary

Demand and supply are the two forces that make market-based economies work. Demand reflects what consumers are willing and able to purchase at various prices. Supply reflects what producers are willing and able to produce at various prices. Price is related to the quantity of goods that consumers want and producers will provide, though other variables can have a significant influence as well. Economists use elasticity as a tool for measuring how responsive consumers and producers are to price changes.

**How do demand and price interact?** The law of demand states that as the price of a good or service increases, the quantity demanded decreases. As the price decreases, the quantity demanded increases. The inverse relationship of quantity demanded and price can be shown in a demand schedule and graphed as a demand curve.

**What can cause demand to change?** Demand in a market changes when quantities demanded at all prices increase or decrease. On a graph, a change in demand causes the demand curve to shift. Significant demand shifters include income, the number of consumers, and the price of substitutes.

**How do supply and price interact?** The law of supply states that as the price of a good or service increases, the quantity supplied increases. As the price decreases, the quantity supplied decreases. The direct relationship of quantity supplied and price can be shown in a supply schedule and graphed as a supply curve.

**What can cause supply to change?** Supply in a market changes when quantities supplied at all prices increase or decrease. On a graph, a change in supply causes the supply curve to shift. Significant supply shifters include cost of inputs, number of producers, and new technology.

**What is demand elasticity? What factors influence it?** Demand elasticity is a measure of how responsive consumers are to changes in price. Demand elasticity is influenced by such factors as the availability of substitutes, the product's price relative to income, whether the product is a necessity or a luxury, and the time needed to adjust to a price change.

**What is supply elasticity? What factors influence it?** Supply elasticity is a measure of how responsive producers are to changes in price. Supply elasticity is influenced by such factors as the availability and mobility of inputs, a producer's storage capacity, and the time needed to adjust to a price change.