

Chapter 5 Supply

A family buys a half-gallon of orange juice at the supermarket. An author hires a graduate student to translate a book. A store sells a bicycle to a woman over the Internet.

Each of these exchanges involves a buyer and a seller. In this chapter you'll read about the "supply side" of the marketplace, where sellers decide how much to produce or supply. After reading the chapter, you'll better understand the factors that influence sellers' decisions on how much orange juice to produce, how many hours a week to work as a translator, or how many bicycles to export.

Economics Journal

Write down a list of three goods: one that is usually available and "on sale," another that is popular but difficult to find, and a third that falls somewhere in between. What prices do stores charge for these goods?



Keep It Current

Items marked with this logo are periodically updated on the Internet. Keep up-to-date with what's in the news. To get current information on supply go to www.phschool.com

Section 1

Understanding Supply

Preview

Objectives

After studying this section you will be able to:

1. Explain the law of supply.
2. Interpret a supply graph using a supply schedule.
3. Explain the relationship between elasticity of supply and time.

Section Focus

The law of supply predicts that producers will offer more of a good as its price goes up. How strongly producers react to a change in price depends on their ability to raise or lower output.

Key Terms

supply
law of supply
quantity supplied
supply schedule
variable
market supply schedule
supply curve
market supply curve
elasticity of supply

If you were running a business, what would you do if you discovered that customers were suddenly willing to pay twice as much for your product? If you were like most entrepreneurs, you would try to produce more in order to take advantage of the higher prices. Even if you used the higher prices as a way to work fewer hours while earning the same income, you could be sure that someone else would jump into the market and start selling the same good.

These two movements—individual firms changing their level of production and firms entering or exiting the market—combine to create the law of supply.

Higher Production

If a firm is already earning a profit by selling a good, then an increase in the price—*ceteris paribus*—will increase the

supply the amount of goods available

law of supply
tendency of suppliers to offer more of a good at a higher price

quantity supplied the amount a supplier is willing and able to supply at a certain price

The Law of Supply

Supply is the amount of goods available. How do producers decide how much to supply? According to the **law of supply**, the higher the price, the larger the quantity produced. Economists use the term **quantity supplied** to describe how much of a good is offered for sale at a specific price.

The law of supply develops from the choices of both current and new producers of a good. As the price of a good rises, existing firms will produce more in order to earn additional revenue. At the same time, new firms will have an incentive to enter the market to earn a profit for themselves. If the price of a good falls, some firms will produce less, and others might drop out of the market.

Figure 5.1 Law of Supply



The law of supply predicts that higher prices lead to more production.
Supply and Demand How is the law of supply different from the law of demand?

In the News As this excerpt from a Wall Street Journal Classroom Edition article shows, it's a mistake to equate profit with greed, as sometimes happens in the popular imagination. On the contrary, when profits are generated and put to use, the economy benefits.

"Truth is, profit has gotten a bum rap. More often than not it's a positive force in the economy. Profit supplies the money needed to build productive businesses and hire new employees, and hunger for profit spurs entrepreneurs to launch new ventures and inventors to turn ideas into reality."

firm's profits. The promise of higher revenues for each sale also encourages the firm to produce more. Consider the pizzeria you read about in Chapter 4. The pizzeria is probably making a reasonable profit by selling a certain number of slices a day at the market price. If the pizzeria weren't making a profit, the owner would soon try to raise the price or switch from pizzas to something more profitable.

If the price of pizza rises, but the firm's cost of making pizza stays the same, then the pizzeria will earn a higher profit on each slice of pizza. A sensible entrepreneur would try to produce and sell more pizza to take advantage of the higher prices.

Similarly, if the price of pizza goes down, the pizzeria will earn less profit per slice or even lose money. The owner will choose to sell less pizza and produce something else,

such as calzones or sandwiches, that will yield more profit.

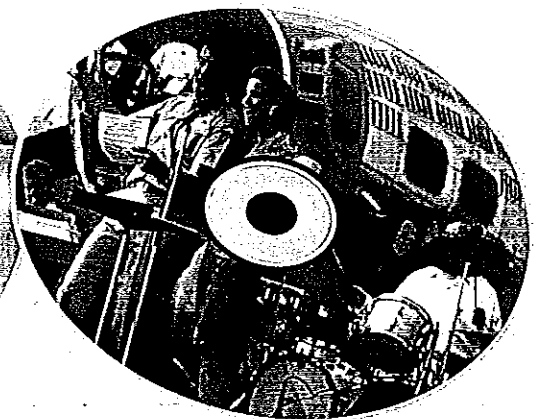
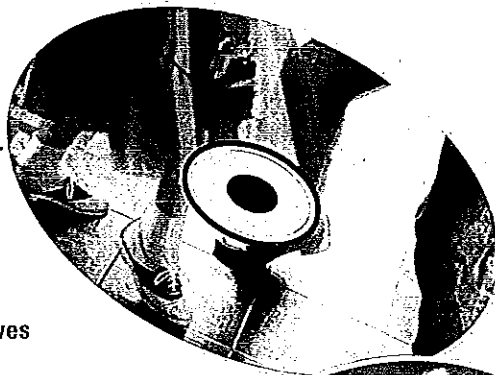
In both cases, the search for profit drives the supplier's decision. When the price goes up, the supplier recognizes the chance to make more money and works harder to produce more pizza. When the price falls, the same entrepreneur is discouraged from producing as much as before.

Market Entry

Profits appeal both to producers already in the market and people who may decide to join the market. As you have seen, when the price of pizza rises, a pizzeria stands out as a good opportunity to make money. If you were considering opening a restaurant of your own, a pizzeria would look like a safe bet. In this way, rising prices draw new firms into a market and add to the quantity supplied of the good.

Consider the market for music. In the late 1970s, disco music became popular among young people. The music industry quickly recognized the popularity of disco, and more and more groups began releasing disco recordings. Even some groups that once performed soul music and rhythm and blues chose to record disco albums. New entrants crowded the market to take advantage of the potential for profit. Disco, however, proved to be a short-lived fad. By the early 1980s, disco music was gone from the radio, and stores couldn't sell the albums on their shelves.

► The music industry illustrates how profit drives suppliers' decisions. As different musical styles become popular, new groups make recordings to profit from the current fad.



This pattern of sharp increases and decreases in supply occurs again and again in the music industry. In the early 1990s, “grunge” music emerged from Seattle to become widely popular among high school and college students across the country. How did the market react? Record labels soon hired many grunge groups. Music stores devoted more and more space to this style of music. Within a few years, however, grunge lost its appeal, and many groups disbanded or moved on to new styles. Swing music enjoyed a smaller peak of popularity in the late 1990s.

In each of the examples above, many musicians joined the market for a particular style of music to profit from a trend. Their actions reflected the law of supply, which says that the output or quantity supplied of a good increases as the price of the good increases.

The Supply Schedule

Similar to a demand schedule, a **supply schedule** shows the relationship between price and quantity supplied for a specific good. The pizzeria discussed earlier might have a supply schedule that looks like the one in Figure 5.2. This table compares two **variables**, or factors that can change. These variables are the price of a slice and the number of slices supplied by a pizzeria. We could collect this information by asking the pizzeria owner how many slices she is willing and able to make at different prices, or we could look at records to see how the quantity supplied has varied as the price has changed. We will almost certainly find that at higher prices, the pizzeria owner is willing to make more pizza. At a lower price she prefers to make less pizza and to devote her limited resources to other, more profitable, items.

Like a demand schedule, a supply schedule lists supply for a very specific set of conditions. The schedule shows how the price of pizza, and only the price of pizza, affects the pizzeria’s output. All of the other factors that could change the restaurant’s output decisions, such as the costs of

Figure 5.2 Supply Schedule

Price per slice of pizza	Slices supplied per day
\$.50	100
\$1.00	150
\$1.50	200
\$2.00	250
\$2.50	300
\$3.00	350



This supply schedule lists how many slices of pizza one pizzeria will offer at different prices. **Incentives** What does this chart tell you about the pizzeria owner’s decisions?

tomato sauce, labor, and rent, are assumed to remain constant.

A Change in the Quantity Supplied

Economists use the word *supply* to refer to the relationship between price and quantity supplied, as shown in the supply schedule. The pizzeria’s supply of pizza includes all possible combinations of price and output. According to this supply schedule, the pizzeria’s supply is 100 slices at \$.50 a slice, 150 slices at \$1.00 a slice, 200 slices at \$1.50 a slice, and so on. The number of slices that the pizzeria offers at a specific price is called the quantity supplied at that price. At \$2.50 per slice, the pizzeria’s quantity supplied is 300 slices per day.

A rise or fall in the price of pizza will cause the quantity supplied to change, but not the supply schedule. In other words, a change in a good’s price moves the seller from one row to another in the same supply schedule, but does not change the supply schedule itself. When a factor other than the price of pizza affects output, we have to build a whole new supply schedule for the new market conditions.

Market Supply Schedule

All of the supply schedules of individual firms in a market can be added up to create a **market supply schedule**. A market supply schedule shows the relationship between prices and the total quantity supplied by all

supply schedule a chart that lists how much of a good a supplier will offer at different prices

variable a factor that can change

market supply schedule a chart that lists how much of a good all suppliers will offer at different prices

Figure 5.3 Market Supply Schedule

Price per slice of pizza	Slices supplied per day
\$.50	1,000
\$1.00	1,500
\$1.50	2,000
\$2.00	2,500
\$2.50	3,000
\$3.00	3,500



A market supply schedule represents all suppliers in a market. **Supply and Demand** How does this market supply schedule compare to the individual supply schedule?

supply curve a graph of the quantity supplied of a good at different prices

market supply curve a graph of the quantity supplied of a good by all suppliers at different prices

elasticity of supply a measure of the way quantity supplied reacts to a change in price

firms in a particular market. The information in a market supply schedule becomes important when we want to determine the total supply of pizza at a certain price in a large area, like a city.

The market supply schedule for pizza resembles the supply schedule at a single pizzeria, but the quantities are much larger. Figure 5.3 shows the supply of pizza for a hypothetical city.

This market supply schedule lists the same prices as those in the supply schedule for the single pizzeria, since all restaurants will charge prices within the same range. The quantities supplied are much larger because there are many pizzerias in the community. Like the individual supply schedule, this market supply schedule reflects the law of supply. Pizzerias supply more pizza at higher prices.

The Supply Graph

When the data points in the supply schedule are graphed, they create a **supply curve**. A supply curve is very similar to a demand curve, except that the horizontal axis now measures the quantity of the good supplied, not the quantity demanded. Figure 5.4 shows a supply curve for one pizzeria and a **market supply curve** for all the pizzerias in the city. The data used to draw the two curves are from the supply schedules in Figures 5.2 and 5.3. The prices

shown along the vertical axes are the same in both graphs. However, the quantities of pizza supplied at each price are much larger in the market supply curve.

The key feature of the supply curve is that it always rises from left to right. As your finger traces the curve from left to right, it moves toward higher and higher output levels (on the horizontal axis) and higher and higher prices (on the vertical axis). This illustrates the law of supply, which says that a higher price leads to higher output.

Supply and Elasticity

In Chapter 4, you learned that elasticity of demand measures how consumers will react to a change in price. **Elasticity of supply** is based on the same concept. Elasticity of supply is a measure of the way suppliers respond to a change in price.

Elasticity of supply tells how firms will respond to changes in the price of a good. The labels *elastic*, *inelastic*, and *unitary elastic* represent the same values of elasticity of supply as those of elasticity of demand. When elasticity is greater than one, supply is very sensitive to changes in price and is considered elastic. If supply is not very responsive to changes in price, and elasticity is less than one, supply is considered inelastic. When a percentage change in price is perfectly matched by an equal percentage change in quantity supplied, elasticity is exactly one, and supply is unitary elastic.

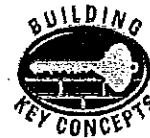
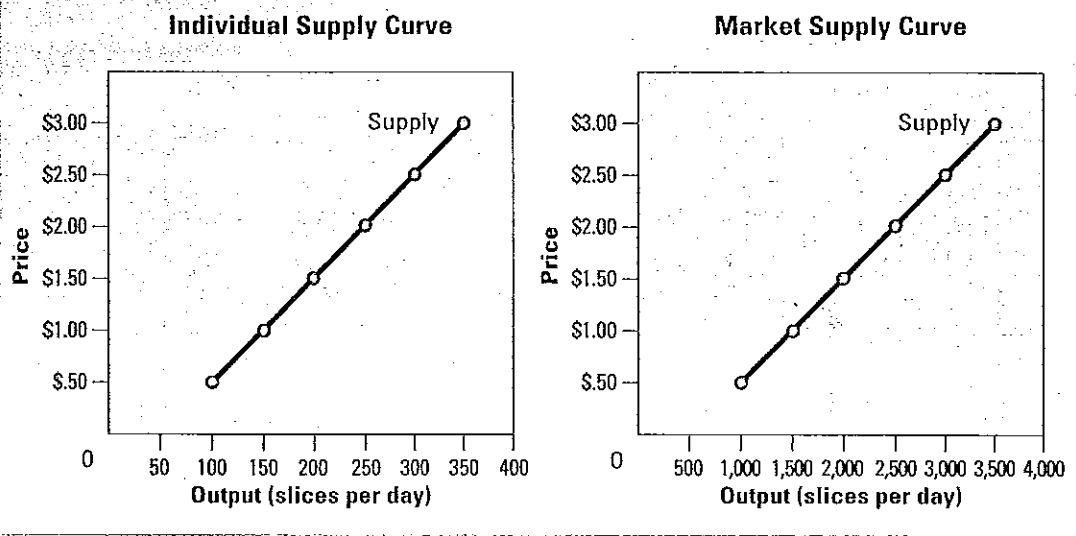
Elasticity of Supply and Time

What determines whether the supply of a good will be elastic or inelastic? The key factor is time. In the short run, a firm cannot easily change its output level, so supply is inelastic. In the long run, firms are more flexible, so supply is more elastic.

Elasticity of Supply in the Short Run

An orange grove is one example of a business that has difficulty adjusting to a change in price in the short term. Orange trees take several years to mature and grow

Figure 5.4 Supply Curves



Supply curves always rise from left to right, as predicted by the law of supply. As price increases, so does the quantity supplied.

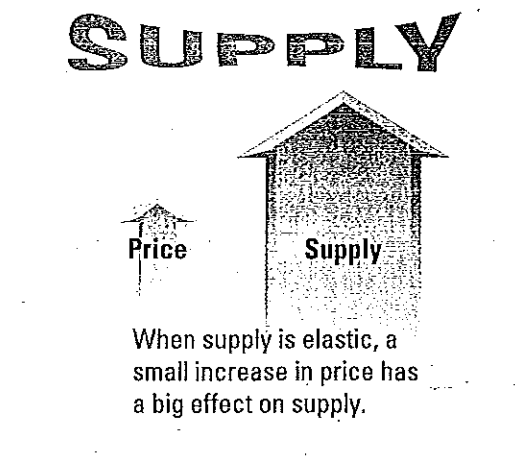
Supply and Demand
How many slices will one pizzeria produce at \$2.00 a slice?

fruit. If the price of oranges goes up, an orange grower can buy and plant more trees, but he will have to wait several years for his investment to pay off. In the short term, the grower could take smaller steps to increase output. For example, he could use a more effective pesticide. While this step might increase his output somewhat, it would probably not increase the number of oranges by very much. Economists would say that his supply is inelastic, because he cannot easily change his output. The same factors that prevent the owner of the orange grove from expanding his supply will also prevent new growers from entering the market and supplying oranges in the short term.

In the short run, supply is inelastic whether the price increases or decreases. If the price of a crate of oranges falls, the grove owner has few ways to cut his supply. He invested years ago in land and trees, and his grove will provide oranges no matter what the price is. Even if the price drops drastically, the grove owner will probably pick and sell nearly as many oranges as before. The grove owner's competitors have also invested heavily in land and trees and won't drop out of the market if they can survive. In this case, supply is inelastic whether prices rise or fall.

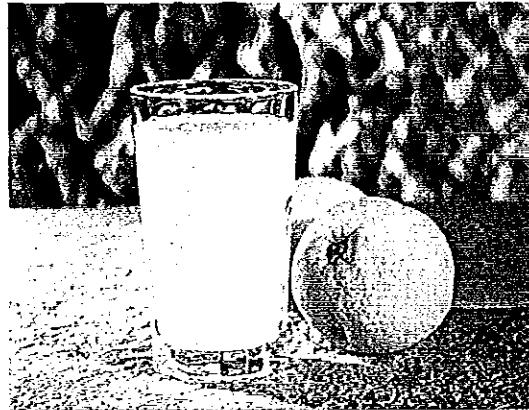
While orange groves illustrate a business in which supply is inelastic, other businesses benefit from more elastic supply. For example, a business that provides a service, such as a haircut, is highly elastic. Unlike oranges, the supply of haircuts is easily expanded or reduced. If the price of a haircut rises, barber shops and salons can hire new workers quickly. In addition,

Figure 5.5 Elastic Supply



When supply is elastic, it reacts strongly to changes in price.
Supply and Demand If supply is inelastic, how will supply react to a small increase in price?

► While the supply of oranges is inelastic, the supply of goods made from oranges is elastic. For example, producers can choose whether to produce more or less orange juice from the oranges.



new barber shops and salons will open, and existing businesses might stay open later in the evening. This means that a small increase in price will cause a large

increase in quantity supplied, even in the short term.

If the price of a haircut drops, some barbers will close their shops earlier in the day, and others will leave the market for jobs elsewhere. Quantity supplied will fall quickly. Because haircut suppliers can quickly change their operations, the supply of haircuts is elastic.

Elasticity in the Long Run

Like demand, supply can become more elastic over time. Consider the example of the orange grower who could not increase his output much when the price of oranges rose. Over time, he could plant more trees to increase his supply of oranges. These changes will become more effective over time as trees grow and bear fruit. After several years, he will be able to sell many more oranges at the high market price.

If the price drops and stays low for several years, orange growers who survived the first two or three years of losses might decide to give up and grow something else. Given five years to respond instead of six weeks, the supply of oranges will be far more elastic. Just like demand, supply becomes more elastic if the supplier has a long time to respond to a price change.

Section 1 Assessment

Key Terms and Main Ideas

1. Explain the law of supply in your own words.
2. What is the difference between supply and quantity supplied?
3. How does the quantity supplied of a good with a large elasticity of supply react to a price change?

Applying Economic Concepts

4. **Problem Solving** If the price of oil rises around the world, what will happen to oil production in Texas? Explain your answer.

5. **Decision Making** Explain whether you think the supply of the following goods is elastic or inelastic, and why. (a) hotel rooms (b) taxi rides (c) photographs
6. **Critical Thinking** When the price of a good rises, total supply in the market will rise, but some entrepreneurs might actually choose to work less. Why might they make this choice?



Take It to the NET

Scarcity can influence the elasticity of the supply of a good or service. Investigate two of our sources of energy (petroleum, natural gas, hydropower, nuclear, geothermal), and determine whether supply is elastic or inelastic. Use the links provided in the Social Studies area at the following Web site for help in completing this activity. www.phschool.com

Skills for LIFE

Critical Thinking

Graphs and Charts

Social Studies

Technology

Test-Taking

Successful test-taking involves more than studying at home the night before the test. You can take steps to prepare for a test well before the test day arrives. You can also follow some specific practices while taking the test to ensure your success. Use the following steps to help you complete a checklist like the one below for an upcoming test in one of your classes.

- 1. Long-Term Planning** Give yourself plenty of time to prepare for a test.
(a) Ask your teacher when the next test will be given. (b) Block off specific times to study before the test date.

TEST PREPARATION CHECKLIST

Long-Term Planning

1. Test date: _____
2. Allocated study time: _____

Short-Term Planning (Day Before the Test)

1. Have you studied enough? _____
2. What will you do to relax? _____
3. What will you eat for breakfast? _____
4. What will you wear so that you will be comfortable during the test? _____
5. List the materials you will need for the test: pencils, pens, erasers, a watch _____

During-the-Test Reminders

1. I should answer these questions first because I know these subjects the best: _____
2. I need more time to think about these subjects: _____

After the Test

1. Which questions were the most difficult? _____
2. What could I have done to prepare better for these questions? _____

- 2. Short-Term Planning** Now that it is the day before the test, what are you going to do? Plan the next morning's events so you are not stressed. Eat a healthy breakfast. Plan to wear comfortable clothing and to have the necessary equipment for taking the test.
(a) Think of three activities to do to stay relaxed. (b) Refer to a checklist of things to do the day before the test.

- 3. Taking the Test** During the test, follow some basic strategies to achieve better results. Read all directions and questions carefully before you answer them. Judge your time limit so you have enough time to complete all parts. Complete all the "easy" questions first.

- 4. After the Test** Evaluate your test performance to determine how to improve your skills in the future.
(a) Looking at your own test-taking experience, what types of questions give you the most difficulty? (b) Make a list of these types of questions, and determine how you can be better prepared for these questions.

Additional Practice

Create your own schedule or checklist for an upcoming essay or research paper. Use a format similar to the one shown here.

Costs of Production

Preview

Objectives

After studying this section you will be able to:

1. Explain how firms decide how much labor to hire to produce a certain level of output.
2. Analyze the production costs of a firm.
3. Understand how a firm chooses to set output.
4. Explain how a firm decides to shut down an unprofitable business.

Section Focus

Entrepreneurs consider marginal benefits and costs when deciding how much output to produce. Ordinarily, firms earn their highest profits when the cost of making one more unit is the same as the market price of the good.

Key Terms

marginal product of labor
 increasing marginal returns
 diminishing marginal returns
 fixed cost
 variable cost
 total cost
 marginal cost
 marginal revenue
 operating cost

marginal product of labor *the change in output from hiring one additional unit of labor*

In Section 1, we identified how producers respond to a change in price. The law of supply states that producers will offer more goods as the price goes up and fewer as the price falls. In this section, we will explain how a supplier decides *how much* to produce.

Consider a firm that produces beanbags. The firm's factory has one sewing machine and one pair of scissors. The firm's inputs are workers and materials, including cloth, thread, and beans. Assume that each beanbag requires the same amount of materials. As the number of workers increases, what happens to the quantity of beanbags produced?

The supply of beanbag chairs in the market depends on several factors, including the cost of labor and capital. ▼



Labor and Output

One of the basic questions any business owner has to answer is how many workers to hire. To answer this question, owners have to consider how the number of workers they hire will affect their total production. For example, at the beanbag factory, one worker can produce four beanbags per hour. Two workers can make a total of ten bags per hour, and three can make a total of seventeen beanbags an hour. As new workers join the company, total output increases. After the seventh worker is hired, production peaks at 32 beanbags per hour. When the firm hires the eighth worker, however, total output drops to 31 bags per hour.

Figure 5.6 shows the relationship between labor, measured by the number of workers in the factory, and the number of beanbags produced.

Marginal Product of Labor

The third column of Figure 5.6 shows the **marginal product of labor**, or the change in output from hiring one more worker. This is called the marginal product because it measures the change in output at the margin, where the last worker has been hired or fired.

The first worker to be hired produces four bags an hour, so her marginal product is four bags. The second worker raises total output from four bags an hour to ten, so her marginal product of labor is six. Looking at this column, we see that the marginal product of labor increases for the first three workers, rising from four to seven.

Increasing Marginal Returns

The marginal product of labor increases for the first three workers because there are three tasks involved in making a beanbag. Workers cut and sew cloth into the correct shape, stuff it with beans, and sew the bag closed. In our example, a single worker performing all these tasks would only produce four bags per hour. Adding a second worker would allow each worker to specialize in one or two tasks. If each worker focuses on only one part of the process, she will waste less time switching between tasks and will become more skillful at her assigned tasks. In other words, specialization increases output per worker, so the second worker adds more to output than the first. The firm enjoys **increasing marginal returns**.

In our example, there are benefits from specialization for the first three workers. The firm enjoys a rising marginal product of labor for the first three workers.

Diminishing Marginal Returns

When the fourth through the seventh workers are hired, the marginal product of labor is still positive. Each new worker still adds to total output. However, the marginal product of labor shrinks as each worker joins the company. The fourth worker increases output by six bags, while the seventh increases output by only one bag. Why?

After the beanbag firm hires its first three workers, one for each task, the benefits of specialization end. At that point, adding more workers increases total output, but at a decreasing rate. This situation is known as **diminishing marginal returns**. A firm with diminishing marginal returns of labor will

Figure 5.6 Marginal Product of Labor

Labor (number of workers)	Output (beanbags per hour)	Marginal product of labor
0	0	—
1	4	4
2	10	6
3	17	7
4	23	6
5	28	5
6	31	3
7	32	1
8	31	-1

produce less and less output from each additional unit of labor added to the mix.

The firm suffers from diminishing marginal returns from labor because its workers must work with a limited amount of capital. Remember that capital is any human-made resource that is used to produce other goods. In this example, capital is represented by the factory's single sewing machine and pair of scissors. When there are three workers, but only one needs to use the sewing machine, this worker will never have to wait to get to



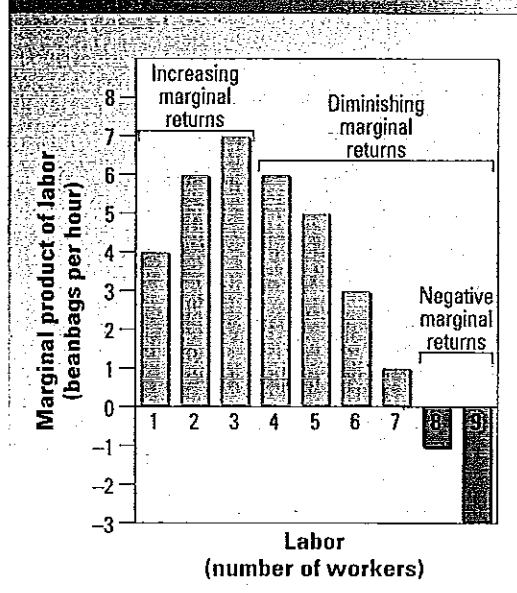
The marginal product of labor is the increase in output added by the last unit of labor.

Specialization
Why does the marginal product of labor decrease with more than four workers in this example?

increasing marginal returns a level of production in which the marginal product of labor increases as the number of workers increases

diminishing marginal returns a level of production in which the marginal product of labor decreases as the number of workers increases

Figure 5.7 Increasing, Diminishing, and Negative Marginal Returns



Labor has increasing and then diminishing marginal returns.

Opportunity Cost
What is the marginal product of labor when the factory currently employs five workers?

FAST FACT

To understand the diminishing marginal returns of capital, consider an Internet service provider that mailed millions of free copies of its software on compact discs. The first discs sent out got customers interested in the product and provided a good return on investment. After consumers received several additional discs, however, the discs no longer caught their attention and more often than not ended up in the trash.

work. When there are more than three workers, the factory will assign more than one to work at the sewing machine. While one is working, the other will have to wait. She may be able to help cut fabric or stuff bags in the meantime, but every bag must be sewn up at some point, so she cannot greatly increase the speed of the production process.

The problem gets worse as more workers are hired and the amount of capital remains constant. Wasted time waiting for the sewing machine or scissors means that additional

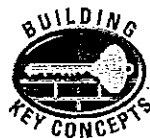
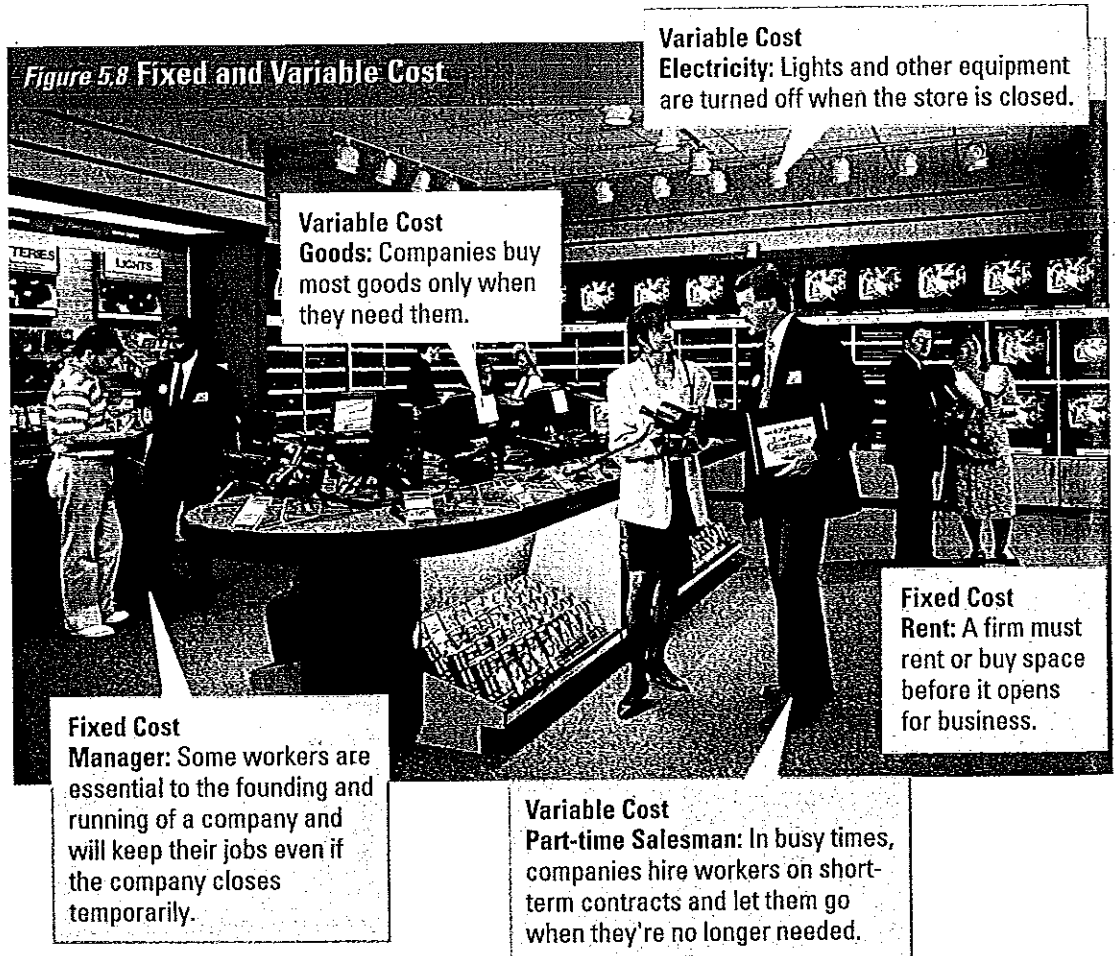
workers will add less and less to total output at the factory.

Negative Marginal Returns

As the table in Figure 5.6 shows, adding the eighth worker at the beanbag factory can actually decrease output by one bag. At this stage, workers get in each other's way and disrupt the production process, so overall output decreases. Of course, few companies ever hire so many workers that their marginal product of labor becomes negative.

Production Costs

Paying workers and purchasing capital are all costs of producing goods. Economists



Firms must separate fixed costs from variable costs to determine whether or not to produce at a given market price.

Entrepreneurs Why are some employees considered variable costs?

Figure 5.9 Production Costs

Beanbags (per hour)	Fixed cost	Variable cost	Total cost (fixed cost + variable cost)	Marginal cost	Marginal revenue (market price)	Total revenue	Profit (total revenue - total cost)
0	\$36	\$0	\$36	—	\$24	\$0	\$-36
1	36	8	44	\$8	24	24	-20
2	36	12	48	4	24	48	0
3	36	15	51	3	24	72	21
4	36	20	56	5	24	96	40
5	36	27	63	7	24	120	57
6	36	36	72	9	24	144	72
7	36	48	84	12	24	168	84
8	36	63	99	15	24	192	93
9	36	82	118	19	24	216	98
10	36	106	142	24	24	240	98
11	36	136	172	30	24	264	92
12	36	173	209	37	24	288	79



Firms consider a variety of costs when deciding how much to produce. **Markets and Prices**
Why is the marginal revenue always equal to \$24?

divide a producer's costs into two categories: fixed costs and variable costs.

Fixed Costs

A **fixed cost** is a cost that does not change, no matter how much of a good is produced. Most fixed costs involve the production facility, the cost of building and equipping a factory, office, store, or restaurant. Examples of fixed costs include rent, machinery repairs, property taxes on a factory, and the salaries of workers who keep the business running even when production temporarily stops.

Variable Costs

Variable costs are costs that rise or fall depending on the quantity produced. They include the costs of raw materials and some labor. For example, to produce more beanbags, the firm must purchase more beans and hire more workers to stuff the beanbags. If the company wants to produce less and cut costs, it can stop buying beans or have some workers work fewer hours a week. The cost of labor is a variable cost because it changes with the number of workers, which changes with the quantity produced. Electricity and heating bills are also variable costs, because the company can cut off heat and

electricity for the factory and its machines when they are not in use.

Total Cost

Figure 5.9 shows some cost data for the firm that produces beanbags. The firm has a factory that is fully equipped to produce beanbags. How does the cost of producing beanbags change as the output increases?

In our example, the fixed costs are the costs of the factory building and all the machinery and equipment inside. As shown in the second column in Figure 5.9, the fixed costs are \$36.00 per hour.

Variable costs include the cost of beans, fabric, and most of the workers hired to produce the beanbags. As shown in the third column, variable costs rise with the number of beanbags produced. Fixed costs and variable costs are added together to find **total cost**. Total cost is shown in the fourth column.

Marginal Cost

If we know the total cost at several levels of output, we can determine the **marginal cost** of production at each level. Marginal cost is the additional cost of producing one more unit.

As shown in Figure 5.9, even if the firm is not producing a single beanbag, it still

fixed cost a cost that does not change, no matter how much of a good is produced

variable cost a cost that rises or falls depending on how much is produced

total cost fixed costs plus variable costs

marginal cost the cost of producing one more unit of a good

marginal revenue the additional income from selling one more unit of a good; sometimes equal to price

must pay \$36.00 an hour for fixed costs. If the firm decides to produce just one beanbag an hour, its total cost rises \$8.00 from \$36.00 to \$44.00 an hour. The marginal cost of the first beanbag is \$8.00.

For the first three beanbags, the marginal cost falls as output increases. The marginal cost of the second beanbag is \$4.00, and the marginal cost of the third beanbag is \$3.00. Each additional beanbag is cheaper to make because of increasing marginal returns resulting from specialization.

With the fourth beanbag, the marginal cost starts to rise. The marginal cost of the fifth per hour is \$7.00, the sixth costs \$9.00, and the seventh costs \$12.00. The rising marginal cost reflects diminishing returns to labor. The benefits of specialization are exhausted when the firm reaches three beanbags, and diminishing returns set in as more and more workers share a fixed production facility.

Setting Output

Behind all of the decisions about how many workers to hire is the firm's basic goal: to maximize profits. Profit is defined as total revenue minus total cost. As you

read in Chapter 4, a firm's total revenue is the money the firm gets by selling its product. Total revenue is equal to the price of each good multiplied by the number of goods sold. Figure 5.9 shows total revenue when the price of a beanbag is \$24.00. To find the level of output with the highest profit, we look for the biggest gap between total revenue and total cost. The gap is biggest and profit is highest when the firm makes 9 or 10 beanbags per hour. At this rate, the firm can expect to make a profit of \$98.00 an hour.

Marginal Revenue and Marginal Cost

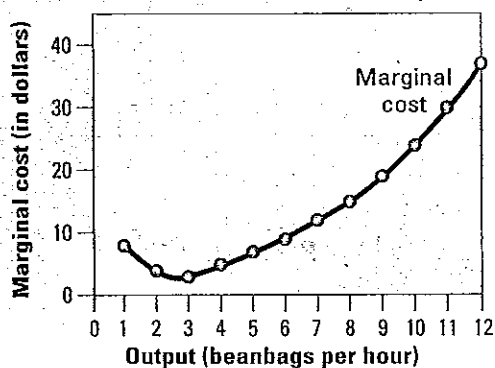
Another way to find the best level of output is to find the output level where **marginal revenue** is equal to marginal cost. Marginal revenue is the additional income from selling one more unit of a good. If the firm has no control over the market price, marginal revenue equals the market price. Each beanbag sold at \$24.00 increases the firm's total revenue by \$24.00, so marginal revenue is \$24.00. According to the table, price equals marginal cost with 10 beanbags, so that's the quantity that maximizes profit at \$98 an hour.

To understand how an output of 10 beanbags maximizes the firm's profits, suppose that the firm picked a different level of output. If the firm made only 4 beanbags per hour, is it making as much money as it can?

From Figure 5.9, we know that the marginal cost of the fifth beanbag is \$7.00. The market price for a beanbag is \$24.00, so the marginal revenue from that beanbag is \$24.00. The \$17.00 difference between the marginal revenue and marginal cost represents pure profit for the company from making and selling the fifth beanbag. The company should increase its production to five beanbags an hour to capture that profit on the fifth beanbag.

If we do the same calculations for a sixth beanbag, we find that the company can capture a profit of \$15.00 by producing the sixth beanbag per hour. The price of the seventh beanbag is \$12.00 higher than its marginal cost, so that beanbag earns an

Figure 5.10 Marginal Cost Curve



For most firms, the marginal cost of production falls as output rises from zero, but eventually begins to rise.

Markets and Prices How many beanbags an hour should this firm make to produce at the lowest possible marginal cost?

additional \$12.00 in profit for the company. The profit is available any time the company receives more for the last beanbag than it cost to produce. Any rational entrepreneur would take this opportunity to increase profit.

Now suppose that the firm is producing so many beanbags an hour that marginal cost is *higher* than price. If the firm produces eleven beanbags an hour, it receives \$24.00 for that eleventh beanbag, but the \$30.00 cost of that beanbag wipes out the profit. The firm actually loses \$6.00 on the sale of the eleventh beanbag. Because marginal cost is increasing, and price is constant in this example, the losses would get worse at higher levels of output. The company would be better off producing less and keeping costs down.

The ideal level of output is where marginal revenue (price) is equal to marginal cost. Any other quantity of output would generate less profit.

Responding to Price Changes

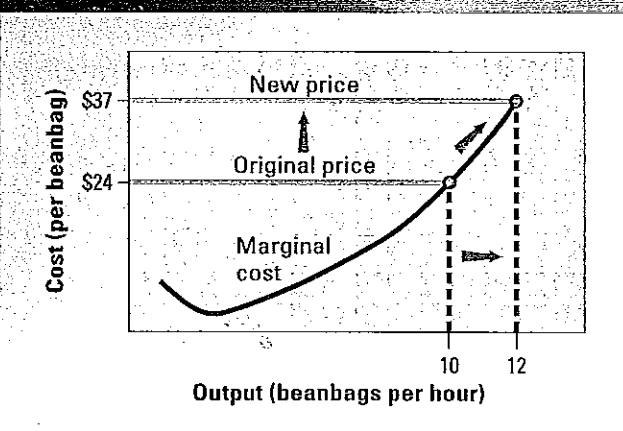
What would happen if the price of a beanbag suddenly rose from \$24.00 to \$37.00? Thinking at the margin, we would predict that the firm would increase production to twelve beanbags per hour. That's the quantity at which the marginal cost is equal to the new, higher price. At the original price of \$24.00, the firm would not produce more than ten beanbags, according to the graph in Figure 5.11. When the price rises to \$37.00, marginal revenue soars above marginal cost at that level of output. Raising production to twelve beanbags an hour would allow the firm to capture profits on the eleventh and twelfth beanbags.

This example shows the law of supply in action. An increase in price from \$24.00 to \$37.00 causes the firm to increase the quantity supplied from ten to twelve beanbags an hour.

The Shutdown Decision

Consider the problems faced by a factory that is losing money. The factory is

Figure 5.11 Output and a Change in Price



The most profitable level of output is where price (or marginal revenue) is equal to marginal cost.

Markets and Prices What would happen to output if the market price fell to \$20?

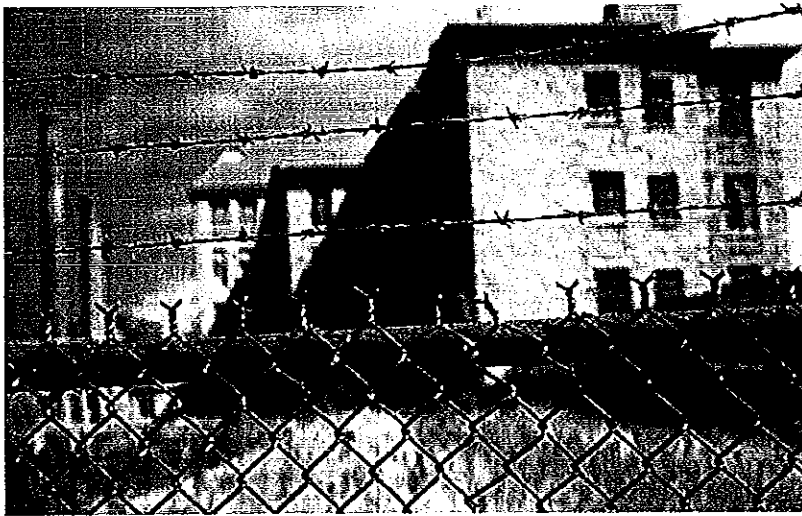
producing at a level of output at which marginal revenue is equal to marginal cost. As you have read, this is the most profitable level of output. However, the market price is so low that the factory's total revenue is still less than its total cost, and the firm is losing money. Should this factory continue to produce goods and lose money, or should its owners shut the factory down?

This may seem like a silly question. In fact, there are times when keeping a money-losing factory open is the best choice. The firm should keep the factory open if the total revenue from the goods and services the factory produces is greater than the cost of keeping it open.

For example, if the price of beanbags drops to \$7, and the factory produces at the profit-maximizing level of five beanbags per hour, the total revenue of the business is \$35 per hour. Weigh this against the factory's **operating cost**, or the cost of operating the facility. The operating cost includes the variable costs the owners must pay to keep the factory running, but not the fixed costs, which the owners must pay whether the factory is open or closed.

According to Figure 5.9, if the factory produces five beanbags, the variable cost is \$27 per hour. Therefore, the benefit of operating the facility (total revenue of \$35)

operating cost the cost of operating a facility, such as a store or factory



▲ When a factory begins losing money, the owner must consider its operating cost and revenue when deciding what to do.

is greater than the variable cost (\$27), so it makes sense to keep the facility running.

Consider the effects of the other choice. If the firm were to shut down the factory, it would still have to pay all of its fixed costs. The factory's total revenue would be zero because it would be producing nothing for

sale. Therefore, the firm would lose an amount of money equal to its fixed costs.

For this beanbag factory, the fixed costs equal \$36 per hour, so the factory would lose \$36 for each hour it is closed. If the factory were to keep producing five beanbags per hour, its total cost would be \$63 (\$36 in fixed costs plus \$27 in variable costs) per hour, but it would lose only \$28 (\$63 in total cost minus \$35 in revenue) for each hour it is open. The factory would lose less money while producing because the total revenue (\$35) would exceed the variable costs (\$27), leaving \$8 to cover some of the fixed costs. Although the factory would lose money in either situation, it would lose less money by continuing to produce and sell beanbags.

How long will a business continue to operate a factory at a loss before it decides to replace the facility? The firm will build a new factory and stay in the market only if the market price of beanbags is high enough to cover all the costs of production, including the cost of building a new factory.

Section 2 Assessment

Key Terms and Main Ideas

1. How does the **marginal product of labor** change as more workers are hired?
2. What is the impact of **diminishing marginal returns** on labor?
3. Give an example of a **fixed cost** and a **variable cost** of a bakery.
4. How does a firm calculate **marginal cost**?

Applying Economic Concepts

5. **Critical Thinking** A firm has two factories, one twice as large as the second. As the number of workers at each factory increases, which factory will experience diminishing returns first?

6. **Decision Making** Explain whether each of these expenses of a textile mill is a fixed cost or a variable cost, and why. (a) repairs to a leaking roof (b) cotton (c) food for the mill's cafeteria (d) night security guard (e) electricity
7. **Math Practice** Use the table below to answer the following questions. (a) What is the total cost when output is 2? (b) What is the marginal cost of the third unit? (c) How much should this firm produce if the market price is \$24?

Output	Fixed Cost	Variable Cost
1	\$5	\$10
2	\$5	\$27
3	\$5	\$55
4	\$5	\$91
5	\$5	\$145



Take It to the NET

Firms must consider their fixed and variable costs when they set their budgets and supply. Create your own virtual factory and determine three fixed and variable costs. Use the links provided in the Social Studies area at the following Web site for help in completing this activity. www.phschool.com

Profile

Robert L. Johnson (b. 1946)

In 1979, while working as chief lobbyist for the National Cable Television Association, Robert Johnson was asked by a businessman to support a proposed cable channel for older Americans. Existing channels targeted young white viewers, leaving older Americans underserved. Johnson immediately realized that this statement applied to African Americans as well. In that moment, the idea for Black Entertainment Television—BET—was born.

Launching BET

Searching for investors, Johnson approached Tele-Communications Incorporated (TCI), a large cable operator that was hoping to expand. He pointed out that a cable company supplying quality programming with appeal to the African American community would have an advantage over its competitors in cities with large black populations. TCI bought a 20 percent stake in his venture.

In January 1980, Johnson launched BET—the first black-owned and -operated television network. Its first broadcasts were limited to two hours each Friday night on another cable network's channel. However, he soon added a gospel show, coverage of college sports, and a music program featuring black recording artists. By 1982, using music videos that record companies provided for free, BET had increased its airtime to six hours a day.

In 1984, Johnson sold another share in BET to Home Box Office (HBO), a division of Time Warner. This provided the money he needed to expand his programming. Johnson now had access to the country's two largest cable providers, Time Warner and TCI, as well as to HBO's satellite, so he could broadcast 24 hours a day. By 1989,

BET was reaching 23 million homes. Ten years later, that figure had grown to nearly 58 million households, including more than 90 percent of African American households with cable.

Creating a Brand

"When I see BET, I don't see a cable network," Johnson says. "I see a black media conglomerate." In the 1990s, Johnson used the network's commercial airtime and its strong reputation among African Americans to create a BET "umbrella brand."

Besides adding four more cable channels, Johnson launched BET Arabesque Films to produce movies for theaters and for his cable network. Arabesque Books, a line of African American romance novels that Johnson purchased in 1998, provided the material for the first movies. In 1997, Johnson launched the first of his BET Soundstage restaurants, an African American version of the Hard Rock Cafe restaurant chain. Other ventures include a clothing line, a health and fitness magazine, and a newsmagazine directed at African Americans. "I want to grow my brand to be like Disney," Johnson says of his goals.

CHECK FOR UNDERSTANDING

1. Source Reading Describe how Johnson's BET affected the supply of television entertainment available to cable viewers.

2. Critical Thinking Using clues in the text above, explain the meaning of the term *umbrella brand*.

3. Learn More Use the Internet and other sources to research and report on the variety of products and services that BET currently has or is planning for the future.

Changes in Supply

Preview

Objectives

After studying this section you will be able to:

1. Identify how determinants such as input costs create changes in supply.
2. Identify three ways that the government can influence the supply of a good.
3. Understand supply and demand in the global economy.
4. Analyze the effects of other factors that affect supply.

Section Focus

Changes in the costs of inputs can raise or lower the supply of a good at all prices. The number of firms in a market and the price and supply of other goods can also have an effect on the supply of a good.

Key Terms

subsidy
excise tax
regulation

Just as several factors can affect demand at all price levels, a separate set of factors can affect supply. In this section, you will read about these factors that can affect supply, and the factors that shift an entire supply curve to the left or right.

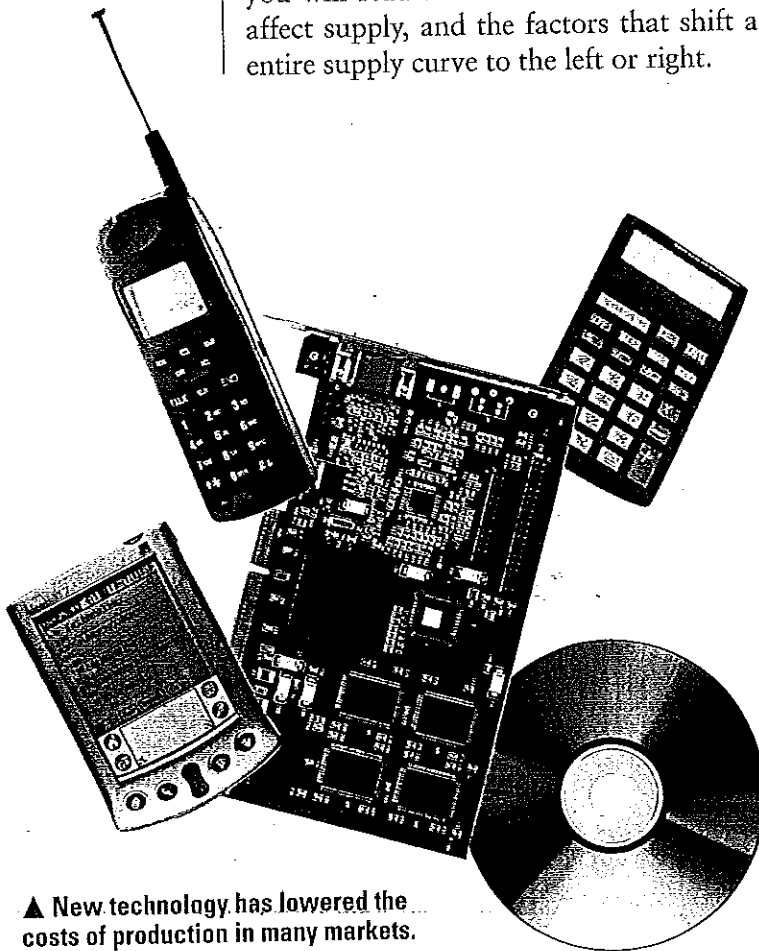
Input Costs

Any change in the cost of an input used to produce a good—such as raw materials, machinery, or labor—will affect supply. A rise in the cost of an input will cause a fall in supply at all price levels because the good has become more expensive to produce. On the other hand, a fall in the cost of an input will cause an increase in supply at all price levels.

Effect of Rising Costs

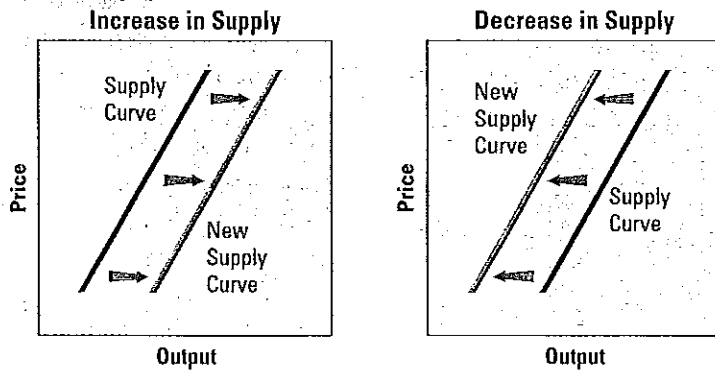
Think of the effects of input costs on the relationship between marginal revenue (price) and marginal cost. A supplier sets output at the most profitable level, where price is equal to marginal cost. Marginal cost includes the cost of the inputs that go into production, so a rise in the cost of labor or raw materials will translate directly into a higher marginal cost. If the cost of inputs increases enough, the marginal cost may become higher than the price, and the firm may not be as profitable as it could be.

If a firm has no control over the price, the only solution is to cut production and lower marginal cost until marginal cost equals the lower price. Supply falls at each price, and the supply curve shifts to the left, as illustrated in Figure 5.12.



▲ New technology has lowered the costs of production in many markets.

Figure 5.12 Shifts in the Supply Curve



Factors that reduce supply shift the supply curve to the left, while factors that increase supply move the supply curve to the right.

Supply and Demand
Which graph best represents the effects of higher costs?

Technology

Input costs can drop as well. Advances in technology, for example, can lower production costs in many industries. Sophisticated robots have replaced many workers on assembly lines and allowed manufacturers to spend less on salaries. Computers have simplified tasks and cut costs in fields as diverse as journalism and architecture. E-mail that can be sent and received in an instant can replace slowly delivered letters and expensive long-distance phone calls.

Technology lowers costs and increases supply at all price levels. This effect is seen in a rightward shift in the supply curve in Figure 5.12.

Government's Influence on Supply

The government has the power to affect the supplies of many goods. By raising or lowering the cost of producing goods, the government can encourage or discourage an entrepreneur or an industry within the country or abroad.

Subsidies

One method used by governments to affect supply is to give subsidies to the producers of a good, particularly food. A **subsidy** is a government payment or discounted loan that supports a business or market. The

government often pays a producer a set subsidy for each unit of a good produced.

Governments have several reasons for subsidizing producers. European countries faced food shortages during and after World War II. Although imported food is cheaper, European governments protect farms so that some will be available to grow food in case imports are ever cut off. The government of France also subsidizes small farms because French citizens want to protect the lifestyle and character of the French countryside.

Governments in developing countries often subsidize manufacturers to protect young, growing industries from strong foreign competition. In the past, countries such as Indonesia and Malaysia have subsidized a national car company as a source of pride, even though imported cars were less expensive to build. In Western Europe, banks and national airlines were allowed to suffer huge losses with the assurance that the government would cover their debts. In many countries, governments have stopped providing industrial subsidies in the interest of free trade and fair competition.

In the United States, the federal government subsidizes producers in many industries. Farm subsidies are particularly controversial, however, especially when farmers are paid to take land out of cultivation to keep prices high. In these cases, more efficient farmers are penalized, and farmers use more herbicides and pesticides

subsidy a government payment that supports a business or market



Global Connections

Common Agricultural Policy The European Union, a group of fifteen countries in Europe, protects its farms through its Common Agricultural Policy (CAP). Under CAP, the European Union subsidizes farms to keep them running and to encourage farmers to produce more food. Although this may have made sense in difficult times after World War II, farms have since modernized, and subsidies have led to a tremendous amount of unneeded food. In 1994, the CAP cost Europe \$40 billion while producing a "wine lake" and "butter mountain" that no one would buy. Since then, Europe has tried to cut subsidies and introduce voluntary limits on production.

excise tax a tax on the production or sale of a good

regulation government intervention in a market that affects the production of a good

on lands they do cultivate to compensate for production lost on the acres the government pays them not to plant.

Taxes

A government can reduce the supply of some goods by placing an **excise tax** on them. An excise tax is a tax on the production or sale of a good. An excise tax increases production costs by adding an extra cost for each unit sold.

Excise taxes are sometimes used to discourage the sale of goods that the

government thinks are harmful to the public good, like cigarettes, alcohol, and high-pollutant gasoline. Excise taxes are built into the prices of these and other goods, so consumers may not realize that they are paying them. Like any increase in cost, an excise tax causes the supply of a good to decrease at all price levels. The supply curve shifts to the left.

Regulation

Subsidies and excise taxes represent ways that government directly affects supply by changing revenue or production costs. Government can also raise or lower supply through indirect means. Government regulation often has the effect of raising costs. **Regulation** is government intervention in a market that affects the price, quantity, or quality of a good.

For many years, pollution from automobiles harmed the environment. Starting in 1970, the federal government required car manufacturers to install technology to reduce pollution from auto exhaust. For example, new cars had to use lead-free fuel because scientists linked health problems to



▲ Although other countries can grow food more cheaply, the French government keeps its farmers in business by offering subsidies.

lead in gasoline. Regulations such as these increased the cost of manufacturing cars and reduced the supply. The supply curve shifted to the left.

Supply in the Global Economy

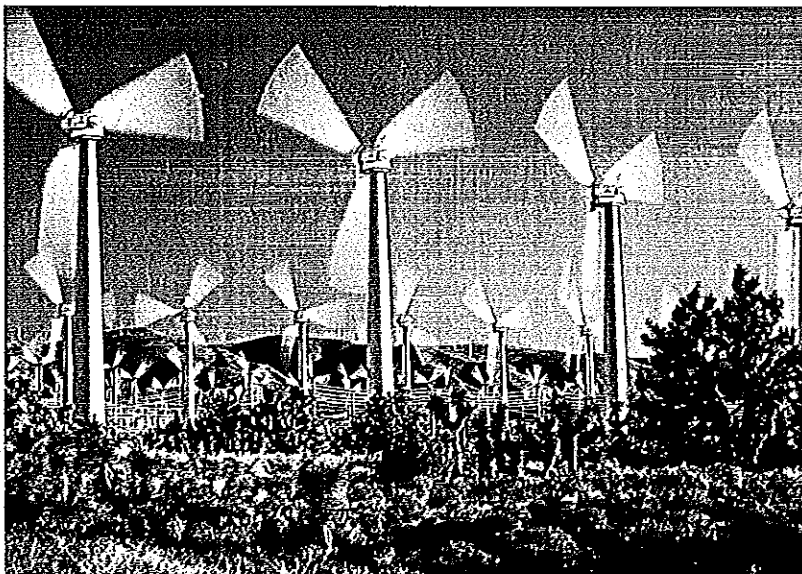
As you read in earlier chapters, a large and rising share of goods and services is produced in one country and imported by another to be sold to consumers. The supplies of imported goods are affected by changes in other countries. Here are some examples of possible changes in the supply of products imported by the U.S.

- The U.S. imports carpets from India. An increase in the wages of Indian workers would decrease the supply of carpets to the U.S. market, shifting the supply curve to the left.
- The U.S. imports telephones from Japan. A new technology that decreases the cost of producing telephones would increase the supply of telephones to the U.S. market, shifting the supply curve to the right.
- The U.S. imports oil from Russia. A new oil discovery in Russia would increase the supply of oil to the U.S. market and shift the supply curve to the right.

Import restrictions also affect the supply curves of restricted goods. The total supply of a product equals the sum of imports and domestically produced products. An import ban on sugar would eliminate foreign sugar suppliers from the market, shifting the market supply curve to the left. At any price, a smaller quantity of sugar would be supplied. If the government restricted imports by establishing an import quota, the supply curve would shift to the left, but the shift would be smaller than it would be for an absolute ban on sugar imports.

Other Influences on Supply

While government can have an important influence on the supply of goods, there are also other important factors that influence



▲ As prices for fossil fuels have risen, electric companies have looked to alternative sources of supply, such as wind.

supply. First, producers' expectations of future prices affect their output decisions. Second, the supply of goods increases with the number of firms producing the good.

Future Expectations of Prices

If you were a soybean farmer, and you expected the price of soybeans to double next month, what would you do with the crop that you just harvested? Would you sell it right now, or hold on to it until soybean prices rise? Most farmers would store their soybeans until the price rose, cutting back supply in the short term.

If a seller expects the price of a good to rise in the future, the seller will store the goods now in order to sell more in the future. On the other hand, if the price of the good is expected to drop in the near future, sellers will earn more money by placing goods on the market immediately before the price falls. Expectations of higher prices will reduce supply now and increase supply later, and expectations of lower prices will have the opposite effect.

Inflation is a condition of rising prices. During periods of inflation, the value of cash in a person's pocket decreases from day to day as prices rise. Not too long ago, one dollar could buy a movie ticket or a small meal, but inflation over many years



▲ High levels of inflation, like those Russia faced in the 1990s, can cause suppliers to hoard their goods to sell later.

has reduced the value of the dollar. However, a good will continue to hold its value, provided that it can be stored for a long period of time. When faced with inflation, suppliers prefer to hold on to goods that will maintain their value rather than sell them for cash that loses its value rapidly. As a result, inflation can affect supply by encouraging suppliers to hold on to goods as long as possible. In the short term, supply can fall dramatically.

During the Civil War, the South faced terrible inflation. The prices of most goods rose very quickly. There were shortages of food, and shopkeepers knew that prices on basic food items like flour, butter, and salt would rise each month. A few decided to hoard their food and wait for higher prices. They succeeded too well; the supply of food fell so much that prices rose out of the reach of many families. Riots broke out in Virginia and elsewhere when hungry people decided they weren't going to wait for the food to be released from the warehouses, and the shopkeepers lost their goods and their profits.

Number of Suppliers

One final factor to consider when looking at changes in supply is the number of suppliers in the market. If more suppliers enter a market to produce a certain good, the market supply of the good will rise, and the supply curve will shift to the right. On the other hand, if suppliers stop producing the good and leave the market, the supply will decline. There is a positive relationship between the number of suppliers in a market and the market supply of the good.

Section 3 Assessment

Key Terms and Main Ideas

1. How does a **subsidy** affect supply?
2. Why does the government impose **excise taxes**?
3. How can **regulation** affect a producer's output decisions?

Applying Economic Concepts

4. **Using the Databank** Turn to the graph on page 534 that lists the production of the American agriculture, timber, and mining industries. If the government wanted the mining industry to produce \$120 billion next year, what step could it take?
5. **Decision Making** Decide whether each of these events would cause an increase or decrease in the supply of American-made backpacks. (a) The government raises the minimum wage of backpack workers to \$40 an hour. (b) A new regulation requires firms to make backpacks out of expensive clear plastic. (c) An engineer invents a machine that can sew ten backpacks a minute, speeding up production.
6. **Critical Thinking** Explain why a change that lowers the marginal revenue (price) changes the quantity produced in the same direction as a change that raises the marginal cost of production.



Take It to the NET

Throughout history, artists have looked to governments and private donors for financial support. Determine what effect government and private donations to the arts have on the supply of cultural activities in the United States. Use the links provided in the Social Studies area at the following Web site for help in completing this activity. www.phschool.com

Are Baseball Players Paid Too Much?

Major league baseball provides us with a prime example of the ways in which supply and demand affect wages. Millions of people are willing to buy tickets to watch major leaguers in person. Even more watch the games on television. Most team owners make enormous amounts of money from the sale of tickets and television rights, as well as licensing fees.

Supply and Demand The salaries of top baseball players are determined by supply and demand. The public creates a high demand for watching professional sports, but the supply of truly talented athletes is relatively small. This drives their salaries up. On the other hand, most people could be trained to work as store clerks or fast-food restaurant employees, so wages for those positions tend to be low.

Free Agency Up until the 1970s, players received relatively low salaries. This was because most were required to play only for the team that first signed them to a contract, or to the team that they had been traded to. In the mid-1970s, players went to court seeking the right to become "free agents." Free agency would allow them, after playing for a team for a certain number of years, to sell their services to any other team willing to pay them the salaries they asked for. Although team owners strongly opposed free agency, the players won their case.

A Price to Pay This victory has led to bidding wars which have resulted in the astronomical salaries that top stars now receive. Yet, while these players have benefited greatly from free agency, both fans and major league baseball itself have had to pay a price. The intense loyalty that fans once demonstrated toward their favorite teams has diminished as players switch from one team to another in search of higher salaries. Owners have sharply increased ticket prices to afford the huge increases in players' salaries.

Now, only teams that operate in the largest television markets or have the wealthiest owners can afford to pay the best players. Some fans believe that only the richest teams can make it to the World Series, while the less-wealthy teams are left behind. The result of this development has been a growing cynicism on the part of many fans who feel—rightly or wrongly—that baseball championships are now purchased rather than won.

Applying Economic Ideas

1. What arguments might players make for free agency?
2. How do the laws of supply and demand affect baseball players' salaries?



▲ In 1994, then acting baseball commissioner Bud Selig presided over a 232-day players' strike that resulted in the cancellation of the World Series for the first time since 1904.