

# Supply

## Economics & You



About how many hours do you spend studying every night? How many hours would you study if you were paid \$1 an hour? \$10 an hour? If you will study more for a higher price, you are following the Law of Supply. To learn more about supply, view the Chapter 6 video lesson:

**What Is Supply?**

**ECONOMICS**  
*Online*



**Chapter Overview** Visit the *Economics: Principles and Practices* Web site at [epp.glencoe.com](http://epp.glencoe.com) and click on **Chapter 5—Chapter Overviews** to preview chapter information.

◀ **CLICK HERE**

A firm's willingness to supply products depends on the price it can charge and on its cost of production.

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# What Is Supply?

## Study Guide

### Main Idea

For almost any good or service, the higher the price, the larger the quantity that will be offered for sale.

### Reading Strategy

**Graphic Organizer** As you read the section, complete a graphic organizer similar to the one below by describing how supply differs from demand.



### Key Terms

supply, Law of Supply, supply schedule, supply curve, market supply curve, quantity supplied, change in

quantity supplied, change in supply, subsidy, supply elasticity

### Objectives

After studying this section, you will be able to:

1. **Understand** the difference between the supply schedule and the supply curve.
2. **Explain** how market supply curves are derived.
3. **Specify** the reasons for a change in supply.

### Applying Economic Concepts

**Supply** The Law of Supply tells us that firms will produce and offer for sale more of their product at a high price than at a low price. On another level, think about your own labor. You are the supplier, and the higher the pay, the more work you are willing to supply.

## Cover Story

### Sell It on the Web

By now, just about everyone has heard the breathless prediction about the coming explosion in e-commerce. From the corner store to the corporate boardroom, entrepreneurs recognize that there's money to be made online. The debate is no longer about whether you should put your business online but about what is the best way to do it. . . .



Online business grows.

A new group of e-commerce solutions lets small businesses take a dip into e-commerce without getting in over their heads. These turnkey solutions offer several advantages. . . . No knowledge of HTML is required, because all the site design is done using ready-made templates (and) authoring tools. . . .

—PC Magazine, September 17, 1998

**T**he concept of supply is based on voluntary decisions made by producers, whether they are proprietorships working out of home offices or large corporations operating out of downtown corporate headquarters. For example, a producer might decide to offer one amount for sale at one price and a different quantity at another price. **Supply**, then, is defined as the amount of a product that would be offered for sale at all possible prices that could prevail in the market.

Because the producer is *receiving* payment for his or her products, it should come as no surprise that more will be offered at higher prices. This forms the basis for the **Law of Supply**, the principle that suppliers will normally offer more for sale at high prices and less at lower prices.

## An Introduction to Supply



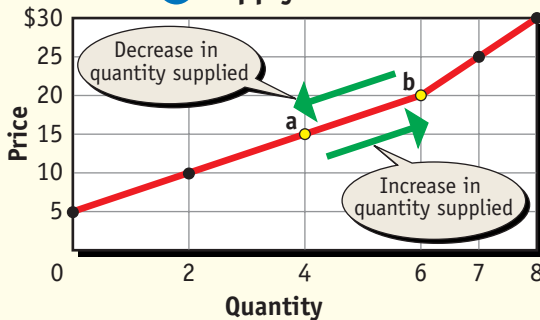
All suppliers of economic products must decide how much to offer for sale at various prices—a decision made according to what is best for the individual seller. What is best depends, in

## Supply of Compact Discs

### A Supply Schedule

Price	Quantity Supplied
\$30	8
25	7
20	6
15	4
10	2
5	0

### B Supply Curve



**Using Tables and Graphs** The supply curve is drawn from the values on the schedule. **How does the Law of Supply differ from the Law of Demand?**

turn, upon the cost of producing the goods or services. The concept of supply, like demand, can be illustrated in the form of a table or a graph.

## The Supply Schedule

The **supply schedule** is a listing of the various quantities of a particular product supplied at all possible prices in the market. **Panel A** of **Figure 5.1** is a hypothetical supply schedule for compact digital discs. It shows the quantities of CDs that will

be supplied at various prices, other things being equal. If you compare it to the demand schedule in **Panel A** of **Figure 4.1** on page 90 you will see that the two are remarkably similar. The only real difference between the two is that prices and quantities now move in the same direction for supply—rather than in opposite directions as in the case of demand.

## The Individual Supply Curve

The data presented in the supply schedule can also be illustrated graphically as the upward-sloping line in **Panel B** of **Figure 5.1**. To draw it, we transfer each of the price-quantity observations in the schedule over to the graph, and then connect the points to form the curve. The result is a **supply curve**, a graph showing the various quantities supplied at each and every price that might prevail in the market.

All normal supply curves slope from the lower left-hand corner of the graph to the upper right-hand corner. This is a positive slope and shows that if one of the values goes up, the other will go up too.

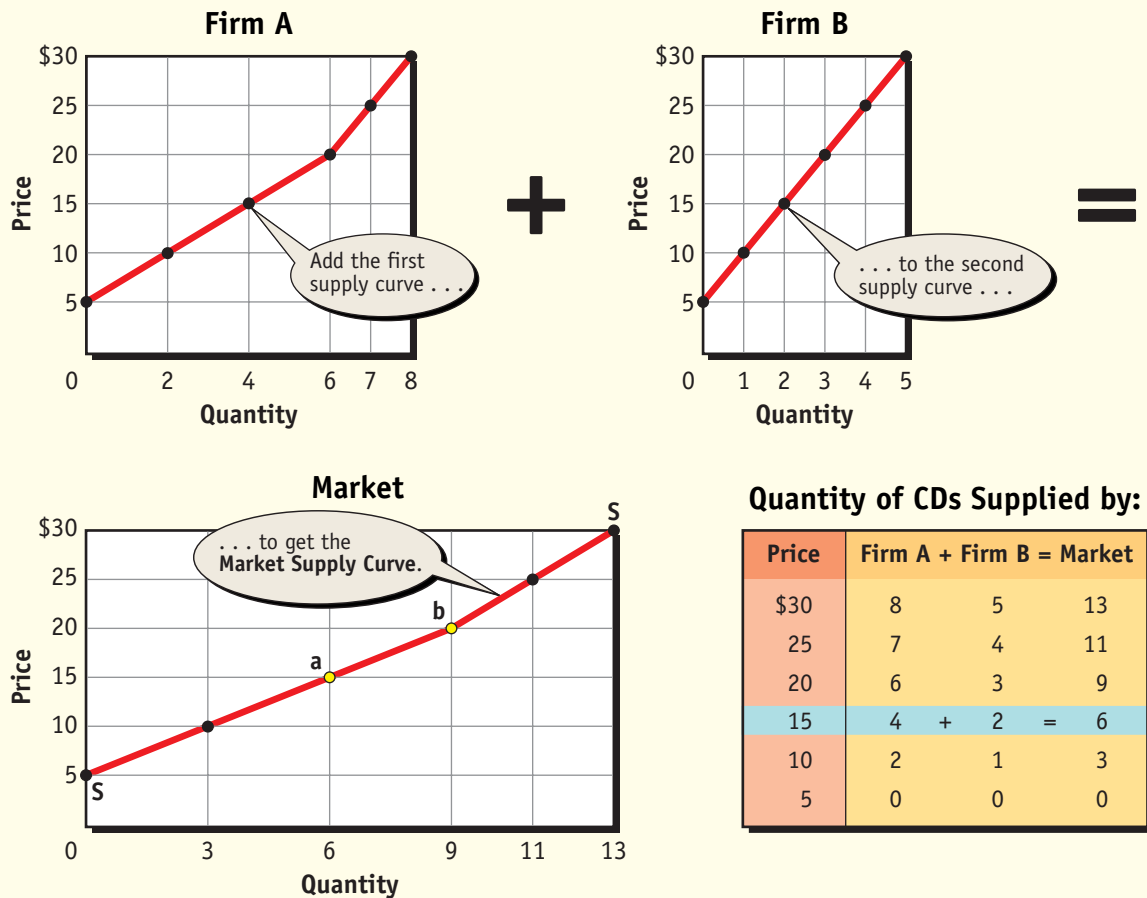
While the supply schedule and curve in the figure represent a single, hypothetical producer of compact digital discs, we should realize that supply is a very general concept. In fact, you are a supplier when you look for a job and offer your services for sale. Your economic product is your labor, and you would probably be willing to supply more labor for a high wage than for a low one.

## The Market Supply Curve

The supply schedule and curve in **Figure 5.1** show the information for a single firm. Frequently, however, we are more interested in the **market supply curve**, the supply curve that shows the quantities offered at various prices by all firms that offer the product for sale in a given market.


To obtain the data for the market supply curve, add the number of CDs that individual firms would produce at each and every price, and then plot them on a separate graph. In **Figure 5.2**, point **a** on the market supply curve represents six CDs—four from the first firm and two from the second—that are offered for sale at a price of \$15. Correspondingly, point **b** on the curve represents a total of nine CDs offered for sale at a price of \$20.

### Individual and Market Supply Curves



**Using Graphs** The market supply curve, SS, is the sum of all individual supply curves in the market. **Why are the supply curves upward sloping?**

### Change in Quantity Supplied

 The **quantity supplied** is the amount that producers bring to market at any given price. A **change in quantity supplied** is the change in amount offered for sale in response to a change in price. In **Figure 5.1**, for example, four CDs are supplied when the price is \$15. If the price increases to \$20, six CDs are supplied. If the price then changes to \$25, seven units are supplied.

These changes illustrate a change in the quantity supplied which—like the case of demand—shows as a movement along the supply curve. Note that the change in quantity supplied can be an *increase* or a *decrease*, depending on whether more or less of a product is offered. For example, the movement from **a** to **b** in **Figure 5.1** shows an increase because the number of products offered for sale goes from four to six when the price goes up.


## Supply



**The Effect of Price** A delicatessen offers different kinds of cheeses at various prices. **How does the price of a product affect the quantity offered for sale?**

In a competitive economy, producers usually react to changing prices in just this way. While the interaction of supply and demand usually determines the final price for the product, the producer has the freedom to adjust production. Take oil as an example. If the price of oil falls, the producer may offer less for sale, or even leave the market altogether if the price goes too low. If the price rises, the oil producer may offer more units for sale to take advantage of the better prices.

## Change in Supply

 Sometimes something happens to cause a **change in supply**, a situation where suppliers offer different amounts of products for sale at all possible prices in the market. For example, the supply schedule in **Figure 5.3** shows that producers are now willing to offer more CDs for sale at every

price than before. Where 6 units were offered at a price of \$15, now there are 13. Where 11 were offered at a price of \$25, 18 are now offered, and so on for every price shown in the schedule.

When both old and new quantities supplied are plotted in the form of a graph, it appears as if the supply curve has shifted to the right, showing an *increase in supply*. For a *decrease in supply* to occur, less would be offered for sale at each and every price, and the supply curve would shift to the left.

Changes in supply, whether increases or decreases, can occur for several reasons. As you read, keep in mind that all but the last reason—the number of sellers—affects both the individual and the market supply curves.

## Cost of Inputs

A change in the cost of inputs can cause a change in supply. Supply might increase because of a decrease in the cost of inputs, such as labor or packaging. If the price of the inputs drops, producers are willing to produce more of a product at each and every price, thereby shifting the supply curve to the right.

An increase in the cost of inputs has the opposite effect. If labor or other costs rise, producers would not be willing to produce as many units at each and every price. Instead, they would offer fewer products for sale, and the supply curve would shift to the left.

## Productivity

When management motivates its workers, or if workers decide to work more efficiently, productivity should increase. The result is that more CDs are produced at every price, which shifts the supply

## Did you know?

**Economic Efficiency** In 1814 Francis Lowell combined all the stages of textile production—spinning, weaving, bleaching, dyeing, and printing—under one roof. His efficient mill launched the nation's Industrial Revolution, changing the system of manufacturing from the home to the factory.



curve to the right. On the other hand, if workers are unmotivated, untrained, or unhappy, productivity could decrease. The supply curve shifts to the left because fewer goods are brought to the market at every possible price.

## Technology

New technology tends to shift the supply curve to the right. The introduction of a new machine, chemical, or industrial process can affect supply by lowering the cost of production or by increasing productivity. For example, improvements in the fuel efficiency of aircraft engines have lowered the cost of providing passenger air service. When production costs go down, the producer is usually able to produce more goods and services at each and every price in the market.

New technologies do not always work as expected, of course. Equipment can break down, or the technology—or even replacement parts—might be difficult to obtain. This would shift the supply curve to the left. These examples are exceptions, however. New technology far more often increases supply.

## Taxes and Subsidies

Firms view taxes as costs. If the producer's inventory is taxed or if fees are paid to receive a license to produce, the cost of production goes up. This causes the supply curve to shift to the left. Or, if taxes go down production costs go down, supply then increases and the supply curve shifts to the right.

A **subsidy** is a government payment to an individual, business, or other group to encourage or protect a certain type of economic activity. Subsidies lower the cost of production, encouraging current producers to remain in the market and new

producers to enter. When subsidies are repealed, costs go up, producers leave the market, and the supply curve shifts to the left.

Historically, many farmers in the milk, corn, wheat, and soybean industries received substantial subsidies to support their income. While many farmers would have gone out of business without these subsidies, the fact that they were paid ensured their ability to remain operational, and the market supply curve shifted to the right.

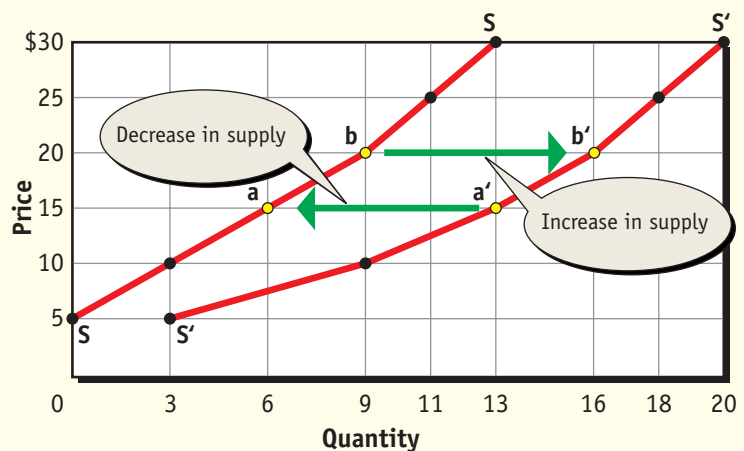
## ECONOMICS AT A GLANCE

Figure 5.3

### A Change in Supply

#### Quantity Supplied

Price	Old (SS)	New (S'S')
\$30	13	20
25	11	18
20	9	16
15	6	13
10	3	9
5	0	3



**Using Tables and Graphs** A change in supply means that a different quantity is supplied at every price. **What does a shift of the supply curve to the right show?**

## Expectations

Expectations about the future price of a product can also affect the supply curve. If producers think the price of their product will go up, they may withhold some of the supply. This causes supply to decrease and the supply curve to shift to the left. On the other hand, producers may expect lower prices for their output in the future. In this situation, they may try to produce and sell as much as possible right away, causing the supply curve to shift to the right.

## Government Regulations

When the government establishes new regulations, the cost of production can be affected, causing a change in supply. For example, when the

government mandates new auto safety features such as air bags or emission controls, cars cost more to produce. Producers adjust to the higher production costs by producing fewer cars at each and every price in the market.

In general, increased—or tighter—government regulations restrict supply, causing the supply curve to shift to the left. Relaxed regulations allow producers to lower the cost of production, which results in a shift of the supply curve to the right.


## Number of Sellers

All of the factors you just read about can cause a change in an individual firm's supply curve and, consequently, the market supply curve. It follows, therefore, that a change in the number of suppliers causes the market supply curve to shift to the right or left.

As more firms enter an industry, the supply curve shifts to the right. In other words, the larger the number of suppliers, the greater the market supply. If some suppliers leave the market, fewer products are offered for sale at all possible prices. This causes supply to decrease, shifting the curve to the left.

In the real world, sellers are entering the market and leaving the market all the time. Some economic analysts believe that, at least initially, the development of the Internet will result in larger numbers entering the market than in leaving. They point out that almost anyone with Internet experience and a few thousand dollars can open up his or her own Internet store. Because of the ease of entry into these new markets, being a seller is no longer just for the big firms.

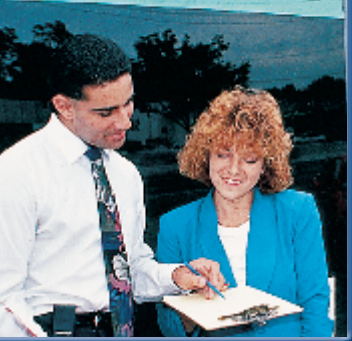
## Elasticity of Supply

 Just as demand has elasticity, there is elasticity of supply. **Supply elasticity** is a measure of the way in which quantity supplied responds to a change in price. If a small increase in price leads to a relatively larger increase in output, supply is elastic. If the quantity supplied changes very little, supply is inelastic.

What is the difference between supply elasticity and demand elasticity? Actually, there is very little difference. If quantities are being purchased, the

## Careers

FOR LEASE



### Real Estate Agent

Real estate agents assist in renting, selling, and buying property for clients. In return, they receive a percentage of the rent or sale prices of the property.

#### The Work

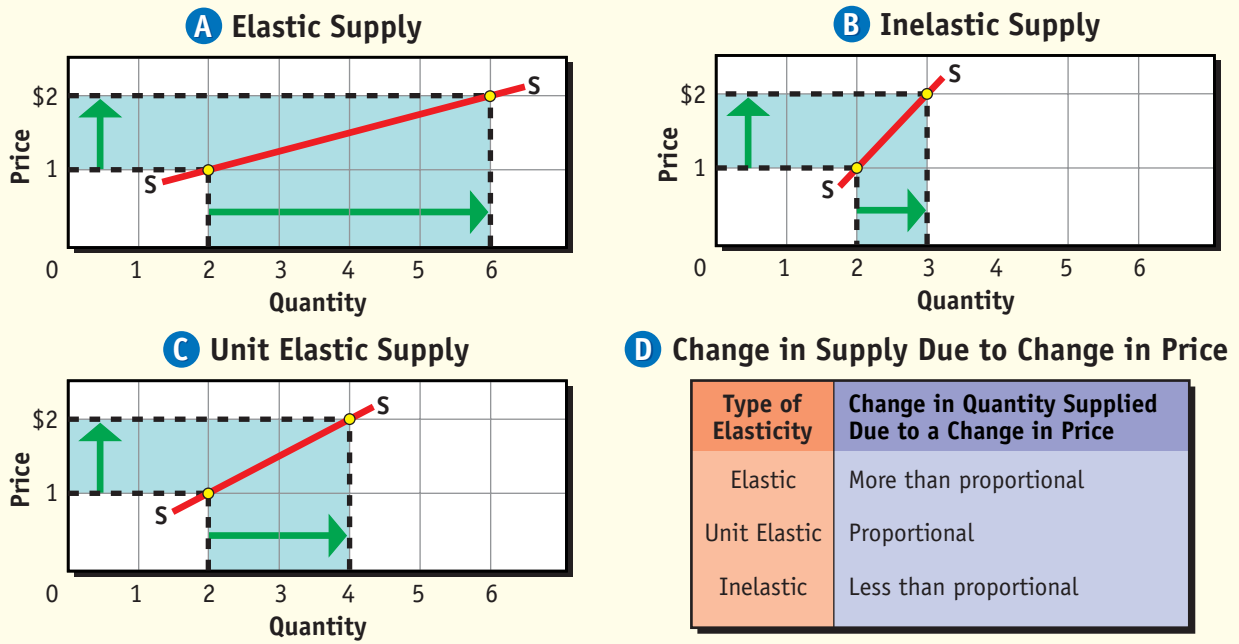
Responsibilities include obtaining listings—owner agreements to place properties for rent or sale—advertising the property, and

showing the property to prospective renters and buyers. Agents need to be familiar with fair-market values, zoning laws, local land-use laws, housing and building codes, insurance coverage, mortgage and interest rates, and credit and loan policies. They may also need to know about leasing practices, business trends, location needs, transportation, utilities, and labor supply. Agents often work evenings and weekends because they must accommodate their schedule to that of the client.

#### Qualifications

Agents should have a high school education at the minimum and possess a real estate license.

## Supply Elasticity



**Using Graphs** The elasticity of supply, like the elasticity of demand, is a measure of responsiveness. The key to elasticity is the way the dependent variable (quantity supplied) changes in response to a change in the independent variable (price). **What determines whether a business's supply curve is elastic or inelastic?**

concept is demand elasticity. If quantities are being brought to market for sale, the concept is supply elasticity. Keep in mind that elasticity is simply a measure of the way quantity adjusts to a change in price.

### Three Elasticities

Examples of supply elasticity are illustrated in **Figure 5.4**. The supply curve in **Panel A** is elastic because the change in price causes a relatively larger change in quantity supplied. Doubling the price from \$1 to \$2 causes the quantity brought to market to triple.

**Panel B** shows an inelastic supply curve. A change in price causes a relatively smaller change in quantity supplied. When the price is doubled

from \$1 to \$2, the quantity brought to market goes up only 50 percent, or from two units to three units.

**Panel C** shows a unit elastic supply curve. A change in price causes a proportional change in the quantity supplied. The price doubles from \$1 to \$2, which causes the quantity brought to market also to double.

### Determinants of Supply Elasticity

The elasticity of a business's supply curve depends on the nature of its production. If a firm can adjust to new prices quickly, then supply is likely to be elastic. If the nature of production is such that adjustments take longer, then supply is likely to be inelastic.



## Supply and Demand



**Elasticity** Business owners need to be aware of the relationship between supply and demand. *What is the difference between supply elasticity and demand elasticity?*

The supply curve for shale oil, for example, is likely to be inelastic in the short run. No matter what price is being offered, companies will find it difficult to increase output because of the huge amount of capital and technology needed before production can be increased very much.

However, the supply curve is likely to be elastic for kites, candy, and other products that can be made quickly without huge amounts of capital and skilled labor. If consumers are willing to pay twice the price for any of these products, most producers will be able to gear up quickly to significantly increase production.

The elasticity of supply is different from the elasticity of demand in several important respects. First, the number of substitutes has no bearing on the elasticity of supply. In addition, considerations such as the ability to delay the purchase or the portion of income consumed have no relevance to supply elasticity even though they are essential for demand elasticity. Instead, only production considerations determine supply elasticity. If a firm can react quickly to higher or lower prices, then supply is likely to be elastic. If the firm takes longer to react to a change in prices, then supply is likely to be inelastic. For these reasons, there is no supply elasticity table equivalent to **Figure 4.6** on page 106.

### Section 1 Assessment

#### Checking for Understanding

- 1. Main Idea** Using your notes from the graphic organizer activity on page 113, describe how supply is different from demand.
- 2. Key Terms** Define supply, Law of Supply, supply schedule, supply curve, market supply curve, quantity supplied, change in quantity supplied, change in supply, subsidy, supply elasticity.
- 3. Describe** the difference between the supply schedule and the supply curve.
- 4. Describe** how market supply curves are obtained.

- 5. List** the factors that can cause a change in supply.

#### Applying Economic Concepts

- 6. Supply** Provide an example of an economic good whose producer would increase the quantity supplied if the price were to go up.

#### Critical Thinking

- 7. Understanding Cause and Effect** According to the Law of Supply, how does price affect the quantity offered for sale?



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# Profiles IN Economics

## Enterprising Entrepreneurs

There have been literally millions of American entrepreneurs. A few, however, are noteworthy for taking modest business dreams to stunning heights. Three of the most impressive are Richard Sears, Milton Hershey, and John Johnson.

### RICHARD SEARS

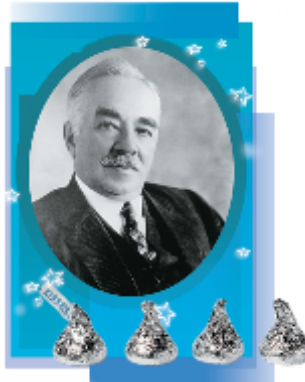
In 1886, 23-year-old Richard Sears was a railway station agent in North Redwood, Minnesota. Sears had free time on his hands, so he decided to make a little money on the side. He bought a surplus shipment of watches and started selling them to other station agents.

Encouraged by his profits, Sears

moved to Chicago, where he partnered with Alvah C. Roebuck, who could repair watches. They founded Sears, Roebuck and Company in

1893, and published their first catalog a year later. Rural residents, who could “Shop at Sears and Save” by avoiding middlemen, loved the catalog, and the company prospered. Within a decade,

Sears was the largest mail-order firm in the world. In 1925, Sears opened its first retail store. Today, Sears, Roebuck and Company is one of the largest retail businesses in the world, employing more than 300,000 people.



### MILTON HERSHEY

Milton Hershey started as a poor farm boy, and received little education. He failed as a candy seller in Philadelphia, Denver, New York, Chicago, and New Orleans. At 30, he was flat broke and shunned by his family. But one more try at the candy business—this time making a caramel candy of his own recipe—made him a success. In fact, his “Hershey’s Crystal A” made him a millionaire. In 1895, Hershey sold his caramel company and went into the chocolate business. In just a few years, the name Hershey became synonymous with chocolate. It still is, due to the dogged persistence of a man who failed for decades before he succeeded.

### JOHN JOHNSON

In 1942, John Johnson set off to publish a magazine called *Negro*

*Digest*. Most white magazine sellers, doubting that there was a sufficient African American readership, refused to carry it. So Johnson convinced hundreds of acquaintances to ask for the magazine at newsstands, and then to buy all the copies once they came in. Circulation soared. Johnson then persuaded the first lady, Eleanor Roosevelt, to write a piece called “If I Were a Negro” for the magazine. The publicity tripled circulation.

Johnson followed this success in 1945 by founding *Ebony*, a magazine aimed at African American veterans of World War II. The magazine proved even more popular than his first. A third magazine, *Jet*, was produced, and whereas there had been no national magazines for African Americans before, there were now three. And they were all a result of the hard work of just one enterprising entrepreneur.



### Examining the Profile

- 1. Making Generalizations** Explain how persistence played a role in the success of each of these men.
- 2. For Further Research** Find out the etymology of *entrepreneur* and explain why the word is used as it is today.

# The Theory of Production

## Study Guide

### Main Idea

A change in the variable input called labor results in a change in production.

### Reading Strategy

**Graphic Organizer** As you read about production, complete a graphic organizer similar to the one below by listing what occurs during the three stages of production.

Stage I	Stage II	Stage III

### Key Terms

theory of production, short run, long run, Law of Variable Proportions, production function, raw materials, total product, marginal product, stages of production, diminishing returns

### Objectives

After studying this section, you will be able to:

1. **Explain** the theory of production.
2. **Describe** the three stages of production.

### Applying Economic Concepts

**Diminishing Returns** Has the quality of your work ever declined because you worked too hard at something? Sometimes you reach a stage where you still make progress but at a diminished rate.

## Cover Story

### The Effects Are Getting Less Special All the Time

When George Lucas declares that digital effects are a technological advance as profound as the advent of sound and color, he is exactly right. . . .

But is the revolution already over?

Mixed reaction to his new movie, *Star Wars Episode I: The Phantom Menace*, suggest that it may be, in the same way that revolutions ushered in by color and sound were profound but brief affairs. . . . after all,

**New technology is altering moviemaking.**

none of us is amazed when we go to the movies and hear an actor speak. Nor are we amazed when we go to the movies and see color images.


What this creates, for effects-driven movies, is a scale of diminishing returns. The more Lucas achieves in the digital arena, the smarter we become, the harder we are to impress. . . .

—Philadelphia Daily News, May 21, 1999

**W**hether they are film producers of multi-million-dollar epics or small firms that market a single product, suppliers face a difficult task. Producing an economic good or service requires a combination of land, labor, capital, and entrepreneurs. The **theory of production** deals with the relationship between the factors of production and the output of goods and services.

The theory of production generally is based on the **short run**, a period of production that allows producers to change only the amount of the variable input called labor. This contrasts with the **long run**, a period of production long enough for producers to adjust the quantities of all their resources, including capital. For example, Ford Motors hiring 300 extra workers for one of its plants is a short-run adjustment. If Ford builds a new factory, this is a long-run adjustment.

## Law of Variable Proportions

 The **Law of Variable Proportions** states that, in the short run, output will change as one input is varied while the others are held constant. Although the name of the law is probably new to you, the concept is not.




For example, if you are preparing a meal, you know that a little bit of salt will make the food taste better. A bit more may make it tastier still. Yet, at some point, too much salt will ruin the meal. As the amount of the input—salt—varies, so does the output—the quality of the meal.

The Law of Variable Proportions deals with the relationship between the input of productive resources and the output of final products. The law helps answer the question: How is the output of the final product affected as more units of one variable input or resource are added to a fixed amount of other resources?

A farmer, for example, may have all the land, machines, workers, and other items needed to produce a crop. However, the farmer, may have some questions about the use of fertilizer. How will the crop yield be affected if different amounts of fertilizer are added to fixed amounts of the other inputs? In this case, the variable input is the fertilizer added per acre.

Of course, it is possible to vary all the inputs at the same time. The farmer may want to know what will happen to output if the fertilizer and other factors of production are varied. Economists do not like to do this, however, because when more than one factor of production is varied, it becomes harder to gauge the impact of a single variable on total output.

## The Production Function

 The Law of Variable Proportions can be illustrated by using a **production function**—a concept that describes the relationship between changes in output to different amounts of a single input while other inputs are held constant. The production function can be illustrated with a schedule, such as the one in **Panel A** of **Figure 5.5**, or with a graph like the one in **Panel B**.

The production schedule in the figure lists hypothetical output as


the number of workers is varied from zero to 12. With no workers, for example, there is no output. If the number of workers increases by one, output rises to seven. Add yet another worker and total output rises to 20. This information is used to construct the production function that appears as the graph in **Panel B**, where the variable input is shown on the horizontal axis with total production on the vertical axis.

In this example, only the number of workers changes. No changes occur in the amount of machinery used, the level of technology, or the quantities of **raw materials**—unprocessed natural products used in production. Under these conditions, any change in output must be the result of the variation in the number of workers.

## Total Product

The second column in the production schedule in **Figure 5.5** shows **total product**, or total output produced by the firm. The numbers indicate that the plant barely operates when it has only one or two workers. As a result, some resources stand idle much of the time.

**The Production Function**



**Inputs and Outputs** All businesses must deal with the questions that surround the production relationship. *Why is the use of the production function important in business?*

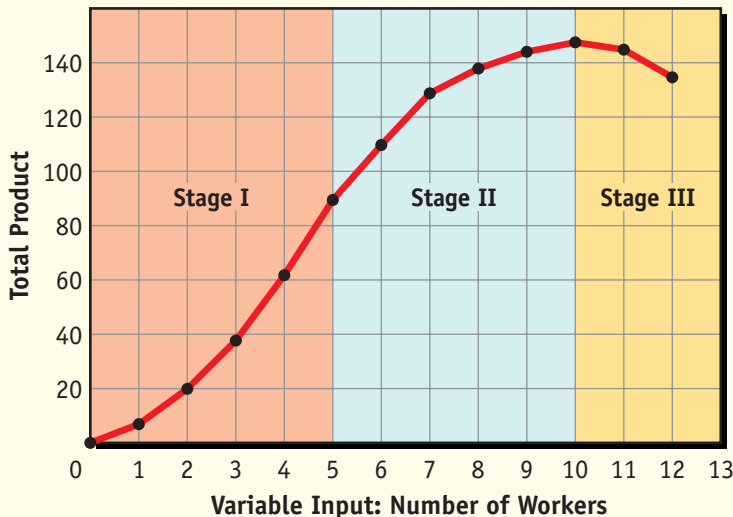
## The Law of Variable Proportions

### A The Production Schedule

Number of Workers	Total Product	Marginal Product*	Regions of Production
0	0	0	Stage I
1	7	7	
2	20	13	
3	38	18	
4	62	24	
5	90	28	Stage II
6	110	20	
7	129	19	
8	138	9	
9	144	6	
10	148	4	Stage III
11	145	-3	
12	135	-10	

\*All figures in terms of output per day

### B The Production Function



**Synthesizing Information** The law can be shown as the production schedule in A, or as the production function shown in B. **How are the three stages of production defined?**

### Total Product Rises

As more workers are added, however, total product rises. More workers can operate more machinery, and plant output rises. Additional workers also means that the workers can specialize. For example, one group runs the machines, another handles maintenance, and a third group assembles the products. By working in this way—as a coordinated whole—the firm can be more productive.

### Total Product Slows

As even more workers are added output continues to rise, but it does so at a slower rate until it can grow no further. Finally, the addition of the eleventh and twelfth workers causes total output to go down because these workers just get in the way of the others. Although the ideal number of workers cannot be determined until costs are considered, it is clear that the eleventh and twelfth workers will not be hired.

### Marginal Product

The measure of output shown in the third column of the production schedule in **Figure 5.5** is an important concept in economics. The measure is known as **marginal product**, the extra output or change in total product caused by the addition of one more unit of variable input.

As we can see in the figure, the marginal product, or extra output of the first worker, is seven. Likewise, the marginal product of the second worker—which is equal to the change in total product—is 13. Together, both workers account for 20 units of total product.

## Three Stages of Production



When it comes to determining the optimal number of variable units to be used in production, changes in marginal product are of special interest. **Figure 5.5** shows the three **stages of production**—increasing returns, diminishing returns, and negative returns—that are based on the way marginal product changes as the variable input of labor is changed.

In Stage I, the first workers hired cannot work efficiently because there are too many resources per worker. As the number of workers increases, they make better use of their machinery and resources. This results in increasing returns (or increasing marginal products) for the first five workers hired.

As long as each new worker hired contributes more to total output than the worker before, total output rises at an increasingly faster rate. Because marginal output increases by a larger amount every time a new worker is added, Stage I is known as the stage of increasing returns. Companies, however, do not knowingly produce in Stage I for very long. As soon as a firm discovers that each new worker adds more output than the last, the firm is tempted to hire another worker.

In Stage II, the total production keeps growing, but by smaller and smaller amounts. Any additional workers hired may stock shelves, package parts, and do other jobs that leave the machine operators free to do their jobs. The rate of increase in total production, however, is now starting to slow down. Each additional worker, then, is making a diminishing, but still positive, contribution to total output.

Stage II illustrates the principle of **diminishing returns**, the stage where output increases at a diminishing rate as more units of a variable input are added. In **Figure 5.5**, Stage II begins when the sixth worker is hired, because the 20-unit marginal product of that worker is less than the 28-unit marginal product of the fifth worker.

The third stage of production begins when the eleventh worker is added. By this time, the firm has hired too many workers, and they are starting to get in each other's way. Marginal product becomes negative and total plant output decreases.

Most companies do not hire workers whose addition would cause total production to decrease. Therefore, the number of workers hired would be found only in Stage II. The exact number of workers hired depends on the cost of each worker. If the cost is low, the firm should hire at least six, but no more than 10, workers.

### Section 2 Assessment

#### Checking for Understanding

- 1. Main Idea** Using your notes from the graphic organizer activity on page 122, explain how production is affected by a change in inputs.
- 2. Key Terms** Define theory of production, short run, long run, Law of Variable Proportions, production function, raw materials, total product, marginal product, stages of production, diminishing returns.
- 3. Describe** the relationship on which the theory of production is based.
- 4. Explain** how marginal product changes in each of the three stages of production.
- 5. Identify** what point will eventually be reached if companies continue adding workers.

#### Applying Economic Concepts

- 6. Diminishing Returns** Provide an example of a time when you entered a period of diminishing returns or even negative returns. Explain why this might have occurred.

#### Critical Thinking

- 7. Sequencing Information** You need to hire workers for a project you are directing. You may add one worker at a time in a manner that will allow you to measure the added contribution of each worker. At what point will you stop hiring workers? Relate this process to the three stages of the production function.



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# BusinessWeek

APRIL 19, 1999

## Newsclip

*The price of the average desktop computer shrank by 17.3% in just one year. As prices continue to fall, computer makers are scrambling to find other ways to make a profit.*

## New Directions for PC Makers



Hardly a week goes by that some wild-eyed startup doesn't announce a scheme to give away personal computers—as if the PC were some throwaway rather than the machine that ushered in the Information Age. On March 31, following in the footsteps of Free-PC, NuAction, and DirectWeb, New York-based Gobi

said it would hand out free PCs to consumers who sign up for three years of Internet service. Meanwhile, emachines Inc. keeps cranking out PCs priced as low as \$399, and startup Microworkz Computer Corp. says it will soon sell them for \$299. . . .

. . . Two years of free-falling prices are squeezing the life out of margins, threatening to leave PC makers gasping for profits. . . . Analysts

expect prices to plummet nearly 15% [in one year], capping industrywide sales growth at less than 5%. . . .

Suddenly, PC makers are heading off in surprising new directions. Dell and Compaq are developing E-commerce businesses—whether it's collecting monthly Internet service fees or becoming online sellers of everything from printers to carrying cases. . . .

Other PC makers think new gizmos are the answer. Compaq and Packard Bell NEC Inc. are preparing non-PC products such as cell phones and newfangled devices that act as Web-access machines. . . .

Ultimately, these launches into cyberspace could morph into sweeping new business models in which PC companies make money not on their hardware but on the services they can bundle with their boxes. Already, Gateway and Compaq get a share of monthly revenues from Internet service providers featured on their machines. And the more subscribers they sign up, the more advertisers will pay to get their ads to these potential shoppers.

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### Examining the Newsclip

- 1. Understanding Cause and Effect** Why are companies moving away from producing PCs?
- 2. Making Generalizations** What are some companies doing in order to stay competitive in the computer industry?

# Cost, Revenue, and Profit Maximization

## Study Guide

### Main Idea

Profit is maximized when the marginal costs of production equal the marginal revenue from sales.

### Reading Strategy

**Graphic Organizer** As you read the section, complete a graphic organizer similar to the one below by explaining how total revenue differs from marginal revenue. Then provide an example of each.

Total revenue is:

Example:

Marginal revenue is:

Example:

### Key Terms

fixed cost, overhead, variable cost, total cost, marginal cost, e-commerce, total revenue, marginal revenue, marginal analysis, break-even point, profit-maximizing quantity of output

### Objectives

After studying this section, you will be able to:

1. **Define** four key measures of cost.
2. **Identify** two key measures of revenue.
3. **Apply** incremental analysis to business decisions.

### Applying Economic Concepts

**Overhead** Overhead is one type of fixed cost that we try to avoid whenever we can. Read to see how overhead can even change the way people do business.

## Cover Story

### More Retailers Discover Net Auctions

Johnelle Lentner rarely made more than \$250 a month peddling benches, chests, pie safes and other collectibles from the space she rented in an Isanti, Minnesota-based antiques shop.

But last August, Lentner gave up brick-and-mortar retailing and took her business entirely online. Since ending the \$60-a-month lease with Isanti Antiques to sell over Internet auction site eBay, Lentner's monthly income has shot up 700%.

"You get the highest dollar amount for what you're trying to sell online, and there is no overhead. . . ."

—USA Today, May 17, 1999



Collectible available online

Johnelle Lentner talked about eliminating overhead for her business. Overhead is one of many different measures of costs.

## Measures of Cost

Because the cost of inputs influences efficient production decisions, a business must analyze costs before making its decisions. To simplify decision making, cost is divided into several different categories.

The first category is **fixed cost**—the cost that a business incurs even if the plant is idle and output is zero. It makes no difference whether the business produces nothing, very little, or a large amount. Total fixed cost, or **overhead**, remains the same.

Fixed costs include salaries paid to executives, interest charges on bonds, rent payments on leased properties, and local and state property taxes. Fixed costs also include depreciation, the

## Production, Costs, and Revenues

Production Schedule				Costs				Revenues		Profit
Regions of Production	Number of Workers	Total Product	Marginal Product	Total Fixed Costs	Total Variable Costs	Total Costs	Marginal Costs	Total Revenue	Marginal Revenue	Total Profit
Stage I	0	0	0	\$50	\$0	\$50	--	\$0	--	-\$50
	1	7	7	50	90	140	\$13	105	\$15	-35
	2	20	13	50	180	230	6.92	300	15	70
	3	38	18	50	270	320	5.00	570	15	250
	4	62	24	50	360	410	3.75	930	15	520
Stage II	5	90	28	50	450	500	3.21	1,350	15	850
	6	110	20	50	540	590	4.50	1,650	15	1,060
	7	129	19	50	630	680	4.74	1,935	15	1,210
	8	138	9	50	720	770	10.00	2,070	15	1,300
	9	144	6	50	810	860	15.00	2,160	15	1,300
Stage III	10	148	4	50	900	950	22.50	2,220	15	1,270
	11	145	-3	50	990	1,040	--	2,175	15	1,135
	12	135	-10	50	1,080	1,130	--	2,025	15	895

**Using Tables** The concepts of marginal product, marginal cost, and marginal revenue are central to economic analysis. Marginal product is used to define the three stages of production. Marginal cost and marginal revenue are used to determine the profit-maximizing quantity of output. **How do total costs differ from marginal costs?**

gradual wear and tear on capital goods over time and through use. A machine, for example, will not last forever because its parts will wear out slowly and eventually break.

The nature of fixed costs is illustrated in the fourth column of the table in **Figure 5.6**, which is an extension of the production schedule in **Figure 5.5** on page 124. Note that, regardless of the level of total output, fixed costs amount to \$50.

Another kind of cost is **variable cost**, a cost that changes when the business rate of operation or output changes. While fixed costs generally are associated with machines and other capital goods, variable costs generally are associated with labor and raw materials. For example, wage-earning workers may be laid off or worked overtime as

output changes. Other examples of variable costs include electric power to run the machines and freight charges to ship the final product.

In **Figure 5.6** the only variable cost is labor. If one worker costs \$90 per day, the total variable cost for one worker is \$90. Two workers, or two units of variable input, cost \$180, and so on.

The **total cost** of production is the sum of the fixed and variable costs. Total cost takes into account all the costs a business faces in the course of its operations. The business represented in **Figure 5.6**, for example, might employ six workers—costing \$90 each for a total of \$540—to produce 110 units of total output. If no other variable costs existed, and if fixed costs amounted to \$50, the total cost of production would be \$590.



## CYBERNOMICS SPOTLIGHT


### Costs and Information Goods

Information goods, rather than industrial goods, are the key forces in many world markets. What are information goods? Essentially, they are anything that can be digitized—baseball scores, music, and stock quotes are all information goods. The cost structure of information goods is unusual. Production of information goods requires high fixed costs but low marginal costs. In other words, producing the first copy of an information good is costly, but the cost of reproducing additional copies is much less.

Another category of cost is **marginal cost**—the extra cost incurred when a business produces one additional unit of a product. Because fixed costs do not change from one level of production to another, marginal cost is the per-unit increase in variable costs that stems from using additional factors of production.

**Figure 5.6** shows that the addition of the first worker increased the total product by seven units. Because total variable costs increased by \$90, each of the additional seven units cost \$12.86, or \$90 divided by seven. If another worker is added, 13 more units of output will be produced for an additional cost of \$90. The marginal, or extra, cost of each unit of output is \$90 divided by 13, or \$6.92.

## Applying Cost Principles

 The cost and combination, or mix, of inputs affects the way businesses produce. The following examples illustrate the importance of costs to business firms.

### Self-Service Gas Station

Consider the case of a self-serve gas station with many pumps and a single attendant who works in an enclosed booth. This operation is likely to have large fixed costs, such as the cost of the lot, the

pumps and tanks, and the taxes and licensing fees paid to state and local governments.

The variable costs, on the other hand, are relatively small. The station's variable costs include the hourly wage paid to the employee, the cost of electricity for lights and pumps, and the cost of the gas sold. When all costs are included, however, the ratio of variable to fixed costs is low.

As a result, the owner may operate the station 24 hours a day, seven days a week for a relatively low cost. Even the extra cost of keeping the station open between the hours of midnight and 6:00 A.M. is minimal. As a result, the extra wages, the electricity, and other variable costs are minor and may be covered by the profits of the extra sales.

### Internet Stores

Stores are flocking to the Internet, making it one of the fastest-growing areas of business today, and for reasons largely related to cost. Specifically, many stores are using the Internet because the overhead, or the fixed cost of operation, is so low.

An individual engaged in **e-commerce**—electronic business or exchange conducted over the Internet—does not need to spend large sums of money to rent a building and stock it with inventory. Instead, for just a fraction of the cost of a store, the e-commerce business owner can purchase Web access along with an e-commerce software package

## STANDARD & POOR'S

## INFOBYTE

**Measures of Cost** Variable costs represent expenses a corporation incurs that change with that company's level of business activity. Fixed costs represent expenses a corporation incurs that remain relatively stable despite a change in the level of that company's business activity. Expense items which generally remain fixed for any given reporting period include rent, depreciation, property tax, and executive salaries.



## MASTER MARKETER

Kathryn Leary helps entrepreneurs enter new markets. Among the services Leary offers are establishing contacts and coordinating trade missions.

After viewing the proverbial glass ceiling firsthand at a majority of firms, Leary, 47, felt it was time to venture off on her own.

“Once I realized the large companies had overseas offices, it became my goal to go abroad,” Leary says. “But this was denied me. I started my company to help Americans market in other countries.”

To prepare for doing business in Japan, Leary took language classes to master basic greetings and common phrases, studied the culture at the Asia Society in New York, subscribed to the international edition of the *Japan Times* and other magazines and newsletters and read books on Japanese business customs. . . .

—*Black Enterprise*, August 1999


### Critical Thinking

1. **Finding the Main Idea** Why did Leary start her own company?
2. **Analyzing Information** What services does Leary’s company provide? Why do you think her service is useful?

that provides everything from Web catalog pages to ordering, billing, and accounting software. The e-commerce business owner inserts pictures and descriptions of the products for sale into the software and loads the program.

When customers visit the “store” on the Web, they see what appears to be a full range of merchandise for sale. In some cases, the owner has the goods in stock, as with Johnelle Lentner’s antique auction site. In other cases, the store takes the orders and forwards them to the manufacturer or to specialty warehouses that handle the shipping.

## Measures of Revenue

 Businesses use two key measures of revenue to find the amount of output that will produce the greatest profits. The first is total revenue, and the second is marginal revenue.


The **total revenue** is the number of units sold multiplied by the average price per unit. If 7 units are sold at \$15 each, the total revenue is \$105, as shown in the total revenue column in **Figure 5.6**. The second, and more important, measure of revenue is **marginal revenue**, the extra revenue associated with the production and sale of one additional unit of output.

The marginal revenues in **Figure 5.6** are determined by dividing the change in total revenue by the marginal product. When a business has no workers, it produces no output, and it receives no revenue. When it adds the first worker, total output jumps to 7 units, and \$105 of total revenue is generated. Because the \$105 is earned from the sale of 7 units of output, each unit must have added \$15. Therefore, the marginal, or extra, revenue each unit of output brings in is \$15.

Keep in mind that whenever an additional worker is added, the marginal revenue computation remains the same. If the business employs five workers, it produces 90 units of output and generates \$1,350 of total revenue. If a sixth worker is added, output increases by 20 units, and total revenues increase to \$1,650. To have increased total revenue by \$300, each of the 20 additional units of output must have added \$15.

If each unit of output sells for \$15, the marginal or extra revenue earned by the sale of one more unit is \$15. For this reason, the marginal revenue appears to be constant at \$15 for every level of output. While marginal revenue is constant in **Figure 5.6**, this will not always be the case. Businesses often find that marginal revenues start high and then decrease as more and more units are produced and sold.

## Marginal Analysis

 Economists use **marginal analysis**, a type of cost-benefit decision making that compares the extra benefits to the extra costs of an action. Marginal analysis is helpful in a number of situations, including break-even analysis and profit maximization. In each case the process involves comparing the costs and benefits of decisions that are made in small, incremental steps.

The **break-even point** is the total output or total product the business needs to sell in order to cover its total costs. In **Figure 5.6**, the break-even point is between 7 and 20 units of total product, so at least two workers would have to be hired to break even.

A business wants to do more than break even, however. It wants to make as much profit as it can. We know that the business represented in **Figure 5.6** will break even when it hires the second worker. But, how many workers and what level of output are needed to generate the maximum profits?

The owners of the business can decide by comparing marginal costs and marginal revenues. The business would probably hire the sixth worker, for example, because the extra output would only cost \$4.50 to produce, and would generate \$15 in revenues. In general, as long as the marginal cost is less than the marginal revenue, the business will keep hiring workers.

Having made a profit with the sixth worker, the business probably would hire the seventh and eighth workers. If it hired the ninth worker, however, the cost of the additional output would equal the additional revenue earned when the product was sold. The addition of the ninth worker neither adds to nor takes away from total profits—so the firm would have little incentive to hire the tenth worker. If it did, it would quickly discover that profits would go down, and it would go back to using nine workers.

When marginal cost is less than marginal revenue, more variable inputs should be hired to expand output. The **profit-maximizing quantity of output** is reached when marginal cost and marginal revenue are equal. In **Figure 5.6**, profits are maximized when the ninth worker is hired. Other combinations may generate equal profits, but no other combination will be more profitable.

**CLICK HERE**



**Student Web Activity** Visit the *Economics: Principles and Practices* Web site at [www.glencoe.com](http://www.glencoe.com) and click on **Chapter 5—Student Web Activities** for an activity on the operation of a company.

### Section 3 Assessment

#### Checking for Understanding

- 1. Main Idea** Using your notes from the graphic organizer activity on page 127, describe how cost affects total revenue.
- 2. Key Terms** Define fixed cost, overhead, variable cost, total cost, marginal cost, e-commerce, total revenue, marginal revenue, marginal analysis, break-even point, profit-maximizing quantity of output.
- 3. List** the four measures of cost.
- 4. Describe** the two measures of revenue.
- 5. Explain** the use of marginal analysis for break-even and profit-maximizing decisions.

#### Applying Economic Concepts

- 6. Overhead** How might overhead affect the price of a new car?

#### Critical Thinking

- 7. Understanding Cause and Effect** Many oil-processing plants operate 24 hours a day, using several shifts of workers to maintain operations. How do you think a plant's fixed and variable costs affect its decision to operate around the clock?



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# STUDY AND WRITING

## Skill

### Outlining

Outlining may be used as a starting point for a writer. The writer begins with the rough shape of the material and gradually fills in the details in a logical manner. You may also use outlining as a method of note taking and organizing information as you read.

#### Learning the Skill

There are two types of outlines—formal and informal. Making an informal outline is similar to taking notes—you write words and phrases needed to remember main ideas. A formal outline has a standard format. Follow these steps to formally outline material.

- Read the text to identify the main ideas. Label these with Roman numerals.
- Write subtopics under each main idea. Label these ideas with capital letters.
- Write supporting details for each subtopic. Label these with Arabic numerals.
- Each level should have at least two entries and should be indented from the level above.
- All entries use the same grammatical form, whether phrases or complete sentences.



Production on the assembly line

I. An Introduction to Supply
A. The Supply Schedule
1.
2. Prices and quantities move in same direction.
B. The Individual Supply Curve
1.
2.
C. The Market Supply Curve
1.
2.
D.
1.
2.
II. Change in Supply
A.
B. Productivity
C.
D.
E. Expectations
F.
G.

#### Practicing the Skill

On a separate sheet of paper, copy the following outline of the main ideas in the first part of Section 1 of Chapter 5. Then use your textbook to fill in the missing subtopics and details.

#### Application Activity

Following the guidelines above, prepare an outline for Section 3 of Chapter 5.



Practice and assess key social studies skills with the *Glencoe Skillbuilder Interactive Workbook, Level 2*.

# Chapter 5 Summary

## Section 1

### What Is Supply? (pages 113–120)

- **Supply** is the quantities of output that producers will bring to market at each and every price. Supply can be represented in a **supply schedule**, or graphically as a **supply curve**.
- The **Law of Supply** states that the quantities of an economic product offered for sale vary directly with its price. If prices are high, suppliers will offer greater quantities for sale. If prices are low, they will offer smaller quantities for sale.
- The **market supply curve** is the sum of the individual supply curves.
- A **change in quantity supplied** is represented by a movement along the supply curve.
- A **change in supply** is a change in the quantity that will be supplied at each and every price. An increase in supply is presented graphically as a shift of the supply curve to the right, and a decrease in supply appears as a shift of the supply curve to the left.
- Changes in supply can be caused by a change in the cost of inputs, productivity, new technology, taxes, **subsidies**, expectations, government regulations, and number of sellers.
- **Supply elasticity** describes how a change in quantity supplied responds to a change in price.
- If supply is elastic, a given change in price will cause a more than proportional change in quantity supplied. If supply is inelastic, a given change in price will cause a less than proportional change in quantity supplied. If supply is unit elastic, a given change in price will cause a proportional change in quantity supplied.

## Section 2

### The Theory of Production (pages 122–125)

- The **theory of production** deals with the relationship between the factors of production and the output of goods and services.

- The theory of production deals with the **short run**, a production period so short that only the variable input (usually labor) can be changed. This contrasts to the **long run**, a production period long enough for all inputs—including capital—to vary.
- The **Law of Variable Proportions** states that the quantity of output will vary as increasing units of a single input are added. This law is presented graphically in the form of a **production function**.
- The two most important measures of output are **total product** and **marginal product**, the extra output gained from adding one additional unit of input.
- Three **stages of production**—increasing returns, **diminishing returns**, and negative returns—show how marginal product changes when additional variable inputs are added. Production takes place in Stage II under conditions of diminishing returns.



## Section 3

### Cost, Revenue, and Profit Maximization (pages 127–131)

- Four important measures of cost exist: **total cost**, which is the sum of **fixed cost** and **variable cost**, and **marginal cost**, which is the increase in total cost that stems from producing one additional unit of output.
- The mix of variable and fixed costs that a business faces affects the way the business operates.
- The key measure of revenue is **marginal revenue**, which is the change in total revenue when one more unit of output is sold.
- The **profit-maximizing quantity of output** occurs when marginal cost is exactly equal to **marginal revenue**. Other quantities of output may yield the same profit, but none yield more.

# Chapter 5 Assessment and Activities

## ECONOMICS Online



**Self-Check Quiz** Visit the *Economics: Principles and Practices* Web site at [epp.glencoe.com](http://epp.glencoe.com) and click on **Chapter 5—Self-Check Quizzes** to prepare for the chapter test.

**CLICK HERE**

### Identifying Key Terms

On a separate sheet of paper, write the letter of the key term that best matches each definition below.

- |                        |                        |
|------------------------|------------------------|
| a. depreciation        | g. production function |
| b. diminishing returns | h. profit-maximizing   |
| c. fixed cost          | i. total cost          |
| d. marginal analysis   | j. variable cost       |
| e. marginal product    | k. overhead            |
| f. marginal revenue    | l. total product       |

1. a production cost that does not change as total business output changes
2. decision making that compares the additional costs with the additional benefits of an action
3. associated with Stage II of production
4. a production cost that changes when output changes
5. a graphical representation of the theory of production
6. the additional output produced when one additional unit of input is added
7. change in total revenue from the sale of one additional unit of output
8. the gradual wearing out of capital goods
9. the sum of variable and fixed costs
10. when marginal revenue equals marginal cost
11. total output produced by a firm
12. total fixed costs

### Reviewing the Facts

#### Section 1 (pages 113–120)

1. **Describe** what is meant by supply.
2. **Distinguish** between the individual supply curve and the market supply curve.
3. **Explain** what is meant by a change in quantity supplied.
4. **Identify** the factors that cause a change in supply.

#### Section 2 (pages 122–125)

5. **Describe** the Law of Variable Proportions.
6. **Explain** the difference between total product and marginal product.
7. **Identify** the three stages of production.

#### Section 3 (pages 127–131)

8. **Describe** the relationship between marginal cost and total cost.
9. **Identify** four measures of cost.
10. **Describe** one practical application of cost principles.

### Thinking Critically

1. **Making Comparisons** Create a chart like the one below to help you explain how supply differs from demand.



2. **Making Generalizations** Why might production functions tend to differ from one firm to another?
3. **Understanding Cause and Effect** Explain why e-commerce reduces fixed costs.



## Applying Economic Concepts

- Supply** According to the Law of Supply, what will happen to the number of products a firm offers for sale when prices go down? What will happen to the cost of additional units of production when a firm starts having diminishing returns? What will happen to the number of products a firm will offer for sale if its cost of production increases while prices remain the same?
- Marginal Analysis** Give an example of a recent decision you made in which you used the tools of marginal analysis.

## Math Practice

Create a supply schedule and a supply graph that shows the following information: American auto-makers are willing to sell 200,000 cars per year when the price of a car is \$6,000. They are willing to sell 400,000 when the price is \$12,000, and 600,000 at a price of \$18,000.

## Thinking Like an Economist

Label the following actions according to their placement in the stages of production: (a) After many hours of studying, you are forgetting some of the material you learned earlier. (b) You are studying for a test and learning rapidly. (c) After a few hours, you are still learning but not as fast as before.

## Technology Skill

**Using a Database** For one week, record every service or job you perform for anyone else. Organize the services and the amount of time spent on each into two columns: Paid Work and Unpaid Work. Use this information to help you build an “employment” database.

- Define and name the fields in your database. The following can be used as examples:

Field Name	Field Type
Job/Service	Text
Employer's Name	Text
Employer's Phone	Number
Hourly Wage/Fee	Number
Hours Worked	Number

- Save the database.
- Change field size as needed so that all information in each field is visible.
- Use the speller, proofread, and preview the database. Save the database again.
- Print your database while in list view.

## Building Skills

**Outlining** On a separate sheet of paper, add supporting details to the outline of Section 2 below.

I. Law of Variable Proportions
A.
1.
2.
B.
1.
2.
II. The Production Function
A.
1.
2.
B.
1.
2.
III. Three Stages of Production
A.
B.
C.



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