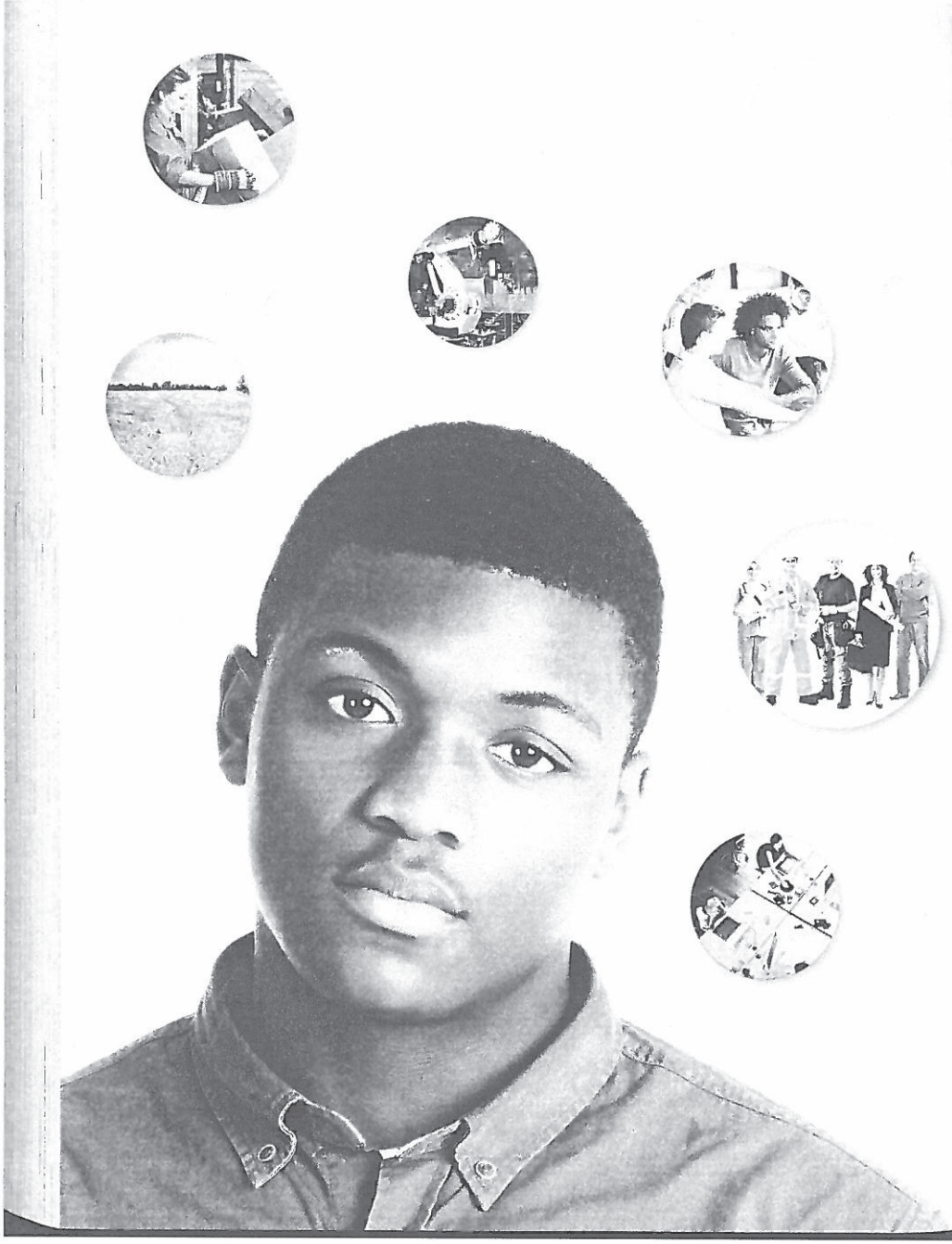


SECTION 13

Factor Markets and the Distribution of Income

THE VALUE OF A DEGREE

Yes, it does: in the modern economy, employers are willing to pay a premium for workers with more education. And the size of that premium has increased a lot over the last few decades. Back in 1973 workers with advanced degrees, such as law degrees or MBAs, earned only 76% more than those who had only graduated from high school. By 2011, the premium for an advanced degree had risen to over 225%.

Who decided that the wages of workers with advanced degrees would rise so much compared with those of high school grads? The answer, of course, is that nobody decided it. Wage rates are prices, the prices of different kinds of labor; and they are decided, like other prices, by supply and demand.

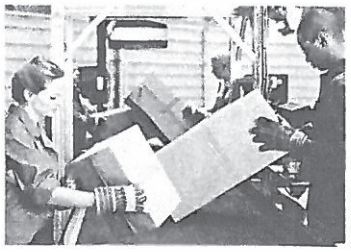
Still, there is a qualitative difference between the wage rate of high school grads and the price of used textbooks: the wage rate isn't the price of a *good*, it's the price of a *factor of production*. And although markets for factors of production are in many ways similar to those for goods, there are also some important differences.

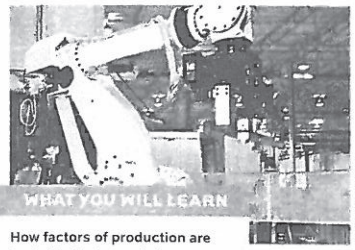
In this section, we examine *factor markets*, the markets in which the factors of production such as labor, land, and capital are traded. Factor markets, like markets for goods and services, play a crucial role in the economy: they allocate productive resources to producers and help ensure those resources are used efficiently.

This section begins by describing the major factors of production. Then we consider the demand for factors of production, which leads us to a crucial insight: the *marginal productivity theory of income distribution*. We then consider some challenges to the marginal productivity theory. The section concludes with a discussion of the supply of the most important factor, labor.

MODULE

40





WHAT YOU WILL LEARN

1. How factors of production are traded in factor markets
2. How factor markets determine the factor distribution of income
3. How the demand for a factor of production is determined

The Economy's Factors of Production

You may recall that we have already defined a factor of production in the context of the circular-flow diagram; it is any resource that is used by firms to produce goods and services, items that are consumed by households. The markets in which factors of production are bought and sold are called *factor markets*, and the prices in factor markets are known as *factor prices*.

What are these factors of production, and why do factor prices matter?

The Factors of Production

Economists divide factors of production into four principal classes. The first is *labor*, the work done by human beings. The second is *land*, which encompasses resources provided by nature. The third is *physical capital*—often referred to simply as "capital"—which consists of manufactured resources such as equipment, buildings, tools, and machines. The fourth and final factor of production is *human capital*, the improvement in labor created by education and knowledge, and embodied in the workforce.

Technological progress has boosted the importance of human capital and made technical sophistication essential to many jobs, thus helping to create the premium for workers with advanced degrees.

The demand for a factor is a derived demand. It results from (that is, it is derived from) the demand for the output being produced.

The factor distribution of income is the division of total income among land, labor, physical capital, and human capital.

Why Factor Prices Matter: The Allocation of Resources

The factor prices determined in factor markets play a vital role in the important process of allocating resources among firms.

Consider the example of Mississippi and Louisiana in the aftermath of Hurricane Katrina, the costliest hurricane ever to hit the U.S. mainland. The states had an urgent need for workers in the building trades—everything from excavation to roofing—to repair or replace damaged structures.

What ensured that those needed workers actually came? The factor market: the high demand for workers drove up wages. During 2005, the average U.S. wage grew at a rate of around 6%. But in areas heavily affected by Katrina, the average wage during the fall of 2005 grew by 30% more than the national rate, and some areas saw twice that rate of increase. Over time, these higher wages led large numbers of workers with the right skills to move temporarily to these states to do the work.

In other words, the market for a factor of production—construction workers—allocated that factor of production to where it was needed.

In this sense factor markets are similar to goods markets, which allocate goods among consumers. But there are two features that make factor markets special. Unlike in a goods market, demand in a factor market is what we call **derived demand.** That is, demand for the factor is derived from demand for the firm's output. The second feature is that factor markets are where most of us get the largest shares of our income (government transfers being the next largest source of income in the economy).

After major hurricanes like Katrina in 2005 and Sandy in 2012, home repair becomes a profitable line of work for those with the right skills.

Factor Incomes and the Distribution of Income

Most American families get most of their income in the form of wages and salaries—that is, they get their income by selling labor. Some people, however, get most of their income from physical capital: when you own stock in a company, what you really own is a share of that company's physical capital. Some people get much of their income from rents earned on land they own. And successful business owners earn income in the form of profits.

Obviously, then, the prices of factors of production have a major impact on how the economic "pie" is sliced among different groups. For example, a higher wage rate, other things equal, means that a larger proportion of the total income in the economy goes to people who derive their income from labor and less goes to those who derive their income from physical capital, land, or human capital. Economists refer to how the economic pie is sliced as the "distribution of income." Specifically, factor prices determine the **factor distribution of income**—how the total income of the economy is divided among labor, land, physical capital, and human capital.

As the following Economics in Action explains, the factor distribution of income in the United States has been quite stable over the past few decades. In other times and places, however, large changes have taken place in the factor distribution. One notable example: during the Industrial Revolution, the share of total income earned by landowners fell sharply, while the share earned by physical capital owners rose.

ECONOMICS IN ACTION

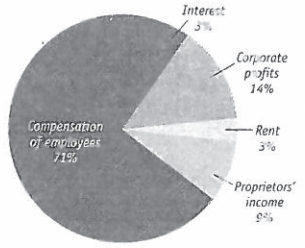
THE FACTOR DISTRIBUTION OF INCOME IN THE UNITED STATES

When we talk about the factor distribution of income, what are we talking about in practice?

In the United States, as in all advanced economies, payments to labor account for most of the economy's total income. Figure 40-1 shows the factor distribution of income in the United States in 2012: in that year, 71% of total income in the economy took the form of "compensation of employees"—a number that includes both wages and benefits such as health insurance. This number is in line with historical standards (it was 72.2% in 1972 and 70.4% in 2007), and reflects the fact that the economy has begun to rebound from the high unemployment and reduced wages for many American employees in the recent recession.

However, measured wages and benefits don't capture the full income of "labor" because a significant fraction of total income in the United States (usually 7 to 10%) is "proprietors' income"—the earnings of people who own their own businesses. Part of that income should be

FIGURE 40-1 Factor Distribution of Income in the United States in 2012



Source: Bureau of Economic Analysis.

considered wages these business owners pay themselves. So the true share of labor in the economy is probably a few percentage points higher than the reported "compensation of employees" share.

But much of what we call compensation of employees is really a return on human capital. A surgeon isn't just supplying the services of a pair of ordinary hands (at least the patient hopes not!): that individual is also supplying the result of many years and hundreds of thousands of dollars invested in training and experience. We can't directly measure what fraction of wages is really a payment for education and training, but many economists believe that human capital has become *the* most important factor of production in modern economies.

Marginal Productivity and Factor Demand

All economic decisions are about comparing costs and benefits—and usually about comparing marginal costs and marginal benefits. This goes both for a consumer, deciding whether to buy more goods or services, and for a firm, deciding whether to hire an additional worker.

Although there are some important exceptions, most factor markets in the modern American economy are perfectly competitive. This means that most buyers and sellers of factors are price-takers because they are too small relative to the market to do anything but accept the market price. And in a competitive labor market, it's clear how to define the marginal cost an employer pays for a worker: it is simply the worker's wage rate. But what is the marginal benefit of that worker? To answer that question, we return to the production function, which relates inputs to output. For now we assume that all firms are price-takers in their output markets—that is, they operate in a perfectly competitive industry.

Value of the Marginal Product

Figure 40-2 reproduces Figures 21-1 and 21-2, which show the production function for wheat on George and Martha's farm. Panel (a) of Figure 40-2 uses the total product curve to show how total wheat production depends on the number of workers employed on the farm; panel (b) shows how the *marginal product of labor*, the increase in output from employing one more worker, depends on the number of workers employed. Table 40-1 shows the numbers behind the figure. Note: sometimes the marginal product (*MP*) is called the marginal product of labor, or *MPL*.

TABLE 40-1

Employment and Output for George and Martha's Farm

Quantity of labor L (workers)	Quantity of wheat Q (bushels)	Marginal product of labor $MPL = \frac{\Delta Q}{\Delta L}$ (bushels per worker)
0	0	
		19
1	19	
		17
2	36	
		15
3	51	
		13
4	64	
		11
5	75	
		9
6	84	
		7
7	91	
		5
8	96	

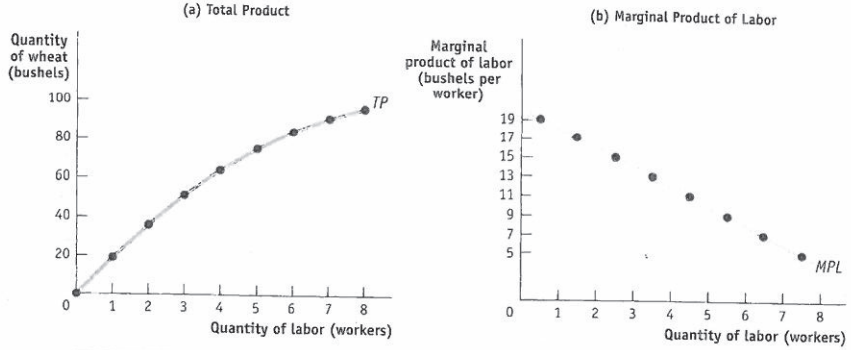
If workers are paid $200 each and wheat sells for $20 per bushel, how many workers should George and Martha employ to maximize profit?

Earlier we showed how to answer this question in several steps. First, we used information from the production function to derive the firm's total cost and its marginal cost. Then we used the *price-taking firm's optimal output rule:* a price-taking firm's profit is maximized by producing the quantity of output at which the marginal cost is equal to the market price. Having determined the optimal quantity of output, we went back to the production function to find the optimal number of workers—which was simply the number of workers needed to produce the optimal quantity of output.

As you might have guessed, marginal analysis provides a more direct way to find the number of workers that maximizes a firm's profit. This alternative approach is just a different way of looking at the same thing. But it gives us more insight into the demand for factors as opposed to the supply of goods.

To see how this alternative approach works, suppose that George and Martha are deciding whether to employ another worker. The increase in *cost* from employing another worker is the wage rate, *W*.

FIGURE 40-2 The Production Function for George and Martha's Farm



Panel (a) shows how the quantity of output of wheat on George and Martha's farm depends on the number of workers employed. Panel (b) shows how the marginal product of labor depends on the number of workers employed.

The *benefit* to George and Martha from employing another worker is the value of the extra output that worker can produce. What is this value? It is the marginal product of labor, *MPL*, multiplied by the price per unit of output, *P*. This amount—the extra value of output generated by employing one more unit of labor—is known as the **value of the marginal product** of labor, or *VMPL*:

(40-1) Value of the marginal product of labor = $VMPL = P \times MPL$

So should George and Martha hire another worker? Yes, if the value of the extra output is more than the cost of the additional worker—that is, if $VMPL > W$. Otherwise, they should not.

The hiring decision is made using marginal analysis, by comparing the marginal benefit from hiring another worker (*VMPL*) with the marginal cost (*W*). And as with any decision that is made on the margin, the optimal choice is made by equating marginal benefit with marginal cost (or if they're never equal, by continuing to hire until the marginal cost of one more unit would exceed the marginal benefit). That is, to maximize profit, George and Martha will employ workers up to the point at which, for the last worker employed,

(40-2) $VMPL = W$ *at the profit-maximizing level of employment*

This rule doesn't apply only to labor; it applies to any factor of production. The value of the marginal product of any factor is its marginal product times the price of the good it produces. The general rule is that a *profit-maximizing price-taking producer employs each factor of production up to the point at which the value of the marginal product of the last unit of the factor employed is equal to that factor's price.*

This rule is consistent with our previous analysis. We saw that a profit-maximizing firm chooses the level of output at which the price of the good it produces equals the marginal cost of producing that good. It turns out that if the level of output is chosen so that price equals marginal cost, then it is also true that with the amount of labor required to produce that output level, the value of the marginal product of labor will equal the wage rate.

A firm should hire another worker if the value of the extra output is more than the cost of the additional worker.

The value of the marginal product of a factor is the value of the additional output generated by employing one more unit of that factor.

The value of the marginal product curve of a factor shows how the value of the marginal product of that factor depends on the quantity of the factor employed.

Now let's look more closely at why choosing the level of employment to equate *VMPL* and *W* works, and at how it helps us understand factor demand.

Value of the Marginal Product and Factor Demand

Table 40-2 shows the value of the marginal product of labor on George and Martha's farm when the price of wheat is $20 per bushel. In Figure 40-3, the horizontal axis shows the number of workers employed; the vertical axis measures the value of the marginal product of labor *and* the wage rate. The curve shown is the **value of the marginal product curve** of labor. This curve, like the marginal product of labor curve, slopes downward because of diminishing returns to labor in production. That is, the value of the marginal product of each worker is less than that of the preceding worker because the marginal product of each worker is less than that of the preceding worker.

TABLE 40-2

Value of the Marginal Product of Labor for George and Martha's Farm

Quantity of labor *L* (workers)	Marginal product of labor *MPL* (bushels per worker)	Value of the marginal product of labor *VMPL* = *P* × *MPL*
0		
	19	$380
1		
	17	340
2		
	15	300
3		
	13	260
4		
	11	220
5		
	9	180
6		
	7	140
7		
	5	100
8		

We have just seen that to maximize profit, George and Martha hire workers until the wage rate is equal to the value of the marginal product of the last worker employed. Let's use the example to see how this principle really works. Assume that George and Martha currently employ 3 workers and that these workers must be paid the market wage rate of $200. Should they employ an additional worker?

Looking at Table 40-2, we see that if George and Martha currently employ 3 workers, the value of the marginal product of an additional worker is $260. So if they employ an additional worker, they will increase the value of their production by $260 but increase their cost by only $200, yielding an increased profit of $60. In fact, a firm can always increase profit by employing one more unit of a factor of production as long as the value of the marginal product produced by that unit exceeds the factor price.

Alternatively, suppose that George and Martha employ 8 workers. By reducing the number of workers to 7, they can save $200 in wages. In addition, the value of the marginal product of the 8th worker is only $100. So, by reducing employment by one worker, they can increase profit by $200 − $100 = $100. In other words, a firm can always increase profit by employing one less unit of a factor of production as long as the value of the marginal product produced by that unit is less than the factor price.

Using this method, we can see from Table 40-2 that the profit-maximizing employment level is 5 workers, given a wage rate of $200. The value of the marginal product of the 5th worker is $220, so adding the 5th worker results in $20 of additional profit.

But George and Martha should not hire more than 5 workers: the value of the marginal product of the 6th worker is only $180, $20 less than the cost of that worker. So, to maximize profit, George and Martha should employ workers up to but not beyond the point at which the value of the marginal product of the last worker employed is equal to the wage rate.

Now look again at the value of the marginal product curve in Figure 40-3. To determine the profit-maximizing level of employment, we set the value of the marginal product of labor equal to the price of labor—a wage rate of $200 per worker. This means that the profit-maximizing level of employment is at point *A*, corresponding to an employment level of 5 workers. If the wage rate were higher, we would simply move up the curve and decrease the number of workers employed: if the wage rate were lower than $200, we would move down the curve and increase the number of workers employed.

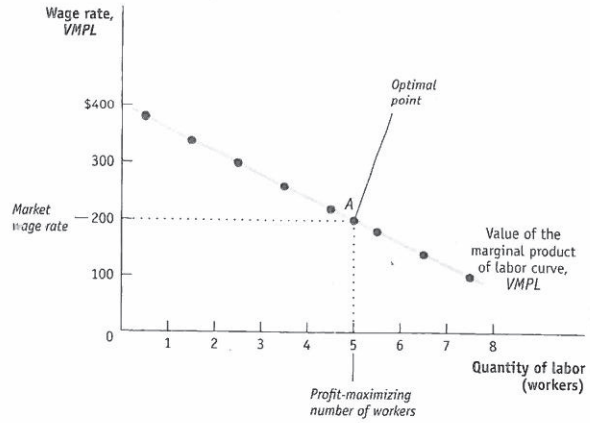
In this example, George and Martha have a small farm in which the potential employment level varies from 0 to 8 workers, and they hire workers up to the point at which the value of the marginal product of another worker would fall below the wage rate.

Firms keep hiring more workers until the value of the marginal product of labor equals the wage rate.

© Rene MacDonald/Alamy

40-3 The Value of the Marginal Product Curve

This curve shows how the value of the marginal product of labor depends on the number of workers employed. It slopes downward because of diminishing returns to labor in production. To maximize profit, George and Martha choose the level of employment at which the value of the marginal product of labor is equal to the market wage rate. For example, at a wage rate of $200 the profit-maximizing level of employment is 5 workers, shown by point *A*. The value of the marginal product curve of a factor is the producer's individual demand curve for that factor.



For a larger farm with many employees, the value of the marginal product of labor falls only slightly when an additional worker is employed. As a result, there will be some worker whose value of the marginal product almost exactly equals the wage rate. (In keeping with the George and Martha example, this means that some worker generates a value of the marginal product of approximately $200.) In this case, the firm maximizes profit by choosing a level of employment at which the value of the marginal product of the last worker hired *equals* (to a very good approximation) the wage rate.

In the interest of simplicity, we will assume from now on that firms use this rule to determine the profit-maximizing level of employment. *This means that the value of the marginal product of labor curve is the individual firm's labor demand curve.* And in general, a firm's value of the marginal product curve for any factor of production is that firm's individual demand curve for that factor of production.

Shifts of the Factor Demand Curve

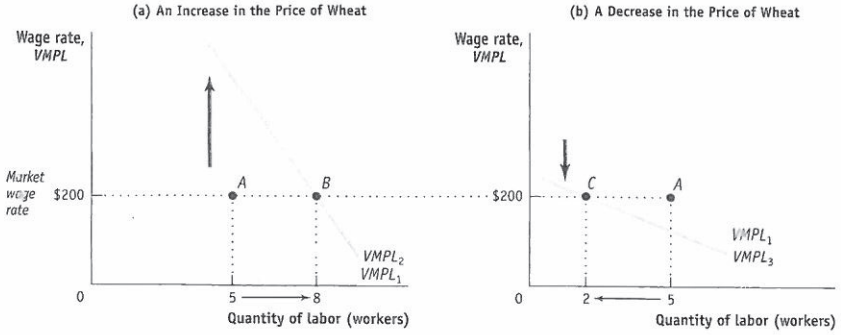
As in the case of ordinary demand curves, it is important to distinguish between movements along the factor demand curve and shifts of the factor demand curve. What causes factor demand curves to shift? There are three main causes:

1. Changes in the prices of goods
2. Changes in the supply of other factors
3. Changes in technology

1. CHANGES IN THE PRICES OF GOODS Remember that factor demand is *derived demand:* if the price of the good that is produced with a factor changes, so will the value of the marginal product of the factor. That is, in the case of labor demand, if *P* changes, *VMPL* = *P* × *MPL* will change at any given level of employment.

Figure 40-4 illustrates the effects of changes in the price of wheat, assuming that $200 is the current wage rate. Panel (a) shows the effect of an *increase* in the price of wheat. This shifts the value of the marginal product of labor curve upward because *VMPL* rises at any given level of employment. If the wage rate remains unchanged at $200, the optimal point moves from point *A* to point *B*: the profit-maximizing level of employment rises.

40-4 Shifts of the Value of the Marginal Product Curve



Panel (a) shows the effect of an increase in the price of wheat on George and Martha's demand for labor. The value of the marginal product of labor curve shifts upward, from $VMPL_1$ to $VMPL_2$. If the market wage rate remains at $200, profit-maximizing employment rises from 5 workers to 8 workers, shown by the movement from point *A* to point *B*. Panel (b) shows the effect of a decrease in the price of wheat. The value of the marginal product of labor curve shifts downward, from $VMPL_1$ to $VMPL_3$. At the market wage rate of $200, profit-maximizing employment falls from 5 workers to 2 workers, shown by the movement from point *A* to point *C*.

Panel (b) shows the effect of a *decrease* in the price of wheat. This shifts the value of the marginal product of labor curve downward. If the wage rate remains unchanged at $200, the optimal point moves from point *A* to point *C*: the profit-maximizing level of employment falls.

2. CHANGES IN THE SUPPLY OF OTHER FACTORS Suppose that George and Martha acquire more land to cultivate—say, by clearing a woodland on their property. Each worker now produces more wheat because each one has more land to work with. As a result, the marginal product of labor on the farm rises at any given level of employment. This has the same effect as an increase in the price of wheat, which is illustrated in panel (a) of Figure 40-4: the value of the marginal product of labor curve shifts upward, and at any given wage rate the profit-maximizing level of employment rises. Similarly, suppose George and Martha cultivate less land. This leads to a fall in the marginal product of labor at any given employment level. Each worker produces less wheat because each has less land to work with. As a result, the value of the marginal product of labor curve shifts downward—as in panel (b) of Figure 40-4—and the profit-maximizing level of employment falls.

3. CHANGES IN TECHNOLOGY In general, the effect of technological progress on the demand for any given factor can go either way: improved technology can either increase or decrease the demand for a given factor of production.

How can technological progress decrease factor demand? Consider horses, which were once an important factor of production. The development of substitutes for horse power, such as automobiles and tractors, greatly reduced the demand for horses.

The usual effect of technological progress, however, is to increase the demand for a given factor, often because it raises the marginal product of the factor. In particular, although there have been persistent fears that machinery would reduce the demand for labor, over the long run the U.S. economy has seen both large wage increases and large increases in employment, suggesting that technological progress has greatly increased labor demand.

MODULE

40 Review

Solutions appear at the back of the book.

Check Your Understanding

1. Suppose that the government places price controls on the market for college professors, imposing a wage that is lower than the market wage. Describe the effect of this policy on the production of college degrees. What sectors of the economy do you think would be adversely affected by this policy? What sectors of the economy might benefit?
2. a. Suppose service industries, such as retailing and banking, experience an increase in demand. These industries use relatively more labor than nonservice industries. Does the demand curve for labor shift to the right, shift to the left, or remain unchanged?
   b. Suppose diminishing fish populations off the coast of Maine lead to policies restricting the use of the most productive types of nets in that area. The result is a decrease in the number of fish caught per day by commercial fishers in Maine. The price of fish is unaffected. Does the demand curve for fishers in Maine shift to the right, shift to the left, or remain unchanged?

Multiple-Choice Questions

1. Which of the following is an example of *physical* capital?
   a. manual labor
   b. welding equipment
   c. farm land
   d. coal
   e. education
2. Which of the following can shift the factor demand curve to the right?
   I. an increase in the price of the good being produced
   II. an increase in the factor's marginal productivity
   III. a technological advance
   a. I only
   b. II only
   c. III only
   d. I and II only
   e. I, II, and III
3. Factor market demand is called a *derived* demand because it
   a. derives its name from the Latin *factorus*.
   b. is derived from the market wage received by workers.
   c. is derived from the productivity of workers.
   d. is derived from the product market.
   e. derives its shape from the price of the factor.
4. Which factor of production receives the largest portion of income in the United States?
   a. land
   b. labor
   c. physical capital
   d. human capital
   e. interest
5. The individual firm's demand curve for labor is
   a. the *VMPL* curve.
   b. upward sloping.
   c. horizontal at the level of the product price.
   d. vertical.
   e. equal to the *MPL* curve.

Critical-Thinking Question

Draw three separate, correctly labeled graphs illustrating the effect of each of the following changes on the demand for labor. Adopt the usual *ceteris paribus* assumption that all else remains unchanged in each case.

a. The price of the product being produced decreases.
b. Worker productivity increases.
c. Firms invest in more capital to be used by workers.

PITFALLS

WHAT IS A FACTOR, ANYWAY?

Imagine a business that produces shirts. The business will make use of workers and machines—that is, of labor and capital. But it will also use other inputs, such as electricity and cloth. Are all of these inputs factors of production?

For example, a worker earns income over time from repeatedly selling his or her efforts; the owner of a machine earns income over time from repeatedly selling the use of that machine. So a factor of production, such as labor and physical capital, represents an enduring source of income. An input like electricity or cloth, however, is used up in the production process. Once exhausted, it cannot be a source of future income for its owner.

To learn more, see the discussion on pages 424–425.

MODULE

41

WHAT YOU WILL LEARN

1. **Labor market applications of the marginal productivity theory of income distribution**
2. **Sources of wage disparities and the role of discrimination**

In the previous module we introduced the factor distribution of income. In this module, we will go a step further and explain how the *marginal productivity theory of income distribution* helps to explain how income is divided among factors of production in an economy. We will consider how the markets for factors of production are broken down. There are different markets for different types of factors. For example, there are different labor markets for different types of labor, such as for computer programmers, pastry chefs, and economists. Then, we look at the marginal productivity theory of income distribution and the extent to which it explains wage disparities between workers.

The Marginal Productivity Theory of Income Distribution

The **marginal productivity theory of income distribution** sums up what we have learned about payments to factors when goods markets and factor markets are perfectly competitive. According to this theory, each factor is paid the value of the output generated by the last unit of that factor employed in the factor market as a whole—its **equilibrium value of the marginal product.**

According to the marginal productivity theory of income distribution, every factor of production is paid the equilibrium value of its marginal product.

The equilibrium value of the marginal product of a factor is the additional value produced by the last unit of that factor employed in the factor market as a whole.

To understand why the marginal productivity theory of income distribution is important, look back at Figure 40-1, which shows the factor distribution of income in the United States in 2012, and ask yourself this question: who or what determined that labor would get 71% of total U.S. income? Why not 90% or 50%?

The answer, according to this theory, is that the division of income among the economy's factors of production isn't arbitrary: in the economy-wide factor market, the price paid for each factor is equal to the increase in the value of output generated by the last unit of that factor employed in the market. Therefore, if a unit of labor is paid more than a unit of capital, it is because at the equilibrium quantity of each

factor, the value of the marginal product of labor exceeds the value of the marginal product of capital.

So far we have treated factor markets as if every unit of each factor were identical. That is, as if all land were identical, all labor were identical, and all capital were identical. But in reality factors differ considerably with respect to productivity. For instance, land resources differ in their ability to produce crops and workers have different skills and abilities.

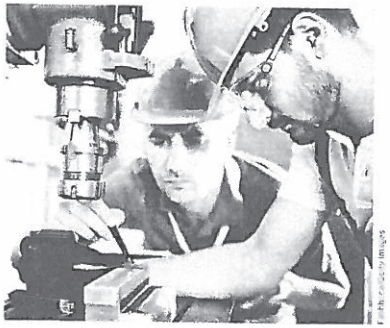
Rather than thinking of one land market for all land resources in an economy, and similarly one capital market and one labor market, we can instead think of different markets for different types of land, physical capital, human capital, and labor. For example, the market for computer programmers is different from the market for pastry chefs.

When we consider that there are separate factor markets for different types of factors, the marginal productivity theory of income distribution still holds. That is, when the labor market for computer programmers is in equilibrium, the wage rate earned by all computer programmers is equal to the market's equilibrium value of the marginal product—the value of the marginal product of the last computer programmer hired in that market.

The marginal productivity theory can explain the distribution of income among different types of land, labor, physical capital, and human capital as well as the distribution of income among the factors of production. Next we look more closely at the distribution of income between different types of labor and the extent to which the marginal productivity theory of income distribution explains differences in workers' wages.

ECONOMICS IN ACTION

HELP WANTED!



The marginal productivity theory of income distribution holds for skilled machinists at Hamill Manufacturing.

Hamill Manufacturing of Pennsylvania makes precision components for military helicopters and nuclear submarines. Their highly skilled senior machinists are well paid compared to other workers in manufacturing, earning nearly $70,000 in 2011, excluding benefits. Like most skilled machinists in the United States, Hamill's machinists are very productive: according to the U.S. Census Annual Survey of Manufacturers, in 2010 the average skilled machinist generated approximately $137,000 in value added.

But there is a $67,000 difference between the salary paid to Hamill machinists and the value added they generate. Does this mean that the marginal productivity theory of income distribution doesn't hold? Doesn't the theory imply that machinists should be paid $137,000, the average value added that each one generates?

The answer is no, for two reasons. First, the $137,000 figure is averaged over *all machinists currently employed.* The theory says that machinists will be paid the value of the marginal product of the *last machinist hired,* and due to diminishing returns to labor, that value will be lower than the average over all machinists currently employed. Second, a worker's equilibrium wage rate includes other costs, such as employee benefits, that have to be added to the $70,000 salary. The marginal productivity theory of income distribution says that workers are paid a wage rate, *including all benefits,* equal to the value of the marginal product.

You can see all these costs are present at Hamill. There the machinists have good benefits and job security, which add to their salary. Including these benefits, machinists' total compensation will be equal to the value of the marginal product of the last machinist employed.

In Hamill's case, there is yet another factor that explains the $67,000 gap: there are not enough machinists at the current wage rate. Although the company increased the number of employees from 85 in 2004 to 125 in 2011, they would like to hire more.

Why doesn't Hamill raise its wages in order to attract more skilled machinists? The problem is that the work they do is so specialized that it is hard to hire from the outside, even when the company raises wages as an inducement. To address this problem, Hamill has spent a significant amount of money training each new hire, approximately $125,000 plus the cost of benefits per trainee. In the end, it does appear that the marginal productivity theory of income distribution holds.

Is the Marginal Productivity Theory of Income Distribution Really True?

Although the marginal productivity theory of income distribution is a well-established part of economic theory, closely linked to the analysis of markets in general, it is a source of some controversy. There are two main objections to it.

First, in the real world we see large disparities in income between factors of production that, in the eyes of some observers, should receive the same payment. Perhaps the most conspicuous examples in the United States are the large differences in the average wages between women and men and among various racial and ethnic groups. Do these wage differences really reflect differences in marginal productivity, or is something else going on?

Second, many people wrongly believe that the marginal productivity theory of income distribution gives a *moral* justification for the distribution of income, implying that the existing distribution is fair and appropriate. This misconception sometimes leads other people, who believe that the current distribution of income is unfair, to reject marginal productivity theory.

To address these controversies, we'll start by looking at income disparities across gender and ethnic groups. Then we'll ask what factors might account for these disparities and whether these explanations are consistent with the marginal productivity theory of income distribution.

Wage Disparities in Practice

Wage rates in the United States cover a very wide range. In 2012, hundreds of thousands of workers received the legal federal minimum of $7.25 per hour. At the other extreme, the chief executives of several companies were paid more than $100 million, which works out to $20,000 per hour even if they worked 100-hour weeks. Even leaving out these extremes, there is a huge range of wage rates. Are people really that different in their marginal productivities?

A particular source of concern is the existence of systematic wage differences across gender and ethnicity. Figure 41-1 compares annual median earnings in 2011 of workers age 25 or older classified by gender and ethnicity. As a group, White males had the highest earnings. Other data show that women (averaging across all ethnicities) earned only about 69% as much; African-American workers (male and female combined), only 69% as much; Hispanic workers (again, male and female combined), only 59% as much.

We are a nation founded on the belief that all men are created equal—and if the Constitution were rewritten today, we would say that *all people* are created equal. So why do they receive such unequal pay? Let's start with the marginal productivity explanations, then look at other influences.

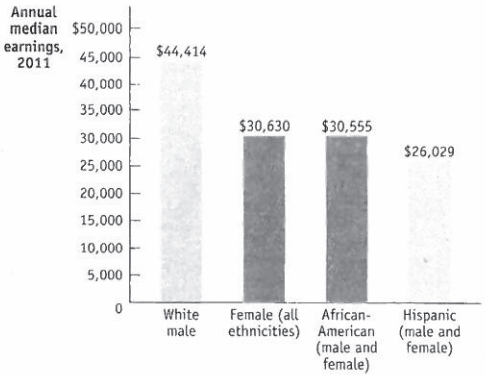
Marginal Productivity and Wage Inequality

A large part of the observed inequality in wages can be explained by considerations that are consistent with the marginal productivity theory of income distribution. In particular, there are three well-understood sources of wage differences across occupations and individuals.

FIGURE 41-1 Median Earnings by Gender and Ethnicity, 2011

The U.S. labor market continues to show large differences across workers according to gender and ethnicity. Women are paid substantially less than men; African-American and Hispanic workers are paid substantially less than White male workers.

Source: U.S. Census Bureau.



First is the existence of **compensating differentials:** across different types of jobs, wages are often higher or lower depending on how attractive or unattractive the job is. Workers with unpleasant or dangerous jobs demand a higher wage in comparison to workers with jobs that require the same skill and effort but lack the unpleasant or dangerous qualities. For example, truckers who haul hazardous loads are paid more than truckers who haul non-hazardous loads. But for any *given* job, the marginal productivity theory of income distribution generally holds true. For example, hazardous-load truckers are paid a wage equal to the equilibrium value of the marginal product of the last person employed in the labor market for hazardous-load truckers.

A second reason for wage inequality that is clearly consistent with marginal productivity theory is differences in talent. People differ in their abilities: a higher-ability person, by producing a better product that commands a higher price compared to a lower-ability person, generates a higher value of the marginal product. And these differences in the value of the marginal product translate into differences in earning potential. We all know that this is true in sports: practice is important, but 99.99% (at least) of the population just doesn't have what it takes to throw passes like Tom Brady or hit tennis balls like Roger Federer. The same is true, though less obvious, in other fields of endeavor.

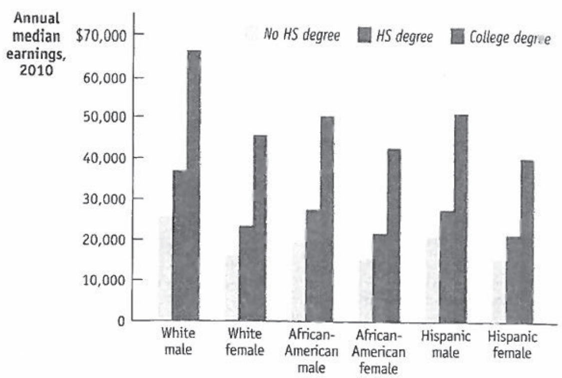
A third and very important reason for wage differences is differences in the quantity of *human capital.* Recall that human capital—education and training—is at least as important in the modern economy as physical capital in the form of buildings and machines. Different people "embody" quite different quantities of human capital, and a person with a higher quantity of human capital typically generates a higher value of the marginal product by producing a product that commands a higher price. So differences in human capital account for substantial differences in wages. People with high levels of human capital, such as skilled surgeons or engineers, generally receive high wages.

The most direct way to see the effect of human capital on wages is to look at the relationship between educational levels and earnings. Figure 41-2 shows earnings differentials by gender, ethnicity, and three educational levels for people age 25 or older in 2010. As you can see, regardless of gender or ethnicity, higher education is associated with higher median earnings. For example, in 2010 White females with 9 to 12 years of schooling but without a high school diploma had median earnings 32%

are wage differences across jobs that reflect the fact that some jobs are less pleasant than others.

41-2 Earnings Differentials by Education, Gender, and Ethnicity, 2010

It is clear that, regardless of gender or ethnicity, education pays: those with a high school diploma earn more than those without one, and those with a college degree earn substantially more than those with only a high school diploma. Other patterns are evident as well: for any given education level, White males earn more than every other group, and males earn more than females for any given ethnic group.
Source: U.S. Census Bureau.



less than those with a high school diploma and 65% less than those with a college degree—and similar patterns exist for the other five groups. Additional data show that surgeons—an occupation that requires steady hands and many years of formal training—earned an average of $225,390 in 2010.

Because even now men typically have had more years of education than women and Whites more years than non-Whites, differences in level of education are part of the explanation for the earnings differences shown in Figure 41-1.

It's also important to realize that formal education is not the only source of human capital; on-the-job training and experience are also very important. Differences in job tenure and experience can partly explain one notable aspect of Figure 41-2: across all ethnicities, women's median earnings are less than men's median earnings for any given education level.

But it's also important to emphasize that earnings differences arising from differences in human capital are not necessarily "fair." A society in which non-White children typically receive a poor education because they live in underfunded school districts, then go on to earn low wages because they are poorly educated, may have labor markets that are well described by marginal productivity theory (and would be consistent with the earnings differentials across ethnic groups shown in Figure 41-1). Yet many people would still consider the resulting distribution of income unfair.

Still, many observers think that actual wage differentials cannot be entirely explained by compensating differentials, differences in talent, and differences in human capital. They believe that market power, efficiency wages, and discrimination also play an important role. We will examine these forces next.

Market Power

The marginal productivity theory of income distribution is based on the assumption that factor markets are perfectly competitive. In such markets we can expect workers to be paid the equilibrium value of their marginal product, regardless of who they are. But how valid is this assumption?

We studied markets that are *not* perfectly competitive; now let's touch briefly on the ways in which labor markets may deviate from the competitive assumption.

One undoubted source of differences in wages between otherwise similar workers is the role of **unions**—organizations that try to raise wages and improve working conditions for their members. Labor unions, when they are successful, replace one-on-one wage deals between workers and employers with collective bargaining, in which the employer must negotiate wages with union representatives. Without question, this leads to higher wages for those workers who are represented by unions. In 2012 the median weekly earnings of union members in the United States were $943, compared with $742 for workers not represented by unions—a 27% difference.

Unions are organizations of workers that try to raise wages and improve working conditions for their members by bargaining collectively with employers.

AP Photo/Rick Bowmer

Unions today have a fairly minor impact on wages compared to several decades ago.

Just as workers can sometimes organize to extract higher wages than they would otherwise receive, employers can sometimes organize to pay *lower* wages than would result from competition. For example, health care workers—doctors, nurses, and so on—sometimes argue that health maintenance organizations (HMOs) are engaged in a collective effort to hold down their wages.

How much does collective action, either by workers or by employers, affect wages in the modern United States? Several decades ago, when around 30% of American workers were union members, unions probably had a significant upward effect on wages. Today, however, most economists think unions exert a fairly minor influence. Union membership in the United States is relatively limited: in 2012, only 6.6% of the employees of private businesses were represented by unions.

Efficiency Wages

A second source of wage inequality is the phenomenon of *efficiency wages*—a type of incentive scheme used by employers to motivate workers to work hard and to reduce turnover. Suppose a worker performs a job that is extremely important but that the employer can observe how well the job is being performed only at infrequent intervals—say, serving as a caregiver for the employer's child. Then it often makes sense for the employer to pay more than the worker could earn in an alternative job—that is, more than the equilibrium wage. Why? Because earning a premium makes losing this job and having to take the alternative job quite costly for the worker.

So a worker who happens to be observed performing poorly and is therefore fired is now worse off for having to accept a lower-paying job. The threat of losing a job that pays a premium motivates the worker to perform well and avoid being fired. Likewise, paying a premium also reduces worker turnover—the frequency with which an employee leaves a job voluntarily.

The **efficiency-wage model** explains why we might observe wages offered above their equilibrium level. Like the price floors we studied in an earlier module—and, in particular, much like the minimum wage—this phenomenon leads to a surplus of labor in labor markets that are characterized by the efficiency-wage model. This surplus of labor translates into unemployment—some workers are actively searching for a high-paying efficiency-wage job but are unable to get one, and other more fortunate but no more deserving workers are able to acquire one.

As a result, two workers with exactly the same profile—the same skills and same job history—may earn unequal wages: the worker who is lucky enough to get an efficiency-wage job earns more than the worker who gets a standard job (or who remains unemployed while searching for a higher-paying job). Efficiency wages are a response to a type of market failure that arises from the fact that some employees don't always perform as well as they should and are able to hide that fact. As a result, employers use nonequilibrium wages in order to motivate their employees, leading to an inefficient outcome.

According to the efficiency-wage model, some employers pay an above-equilibrium wage as an incentive for better performance.

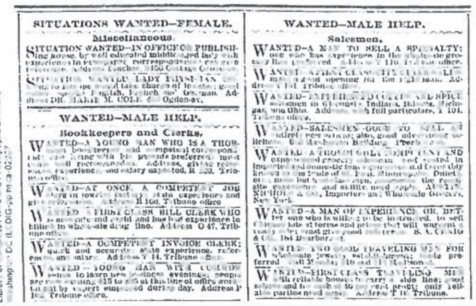
Discrimination

It is a real and ugly fact that throughout history there has been discrimination against workers who are considered to be of the wrong race, ethnicity, gender, or other characteristics. How does this fit into our economic models?

The main insight economic analysis offers is that discrimination is *not* a natural consequence of market competition. On the contrary, market forces tend to work against discrimination. To see why, consider the incentives that would exist if social convention dictated that women be paid, say, 30% less than men with equivalent qualifications and experience. A company whose management was itself unbiased would then be able to reduce its costs by hiring women rather than men—and such companies would have an advantage over other companies that hired men despite their higher cost. The result would be to create an excess demand for female workers, which would tend to drive up their wages.

But if market competition works against discrimination, how is it that so much discrimination has taken place? The answer is twofold. First, when labor markets don't work well, employers may have the ability to discriminate without hurting their profits. For example, market interferences (such as unions or minimum-wage laws) or market failures (such as efficiency wages) can lead to wages that are above their equilibrium levels. In these cases, there are more job applicants than there are jobs, leaving employers free to discriminate among applicants. In 2011, with unemployment over 9%, the Equal Employment Opportunity Commission, the federal agency tasked with investigating employment discrimination charges, reported that the complaints from workers and job-seekers had hit an all-time high, the most logged in the agency's 46-year history.

Second, discrimination has sometimes been institutionalized in government policy. This institutionalization of discrimination has made it easier to maintain it against market pressure, and historically it is the form that discrimination has typically taken. For example, at one time in the United States, African-Americans were barred from attending "Whites-only" public schools and universities in many parts of the country and forced to attend inferior schools. Although market competition tends to work against *current* discrimination, it is not a remedy for past discrimination, which typically has had an impact on the education and experience of its victims and thereby reduces their income.


SITUATIONS WANTED—FEMALE.
Miscellaneous.
WANTED—MALE HELP.
Bookkeepers and Clerks.
WANTED—MALE HELP.
Salesmen.

In the past, newspapers separated help-wanted ads by gender, as in this case, and by race.

So Does Marginal Productivity Theory Work?

The main conclusion you should draw from this discussion is that the marginal productivity theory of income distribution is not a perfect description of how factor incomes are determined but that it works pretty well. The deviations are important. But, by and large, in a modern economy with well-functioning labor markets, factors of production are paid the equilibrium value of the marginal product—the value of the marginal product of the last unit employed in the market as a whole.

It's important to emphasize, once again, that this does not mean that the factor distribution of income is morally justified.

MODULE 41 Review

Solutions appear at the back of the book.

Check Your Understanding

1. Assess each of the following statements. Do you think they are true, false, or ambiguous? Explain.
   a. The marginal productivity theory of income distribution is inconsistent with the presence of income disparities associated with gender, race, or ethnicity.
   b. Companies that engage in workplace discrimination but whose competitors do not are likely to earn less profit as a result of their actions.
   c. Workers who are paid less because they have less experience are not the victims of discrimination.

Multiple-Choice Questions

1. Which group of U.S. workers had the highest median earnings in 2011?
   a. white males
   b. females (all ethnicities)
   c. African-Americans (males and female)
   d. Hispanics
   e. African-American males
2. Which of the following sources of wage differences is/are consistent with the marginal productivity theory of income distribution?
   I. talent
   II. discrimination
   III. efficiency wages
   a. I only
   b. II only
   c. III only
   d. I and II only
   e. I, II, and III
3. Compensating differentials mean that which of the following leads to higher wages for some jobs?
   a. danger
   b. discrimination
   c. marginal productivity
   d. market power
   e. a surplus of labor
4. Which of the following is a result in the efficiency-wage model?
   a. compensating differentials
   b. surpluses of labor
   c. shortages of labor
   d. discrimination
   e. increased productivity
5. Which of the following statements regarding the marginal productivity theory of income distribution is correct?
   a. Each worker should earn a wage based on his or her marginal productivity.
   b. Substantial differences in human capital do not account for substantial differences in wages.
   c. Workers with higher marginal products always receive a higher wage than workers with lower marginal products.
   d. The factor distribution of income is morally justified.
   e. With well-functioning labor markets, each factor is paid the equilibrium value of the marginal product of that factor.

Critical-Thinking Question

List three different economic concepts that explain wage differences when the marginal productivity theory of income distribution does not. Explain each.

PITFALLS

GETTING MARGINAL PRODUCTIVITY THEORY RIGHT

? According to the marginal productivity theory, are workers paid a wage equal to the value of their own marginal product of labor?

For an example, look back at Table 40-2 on p. 428. There, the first worker has a value of the marginal product of $380. It's tempting to conclude that because that worker has a value of the marginal product of $380, he or she is paid $380 in equilibrium. But, that's not the case. If the equilibrium value of the marginal product in the labor market is equal to $200, then *all* workers receive $200.

To learn more, see pages 432–433 and 436–437.

MODULE

42

WHAT YOU WILL LEARN

1. The way in which a worker's decision about time preference gives rise to labor supply
2. How to find equilibrium in the labor market

So far in this section we've focused on the demand for factors, which determines the quantities demanded of labor, capital, or land by producers as a function of their factor prices. But what about the supply of factors? In this module we focus exclusively on the supply of labor. Labor is the most important factor of production in the modern U.S. economy, accounting for most of factor income. We will look at how labor supply arises from a worker's decision about time allocation and explore the determination of equilibrium wage and quantity in the labor market.

The Supply of Labor

There are only 24 hours in a day, so to supply labor is to give up leisure, which presents a dilemma of sorts. For this and other reasons, as we'll see, the labor market looks different from markets for goods and services.

Work versus Leisure

In the labor market, the roles of firms and households are the reverse of what they are in markets for goods and services. A good such as wheat is supplied by firms and demanded by households; labor, though, is demanded by firms and supplied by households. How do people decide how much labor to supply?

As a practical matter, most people have limited control over their work hours: sometimes a worker has little choice but to take a job for a set number of hours per week. However, there is often flexibility to choose among different careers and employment situations that involve varying numbers of work hours. There is a range of part-time and full-time jobs; some are strictly 9:00 A.M. to 5:00 P.M., and others have much longer or shorter work hours. Some people work two jobs; others don't work at all. And self-employed people have many work-hour options. To simplify our study of

labor supply, we will imagine an individual who can choose to work as many or as few hours as he or she likes.

Why wouldn't such an individual work as many hours as possible? Because workers are human beings, too, and have other uses for their time. An hour spent on the job is an hour not spent on other, presumably more pleasant, activities. So the decision about how much labor to supply involves making a decision about **time allocation**—how many hours to spend on different activities.

By working, people earn income that they can use to buy goods. The more hours an individual works, the more goods he or she can afford to buy. But this increased purchasing power comes at the expense of a reduction in **leisure,** the time spent not working. (Leisure doesn't necessarily mean time goofing off. It could mean time spent with one's family, pursuing hobbies, exercising, and so on.) And though purchased goods yield utility, so does leisure. Indeed, we can think of leisure itself as a normal good, which most people would like to consume more of as their incomes increase.

How does a rational individual decide how much leisure to consume? By making a marginal comparison, of course. In analyzing consumer choice, we asked how a utility-maximizing consumer uses a marginal *dollar.* In analyzing labor supply, we ask how an individual uses a marginal *hour.*

Consider Clive, an individual who likes both leisure and the goods money can buy. Suppose that his wage rate is $10 per hour. In deciding how many hours he wants to work, he must compare the marginal utility of an additional hour of leisure with the additional utility he gets from $10 worth of goods. If $10 worth of goods adds more to his total utility than an additional hour of leisure, he can increase his total utility by giving up an hour of leisure in order to work an additional hour. If an extra hour of leisure adds more to his total utility than $10 worth of goods, he can increase his total utility by working one fewer hour in order to gain an hour of leisure.

At Clive's optimal level of labor supply, then, the marginal utility he receives from one hour of leisure is equal to the marginal utility he receives from the goods that his hourly wage can purchase. This is very similar to the *optimal consumption rule* we encountered previously, except that it is a rule about time rather than money.

Our next step is to ask how Clive's decision about time allocation is affected when his wage rate changes.

Every worker faces a trade-off between leisure and work.

Wages and Labor Supply

Suppose that Clive's wage rate doubles, from $10 to $20 per hour. How will he change his time allocation?

You could argue that Clive will work longer hours because his incentive to work has increased: by giving up an hour of leisure, he can now gain twice as much money as before. But you could equally well argue that he will work less because he doesn't need to work as many hours to generate the income required to pay for the goods he wants.

As these opposing arguments suggest, the quantity of labor Clive supplies can either rise or fall when his wage rate rises. To understand why, let's recall the distinction between *substitution effects* and *income effects.* We have seen that a price change affects consumer choice in two ways: by changing the opportunity cost of a good in terms of other goods (the substitution effect) and by making the consumer richer or poorer (the income effect).

Now think about how a rise in Clive's wage rate affects his demand for leisure. The opportunity cost of leisure—the amount of money he gives up by taking an hour off instead of working—rises. That substitution effect gives him an incentive, other things equal, to consume less leisure and work longer hours. Conversely, a higher wage rate makes Clive richer—and this income effect leads him, other things equal, to want to consume *more* leisure and supply less labor because leisure is a normal good.

So in the case of labor supply, the substitution effect and the income effect work in opposite directions. If the substitution effect is so powerful that it dominates the income effect, an increase in Clive's wage rate leads him to supply *more* hours of labor.

Decisions about labor supply result from decisions about how allocate goods how many hours to spend on different activities.

is time available for purposes other than earning money to buy marketed goods.

The individual labor supply curve shows how the quantity of labor supplied by an individual depends on that individual's wage rate.

If the income effect is so powerful that it dominates the substitution effect, an increase in the wage rate leads him to supply *fewer* hours of labor.

We see, then, that the **individual labor supply curve**—the relationship between the wage rate and the number of hours of labor supplied by an individual worker—does not necessarily slope upward. If the income effect dominates, a higher wage rate will reduce the quantity of labor supplied.

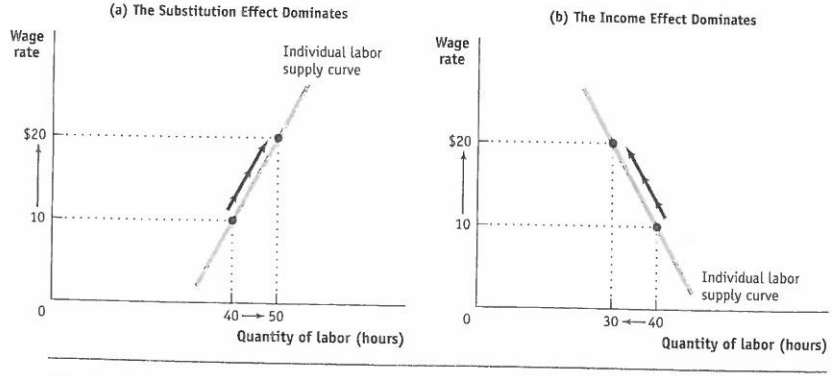
Figure 42-1 illustrates the two possibilities for labor supply. If the substitution effect dominates the income effect, the individual labor supply curve slopes upward; panel (a) shows an increase in the wage rate from $10 to $20 per hour leading to a *rise* in the number of hours worked from 40 to 50. However, if the income effect dominates, the quantity of labor supplied goes down when the wage rate increases. Panel (b) shows the same rise in the wage rate leading to a *fall* in the number of hours worked from 40 to 30.

Economists refer to an individual labor supply curve that contains both upward-sloping and downward-sloping segments as a "backward-bending labor supply curve." At lower wage rates, the substitution effect dominates the income effect. At higher wage rates, the income effect eventually dominates the substitution effect.

Is a backward-bending labor supply curve a real possibility? Yes: many labor economists believe that income effects on the supply of labor may be somewhat stronger than substitution effects at high wage rates.

The most compelling piece of evidence for this belief comes from Americans' increasing consumption of leisure over the past century. At the end of the nineteenth century, wages adjusted for inflation were only about one-eighth what they are today; the typical work week was 70 hours, and very few workers retired at age 65. Today the typical work week is less than 40 hours, and most people retire at age 65 or earlier. So it seems that Americans have chosen to take advantage of higher wages in part by consuming more leisure.

42-1 The Individual Labor Supply Curve



When the substitution effect of a wage increase dominates the income effect, the individual labor supply curve slopes upward, as in panel (a). Here a rise in the wage rate from $10 to $20 per hour increases the number of hours worked from 40 to 50. But when the income effect of a wage increase dominates the substitution effect, the individual labor supply curve slopes downward, as in panel (b). Here the same rise in the wage rate reduces the number of hours worked from 40 to 30. The individual labor supply curve shows how the quantity of labor supplied by an individual depends on that individual's wage rate.

Shifts of the Labor Supply Curve

Now that we have examined how income and substitution effects shape the individual labor supply curve, we can turn to the market labor supply curve. In any labor market, the market supply curve is the horizontal sum of the individual labor supply curves of all workers in that market. A change in any factor *other than the wage* that alters workers' willingness to supply labor causes a shift of the labor supply curve. A variety of factors can lead to such shifts, including changes in preferences and social norms, changes in population, changes in opportunities, and changes in wealth.

When factors other than wages alter the willingness of workers to supply labor, the labor supply curve will shift.

CHANGES IN PREFERENCES AND SOCIAL NORMS Changes in preferences and social norms can lead workers to increase or decrease their willingness to work at any given wage. A striking example of this phenomenon is the large increase in the number of employed women—particularly married, employed women—that has occurred in the United States since the 1960s. Until that time, women who could afford to largely avoided working outside the home.

Changes in preferences and norms in post–World War II America (helped along by the invention of labor-saving home appliances such as washing machines, the trend for more people to live in cities, and higher female education levels) have induced large numbers of American women to join the workforce—a phenomenon often observed in other countries that experience similar social and technological changes.

CHANGES IN POPULATION Changes in the population size generally lead to shifts of the labor supply curve. A larger population tends to shift the labor supply curve rightward as more workers are available at any given wage; a smaller population tends to shift the labor supply curve leftward due to fewer available workers. Currently the size of the U.S. labor force grows by approximately 1% per year, a result of immigration and, in comparison to other developed countries, a relatively high birth rate, shifting the U.S. labor supply curve to the right. Of course, from 2008 to 2010, due to the Great Recession and despite continued population growth, the size of the labor force began to shrink as workers disillusioned by bad job prospects left the labor force. The result: during that time, the U.S. labor supply curve shifted leftward.

CHANGES IN OPPORTUNITIES At one time, teaching was the only occupation considered suitable for well-educated women. However, as opportunities in other professions opened up to women starting in the 1960s, many women left teaching and chose other careers. This generated a leftward shift of the supply curve for teachers, reflecting a fall in the willingness to work at any given wage and forcing school districts to pay more to maintain an adequate teaching staff.

These events illustrate a general result: when superior alternatives arise for workers in another labor market, the supply curve in the original labor market shifts leftward as workers move to the new opportunities.

Similarly, when opportunities diminish in one labor market—say, layoffs in the manufacturing industry due to increased foreign competition—the supply in alternative labor markets increases as workers move to these other markets.

CHANGES IN WEALTH A person whose wealth increases will buy more normal goods, including leisure. So when a class of workers experiences a general increase in wealth—say, due to a stock market boom—the income effect from the wealth increase will shift the labor supply curve associated with those workers leftward as workers consume more leisure and work less. Note that *the income effect caused by a change in wealth shifts the labor supply curve,* but *the income effect from a wage rate increase*—as we discussed in the case of the individual labor supply curve—*is a movement along the labor supply curve.*

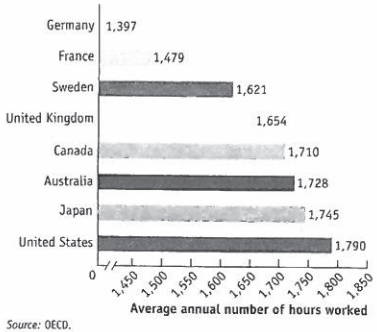
ECONOMICS IN ACTION

THE OVERWORKED AMERICAN?

Americans today may work less than they did a hundred years ago, but they still work more than workers in any other industrialized country.

Figure 42-2 compares average annual hours worked in the United States with those worked in other industrialized countries. The differences result from a combination of Americans' longer workweeks and shorter vacations. For example, the great majority of full-time American workers put in at least 40 hours per week. Until recently, however, a government mandate limited most French workers to a 35-hour workweek; collective bargaining has achieved a similar reduction in the workweek for many German workers.

FIGURE 42-2 The Average Number of Hours Worked Annually for Select Industrialized Countries, 2012



Source: OECD.

In 2012, American workers got, on average, ten paid vacation days, but 23% of American workers got none at all. In contrast, German workers are guaranteed six weeks of paid vacation a year. Also, American workers use fewer of the vacation days they are entitled to than do workers in other industrialized countries. A 2011 survey found that only 57% of American workers use all the vacation days they are entitled to, compared to 89% in France.

Why do Americans work so much more than others? Unlike their counterparts in other industrialized countries, Americans are not legally entitled to paid vacation days; as a result, the average American worker gets fewer of them. Moreover, anecdotal evidence suggests that during the recent recession, with its high rates of unemployment, American workers became more reluctant to use the vacation days they were entitled to.

Equilibrium in the Labor Market

Now that we have discussed the labor supply curve, we can use the supply and demand curves for labor to determine the equilibrium wage and level of employment in the labor market.

Figure 42-3 illustrates the labor market as a whole. The *market labor demand curve*, like the market demand curve for a good, is the horizontal sum of all the individual labor demand curves of all the firms that hire labor. And recall that a price-taking firm's labor demand curve is the same as its value of the marginal product of labor curve.

The equilibrium wage rate is the wage rate at which the quantity of labor supplied is equal to the quantity of labor demanded. In Figure 42-3, this leads to an equilibrium wage rate of W^* and the corresponding equilibrium employment level of L^*. (The equilibrium wage rate is also known as the market wage rate.)

When the Product Market Is Not Perfectly Competitive

When the product market is perfectly competitive, the wage rate is equal to the value of the marginal product of labor at equilibrium. In other market structures this is not the case. For example, in a monopoly, the demand curve for the product faced by the monopolist slopes downward. This means that to sell an additional unit of output, the monopolist must lower the price. As a result, the additional revenue received from selling one more unit for a monopolist is not simply the price like it was for a perfect competitor. It is less than the price by the amount of the *price effect* explained previously—the decreased revenue on units that could have been sold at a higher price if the price hadn't been lowered to sell another unit. How does this affect hiring? To determine its demand for workers, the monopolist must multiply the marginal product of labor by the *marginal revenue* received from selling the additional output. This is called the **marginal revenue product of labor** or ***MRPL***.

(42-1) $MRPL = MPL \times MR$

Table 42-1 shows the calculation of a firm's marginal revenue product of labor.

For a perfectly competitive firm, marginal revenue equals price, so *VMPL* and *MRPL* are equivalent. The two concepts measure the same thing: the value to the firm of hiring an additional worker. The term *MRPL* is a more general term that applies to firms in both perfect competition and imperfect competition. The general rule is that *a profit-maximizing firm in an imperfectly competitive product market employs each factor of production up to the point at which the marginal revenue product of the last unit of the factor employed is equal to that factor's cost.*

The demand curve for labor for a firm operating in an imperfectly competitive product market is the [illegible] It is equal to the marginal product of labor times the marginal revenue received from selling the additional output. The marginal revenue product of land and the marginal revenue product of capital are equivalent concepts.

FIGURE 42-3 Equilibrium in the Labor Market

The market labor demand curve is the horizontal sum of the individual labor demand curves of all producers. Here the equilibrium wage rate is W^*, the equilibrium employment level is L^*, and every producer hires labor up to the point at which $VMPL = W^*$. So labor is paid its equilibrium value of the marginal product, that is, the value of the marginal product of the last worker hired in the labor market as a whole.

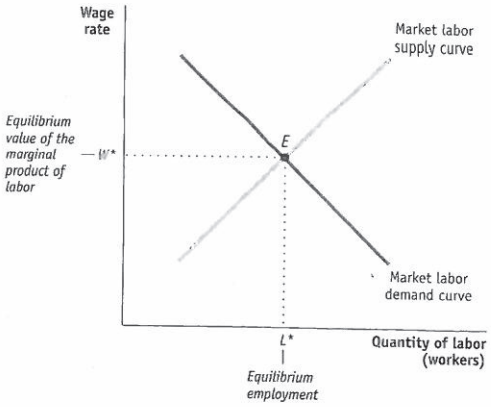


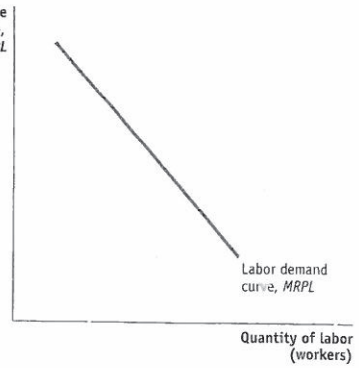
TABLE 42-1

Marginal Revenue Product of Labor with Imperfect Competition in the Product Market

Quantity of labor (L)	Quantity of output (Q)	Marginal product of labor (MPL)	Product price (P)	Total revenue ($TR = P \times Q$)	Marginal revenue ($MR = \Delta TR/\Delta Q$)	Marginal revenue product of labor ($MRPL = MPL \times MR$)
0	0			$0.00		
		10			$10.00	$100.00
1	10		$10.00	100.00		
		9			9.58	86.20
2	19		9.80	186.20		
		8			9.13	73.00
3	27		9.60	259.20		
		7			8.63	60.40
4	34		9.40	319.60		
		6			8.07	48.40
5	40		9.20	368.00		

42-4 Firm Labor Demand with Imperfect Competition

A firm's labor demand curve is the marginal revenue product of labor curve, which differs from the value of the marginal product of labor curve when there is imperfect competition in the product market (as with a monopoly, for example). With perfect competition, the marginal revenue product of labor ($MPL \times MR$) and the value of the marginal product of labor ($MPL \times P$) are the same because $MR = P$.



In the case of a firm operating in an imperfectly competitive product market, the demand curve for a factor is the marginal revenue product curve, as shown in Figure 42-4.

When the Labor Market Is Not Perfectly Competitive

There are also important differences when considering the labor demand curve for a firm in an imperfectly competitive *labor* market rather than in a perfectly competitive labor market. With perfect competition in the labor market, each firm is so small that it can hire as much labor as it wants at the market wage. The firm's hiring decision will not affect the market. In contrast, a firm in an imperfectly competitive labor market is large enough to affect the market wage. A labor market in which there is only one firm hiring labor is called a **monopsony. A monopsonist** is the single buyer of a factor. Perhaps you've seen a small town where one firm, such as a meatpacking company or a lumber mill, hires most of the labor—that's an example of a monopsony. Since the firm already hires most of the available labor in the town, if it wants to hire more workers, it has to offer higher wages to attract them.

A monopsony is a single buyer in a factor market. A market in which there is a monopsonist is a

MODULE

42 Review

Solutions appear at the back of the book.

Check Your Understanding

1. Formerly, Clive was free to work as many or as few hours per week as he wanted. But a new law limits the maximum number of hours he can work per week to 35. Explain under what circumstances, if any, he is made
   a. worse off.
   b. equally well off.
   c. better off.
2. Explain in terms of the income and substitution effects how a fall in Clive's wage rate can induce him to work more hours than before.

Multiple-Choice Questions

1. Which of the following is necessarily true if you work more when your wage rate increases?
   a. The income effect is large.
   b. The substitution effect is small.
   c. The income effect dominates the substitution effect.
   d. The substitution effect dominates the income effect.
   e. The income effect equals the substitution effect.
2. Which of the following will cause you to work more as your wage rate decreases?
   I. the income effect
   II. the substitution effect
   III. a desire for leisure
   a. I only
   b. II only
   c. III only
   d. I and II only
   e. I, II, and III
3. Which of the following will shift the supply curve for labor to the right?
   a. a decrease in the labor force participation rate of women
   b. a decrease in population
   c. an increase in wealth
   d. a decrease in the opportunity cost of leisure
   e. an increase in labor market opportunities for women
4. An increase in the wage rate will
   a. shift the labor supply curve to the right.
   b. shift the labor supply curve to the left.
   c. cause an upward movement along the labor supply curve.
   d. cause a downward movement along the labor supply curve.
   e. have no effect on the quantity of labor supplied.
5. Which of the following statements about the U.S. labor force since World War II is incorrect?
   a. Increases in population have shifted the labor supply curve to the right.
   b. Increases in immigration have shifted the labor supply curve to the right.
   c. Increases in educational opportunities for women have shifted the labor supply curve to the right.
   d. Decreases in work opportunities in foreign markets have shifted the labor supply curve to the right.
   e. Disillusionment with the state of the job market during a recession has shifted the labor supply curve to the left.

Critical-Thinking Questions

1. Draw a correctly labeled graph showing a perfectly competitive labor market in equilibrium. On your graph, label the labor demand curve, the labor supply curve, marginal revenue product of labor, the equilibrium wage (W^*), and the equilibrium quantity of labor (L^*).
2. Then, on the same graph, illustrate how a decrease in the price of the product made by the firm would affect the equilibrium wage and quantity of labor. Label the resulting wage rate W_2 and the resulting quantity of labor L_2.

Alta Gracia: Can Fair Trade Work?

Check out a T-shirt or sweatshirt emblazoned with your school's logo at your campus bookstore, and the odds are very good that it was made by Alta Gracia, the leading supplier of college-logo apparel to American universities. Alta Gracia is owned by Knights Apparel, a company based in Spartanburg, South Carolina, that manufactures apparel in 30 factories around the world. The Alta Gracia factory is located in the Dominican Republic, where 120 employees turn out T-shirts and sweats.

Julian Eaton/Alamy

Workers at Alta Gracia consider themselves lucky because the company pays what it considers a "living wage"—sufficient to feed and shelter a family of four—and allows workers to join a union. Seamstress Santa Castillo, for example, earns $500 a month, three times the average monthly pay of $147 earned by apparel workers in the Dominican Republic, where a loaf of bread costs $1.

Workers at the factory have not always been so fortunate. When the factory was owned by another company, BJ&B, which made baseball caps for Nike and Reebok, workers were paid the prevailing wage and were fired if they complained about working conditions or tried to form a union. Eventually, BJ&B moved its operations to lower-wage Bangladesh, where the minimum wage is 15 cents an hour, compared to 85 cents an hour in the Dominican Republic. In contrast, Alta Gracia pays $2.83 an hour.

Joe Bozich started Knights Apparel in 2000; through scores of deals he has made with universities, his company has surpassed Nike as the number-one college supplier. He works closely with the Worker Rights Consortium, a group of 186 universities that press college-logo apparel manufacturers to improve workers' welfare. The consortium is part of the "Fair Trade Movement," an organization dedicated to improving the welfare of workers in developing countries, principally by raising wages. In 2011, $6.6 billion of Fair Trade–approved goods were sold globally, up 12% from 2010.

Alta Gracia was conceived by Bozich as a model factory to show that an apparel manufacturer could pay its workers a living wage and still succeed when competitors are paying their workers much less. Its production cost for a T-shirt is $4.80—80 cents, or 20%, higher than if it paid minimum wage. Knights Apparel accepts a lower profit margin so it doesn't have to ask retailers to pay a higher wholesale price for its merchandise.

Some observers, though, are skeptical because Alta Gracia merchandise is sold alongside products made by Nike and Adidas, at approximately the same premium price these well-known brands command. "It's a noble effort, but it is an experiment," says Andrew Jassin, an industry analyst. "There are consumers who really care and will buy this apparel at a premium price, and there are those who say they care, but just want value."

Kellie McElhaney, a professor of corporate social responsibility at the University of California at Berkeley, is less skeptical: "A lot of college students would much rather pay for a brand that shows workers are treated well."

Questions for Thought

1. Use the marginal productivity theory of income distribution to explain how the prevailing wage for apparel workers can fall below a living wage in the Dominican Republic.
2. From the point of view of Knights Apparel, what are the pros and cons of paying the Alta Gracia workers a living wage? What are the pros and cons from the point of view of workers generally?
3. What factors does the success or failure of Alta Gracia depend on? What should Knights Apparel do to improve its chances of success?

SECTION 13 REVIEW

Summary

Factor Markets

1. Just as there are markets for goods and services, there are markets for factors of production, including labor, land, and both *physical capital* and *human capital*. These markets determine the **factor distribution of income.**
2. A profit-maximizing, price-taking firm will keep employing more units of a factor until the factor's price is equal to the **value of the marginal product**—the marginal product of the factor multiplied by the price of the output it produces. The **value of the marginal product curve** is therefore the price-taking firm's demand curve for a factor. Factor demand is often referred to as a **derived demand** because it is derived from the demand for the producer's output.
3. The market demand curve for labor is the horizontal sum of the individual demand curves of firms in that market. It shifts for three main reasons: changes in the prices of goods, changes in the supply of other factors, and technological changes.

Marginal Productivity Theory

4. According to the **marginal productivity theory of income distribution,** each factor is paid the value of the marginal product of the last unit of that factor employed in the factor market as a whole—its **equilibrium value of the marginal product.**
5. Large disparities in wages raise questions about the validity of the marginal productivity theory of income distribution. Many disparities can be explained by **compensating differentials** and by differences in talent, job experience, and human capital across workers. Market interference in the forms of **unions** and collective action by employers also creates wage disparities. The **efficiency-wage model,** which arises from a type of market failure, shows how wage disparities can result from employers' attempts to increase worker performance. Free markets tend to diminish discrimination, but discrimination remains a real source of wage disparity. Discrimination is typically maintained either through problems in labor markets or (historically) through institutionalization in government policies.

The Market for Labor

6. Labor supply is the result of decisions about **time allocation,** with each worker facing a trade-off between **leisure** and work. An increase in the hourly wage rate tends to increase work hours via the substitution effect but decrease work hours via the income effect. If the net result is that a worker increases the quantity of labor supplied in response to a higher wage, the **individual labor supply curve** slopes upward. If the net result is that a worker decreases work hours, the individual labor supply curve—unlike supply curves for goods and services—slopes downward.
7. The market labor supply curve is the horizontal sum of the individual labor supply curves of all workers in that market. It shifts for four main reasons: changes in preferences and social norms, changes in population, changes in opportunities, and changes in wealth.
8. When a firm is not a price-taker in a factor market, the firm will consider the **marginal revenue product** when determining how much of a factor to hire. This concept is equivalent to the value of the marginal product in a perfectly competitive market.
9. A **monopsonist** is the single buyer of a factor. A market in which there is a monopsonist is a **monopsony.**

Key Terms

Derived demand, p. 424
Factor distribution of income, p. 424
Value of the marginal product, p. 427
Value of the marginal product curve, p. 428
Marginal productivity theory of income distribution, p. 432
Equilibrium value of the marginal product, p. 432
Compensating differentials, p. 435
Unions, p. 436
Efficiency-wage model, p. 437
Time allocation, p. 441
Leisure, p. 441
Individual labor supply curve, p. 442
Marginal revenue product of labor (*MRPL*), p. 445
Monopsony, p. 446
Monopsonist, p. 446