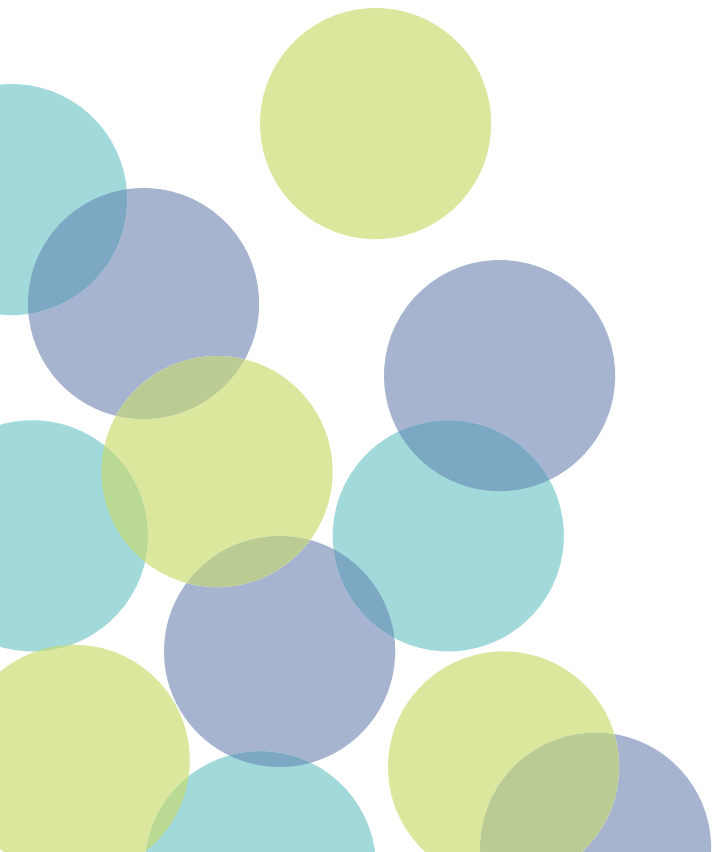
PART THREE WEB

Resource Markets



WEB CHAPTER A

Wage Determination

After reading this chapter, you should be able to:

1. Explain why the firm's marginal revenue product curve is its labor demand curve.
2. List the factors that increase or decrease labor demand.
3. Discuss the determinants of elasticity of labor demand.
4. Demonstrate how wage rates are determined in competitive and monopsonistic labor markets.
5. Show how unions increase wage rates and how minimum wage laws affect labor markets.
6. Identify the major causes of wage differentials.

We now turn from the pricing and production of *goods and services* to the pricing and employment of *resources*. Although firms come in various sizes and operate under highly different market conditions, each has a demand for productive resources. They obtain those resources from households—the direct or indirect owners of land, labor, capital, and entrepreneurial resources. So, referring to the circular flow diagram (Figure 2.2, page 41), we shift our attention from the bottom loop (where businesses supply products that households demand) to the top loop (where businesses demand resources that households supply).

A Focus on Labor

The basic principles we develop in this chapter apply to land, labor, and capital resources, but we will emphasize the pricing and employment of labor. About 70 percent of all income in the United States flows to households in the form of wages and salaries. More than 140 million of us go to work each day in the United States. We have an amazing variety of jobs with thousands of different employers and receive large differences in pay. What determines our hourly wage or annual salary? Why is the salary of, say, a topflight major-league baseball player $15 million or more a year, whereas the pay for a first-rate schoolteacher is $50,000? Why are starting salaries for college graduates who major in engineering and accounting so much higher than those for graduates majoring in journalism and sociology?

Demand and supply analysis helps us answer these questions. We begin by examining labor demand and labor supply in a **purely competitive labor market.** In such a market,

- Numerous employers compete with one another in hiring a specific type of labor.
- Each of many workers with identical skills supplies that type of labor.
- Individual employers and individual workers are "wage takers" because neither can control the market wage rate.

purely competitive labor market
A labor market in which a large number of similarly qualified workers independently offer their labor services to a large number of employers, none of whom can set the wage rate.

Labor Demand

Labor demand is the starting point for any discussion of wages and salaries. Labor demand is a schedule or a curve showing the amounts of labor that buyers are willing and able to purchase at various price levels (hourly wages) over some period of time. As with all resources, labor demand is a **derived demand**, meaning that the demand for labor is derived from the demand for the products that labor helps to produce. This is true because labor resources usually do not directly satisfy customer wants but do so indirectly through their use in producing goods and services. Almost nobody wants to directly consume the labor services of a software engineer, but millions of people do want to use the software that the engineer helps create.

derived demand
The demand for a resource that results from the demand for the products it helps produce.

Marginal Revenue Product

Because resource demand is derived from product demand, the strength of the demand will depend on the productivity of the labor—its ability to produce goods and services—and the price of the good or service it helps produce. Other things equal, a resource that is highly productive in turning out a highly valued commodity will be in great demand. In contrast, a relatively unproductive resource that is capable of producing only a minimally valued commodity will be in little demand. And no demand whatsoever will exist for a resource that is phenomenally efficient in producing something that no one wants to buy.

Consider the table in Figure A.1, which shows the roles of marginal productivity and product price in determining labor demand.

Productivity Columns 1 and 2 give the number of units of labor employed and the resulting total product (output). Column 3 provides the marginal product (MP), or additional output, resulting from using each additional unit of labor. Columns 1 through 3 remind us that the law of diminishing returns applies here, causing the

FIGURE A.1
The purely competitive seller's demand for labor. The MRP-of-labor curve is the labor demand curve; each of its points relates a particular wage rate (= MRP when profit is maximized) with a corresponding quantity of labor demanded. The downward slope of the D = MRP curve results from the law of diminishing marginal returns.

(1) Units of Labor	(2) Total Product (Output)	(3) Marginal Product (MP)	(4) Product Price	(5) Total Revenue, (2) × (4)	(6) Marginal Revenue Product (MRP)
0	0		$2	$ 0	
		7			$14
1	7		2	14	
		6			12
2	13		2	26	
		5			10
3	18		2	36	
		4			8
4	22		2	44	
		3			6
5	25		2	50	
		2			4
6	27		2	54	
		1			2
7	28		2	56	

marginal product of labor to fall beyond some point. For simplicity, we assume that these diminishing marginal returns—these declines in marginal product—begin with the second worker hired.

Product Price The derived demand for labor depends also on the market value (product price) of the good or service. Column 4 in the table in Figure A.1 adds this price information to the mix. Because we are assuming a competitive product market, product price equals marginal revenue. The firm is a price taker and can sell units of output only at this market price. And this price will also be the firm's marginal revenue. In this case, both price and marginal revenue are a constant $2.

WORKED PROBLEMS
W A.1
Labor demand

marginal revenue product (MRP)
The change in a firm's total revenue when it employs 1 more unit of labor.

Multiplying column 2 by column 4 provides the total-revenue data of column 5. These are the amounts of revenue the firm realizes from the various levels of employment. From these total-revenue data we can compute the **marginal revenue product (MRP)**

of labor—the change in total revenue resulting from the use of each additional unit of labor. In equation form,

$$\text{Marginal revenue product} = \frac{\text{change in total revenue}}{\text{unit change in labor}}$$

The MRPs are listed in column 6 in the table.

Rule for Employing Labor: MRP = MRC

The MRP schedule, shown as columns 1 and 6, is the firm's demand schedule for labor. To understand why, you must first know the rule that guides a profit-seeking firm in hiring any resource: To maximize profit, a firm should hire additional units of labor as long as each successive unit adds more to the firm's total revenue than to the firm's total cost.

Economists use special terms to designate what each additional unit of labor (or any other variable resource) adds to total revenue and what it adds to total cost. We have seen that MRP measures how much each successive unit of labor adds to total revenue. The amount that each additional unit of labor adds to the firm's total cost is called its **marginal resource cost (MRC).** In equation form,

$$\text{Marginal resource cost} = \frac{\text{change in total (labor) cost}}{\text{unit change in labor}}$$

marginal resource cost (MRC)
The change in a firm's total cost when it employs 1 more unit of labor.

So we can restate our rule for hiring resources as follows: It will be profitable for a firm to hire additional units of labor up to the point at which labor's MRP is equal to its MRC. If the number of workers a firm is currently hiring is such that the MRP of the last worker exceeds his or her MRC, the firm can profit by hiring more workers. But if the number being hired is such that the MRC of the last worker exceeds his or her MRP, the firm is hiring workers who are not "paying their way" and it can increase its profit by discharging some workers. You may have recognized that this **MRP = MRC rule** is similar to the MR = MC profit-maximizing rule employed throughout our discussion of price and output determination. The rationale of the two rules is the same, but the point of reference is now *inputs* of a resource, not *outputs* of a product.

MRP = MRC rule
The principle that to maximize profit a firm should expand employment until the marginal revenue product (MRP) of labor equals the marginal resource cost (MRC) of labor.

MRP as Labor Demand Schedule

In a competitive labor market, market supply and market demand establish the wage rate. Because each firm hires such a small fraction of the market supply of labor, an individual firm cannot influence the market wage rate; it is a wage taker, not a wage maker. This means that for each additional unit of labor hired, each firm's total labor cost increases by exactly the amount of the constant market wage rate. More specifically, the MRC of labor exactly equals the market wage rate. Thus, resource "price" (the market wage rate) and resource "cost" (marginal resource cost) are equal for a firm that hires labor in a competitive labor market. As a result, the MRP = MRC rule tells us that a competitive firm will hire units of labor up to the point at which the market *wage rate* (its MRC) is equal to its MRP.

In terms of the data in columns 1 and 6 of Figure A.1's table, if the market wage rate is, say, $13.95, the firm will hire only one worker. This is the outcome because only the hiring of the first worker results in an increase in profits. To see this, note that for

the first worker, MRP (= $14) exceeds MRC (= $13.95). Thus, hiring the first worker is profitable. For each successive worker, however, MRC (= $13.95) exceeds MRP (= $12 or less), indicating that it will not be profitable to hire any of those workers. If the wage rate is $11.95, by the same reasoning we discover that it will pay the firm to hire both the first and second workers. Similarly, if the wage rate is $9.95, three will be hired; if it is $7.95, four; if it is $5.95, five; and so forth. *The MRP schedule therefore constitutes the firm's demand for labor because each point on this schedule (or curve) indicates the quantity of labor units the firm would hire at each possible wage rate*. In the graph in Figure A.1, we show the D = MRP curve based on the data in the table. The competitive firm's labor demand curve identifies an inverse relationship between the wage rate and the quantity of labor demanded, other things equal. The curve slopes downward because of diminishing marginal returns.[1]

Market Demand for Labor

We have now explained the individual firm's demand curve for labor. Recall that the total, or market, demand curve for a *product* is found by summing horizontally the demand curves of all individual buyers in the market. The market demand curve for a particular *resource* is derived in essentially the same way. Economists sum horizontally the individual labor demand curves of all firms hiring a particular kind of labor to obtain the market demand for that labor.

Changes in Labor Demand

What will alter the demand for labor (shift the labor demand curve)? The fact that labor demand is derived from *product demand* and depends on *resource productivity* suggests two "resource demand shifters." Also, our analysis of how changes in the prices of other products can shift a product's demand curve (Chapter 3) suggests another factor: changes in the *prices of other resources*.

Changes in Product Demand

Other things equal, an increase in the demand for a product will increase the demand for a resource used in its production, whereas a decrease in product demand will decrease the demand for that resource.

Let's see how this works. The first thing to recall is that a change in the demand for a product will normally change its price. In the table in Figure A.1, let's assume that an increase in product demand boosts product price from $2 to $3. You should calculate the new labor demand schedule (columns 1 and 6) that would result, and plot it in the graph to verify that the new labor demand curve lies to the right of the old demand curve. Similarly, a decline in the product demand (and price) will shift the labor demand curve to the left. The fact that labor demand changes along with product demand demonstrates that labor demand is derived from product demand.

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[1]Note that we plot the points in Figure A.1 halfway between succeeding numbers of labor units. For example, we plot the MRP of the second unit ($12) not at 1 or 2 but at 1½. This "smoothing" enables us to sketch a continuously downsloping curve rather than one that moves downward in discrete steps as each new unit of labor is hired.

Example: With no offsetting change in supply, a decrease in the demand for new houses will drive down house prices. Those lower prices will decrease the MRP of construction workers, and therefore the demand for construction workers will fall. The labor demand curve will shift to the left.

Changes in Productivity

Other things equal, an increase in the productivity of a resource will increase the demand for the resource and a decrease in productivity will reduce the demand for the resource. If we doubled the MP data of column 3 in the table in Figure A.1, the MRP data of column 6 also would double, indicating a rightward shift of the labor demand curve in the graph.

The productivity of any resource may be altered over the long run in several ways:

- ***Quantities of other resources*** The marginal productivity of any resource will vary with the quantities of the other resources used with it. The greater the amount of capital and land resources used with labor, the greater will be labor's marginal productivity and, thus, labor demand.
- ***Technological advance*** Technological improvements that increase the quality of other resources, such as capital, have the same effect. The better the *quality* of capital, the greater the productivity of labor used with it. Dockworkers employed with a specific amount of capital in the form of unloading cranes are more productive than dockworkers with the same amount of capital embodied in older conveyor-belt systems.
- ***Quality of labor*** Improvements in the quality of labor will increase its marginal productivity and therefore its demand. In effect, there will be a new demand curve for a different, more skilled, kind of labor.

Changes in the Prices of Other Resources

Changes in the prices of other resources may change the demand for labor.

Substitute Resources Suppose that labor and capital are substitutable in a certain production process. A firm can produce some specific amount of output using a relatively small amount of labor and a relatively large amount of capital, or vice versa. What happens if the price of machinery (capital) falls? The effect on the demand for labor will be the net result of two opposed effects: the substitution effect and the output effect.

- ***Substitution effect*** The decline in the price of machinery prompts the firm to substitute machinery for labor. This allows the firm to produce its output at lower cost. So at the fixed wage rate, smaller quantities of labor are now employed. This **substitution effect** decreases the demand for labor. More generally, the substitution effect indicates that a firm will purchase more of an input whose relative price has declined and, conversely, use less of an input whose relative price has increased.
- ***Output effect*** Because the price of machinery has declined, the costs of producing various outputs also must decline. With lower costs, the firm can profitably produce and sell a greater output. The greater output increases the demand for all resources, including labor. So this **output effect** increases the demand for labor. More generally, the output effect means that the firm will purchase more of one

substitution effect
The replacement of labor by capital when the price of capital falls.

output effect
An increase in the use of labor that occurs when a decline in the price of capital reduces a firm's production costs and therefore enables it to sell more output.

particular input when the price of the other input falls and less of that particular input when the price of the other input rises.

- ***Net effect*** The substitution and output effects are both present when the price of an input changes, but they work in opposite directions. For a decline in the price of capital, the substitution effect decreases the demand for labor and the output effect increases it. The net change in labor demand depends on the relative sizes of the two effects: If the substitution effect outweighs the output effect, a decrease in the price of capital decreases the demand for labor. If the output effect exceeds the substitution effect, a decrease in the price of capital increases the demand for labor.

Complementary Resources Resources may be complements rather than substitutes in the production process; an increase in the quantity of one of them also requires an increase in the amount of the other used, and vice versa. Suppose a small design firm does computer-assisted design (CAD) with relatively expensive personal computers as its basic piece of capital equipment. Each computer requires exactly one design engineer to operate it; the machine is not automated—it will not run itself—and a second engineer would have nothing to do.

Now assume that these computers substantially decline in price. There can be no substitution effect because labor and capital must be used in *fixed proportions:* one person for one machine. Capital cannot be substituted for labor. But there *is* an output effect. Other things equal, the reduction in the price of capital goods means lower production costs. It will therefore be profitable to produce a larger output. In doing so, the firm will use both more capital and more labor. When labor and capital are complementary, a decline in the price of capital increases the demand for labor through the output effect.

We have cast our analysis of substitute resources and complementary resources mainly in terms of a decline in the price of capital. Obviously, an *increase* in the price of capital causes the opposite effects on labor demand.

Photo Op Substitute Resources versus Complementary Resources

Automatic teller machines (ATMs) and human tellers are substitute resources, whereas construction equipment and their operators are complementary resources.

Occupational Employment Trends

Changes in labor demand are of considerable significance because they affect employment in specific occupations. Other things equal, increases in labor demand for certain occupational groups result in increases in their employment; decreases in labor demand result in decreases in their employment. For illustration, let's look at occupations that are growing and declining in demand.

Table A.1 lists the 10 fastest-growing and 10 most rapidly declining U.S. occupations (in percentage terms) for 2010–2020, as projected by the Bureau of Labor Statistics. Notice that service occupations dominate the fastest-growing list. In general, the demand for service workers is rapidly outpacing the demand for manufacturing, construction, and mining workers in the United States.

TABLE A.1

The 10 Fastest-Growing and Most Rapidly Declining U.S. Occupations, in Percentage Terms, 2010–2020

Occupation	Employment, Thousands of Jobs		Percentage Change*
	2010	2020	
Fastest Growing			
Personal and home care aides	1878	3192	70
Biomedical engineers	16	25	62
Veterinary technologists and technicians	80	122	52
Reinforcing iron and rebar workers	19	28	49
Physical therapist assistants and aides	114	166	45
Meeting, convention, and event planners	72	103	44
Diagnostic medical sonographers	54	77	44
Glaziers	42	60	42
Interpreters and translators	58	83	42
Occupational therapy assistants and aides	36	51	41
Most Rapidly Declining			
Postal service workers	524	386	−26
Sewing machine operators	163	121	−26
Switchboard operators	143	109	−23
Textile knitting and weaving machine setters	23	18	−18
Semiconductor processors	21	17	−18
Prepress technicians and workers	51	43	−16
Petroleum pump system and refinery operators	44	38	−14
Textile winding, twisting, and drawing out machine workers	29	25	−12
Chemical plant and system operators	43	38	−12
Word processors and typists	115	102	−12

* Percentages may not correspond with employment numbers due to rounding of the employment data and the percentages.

Source: Bureau of Labor Statistics, "Employment Projections," **www.bls.gov.**

Of the 10 fastest-growing occupations in percentage terms, over half of the new jobs projected are related to health care services, research, and medical technology. The rising demands for these types of labor are derived from the growing demand for health services, caused by several factors. The aging of the U.S. population has brought with it more medical problems, rising incomes have led to greater expenditures on health care, and the growing presence of private and public insurance has allowed people to buy more health care than most could afford individually.

Table A.1 also lists the 10 U.S. occupations with the greatest projected job loss (in percentage terms) between 2010 and 2020. These occupations are more diverse than the fastest-growing occupations. Several of the occupations owe their declines mainly to "labor-saving" technological change. For example, automated or computerized equipment has greatly reduced the need for postal workers, switchboard operators, and various machine operators.

Three of the occupations in the declining-employment list are related to textiles and apparel. The U.S. demand for these goods is increasingly being filled through imports. Those jobs are therefore rapidly disappearing in the United States.

Question:
Name some occupation (other than those listed) that you think will grow in demand over the next decade. Name an occupation that you think will decline in demand. In each case, explain your reasoning.

Elasticity of Labor Demand

The employment changes we have just discussed have resulted from shifts in the locations of labor demand curves. Such changes in demand must be distinguished from changes in the quantity of labor demanded caused by a change in the wage rate. Such a change is caused not by a shift of the demand curve but, rather, by a movement from one point to another on a fixed labor demand curve. Example: In Figure A.1 we note that an increase in the wage rate from $5 to $7 will reduce the quantity of labor demanded from 5 units to 4 units. This is a change in the *quantity of labor demanded* as distinct from a *change in the demand for labor*.

elasticity of labor demand
A measure of the responsiveness of labor quantity to a change in the wage rate.

The sensitivity of labor quantity to changes in wage rates along a fixed labor demand curve is measured by the **elasticity of labor demand** (or *wage elasticity of demand*). In coefficient form,

$$E_w = \frac{\text{percentage change in labor quantity demanded}}{\text{percentage change in wage rate}}$$

When E_w is greater than 1, labor demand is elastic; when E_w is less than 1, labor demand is inelastic; and when E_w equals 1, labor demand is unit-elastic. Several factors interact to determine the wage elasticity of demand.

ORIGIN OF THE IDEA
O A.1
Elasticity of resource demand

Ease of Resource Substitutability

The greater the substitutability of other resources for labor, the more elastic is the demand for labor. As an example, the high degree to which computerized voice

recognition systems are substitutable for human beings implies that the demand for human beings answering phone calls at call centers is quite elastic. In contrast, there are few good substitutes for physicians, so demand for them is less elastic or even inelastic.

Time can play a role in the input substitution process. For example, a firm's truck drivers may obtain a substantial wage increase with little or no immediate decline in employment. But over time, as the firm's trucks wear out and are replaced, that wage increase may motivate the company to purchase larger trucks and in that way deliver the same total output with fewer drivers.

Elasticity of Product Demand

The greater the elasticity of product demand, the greater is the elasticity of labor demand. The derived nature of resource demand leads us to expect this relationship. A small rise in the price of a product (caused by a wage increase) will sharply reduce output if product demand is elastic. So a relatively large decline in the amount of labor demanded will result. This means that the demand for labor is elastic.

Ratio of Labor Cost to Total Cost

The larger the proportion of total production costs accounted for by labor, the greater is the elasticity of demand for labor. In the extreme, if labor cost is the only production cost, then a 20 percent increase in wage rates will increase marginal cost and average total cost by 20 percent. If product demand is elastic, this substantial increase in costs will cause a relatively large decline in sales and a sharp decline in the amount of labor demanded. So labor demand is highly elastic. But if labor cost is only 50 percent of production cost, then a 20 percent increase in wage rates will increase costs by only 10 percent. With the same elasticity of product demand, this will cause a relatively small decline in sales and therefore in the amount of labor demanded. In this case the demand for labor is much less elastic.

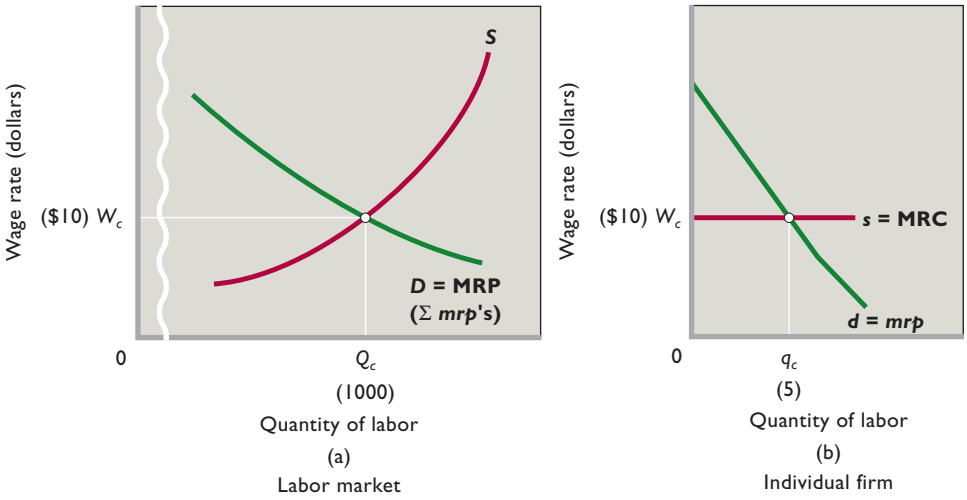
Market Supply of Labor

Let's now turn to the supply side of a purely competitive labor market. The supply curve for each type of labor slopes upward, indicating that employers as a group must pay higher wage rates to obtain more workers. Employers must do this to bid workers away from other industries, occupations, and localities. Within limits, workers have alternative job opportunities. For example, they may work in other industries in the same locality, or they may work in their present occupations in different cities or states, or they may work in other occupations.

Firms that want to hire these workers must pay higher wage rates to attract them away from the alternative job opportunities available to them. They also must pay higher wages to induce people who are not currently in the labor force—who are perhaps doing household activities or enjoying leisure—to seek employment. In short, assuming that wages are constant in other labor markets, higher wages in a particular labor market entice more workers to offer their labor services in that market. This fact results in a direct relationship between the wage rate and the quantity of labor supplied, as represented by the upward-sloping market supply-of-labor curve *S* in Figure A.2a.

FIGURE A.2

A purely competitive labor market. In a purely competitive labor market (a), market labor supply *S* and market labor demand *D* determine the equilibrium wage rate W_c and the equilibrium number of workers Q_c. Each individual competitive firm (b) takes this competitive wage W_c as given. Thus, the individual firm's labor supply curve *s* = MRC is perfectly elastic at the going wage W_c. Its labor demand curve, *d*, is its MRP curve (here labeled *mrp*). The firm maximizes its profit by hiring workers up to the point where MRP = MRC.



Wage and Employment Determination

What determines the market wage rate and how do firms respond to it? Suppose 200 firms demand a particular type of labor, say, carpenters. These firms need not be in the same industry; industries are defined according to the products they produce and not the resources they employ. Thus, firms producing wood-framed furniture, wood windows and doors, houses and apartment buildings, and wood cabinets will demand carpenters. To find the total, or market, labor demand curve for a particular labor service, we sum horizontally the labor demand curves (the marginal revenue product curves) of the individual firms, as indicated in Figure A.2. The horizontal summing of the 200 labor demand curves like *d* in Figure A.2b yields the market labor demand curve *D* in Figure A.2a.

The intersection of the market labor demand curve *D* and the market labor supply curve *S* in Figure A.2a determines the equilibrium wage rate and the level of employment in this purely competitive labor market. Observe that the equilibrium wage rate is W_c ($10) and the number of workers hired is Q_c (1000).

To the individual firm (Figure A.2b) the market wage rate W_c is given at $10. Each of the many firms employs such a small fraction of the total available supply of this type of labor that no single firm can influence the wage rate. As shown by the horizontal line *s* in Figure A.2b, the supply of labor faced by an individual firm is perfectly elastic. It can hire as many or as few workers as it wants to at the market wage rate. This fact is clarified in Table A.2, where we see that the marginal cost of labor MRC is constant at $10 and is equal to the wage rate. Each additional unit of labor employed adds precisely its own wage rate (here, $10) to the firm's total resource cost.

Each individual firm will apply the MRP = MRC rule to determine its profit-maximizing level of employment. So the competitive firm maximizes its profit by

TABLE A.2
The Supply of Labor: Pure Competition in the Hiring of Labor

(1) Units of Labor	(2) Wage Rate	(3) Total Labor Cost (Wage Bill)	(4) Marginal Resource (Labor) Cost
0	$10	$ 0	
			$10
1	10	10	
			10
2	10	20	
			10
3	10	30	
			10
4	10	40	
			10
5	10	50	
			10
6	10	60	

hiring units of labor to the point at which its wage rate (= MRC) equals MRP. In Figure A.2b the employer will hire q_c (5) units of labor, paying each worker the market wage rate W_c ($10). The other 199 firms (not shown) in this labor market will also each employ 5 workers and pay $10 per hour. The workers will receive pay based on their contribution to the firm's output and thus revenues.

INTERACTIVE GRAPHS
G A.1
Competitive labor market

Monopsony

In the purely competitive labor market, each firm can hire as little or as much labor as it needs at the market wage rate, as reflected in its horizontal labor supply curve. The situation is strikingly different when the labor market is a **monopsony**, a market structure in which there is only a single buyer. Labor market monopsony has the following characteristics:

monopsony
A market structure in which only a single buyer of a good, service, or resource is present.

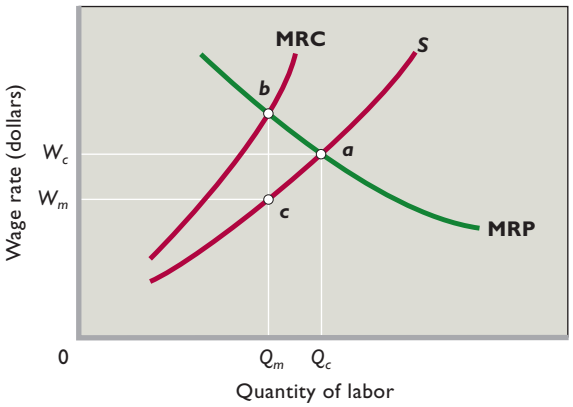
- There is only a single buyer of a particular type of labor.
- The workers providing this type of labor have few employment options other than working for the monopsony either because they are geographically immobile or because finding alternative employment would mean having to acquire new skills.
- The firm is a "wage maker" because the wage rate it must pay varies directly with the number of workers it employs.

ORIGIN OF THE IDEA
O A.2
Monopsony

As is true of monopoly power, there are various degrees of monopsony power. In *pure* monopsony, such power is at its maximum because only a single employer hires labor in the labor market. The best real-world examples are probably the labor markets in towns that depend almost entirely on one major firm. For example, a silver-mining company may be almost the only source of employment in a remote Idaho town. A Wisconsin paper mill, a Colorado ski resort, or an Iowa food processor may provide most of the employment in its locale. In other cases, three or four firms may each hire a large portion of the supply of labor in a certain market and therefore have some monopsony power. Moreover, if they illegally act in concert in hiring labor, they greatly enhance their monopsony power.

FIGURE A.3

Monopsony. In a monopsonistic labor market, the employer's marginal resource (labor) cost curve (MRC) lies above the labor supply curve *S*. Equating MRC with MRP at point *b*, the monopsonist hires Q_m workers (compared with Q_c under competition). As indicated by point *c* on *S*, it pays only wage rate W_m (compared with the competitive wage W_c).



Upward-Sloping Labor Supply to Firm

When a firm hires most of the available supply of a certain type of labor, its decision to employ more or fewer workers affects the wage rate it pays to those workers. Specifically, if a firm is large in relation to the size of the labor market, it will have to pay a higher wage rate to obtain more labor. Suppose that there is only one employer of a particular type of labor in a certain geographic area. In this pure monopsony situation, the labor supply curve for the *firm* and the total labor supply curve for the *labor market* are identical. The monopsonist's supply curve—represented by curve *S* in Figure A.3—is upsloping because the firm must pay higher wage rates if it wants to attract and hire additional workers. This same curve is also the monopsonist's average-cost-of-labor curve. Each point on curve *S* indicates the wage rate (cost) per worker that must be paid to attract the corresponding number of workers.

MRC Higher Than the Wage Rate

When a monopsonist pays a higher wage to attract an additional worker, it must pay that higher wage not only to the additional worker, but to all the workers it is currently employing at a lower wage. If not, labor morale will deteriorate and the employer will be plagued with labor unrest because of wage-rate differences existing for the same job. Paying a uniform wage to all workers means that the cost of an extra worker—the marginal resource (labor) cost (MRC)—is the sum of that worker's wage rate and the amount necessary to bring the wage rate of all current workers up to the new wage level.

Table A.3 illustrates this point. One worker can be hired at a wage rate of \$6. But hiring a second worker forces the firm to pay a higher wage rate of \$7. The marginal resource cost of the second worker is \$8—the \$7 paid to the second worker plus a \$1 raise for the first worker. From another viewpoint, total labor cost is now \$14 (= 2 × \$7), up from \$6 (= 1 × \$6). So the MRC of the second worker is \$8 (= \$14 − \$6), not just the \$7 wage rate paid to that

WORKED PROBLEMS

W A.2
Labor markets: competition and monopsony

TABLE A.3
The Supply of Labor: Monopsony in the Hiring of Labor

(1) Units of Labor	(2) Wage Rate	(3) Total Labor Cost (Wage Bill)	(4) Marginal Resource (Labor) Cost
0	$ 5	$ 0	
			$ 6
1	6	6	
			8
2	7	14	
			10
3	8	24	
			12
4	9	36	
			14
5	10	50	
			16
6	11	66	

worker. Similarly, the marginal labor cost of the third worker is $10—the $8 that must be paid to attract this worker from alternative employment plus $1 raises, from $7 to $8, for the first two workers.

Here is the key point: Because the monopsonist is the only employer in the labor market, its marginal resource (labor) cost exceeds the wage rate. Graphically, the monopsonist's MRC curve lies above the average-cost-of-labor curve, or labor supply curve *S*, as is clearly shown in Figure A.3.

Equilibrium Wage and Employment

How many units of labor will the monopsonist hire, and what wage rate will it pay? To maximize profit, the monopsonist will employ the quantity of labor Q_m in Figure A.3 because at that quantity MRC and MRP are equal (point *b*). The monopsonist next determines how much it must pay to attract these Q_m workers. From the supply curve *S*, specifically point *c*, it sees that it must pay wage rate W_m. Clearly, it need not pay a wage equal to MRP; it can attract and hire exactly the number of workers it wants (Q_m) with wage rate W_m. And that is the wage that it will pay.

Contrast these results with those that would prevail in a competitive labor market. With competition in the hiring of labor, the level of employment would be greater (at Q_c) and the wage rate would be higher (at W_c). Other things equal, the monopsonist maximizes its profit by hiring a smaller number of workers and thereby paying a less-than-competitive wage rate. Society obtains a smaller output, and workers get a wage rate that is less by *bc* than their marginal revenue product.

INTERACTIVE GRAPHS
G A.2
Monopsony

Monopsony Power

Applying the Analysis

Fortunately, monopsonistic labor markets are uncommon in the United States. In most labor markets, several potential employers compete for most workers, particularly for workers who are occupationally and geographically mobile. Also, where monopsony labor market outcomes might have otherwise occurred, unions

have often sprung up to counteract that power by forcing firms to negotiate wages. Nevertheless, economists have found some evidence of monopsony power in such diverse labor markets as the markets for nurses, professional athletes, public school teachers, newspaper employees, and some building-trade workers.

In the case of nurses, the major employers in most locales are a relatively small number of hospitals. Further, the highly specialized skills of nurses are not readily transferable to other occupations. It has been found, in accordance with the monopsony model, that, other things equal, the smaller the number of hospitals in a town or city (that is, the greater the degree of monopsony), the lower the beginning salaries of nurses.

Professional sports leagues also provide a good example of monopsony, particularly as it relates to the pay of first-year players. The National Football League, the National Basketball Association, and Major League Baseball assign first-year players to teams through "player drafts." That device prohibits other teams from competing for a player's services, at least for several years, until the player becomes a "free agent." In this way each league exercises monopsony power, which results in lower salaries than would occur under competitive conditions.

Question:
The salaries of star players often increase substantially when they become free agents. How does that fact relate to monopsony power?

Union Models

Our assumption thus far has been that workers compete with one another in selling their labor services. In some labor markets, however, workers unionize and sell their labor services collectively. In the United States, about 12 percent of wage and salary workers belong to unions. (As shown in Global Snapshot A.1, this percentage is low relative to some other nations.)

Union efforts to raise wage rates are mainly concentrated on the supply side of the labor market.

Exclusive or Craft Union Model

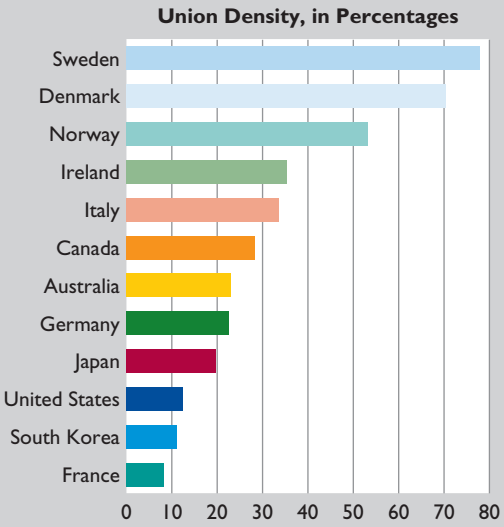
Unions can boost wage rates by reducing the supply of labor, and over the years organized labor has favored policies to do just that. For example, labor unions have supported legislation that has (1) restricted permanent immigration, (2) reduced child labor, (3) encouraged compulsory retirement, and (4) enforced a shorter workweek.

Moreover, certain types of workers have adopted techniques designed to restrict the number of workers who can join their union. This is especially true of *craft unions*, whose members possess a particular skill, such as carpenters or brick masons or plumbers. Craft unions have frequently forced employers to agree to hire only union members, thereby gaining virtually complete control of the labor supply. Then, by following restrictive membership policies—for example, long apprenticeships, very high initiation fees, and limits on the number of new members admitted—they have artificially restricted labor supply. As indicated in Figure A.4, such practices result in

Union Density, Selected Nations

Global Snapshot A.1

The percentage of workers unionized varies considerably across countries, but sometimes this is due to differences in international practices, including some nations' legal restrictions preventing unionization in certain occupations. To adjust for these differences, alternative measures such as "union density," the rate of "actual" to "potential" membership, are used. Compared with most other industrialized nations, the percentage of potential wage and salary earners belonging to unions in the United States is small.



Source: U.S. Bureau of Labor Statistics, *Union Membership Statistics in 24 Countries*, 2006, **www.bls.gov**.

higher wage rates and constitute what is called **exclusive unionism.** By excluding workers from unions and therefore from the labor supply, craft unions succeed in elevating wage rates.

exclusive unionism
The union practice of restricting the supply of skilled union labor to increase the wage rate received by union members.

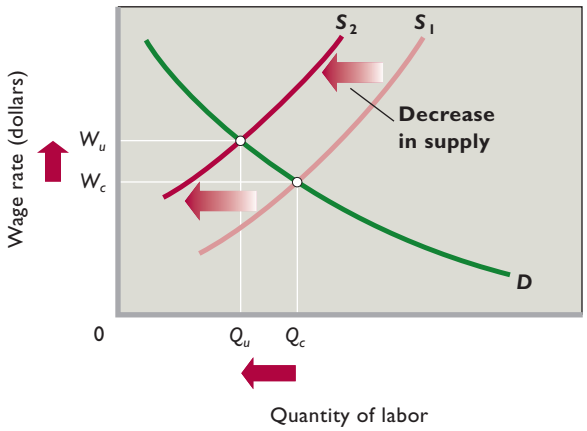


FIGURE A.4
Exclusive or craft unionism. By reducing the supply of labor (say, from S_1 to S_2) through the use of restrictive membership policies, exclusive unions achieve higher wage rates (W_c to W_u). However, restriction of the labor supply also reduces the number of workers employed (Q_c to Q_u).

This craft union model is also applicable to many professional organizations, such as the American Medical Association, the National Education Association, the American Bar Association, and hundreds of others. Such groups seek to prohibit competition for their services from less-qualified labor suppliers. One way to accomplish that is through **occupational licensing.** Here, a group of workers in a given occupation pressure federal, state, or municipal government to pass a law that says that some occupational group (for example, barbers, physicians, lawyers, plumbers, cosmetologists, egg graders, pest controllers) can practice their trade only if they meet certain requirements. Those requirements might include level of education, amount of work experience, and the passing of an examination. Members of the licensed occupation typically dominate the licensing board that administers such laws. The result is self-regulation, which can lead to policies that restrict entry to the occupation and reduce labor supply.

occupational licensing Government laws that require a worker to satisfy certain specified requirements and obtain a license from a licensing board before engaging in a particular occupation.

The expressed purpose of licensing is to protect consumers from incompetent practitioners—surely a worthy goal. But such licensing, if abused, simply results in above-competitive wages and earnings for those in the licensed occupation (Figure A.4). Moreover, licensing requirements often include a residency requirement, which inhibits the interstate movement of qualified workers. Some 600 occupations are now licensed in the United States.

Inclusive or Industrial Union Model

Instead of trying to limit their membership, however, most unions seek to organize all available workers. This is especially true of the *industrial unions*, such as those of the automobile workers and steelworkers. Such unions seek as members all available unskilled, semiskilled, and skilled workers in an industry. It makes sense for a union to be exclusive when its members are skilled craft workers for whom the employer has few substitutes. But it does not make sense for a union to be exclusive when trying to organize unskilled and semiskilled workers. To break a strike, employers could then easily substitute unskilled or semiskilled nonunion workers for the unskilled or semiskilled union workers.

By contrast, an industrial union that includes virtually all available workers in its membership can put firms under great pressure to agree to its wage demands. Because of its legal right to strike, such a union can threaten to deprive firms of their entire labor supply. And an actual strike can do just that. Further, with virtually all available workers in the union, it will be difficult in the short run for new nonunion firms to emerge and thereby undermine what the union is demanding from existing firms.

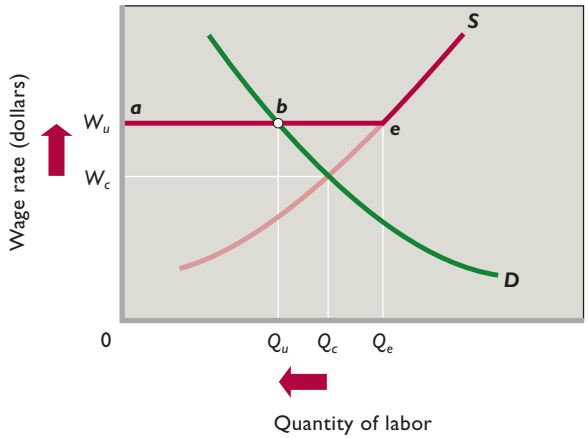
inclusive unionism The union practice of including as members all workers employed in an industry.

We illustrate such **inclusive unionism** in Figure A.5. Initially, the competitive equilibrium wage rate is W_c and the level of employment is Q_c. Now suppose an industrial union is formed that demands a higher, above-equilibrium wage rate of, say, W_u. That wage rate W_u would create a perfectly elastic labor supply over the range ae in Figure A.5. If firms wanted to hire any workers in this range, they would have to pay the union-imposed wage rate. If they decide against meeting this wage demand, the union will supply no labor at all, and the firms will be faced with a strike. If firms decide it is better to pay the higher wage rate than to suffer a strike, they will cut back on employment from Q_c to Q_u.

By agreeing to the union's W_u wage demand, individual employers become wage takers at the union wage rate W_u. Because labor supply is perfectly elastic over range ae, the marginal resource (labor) cost is equal to the union wage rate W_u over this range. The Q_u level of employment is the result of employers' equating this MRC (now equal to the union wage rate) with MRP, according to our profit-maximizing rule.

FIGURE A.5

Inclusive or industrial unionism. By organizing virtually all available workers in order to control the supply of labor, inclusive industrial unions may impose a wage rate, such as W_u, that is above the competitive wage rate W_c. In effect, this changes the labor supply curve from S to aeS. At wage rate W_u, employers will cut employment from Q_c to Q_u.



Note from point e on labor supply curve S that Q_e workers desire employment at wage W_u. But as indicated by point b on labor demand curve D, only Q_u workers are employed. The result is a surplus of labor of $Q_e - Q_u$ (also shown by distance eb). In a purely competitive labor market without the union, the effect of a surplus of unemployed workers would be lower wages. Specifically, the wage rate would fall to the equilibrium level W_c where the quantity of labor supplied equals the quantity of labor demanded (each, Q_c). But this drop in wages does not happen because workers are acting collectively through their union. Individual workers cannot offer to work for less than W_u nor can employers pay less than that.

Wage Increases and Job Loss

Evidence suggests that union members on average achieve a 15-percent wage advantage over nonunion workers. But when unions are successful in raising wages, their efforts also have another major effect. As Figures A.4 and A.5 suggest, the wage-raising actions achieved by both exclusive and inclusive unionism reduce employment in unionized firms. Simply put, a union's success in achieving above-equilibrium wage rates thus tends to be accompanied by a decline in the number of workers employed. That result acts as a restraining influence on union wage demands. A union cannot expect to maintain solidarity within its ranks if it seeks a wage rate so high that 20–30 percent of its members lose their jobs.

Wage Differentials

Hourly wage rates and annual salaries differ greatly among occupations. In Table A.4 we list average annual salaries for a number of occupations to illustrate such **wage differentials.** For example, observe that commercial pilots on average earn about three times as much as retail salespersons. Not shown, there are also large wage differentials within some of the occupations listed. For example, some highly experienced pilots

wage differentials
The differences between the wage received by one worker or group of workers and that received by another worker or group of workers.

TABLE A.4
Average Annual Wages in Selected Occupations, 2011

Occupation	Average Annual Wages
Surgeons	$231,550
Petroleum engineers	138,980
Law professors	108,760
Chemical engineers	99,440
Financial analysts	87,740
Commercial pilots	76,050
Dental hygienists	69,760
Registered nurses	69,110
Police officers	56,260
Electricians	52,910
Travel agents	35,740
Barbers	28,050
Recreation workers	25,330
Teacher aides	25,270
Retail salespersons	25,130
Fast-food cooks	18,720

Source: Bureau of Labor Statistics, **www.bls.gov.**

earn several times as much income as pilots just starting their careers. And, although average wages for retail salespersons are relatively low, some top salespersons selling on commission make several times the average wages listed for their occupation.

What explains wage differentials such as these? Once again, the forces of demand and supply are highly revealing. As we demonstrate in Figure A.6, wage differentials can arise on either the supply or the demand side of labor markets. Panels (a) and (b) in Figure A.6 represent labor markets for two occupational groups that have identical *labor supply curves*. Labor market (a) has a relatively high equilibrium wage (W_a) because labor demand is very strong. In labor market (b) the equilibrium wage is relatively low (W_b) because labor demand is weak. Clearly, the wage differential between occupations (a) and (b) results solely from differences in the magnitude of labor demand.

Contrast that situation with panels (c) and (d) in Figure A.6, where the *labor demand curves* are identical. In labor market (c) the equilibrium wage is relatively high (W_c) because labor supply is low. In labor market (d) labor supply is highly abundant, so the equilibrium wage (W_d) is relatively low. The wage differential between (c) and (d) results solely from the differences in the magnitude of labor supply.

Although Figure A.6 provides a good starting point for understanding wage differentials, we need to know *why* demand and supply conditions differ in various labor markets. There are several reasons.

Marginal Revenue Productivity

The strength of labor demand—how far rightward the labor demand curve is located—differs greatly among occupations due to differences in how much various occupational groups contribute to the revenue of their respective employers. This revenue contribution, in turn, depends on the workers' productivity and the strength of the demand for the products they are helping to produce. Where labor is highly productive

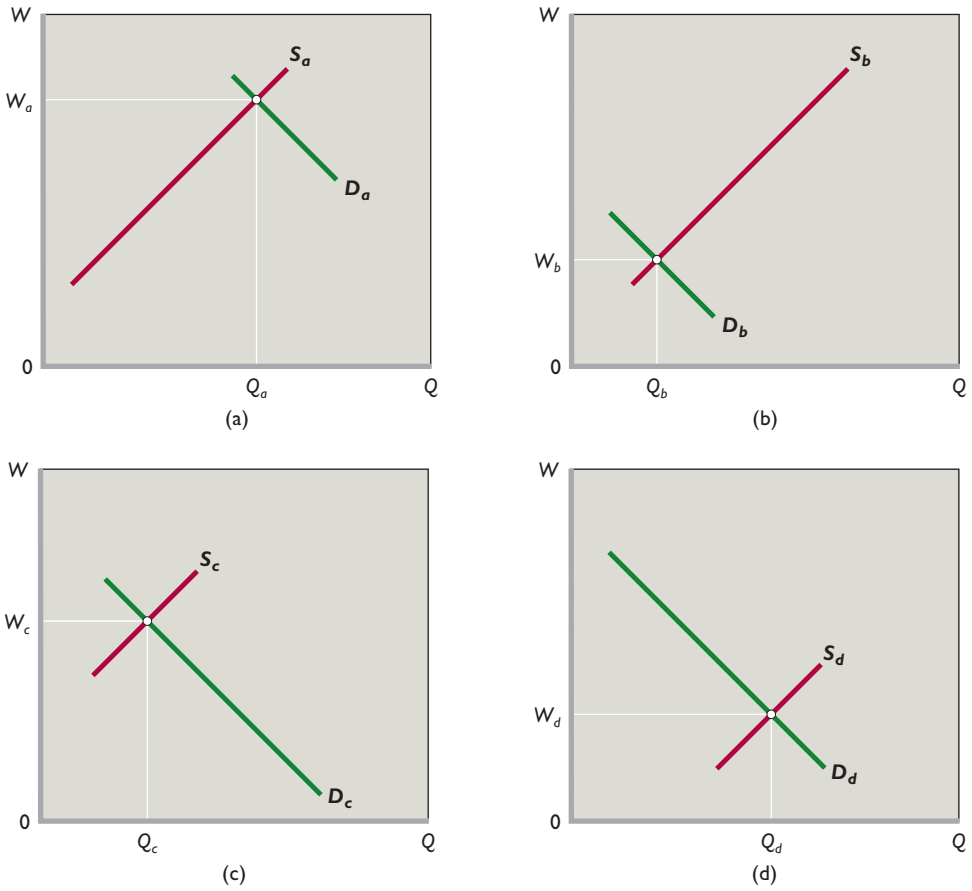


FIGURE A.6
Labor demand, labor supply, and wage differentials. The wage differential between labor markets (a) and (b) results solely from differences in labor demand. In labor markets (c) and (d), differences in labor supply are the sole cause of the wage differential.

and product demand is strong, labor demand also is strong and, other things equal, pay is high. Top professional athletes, for example, are highly productive at producing sports entertainment, for which millions of people are willing to pay billions of dollars over the course of a season. Because the marginal revenue productivity of these players is so high, they are in very high demand by sports teams. This high demand leads to their extremely high salaries (as in Figure A.6a). In contrast, most workers generate much more modest revenue for their employers. This results in much lower demand for their labor and, consequently, much lower wages (as in Figure A.6b).

Noncompeting Groups

On the supply side of the labor market, workers are not homogeneous; they differ in their mental and physical capacities and in their education and training. At any given time the labor force is made up of many noncompeting groups of workers, each representing several occupations for which the members of that particular group qualify. In some groups qualified workers are relatively few, whereas in others they are plentiful. And workers in one group do not qualify for the occupations of other groups.

Ability Only a few workers have the ability or physical attributes to be brain surgeons, concert violinists, top fashion models, research chemists, or professional athletes. Because the supply of these particular types of labor is very small in relation

to labor demand, their wages are high (as in Figure A.6c). The members of these and similar groups do not compete with one another or with other skilled or semiskilled workers. The violinist does not compete with the surgeon, nor does the surgeon compete with the violinist or the fashion model.

human capital
The personal stock of knowledge, know-how, and skills that enables a person to be productive and thus to earn income.

Education and Training Another source of wage differentials is differing amounts of **human capital,** which is the personal stock of knowledge, know-how, and skills that enables a person to be productive and thus to earn income. Such stocks result from investments in human capital. Like expenditures on machinery and equipment, productivity-enhancing expenditures on education or training are investments. In both cases, people incur *present costs* with the intention that those expenditures will lead to a greater flow of *future earnings*.

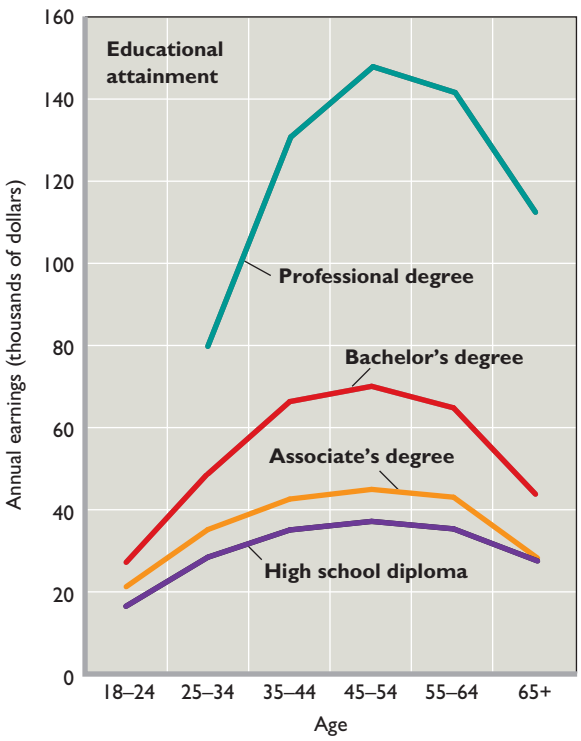
ORIGIN OF THE IDEA
O A.3
Human capital

Figure A.7 indicates that workers who have made greater investments in education achieve higher incomes during their careers. The reason is twofold: (1) There are fewer such workers, so their supply is limited relative to less-educated workers, and (2) more educated workers tend to be more productive and thus in greater demand. Figure A.7 also indicates that the incomes of better-educated workers generally rise more rapidly than those of poorly educated workers. The primary reason is that employers provide more on-the-job training to the better-educated workers, boosting their marginal revenue productivity and therefore their earnings.

Although education yields higher incomes, it carries substantial costs. A college education involves not only direct costs (tuition, fees, books) but indirect or

FIGURE A.7
Education levels and average annual income. Annual income by age is higher for workers with more education. Investment in education yields a return in the form of earnings differences enjoyed over one's work life.

Source: U.S. Bureau of the Census, **www.census.gov.** Data are for 2008 and include both men and women.



opportunity costs (forgone earnings) as well. Does the higher pay received by better-educated workers compensate for these costs? The answer is yes. Rates of return are estimated to be 10 to 13 percent for investments in secondary education and 8 to 12 percent for investments in college education. One generally accepted estimate is that each year of schooling raises a worker's wage by about 8 percent. Currently, college graduates on average earn about $1.70 for each $1 earned by high school graduates.

Illustrating the Idea

My Entire Life

For some people, high earnings have little to do with actual hours of work and much to do with their tremendous skill, which reflects their accumulated stock of human capital. The point is demonstrated in the following story: It is said that a tourist once spotted the famous Spanish artist Pablo Picasso (1881–1973) in a Paris café. The tourist asked Picasso if he would do a sketch of his wife for pay. Picasso sketched the wife in a matter of minutes and said, "That will be 10,000 francs [roughly $2000]." Hearing the high price, the tourist became irritated, saying, "But that took you only a few minutes."

"No," replied Picasso, "it took me my entire life!"

Question:
In general, how do the skill requirements of the highest-paying occupations in Table A.4 compare with the skill requirements of the lowest-paying occupations?

Compensating Differences

If the workers in a particular noncompeting group are equally capable of performing several different jobs, you might expect the wage rates to be identical for all these jobs. Not so. A group of high school graduates may be equally capable of becoming salesclerks or general construction workers, but these jobs pay different wages. In virtually all locales, construction laborers receive much higher wages than salesclerks. These wage differentials are called **compensating differences** because they must be paid to compensate for nonmonetary differences in various jobs.

compensating differences
Wage differentials received by workers to compensate them for nonmonetary disparities in their jobs.

The construction job involves dirty hands, a sore back, the hazard of accidents, and irregular employment, both seasonally and during recessions (the economywide economic slowdowns that periodically affect the economy). The retail sales job means clean clothing, pleasant air-conditioned surroundings, and little fear of injury or layoff. Other things equal, it is easy to see why workers would rather pick up a credit card than a shovel. So the amount of labor that is supplied to construction firms (as in Figure A.6c) is smaller than that which is supplied to retail shops (as in Figure A.6d). Construction firms must pay higher wages than retailers to compensate for the unattractive nonmonetary aspects of construction jobs.

Compensating differences play an important role in allocating society's scarce labor resources. If very few workers want to be garbage collectors, then society must pay high wages to garbage collectors to get the garbage collected. If many more people want to be salesclerks, then society need not pay them as much as it pays garbage collectors to get those services performed.

Applying the Analysis

The Minimum Wage

Since the passage of the Fair Labor Standards Act in 1938, the United States has had a federal minimum wage. That wage has ranged between 35 and 50 percent of the average wage paid to manufacturing workers and was most recently raised to $7.25 in July 2009. Numerous states, however, have minimum wages considerably above the federal mandate. The purpose of minimum wages is to provide a "wage floor" that will help less-skilled workers earn enough income to escape poverty.

Critics, reasoning in terms of Figure A.5, contend that an above-equilibrium minimum wage (say, W_u) will simply cause employers to hire fewer workers. Downsloping labor demand curves are a reality. The higher labor costs may even force some firms out of business. In either case, some of the poor, low-wage workers whom the minimum wage was designed to help will find themselves out of work. Critics point out that a worker who is *unemployed* and desperate to find a job at a minimum wage of $7.25 per hour is clearly worse off than he or she would be if *employed* at a market wage rate of, say, $6.50 per hour.

A second criticism of the minimum wage is that it is "poorly targeted" to reduce household poverty. Critics point out that much of the benefit of the minimum wage accrues to workers, including many teenagers, who do not live in impoverished households.

Advocates of the minimum wage say that critics analyze its impact in an unrealistic context, specifically a competitive labor market (Figure A.2). But in a less-competitive, low-pay labor market where employers possess some monopsony power (Figure A.3), the minimum wage can increase wage rates without causing significant unemployment. Indeed, a higher minimum wage may even produce more jobs by eliminating the motive that monopsonistic firms have for restricting employment. For example, a minimum-wage floor of W_c in Figure A.3 would change the firm's labor supply curve to $W_c aS$ and prompt the firm to increase its employment from Q_m workers to Q_c workers.

Moreover, even if the labor market is competitive, the higher wage rate might prompt firms to find more productive tasks for low-paid workers, thereby raising their productivity. Alternatively, the minimum wage may reduce *labor turnover* (the rate at which workers voluntarily quit). With fewer low-productive trainees, the *average* productivity of the firm's workers would rise. In either case, the alleged negative employment effects of the minimum wage might not occur.

Which view is correct? Unfortunately, there is no clear answer. All economists agree that firms will not hire workers who cost more per hour than the value of their hourly output. So there is some minimum wage so high that it would severely reduce employment. Consider $30 an hour, as an absurd example. Because the majority of U.S. workers earn far less than $30 per hour, a minimum wage that high would render the majority of workers unemployable because the minimum wage that they would have to be paid would far exceed their marginal revenue products.

It has to be remembered, though, that a minimum wage will only cause unemployment in labor markets where the minimum wage exceeds the equilibrium wage. Jobs in these labor markets are typically filled by unskilled or low-skilled workers. For members of such groups, recent research suggests that a 10 percent increase in the minimum wage will reduce employment of unskilled workers by about 1 to 3 percent. However, estimates of the employment effects of minimum wage laws vary from study to study, so significant controversy remains.

The overall effect of the minimum wage is thus uncertain. There seems to be a consensus emerging that, on the one hand, the employment and unemployment effects of the minimum wage are not as great as many critics fear. On the other hand, because a large part of its effect is dissipated on nonpoverty families, the minimum wage is not as strong an antipoverty tool as many supporters contend.

Voting patterns and surveys make it clear, however, that the minimum wage has strong political support. Perhaps this stems from two realities: (1) More workers are believed to be helped than hurt by the minimum wage and (2) the minimum wage gives society some assurance that employers are not "taking undue advantage" of vulnerable, low-skilled workers.

Question:
Have you ever worked for the minimum wage? If so, for how long? Would you favor increasing the minimum wage by $1? By $2? By $5? Explain your reasoning.

Summary

1. The demand for labor is derived from the product it helps produce. That means the demand for labor will depend on its productivity and on the market value (price) of the good it is producing.
2. Because the firm equates the wage rate and MRP in determining its profit-maximizing level of employment, the marginal revenue product curve is the firm's labor demand curve. Thus, each point on the MRP curve indicates how many labor units the firm will hire at a specific wage rate.
3. The competitive firm's labor demand curve slopes downward because of the law of diminishing returns. Summing horizontally the demand curves of all the firms hiring that resource produces the market demand curve for labor.
4. The demand curve for labor will shift as the result of (a) a change in the demand for, and therefore the price of, the product the labor is producing; (b) changes in the productivity of labor; and (c) changes in the prices of substitutable and complementary resources.
5. The elasticity of demand for labor measures the responsiveness of labor quantity to a change in the wage rate. The coefficient of the elasticity of labor demand is

$$E_w = \frac{\text{percentage change in labor quantity demanded}}{\text{percentage change in wage rate}}$$

   When E_w is greater than 1, labor demand is elastic; when E_w is less than 1, labor demand is inelastic; and when E_w equals 1, labor demand is unit-elastic.
6. The elasticity of labor demand will be greater (a) the greater the ease of substituting other resources for labor, (b) the greater the elasticity of demand for the product, and (c) the larger the proportion of total production costs attributable to labor.
7. Specific wage rates depend on the structure of the particular labor market. In a competitive labor market, the equilibrium wage rate and level of employment are determined at the intersection of the labor supply curve and labor demand curve. For the individual firm, the market wage rate establishes a horizontal labor supply curve, meaning that the wage rate equals the firm's constant marginal resource cost. The firm hires workers to the point where its MRP equals its MRC.
8. Under monopsony, the marginal resource cost curve lies above the resource supply curve because the monopsonist must bid up the wage rate to hire extra workers and must pay that higher wage rate to all workers. The monopsonist hires fewer workers than are hired under competitive conditions, pays less-than-competitive wage rates (has lower labor costs), and thus obtains greater profit.
9. A union may raise competitive wage rates by (a) restricting the supply of labor through exclusive unionism or (b) directly enforcing an above-equilibrium wage rate through inclusive unionism. On average, unionized workers realize wage rates 15 percent higher than those of comparable nonunion workers.
10. Wage differentials are largely explainable in terms of (a) marginal revenue productivity of various groups of workers; (b) noncompeting groups arising from differences in the capacities and education of different groups of workers; and (c) compensating wage differences, that is, wage differences that must be paid to offset nonmonetary differences in jobs.
11. Economists disagree about the desirability of the minimum wage. While it raises the income of some workers, it reduces the income of other workers whose skills are not sufficient to justify being paid the mandated wage.

Terms and Concepts

purely competitive labor market
derived demand
marginal revenue product (MRP)
marginal resource cost (MRC)
MRP = MRC rule
substitution effect
output effect
elasticity of labor demand
monopsony
exclusive unionism
occupational licensing
inclusive unionism
wage differentials
human capital
compensating differences

Questions

1. Explain the meaning and significance of the fact that the demand for labor is a derived demand. Why do labor demand curves slope downward? **LO1**
2. Complete the table below that shows the labor demand for a firm that is hiring labor competitively and selling its product in a purely competitive market. **LO1**
   a. How many workers will the firm hire if the market wage rate is $27.95? $19.95? Explain why the firm will not hire a larger or smaller number of units of labor at each of these wage rates.
   b. Show in schedule form and graphically the labor demand curve of this firm.

Units of Labor	Total Product	Marginal Product	Product Price	Total Revenue	Marginal Revenue Product
0	0		$2	$_____	$_____
1	17	_____	2	_____	_____
2	31	_____	2	_____	_____
3	43	_____	2	_____	_____
4	53	_____	2	_____	_____
5	60	_____	2	_____	_____
6	65	_____	2	_____	_____

3. In 2009 General Motors (GM) announced that it would reduce employment by 21,000 workers. What does this decision reveal about how GM viewed its marginal revenue product (MRP) and marginal resource cost (MRC)? Why didn't GM reduce employment by more than 21,000 workers? By less than 21,000 workers? **LO2**
4. How will each of the following affect the demand for resource A, which is being used to produce commodity Z? Where there is any uncertainty as to the outcome, specify the causes of that uncertainty. **LO2**
   a. An increase in the demand for product Z.
   b. An increase in the price of substitute resource B.
   c. A technological improvement in the capital equipment with which resource A is combined.
   d. A fall in the price of complementary resource C.
   e. A decline in the elasticity of demand for product Z due to a decline in the competitiveness of product market Z.
5. What effect would each of the following factors have on elasticity of demand for resource A, which is used to produce product Z? **LO3**
   a. There is an increase in the number of resources substitutable for A in producing Z.
   b. Due to technological change, much less of resource A is used relative to resources B and C in the production process.
   c. The elasticity of demand for product Z greatly increases.
6. Florida citrus growers say that the recent crackdown on illegal immigration is increasing the market wage rates necessary to get their oranges picked. Some are turning to $100,000 to $300,000 mechanical

harvesting machines known as "trunk, shake, and catch" pickers, which vigorously shake oranges from the trees. If widely adopted, how will this substitution affect the demand for human orange pickers? What does that imply about the relative strengths of the substitution and output effects? **LO2**

7. Why is a firm in a purely competitive labor market a *wage taker*? What would happen if it decided to pay less than the going market wage rate? **LO4**
8. Contrast the methods used by inclusive unions and exclusive unions to raise union wage rates. **LO5**
9. What is meant by the terms "investment in human capital" and "compensating wage differences"? Use these concepts to explain wage differentials. **LO6**
10. Why might an increase in the minimum wage in the United States simply send some jobs abroad? Relate your answer to elasticity of labor demand. **LO5**

Problems

1. Suppose that marginal product tripled while product price fell by one-half in the table accompanying Figure A.1. What would be the new MRP values in the table? What would be the net impact on the location of the resource demand curve in Figure A.1? **LO2**
2. Complete the following labor supply table for a firm hiring labor competitively: **LO4**
   a. Show graphically the labor supply and marginal resource (labor) cost curves for this firm. Are the curves the same or different? If they are different, which one is higher?
   b. Plot the labor demand data of question 2 on the graph used in part *a* above. What are the equilibrium wage rate and level of employment?

Units of Labor	Wage Rate	Total Labor Cost	Marginal Resource (Labor) Cost
0	$14	$_____	$_____
1	14	_____	_____
2	14	_____	_____
3	14	_____	_____
4	14	_____	_____
5	14	_____	_____
6	14	_____	

3. Assume a firm is a monopsonist that can hire its first worker for $6 but must increase the wage rate by $3 to attract each successive worker (so that the second worker must be paid $9, the third $12, and so on). **LO4**
   a. Draw the firm's labor supply and marginal resource cost curves. Are the curves the same or different? If they are different, which one is higher?
   b. On the same graph, plot the labor demand data of question 2. What are the equilibrium wage rate and level of employment?
   c. Compare these answers with those you found in problem 2. By how much does the monopsonist reduce wages below the competitive wage? By how much does the monopsonist reduce employment below the competitive level?
4. Suppose that low-skilled workers employed in clearing woodland can each clear one acre per month if they are each equipped with a shovel, a machete, and a chainsaw. Clearing one acre brings in $1000 in revenue. Each worker's equipment costs the worker's employer $150 per month to rent and each worker toils 40 hours per week for four weeks each month. **LO5**
   a. What is the marginal revenue product of hiring one low-skilled worker to clear woodland for one month?
   b. How much revenue per hour does each worker bring in?
   c. If the minimum wage were $6.20, would the revenue per hour in part *b* exceed the minimum wage? If so, by how much per hour?
   d. Now consider the employer's total costs. These include the equipment costs as well as a normal profit of $50 per acre. If the firm pays workers the minimum wage of $6.20 per hour, what will the firm's economic profit or loss be per acre?
   e. At what value would the minimum wage have to be set so that the firm would make zero economic profit from employing an additional low-skilled worker to clear woodland?

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