Chapter 6

Wage Determination and the Allocation of Labor

After reading this chapter, you should be able to:

1. **Explain the supply and demand of labor in a perfectly competitive labor market.**
2. **Discuss the effects on wage and employment if an employer is a monopolist in the product market.**
3. **Explain the effects on wage and employment if an employer is a monoposonist in the labor market.**
4. **Explain why labor markets characterized by delayed supply responses may exhibit a cobweb-shaped adjustment path to equilibrium.**

Something quite remarkable happens in the United States every workday. Over 148 million of us go to work sometime, somewhere, during the day. We work at an amazing array of jobs: We are carpenters, secretaries, executives, professional athletes, lawyers, dockworkers, farmhands, geologists, hairstylists, nurses, managers, truck drivers, and professors. And the list goes on. Equally remarkable are the pay differences among us. Professional baseball players make, on average, $1,836 per hour; restaurant employees, $11 per hour.

Who or what determines the occupational composition of the total jobs in the economy? What mechanisms allocate us to our various occupations and specific work-places? How are occupational and individual wage rates determined? In this chapter, we combine labor supply and labor demand into basic models that help us answer these important questions.

In reading this chapter, beware: We are assuming for simplicity that all compensation is paid in the form of the wage rate. In Chapter 7, we will relax this assumption, specifically looking at the composition of pay and the economics of fringe benefits.

THEORY OF A PERFECTLY COMPETITIVE LABOR MARKET

A ***perfectly competitive labor market*** has the following characteristics that contrast it with other labor markets: (1) a large number of firms competing with one another to hire a specific type of labor to fill identical jobs; (2) numerous qualified people who have identical skills and independently supply their labor services; (3) "wage-taking" behavior—that is, neither workers nor firms exert control over the market wage; and (4) perfect, costless information and labor mobility.

Let's examine the components, operation, and outcomes of this stylized labor market in some detail. Specifically, we will divide our discussion into three subsections: the labor market, the hiring decision by an individual firm, and allocative efficiency.

The Labor Market

We can best analyze the competitive market for a specific type of labor by separating it into two parts: labor demand that reflects the behavior of employers and labor supply, deriving from the decisions of workers.

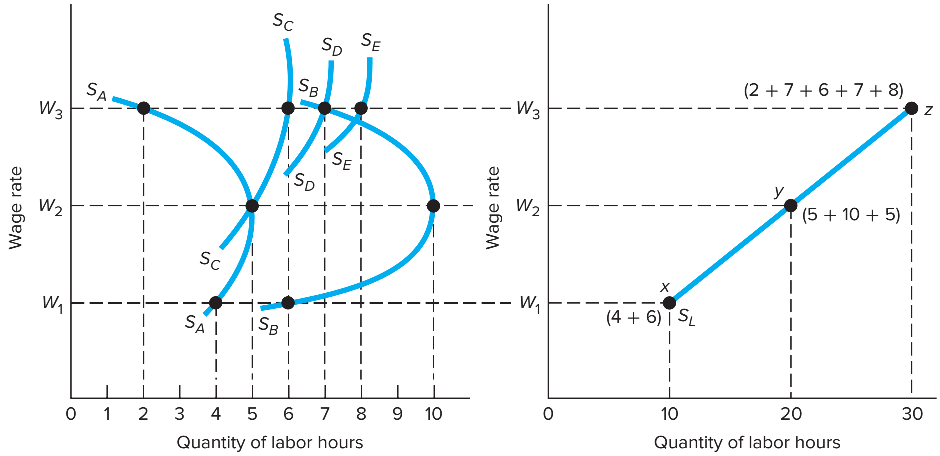
Labor Demand and Supply

Recall from the previous chapter (Figure 5.6) that we find the market demand for a particular type of labor by summing over a range of wage rates the price-adjusted amounts of labor that employers desire to hire at each of the various wage rates. Also remember that *individual* labor supply curves are normally backward-bending. Can we then conclude that the *market* supply of a particular grade of labor is also backward-bending? In most labor markets, this is not the case; market supply curves generally slope upward and to the right, indicating that collectively workers will offer more labor hours at higher relative wage rates. Why is this so?

Figure 6.1 helps explain the positive relationship between the wage rate and the quantity of labor hours supplied in most labor markets. Graph (a) displays five separate backward-bending *individual* labor supply curves in a specific labor market, while graph (b) sums the curves horizontally to produce a *market* labor supply curve.[1] Notice from their respective labor supply curves S_A and S_B that at wage W_1, Adams will offer 4 hours of labor and Bates 6 hours. We simply sum these outcomes (4 + 6) to get point *x* at wage W_1 on the market labor supply curve shown in graph (b). Now let's suppose the wage rate rises from W_1 to W_2 in this labor market while all other wage rates remain constant. Adams will increase her hours from 4 to 5 and Bates will work 10 hours rather than 6. We know from previous analysis that this implies that for these two workers, substitution effects exceed income effects over the W_1 to W_2 wage range. But also notice that at W_2, a third worker—Choy (S_C)—chooses to participate in this labor market, deciding to offer 5 hours of labor. Presumably he is attracted away from another labor market, household production,

[1] We are assuming that while all these workers have identical skills, they have differing preferences for leisure, differing levels of nonwage income, and so forth. Thus, their reservation wages and individual labor supply curves differ.

FIGURE 6.1 The Market Supply of Labor
Even though specific individuals normally have backward-bending labor supply curves, labor supply curves generally are positively sloped over realistic wage ranges. Higher relative wages attract workers away from household production, leisure, or their previous jobs. The height of the market labor supply measures the opportunity cost of using the marginal labor hour in this employment. The shorter the time period, the less elastic this curve.



(a) Individual labor supplies to a specific labor market

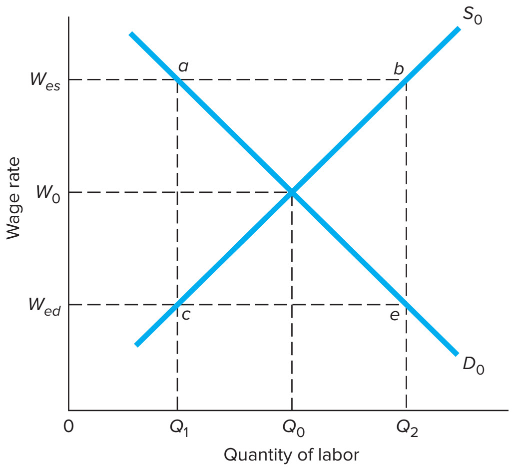
(b) Market supply of labor

or leisure by the W_2 wage rate. Thus, the total quantity of hours supplied is 20 (= 5 + 10 + 5), as shown by point y in the right graph. Finally, observe wage rate W_3, at which Adams and Bates choose to work fewer hours than previously, but Choy decides to offer 6 hours, and two new workers—Davis (S_D) and Egan (S_E)—now enter this labor market. The total number of hours, as observed at point z on the market labor supply curve, is now 30 (= 2 + 7 + 6 + 7 + 8).

Conclusion? Even though specific people may reduce their hours of work as the market wage rises, labor supply curves of specific labor markets generally are positively sloped over realistic wage ranges. *Higher relative wages attract workers away from household production, leisure, or other labor markets and toward the labor market in which the wage increased.*

The vertical height of the market labor supply curve xyz measures the opportunity cost of employing the last labor hour in this occupation. For example, point y on S_L in Figure 6.1(b) indicates that wage rate W_2 is necessary to entice the 20th hour of labor. Where there is competition in product and labor markets, perfect information, and costless migration, the value of the alternative activity which that hour previously produced—either as utility from leisure or as output from work in a different occupation—is equivalent to W_2. To attract 30 hours of labor compared to 20, the wage must rise to W_3 (point z) because the 21st through 30th hours generate more than W_2 worth of value to workers and society in their alternative uses. To attract these hours to this labor market, these opportunity costs must be compensated for via a higher wage rate. *In perfectly competitive product and labor markets, labor supply curves measure marginal opportunity costs.*

FIGURE 6.2 Wage and Employment Determination
The equilibrium wage rate W_0 and level of employment Q_0 occur at the intersection of labor supply and demand. A surplus, or excess supply, of *ba* would occur at wage rate W_{es}; a shortage, or excess demand, of *ec* would result if the wage were W_{ed}.



One final point needs to be emphasized concerning market labor supply. The shorter the time period and the more specialized the variety of labor, the less elastic the labor supply curve. In the short run, increases in the wage may not result in significant increases in the number of workers in a market; but in the long run, human capital investments can be undertaken that will allow greater responsiveness to the higher relative wage.

Equilibrium

Figure 6.2 combines the market labor demand and supply curves for a specific type of labor and shows the equilibrium wage W_0 and the equilibrium quantity of labor Q_0. If the wage were W_{es}, an *excess supply* or surplus of labor ($b - a$) would occur, driving the wage down to W_0. If instead the wage rate were W_{ed}, an *excess demand* or shortage ($e - c$) of workers would develop, and the wage would increase to W_0. Wage W_0 and employment level Q_0 is the only wage–employment combination at which the market clears. At W_0, the number of hours offered by labor suppliers just matches the number of hours that firms desire to employ.

Determinants

The supply and demand curves in Figure 6.2 are drawn holding constant all factors other than the wage rate for this variety of labor. But a number of other factors—or ***determinants of labor supply and demand***—can change and cause either rightward or leftward shifts in the curves. We discussed many of these factors in Chapters 2 and 5; they are simply formalized here in Table 6.1. The distinctions between "changes in demand" versus "changes in quantity demanded" *and* "changes in supply" versus "changes in quantity supplied" apply to the labor market as well as

TABLE 6.1
The Determinants of Labor Supply and Demand

Determinants of Labor Supply

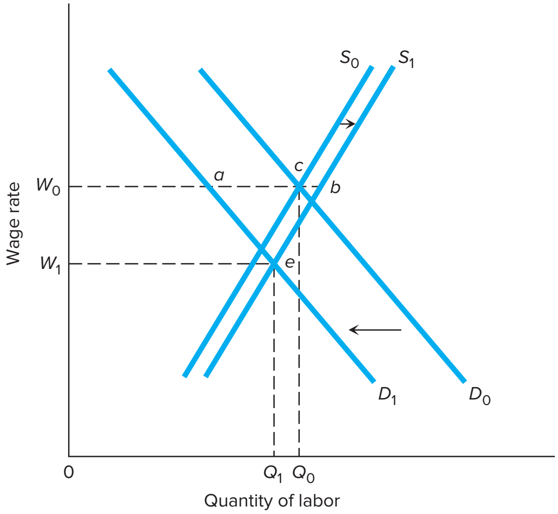
1. **Other wage rates**
   An increase (decrease) in the wages paid in other occupations for which workers in a particular labor market are qualified will decrease (increase) labor supply.
2. **Nonwage income**
   An increase (decrease) in income other than from employment will decrease (increase) labor supply.
3. **Preferences for work versus leisure**
   A net increase (decrease) in people's preferences for work relative to leisure will increase (decrease) labor supply.
4. **Nonwage aspects of the job**
   An improvement (worsening) of the nonwage aspects of the job will increase (reduce) labor supply.
5. **Number of qualified suppliers**
   An increase (decrease) in the number of qualified suppliers of a specific grade of labor will increase (decrease) labor supply.

Determinants of Labor Demand

1. **Product demand**
   Changes in product demand that increase (decrease) the product price will raise (lower) the marginal revenue product (MRP) of labor and therefore increase (decrease) the demand for labor.
2. **Productivity**
   Assuming that it does not cause an offsetting decline in product price, an increase (decrease) in productivity will increase (decrease) the demand for labor.
3. **Prices of other resources**
   Where resources are *gross complements* (output effect > substitution effect), an increase (decrease) in the price of a substitute in production will decrease (increase) the demand for labor; where resources are *gross substitutes* (substitution effect > output effect), an increase (decrease) in the price of a substitute in production will increase (decrease) the demand for labor. An increase (decrease) in the price of a pure complement in production will decrease (increase) labor demand (no substitution effect; therefore a gross complement).
4. **Number of employers**
   Assuming no change in employment by other firms hiring a specific grade of labor, an increase (decrease) in the number of employers will increase (decrease) the demand for labor.

the product market. Changes in the determinants of labor demand and supply shown in the table shift the entire curves; these curve shifts are designated as "changes in labor demand" and "changes in labor supply." Changes in the wage rate, on the other hand, cause movements *along* demand and supply curves; that is, the quantity of labor demanded or supplied changes. But in the short run, changes in the wage rate normally do not cause shifts of the curves themselves.

FIGURE 6.3 Changes in Demand, Supply, and Market Equilibrium
Changes in labor supply and demand create initial shortages or surpluses in labor markets, followed by adjustments to new equilibrium wage rates and employment. Here the decline in demand from D_0 to D_1 and increase in supply from S_0 to S_1 produce an initial excess supply of *ab* at wage W_0. Consequently, the wage rate falls to W_1; and because the decline in demand is large relative to the increase in supply, the equilibrium quantity falls from Q_0 to Q_1.



To demonstrate how a competitive market for a particular type of labor operates and to emphasize the role of the determinants of supply and demand, let's suppose that the labor market in Figure 6.3 is characterized by labor demand D_0 and labor supply S_0, which together produce equilibrium wage and employment levels W_0 and Q_0 (point *c*). Next assume that demand declines for the product produced by firms hiring this labor, reducing the price of the product and thus the ***marginal revenue product*** (MRP) of labor (demand determinant 1, Table 6.1). Also, let's suppose that simultaneously the federal government releases findings of a definitive research study that concludes that the considerable health and safety risks that were heretofore associated with this occupation are in fact minimal. Taken alone, this information will increase the relative nonwage attractiveness of this labor and shift the labor supply curve rightward—say from S_0 to S_1 (supply determinant 4, Table 6.1).

WW6.1

Now observe that at the initial wage rate W_0 the number of workers seeking jobs in this occupation (point *b*) exceeds the number of workers that firms wish to hire (point *a*). How will the market adjust to this surplus? Because wages are assumed to be perfectly flexible, the wage rate will drop to W_1, where the labor market will once again clear (point *e*). Figure 6.3 illustrates two generalizations. First, taken alone, a decline in labor demand reduces *both* the wage rate and quantity of labor employed. Second, an increase in labor supply—also viewed separately—reduces the wage rate and increases equilibrium quantity. In this case, the net outcome of the

6.1 **World of Work**

Hurricanes and Local Labor Markets

Hurricanes are very destructive: They can kill thousands of people and destroy billions of dollars worth of property. These powerful storms occur each year between June 1 and November 30 when the water temperature is 80 degrees or more. However, we can't forecast exactly where or when a hurricane will hit.

In afflicted locations, hurricanes affect both labor supply and demand. Hurricanes decrease labor supply because people flee stricken areas. Hurricanes also have an uncertain, but likely positive, effect on labor demand. If a hurricane destroys a lot of property and capital, employers will leave and reduce labor demand. If a hurricane hits mostly residential areas, labor demand may rise as employers try to fill vacant positions. In addition, labor demand may rise if firms substitute labor for destroyed physical capital. If labor supply falls and labor demand rises, wages will rise with an uncertain effect on employment.

Ariel Belasen and Solomon Polachek have examined the impact of hurricanes on wages and employment in Florida over the 1988–2005 period using quarterly data. It is useful to study Florida because all of its 67 counties were hit by at least 1 of the 19 hurricanes that landed in Florida over this period. In fact, five of the six most destructive Atlantic hurricanes during this period landed in Florida.

Belasen and Polachek's results indicate that the impact of a hurricane in a county directly struck depends on the severity of the storm. High-intensity storms raise earnings by 4.4 percent and decrease employment by 4.8 percent relative to a typical county. Low-intensity storms increase earnings by 1.3 percent and decrease employment by 1.5 percent relative to a typical county. The employment and earnings effects diminish over time but linger for as long as two years after a hurricane hits.

Source: Ariel R. Belasen and Solomon W. Polachek, "How Disasters Affect Local Labor Markets: The Effects of Hurricanes in Florida," *Journal of Human Resources,* Winter 2009, pp. 251–76.

WW6.2

simultaneous changes in supply and demand is a decline in the wage rate from W_0 to W_1 and a fall in the quantity of labor offered and employed from Q_0 to Q_1. The latter occurred because the decrease in demand was greater than the increase in labor supply. At W_1, the Q_1Q_0 workers formerly employed in this market were not sufficiently compensated for their opportunity costs, and they left this occupation for leisure, household production, or other jobs.

The Hiring Decision by an Individual Firm

Given the presence of market wage W_0 or W_1 in Figure 6.3, how will a firm operating in a perfectly competitive labor and product market decide on the quantity of labor to employ? The answer can be found in Figure 6.4. Graph (a) portrays the labor market for a specific occupational group, and graph (b) shows the labor supply and demand curves for an individual firm hiring this labor. Because this particular employer is just one of many firms in this labor market, its decision on how many workers to employ will not affect the market wage. Instead, this firm is a wage taker in the same sense that a perfectly competitive seller is a price taker in the product market. The single employer in (b) has no incentive to pay more than the equilibrium wage W_0 because at the

6.2 World of Work

China Syndrome*

The U.S. volume of imports from China skyrocketed over the past two decades, while exports have not risen as much. Spending on Chinese imports rose from 0.6 percent of all U.S. spending in 1990 to 4.6 percent in 2007. Chinese imports now account for over 30 percent of all imports in the apparel, textiles, furniture, electrical appliances, and jewelry industries. This rapid rise in imports from China has raised concerns about its impact on the U.S. economy.

David Autor, David Dorn, and Gordon Hanson have examined the impact of changes in exposure to Chinese import competition on 722 U.S. labor markets between 1990 and 2007. Rising import competition from China will lower the demand for U.S. manufactured products and thus the demand for manufacturing workers. They find that labor markets with more exposure to Chinese imports had greater declines in manufacturing employment than those with less exposure. The employment declines were concentrated among those without a college degree. Their study reports that increases in Chinese import competition account for 21 percent of the decline in U.S. manufacturing employment over the 1990 to 2007 period.

The increase in Chinese import competition also affected wages. The layoffs in manufacturing lowered the demand for nonmanufactured products and raised labor supply in the nonmanufacturing sector. Because of these shifts, the wages of nonmanufacturing workers declined. Wages in the manufacturing sector did not decline, possibly because the most productive workers kept their jobs.

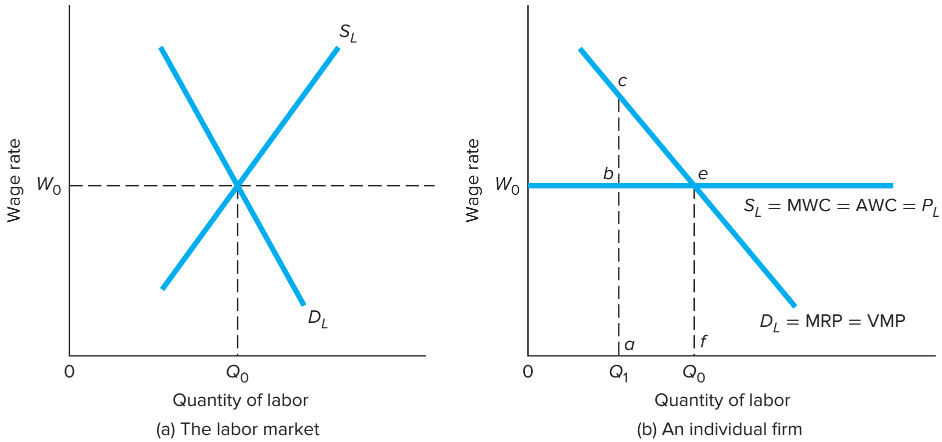
The declines in wages and employment due to increases in Chinese import competition also increased the demand for government transfer payments. Not surprisingly, the largest increases were for unemployment, disability, retirement, and health-care benefit payments. However, the increase in government transfer payments offset only a small part of the decline in household income caused by the decline in worker earnings.

* Based on David H. Autor, David Dorn, and Gordon H. Hanson, "The China Syndrome: Local Labor Market Effects of Import Competition in the United States," *American Economic Review*, December 2013, pp. 2121–2168.

W_0 wage, it can attract as many labor units as it wants. On the other hand, if it offers a wage below W_0, it will attract *no* units of labor. All workers who possess this skill have marginal opportunity costs of at least W_0; they can get a minimum of W_0 in alternative employment. Consequently, the horizontal wage line W_0 in Figure 6.4(b) *is* this firm's labor supply curve (S_L). You will observe that it is perfectly elastic.

Curve S_L in graph (b) also indicates this firm's average wage cost and marginal wage cost. ***Average wage cost*** (AWC) is *the total wage cost divided by the number of units of labor employed.* ***Marginal wage cost*** (MWC), on the other hand, is *the absolute change in total wage cost resulting from the employment of an additional unit of labor.* To see why average and marginal wage costs are equal in this case, suppose the firm hires 100 labor hours at \$8 per hour. The total hourly wage bill will be \$800 (= \$8 × 100). What will be the average wage cost and marginal wage cost? Answers: AWC = \$8 (= \$800/100); MWC (extra cost of the last worker hour) = \$8 (= \$800 − \$792). And if the firm hires 200 labor hours? Answers: total wage cost = \$1,600; AWC = \$8 (= \$1,600/200); MWC = \$8 (= \$1,600 − \$1,592). For all levels of employment, $W = \$8 = \text{MWC} = \text{AWC} = S_L$ in this labor market.

FIGURE 6.4 Perfect Competition: The Labor Market (a) and the Individual Firm (b)
In a perfectly competitive labor market, the equilibrium wage rate W_0 and quantity of labor Q_0 are determined by supply and demand, as shown in (a). The individual firm (b) hiring in this market is a wage taker; its labor supply curve, S_L = MWC = AWC, is perfectly elastic at W_0. The firm maximizes its profits by hiring Q_0 units of labor (MRP = MWC). Assuming competition in the product market, this employment level constitutes an efficient allocation of resources (VMP = P_L).



Recall from Chapter 5 that in the short run a firm's demand for labor curve *is* its marginal revenue product curve. Thus, this firm can compare the additional revenue (MRP) obtained by hiring one more unit of labor with the added cost (MWC) or, in this case, the wage rate (W = MWC). If MRP > W, it will employ the particular hour of labor; on the other hand, if MRP < W, it will not. To generalize: *The profit-maximizing employer will obtain its optimal level of employment where MRP = MWC*. We label this equality the ***MRP = MWC rule***.

The profit-maximizing quantity is Q_0 in Figure 6.4(b). To confirm this, observe level Q_1, where MRP, as shown by the vertical distance *ac,* exceeds MWC (distance *ab*). Clearly this firm will gain profits if it hires this unit of labor because it can sell the added product produced by this worker for more than the wage W_0 (= MWC). This is true for all units of labor up to Q_0, where MRP and MWC are equal (distance *fe*). Beyond Q_0 diminishing returns finally reduce marginal product (MP) to the extent that MRP (= MP × P) lies below the market wage W_0 (= MWC). Thus, this firm's total profit will fall if it hires more than Q_0 worker hours.

Allocative Efficiency

We stressed at the outset of Chapter 1 that labor is a scarce resource, and it therefore behooves society to use it efficiently. How do we define an efficient allocation of labor? Is labor efficiently allocated in the perfectly competitive labor market just discussed? And what about the noncompetitive labor market models to follow?

Labor Market Efficiency

Let's first bring the notion of allocative efficiency into focus. An ***efficient allocation of labor*** is realized when workers are being directed to their highest-valued uses. Labor is being allocated efficiently when society obtains the largest amount of domestic output from the given amount of labor available. Stated technically, available labor is efficiently allocated when its value of marginal product or VMP—the dollar value to society of its marginal product—is the same in all alternative employments.

This assertion can be demonstrated through a simple example. Suppose that type *A* labor (for example, assembly-line labor) is capable of producing both product *x* (autos) and product *y* (refrigerators). Suppose the available amount of type *A* labor is currently allocated so that the value of marginal product of labor in producing autos is \$12 and its value of marginal product in producing refrigerators is \$8. In short, VMP_{Ax} (= \$12) > VMP_{Ay} (= \$8). This is *not* an efficient allocation of type *A* labor because it is not making the maximum contribution to domestic output. It is clear that by shifting a worker from producing *y* (refrigerators) to making *x* (autos), the domestic output can be increased by \$4 (= \$12 − \$8). This reallocation will cause a movement down the VMP curve for *x* and up the VMP curve for *y*. That is, VMP_{Ax} will fall and VMP_{Ay} will rise. The indicated reallocation from *y* to *x* should continue until the VMP of type *A* labor is the same for both products, or $\text{VMP}_{Ax} = \text{VMP}_{Ay}$. In our example, this might occur where, say, $\text{VMP}_{Ax} = \text{VMP}_{Ay} = \$10$. When this equality is achieved, no further reallocation of labor will cause a net increase in the domestic output.

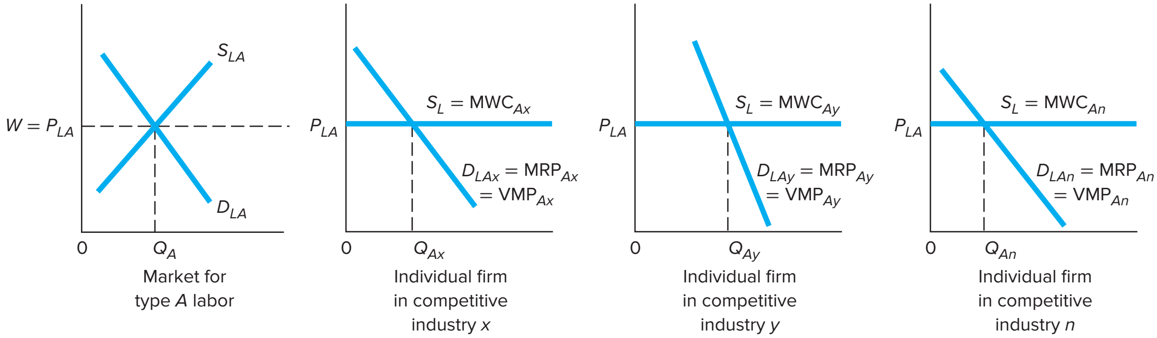
If we expand our example from just two products to any number of products (that is, *n* products), we can state the condition for allocative efficiency for any given type of labor by the following equation:

$$\text{VMP}_{Ax} = \text{VMP}_{Ay} = \cdots = \text{VMP}_{An} = \text{P}_{LA} \qquad \textbf{(6.1)}$$

where *A* is the given type of labor; *x, y,. . . , n* represent all possible products that labor might produce; and VMP is the value of labor's marginal product in producing the various products.

Observe that in Equation (6.1) we have made the VMPs of labor equal not only to one another but also to the ***price of labor*** P_L. Why so? The reason is that we take into consideration that type *A* labor will be made available in this labor market only if the price of labor is sufficiently high to cover the opportunity costs of those supplying their labor services. Type *A* labor may be used in non–type *A* work, household production (child care, meal preparation, and the like), or pure leisure. Indeed, the optimal position in Chapter 2's work–leisure model (specifically point u_1 in Figure 2.5) defines an efficient allocation of labor (time) between labor market and non–labor market activities. In Figure 6.1, we found that such individual work–leisure allocations—along with wage opportunities in other labor markets—are reflected in the labor supply curve within a competitive labor market. Thus, Equation (6.1) tells us that human resources are efficiently allocated when the values of the last units of labor in various labor market uses (producing goods *x, y,. . . , n*) are all equal and these values in turn are equal to the opportunity cost of labor P_L (the marginal value of alternative work, non–labor market production, and leisure). Alternatively, an

FIGURE 6.5 Perfect Competition and an Efficient Allocation of Labor
Representative firms producing goods such as *x, y,* and *n* maximize profits by employing type *A* labor where the marginal revenue product of labor (MRP) equals the marginal wage cost (MWC). Perfect competition in the product market ensures that MRP equals the value of marginal product (VMP), and perfect competition in the labor market means that MWC equals the price of labor (P_L). Thus, VMP matches P_L in each use, satisfying the condition for efficiency in the allocation of type *A* labor: $\text{VMP}_{Ax} = \text{VMP}_{Ay} = \cdots = \text{VMP}_{An} = P_L$.



underallocation of a particular type of labor to labor market production occurs when its VMP in any employment exceeds P_L; an *overallocation* occurs when its VMP in any labor market employment is less than P_L.

Perfect Competition and Allocative Efficiency

Having defined allocative efficiency, let's consider our second question: Do perfectly competitive labor markets result in an efficient allocation of labor? Figure 6.5 is simply an expansion of Figure 6.4 to show the equilibrium positions of representative firms from several competitive industries—that is, industries producing *x, y,* and *n* with type *A* labor. Note that equilibrium for the three representative firms occurs at employment levels Q_{Ax}, Q_{Ay}, and Q_{An}, respectively. The equilibrium positions are the result of each firm's desire to maximize profits by equating the MRPs of *A* with the MWC of *A*. But perfect competition in the hiring of labor means that P_{LA} equals the MWC of *A*. Similarly, perfect competition in the sale of the three products means that the MRP of *A* equals its VMP for all three products. Thus, each firm maximizes profits where MWC = MRP. But because P_{LA} = MWC *and* MRP = VMP for all competitive firms using type *A* labor, we find that Equation (6.1) is fulfilled. In short, competitive labor markets *do* result in an efficient allocation of labor. This is an example of Adam Smith's famous concept of the "invisible hand." In competitive labor and product markets, pursuit of private self-interest (profit maximization) furthers society's interest (an efficient allocation of scarce resources). It is as if there is an unseen coordinator moving resources to where they are most beneficial to society.

With this understanding of allocative efficiency and its realization when perfect competition prevails, let's now seek to determine whether noncompetitive labor markets are consistent with an efficient allocation of labor.

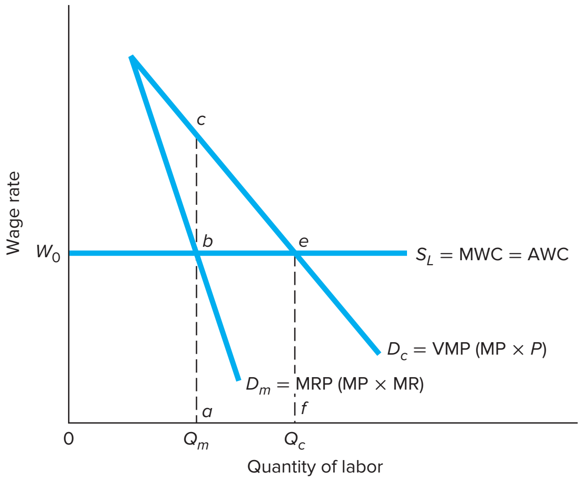
WAGE AND EMPLOYMENT DETERMINATION: MONOPOLY IN THE PRODUCT MARKET

To this point, we have assumed that the employers hiring labor in a perfectly competitive labor market are price takers in the product market; that is, they do not possess monopoly power. But recall from Chapter 5, specifically Table 5.3 and Figure 5.3, that if a firm is a monopolist in the sale of its product, it will face a downward-sloping product demand curve. This means that increases in its output will require price reductions, and because the lower prices will apply to all the firm's output, its marginal revenue (MR) will be less than its price. Consequently, MRP_L (= MP × MR) will fall for two reasons: (1) MP will decline because of diminishing returns (also true for perfect product market competition), *and* (2) MR will decline more rapidly than price as more workers are hired (in perfect competition, MR is constant and equals product price P).

The labor market consequences of product market monopoly are shown in Figure 6.6. Here we assume that the labor market is perfectly competitive but that one particular firm hiring this type of labor is a monopolist in the sale of its product. Restated, this type of labor is used by thousands of firms, not just this monopolist, and thus there is competition in the labor market.

Figure 6.6 indicates that this monopolist is a wage taker and therefore faces the perfectly elastic labor supply curve shown as S_L. This supply curve coincides with

FIGURE 6.6 Wage Rate and Employment Determination: Monopoly in the Product Market
Because a product market monopolist faces a downward-sloping demand curve, increased hiring of labor and the resulting larger output force the firm to lower its price. And because it must lower its price on all units, its marginal revenue (MR) is less than the price. Thus, the firm's MRP curve (MP × MR) lies below the VMP curve (MP × P), and this employer hires Q_m rather than Q_c units of labor. An efficiency loss to society of *bce* results.



the firm's marginal wage cost (MWC) and its average wage cost (AWC), just as it did in our previous model.

Labor demand curve D_c is the MRP curve that would have existed had there been competition rather than monopoly and therefore no decline in marginal revenue as the firm increased its employment and output. This MRP curve would be equal to VMP; the firm's revenue gain from hiring one more worker would equal society's gain in output. On the other hand, demand curve D_m is the *monopolist's* MRP curve. In this case, MRP *does not equal* VMP. The value of the extra output of each worker to the monopolist is less than the value to society. The reason again: The monopolist's sale of an additional unit of output does not add the full amount of the product's price to its marginal revenue. Thus, MRP (= MR × MP)—the value to the firm—is less than VMP (= P × MP)—the value to society.[2]

Several noteworthy outcomes of monopoly in the product market are evident in Figure 6.6. First, the monopolist's labor demand curve D_m is *less elastic* than the competitive curve D_c. Second, the monopolist behaves in the same way as the competitor by determining its profit-maximizing level of employment where MRP = MWC. Nevertheless, this equality produces a lower level of employment—Q_m in this case—than would occur under competitive product market conditions (Q_c). Third, the wage paid by the monopolist is the same as that paid by competitive firms. Without unions, both are wage takers.[3] Fourth, labor resources are misallocated. To understand why, recall that in a perfectly competitive labor market the price of labor ($P_L = W$) reflects the marginal opportunity cost to society of using a resource in a particular employment. Also remember that the VMP of labor is a measure of the added contribution to output of a worker in a specific employment. Notice in the figure VMP > P_L (W_0) for the Q_m through Q_c workers. This implies that too few labor resources are being allocated to this employment and therefore too many are allocated somewhere else. An efficiency loss of area *bce* occurs. Assuming costless labor mobility, if Q_mQ_c (or *be*) workers were reallocated from alternative activities to work in this industry, the *net* value of society's output would rise by area *bce.* These workers would contribute output valued at *acef* in this employment—the value of the total product added—whereas they previously contributed output valued at area *abef*—the opportunity cost to society of using them here.[4]

[2] If you are not clear on this point, review Table 5.3 and Figure 5.3.

[3] For evidence supporting this theoretical prediction, see Leonard W. Weiss, "Concentration and Labor Earnings," *American Economic Review,* March 1966, pp. 96–117.

The less elastic labor demand curve possessed by the monopolist, however, may increase the collective bargaining power of unions and result in a higher wage for workers in monopolized product markets. For evidence of a positive impact of monopoly power on wages, see Stephen Nickell, "Product Markets and Labour Markets," *Labour Economics,* March 1999, pp. 1–20.

[4] We are assuming that the monopoly firm cannot "price discriminate." If it could charge purchasers the exact price they would be willing to pay rather than do without the product, MRP would coincide with VMP in Figure 6.6. The firm would now find it profitable to hire Q_c (rather than Q_m) workers, and labor resources would be allocated efficiently (Q_c).

6.1 *Quick Review*

- Changes in the determinants of labor supply and demand (Table 6.1) shift the labor supply and demand curves and produce new equilibrium wage and employment levels.
- The perfectly competitive firm is a wage taker whose labor supply curve is perfectly elastic (WR = MWC = AWC); it maximizes profit at the level of employment where marginal wage cost equals marginal revenue product (MWC = MRP).
- By equating the value of the marginal product of labor (= VMP_L) and the opportunity cost of labor (= P_L), perfect competition in product and labor markets creates allocative efficiency.
- Because a product market monopolist's MRP (= MP × MR) curve lies below the VMP (= MP × *P*) curve, employment is less in the monopolized industry than it would be if the industry were competitive. So an efficiency loss occurs.

Your Turn

Assume that perfectly competitive firms are employing labor in profit-maximizing amounts. Now suppose that, all else being equal, the market supply of this labor increases. How will the firms respond? How will they know when to stop responding? Explain, referring to MRP and MWC. (*Answers:* See page 599.)

MONOPSONY

Thus far, we have assumed that the labor market is perfectly competitive. Now we wish to analyze a labor market where either a single firm is the sole hirer of a particular type of labor or two or more employers collude to fix a below-competitive wage. These market circumstances are called ***pure monopsony*** and ***joint monopsony***, respectively. For simplicity, our discussion will be confined to pure forms of monopsony, but keep in mind that monopsony power, much the same as monopoly power, extends beyond the *pure* model to include weaker forms of market power.

We will again assume that (1) there are numerous qualified, homogeneous workers who act independently to secure employment in the monopsonized labor market, and (2) information is perfect and mobility is costless. But unlike the perfect competitor, the monopsonist is a wage setter; it can control the wage rate it pays by adjusting the amount of labor it hires, much as a product market monopolist can control its price by adjusting its output.

Table 6.2 contains the elements needed to examine labor supply and demand, wage and employment determination, and allocative outcomes in the monopsony model. Comprehension of the table will greatly clarify the graphic analysis that follows.

Notice in Table 6.2 that columns 1 and 2 indicate that the firm must increase the wage rate it pays to attract more units of labor toward this market and away from alternative employment opportunities. We assume that this firm cannot "wage discriminate" when hiring additional workers; it must pay the higher wage *to all workers,* including those who could have been attracted at a lower wage. This fact is reflected in column 3,

TABLE 6.2
Wage and Employment Determination: Monopsony (Hypothetical Data)

(1) Units of Labor	(2) (AWC) Wage	(3) TWC	(4) MWC	(5) (VMP) MRP
1	$1	$1	$1	$7
2	2	4	3	6
3	3	9	5	5
4	4	16	7	4
5	5	25	9	3
6	6	36	11	2

where total wage cost (TWC) is shown. We find the values for TWC by multiplying the units of labor times the wage rate, rather than by summing the wage column. For example, if the monopsonist hires five units of labor, it will have to pay $5 for each, for a total of $25. Next notice the marginal wage cost (MWC) shown in column 4. The extra cost of hiring, say, the fifth unit of labor ($9) is more than the wage paid for that unit ($5). Each of the four labor units that could have been attracted at $4 must now also be paid $5. The $1 extra wage paid for each of these workers (= $4 total) plus the $5 paid for the fifth worker yield the $9 MWC in column 4. To generalize: *The monopsonist's marginal wage cost exceeds the wage rate because it must pay a higher wage to attract more workers, and it must pay this higher wage to all workers.*

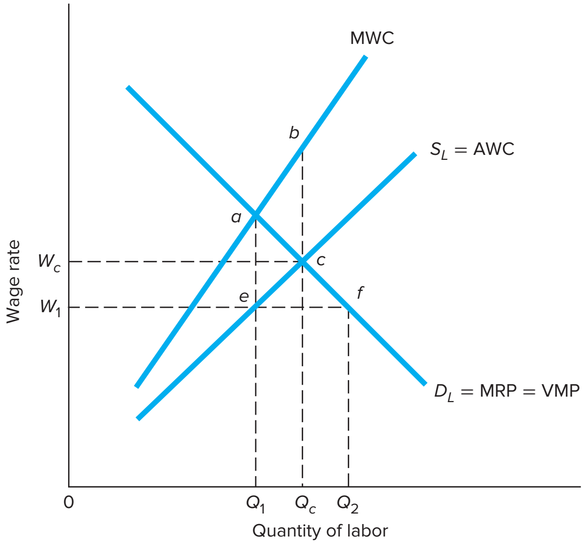
Finally, note column 5 in Table 6.2, which shows the marginal revenue product (MRP) of labor. We know that the MRP schedule is the firm's short-run demand for labor curve. In this case, we can avoid unnecessary complexity by assuming that the monopsonist is selling its product in a perfectly competitive market, and therefore MRP = VMP. We will soon discover, however, that the monopsonist will disregard this MRP schedule once it selects its profit-maximizing level of employment.

Figure 6.7 shows the monopsony model graphically. The labor supply curve slopes upward because the monopsonist is the only firm hiring this labor and hence faces the market labor supply curve. Notice that S_L is also the firm's average wage cost (AWC) curve (total wage cost/quantity of labor). Marginal wage cost (MWC) lies above and rises more rapidly than S_L because the higher wage rate paid to attract an additional worker must also be paid to all workers already employed. As we previously indicated, the marginal revenue curve MRP is the competitive labor demand curve and also measures the value of the marginal product of labor, VMP.

What quantity of labor will this monopsonistic firm hire, and what wage will it pay? To maximize profits, the firm will equate MWC with MRP, as shown at point *a,* and employ Q_1 units of labor. To understand this, suppose the firm employed Q_c units of labor rather than Q_1. The MWC of the Q_c unit is shown by point *b* on the MWC curve, but the MRP of the extra labor is only *c*; thus, the firm would lose profits equal to area *abc* by its action. To repeat: *The monopsonist, like the perfect competitor, finds its profit-maximizing employment level where MRP equals MWC.*

Having decided to hire Q_1 units of labor, the monopsonist's effective labor demand becomes a single point *e* rather than the entire curve D_L. This point lies

FIGURE 6.7 Wage Rate and Employment Determination Monopsony
The firm's MWC lies above the S_L = AWC curve in a monopsonistic labor market. The monopsonist equates MRP with its MWC at point *a* and chooses to hire Q_1 units of labor. To attract these workers, it need only pay W_1 an hour, as shown by point *e*. The firm thus pays a lower wage rate (W_1 rather than W_c) and hires fewer units of labor (Q_1 as compared to Q_c) than firms in a competitive labor market. Society loses area *eac* because of allocative inefficiency.



along the market labor supply curve S_L, allowing the firm to set the wage at W_1. The market clears at this wage; the quantity of labor demanded by the firm, Q_1, equals the amount of labor that suppliers are willing to offer. This equilibrium wage corresponds to that in Table 6.2 (circled row of data). Notice from point *f* on the MRP = VMP curve in Figure 6.7, however, that this monopsonist would prefer to hire Q_2 units of labor *if* it could hire each unit at a W_1 wage. Thus, the monopsonist may perceive a shortage of this type of labor. It would like more units of labor at the W_1 wage than it can get, but its self-interest keeps it from raising the wage above W_1. This may explain why monopsony markets, such as the one for nurses, are characterized by chronically unfilled job vacancies.[5] If we transformed this labor market into a perfectly competitive one, the equilibrium wage and quantity of labor would be W_c and Q_c units, respectively (point *c*). But as previously indicated, it simply is not profitable for this monopsonist to hire the Q_c units of labor and pay W_c to all Q_c workers. Instead it restricts the quantity of labor hired and

[5] The traditional view is that the labor market for nurses is monopsonistic. Hospitals are relatively few, particularly in small and medium-size cities. See Richard Hurd, "Equilibrium Vacancies in a Labor Market Dominated by Non-Profit Firms: The 'Shortage' of Nurses," *Review of Economics and Statistics,* May 1973, pp. 234–40. More recent research, however, questions whether monopsony exists in the market for nurses. See Barry T. Hirsch and Edward J. Schumacher, "Classic or New Monopsony? Searching for Evidence in Nursing Labor Markets," *Journal of Health Economics,* September 2005, pp. 969–89.

pays (1) a lower-than-competitive wage (W_1 compared to W_c) and (2) a wage below the MRP of the last unit of labor employed (e as opposed to a).

It is easy to see the basic divergence between the monopsonist's profit-maximizing goal and society's desire to maximize the total value of its output. Indeed, MRP equals MWC at Q_1 units of labor, but VMP is greater than the supply price of labor, W_1 ($= Q_1e$). Remember that the market labor supply curve reflects the price of labor in terms of the value of the output that the labor can produce in the next best employment opportunity. We observe that along segment *ac* of the VMP curve, the value of the marginal product of the Q_1Q_c labor units exceeds the opportunity cost to society of using that labor in this specific employment (shown by *ec* on the supply of labor curve). Therefore, if society reallocated this labor from alternative employments to this market, it would gain output of more value than it would forgo. The labor would contribute total output shown by area Q_1acQ_c in Figure 6.7. Society would forgo area Q_1ecQ_c of domestic product elsewhere, and thus the net gain would be area *eac.* This latter triangle identifies the allocative cost to society of the monopsonized labor market. Labor is underallocated to the goods and services produced in monopsonized industries.

Several attempts have been made to identify and measure monopsony power in real-world labor markets. Monopsony outcomes are not widespread in the U.S. economy.[6] Many potential employers exist for most workers, particularly when these workers are occupationally and geographically mobile. Also, strong labor unions counteract monopsony power in many labor markets.

Table 6.3 provides a matrix showing the wage outcomes of the three labor market models discussed thus far. The outcome in the bottom right corner of the matrix simply extends the monopsony outcome to a market where the monopsonist is

TABLE 6.3
Wage Outcomes of Labor Markets without Unions

		Product Market Structure (Firm)	
		Perfect competitor in sale of product (MR = P)	Monopolist in sale of product (MR < P)
Labor Market Structure (Firm)	Perfect competitor in hire of labor (MWC = W)	W = MRP = VMP (Figure 6.4)	W = MRP W < VMP (Figure 6.6)
	Monopsonist in hire of labor (MWC > W)	W < MRP (= VMP) (Figure 6.7)	W < MRP (< VMP)

[6] For a survey of theoretical and empirical studies of monopsony, see William M. Boal and Michael R. Ransom, "Monopsony in the Labor Market," *Journal of Economic Literature,* March 1997, pp. 86–112. See also Alan Manning, *Monopsony in Motion: Imperfect Competition in Labor Markets* (Princeton, NJ: Princeton University Press, 2003).

6.3 **World of Work**

Pay and Performance in Professional Baseball

Professional baseball has provided an interesting laboratory in which the predictions of orthodox wage theory have been empirically tested. Until 1976 professional baseball players were bound to a single team through the so-called reserve clause that prevented players from selling their talents on the open (competitive) market. Stated differently, the reserve clause conferred monopsony power on the team that originally drafted the player. Labor market theory (Figure 6.7) would lead us to predict that this monopsony power would let teams pay wages less than a player's marginal revenue product (MRP). However, since 1976 major league players have been able to become "free agents" at the end of their sixth season of play; at that time, they can sell their services to any team. Theory suggests that free agents should be able to increase their salaries and bring them more closely into accord with their MRPs. Research tends to confirm both predictions.

Scully* found that before baseball players could become free agents, their salaries were substantially below their MRPs. He estimated a player's MRP as follows. First, he determined the relationship between a team's winning percentage and its revenue. Then he estimated the relationship between various possible measures of player productivity and a team's winning percentage. He found the ratio of strikeouts to walks for pitchers and the slugging averages for hitters (all nonpitchers) to be the best indicators of a player's contribution to the winning percentage. These two estimates were combined to calculate the contribution of a player to a team's total revenue.

Scully discovered that prior to free agency the estimated MRPs of both pitchers and hitters were substantially greater than player salaries. Even the lowest-quality pitchers received on the average salaries amounting to only about 54 percent of their MRPs. "Star" players were exploited more than other players. The best pitchers received salaries that were only about 21 percent of their MRPs, according to Scully. The same general results applied to hitters. For example, the least productive hitters on the average received a salary equal to about 37 percent of their MRPs.

Several researchers have examined the impact of free agency on baseball players' salaries.† In accordance with the predictions of labor market theory, their studies indicate that the competitive bidding of free agency brought the salaries of free agents more closely into accord with their MRPs. The overturning of the monopsonistic reserve clause forced owners to pay players more closely in relation to their contribution to team revenues.

Thanks largely to free agency, the average salary in major league baseball had soared to $4.25 million for the 2015 season.

* Gerald W. Scully, "Pay and Performance in Major League Baseball," *American Economic Review,* December 1974, pp. 915–30.

† For surveys of such studies, see Andrew Zimbalist, *Baseball and Billions* (New York: Basic Books, 1992); and Lawrence M. Kahn, "The Sports Business as a Labor Market Laboratory," *Journal of Economic Perspectives*, Summer 2000, pp. 75–94.

WW6.3 an imperfect competitor in the sale of the product. You are urged to study each part of this table carefully.

WAGE DETERMINATION: DELAYED SUPPLY RESPONSES

The standard supply and demand model of the labor market (Figures 6.2 and 6.3) assumes that suppliers of labor respond quickly to changes in the market wage rate brought about by changes in labor demand. When the market wage rate rises in relative terms, more workers offer their labor services in that market. When the market wage falls, fewer workers supply their labor services there. Movements of this sort along a market supply of labor curve bring the quantity of labor supplied into equality with the quantity of labor demanded at the equilibrium wage rate. In brief, the labor market immediately clears.

Although rapid supply responses are indeed characteristic of some labor markets, in other situations labor supply adjustments are less rapid than the standard model suggests. In fact, in some cases, supply adjustments may take several years. Our attention now turns to a model of one of these slowly adjusting labor markets.

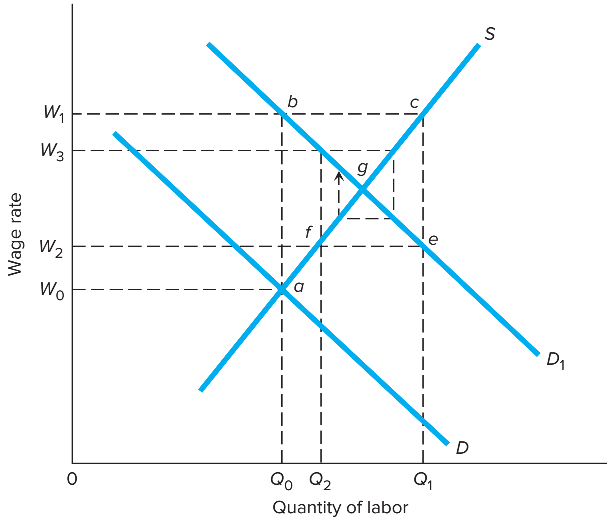
Cobweb Model

Consider Figure 6.8, where we depict the market for new engineers who are recent college graduates. Suppose labor demand and supply initially are D and S, respectively. Also assume that the market is presently in equilibrium at *a,* where the wage rate is W_0 and the level of employment is Q_0.

Now suppose an unexpected increase in the demand for engineers occurs, perhaps because of the emergence of new technologies. In the standard labor

FIGURE 6.8 Cobweb Model

The market for highly trained professionals such as engineers is characterized by delayed supply responses to changes in demand and wage rates. Because the quantity of labor supplied is temporarily fixed at Q_0, the wage rate rises to W_1 when demand changes from D to D_1. At wage rate W_1, Q_1 engineers eventually are attracted to this profession. With supply fixed at Q_1, however, the wage rate falls to W_2. Given this wage rate, the quantity of engineers available eventually falls to Q_2. This cycle repeats until equilibrium is achieved—in this case at the intersection of S and D_1.



market model, the market would quickly clear at the intersection of supply S and demand D_1. But the market for new engineers and other highly trained professionals is atypical. It is not unusual in these markets to observe four- or five-year delays in the supply response to new labor market conditions. Students currently enrolling in engineering schools will not graduate and enter the labor force for several years.

In the immediate market period, the number of new engineers available remains temporarily fixed at Q_0. The immediate market period is so short that there is no quantity-supplied response to a change in the wage rate. We might therefore envision a vertical *immediate-market-period labor supply curve* emanating upward from Q_0 through a and b. Supply curve S, on the other hand, may be thought of as the *long-run supply curve;* it indicates the *eventual* response of labor suppliers to changes in wage rates. Here, the long run entails a four- to five-year period.

Given that Q_0 engineers are now in the labor force and that demand now is D_1, a *shortage* of workers will occur at W_0 and the market wage rate will shoot upward to W_1. This wage rate will eliminate the shortage because at point b, demand curve D_1 intersects the vertical immediate-market-period labor supply curve comprising Q_0ab.

This is only the beginning of the story. Because of the high wage rate W_1, numerous new students will flock to the field of engineering. When they graduate some five years hence, Q_1 engineers will be available in the labor market. This supply response is determined at c on the long-run supply curve S and results from the previous wage rate W_1. In effect, the vertical immediate-market-period labor supply curve shifts rightward in a parallel fashion from Q_0 to Q_1.

Now that the quantity of labor supplied is again temporarily fixed—this time at Q_1—a *surplus* of bc engineers occurs at W_1. The wage rate consequently drops to W_2 (point e on D_1). Here the new immediate-market-period labor supply curve going upward from Q_1 through e and c cuts the demand curve D_1 at e, and the surplus is eliminated.

This scenario continues. Although the new starting wage rate W_2 is considerably lower than W_1, it will not immediately elicit a decline in the number of new engineers offering their labor services. Recent graduates holding engineering degrees are not likely to abandon their careers in response to lower relative salaries. Moreover, wage rate W_2 in all likelihood is higher than wage rates available to engineers in nonengineering jobs. The relatively low wage rate W_2, however, *does* affect the decisions of beginning college students who are planning their academic programs. The poor starting pay will discourage these students from opting to become engineers. In four or five years, colleges will confer fewer engineering diplomas during their graduation ceremonies. The number of new engineers in this labor market will fall from Q_1 to Q_2, the latter being determined at f on long-run supply curve S. Given demand D_1, a shortage of fe engineers occurs, and the wage rate responds by rising from W_2 to W_3.

The cycle just described repeats itself. The quantity of labor *demanded* in each period depends on the wage rate at that time; the quantity of labor *supplied* in each period results from the wage rate during the previous period when education and career decisions were originally made. In this instance, equilibrium eventually is achieved at the intersection of the long-run labor supply curve S and demand curve D_1. You are urged to carry the analysis forward through another cycle to test your understanding of this unusual model. The adjustment path toward equilibrium at g results in a cobweb pattern; for that reason, this model is called a ***cobweb model***.

Two further observations merit comment. It is entirely possible for still another shift in labor demand to occur before the cobweb path is completed to g. Thus, a new set of cobweb adjustments may be necessitated. Also, the elasticities of the demand and supply curves might be such that the market does not move to the ultimate equilibrium at g, but rather continues to oscillate between periodic shortages and surpluses.[7]

Evidence and Controversy

Cobweb models help explain adjustments in several labor markets having long training periods and highly specialized labor. For example, historical cobweb adjustments have been found in the markets for new engineers, lawyers, and physicists.[8] Recent evidence, however, indicates demand shocks are now causing a greater change in employment and a smaller adjustment of wages for information technology workers than in the past due to increased immigration of skilled workers.[9]

But not all economists find the cobweb model persuasive. Some critics question the relevance of the model to the majority of today's labor markets for the college-trained workforce. You will note that in the model labor market participants are assumed to adjust their career decisions to changes in *starting salaries.* Some economists suggest that the more likely scenario is that college students look to the present value of *lifetime earnings streams* in making education and career decisions.[10] Other critics assert that today's students are highly attuned to the possible boom–bust potential in some labor markets; therefore, they form *rational expectations* about the end result of any sudden change in the demand for labor and adjust their supply responses accordingly. If either of these two related criticisms is correct, the abrupt changes in immediate-market-period labor supply

[7] For the cobweb model to converge toward equilibrium, the supply curve must be steeper than the demand curve.

[8] Richard B. Freeman, "A Cobweb Model of the Starting Salary of New Engineers," *Industrial and Labor Relations Review,* January 1976, pp. 236–48; Freeman, "Legal Cobwebs: A Recursive Model of the Market for New Lawyers," *Review of Economics and Statistics,* May 1975, pp. 171–80; Freeman, "Supply and Salary Adjustments to the Changing Science Manpower Markets: Physics, 1948–1973," *American Economic Review,* March 1975, pp. 27–39.

[9] John Bound, Breno Bragal, Joseph M. Golden, and Sarah Turner, "Pathways to Adjustment: The Case of Information Technology Workers," *American Economic Review*, May 2013, pp. 203–207.

[10] See Joel W. Hay, "Physicians' Specialty Choice and Specialty Income," in G. Duru and J. H. P. Paelinck (eds.), *Econometrics of Health Care* (Netherlands: Kluwer Academic, 1991); and Sean Nicholson, "Physician Specialty Choice under Uncertainty," *Journal of Labor Economics,* October 2002, pp. 816–47.

6.4 World of Work

Do Medical Students Know How Much Doctors Earn?

Usually labor economists assume that individuals make unbiased predictions about their future income prospects. That is, people make income forecasts that are not systematically high or low. Economists also assume that people have access to the same information and use this information in the same manner to generate their income forecasts.

Nicholson tested these assumptions by examining how much medical students know about the current earnings of physicians. To conduct his study, Nicholson used data from an annual survey, conducted between 1974 and 1998, of medical students at a large medical school in Philadelphia. The survey asks first- and fourth-year medical school students how much physicians currently receive in six specialties and which specialty they prefer.

The results indicate that medical students have a significant amount of error in their estimates of current earnings of physicians. The average medical student overestimated physician earnings in the 1970s, but now she underestimates earnings by 25 percent. Although the average error rate is substantial, students are more accurate in estimating earnings for their preferred specialties. Also, students learn over time: The forecast error is 35 percent lower for students in the fourth year than those in the first year. The error rate varies by demographic group: Students who are female, older, or have a higher medical entrance exam score tend to underestimate earnings more than their peers.

Source: Sean Nicholson, "How Much Do Medical Students Know about Physician Income?" *Journal of Human Resources*, Winter 2005, pp. 100–14.

in the cobweb model and the resulting oscillating path to equilibrium are less likely to occur. That is, equilibrium is more likely to be achieved without the cobweb effects.

In any event, the cobweb model is important because it reminds us that labor supply adjustments are not always as immediate or as certain as our basic labor market model predicts. The upshot is that many labor markets may better be characterized as moving toward allocative efficiency (VMP $= P_L$) than as having actually achieved it.

WW6.4

6.2 *Quick Review*

- A monopsonist pays a lower wage rate and employs fewer workers than firms hiring in a competitive labor market; this outcome is allocatively inefficient.
- In the cobweb model, the equilibrium wage rate is achieved only after a period of oscillating wage rate changes caused by recurring labor shortages and surpluses.

Your Turn

WW6.5

Why does the monopsonist's MWC curve lie above the market labor supply curve? Isn't this a disadvantage to the monopsonist? (*Answers:* See page 599.)

6.5 World of Work

NAFTA and American Labor

After much national and congressional debate, in late 1993 Congress passed the North American Free Trade Agreement (NAFTA). This agreement eliminated tariffs and other trade barriers among the United States, Canada, and Mexico over a 15-year period. NAFTA is the world's largest free-trade zone, covering 475 million people. Economists generally agree that this trade pact will raise the standard of living of U.S. citizens and Mexicans, mainly through increased output and lower product prices.

Some analysis has been done on NAFTA's impact on international trade. Trade among the United States, Canada, and Mexico has expanded. The largest increase has been between the United States and Mexico. For example, Mexico's share of U.S. imports rose from 6.6 percent in 1993 to 12.0 percent in 2012, while Mexico's share of U.S. exports rose from 8.9 percent to 14.0 percent over this period.* Gould finds that imports and exports between the United States and Mexico are 16 percent higher with NAFTA than without it.†

The effect of NAFTA on employment appears to have been modest. Francis and Zheng conclude that there has been little net employment change in the United States due to NAFTA.‡ They find that NAFTA decreased the annual growth rate in the number unemployed by 4.4 percent. They also report that NAFTA had an immediate impact on U.S. labor markets and its impact was felt for at least seven years.

* **www.wto.org** and **www.stlouisfed.org.**

† David M. Gould, "Has NAFTA Changed North American Trade?" *Federal Reserve Bank of Dallas Economic Review,* 1st Quarter 1998, pp. 12–23.

‡ John Francis and Yuqing Zheng, "Trade Liberalization, Unemployment and Adjustment: Evidence from NAFTA Using State Level Data," *Applied Economics*, May 2011, pp. 1657–1671. For a similar conclusion, see Burfisher, Mary E., Sherman Robinson, and Karen Thierfelder, "The Impact of NAFTA on the United States." *Journal of Economic Perspectives*, Winter 2001, pp. 125–144.

Chapter Summary

1. In a competitive labor market, the demand for labor is a price-adjusted summation of labor demand by independently acting individual employers, and the supply of labor is a summation of the responses of individual workers to various wage rates. Market supply and demand determine an equilibrium wage rate and level of employment.
2. The vertical height of the market labor supply curve measures the opportunity cost to society of employing the last worker in some specific use (P_L). The vertical height of the labor demand curve indicates the extra revenue the employer gains by hiring that unit of labor (MRP) and, given perfectly competitive markets, the value of that output to society (VMP).
3. The locations of the supply and demand curves in the labor market depend on the determinants of each (Table 6.1). When one of these determinants changes, the affected curve shifts either rightward or leftward, altering the equilibrium wage and employment levels.

4. The individual firm operating in a perfectly competitive labor market is a wage taker. This implies that its MWC equals the wage rate W; that is, the supply of labor is perfectly elastic. This firm maximizes its profits by hiring the quantity of labor at which MRP = MWC, or MRP = W.
5. An efficient allocation of labor occurs when the VMPs of a particular type of labor are equal in various uses and these VMPs also equal the opportunity cost P_L of that labor. Perfectly competitive product and resource markets result in allocative efficiency. By maximizing profits where MRP = MWC, firms also equate VMP and P_L because MRP = VMP and MWC = P_L.
6. Monopoly in the product market causes marginal revenue to fall faster than product price as more workers are hired and output is expanded. Because product price P exceeds marginal revenue MR, it follows that MRP (= MP × MR) is less than VMP (= MP × P). The result is less employment and an underallocation of labor resources relative to the case of perfect competition in the product market.
7. Under monopsony MWC > S_L (or P_L) because the employer must bid up wages to attract a greater quantity of labor and pay the higher wage to all workers. Consequently, it will employ fewer workers than under competitive conditions and pay a wage rate below the MRP of labor. This underallocation of labor resources (VMP > P_L) reduces the total value of output in the economy.
8. The cobweb model traces labor supply adjustments to changes in labor demand and wage rates in markets characterized by long training periods. The equilibrium wage rate is achieved only after a period of oscillating wage rate changes caused by recurring labor shortages and surpluses.

Terms and Concepts

perfectly competitive labor market
determinants of labor supply and demand
marginal revenue product
average wage cost
marginal wage cost
MRP = MWC rule
efficient allocation of labor
price of labor
pure monopsony
joint monopsony
cobweb model

Questions and Study Suggestions

1. List the distinct characteristics of a perfectly competitive labor market and compare them to the characteristics of monopsony.
2. Explain why most market labor supply curves slope upward and to the right, even though individual labor supply curves are presumed to be backward-bending. How does the height of a market labor supply curve relate to the concept of opportunity costs?
3. What effect will each of the following have on the market labor demand for a specific type of labor?
   a. An increase in product demand that increases product price.
   b. A decline in the productivity of this type of labor.
   c. An increase in the price of a gross substitute for labor.

d. A decline in the price of a gross complement for labor.

e. The demise of several firms that hire this labor.

f. A decline in the market wage rate for this labor.

g. A series of mergers that transforms the product market into a monopoly.

4. Predict the impact of each of the following on the equilibrium wage rate and level of employment in labor market *A:*

a. An increase in labor demand and supply in labor market *A*.

b. The transformation of labor market *A* from a competitive to a monopsonistic market.

5. Assume a surplus of doctors exists. Use labor market supply and demand graphics to depict this outcome. How would the market remedy this situation in the short run and the long run?

Q_B	VMP_{Bx}	VMP_{By}
1	\$18	\$23
2	15	19
3	12	15
4	9	11
5	6	9
6	3	5

6. Answer the following questions on the basis of the table shown here. Q_B is type *B* labor, and VMP_{Bx} and VMP_{By} are the industry values of the marginal products of this labor in producing *x* and *y,* the only two goods in the economy.

a. Explain why the VMPs in the table decline as more units of labor are employed.

b. If the supply price or opportunity cost of labor P_L is \$9, how many units of type *B* labor need to be used in producing *x* and *y* to achieve an efficient allocation of labor? What will be the combined total value of the two outputs?

c. Suppose P_L is \$15 and that presently five units of labor are being allocated to producing *x* while two units are being allocated to *y.* Is this an efficient allocation of labor? Why or why not? If not, what is the efficient allocation of type *B* labor?

d. Suppose P_L is \$25 and three units of labor are being allocated to producing *x,* while six units are being allocated to producing *y.* Explain why this is not an efficient allocation of labor. What *is* the efficient allocation of this type of labor? What gain in the total value of leisure, alternative outputs, or home production results from this reallocation of labor?

e. Suppose product *x* is sold in a perfectly competitive product market. Also ignore the VMP_{By} column and assume that the VMP_{Bx} schedule is representative of each firm hiring workers in a perfectly competitive labor market. If the market wage rate is \$12, what will be each firm's MWC? What will be their MRPs at their profit-maximizing level of employment? Explain why an efficient allocation of labor will occur in this industry.

7. Complete the following table for a single firm operating in labor market *A* and product market *AA:*

Units of Labor	Wage Rate (*W*)	Total Wage Cost	MWC	MRP	VMP
1	$10			$16	$16
2	10			14	15
3	10			12	14
4	10			10	12
5	10			8	10
6	10			6	8

   a. What, if anything, can one conclude about the degree of competition in labor market *A* and product market *AA?*
   b. What is the profit-maximizing level of employment? Explain.
   c. Does this profit-maximizing level of employment yield allocative efficiency? Explain.

8. Use the production data shown here on the left and the labor supply data on the right for a single firm to answer the following questions. Assume that this firm is selling its product for $1 per unit in a perfectly competitive product market.

Units of Labor	Total Product
0	0
1	13
2	25
3	34
4	42
5	46
6	48

Units of Labor	Wage Rate
0	—
1	$1
2	2
3	3
4	4
5	5
6	6

   a. How many workers will this firm choose to employ?
   b. What will be its profit-maximizing wage rate?
   c. What labor market model do these data best describe?

9. Assume a firm *(a)* is a monopsonist in hiring labor and *(b)* is selling its product as a monopolist. Portray this market graphically. Correctly label all relevant curves, show the equilibrium wage rate and level of employment, and indicate the efficiency loss (if any).

10. Use graphical analysis to show how an unexpected decline in labor demand may set off a cobweb adjustment cycle in a labor market for highly trained professionals. In explaining your graph, distinguish between the immediate-period supply curve and the long-run supply curve.

Internet Exercise

WWW...

Who Is Getting Pay Raises and Who Is Getting Pay Cuts?

Go to the Bureau of Labor Statistics Data website **(www.bls.gov/data/home.htm)** and select "Series Report." Enter the following ID series numbers: CES1000000001, CES1000000032, CES4200000001, and CES4200000032. Then click on "All Years." This will retrieve average hourly earnings (in 1982–1984 dollars) and employment for mining and logging and retail trade.

What were the average real hourly wage and employment rates in 1979 and 1995 in the retail trade and mining and logging industries? What were the percentage changes in the wage rate and employment for both industries? On the basis of the changes in wages and employment, what can you infer about the relative size of the changes in labor demand and labor supply?

What are the average real hourly wages and employment rates for the most recent month shown in the retail trade and mining and logging industries? What were the percentage changes between 1995 and the most recent month for the wage rate and employment for both industries? On the basis of the changes in wages and employment, what can you infer about the relative size of the changes in labor demand and labor supply?

Internet Links

WWW...

The Bureau of Labor Statistics Wages, Earnings, and Benefits website contains detailed statistics about wages by state, occupation, and industry **(www.bls.gov/bls/blswage.htm)**.