ers, so firms that heavily use part-time workers would face the greatest cost increases, other things equal. Second, mandated health insurance would raise the quasi-fixed costs of hiring workers relative to employing fewer workers for longer hours, thus increasing the costs of hiring part-time workers relative to full-time employees. Indeed, a recent study estimated that requiring firms to provide health insurance to their employees would cause a sizable reduction in the demand for part-time workers.[13] (Similarly, reductions in employment relative to hours can be expected to result when *firing* workers becomes more costly; see Example 5.2.)

ms’ Labor Investments and the Demand for Labor

The models of the demand for labor given in Chapters 3 and 4 were static in the sense that they considered only *current* marginal productivities and *current* labor costs. If all of a firm’s labor costs are variable each year, then it will employ labor *each period* to the point at which labor’s marginal revenue product equals the wage. Once we begin to consider hiring and training costs, however, the analysis changes somewhat.

Hiring and training costs are usually heavily concentrated in the initial periods of employment and do not recur. Later on, however, these early investments in hiring and training raise the productivity of employees. Once the investments are made, it is cheaper for the firm to *continue* using its current workers than to hire, at the same wage rate, new ones (who would have to be trained). Likewise, with an investment required for all *new* workers, employers have to consider not only *current* marginal productivity and labor cost but also *future* marginal productivity and labor costs in deciding whether (and how many) to hire. In short, the presence of investment costs—hiring and training expenses—means that hiring decisions must take into account past, present, and future factors.

To illustrate the hiring decision in the face of labor-investment costs, let us consider a firm that is seeking to determine its employment level over a two-period horizon. To keep the discussion simple, we shall ignore employee-benefit costs and the decision about how many hours employees will work; all workers employed in a period will be assumed to work for the entire period. We shall also assume that the firm is in a competitive product market and therefore takes its product price as given. Finally, firms that invest in their workers do so in the initial period (period 0) and reap their returns in the final period (period 1).

We will assume, with reference to Figure 5.2, that in the absence of training the firm’s marginal product of labor schedule is MP^*. If the firm decides to invest in training during period 0, however, the marginal product of labor schedule during this period is reduced to MP_0. After training (that is, in period 1), the schedule of labor’s marginal product rises to MP_1, where MP_1 exceeds both MP_0 and MP^*.[14]

[13] Mark Montgomery and James Cosgrove, “The Effect of Employee Benefits on the Demand for Part-Time Workers,” *Industrial and Labor Relations Review* 47, no. 1 (October 1993): 87–98.

[14] In the remainder of this chapter, the subscript L is omitted from the algebraic representation of labor’s marginal product. The subscripts used designate time period; the L is omitted to avoid clutter.

EXAMPLE 5.2

Unjust Dismissal Policies

In most European nations, workers have some protection against "unjust dismissals." Typically the legislation mandates the use of labor courts or industrial tribunals to resolve disputes, and while reinstatement of unjustly dismissed workers is rare, often severance pay is required. In contrast, the doctrine of *employment-at-will,* under which employers (and employees) have the right to terminate the employment relationship at any time, for any reason, has historically prevailed in the United States. Those not subject to this doctrine in the United States have included unionized workers with contract provisions governing discharges, tenured teachers, and workers under some civil service systems.

Recently, however, a number of state courts have adopted exceptions to this doctrine based on public policy or the existence of implicit contracts. The former exceptions prevent an employee from being discharged for an action that is consistent with public policy (e.g., reporting an employer for failing to pay the minimum wage), while the latter prevent discharges "without cause" if an employer's oral statements, established past practices, or statements in a personnel manual implicitly promise such protection. In one state, Montana, legislation has been passed requiring employers to have a "just reason" to fire a worker.

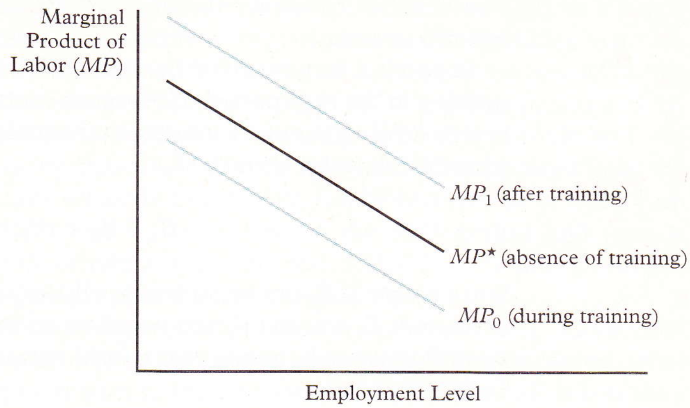
Relaxation of the employment-at-will doctrine effectively increases the costs of both terminating and hiring workers (the latter occurs because employers are likely to respond by expending more resources to screen out undesirable job applicants). Economic theory suggests that these increased hiring and firing costs provide firms with an incentive to reduce employment and substitute additional hours per worker; firms will also respond to fluctuations in demand by varying hours more than employment.

Do such predicted adjustments actually occur? One study of European countries found that, holding other factors constant, more stringent severance pay requirements were associated with lower employment levels. A U.S. study found that states that had adopted exceptions to the employment-at-will doctrine had lower levels of employment, other factors held constant, than other states. Finally, a third study found that fluctuations in demand were met more through hours adjustments and less through employment adjustments after the relaxation of the employment-at-will doctrine in the United States. These unintended side effects of unjust dismissal policies must be weighed against the protection they provide for workers.

SOURCES: Ronald Ehrenberg, "Workers' Rights: Rethinking Protective Labor Legislation," in *Rethinking Employment Policy,* ed. Lee Bawden and Felicity Skidmore (Washington, D.C.: Urban Institute, 1989); Edward Lazear, "Job Security Provisions and Employment," *Quarterly Journal of Economics* (August 1990): 696–726; James M. Dertouzos and Lynn A. Karoly, "Employment Effects of Worker Protection: Evidence from the United States," in *Employment Security and Labor Market Behavior,* ed. Christoph F. Buechtermann (Ithaca, NY: ILR Press, 1993); Alan B. Krueger, "The Evolution of Unjust Dismissal Legislation in the United States," *Industrial and Labor Relations Review* 44 (July 1991): 644–660; Daniel Hamermesh, "Employment Protection: Theoretical Implications and Some U.S. Evidence," in *Employment Security and Labor Market Behavior,* ed. Christoph F. Buechtermann.

We will also assume that the direct outlays on training the firm would have to make during period 0 are Z per worker in real terms (dollar costs divided by product price). Further, it will be assumed that the real wage it pays during the training period is W_0 and that the posttraining wage is W_1; for now, we take these wages as given, although we shall shortly examine how they are determined.

FIGURE 5.2
Effects of Training on Marginal Product Schedules



THE CONCEPT OF PRESENT VALUE

In determining its optimal employment level over the two periods, the firm clearly must consider the costs of employing workers in both periods and their marginal products in both periods. A *naive* approach would be to simply add up the costs ($W_0 + W_1 + Z$), add up the marginal products ($MP_0 + MP_1$), and then stop hiring when the sum of the marginal products that the last worker produces over the two periods is just equal to the sum of his or her real wages and training costs. This approach is naive because it ignores the fact that revenues accruing in the future are worth less to the firm than an equal level of revenues that accrue now. Similarly, costs that occur in the future are less burdensome to the firm than equal dollar costs that occur in the present.

Why should this be the case? The answer hinges on the role of interest rates. A dollar of revenue earned by a firm today can be invested at some market rate of interest so that by the next period it will be worth more than a dollar. Hence, faced with a choice of employing a worker whose marginal product is 5 in period 0 and 2 in period 1, or a worker whose marginal product is 2 in period 0 and 5 in period 1, the firm would prefer the former (if wages for the two workers were equal in each period). The sooner the product is produced and sold, the more quickly the firm can gain access to the funds, invest them, and earn interest.[15] Similarly, faced with the option of paying \$100 today or \$100 next period, the firm should prefer the second option. It could invest and earn interest on the \$100 now, make the payment in the next period, and have the interest left over. If the firm makes the payment now, it cannot earn interest income on the \$100.

These examples illustrate why firms prefer benefit streams in which the benefits occur as early as possible and cost streams in which the costs occur as late as possible. But how do we compare different benefit and cost streams when benefits and costs occur in more than one period? Economists rely on the concept of

[15] We are assuming here, of course, that the price the firm receives for its product is constant and that the rate of interest is positive.

present value, which we define to be the value *now* of an entire stream of future benefits or costs.

Suppose a firm receives the sum of $\$B_0$ in the current period and will receive nothing in the next period. How much money could it have in the next period if it invested $\$B_0$ at a rate of interest that equals r? It would have its original sum, B_0, plus the interest it earned, rB_0:

$$B_1 = B_0 + rB_0 = B_0(1 + r) \tag{5.2}$$

Since assets of B_1 can be automatically acquired by investing B_0 at the market rate of interest, *B_0 now and B_1 next period are equivalent values.* That is, a person who is offered B_0 now or B_1 in one year would regard the offers as exactly the same as long as $B_1 = B_0(1 + r)$.

Following this line of reasoning, suppose that the firm knows it will receive B_1 in the next period. What is the *current* value of that sum? Receiving B_1 in one year is equivalent to receiving a smaller amount (call it X) *now* and investing it so that it equals B_1 in a year. That is, the firm would need to have amount X now in order to invest it and wind up with principal plus interest equal to B_1 in the next period:

$$X(1 + r) = B_1 \tag{5.3}$$

Dividing both sides by $(1 + r)$:

$$X = \frac{B_1}{1 + r} \tag{5.4}$$

The quantity X in equation (5.4) is called the *discounted value* of B_1 earned one period in the future.

The *present value* of the firm's earnings over two periods is equal to its earnings in the initial period plus the discounted value of its earnings in the next period.[16] Returning to our two-period hiring decision example given at the start of this section, the *present value* of marginal productivity (PVP) can now be seen as

$$PVP = MP_0 + \frac{MP_1}{1 + r} \tag{5.5}$$

That is, the value *now* of a worker's marginal productivity over two periods is the marginal productivity in the current period (MP_0) plus the marginal productivity in the next period *discounted* by $(1 + r)$. Likewise, the present value of the real marginal expense of labor (PVE) is equal to

$$PVE = W_0 + Z + \frac{W_1}{1 + r} \tag{5.6}$$

where r is the market rate of interest. W_0 and Z are not discounted because they are incurred in the current period. However, W_1 is discounted by $(1 + r)$ because it is incurred one year in the future.

[16]Earnings in the initial period are not discounted because they are received *now*, not in the future.

The present-value calculation reduces a stream of benefits or costs to a single number that summarizes a firm's entire stream of revenues or liabilities over different time periods. For example, the *PVE* can be thought of as the answer to the question, "Given that a firm incurs costs per worker of $W_0 + Z$ this period and W_1 next period, how much does it have to set aside today to be able to cover both periods' costs?" The *PVE* is *less* than $W_0 + Z + W_1$ because W_1 is not owed until the latter period and any funds set aside to cover W_1 can be invested now. If the firm sets aside $W_1/(1 + r)$ to cover its labor cost in the next period and invests this amount earning a rate of return r, the interest, $r[W_1/(1 + r)]$, plus principal, $W_1/(1 + r)$, available in the next period will just equal W_1.

Similarly, the *PVP* can be thought of as the answer to the question, "Given that a worker's marginal product will be MP_0 in this period and MP_1 next period, what is the value of that output stream to the employer today?" The *PVP* is less than $MP_0 + MP_1$ because if the firm were to attempt to borrow against the employee's future marginal product, it could borrow at most $MP_1/(1 + r)$ today and still afford to repay this principal plus the interest, $r[MP_1/(1 + r)]$, out of earnings in the next period.[17]

THE MULTIPERIOD DEMAND FOR LABOR

The concept of present value can help clarify what determines the labor demand function in our two-period model. Rather than focusing on the marginal product of labor schedule for each period separately, the firm must consider them jointly by summarizing their present values. Thus, the present value of schedules MP_0 and MP_1 in Figure 5.3 is shown as curve *PVP*. Similarly, rather than focusing on the hiring and training costs and the wage rates in each period separately, an employer must consider the *present value* of the marginal cost of labor (*PVE*). To maximize its present value of profits, a firm should employ labor up until the point that adding an *additional* employee yields as much as it costs (when both yields and costs are stated as present values). That is, the profit-maximizing condition in our two-period example is

$$PVP = PVE, \text{ or} \tag{5.7a}$$

[17] More generally, if the firm expects to receive benefits of $B_0, B_1, B_2, \ldots, B_n$ dollars over the current and next n periods, and if it faces the same interest rate, r, in each period, its present value of benefits (*PVB*) is given by

$$PVB = B_0 + \frac{B_1}{1+r} + \frac{B_2}{(1+r)^2} + \frac{B_3}{(1+r)^3} + \ldots + \frac{B_n}{(1+r)^n}$$

An analogous expression exists for the present value of costs. The reader should make sure that he or she understands why the denominator of B_2 is $(1 + r)^2$, the denominator of B_3 is $(1 + r)^3$, etc. If one thinks in terms of a series of one-period loans or investments, it should become obvious. For example, X_0 invested for one period yields $X_0(1 + r)$ at the end of the period. Let us call $X_0(1 + r) = X_1$. Now X_0 invested for two periods is equal to its value after one period (X_1) multiplied by $(1 + r)$— or $X_2 = X_1(1 + r)$. But $X_1 = X_0(1 + r)$, so $X_2 = X_0(1 + r)^2$. To find the present value of X_2 we divide by $(1 + r)^2$, so $X_0 = X_2/(1 + r)^2$.

$$MP_0 + \frac{MP_1}{1+r} = W_0 + Z + \frac{W_1}{1+r} \tag{5.7b}$$

Given the particular values of W_0, W_1, Z, and r that are specified in Figure 5.3, profits are maximized at employment level E^*.

Now, equation (5.7b) merely states the familiar profit-maximizing condition that marginal returns should equal marginal costs, in a multiperiod context. If Z were zero, for example, equation (5.7b) implies that profits could be maximized when labor is hired so that $MP_0 = W_0$ and $MP_1/(1 + r) = W_1/(1 + r)$, or, since $1 + r$ is the denominator on both sides of the equation, $MP_1 = W_1$. Thus, when there are no hiring or training costs ($Z = 0$), the conditions demonstrated in Chapter 3 are sufficient to guarantee profit maximization in the multiperiod context. However, when Z is positive, which means that firms make initial investments in their workers, the conditions for maximizing profits change.

To understand the change in profit-maximizing conditions suggested by equation (5.7b), suppose that in the initial period the real wage an additional worker receives (W_0) plus the firm's direct investment outlays (Z) exceed the worker's output (MP_0). We can call this difference the *net expense* to the firm of hiring an additional worker in the initial period (NE_0):

$$NE_0 = W_0 + Z - MP_0 > 0 \tag{5.8}$$

In order for the firm to maximize the present value of its profit stream, it must thus get a net *surplus* in the subsequent period. If it does not, the firm will not have any incentive to hire the additional worker.

The discounted value of the subsequent period's surplus (G) is defined as:

$$G = \frac{MP_1}{1+r} - \frac{W_1}{1+r} = \frac{MP_1 - W_1}{1+r} \tag{5.9}$$

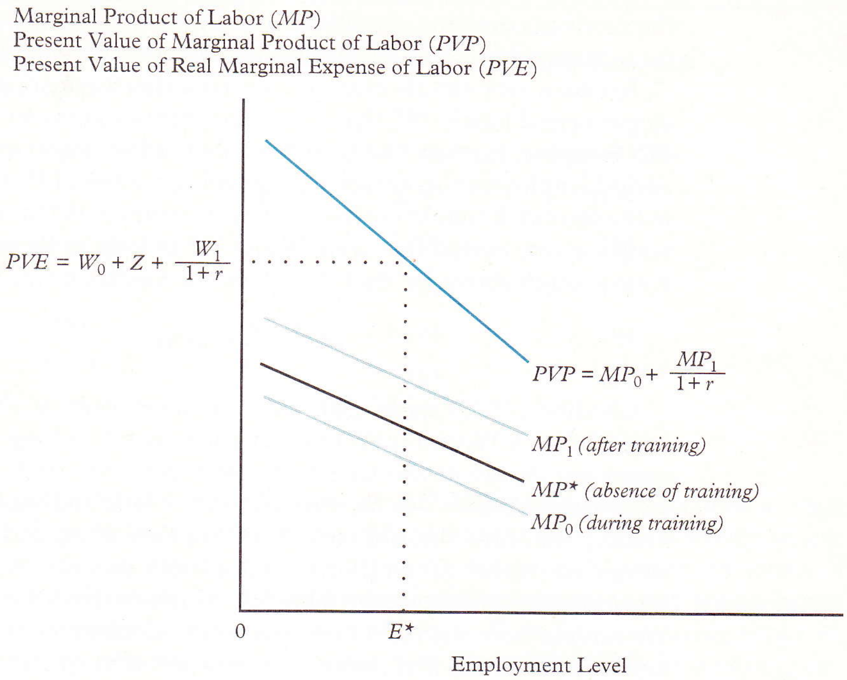
From equations (5.7b), (5.8), and (5.9), we see that, if the firm is to maximize profits, labor must be hired until the discounted value of the subsequent-period surplus equals the net expense (NE_0) in the initial period:

$$W_0 + Z - MP_0 = \frac{MP_1 - W_1}{1+r} \tag{5.10}$$

A subsequent-period surplus can exist *only* if real wages in that period (W_1) lie *below* marginal product (MP_1). This surplus makes up for the fact that the employer's labor costs in the initial period ($W_0 + Z$) were above the worker's marginal product (MP_0).

To this point we have established two things. First, equation (5.7b) has shown that in a multiperiod model of labor demand, the firm's demand curve is the same as the curve representing the *present value* of labor's marginal product over the periods of hire. Thus, the firm maximizes profits when the present value of its marginal labor expense equals the present value of labor's marginal product. Second, we

FIGURE 5.3
Multiperiod Demand for Labor



demonstrated in equation (5.10) that maximizing profits when the firm's labor costs in the initial period exceed the worker's initial-period marginal product requires real wages in the subsequent period to be below marginal product in the subsequent period (so that a surplus is generated). The only times when a subsequent-period surplus is not necessary to induce the hiring of an additional employee are when investment costs (Z) are zero in the initial period or when investment costs of Z exist but the initial-period real wage is decreased to such an extent that it equals $MP_0 - Z$. (In the latter case, employees pay for their own training by accepting a wage in the initial period that is decreased by the direct costs of training.)

CONSTRAINTS ON MULTIPERIOD WAGE OFFERS

In the single-period model of labor demand introduced in Chapter 3, a firm in a competitive labor market takes the market wage as given and adjusts its hiring of labor so that labor's marginal product is equal to it. Our discussion above, however, implies that a profit-maximizing firm employing its workers for more than one period has some choice about its wage stream over these periods; it can pay more than marginal product in some periods and less in others. While such choice potentially does exist, it is constrained by the need to make a multiperiod "package" of wage offers that is competitive with the offers being made by other employers in the market. Just as the concept of present value was useful in expressing the profit-maximizing conditions in a multiperiod context, the concept is also useful in summarizing the constraints on a firm's stream of wage offers.

To take a very simple example, suppose that the market wage for firms offering single-period jobs is W^*; that is, assume that workers can always find a job paying W^*. Suppose, further, that firm X wants to offer its job applicants a written, two-period employment contract, guaranteeing a wage of W_0 in the first period and W_1 in the second. It would *not* have to pay its workers W^* in both periods! It could pay wages in one period that were below W^* as long as its wages in the other period were enough above W^* that the following condition was met:

$$W_0 + \frac{W_1}{1+r} \geq W^* + \frac{W^*}{1+r} \tag{5.11}$$

Condition (5.11) states that, with a market wage of W^* in each period, firm X could select a W_0 and a W_1 that varied from W^* as long as the *present value of its wages over the two periods were at least as large as the present value of wages the workers could obtain elsewhere.* If, for example, $W^* = \$100$ and we continue our two-period assumption, firm X could make several offers of W_0 and W_1 that yielded present values equivalent to receiving \$100 in both periods. A few of these alternative wage streams are shown in Table 5.3, which assumes a discount rate of 6 percent. We can see from the table that, given our assumption, if firm X wished to pay its workers \$81 in the first period, for instance, it must pay them at least \$120 in the second period to be competitive in the labor market.

Does the fact that all five alternative wage streams in Table 5.3 have equal present values mean that all are equally attractive to firm X and its potential workers? *If a two-period employment contract were legally binding on both the firm and its employees,* and if both used the same 6 percent discount rate, then all five wage streams would indeed be equally attractive to both parties. Generally speaking, however, written employment contracts are legally binding only on the *employer,* which means that employees are free to quit at any time.[18] Alternative A is therefore unattractive to the employer, because employees could take the \$128 offered in the first period and then, when wages are cut to \$70, quit to take an always-available \$100 job elsewhere in the second period.

If instead of offering its workers a written ("formal") contract of employment, firm X were offering a set of promises about employment and wages over two periods that were not legally enforceable (often called an "informal" or "implicit" contract), it would face further constraints. Specifically, with implicit contracts, alternatives C, D, and E are unattractive to employees. With these alternatives, workers would fear that the firm might profit from paying a wage less than \$100 in the first period and then fire them in the second period, when their wages were due to rise above what they could obtain elsewhere.

If firm X always rules out alternative A and, in the absence of a formal contract, its employees rule out alternatives C, D, and E, is there any practical choice other

[18]An obvious exception to this general rule in the United States is the contract military recruits sign with the armed forces. (While professional athletes are bound to a particular team during their contract period, even they cannot be sued for quitting their sport altogether and pursuing another line of work!)

TABLE 5.3
Alternative Two-Period Wage Streams That Have Equal Present Values Using a 6 Percent Discount Rate

Alternative	W_0	W_1	Present Value
A	$128	$ 70	$194
B	100	100	194
C	81	120	194
D	62	140	194
E	43	160	194

than paying the market wage in each period? If the firm wants to offer a wage stream that departs from paying W^* in both periods, it must offer a stream whose present value is *above* that of a stream paying W^* in each period. In terms of Table 5.3, if firm X, in the absence of a formal contract, wants to pay wages below $100 in the first period, it must alter alternatives C, D, or E by increasing either W_0 or W_1 so that the present value of its offer rises above $194. Only by so doing can firm X induce at least some workers to take the risk that the firm will renege on its promises and fire them in the second period.

How, then, can a firm offering multiperiod employment afford to pay its workers a wage stream whose present value is above the market? One way is to train its workers so that their marginal product is increased beyond that of untrained workers. The other, which is useful when workers differ in their abilities, is to carefully select applicants so that only the best are hired. We therefore turn our attention to training and hiring investments to see just how it is that firms can profit from them.

Do worker care about which one is a compatible wage? which gonna lower wage later?

General and Specific Training

It is useful to conceptually distinguish between two types of training: *general training* that increases an individual's productivity *to many employers* equally, and *specific training* that increases an individual's productivity *only at the firm* in which he or she is currently employed.[19] Pure general training might include teaching an applicant basic reading skills or teaching a would-be secretary how to type and use a word-processing program. Pure specific training might include teaching a worker how to use a machine that is unique to a single employer or showing him

[19] Gary Becker, *Human Capital*, 2d ed. (New York: National Bureau of Economic Research, 1975), was first to formalize this distinction. A recent refinement can be found in Margaret Stevens, "A Theoretical Model of On-the-Job Training with Imperfect Competition," *Oxford Economic Papers* 46, no. 4 (October 1994): 537–562.

or her the organization of the production process in the plant. The distinction is primarily a conceptual one because most training contains aspects of both types; however, the distinction does yield some interesting insights.

Suppose, continuing our two-period model, that a firm offers *general* training to its employees, who have a marginal product of MP^* (and can obtain wage offers of $W^* = MP^*$ elsewhere). Suppose, too, that the firm incurs an initial-period net cost of training equal to NE_0 of equation (5.8). This training increases employee marginal product to MP_1 ($>MP^*$) in the subsequent period, and the firm scales its wages (W_1) in the subsequent period so that there is a surplus in that period whose present value (G) equals NE_0. What will happen?

The trained employee is worth MP_1 to several other firms, but is getting paid less than MP_1 by the firm doing the training (so that it can obtain the required surplus). The employee can thus get *more* from some other employer, who did not incur training costs and thus will not demand a surplus, than he or she can get from the employer offering the training. This situation is likely to induce the employee to quit after training and seek work elsewhere. Assuming all other conditions of employment are the same, the firm would have to pay its employees MP_1 after general training to keep them from quitting.

If firms must pay a wage equal to MP_1 after training, they will not be willing to pay for general training of their employees. Either they will not offer it, or they will force trainees to bear the full cost of their training by paying wages that are less than marginal product in the period of training by an amount equal to the direct training costs (that is, NE_0 must equal zero).

In contrast, consider an individual who receives *specific training* that increases marginal productivity with the *current* employer to MP_1 in the subsequent period. Since the training is firm-specific, the trainee's marginal product in *other* firms remains at its pretraining level of MP^*; therefore, the most the employee can obtain elsewhere is still W^*. The firm that trains the worker in firm-specific skills *will* have an incentive to offer (and at least partially pay for) the job training because it can pay a wage above W^* but below MP_1 in the subsequent period. We explain below.

SPECIFIC TRAINING AND THE WAGE PROFILE

With regard to specific training investments, firms have two related decisions to make: how much to invest in training their employees and, if they offer training, how to structure wages during and after training so that they can recoup their investment. How much training to offer any group of employees is affected by how much their productivity can be enhanced and by how likely they are to remain with the firm after being trained; clearly, firms are more likely to offer training to workers who learn efficiently and are less inclined to job-hop or to quit for some other reason (to leave the labor force or to retire, for example). While some workers are more likely to quit than others in any given situation, firms can also adopt pay policies that reduce their workers' quit rates, as we will see in a moment.

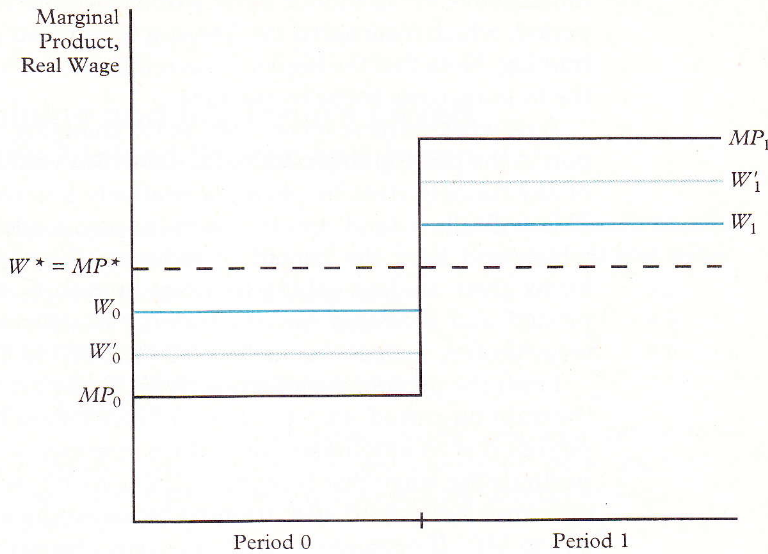


FIGURE 5.4 *A Two-Period Wage Stream Associated with Specific Training*

To help understand how a firm offering specific training decides on the wage stream it will offer, refer to the two-period example summarized in Figure 5.4. The firm's workers come to it with a marginal product of MP^*, and they can obtain a wage of W^* ($= MP^*$) elsewhere. If they receive specific training in the first period of employment, their marginal product with the firm is reduced to MP_0 during the training period but rises to MP_1 ($>MP^*$) in the posttraining period. *How will the firm set wages in the training and posttraining periods?*

In selecting its stream of wage offers, the firm must meet three conditions. First, it must not incur wage and training expenses whose present value is larger than that of its workers' marginal products; that is, in maximizing profits, it must satisfy equation (5.7b). Second, it must offer a wage stream whose present value is at least as large as that of alternative employers, as indicated by equation (5.11). Third, it must offer a posttraining wage that is high enough to discourage its trained workers from quitting right after training, for if they do, the firm's training investments will be lost. Clearly, these conditions imply that the posttraining wage will lie above W^* (to discourage quits) but below MP_1 (to allow the firm to recoup investment costs).

As we will learn in Chapter 10, quitting one job and taking another often involves some costs for the employee, especially if a change of residence is involved or if the job search process is costly in some way. If the firm believes that its workers will find it relatively costly to quit after training, then it could offer a wage stream similar to (W_0, W_1) in Figure 5.4, in which W_1 is only slightly more than W^* and W_0 is only slightly less. Put differently, if workers are not very mobile, the firm can offer a wage profile that rises only modestly after training. W_1 need not be much above W^* to induce those workers to stay with the firm in the posttraining period, which means that the firm can (and must) pay a wage closer to W^* during training. Note that the higher W_0 is relative to MP_0 during training, the greater are the training costs borne by the firm.

If its workers have lower costs of job changing and are therefore more likely to quit in the posttraining period, then the firm will want to force them to bear more of any training costs by paying a relatively low wage during the training period. This will allow (and require) them to pay a relatively high posttraining wage, which will have the benefit of reducing their workers' likelihood of quitting. Firms, then, are less willing to invest in groups of workers who are more "quit-prone," and if offered, specific training is associated with a more steeply rising wage profile, such as the one labeled (W_0', W_1') in Figure 5.4.[20]

From the perspective of employees, if they are paid a wage below W^* during the training period, they too have an investment to "protect" in the posttraining period. Just as employers can reduce employees' incentives to quit by paying a posttraining wage that is higher relative to W^*, workers can obtain more protection from being fired after training by accepting a posttraining wage lower relative to MP_1. If *employees* bore all the costs of specific training and received all the returns (by receiving a posttraining wage equal to MP_1), then employers would have no investment of their own to protect, would receive no posttraining surplus from their employees, and would not be inhibited from firing employees after training. If *employers* bore all the costs, they might not be able to pay their employees enough in the subsequent period to guard against their quitting. It is in the *mutual* interest of both employers and employees, then, to share the costs of specific training and thereby foster a long-term employment relationship. As emphasized by Example 5.3, we expect that the presence of more job training will be associated with employees who are more permanently attached to their employers.

Empirical studies measuring the wage profiles associated with on-the-job training in the United States suggest that employers bear much of the costs and reap most of the returns. There is evidence that wages are not depressed enough initially to offset employers' direct costs of training,[21] and there is corresponding evidence that subsequent wage increases are much smaller than productivity increases. A recent survey of employers, summarized in Figure 5.5, estimates that productivity increases, which generally rise with the hours of initial on-the-job training, are far larger than wage increases over a worker's first two years with an employer. Other studies that directly link the wage profiles of American workers

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[20]For more theory and evidence on this issue, see Elizabeth Becker and Cotton Lindsay, "Sex Differences in Tenure Profiles: Effects of Shared Firm-Specific Investment," *Journal of Labor Economics* 12, no. 1 (January 1994): 98–118.

[21]John Bishop, "The Incidence of and Payoff to Employer Training," 41, and Margaret Stevens, "An Investment Model for the Supply of General Training by Employers," *Economic Journal* 104 (May 1994): 556–570.

EXAMPLE 5.3

Training and Job Tenure Levels in the United States and Japan

We emphasized in the text that the presence of employer training and a low employee quit rate should go hand in hand. A lower propensity to quit among its employees will induce firms to offer them more training, and once having offered training, firms will adopt compensation policies designed to reduce quits. Thus, a lower quit rate is both a cause and an effect of more employer training.

Among the developed nations of the world, Japan stands out as offering relatively high levels of employer training while the United States offers relatively little. In 1991, for example, 79 percent of Japanese workers went through a formal employer training program during their first year of employment with a firm, as compared to only 8 percent for American workers. (In the Netherlands, to take a European example, the comparable percentage was 19.) It should not be surprising to learn, then, that the average length of time Japanese workers remain with their employers is much longer than in the United States. For example, among workers between the ages of 25 and 34, the following comparisons can be made:

	Years with Current Employer	
	Japan	United States
Men, large firms	8.2	4.8
Women, large firms	7.5	4.3
Men, small firms	5.9	4.0
Women, small firms	5.1	3.1

Clearly, Japanese workers, who are more likely to receive on-the-job training, are more "attached" to their employers than are American workers.

SOURCE: Organisation for Economic Co-Operation and Development, *Employment Outlook 1993* (Paris: OECD, 1993), Tables 4.8 and 4.9. Job tenure data for Japan are for 1989, while tenure data for the United States are for 1991. For a study that questions the link between job training and turnover in the two countries, see David I. Levine, "Worth Waiting For? Delayed Compensation, Training, and Turnover in the United States and Japan," *Journal of Labor Economics* 11, no. 4 (October 1993): 724–752.

with the amount of training they have received find that posttraining wage increases are relatively modest.[22]

[22]Lisa Lynch, "Private-Sector Training and the Earnings of Young Workers," *American Economic Review* 82, no. 1 (March 1992): 299–312; David Blanchflower and Lisa Lynch, "Training at Work: A Comparison of U.S. and British Youths," in *Training and the Private Sector: International Comparisons,* ed. Lisa Lynch (Chicago: University of Chicago Press for the National Bureau of Economic Research, 1994), 233–260; Jonathan Veum, "Sources of Training and Their Impact on Wages"; Alan Krueger and Cecilia Rouse, "New Evidence on Workplace Education," working paper no. 329, Industrial Relations Section, Princeton University, May 1994; Harry Holzer, Richard N. Block, Marcus Cheatham, and Jack H. Knott, "Are Training Subsidies for Firms Effective? The Michigan Experience," *Industrial and Labor Relations Review* 46, no. 4 (July 1993): 625–636; Lauri Bassi, "Workplace Education for Hourly Workers," *Journal of Policy Analysis and Management* 13, no.1 (Winter 1994): 55–74; and Judith K. Hellerstein and David Neumark, "Are Earnings Profiles Steeper Than Productivity Profiles? Evidence from Israeli Firm-Level Data," *Journal of Human Resources* 30, no.1 (Winter 1995): 89–112.