Chapter 8
Compensating Wage Differentials
and Labor Markets

Summary

The focus of the previous two chapters was on the question: Will an individual work for pay, and if so, how much? But assuming the person does decide to look for work, what type of work will it be? What benefits will accompany the job? These are the kinds of questions taken up in Chapter 8. The purpose of the chapter is to provide a framework for thinking about the role that recurring job characteristics play in an individual’s labor supply decision and the repercussions such characteristics have on labor market outcomes such as the level of wages. The framework is then used to analyze the effects that regulations governing workplace safety and the provision of employee benefits can have on worker well-being.

One of the unique features of the labor market emphasized in Chapter 1 was that participants are much more sensitive to the nonpecuniary aspects of a transaction than in other markets. Labor services cannot be separated from the person rendering them. Therefore, given two offers of employment that are identical in all respects except working conditions, individuals trying to maximize their utility (satisfaction) will choose to supply their labor under the more desirable conditions. Hence, firms wishing to attract workers are faced with a dilemma. If they wish to attract more workers, they must either incur the costs necessary to make working conditions better, or they must pay higher wages. If the firm chooses to pay higher wages, the extra wage it pays relative to the firm with the more desirable working conditions is called a compensating wage differential. The compensating differential can be viewed as a reward to those workers accepting undesirable conditions, or alternatively, as the amount workers must pay to receive desirable conditions.

Of course, there are many things other than working conditions that influence a worker’s wage. Training, skill, experience, age, race, gender, union status, and location may all exert an influence on the wage received. It is important to realize that the theory of compensating differentials does not imply that workers experiencing bad conditions will earn more than those experiencing good. After all, the chief executive at General Motors earns more and works under better conditions than the typical worker on the assembly line. What the theory does imply is that, holding all else constant, comparable workers will receive higher wages when they work under unpleasant conditions. The theory is also based on the assumptions that workers seek to maximize utility rather than income, have complete information about the characteristics associated with a particular job, and that they have enough mobility so that they can potentially accumulate a number of different job offers.

Empirical studies that attempt to measure the size of compensating differentials are inherently difficult, since not everyone will agree on whether certain job characteristics (e.g., outdoor work) are desirable or undesirable. Also, it is essential to control for all the other factors that influence wages. Still, studies that have focused on the risk of fatal injury in manufacturing industries have found that wages are 1% higher when workers face twice the average risk of a job-related fatality. Compensating differentials have also been associated with such characteristics as night shifts, longer work hours, inflexible schedules, lower job security, and dangerous, expensive, or distant work locations.
But what is the process through which compensating differentials emerge? What roles do employers and employees play in the process? The answers to these questions can be found in a framework known as the **hedonic theory of wages**. This theory is illustrated in Figure 8-1, where the undesirable characteristic is assumed to be **risk of fatal injury**.

![Figure 8-1](image)

The preferences of two workers are summarized by the series of **indifference curves** labeled $A$ and $B$. Any given curve shows all the combinations of risk and wages that will yield a certain level of utility. Higher curves (i.e., movements to the northwest) yield higher levels of utility and are denoted by higher subscript numbers. The curves are upward sloping since as the level of risk increases, the only way to keep the worker at the same level of utility would be to raise the wage. The convexity of the curves suggests that when the workplace is very risky, workers are willing to forgo a large amount in wages in return for a given reduction in risk. However, as the workplace grows safer, workers are less willing to give up wages for that same reduction in risk. The steeper slope to person A’s indifference curves suggests that preferences about risk and wages are not the same for all individuals. Person A is more concerned about safety (more averse to risk) and so is willing to forgo more in wages than person B is for a given reduction in the level of risk.

The constraints facing two employers are summarized by the **isoprofit curves** labeled $X$ and $Y$. Any given curve shows all the combinations of risk and wages that will yield a certain level of profit. Higher curves (i.e., movements to the northwest) would yield lower profits. The curves shown are assumed to be wage/risk combinations associated with zero economic profits, or just a normal rate of return. Zero economic profits are consistent with the notion that firms face perfect competition in the input and output markets. The curves are upward sloping since reducing the level of risk is costly, and so reductions in risk must be accompanied by wage reductions if the firm is to remain at a certain profit level. The convexity of the curves suggests when the level of risk is high, risk reductions are relatively easy to find and a given reduction in risk can be found at a relatively low cost. However, once the workplace has been made safer, additional risk reductions are likely to be difficult and that same reduction in risk will be more costly. The steeper slope to firm Y’s isoprofit curve suggests that at any given level of risk, firm Y finds a given reduction in risk more costly than firm X.

Note that at low levels of risk, firm X will be able to offer higher wages than firm Y and still stay on the zero-profit isoprofit curve. At high levels of risk the opposite will be true. This suggests that the final outcome is constrained to lie along the portions of the zero-profit isoprofit curves that lie furthest to the northwest. The set of potentially acceptable offers is called the **offer curve**.

Given that the employees will be trying to maximize their utility given the offers made by the firms, person A will choose to work for employer X at a risk level of 4 and a wage of $8, while worker B will choose to work for employer Y with a risk of 8, but will receive a wage slightly over $12 for accepting this higher level of risk. Such a matching allows each firm to obtain the workers they need and at the same
time allows the workers to obtain the highest feasible level of utility. Note that if A accepted the offer B did, A would be on a much lower indifference curve. The same would be true if B accepted the offer A did. Note that the process results in the worker least sensitive to risk (person B) being matched with the firm that finds risk reductions most costly (firm Y). Similarly, the worker most averse to risk (person A) is matched with the firm that finds risk reductions least costly (firm X).

Note that if Figure 8-1 is an accurate depiction of the matching process through which compensating differentials are generated, mandatory safety standards may make at least some workers worse off. For example, if all firms were forced to reduce the risk level to 4, workers like B would be forced onto a lower indifference curve. Mandatory reductions in risk below 4 would make both workers worse off. Additionally, while businesses may initially bear the costs of additional safety, they may eventually try to cut costs elsewhere. This may result in permanent layoffs (or reduced hiring of new workers), and workers will have to find other jobs (presumably less desirable jobs, since they could have chosen them before and did not).

Recall, however, that Figure 8-1 was based on the assumption that workers had complete information about the actual risk associated with different employment offers. If this is not true, a window of opportunity may be created for mandatory risk reductions to make at least some workers better off. Even in these situations, however, it is important that the standards not be set too strict. In setting standards for workplace safety, it is important that a benefit/cost study be done to see whether the value that workers place on risk reductions is at least as great as the costs borne by firms, which invariably will be paid by the workers in one form or another. In such a study, the benefits can often be estimated by using the compensating differentials that are generated in markets where there is complete information.

For example, some empirical studies of compensating differentials have suggested that manufacturing workers may be willing to give up as much as $700 for a 1 in 10,000 reduction in the risk of a fatal injury. Using this information, it would be possible to extrapolate what a worker might be willing to give up, say, for a 4 in 10,000 reduction in risk. The regulation would thus seem to be worth up to (4)($700) or $2,800 per worker. This benefit level could then be compared with the estimated cost per worker of implementing the regulation.

Benefits computed in this manner, however, are often criticized for not taking into account the benefits from increased safety that would accrue to people not directly affected by the regulation. Also, the extrapolation takes worker willingness to pay for increased safety as a given. This ignores the convexity of indifference curves as well as changes in preferences and attitudes such regulations can bring about over time.

Another recurring job characteristic that can be analyzed using the hedonic wage theory is the level of employee benefits that workers receive. Employee benefits include payments in kind (e.g., medical insurance or paid vacations) or deferred compensation (e.g., pension fund contributions). Figure 8-2 shows how the model is adapted when the recurring characteristic is something of benefit to the workers.

![Figure 8-2](image_url)
The preferences of two employees are summarized by the series of indifference curves labeled $Y$ and $Z$. Any given curve shows all the combinations of employee benefits and wages that will yield a certain level of utility. Higher curves (i.e., movements to the northeast) yield higher levels of utility and are denoted by higher subscript numbers. The curves are downward sloping since as the level of benefits increases, the only way to keep the worker at the same level of utility would be to lower the wage. The convexity of the curves suggests that when the workers do not receive many benefits, they are willing to give up a significant amount in wages for a given increase in benefits. This occurs because in-kind benefits are not subject to income taxes, and deferred benefits will generally be taxed at a lower rate than current income. However, as the level of benefits rises, workers are less willing to give up wages for that same increase in benefits. This occurs because receiving compensation in the form of benefits does reduce the discretion workers have in how they allocate their income. The steeper slope to person Z’s indifference curves suggests that person Z finds additional benefits more valuable than person Y, and so is willing to give up more in wages than person Y for a given increase in benefits.

As income tax rates change over time, the benefits associated with taking compensation in the form of fringe benefits also changes. Holding all else constant, indifference curves between wages and benefits should become steeper as tax rates increase. Of course, preferences for wages and benefits will be heavily influenced by exactly what benefits are being modeled and the characteristics of the individual worker. For example, if the benefits on the horizontal axis consist primarily of child-care benefits, and the worker is without children, the benefits will be of little use and so we would expect the indifference curve for this individual to be much flatter than that for someone with small children.

The constraint facing employers is summarized by the isoprofit curve labeled $X$. (Since all firms are assumed to have the same isoprofit curves in this analysis, the line labeled $X$ can also be thought of as the offer curve facing workers.) The curve shows all the combinations of fringe benefits and wages that will yield the same total cost of compensation to the firm. With the total cost of compensation constant along the curve, it can be inferred that profits will also be constant along the curve. Higher curves (i.e., movements to the northeast) represent higher total compensation levels and so would yield lower profits. The curve shown is assumed to be that level of compensation associated with zero economic profits.

In Figure 8-2, the compensation level associated with zero economic profits is assumed to be $500. Since the isoprofit curve is drawn with horizontal and vertical intercepts at $500 (resulting in a slope of $-1$), it is also assumed that the firms can trade off between benefits and wages on a one-to-one basis and still keep total compensation costs the same. From the firm’s perspective, then, paying employees a dollar of fringe benefits is the same as paying a dollar in wages.

Although a one-to-one tradeoff is a useful starting point in the analysis, it is important to realize that the tradeoff is likely to be different. Business taxes like Social Security and workers’ compensation are computed as a percentage of a firm’s payroll, and so compensating workers in the form of wages can lead to additional costs that would not be incurred if the compensation was made in the form of benefits. So, for example, the firm may find that it can offer only $400 in wages in place of $500 in benefits (or $1 in benefits for every 80 cent reduction in wages).

Other reasons that benefits can be offered on more than a one-to-one basis include the reduced turnover costs that come when benefits tie people to firms, as well as possible volume discounts that firms may be able to obtain when buying things like medical insurance for their workers. There are also factors, however, that can counteract this tendency. For example, some benefits may result in more absenteeism, raising the cost of providing benefits relative to the cost of wages.

Combining the indifference curves for each individual with the employers’ isoprofit curves yields the equilibrium combinations of wages and benefits shown in Figure 8-2. If allowed to choose the mix of wages and benefits, worker Y would choose $400 in wages and $100 in benefits, while worker Z would choose only $300 in wages but $200 in benefits. Although some firms do give employees some flexibility as to the form of their compensation, most firms will choose a particular point along the isoprofit curve to
offer to prospective employees. The result, of course, is that firms will tend to attract different types of workers. A firm offering only $300 in wages but $200 in benefits would have no trouble attracting a worker like Z, but such a package would put Y on a lower indifference curve and create an incentive for Y to seek employment at a firm with a compensation package more suited to his or her preferences. Similarly, a firm offering more in wages but less in benefits would have trouble attracting workers like Z since such a package would put Z on a lower indifference curve.

Knowing that different types of compensation packages will appeal to different kinds of workers, firms will structure their compensation strategically to attract the types of workers they want. For example, what kinds of workers are likely to have preferences like person Z in Figure 8-2? Since the indifference curves are relatively steep, this means that additional benefits are highly valued. If the benefits are traditional things like pensions and health insurance, this is likely to be an older worker. Alternatively, if the benefits are maternity leave and child care, the person could be a young woman. By appropriately setting the type of benefits and their levels, the firm would be sure to attract workers like Z while discouraging applicants like Y.

Regardless of the compensation mix offered by the firms, note that Figure 8-2 clearly shows that workers pay for additional benefits in the form of lower wages. Holding all else constant, firms that offer comparable workers more generous benefits must pay lower wages to remain competitive. Figure 8-2 also provides a framework for rationalizing the growth of fringe benefits documented in Chapter 5. Higher income tax rates tend to steepen the indifference curves at the same time higher payroll taxes tend to flatten the isoprofit curves. As the indifference curves steepen and the isoprofit curves flatten, the optimal combination of wages and benefits moves in a southeast direction.

Example

Consider a worker who ranks combinations of employee benefits (E) and wages (W) according to the utility function

\[ U = E^\alpha W^\beta, \]

where \( \alpha \) and \( \beta \) are positive constants and \( U \) is the index of satisfaction. Suppose \( \alpha \) and \( \beta \) are both equal to one and that firms are able to remain competitive (i.e., keep profits at zero) if they offer $400 in wages and no employee benefits. If they offer benefits, wages must be reduced by 80 cents for every dollar of benefits offered. Suppose that currently, the firm is offering a compensation package of $250 in benefits and $200 in wages. Would the worker be made better off or worse off by a regulation that forced this firm to increase the value of its benefit package to $300?

The original wage/benefit package yielded an index of satisfaction equal to

\[ U = (250) (200) = 50,000. \]

If the level of benefits is increased to 300, the workers would stay at the same level of utility if wages fell to

\[ W = \frac{50,000}{300} = \$166.67. \]

In other words, the worker would be willing to give up $33.33 for the additional $50 in benefits.

However, to provide the additional $50 in benefits and still keep profits at zero, by how much will the firm have to reduce wages? Since every dollar of fringe benefits requires the firm to reduce wages by 80 cents, an additional $50 in benefits would require the firm to reduce wages by \((0.8)($50)\) or $40. Since the cost of providing the additional benefits exceeds what the worker is willing to pay, the regulation will make the worker worse off. Note also that the level of utility associated with the new compensation package of \( E = 300 \) and \( W = 160 \) falls to \( U = (300) (160) = 48,000. \)
The appendix to Chapter 8 provides a framework for thinking about the size of the compensating differential that must arise when workers are constrained by employers in their choice of work hours. For example, employees may be forced through excessive layoffs to consume more leisure than they consider optimal. Using the labor supply framework from Chapter 6, the appendix illustrates how to determine the income necessary to keep workers at their original utility when the level of leisure is forced away from its optimum. Once the level of income is found that will keep the worker’s utility constant, the wage that the firm must pay can be found by dividing the income level by the constrained number of work hours.

The appendix also provides a framework for thinking about why compensating differentials will be necessary when workers are subjected to uncertain layoffs. In such a situation, compensating differentials will arise if workers are risk averse, that is, if they have preferences such that they place a larger value on negative changes from a given income level than they do on positive changes of the same magnitude. In such a situation, the average level of utility associated with a job that always involves, say, 200 hours will be greater than the average utility that results from a job that averages 200 hours, but where hours range from 300 hours 50% of the time to 100 hours the other 50% of the time. Since the more variable schedule results in a lower average level of utility, a compensating differential will be necessary to attract risk-averse workers to this type of workplace.

**Review Questions**

Choose the letter that represents the **BEST** response.

**A Verbal Analysis of Occupational Choice**

1. If all jobs were exactly alike and located in the same place, an individual would tend to seek work at employers that
   a. paid the highest wages.
   b. had the most applicants.
   c. had the fewest applicants.
   d. had the most job openings.

2. In practice, jobs are not exactly alike and can be located in very different places. When this happens, a compensating wage differential can be expected to arise to attract workers to the jobs with less desirable characteristics. Such a differential is in equilibrium when
   a. all the workers are employed for the higher wage firm.
   b. all the workers who are indifferent about the adverse conditions are employed at the firm offering the most adverse conditions.
   c. each firm can obtain the quality and quantity of workers that it wants.
   d. the wage rises enough so that the firm with the worst working conditions has an incentive to improve its conditions.

3. Workers performing dangerous jobs in the economy are typically people that
   a. cannot find work offering better conditions.
   b. see the jobs as paying well compared to alternative employment.
   c. are poorly paid.
   d. enjoy danger.