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.
4. Suppose that the compensating differential associated with working in a noisy workplace is $500 per year. This $500 payment can be interpreted as
   a. the amount sufficient to attract any worker to the noisy environment.
   b. the amount that the marginal worker is willing to pay for a quiet environment.
   c. the minimum amount necessary to attract a worker to the noisy environment.
   d. the most that any worker would pay for a quiet work environment.

5. The theory of compensating differentials predicts that
   a. workers with poor conditions will earn more than those with good conditions.
   b. holding worker characteristics constant, workers experiencing poor conditions will earn more than those experiencing good conditions.
   c. holding wages constant, highly skilled workers will work under better conditions than less skilled workers.
   d. both b and c.

6. Which of the following is not an assumption on which the theory of compensating differentials is based?
   a. Workers always try to choose the highest paying job available to them.
   b. Given a certain wage, workers will always choose the job with more pleasant conditions.
   c. Workers know about the job characteristics associated with different employment opportunities.
   d. Workers have a variety of employment opportunities from which to choose.

A Hedonic Theory of Wages: The Risk of Injury

In answering Questions 7–13 please refer to Figure 8-3. The curves labeled $A_2$ and $B_2$ refer to indifference curves between the wage and risk of injury for two individuals, while the curves $X$ and $Y$ refer to zero-profit isoprofit curves for two firms.

![Figure 8-3](image-url)
7. In Figure 8-3 the indifference curves between the wage and risk of injury are drawn upward sloping. This is consistent with the statement that
   a. workers enjoying safe workplaces also typically earn higher wages.
   b. firms with safer conditions must pay less because risk reduction is costly.
   c. safer workplaces increase worker utility, so the only way to keep utility constant as risk is reduced is to lower the wage workers receive.
   d. both b and c.

8. In Figure 8-3 the indifference curves between the wage and risk of injury are drawn with a convex shape (when viewed from below). This is consistent with the statement that
   a. when a person feels relatively safe, he or she is not willing to give up much in wages for a given reduction in risk.
   b. when a person is in imminent danger of injury, he or she is willing to give up a large amount in wages for a given reduction in risk.
   c. the flatter the slope of the indifference curve, the more risk averse the person is.
   d. both a and b.

9. In Figure 8-3 the isoprofit curves between the wage and risk of injury are drawn upward sloping because
   a. reducing risk is costly, and so to stay at the same profit level, the firm must lower the wage.
   b. profits fall as the firm offers safer conditions.
   c. the firm must pay workers higher wages to accept higher levels of risk.
   d. increased risk of injury means that the firm must pay more in insurance and medical costs.

10. In Figure 8-3 the isoprofit curves between the wage and risk of injury are drawn with a concave shape (when viewed from below). This is consistent with the statement that
   a. When the workplace is relatively unsafe, a given reduction in risk can be attained cheaply.
   b. When the workplace is relatively safe, a given reduction in risk can only be achieved at a high cost.
   c. The steeper the isoprofit curve, the less costly are risk reductions to the firm.
   d. Both a and b.

11. In Figure 8-3 the offer curve for wage and risk is formed by the darkened portions of the isoprofit curves (including points a, b, and OC). Which of the following statements is not true about the offer curve?
   a. The offer curve represents the wage/risk combinations that firms can afford to make and workers are willing to accept.
   b. Every point on the offer curve is a point of positive economic profit for some firm.
   c. Every point on the offer curve is potentially an optimal combination of wage and risk for some worker.
   d. Constructing an offer curve could help to simplify the hedonic wage theory graph in the case when there are more than two firms.

12. In Figure 8-3 the matching process between firms and workers results in the wage/risk combinations indicated by points a and b. This diagram predicts that
   a. holding all else constant, wages rise with risk.
   b. workers most averse to risk will be matched with employers that find risk reductions least costly.
   c. workers with undesirable conditions are being exploited by their employers.
   d. both a and b.
13. If the workers in Figure 8-3 are mobile and perfectly informed about the degree of risk associated with a particular occupation, a mandatory risk reduction to 4 deaths per 10,000 workers would
   a. make both workers worse off.
   b. make person B worse off.
   c. force person B to change employers.
   d. both b and c.

14. In general, if a worker is imperfectly informed about the degree of risk associated with a particular occupation, a mandatory risk reduction
   a. will always make the worker worse off.
   b. will always make the worker better off.
   c. will make the worker better off provided the worker’s willingness to pay for the risk reduction exceeds the cost to the firms of providing it.
   d. will result in the optimal level of risk being attained.

15. Benefit/cost analyses of occupational safety and health standards may understate the benefits associated with such standards because
   a. benefits of safety and health standards can extend beyond just those workers protected by the standards.
   b. workers may not always know what is best for themselves.
   c. if workers experience safer standards, their attitudes may change and they may be willing to pay more for increased safety.
   d. all of the above.

**Hedonic Wage Theory and Employee Benefits**

16. As income tax rates increase, the advantage of receiving compensation in the form of employee benefits (payments in kind or deferred payments) increases. Assuming employee benefits are graphed on the horizontal axis and wage earnings on the vertical axis, what effect would income tax rate increases have on the indifference curves between benefits and wages?
   a. They would become steeper.
   b. They would become flatter.
   c. They would become more convex.
   d. They would eventually become upward sloping.

17. Firms may be able to offer employees an extra dollar in employee benefits and reduce wage earning by less than a dollar if
   a. the tax and insurance payments made by firms are based on a percentage of their total compensation.
   b. a more attractive tradeoff between wages and benefits attracts workers that are more stable and hence involve lower hiring, screening, and training costs.
   c. employees prefer having the discretion over spending that comes with receiving compensation in the form of wages.
   d. all of the above.
18. The hedonic wage theory of employee benefits typically assumes that
   a. firms are well informed about the compensation packages offered by their rivals.
   b. workers have a number of employment opportunities from which to choose.
   c. workers are offered a certain level of compensation and then are free to decide how it is split
      between wage and employee benefits.
   d. all of the above.

19. Employers that tailor their compensation packages to include a relatively large proportion of
    employee benefits will tend to attract workers that
   a. have steeper indifference curves (assuming benefits are plotted on the horizontal axis and wage
      earnings on the vertical axis).
   b. tend to be older and have higher family incomes.
   c. tend to be more present oriented.
   d. both a and b.

20. If workers are mobile and well informed about the compensation packages available at different
    firms, the mandated provision of employee benefits (e.g., health insurance) will tend to
   a. make all workers better off.
   b. make all workers worse off.
   c. make all firms worse off.
   d. make workers worse off if the reduction in wages that is necessary for firms to provide the
      benefits exceeds what workers are willing to pay for the benefits.

Compensating Wage Differentials and Layoffs (Appendix 8A)

In answering Questions 21–23, please refer to Figure 8-4. Point $a$ shows the unconstrained labor/leisure
choice for an individual with no nonlabor income that faces a market wage of $4 per hour. The maximum
hours available is 400 hours. Leisure time is denoted by $L$, work hours by $H$, income by $Y$, and utility by $U$.

![Figure 8-4](image)

21. In Figure 8-4 the optimal number of work hours for this individual is 200 hours. Which of the
    following statements is true about this point?
   a. The choice may involve the person being laid off for part of the period.
   b. The choice may involve the person being laid off for part of the period provided the wage
      adjusts to reflect a compensating differential.
   c. The choice reflects a desire for part-time work.
   d. The choice reflects a desire for full-time work.
22. Suppose that the individual is offered a job that involves only 80 work hours per period because of a predictable temporary layoff. What is the compensating wage differential required to keep the worker at the level of utility consistent with the unconstrained choice? In other words, what compensating differential would allow the person to attain point $b$? (Note that point $b$ has the coordinates $H = 80, Y = $500.)
   a. $2.25
   b. $6.25
   c. $180
   d. $300

23. If one were to draw the budget constraint consistent with compensating differential required when work hours are constrained to 80, the vertical intercept of that budget constraint would be
   a. $1,780.
   b. $1,900.
   c. $2,100.
   d. $2,500.

In answering Questions 24–25, please refer to Figure 8-5 which shows an individual’s relationship between income ($Y$) and utility. The wage rate is constant at $20. Work hours are denoted by $H$. Suppose the individual is offered a job that involves uncertain layoffs. In this job the person will work 50 hours half of the time and 450 hours the other half of the time.

![Figure 8-5](image-url)

24. The average level of utility experienced by this person would be
   a. 20.
   b. 22.5.
   c. 250.
   d. 500.

25. If instead of the job with uncertain layoffs, the person was offered a job that involved 250 hours of work with certainty, the average level of utility would
   a. decrease since the person is risk averse.
   b. increase since the person is risk averse.
   c. increase unless a compensating differential developed to make the two jobs yield the same average level of utility.
   d. both b and c.
Problems

The Hedonic Theory of Wages and the Assumption of Perfect Mobility

26. Figure 8-6 represents the matching process between employers and employees that occurs when working conditions differ across jobs. The curves labeled $A_1$ and $B_2$ refer to indifference curves between the wage and risk for two individuals, while the curves $X$ and $Y$ refer to isoprofit curves for two firms. Suppose that both workers are well informed about the wage/risk combinations offered at different workplaces.

26a. Suppose that person B is mobile, but person A is constrained to work only for firm Y. If firm Y offers the wage and risk combination indicated by point $a$ (Risk = 8, Wage = $12.25) to all workers, what effect does the lack of alternative offers have on person A’s level of utility (relative to what could be attained if person A was mobile)?

26b. Given the situation in Question 26a, what effect would a regulation that reduced risk to 4 deaths per 10,000 workers have on worker A’s level of utility?

26c. What effect would a regulation that reduced risk to 4 deaths per 10,000 workers have on person B’s level of utility? Would the effect of the regulation be better or worse if B was constrained to work for employer Y?

The Hedonic Theory of Wages and the Assumption of Perfect Information

27. Figure 8-7 represents the matching process between employers and employees that occurs when working conditions differ across jobs. The curves labeled $A_1$, $A_3$, and $A_4$ refer to indifference curves between the wage and risk of injury for one individual. The curve OC refers to the offer curve formed by the isoprofit curves of many different employers. The matching process shown in Figure 8-7 assumes that the worker is perfectly mobile but imperfectly informed about the degree of risk associated with a particular job. In particular, suppose that the worker receives a wage of approximately $10.60 and thinks that he or she is being exposed to a risk level of 3 deaths per 10,000 workers (point $a$) when in fact the actual level of risk is 7 deaths per 10,000 workers (point $b$). Also assume that the firms know the degree of risk actually associated with a particular job, but are not aware of the worker’s misconception.
27a. Suppose that the government does a study, learns about the worker’s misconception, and decides to regulate a reduction in risk. What would be the optimal level of risk exposure to allow? What wage would person A receive when exposed to the optimal level of risk?

27b. What would be the lowest level of risk exposure the government could set without actually making the worker worse off?

27c. Assuming the results of the government study are not made public, would person A be in favor of a regulation limiting risk exposure to 1 death per 10,000 workers per year?

27d. Now suppose the worker is perfectly informed and mobile. What wage/risk combination would he or she choose?

27e. Would a perfectly informed and mobile worker support a regulation limiting risk exposure to 1 death per 10,000 workers per year?

The Benefits and Costs of Reduced Risk

28. Figure 8-8 represents the matching process between employers and employees that occurs when working conditions differ across jobs. The curve labeled $A_i$ refers to the indifference curve between the wage and risk of injury for one individual while the curve OC refers to the offer curve formed by the isoprofit curves of many different employers. The matching process shown in Figure 8-7 assumes that the worker is perfectly informed and perfectly mobile. The utility maximizing choice for person A is a job with a wage of $8 and a risk level of 4 (point a). Now consider a regulation that would mandate a decrease in risk exposure to 1 death per 10,000 workers.
28a. Approximately how much per hour would person A be willing to pay for such a risk reduction?

28b. How much per hour would it cost firms to comply with the regulation?

28c. Would such a regulation pass a benefit/cost test?

28d. Empirical studies of compensating differentials attempt to measure the tradeoff between wage and risk (holding all else constant) based on people’s actual choices. In Figure 8-8, at person A’s actual choice, the rate at which person A (and A’s employer) are willing to trade off wages and risk is given by the slope of the dashed line. What is the slope of this line?

28e. In actually carrying out benefit/cost studies of various safety regulations, the observed tradeoffs between wages and risk are extrapolated to measure the benefits associated with the regulation. If the tradeoff between wages and risk implicit at point a is assumed to be constant for any change in risk, how much would one predict person A would be willing to pay for a risk reduction to 1 death per 10,000 workers?

28f. Does the extrapolation in 28e overstate or understate person A’s actual willingness to pay for such a risk reduction? Why does the difference occur? What are the implications for benefit/cost studies of safety regulations?

Hedonic Wage Theory and Employee Benefits

29. Consider a worker that 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 that firms are able to remain competitive (i.e., keep profits at zero) if they offer $90 in wages and no employee benefits. If they offer benefits, wages must be reduced by 75 cents for every dollar of benefits offered. Suppose that currently, the firm is offering a compensation package of $40 in benefits and $60 in wages.

29a. Suppose an individual’s preferences are such that \( \alpha = 1 \) and \( \beta = 2 \) (i.e., they give more weight to wages than to benefits in the ranking process). Why might such a weighting occur?

29b. What is the utility level associated with the initial compensation package?

29c. How much would this individual be willing to give up for a $20 increase in benefits? What would such an increase in benefits cost the firm? Would the worker be made better off by such an increase in benefits?

29d. Suppose that workers are now given more freedom over the choice of benefits so that \( \alpha \) and \( \beta \) are both given an equal weight of one. Given the original compensation package, how much would the individual be willing to give up for a $20 increase in benefits? What would such an increase in benefits cost the firm? Would the worker be made better off by such an increase in benefits?
Chapter 8  Compensating Wage Differentials and Labor Markets

Compensating Wage Differentials and Layoffs (Appendix 8A)

30. Consider a worker who ranks combinations of leisure hours ($L$) and income ($Y$) according to the utility function

$$U = L^\alpha Y^\beta,$$

where $\alpha$ and $\beta$ are positive constants and $U$ is the index of satisfaction. Suppose $\alpha = 2$ and $\beta = 1$, the total time available ($T$) is 300 hours, the wage rate ($W$) is $4$, and the level of nonlabor income ($V$) is $0$. In such a situation, the optimal number of leisure hours is 200, and the optimal number of work hours ($H$) is 100. When the person works 100 hours, the resulting level of income is $400$.

30a. What is the level of utility associated with the unconstrained choice of leisure hours?

30b. Now suppose that this individual is forced through additional layoffs to consume 250 leisure hours. What must the level of income be for this individual to stay at the level of utility that was attainable before the additional layoffs?

30c. What wage rate would make it possible for the individual to attain the level of income found in 30b? What is the compensating differential associated with the firm’s higher layoff policy?

*30d. Redo Questions 30b and 30c assuming the person derives utility from consuming leisure and income in fixed proportions, where the proportion is $2$ of income for every one hour of leisure. Note that if utility is generated in this way, once the person is at the designated proportion, increases in leisure that are not accompanied by increases in income will not increase utility. Similarly, increases in income that are not accompanied by increases in leisure will not increase utility. Such a situation means that leisure and income are viewed as perfect complements.

*30e. How did the change in preferences affect the size of the compensating differential associated with constrained work hours? Explain the intuition behind your findings.

*31. Consider a worker with a utility function given by the equation

$$U = Y^{\sqrt{Y}},$$

where $Y$ is total income and $U$ is the level of utility. Assume the individual receives no nonlabor income.

*31a. Suppose that Job A pays $5 per hour and involves working 5 hours per day every day during the year. What is the level of utility the person will attain on a daily basis? What will be the average level of utility attained (per day) during the year?

*31b. Suppose that Job B also pays $5 per hour but involves working 2 hours per day 50% of the year, and 8 hours per day the other 50% of the year. How many work hours will the person average (per day) during the year?

*31c. What level of utility will be attained during the 2-hour days? What level of utility will be attained during the 8-hour days? What will be the average level of utility attained (per day) during the year?

*31d. Will the typical worker prefer Job A or Job B?

*31e. What wage must the firm with the less desirable schedule pay to just make their job comparable to the job with the more desirable schedule? What would the compensating differential be for accepting the less desirable schedule?