Answers To Chapter 8

■ Review Questions

1. **Answer a.** Worker utility is a function of both the pecuniary and nonpecuniary aspects of the job. However, with the nonpecuniary characteristics held constant, the level of utility will be determined by the level of monetary compensation.

2. **Answer c.** The whole point of a compensating wage differential is to make sure that even firms with undesirable working conditions can obtain workers. It will also be true that workers who are indifferent about the adverse conditions will work for the higher-paying firm, but this will occur even before the equilibrium compensating differential is reached. Compensating differentials do not represent so much an incentive to improve conditions as they do a way firms can avoid making improvements in their working conditions.

3. **Answer b.** The compensating differential framework assumes that people choose the wage/risk combinations that best suit their preferences. This results in those doing dangerous work being better paid than those in comparable jobs working under safer conditions. While those who choose dangerous jobs will generally be less averse to risk, the model in no way assumes that danger is a good. Also, the model explicitly assumes that people do have other employment opportunities.

4. **Answer b.** A compensating differential represents the payment needed to attract the borderline or marginal worker. There will always be some workers who would work under the adverse conditions for less than the equilibrium differential, and some workers who probably could never be induced to work under the adverse conditions.

5. **Answer d.** It is important to realize that the theory only predicts higher wages will be associated with less desirable conditions if all the other things that influence wages are held constant. In answer c, wages are the same even though some workers are experiencing more desirable conditions. This does not contradict the theory, however, since these workers are more highly skilled. They normally would be paid more than their less skilled counterparts. All that is important is that here the more desirable conditions still exert a dampening effect on wages.

6. **Answer a.** The theory assumes workers try to maximize their utility, not their level of compensation.

7. **Answer c.** Indifference curves are typically drawn downward sloping since a “good” appears on each axis. In this case, however, a “bad” (risk of injury) appears on the horizontal axis. While b may be true, it does not impact the shape of the indifference curves, which only reflect worker preferences.

8. **Answer d.** The slope of the indifference curve indicates the willingness of the person to give up wages for a given reduction in risk. As one moves up a given indifference curve, the slope increases and so the willingness to pay for a given risk reduction increases.
9. **Answer a.** Isoprofit curves represent all the wage/risk combinations that yield a certain profit level. Since making the workplace safer is costly, the firm stays at the same profit level only if it reduces the wage.

10. **Answer d.** The slope of the isoprofit curve indicates the rate at which a firm must reduce wages for a given reduction in risk. As one moves up a given isoprofit curve, the slope decreases and so the rate at which the firm must reduce wages for a given risk reduction is lower. If the firm can reduce wages at a lower rate for a given risk reduction, that risk reduction must be less costly.

11. **Answer b.** Since the isoprofit curves shown in Figure 8-3 are assumed to be wage/risk combinations associated with zero economic profits, the offer curve also represents actual wage/risk offers consistent with zero economic profits, not positive economic profits.

12. **Answer d.** In the hedonic theory of wages, workers like B who experience undesirable conditions do so voluntarily as part of a mutually beneficial arrangement between themselves and firm Y.

13. **Answer d.** By forcing risk exposure down to 4 deaths per 10,000 workers, person B will be forced to a lower indifference curve. The reduction can be minimized by switching to employer X (i.e., moving to point a), but this will still represent a lower level of utility for B.

14. **Answer c.** When imperfect information exists, Figure 8-3 may no longer be an accurate depiction of the matching process between employers and employees. Such imperfect information often leads to a window of opportunity for regulation to make workers better off provided the worker’s willingness to pay for a certain risk reduction does not exceed the cost. If it does, the person will actually end up on a lower indifference curve because of the mandated risk reduction.

15. **Answer d.** Estimates of the benefits of a regulation typically focus on the current willingness to pay values of those directly affected by the regulation. This is a fairly narrow perspective that is often criticized for the reasons listed in responses a through c.

16. **Answer a.** As income tax rates increase, the benefits of receiving compensation in the form of wages decreases, and so the willingness to give up wages for a given increase in employee benefits should increase. This increased willingness to pay shows up as an increase in the slope of the indifference curve.

17. **Answer b.** Answer a would be true if it stated that taxes and insurance contributions were based on a percentage of the firm’s cash payroll. Answer c is a true statement but does not relate to the slope of the firm’s isoprofit curve.

18. **Answer b.** The hedonic wage theory of employee benefits is based on the same assumptions as the hedonic wage theory relating to risk of fatal injury. Workers (not firms) are assumed to have complete information and are assumed to be mobile enough to have access to various employment opportunities. Although workers being free to determine their own mix of wages and benefits would make it easier for workers to achieve their optimal mix, it is typically the firms that set the compensation mix. Workers must then match themselves with the firms that best satisfy their preferences.
19. **Answer d.** When workers have steeper indifference curves, the optimal compensation mix will include a higher proportion of employee benefits. Workers have steeper indifference curves, in turn, when they are willing to give up a significant amount in wages for a given increase in benefits. This willingness is usually displayed by older workers with higher incomes, since the tax advantages associated with receiving compensation in the form of benefits are likely to be more substantial. Younger workers are typically more in need of discretionary income to facilitate the purchase of things like homes and automobiles.

20. **Answer d.** The mandated provision of benefits, like mandatory risk reduction, only increases worker well-being if worker willingness to pay for the benefit exceeds the cost to the firms of providing it.

21. **Answer a.** The unconstrained choice of 200 leisure hours may involve a job with a layoff since layoffs are one way for a worker to obtain more leisure time. Two hundred work hours may constitute a part-time or full-time job depending on the time period being considered and the work hours that are customary for that occupation. Since the choice is unconstrained, however, any layoff implicit in this level of hours will not be considered an undesirable characteristic and so need not be accompanied by a compensating differential.

22. **Answer a.** To attain an income of $500 when working only 80 hours requires a wage of $500/80 or $6.25. Since the original wage was $4, the new wage reflects a compensating differential of $2.25.

23. **Answer d.** The vertical intercept of the budget line represents the level of income attained if the person works the maximum number of hours. (This is often called the level of full income.) If the wage is $6.25 and the maximum number of work hours is 400, the maximum level of income is ($6.25)(400) or $2,500.

24. **Answer a.** The person experiences a utility level of 10 half of the time, and a utility level of 30 the other half of the time, so the average level of utility is 20.

25. **Answer d.** A job that involves 250 hours all of the time will yield a utility level between 20 and 25 all of the time, which means that the average level of utility will exceed the average level associated with the uncertain schedule. This preference for the certain situation is called risk aversion. The only way the uncertain schedule could yield the same average level of utility would be if the wage associated with this job was higher.

### Problems

26a. The lack of alternative offers means that person A ends up on the indifference curve A\_1 that goes through point \(a\) instead of being able to reach a higher indifference curve. Given the shape of A’s indifference curve, it appears A’s maximum utility would be attained near point \(c\). To reach point \(c\), however, A would have to be able to move and work for employer X.

26b. Such a regulation would make the immobile person A better off by allowing A to attain the level of utility associated with point \(b\).

26c. The regulation would make person B worse off by forcing B to point \(c\), a point associated with a lower indifference curve. The regulation, however, would be even worse if B was constrained to work for employer Y since that would require a movement to point \(b\).
27a. The optimal level of risk is that level associated with point c (4 deaths per 10,000 workers). The wage rate, however, would fall from somewhere between $10 and $11 to $8.

27b. The lowest level of risk is that associated with point d (approximately 1.6 deaths per 10,000 workers).

27c. No, person A would not be in favor of such a regulation since A perceives that he or she is on indifference curve A3. In this case, however, movement to point e does also lead to a lower actual level of utility.

27d. Under perfect information and mobility, person A should choose point c where the wage is $8 and the risk of fatal injury is 4 deaths per 10,000 workers.

27e. No, regulation to any risk level lower than 4 deaths per 10,000 workers would make a fully informed and mobile worker worse off.

28a. Person A would be willing to see the wage reduced from $8 to just under $6 (from point a to point c).

28b. The cost of reducing risk can be seen in the wage reductions necessary to keep the firms competitive. In this case, the wage must fall from $8 to $4 (from point a to point b) for a cost per hour of $4.

28c. No, since the cost ($4) exceeds the worker’s willingness to pay (slightly over $2), the regulation fails a benefit/cost test. When this happens, note that the worker will be forced to a lower indifference curve.

28d. The slope of the dashed line is −1. At point a, the tradeoff between wage and risk is such that every one-unit reduction in risk must be accompanied by a one-dollar reduction in the wage.

28e. Based on the rate of change at point a, one would predict that person A would be willing to give up $3 in wages for a reduction in risk from 4 deaths per 10,000 to 1.

28f. The extrapolation overstates A’s willingness to pay for risk reductions. This occurs because the extrapolation ignores the convexity of A’s indifference curves. This convexity reflects a decreasing willingness to pay for risk reductions as the workplace becomes safer. This means that benefit/cost studies of risk reductions may be slightly biased in favor of finding that the benefits exceed the costs.

29a. Such a weighting occurs when the spending flexibility that wage income provides is more important than the tax advantages of receiving compensation in the form of employee benefits.

29b. Originally $E = 40$ and $W = 60 \Rightarrow U = (40)(60)^2 = 144,000.$

29c. To keep utility constant as $E$ rises by $20 to $60, the wage can fall to

$$W = \sqrt{\frac{144,000}{60}} = \$48.99.$$  

This means the person is willing to give up $11.01 in wages for the $20 increase in benefits. However, since every $1 increase in benefits costs the firm 75 cents, a $20 increase in benefits costs the firm $15. Since the willingness to pay for the increased benefits is lower than the cost, the change in the compensation mix would make the worker worse off.
29d. Originally $E = 40$ and $W = 60 \Rightarrow U = (40)(60) = 2,400.$

To keep utility constant as $E$ rises by $20$ to $60$, the wage can fall to

$$W = \frac{2,400}{60} = 40.$$

This means the person is willing to give up $20$ in wages for the $20$ increase in benefits. However, since every $1$ increase in benefits costs the firm 75 cents, a $20$ increase in benefits costs the firm $15$. Since the willingness to pay for the increased benefits is greater than the cost, the change in the compensation mix would make the worker better off.

30a. Originally $L = 200$ and $Y = 400 \Rightarrow U = (200)(400) = 16,000,000.$

See the indifference curve labeled $U_1$ in Figure 8-10. The original budget line is the line $ab$ and the original optimum is point $c$.

![Figure 8-10](image)

30b. To find the income level needed to keep utility constant, solve the equation

$$(250)(Y) = 16,000,000 \Rightarrow Y = 256.$$

See point $e$ in Figure 8-10. At $L = 250$, however, the person only earns $200$ (point $d$).

30c. If leisure increases to 250 hours, then work hours decrease to 50. To earn $256$ when $H$ is only 50, the wage must rise to

$$W = \frac{256}{50} = 5.12.$$

Since the original wage was $4$, this new wage represents a compensating differential of $1.12$. The budget line consistent with this new wage is line $bf$ in Figure 8-10.
*30d. If, at the original equilibrium, the person saw leisure and income as perfect complements, the original indifference curve would be represented by curve $U_1'$ in Figure 8-10. Therefore, to keep utility constant as leisure increases to 250, income would have to stay at $400 (point $g$). This would require a wage of $400/50 or $8. This means the compensating differential is now $4. This new wage is represented by the dashed budget line connecting points $b$ and $g$ in Figure 8-10.

*30e. The change in preferences raised the compensating differential that is required. With the new preferences, the extra leisure that is forced upon the worker has no value, whereas with normal downward-sloping indifference curves it does. So to keep utility constant, income (and hence the wage) must be higher in the perfect complement case.

*31a. When work hours ($H$) = 5, then $Y$ is $25 and $U$ is 5. If $U$ is always equal to 5, then the average level of utility is also 5.

*31b. The average work hours is given by the equation

$$\text{Average Hours} = \frac{1}{2} (2) + \frac{1}{2} 8 = 5.$$ 

*31c. When $H = 2$, $Y = $10. When $H = 8$, $Y = $40. The average level of utility is given by the equation

$$\text{Average} U = \frac{1}{2} \sqrt{10} + \frac{1}{2} \sqrt{40} = 4.74.$$ 

*31d. The worker will prefer job A, the job with the certain schedule since the average level of utility is higher.

*31e. The compensating differential can be inferred from the wage that is necessary to make the average level of utility from job B equal the average level of utility from job A. This wage can be found by solving the equation

$$\frac{1}{2} \sqrt{2W} + \frac{1}{2} \sqrt{8W} = 5 \Rightarrow 2.121 \sqrt{W} = 5 \Rightarrow W = $5.56.$$ 

Since the original wage was $5, the compensating differential for the less desirable schedule is 50 cents.

### Applications

32a. The law would force the non-union worker (person A) away from the point $a$ to point $c$. This point would be associated with a lower indifference curve.

32b. Person A will now try to move from point $c$ to point $b$ since $b$ will be associated with a higher level of utility. The problem is that all the B workers will still be at point $b$ as well. With all the workers preferring firm U, the firm will be able to be more selective in its personnel decisions and so will end up with the most skilled and productive workers among this general class of workers.
32c. Although the wage will be the same for all workers, the more skilled and productive workers at firm U will also be enjoying better working conditions than those workers at firm NU. This situation is consistent with theory of compensating differentials. More productive workers typically will be paid more, so here the better working conditions are still exerting a dampening effect on the wage.

32d. The argument about the effects of the minimum wage is identical to that observed in this problem. A higher minimum wage should cause firms to move up along their isoprofit curve, offsetting the increased wage costs with reductions in costs obtained by increasing the pace of work and decreasing other desirable conditions and benefits such as job training. Among all the firms paying the minimum wage, workers will seek out those with the best conditions. Those firms can then be more selective in their personnel decisions. The result will be that the least skilled workers will end up working at the minimum wage firms offering the least desirable working conditions.

*33a. In Table 8-1, \( U_A \) and \( U_B \) represent the levels of utility attained by persons A and B under each of the 4 possible scenarios. The utilities were computed as follows.

Safe for A/Safe for B

\[
\Rightarrow U_A = 200 + 200 + 0 = 400, \\
U_B = 200 + 200 + 0 = 400. 
\]

Unsafe for A/Safe for B

\[
\Rightarrow U_A = 300 + 0 + 200 = 500, \\
U_B = 200 + 200 - 250 = 150. 
\]

Safe for A/Unsafe for B

\[
\Rightarrow U_A = 200 + 200 - 250 = 150, \\
U_B = 300 + 0 + 200 = 500. 
\]

Unsafe for A/Unsafe for B

\[
\Rightarrow U_A = 300 + 0 + 0 = 300, \\
U_B = 300 + 0 + 0 = 300. 
\]

**Table 8-1**

<table>
<thead>
<tr>
<th>Person A/Person B</th>
<th>Safe conditions</th>
<th>Unsafe conditions</th>
</tr>
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<tbody>
<tr>
<td>Safe conditions</td>
<td>( U_A = 400 )</td>
<td>( U_A = 150 )</td>
</tr>
<tr>
<td></td>
<td>( U_B = 400 )</td>
<td>( U_B = 500 )</td>
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<tr>
<td>Unsafe conditions</td>
<td>( U_A = 500 )</td>
<td>( U_A = 300 )</td>
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<tr>
<td></td>
<td>( U_B = 150 )</td>
<td>( U_B = 300 )</td>
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*33b. Regardless of person B’s choice, person A always does better by choosing the unsafe conditions. Similarly, regardless of A’s choice, person B always does better by choosing the unsafe conditions.

*33c. Forcing the workers to the safe conditions makes each worker better off.

*33d. Norms and standards play an important role in shaping our behavior and influencing our level of satisfaction. While a fifty-degree day seems delightful if it occurs in January, that same temperature seems uncomfortably cold in July. It is not so much the absolute temperature that is important but what we are accustomed to. In much the same way, material satisfaction depends on the amount of goods one has relative to the amount needed or desired. These needs and desires in turn are largely determined by the way in which one observes other members of the society living. As the obligations
and expectations of individuals change, the goods they consume change and people’s perceptions of what they need change. For example, the average family in the United States today does not consider itself wealthy even though they live in a way only the wealthy did 200 years ago. Our consumption standards are not those of the colonial days but those of a much more complex society. In addition it is important to recognize that concern about relative standing may be instrumental in helping to achieve certain absolute goals. In general, any winner-take-all competition or auction system makes it imperative for people to be concerned about relative standing. When viewed in this way, it seems clear that concern about relative income can be something perfectly consistent with the assumption of rational consumers.

34a. The premise of the proposed change is essentially the theory of compensating differentials presented in this chapter. Regulations to reduce risk force costly adjustments upon firms, and the result is lower wages. When individuals earn lower incomes, their spending on health care may be reduced, leading to more illness and earlier deaths. While it may sound insensitive to refer to a tradeoff between wages and risk, the fact is that safety cannot be achieved without cost. This forces workers to balance the desire for more safety against their desire for more income.

34b. Benefit computations often do not take into account the benefits from increased safety that would accrue to people not directly affected by the regulation, including those workers who will be employed in helping to make the workplace safer. Also, the computations typically take 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. Also, one could argue that regulations leading to increased health and safety will help to raise productivity and income since healthier and safer workers may work harder and have better morale.

35a. Increased administrative costs should rotate the isoprofit curve for the firm inward. For example, in Figure 8-11, the firm initially is willing to tradeoff $500 in wages for $750 in benefits (line $ab$). However, if the benefits become more costly to administer, the firm may be willing to trade $500 in wages for only $500 in benefits (line $ad$).

35b. An increase in administrative costs should lead to a reduction in employee benefits. In Figure 8-11 the level of benefits falls from $300 to $200 (point $c$ to point $e$).

36a. Taxing health care benefits should lead to a flattening of the indifference curves in the hedonic wage model as the willingness to give up wages for additional dollars of benefits should decrease. This is shown in Figure 8-12 as a change in the shape of the indifference curves from $U_1$ to $U_1'$. 

![Figure 8-11](image-url)
36b. Allowing firms to deduct only part of their health care expenses would increase the cost of providing benefits relative to the cost of providing wages. This should lead to steeper isoprofit curves for firms. For example, in Figure 8-12, the isoprofit curve is shown rotating from line \( ab \) to line \( ad \). Previously, the firm could trade off, say, $500 in wages for $750 in benefits. With the change in policy, however, the firm may be able to trade off $500 in wages for only $500 in benefits.

![Figure 8-12](image)

36c. Taken by itself, the flattening of the indifference curve should lead to more wages and fewer benefits. The steepening of the isoprofit curve should lead to fewer benefits (and perhaps more wages). Taken together, the prediction would be for fewer benefits and more wages. This is illustrated in Figure 8-12 as a movement from point \( c \) to point \( e \). In this movement, benefits decrease from $300 to $100 and wages increase from $300 to $400.

37a. Firms make changes such as these so that they can attract the type of workers they feel will be best for the firm. In this case, offering more work at home and family leave policies means that the firm is strategically trying to attract older workers with families. Perhaps they feel these workers will be more reliable, dependable, and productive, and that they will stay with the firm for longer periods.

37b. While such compensation packages will be attractive to many workers, the provision of such benefits will be costly and will cause the firm to reduce wages below what they would otherwise be. Mandating such a move for all workers would make workers who preferred to take more of their compensation in the form of wages worse off.

38a. This unemployment insurance payment will allow the worker to attain point \( e \) (\( L = 250, Y = $256 \)) in Figure 8-10. No compensating differential will be required.

38b. By not having to pay the compensating differential of $1.12 on the 50 hours the person works, the firm saves $56. However, since the firm has paid only $30 into the fund, the unemployment insurance program effectively subsidizes this firm by $26. Firms subsidized in this way will tend to thrive and grow, and so the program is promoting the growth of firms that rely on temporary layoffs.