Answers To Chapter 15

## Review Questions

1. **Answer a.** The distribution can also be described by the percentage of people falling within specified earnings ranges.

2. **Answer b.** The average (mean) and median earnings are measures of the central location of the distribution.

3. **Answer b.** The variance is the only dispersion measure listed that would increase if all earnings were multiplied by some constant number.

4. **Answer a.** The median would increase. The standard deviation and variance would stay the same. The coefficient of variation would fall since its denominator, the standard deviation, is unchanged, and its numerator, the mean, will rise.

5. **Answer a.** According to Table 15.1 in the text, the 80:20 ratio for men rose from 3.08 in 1980 to 3.41 in 2005, a 10% increase. Over the same time period, the ratio for women increased by about 6%, from 3.70 to 3.94.

6. **Answer c.** According to Table 15.1 in the text, real earnings for men at the 20th percentile fell and the 80th percentile rose over the period 1980–2005. Over this same period, the earnings of women at the 20th and 80th percentiles rose, with the largest increases being at the top of the distribution.

7. **Answer d.** Mathematically, each of these changes would lead to the distribution of earnings becoming more stretched.

8. **Answer c.** According to Table 15.2 in the text, the 80:50 ratios increased over this period for both men and women, showing worsening inequality. At the same time, the 50:20 ratios improved for both groups, showing slightly improving inequality.

9. **Answer a.** These trends are clearly indicated in Table 15.3 of the text. Note the significant increases in the returns to education for both men and women. For women, the average earnings of college graduates relative to high school graduates rose from 1.36 to 1.85 over the period 1980–2005, a 36% increase; the increase for males, from 1.41 to 1.91, was 35%. Returns to other types of education also generally increased, but not by as much.

10. **Answer d.** See Table 15.3 in the text. The gain in relative earnings for college-educated men is due both to the falling earnings of high school graduates and to rises in their own earning. In contrast, the gain in relative earnings for women were due exclusively to the rising earnings (over 26%) of college-educated women; earnings of high school-educated women actually rose slightly over the period.
11. **Answer d.** Returns to a college education increased in both periods, but higher returns also encourage entry into the market, so the supply of college graduates also increased. This lowered the return to a college education relative to what it would have been without the increase in supply.

12. **Answer b.** Note that in Table 15.3 of the text, the ratio of earnings at the 80th and 20th percentiles rose for each male human capital group over the period 1980–2005.

13. **Answer d.** Note that each of these factors would increase earnings inequality by affecting relative wages.

14. **Answer b.** If supply shifts had been the cause, the share of aggregate employment accounted for by less-educated workers would have grown. However, just the opposite change took place, supporting the hypothesis of relative demand shifts in favor of more-educated workers. Explanations related to institutional factors such as the declining share of unionism are flawed for several reasons. For example, union membership has been declining steadily since the mid-1950s, yet the increases in earnings inequality have not occurred until more recently.

15. **Answer d.** Answer a corresponds to a scale effect favoring more-educated workers, while Answer b refers to a substitution effect in favor of more-educated workers.

16. **Answer b.** Several studies cited in the text suggest that shifts in employment across industries played a relatively small role in raising the relative wage of college-educated workers.

17. **Answer d.** Recall that when two inputs are gross complements, a reduction in the price of one leads to an increase in the demand for the other. While the rising wage inequality in other countries is consistent with the technological change explanation, the differences in rates have focused attention on factors other than the demand side of the labor market.

18. **Answer c.** Note that Answers a and b together simply ensure a decrease in the demand for unskilled labor. Without seniority rule, there would not necessarily be a larger decrease in demand for younger unskilled workers.

19. **Answer c.** When the Lorenz curves cross, it is possible for the area between each curve and the line of perfect equality to be the same. Since the Gini coefficient is this area divided by 0.5, the same Gini coefficient can be associated with two different Lorenz curves.

20. **Answer d.** Note that if all earnings increase by the same proportion, the Lorenz curve will be unchanged.

### Problems

21a. The variance is reduced to 1,440 and the coefficient of variation is reduced to 0.47.

21b. The variance is now 2,080 and the coefficient of variation is 0.57.
21c. Many people would view the first redistribution as bringing about greater equality since it brings the ends of the distribution closer. Note that both measures show a larger decrease for the first redistribution.

21d. In the first case, the 80:20 ratio would fall to $100/40 = 2.5$. In the second case, the ratio would actually rise to $120/20 = 6$. The response in the first case seems consistent with the reduced inequality. The response in the second case seems to indicate more inequality, even though earnings have been redistributed away from the richest person.

22a. In group A the mean is $80$, the variance is $66.67$, and the coefficient of variation is $0.10$. In group B the mean is $20$, the variance is $66.67$, and the coefficient of variation is $0.41$.

22b. For the entire population, the variance is $966.67$ and the coefficient of variation is $0.62$.

22c. The mean earnings for group A are still $80$, but the variance has increased to $150$ and the coefficient of variation has increased to $0.15$. The mean earnings for group B are still $20$, but the variance has increased to $150$ and the coefficient of variation has increased to $0.61$.

22d. For the entire population, the variance has increased to $1,050$ and the coefficient of variation has increased to $0.65$. The increased within-group dispersion had increased the inequality measures for the entire group. The increased within-group dispersion is consistent with the earnings patterns observed in the United States. The difference is that the increased within-group dispersion in the United States has also been accompanied by a rise in across-group dispersion as the earnings of more-educated workers have risen relative to the earnings of less-educated workers. In this example, the ratio of average earnings in group A to average earnings in group B remained constant.

23a. $\Delta C = 1500(0.1) + 0 = 150$.

23b. $\Delta C = 0 + 0.2(500) = 100$.

23c. $\Delta C = 800(0.1) + 0.2(−200) = 40$.

*24a. Since the mean and the median earnings are both $80$, $\gamma = 0$.

*24b. This redistribution lowers the variance from $2,400$ to $2,080$. Given that the median earnings is now $60$, while the mean is $80$, and the standard deviation is $45.61$, $\gamma$ is computed as $1.32$. Since $\gamma > 0$, the distribution is skewed to the right.

*24c. Note that in this example, increased equality was accompanied by increased skewness. This serves as a reminder that dispersion and skewness are separate and distinct characteristics of any earnings distribution.

*24d. Recall that an earnings distribution that is skewed to the right means that individuals are bunched at the lower end of the distribution, while a few individuals have high incomes. This type of distribution violates many people’s sense of fairness.
25a. See curve $L_1$ in Figure 15-1.

*25b. To find the area under the Lorenz curve, add the areas of rectangles $a$, $b$, $c$, and $d$, for a total area of 0.23. The remaining triangles have an area of 0.1 since each has a base equal to 0.2 and their height sums to one. Given that the total area under the Lorenz curve is 0.33, the Gini coefficient is given by

$$Gini = \frac{0.5 - 0.33}{0.5} = 0.34.$$

25c. See curve $L_2$ in Figure 15-2. The coordinates of the points on the new Lorenz curve are (0,0), (0.2,0.08), (0.4,0.2), (0.6,0.35), (0.8,0.55), and (1,1). Curve $L_1$ is repeated for comparison purposes.
25d. Since the Lorenz curves cross, a conclusion about which represents the greater equality is not possible.

*25e. Using the same method as before, the area under $L_2$ is computed as 0.336. This yields a Gini coefficient of 0.328, slightly smaller than the previous one. This suggests that the second distribution displays more earnings equality.

**Applications**

26a. The growing inequality for men took place in the context of falling real earnings along all points in the earnings distribution. Hence, the higher earnings group simply declined less than the rest. For women, real earnings rose along all points on the earnings distribution.

26b. The gain in relative position was largely determined by increasing returns to education. It is hard to see how this could be construed as the rich exploiting the poor for material gain.

26c. Such supply shifts would have led to an increase in the share of aggregate employment accounted for by low-skilled workers. However, just the opposite happened.

26d. On tests of cognitive achievement, the scores of high school graduates actually rose relative to those of college graduates during the 1980s (even though the scores for both groups were falling). Since the relative quality of labor supplied by high school graduates seemed to be rising, this cannot explain the rising wage gap between more- and less-educated workers.

26e. Union membership as a percentage of the labor force peaked in 1954, and has been declining steadily since then. If this decline were the major factor explaining the increasing returns to education, it would be very difficult to explain why the returns to education dropped significantly during the 1970s. As noted in the text, women have traditionally been less unionized than men, so declining unionization should not have had as much impact on their rate of return from education. That the returns to education for women rose as fast as or faster than those for men during the 1980s does not appear to have any relationship to the decline in unionization.

27a. I would be willing to pay up to $1 million for A, but nothing for B.

27b. In this example, very slight differences in productivity are translated into very large differences in earnings because of the winner-take-all nature of the contest.

27c. Such contests would increase the within-group dispersion of earnings significantly. This, in turn, would increase the inequality of the overall population.

27d. According to the hypothesis presented in Chapter 1, concern for relative standing tends to flatten the relationship between wages and productivity. This would tend to reduce the dispersion of earnings both within and across groups.

28a. Originally, the person worked 100 hours at $4 per hour for total earnings of $400. After the welfare program, work hours were cut back to 53.125 for total earnings of $212.5.

28b. This person was not affected by the program. Earnings remained constant at $1,200.
28c. The welfare program increased the dispersion of earnings by leading the lower earnings person to cut back on his or her work hours.

29a. The Lorenz curve is unchanged since the share of earnings going to any particular group has not changed.

*29b. See curve $L_3$ in Figure 15-3. The coordinates of the points on the Lorenz curve are (0,0), (0.2,0.08), (0.4,0.2), (0.6,0.4), (0.8,0.64), and (1,1). Curve $L_1$ is repeated for comparison purposes. The new Gini coefficient is 0.27. In this case, both the Lorenz curve and the Gini coefficient reflect increased earnings equality.

![Figure 15-3](image)

29c. The after-tax income distribution tends to be more equal than the earnings distribution because of government transfers to the poor and higher tax rates for the rich.