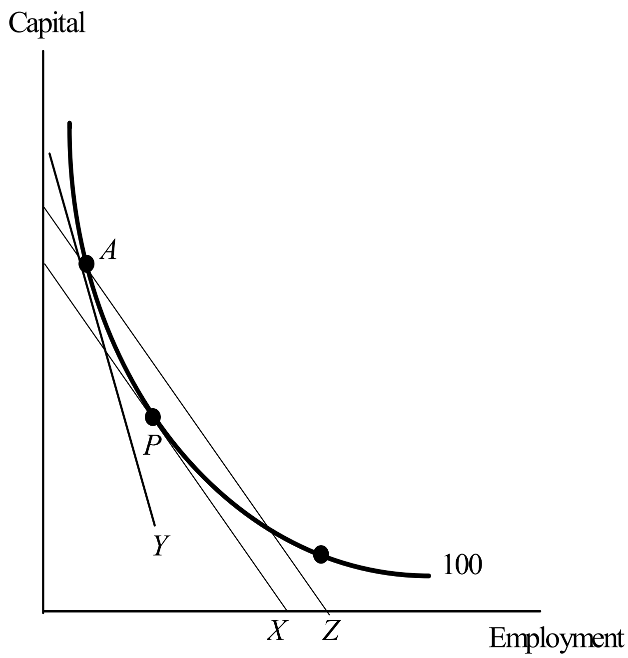
CHAPTER 10

10-1. Suppose blacks and whites are not perfect substitutes in production. The firm would like to minimize the costs of producing 100 units of output. Show that employers who discriminate against blacks earn lower profits. Does your conclusion depend on whether the market-determined black wage is lower than the white wage?

As drawn in the figure below, the profit-maximizing position for a non-discriminating employer occurs at point *P* where the 100-unit isoquant is tangent to the lowest possible isocost line given by *X*. Discrimination against blacks implies that the utility-adjusted black wage is relatively high, and hence employers would move to a point like *A*, which is tangent to the utility-adjusted isocost given by line *Y*. Note, however, that at point *A* the *true* costs of production are given by isocost line *Z*, which is clearly higher than isocost line *X*. As a result, discrimination is costly. It is worth noting that this analysis assumes nothing about which wage, the black or the white, is higher.



10-2. Suppose black and white workers are complements in the sense that the marginal product of whites increases when more blacks are hired. Suppose also that white workers do not like working alongside black workers. Does employee discrimination lead to complete segregation? Does it create a wage differential between black and white workers?

If blacks and whites are perfect substitutes, employee discrimination leads to complete segregation. If, however, blacks and whites are complements as in this problem, then there is an incentive for employers to employ blacks and whites together in the work place if the increase in productivity achieved by integrating the work force is higher than the extra wages employers must pay white workers to compensate them for working alongside blacks. The interpretation of the wage differential between black and white workers is more difficult. The wage differential between the two groups will reflect not only the effect of discrimination (a higher wage for whites to encourage them to work alongside blacks), but also the effect of differences in productivity. Overall, however, it is clear that whites must be paid a compensating differential.

10-3. In 1960, the proportion of blacks in Southern states was higher than the proportion of blacks in Northern states. The black-white wage ratio in Southern states was also much lower than in Northern states. Does the difference in the relative black-white wage ratios across regions indicate that Southern employers discriminated more than Northern employers?

Suppose employers in neither region discriminate, so that the equilibrium black-white wage differential in both regions is determined by the (relative) demand for and supply of black workers. If there are relatively many more black workers in the South than in the North, then the black-white wage ratio will be lower in the South than in the North, as the marginal black hired in the South is less valuable than the marginal black hired in the North. Thus, the fact that blacks earn relatively less in the South need not indicate that Southern employers discriminate more than Northern employers. Rather, the large differential may simply reflect the relatively large number of black workers in the South. (This does assume that blacks and whites are not perfect substitutes.)

10-4. Suppose years of schooling, *s*, is the only variable that affects earnings. The equations for the weekly salaries of male and female workers are given by:

$$\boldsymbol{w_m = 500 + 100s}$$

and

$$\boldsymbol{w_f = 300 + 75s.}$$

On average, men have 14 years of schooling and women have 12 years of schooling.

(a) What is the male-female wage differential in the labor market?

The wage differential can be written as:

$$\begin{aligned}\Delta\overline{w} = \overline{w}_m - \overline{w}_f &= 500 + 100\,\overline{s}_m - (\,300 + 75\,\overline{s}_f\,) \\ &= 500 + 100(14) - 300 - 75(12) = \$700\end{aligned}$$

(b) Using the Oaxaca decomposition, calculate how much of this wage differential is due to discrimination?

The raw wage differential is

$$\Delta\overline{w} = \underbrace{(\alpha_m - \alpha_f) + (\beta_m - \beta_f)\overline{s}_f}_{\text{Differential Due to Discrimination}} + \underbrace{\beta_m(\overline{s}_m - \overline{s}_f)}_{\text{Differential Due to Difference in Skills}}$$

$$= \underbrace{(500-300)+(100-75)12}_{\text{Differential Due to Discrimination}} + \underbrace{100(14-12)}_{\text{Differential Due to Difference in Skills}} = \$500 + \$200 = \$700\,.$$

The wage differential that is due to discrimination equals \$500, or 5/7ths of the raw differential.

(c) Can you think of an alternative Oaxaca decomposition that would lead to a different measure of discrimination? Which measure is better?

Suppose instead of adding and subtracting $\beta_m \bar{s}_f$ to the expression giving the raw wage differential, $\beta_f \bar{s}_m$ had been added and subtracted to the expression. The Oaxaca decomposition would then be given by

$$\Delta\bar{w} = \underbrace{(\alpha_m - \alpha_f) + (\beta_m - \beta_f)\bar{s}_m}_{\text{Differential Due to Discrimination}} + \underbrace{\beta_f(\bar{s}_m - \bar{s}_f)}_{\text{Differential Due to Difference in Skills}}$$

$$= \underbrace{(500-300)+(100-75)14}_{\text{Differential Due to Discrimination}} + \underbrace{75(14-12)}_{\text{Differential Due to Difference in Skills}} = \$550 + \$150 = 700.$$

Under this method, \$550 of the \$700 wage differential is due to discrimination. The difference between methods arises because of the way in which discrimination is defined. In one, discrimination is measured by calculating how much a woman would earn if she were treated like a man (as in the text), and in the second it is measured by calculating how much a man would earn if he were treated like a woman. On the surface, neither is a better measure. It can be shown, however, that the second approach (as in part c) attributes more variation to discrimination.

10-5. Suppose the firm's production function is given by

$$q = 10\sqrt{E_w + E_b},$$

where E_w and E_b are the number of whites and blacks employed by the firm respectively. It can be shown that the marginal product of labor is then

$$MP_E = \frac{5}{\sqrt{E_w + E_b}}.$$

Suppose the market wage for black workers is \$10, the market wage for whites is \$20, and the price of each unit of output is \$100.

(a) How many workers would a firm hire if it does not discriminate? How much profit does this non-discriminatory firm earn if there are no other costs?

There are no complementarities between the types of labor as the quantity of labor enters the production function as a sum, $E_w + E_b$. Further, the market-determined wage of black labor is less than the market-determined wage of white labor. Thus, a profit-maximizing firm will not hire any white workers and will hire black workers up to the point where the black wage equals the value of their marginal product:

$$w_b = p \times MP_E = \frac{100(5)}{\sqrt{E_b}}$$

which yields E_b = 2,500. The 2,500 black workers produce q = 10(sqrt(2,500)) = 500 units of output, and profits are:

$$\Pi = pq - w_b E_b = 100(500) - 10(2{,}500) = \$25{,}000.$$

(b) Consider a firm that discriminates against blacks with a discrimination coefficient of .25. How many workers does this firm hire? How much profit does it earn?

The firm acts as if the black wage is $w_b(1 + d)$, where d is the discrimination coefficient. The employer's hiring decision, therefore, is based on a comparison of w_w and $w_b(1 + d)$. The employer will then hire whichever input has a lower utility-adjusted price. As d = 0.25, the employer is comparing a white wage of \$20 to a black (adjusted) wage of \$12.50. As \$12.50 < \$20, the firm will hire only blacks.

As before, the firm hires black workers up to the point where the utility-adjusted price of a black worker equals the value of marginal product, or

$$12.50 = \frac{100(5)}{\sqrt{E_b}}$$

so that E_b= 1,600 workers. The 1,600 workers produces 400 units of output, and profits are

$$\Pi = 100(400) - 10(1{,}600) = \$24{,}000.$$

(c) Finally, consider a firm that has a discrimination coefficient equal to 1.25. How many workers does this firm hire? How much profit does it earn?

As d = 1.25, the employer compares a white wage of \$20 against a black wage of \$22.50. Thus, the firm hires only whites. The firm hires white workers up to the point where the price of a white worker equals the value of marginal product:

$$20 = \frac{100(5)}{\sqrt{E_w}}$$

so the firm hires 625 whites, produces 250 units of output, and earns profits of

$$\Pi = 100(250) - 20(625) = \$12{,}500.$$

10-6. Suppose a restaurant hires only women to wait on tables, and only men to cook the food and clean the dishes. Is this most likely to be indicative of employer, employee, consumer, or statistical discrimination?

If this hiring pattern is due to discrimination at all, it is most likely due to customer discrimination. It is not employer discrimination as the employer is hiring both men and women. It is further unlikely to be statistical discrimination as an employer would likely be able to determine in a short time what would happen if women became chefs or men waited on tables. The hiring pattern could result from employee discrimination as well, but this seems unlikely as wait staff and chefs/dishwashers interact on the job.

10-7. Suppose that an additional year of schooling raised wages by 7 percent in 1970, regardless of the worker's race or ethnicity. Suppose also that the wage differential between the average white and the average Hispanic was 36 percent. Finally, assume education is the only factor that affects productivity, and the average white worker had 12 years of schooling in 1970, while the average Hispanic worker had 9 years. By 1980, the average white worker had 13 years of education, while the average Hispanic had 11 years. A year of schooling still increased earnings by 7 percent, regardless of the worker's ethnic background, and the wage differential between the average white worker and the average Hispanic fell to 24 percent. Was there a decrease in wage discrimination during the decade? Was there a decrease in the share of the wage differential between whites and Hispanics that can be attributed to discrimination?

On the basis of their education, the average white worker should have earned 21 percent more in 1970 and 14 percent more in 1980 than the average Hispanic worker. The average Hispanic worker actually received 36 percent less in 1970 and 24 percent less in 1980. Thus, in 1970, 15 percentage points can be attributed to wage discrimination, while 10 percentage points can be attributed to wage discrimination in 1980. Hence, the degree of discrimination declined from 15 to 10 percent from 1970 to 1980. On the other hand, discrimination accounted for $(15/36)\times100 = 41.7$ percent of the 1970 differential and $(10/24)\times100 = 41.7$ percent of the 1980 differential. Thus, there was no change in the portion due to discrimination. The two findings are not contradictory. The wage differential decreased for two reasons – less discrimination and smaller educational differences – and the two channels were equally important. Hence, despite its absolute decrease, the importance of discrimination relative to other factors was unchanged.

10-8. Use Table 211 of the 2002 U.S. Statistical Abstract.

(a) How much does the average female worker earn for every 1 dollar earned by the average male worker?

$23,551 / $40,257 = $0.59

(b) How much does the average black worker earn for every 1 dollar earned by the average white worker?

$24,979 / $33,326 = $0.75.

(c) How much does the average Hispanic worker earn for every 1 dollar earned by the average white worker?

$22,096 / $33,326 = $0.66.

10-9. Repeat each of the three comparisons in Problem 8, except now condition on education level. In other words, calculate the wage ratios separately for all workers who have not graduated high school, have only a high school degree, have a Bachelor's degree, and have a Master's degree. Does the degree of labor market inequality decrease or increase after conditioning on education? Why?

Men & Women:

No High School Degree:	\$12,145 / \$18,855 = \$0.64.
High School Degree:	\$18,092 / \$30,414 = \$0.59.
Bachelor's Degree:	\$32,546 / \$57,706 = \$0.56.
Master's Degree:	\$42,378 / \$68,367 = \$0.62.

Whites & Blacks:

No High School Degree:	\$13,569 / \$16,620 = \$0.82.
High School Degree:	\$20,991 / \$25,270 = \$0.83.
Bachelor's Degree:	\$37,422 / \$46,894 = \$0.80.
Master's Degree:	\$48,777 / \$55,622 = \$0.88.

Whites & Hispanics:

No High School Degree:	\$16,106 / \$16,620 = \$0.97.
High School Degree:	\$20,704 / \$25,270 = \$0.82.
Bachelor's Degree:	\$36,212 / \$46,894 = \$0.77.
Master's Degree:	\$50,576 / \$55,622 = \$0.91.

In every case, the wage gap closes when education attainment is taken into account except the gap stays the same between men and women with a high school degree and the gap worsens between men and women with a Bachelor's degree.

10-10. After controlling for age and education, it is found that the average woman earns \$0.80 for every \$1.00 earned by the average man. After controlling for occupation to control for compensating differentials (i.e., maybe men accept riskier or more stressful jobs than women, and therefore are paid more), the average woman earns \$0.92 for every \$1.00 earned by the average man. The conclusion is made that occupational choice reduces the wage gap 12 cents and discrimination is left to explain the remaining 8 cents.

(a) Explain why discrimination may explain more than 8 cents of the 20 cent differential (and occupational choice may explain less than 12 cents of the differential).

Discrimination may occur during the process of choosing an occupation (i.e., occupational crowding). As students, for example, girls may be encouraged to take a different set of courses than boys. Later, discrimination may preclude women from being hired into the higher paying occupations. Put differently, accepting the statistics at face value requires there to be wage discrimination but no employment discrimination.

(b) Explain why discrimination may explain less than 8 cents of the 20 cent differential.

The labor supply curve of women and men could be different, because they have different preferences when it comes to leisure and consumption. Thus, wage differences might come about to account for gender-based preferences and not discrimination. Put differently, other factors chosen by the employee, such as hours worked or work experience, have yet to be controlled for and could explain at least some of the remaining 8 cent differential.

10-11. Consider a town with 10 percent blacks (and the remainder is white). Because blacks are more likely to work the night shifts, 20 percent of all cars driven in that town at night are driven by blacks. One out of every twenty people driving at night is drunk, regardless of race. Persons who are not drunk never swerve their car, but 10 percent of all drunk drivers, regardless of race, swerve their cars. On a typical night, 5,000 cars are observed by the police force.

(a) What percent of blacks driving at night are driving drunk? What percent of whites driving at night are driving drunk?

The percent of drivers who are drunk is identical across races – 5 percent of all drivers regardless of race are drunk.

(b) Of the 5,000 cars observed, how many are driven by blacks? How many of these cars are driven by a drunk? Of the 5,000 cars observed at night, how many are driven by whites? How many of these cars are driven by a drunk? What percent of nighttime drunk drivers are black?

Of the 5,000 cars driven at night, 20 percent (or 1,000) are driven by blacks. As one out of every twenty people are drunk, there are 50 black drunk drivers. Similarly, 4,000 of the cars are driven by whites, and there are 200 drunk white drivers. Thus 20 percent (50 out of 250) of the drunk drivers are black, just like 20 percent of all drivers are black.

(c) The police chief believes the drunk-driving problem is mainly due to black drunk drivers. He orders his policemen to pull over all swerving cars *and* one in every two non-swerving cars that is driven by a black person. The driver of a non-swerving car is then given a breathalyzer test that is 100 percent accurate in diagnosing drunk driving. Under this enforcement scheme, what percent of people arrested for drunk driving will be black?

One-tenth of white drunk drivers will be arrested as they were swerving. This totals 20 drivers. Likewise one-tenth of black drunk drivers will be arrested as they were seen swerving. This totals 5 drivers.

Of the remaining 4,975 drivers, 995 are black with 45 being drunk. As one in every two blacks is pulled over on suspicion, 22.5 additional blacks will be arrested for drunk driving as they will fail the breathalyzer test. Therefore, at the end of the night, 47.5 people will be arrested for drunk driving, 27.5 of which are black. Therefore, even though only 20 percent of all drunks are black, the percent of drunks arrested who are black is almost 50 percent (27.5/47.5).

10-12. Suppose 100 men and 100 women graduate from high school. After high school, each can work in a low-skill job and earn \$200,000 over his or her lifetime, or each can pay \$50,000 and go to college. College graduates are given a test. If someone passes the test, he or she is hired for a high-skill job paying lifetime earnings of \$300,000. Any college graduate who fails the test, however, is relegated to a low-skill job. Academic performance in high school gives each person some idea of how he or she will do on the test if they go to college. In particular, each person's GPA, call it x, is an "ability score" ranging from 0.01 to 1.00. With probability x, the person will pass the test if he or she attends college. Upon graduating high school, there is one man with $x = .01$, one with $x = .02$, and so on up to $x = 1.00$. Likewise, there is one woman with $x = .01$, one with $x = .02$, and so on up to $x = 1.00$.

(a) Persons attend college only if the expected lifetime payoff from attending college is higher than that of not attending college. Which men and which women will attend college? What is the expected pass rate of men who take the test? What is the expected pass rate of women who take the test?

Both groups are identical, so the answers are identical. The expected value requirement for attending college is:

$$\$300{,}000\,x + \$200{,}000\,(1 - x) - \$50{,}000 > \$200{,}000$$
$$\$100{,}000\,x > \$50{,}000$$
$$x > 0.50.$$

Thus, the 50 men and 50 women with $x = .51$ to $x = 1.00$ all go to college and take the test. The number of test takers expected to pass is then the sum of expected pass rates: .51 + .52 + … + 1.00 = 37.75. Thus, 75.5 percent (37.75 of the 50) of men and 75.5 percent of the women who take the test are expected to pass the test.

(b) Suppose policymakers feel not enough women are attending college, so they take actions that reduce the cost of college for women to \$10,000. Which women will now attend college? What is the expected pass rate of women who take the test?

The expected value requirement for attending college for women has changed to:

$$\$300{,}000\,x + \$200{,}000\,(1 - x) - \$10{,}000 > \$200{,}000$$
$$\$100{,}000\,x > \$10{,}000$$
$$x > 0.10.$$

Thus, the 90 women with $x = .11$ to $x = 1.00$ attend college and take the test. The number of female test takers expected to pass is the sum of expected pass rates: .11 + .12 + … + 1.00 = 49.95. Thus, 55.5 percent (49.95 of the 90) of the women who take the test are expected to pass the test.