USC, Fall 2016, Economics 513

Lecture 7A: Using regression analysis to measure gender discrimination.

A simple regression model for gender differences in wages

If we have data on a sample of individuals who report their wage W and their gender D (with $D = 1$ for males and $D = 0$ for females) we can consider the regression model for these observations with the log wage as the dependent variable

$$\ln W_i = \beta_1 + \beta_2 D_i + \varepsilon_i$$

The OLS estimators of the regression coefficients are

$$\hat{\beta}_1 = \frac{\sum_{i=1}^{n}(1-D_i)\ln W_i}{\sum_{i=1}^{n}(1-D_i)} = \ln \overline{W}_f$$

$$\hat{\beta}_2 = \frac{\sum_{i=1}^{n} D_i \ln W_i}{\sum_{i=1}^{n} D_i} - \frac{\sum_{i=1}^{n}(1-D_i)\ln W_i}{\sum_{i=1}^{n}(1-D_i)} = \ln \overline{W}_m - \ln \overline{W}_f$$

with

$$\overline{W}_f = \prod_{i=1}^{n} W_i^{\frac{1-D_i}{n_f}}$$

$$\overline{W}_m = \prod_{i=1}^{n} W_i^{\frac{D_i}{n_m}}$$

the *geometric* average of the wage for men and women, respectively.

If we define the relative difference in the (geometric) average wage of men and women

$$G = \frac{\overline{W}_m - \overline{W}_f}{\overline{W}_f}$$

then the question is whether G is a good measure of the gender discrimination (if any) on the labor market.

If we find that $G = .3$ do we conclude that there is gender discrimination against women?

Consider two differences between men and women:

(i) Women have on average less work experience than men. This increases the wage difference.

(ii) Men and women are concentrated in different occupations. This increases the wage difference.

Are both factors that increase the average wage difference between men and women caused by gender bias?

What about education, health, industry, marital status, ...

The economics of discrimination

The seminal work by the Chicago economist Gary Becker in his 'The Economics of Discrimination' (1973) that actually was started as his PhD thesis in 1957 gives some help: discrimination occurs if two types of labor that are perfect substitutes in production have different prices (wages).

Wage differences associated with productive characteristics as work experience and education are not reflective of gender bias, but reflect different choices under different restrictions.

What about occupation, industry, marital status, ... Unobservable productive characteristics?

Fact: If we control for enough characteristics, in particular if we focus on fine occupational categories, then there are no, and have not been for decades, differences in the average wage of men and women.

Oaxaca-Blinder decomposition

Following Becker we define a measure for the degree of discrimination:

$$D = \frac{\overline{W}_m/\overline{W}_f - \left(\overline{W}_m/\overline{W}_f\right)^0}{\left(\overline{W}_m/\overline{W}_f\right)^0}$$

with $\overline{W}_m, \overline{W}_f$ the (geometric) average wage of men and women, respectively and $\left(\overline{W}_m/\overline{W}_f\right)^0$ the ratio of the average wage of men and women if there is no discrimination on the labor market.

Note that

$$\ln(D+1) = \ln\left(\overline{W}_m/\overline{W}_f\right) - \ln\left(\overline{W}_m/\overline{W}_f\right)^0$$

Two extremes:

$$\left(\overline{W}_m/\overline{W}_f\right)^0 = \overline{W}_m/\overline{W}_f$$

so that $\ln(D+1) = 0$, i.e. the observed difference in average wage is due to differences in productive characteristics, and

$$\left(\overline{W}_m/\overline{W}_f\right)^0 = 1$$

so that $\ln(D+1) = \ln\left(\overline{W}_m/\overline{W}_f\right)$, i.e. the observed difference in average wage is due to gender bias.

Wage regression

$$\ln W_{ki} = Z'_{ki}\beta_k + \varepsilon_{ki}$$

for $k = m, f$. This means that we estimate separate wage regressions for men and women. This is an example of a hedonic regression that links characteristics of a 'product' (here the worker) to its price. Just as cars or houses labor is a heterogeneous commodity.

With D the gender dummy we can combine the two wage regressions

$$\begin{aligned} \ln W_i &= Z'_i(D_i\beta_m + (1 - D_i)\beta_f) + \varepsilon_i \\ &= Z'_i\beta_f + D_i Z'_i(\beta_m - \beta_f) + \varepsilon_i \end{aligned}$$

Which test can we use to test for a difference in the male and female coefficients. What is the implicit assumption?

Using the property of OLS that the averages are on the regression line, we have

$$\ln \overline{W}_m = \hat{\beta}'_m \overline{Z}_m \qquad \ln \overline{W}_f = \hat{\beta}'_f \overline{Z}_f$$

This leads to the Oaxaca-Blinder decomposition of the difference of the average wages

(i) Decomposition 1

$$\ln \overline{W}_m - \ln \overline{W}_f = \hat{\beta}'_m \overline{Z}_m - \hat{\beta}'_f \overline{Z}_f = \hat{\beta}'_f(\overline{Z}_m - \overline{Z}_f) - (\hat{\beta}_f - \hat{\beta}_m)\overline{Z}_m$$

(ii) Decomposition 2

$$\ln \overline{W}_m - \ln \overline{W}_f = \hat{\beta}'_m \overline{Z}_m - \hat{\beta}'_f \overline{Z}_f = \hat{\beta}'_m(\overline{Z}_m - \overline{Z}_f) - (\hat{\beta}_f - \hat{\beta}_m)\overline{Z}_f$$

We take

$$\ln \left(\overline{W}_m / \overline{W}_f\right)^0 = \hat{\beta}'_f(\overline{Z}_m - \overline{Z}_f)$$

or

$$\ln \left(\overline{W}_m / \overline{W}_f\right)^0 = \hat{\beta}'_m(\overline{Z}_m - \overline{Z}_f)$$

In the first case we assume that the price of the productive characteristics is that for women and in the second case we assume that the price of the productive characteristics is that for men.
Because

$$\ln \left(\overline{W}_m / \overline{W}_f\right) = \ln(D + 1) + \ln \left(\overline{W}_m / \overline{W}_f\right)^0$$

we have for female prices

$$\ln(D + 1) = -(\hat{\beta}_f - \hat{\beta}_m)\overline{Z}_m$$

and for male prices

$$\ln(D + 1) = -(\hat{\beta}_f - \hat{\beta}_m)\overline{Z}_f$$

Think of the two estimates as bounds.

Because e.g. for female prices

$$\ln(D+1) = \sum_{l=1}^{K} -(\hat{\beta}_{fl} - \hat{\beta}_{ml})\overline{Z}_{ml}$$

we can consider the contribution of individual variables as education or groups of variables as occupation to the measure of gender discrimination. We could also consider, as is done in the empirical study

$$\sum_{l=1}^{K} \hat{\beta}'_{fl}(\overline{Z}_{ml} - \overline{Z}_{fl})$$

i.e. the contribution of differences in the average characteristics to the difference in the average wage between men and women.

Empirical implementation

The main issue is the choice of Z: we should include characteristics that affect the labor productivity of the individuals.

We will consider the original study of Ronald Oaxaca, 'Male-female wage differentials in urban labor markets', International Economic Review, vol. 14, no. 3 (1973), pp. 693-709. This study introduced the Oaxaca-Blinder decomposition in a study of gender discrimination. It has almost 8000 cites and is one of the most cited papers in labor economics. The decomposition is widely used in empirical economics, see e.g. the survey in the Chapter 1 of the Handbook of Labor Economics, vol. 4A (2011) by Fortin, Lemieux and Firpo, 'Decomposition methods in economics'.
Variables in Z

- Work experience (Potential work experience= Age Education 6). Accurate? For men, for women? Linear and quadratic terms.
- Number of children (to correct for inaccuracy potential work experience for women).
- Education (years completed, linear and quadratic).
- Class of worker. Classification: union privately employed, government, self-employed, non-union privately employed (reference).
- Industry: 2 digit (retail trade is reference). OK?
- Occupation: 2 digit (sales worker is reference). OK?

- Health problems: dummy 1 if health problem.
- Part-time: dummy 1 if workweek is less than 35 hours.
- Migration: dummy is 1 if not moved more than 50 miles since age 17; years since last migrated (linear and quadratic).
- Marital status. Classification: married spouse present, married spouse absent, widowed, divorced, never married (reference).
- Size of urban area: SMSA<250K, 250K-500K, 500K-750K, 750K+, not in SMSA (reference). Allows for non-linear effect.
- Region. Classification: North East, North Central, West, South (reference).

Results

Data from 1967 SEO. Population considered: report hourly wage in week before survey; age over 16 ; live in urban area; white or black.

Some missing coefficients: reference group or no observations (e.g. no black women in mining).

Results in Tables 1 and 2.

- Note reporting of regression results; I prefer standard errors over t-values. Standard error of estimate is the estimated standard deviation of the error term.
- Experience variable is measured with error for women. Likely to be downward biased. Hence contribution of difference in experience coefficients between men and women overestimated and discrimination overestimated.
- F-tests equality of coefficients. Not clear whether also tested that coefficient of Children is 0. If not then 28 restrictions. In unrestricted model 28 (men) + 29 (women) = 57 coefficients. No. of observations N=8123+4962=13085. Hence df are 28 (numerator) and 13028 (denominator). In table of the F-distribution we take entry $n_1 = 30, n_2 = \infty$, i.e. 1.46.
- For whites the difference in the intercepts is not significant, i.e. all discrimination is due to differential pricing of productive characteristics. Not true for blacks.
- For white men the effect of experience is

  $$.0176EXP - .00288EXP^2$$

  and for women

  $$.0138EXP - .00248EXP^2$$

- Note return to experience initially higher for men (1.8% versus 1.4%). Men have a positive return until 61 years of experience and women until 55 years. See graph.

- Table 3 (and 4) indicate how much of the observed relative wage difference can be explained by differences in productive characteristics. Note the importance of industry.

- Estimate of fraction of wage ratio due to discrimination is between .25 and .32 for whites and .22 and .27 for blacks.

- Oaxaca also consider a smaller set of productive characteristics that exclude occupation and industry and finds higher levels of discrimination .40 for whites and between .42 and .48 for blacks.

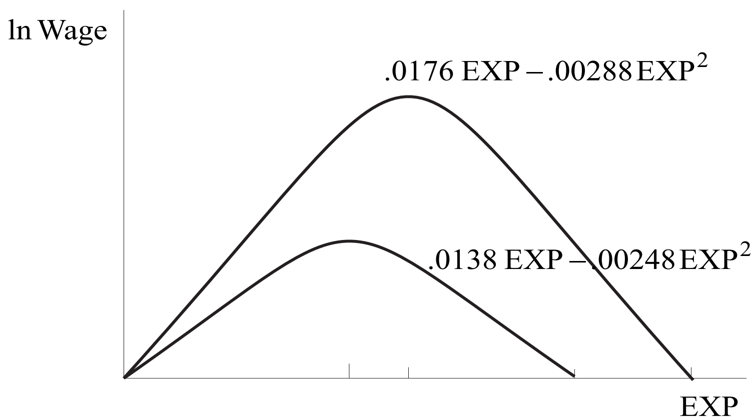
ln Wage
.0176 EXP − .00288 EXP²
.0138 EXP − .00248 EXP²
EXP

TABLE 1

FULL-SCALE WAGE REGRESSIONS[a]

Variable	Whites			Blacks		
	Male	Female	$\Delta\beta$	Male	Female	$\Delta\beta$
Constant	.0365 (.77)	−.1024 (−1.34)	−.1389 (−1.60)	.0953 (1.71)	−.3851* (−6.35)	−.4804* (−5.85)
Experience						
Experience	.0176* (13.89)	.0138* (8.19)	−.0038 (−1.88)	.0117* (7.73)	.0067* (4.38)	−.0050* (−2.29)
Experience**2	−.000288* (−12.22)	−.000248* (−7.31)	.000040 (.98)	−.000204* (−7.59)	−.000122* (−4.33)	.000082* (2.11)
Education						
Education	.0082 (1.27)	−.0118 (−.98)	−.0200 (−1.53)	−.0308* (−4.60)	−.0175* (−1.98)	.0133 (1.19)
Education**2	.00169* (5.92)	.00194* (3.53)	.00025 (.42)	.00300* (8.23)	.00245* (5.26)	−.00055 (−.93)
Class of Worker						
Union	.1113* (9.39)	.1500* (6.70)	.0387 (1.59)	.2129* (14.15)	.0719* (3.11)	−.1410* (−5.14)
Nonunion Private Wage and Salary	—	—	—	—	—	—
Government	.0646* (3.15)	.1445* (5.89)	.0799* (2.54)	.1328* (5.44)	.1263* (5.19)	−.0065 (−.19)
Self-Employed	−.1290* (3.51)	.1137 (1.22)	.2427* (2.54)	−.0128 (−.15)	−.3437* (−2.67)	−.3309* (−2.15)
Industry						
Agriculture	.1285 (1.81)	.2847 (1.09)	.1562 (.61)	−.0067 (−.08)	−.0190 (−.21)	−.0123 (−1.18)
Mining	.3604* (6.83)	.4112* (2.02)	.0508 (.26)	.0697 (.40)	—	—
Construction	.2997* (13.72)	.2444* (3.80)	−.0553 (−.86)	.2729* (10.54)	.0395 (.22)	−.2334 (−1.30)
Manufacturing-Durable	.2398* (13.76)	.2562* (8.39)	.0164 (.48)	.2101* (9.15)	.2590* (6.46)	.0489 (1.06)
Manufacturing-Non Durable	.2086* (11.03)	.1968* (6.60)	−0.118 (−.35)	.1679* (6.85)	.2305* (6.46)	.0626 (1.45)
Transportation	.2332* (9.81)	.3154* (5.54)	.0822 (1.40)	.2182* (7.39)	.5463* (5.73)	.3281* (3.32)
Communications	.2370* (5.62)	.2290* (4.56)	−.0080 (−.12)	.1555 (1.78)	.2657* (3.71)	.1102 (.98)
Utilities	.2414* (7.32)	.2451* (2.83)	.0087 (.04)	.1433* (3.45)	.7026* (2.76)	.5593* (2.19)
Wholesale Trade	.2039* (8.45)	.1979* (4.74)	−.0060 (−.13)	.1204* (3.76)	.3065* (4.34)	.1861* (2.41)
Retail Trade	—	—	—	—	—	—
Finance	.2224* (8.25)	.1761* (5.65)	−.0463 (−1.14)	.0184 (.47)	.1593* (3.22)	.1409* (2.25)

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TABLE 1

(CONTINUED)

Variable	Whites			Blacks		
	Male	Female	$\Delta\beta$	Male	Female	$\Delta\beta$
Business and Repair Services	.1385* (4.44)	.1525* (3.24)	.0140 (.26)	.0766* (2.10)	.1326* (2.31)	.0560 (.83)
Personal Services	−.0618 (−1.71)	−.0183 (−.50)	.0435 (.85)	−.1055* (−3.22)	.0118 (.40)	.1173* (2.65)
Recreation	.0488 (.97)	.1527* (1.97)	.1039 (1.16)	.0020 (.04)	.1019 (1.29)	.0999 (1.05)
Professional Services	−.0629* (−2.53)	.0528* (2.01)	.1157* (3.24)	.0633* (2.13)	.1181* (4.45)	.0548 (1.38)
Public Administration	.1970* (6.58)	.2165* (4.86)	.0195 (.37)	.2374* (6.75)	.2170* (5.61)	−.0204 (−.39)
Occupation						
Professional Workers	.1563* (6.62)	.3736* (10.25)	.2173* (5.16)	.2144* (4.62)	.4631* (10.80)	.2487* (3.43)
Managers	.1822* (8.27)	.2759* (6.85)	.0937* (2.12)	.0810 (1.49)	.2792* (3.53)	.1982* (2.07)
Clerical Workers	−.0639* (−2.68)	.1665* (6.03)	.2304* (6.41)	.0208 (.54)	.1509* (4.50)	.1301* (2.55)
Sales Workers	—	—	—	—	—	—
Craftsmen	.0275 (1.28)	.0932 (1.31)	.0657 (.93)	.0733* (1.99)	.1297* (1.97)	.0564 (.75)
Operatives	−.1064* (−4.92)	.0128 (.37)	.1192* (3.00)	−.0271 (−.77)	.0236 (.62)	.0507 (.98)
Private Household Workers	−.1900 (−1.03)	−.3060* (−5.46)	−.1160 (−.58)	−.0458 (−.28)	−.1432* (−3.58)	−.0974 (−.58)
Service Workers	−.1358* (−5.19)	−.0219 (−.72)	.1139* (2.89)	−.0998 (−2.84)	−.0164 (−.53)	.0834 (1.78)
Farm Laborers	−.4570* (−5.38)	.1579 (.43)	.6149 (1.71)	−.1421 (−1.36)	—	—
Laborers	−.1540* (−5.59)	−.0166 (−.15)	.1374 (1.29)	−.0637 (−1.77)	.0317 (.37)	.0954 (1.03)
Health Problems	−.1001* (−6.08)	−.0710* (−2.70)	.0291 (.97)	−.0811* (−3.79)	−.0270 (−1.31)	.0541 (1.82)
Part-Time	−.1874* (−9.14)	−.0445* (−2.64)	.1429* (5.37)	−.1117* (−4.80)	.0034 (.21)	.1151* (4.04)
Migration						
Migration	−.0356* (−2.48)	−.1073* (−5.03)	−.0717* (−2.87)	.0052 (.44)	−.0361 (−1.94)	−.0413 (−1.88)
YRSM	.0072* (4.22)	.0087* (3.33)	.0015 (.48)	—	.0025* (2.73)	—
YRSM**2	−.000140* (−3.08)	−.000147* (−2.14)	−.000007 (−.10)	—	—	—
Marital Status						
Spouse Present	.1841* (11.88)	.0883* (4.51)	−.0958* (−3.91)	.1211* (6.43)	.0995* (5.13)	−.0216 (−.80)

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TABLE 1

(CONTINUED)

Variable	Whites			Blacks		
	Male	Female	$\Delta\beta$	Male	Female	$\Delta\beta$
Spouse Absent	.1124 (1.72)	.0852 (1.39)	−.0272 (−.30)	.0446 (.79)	.1050* (2.38)	.0604 (.84)
Widowed	.1030* (2.37)	.0687* (2.21)	−.0343 (−.64)	.0920* (2.13)	.0980* (3.47)	.0060 (.12)
Divorced	.0793* (2.74)	.0933* (3.38)	.0140 (.35)	.0396 (1.53)	.0607* (2.72)	.0211 (.62)
Single, Never Married	—	—	—	—	—	—
Children	—	−.0198* (−4.51)	—	—	−.0007 (−.24)	—
Size of Urban Area						
Urban, Non SMSA	—	—	—	—	—	—
SMSA<250	.0332* (1.98)	.0920* (3.86)	.0588* (2.07)	.0523 (1.54)	.1458* (4.19)	.0935 (1.93)
SMSA 250–500	.0727* (3.89)	.0956* (3.65)	.0229 (.73)	.1098* (2.83)	.1833* (4.61)	.0735 (1.32)
SMSA 500–750	.1411* (7.30)	.1524* (5.46)	.0113 (.34)	.1349* (3.55)	.1816* (4.46)	.0467 (.84)
SMSA 750+	.1745* (12.57)	.2186* (11.21)	.0441 (1.89)	.2079* (6.46)	.3643* (10.92)	.1564* (3.38)
Region						
North East	.0738* (5.63)	.0882* (4.69)	.0144 (.64)	.1366* (7.86)	.1724* (9.24)	.0358 (1.41)
North Central	.0749* (5.85)	.0646* (3.52)	−.0103 (−.47)	.1479* (9.37)	.1376* (8.00)	−.0103 (−.44)
South	—	—	—	—	—	—
West	.1200* (8.51)	.1389* (6.83)	.0189 (.79)	.2452* (12.48)	.2612* (12.07)	.0160 (.55)
F Statistic for Joint Test of Significance	128.31*	50.88*	13.28*	71.96*	97.14*	9.93*
R^2	.43	.33		.46	.56	
Standard Error of Estimate	.40	.45		.35	.36	
Number of Observations	8,123	4,962		3,897	3,502	

[a] '*t*' values in parentheses.

* Significant at the 5% level.

TABLE 2

PERSONAL CHARACTERISTICS WAGE REGRESSIONS[a]

Variable	Whites			Blacks		
	Male	Female	$\Delta\beta$	Male	Female	$\Delta\beta$
Constant	−.0681* (−2.03)	.0894 (.94)	.1575 (1.87)	.1472* (2.44)	−.2325* (−3.75)	−.3797* (−4.65)
Experience						
Experience	.0222* (16.51)	.0182* (10.20)	−.0039 (−1.81)	.0195* (12.03)	.0066* (4.02)	−.0129* (−5.53)
Experience**2	−.000354* (−14.19)	−.000349* (−9.69)	.000005 (.13)	−.000340* (−11.69)	−.000133* (−4.26)	.000207* (4.86)
Education						
Education	.0342* (5.24)	−.0394* (−3.30)	−.0736* (−5.63)	−.0434* (−6.16)	−.0660* (−7.12)	−.0226 (−1.95)
Education**2	.00097* (3.51)	.00450* (8.63)	.00353* (6.24)	.00417* (11.46)	.00685* (15.35)	.00268* (4.68)
Health Problems	−.1325* (−7.57)	−.1097* (−3.89)	.0228 (.71)	−.1275* (−5.41)	−.0638* (−2.75)	.0637 (1.92)
Part-Time	−.3154* (−14.84)	−.1560* (−9.09)	.1594* (5.81)	−.1908* (−7.57)	−.1139* (−6.73)	.0769* (2.52)
Migration						
Migration	−.0316* (−2.05)	−.1262* (−5.54)	−.0946* (−3.56)	.0125 (.96)	−.0726* (−3.48)	−.0851* (−3.49)
YRSM	.0073* (3.98)	.0107* (3.81)	.0034 (1.05)	—	.0034* (3.24)	—
YRSM**2	−.000140* (−2.91)	−.000169* (−2.29)	−.000029* (−.34)	—	—	—
Marital Status						
Spouse Present	.2514* (15.44)	.1246* (5.96)	−.1268* (−4.90)	.1584* (7.66)	.0986* (4.53)	−.0598* (−1.99)
Spouse Absent	.1189 (1.71)	.0706 (1.07)	−.0483 (−.51)	.0975 (1.56)	.0964 (1.94)	−.0011 (−.01)
Widowed	.1389* (3.00)	.0804* (2.41)	−.0585 (−1.01)	.1648* (3.46)	.0754* (2.38)	−.0894 (−1.55)
Divorced	.1027* (3.34)	.1064* (3.61)	.0037 (.09)	.0511 (1.78)	.0618* (2.46)	.0107 (.28)
Single, Never Married	—	—	—	—	—	—
Children	—	−.0295* (−6.31)	—	—	−.0025 (−.80)	—
Size of Urban Area						
Urban, Non SMSA	—	—	—	—	—	—
SMSA <250	.0412* (2.30)	.1080* (4.23)	.0668* (2.20)	.0667 (1.78)	.1415* (3.60)	.0748 (1.38)
SMSA 250–500	.0845* (4.26)	.1154* (4.11)	.0309 (.92)	.1103* (2.57)	.1879* (4.20)	.0776 (1.25)
SMSA 500–750	.1739* (8.47)	.1721* (5.77)	−.0018 (−.05)	.1821* (4.34)	.1769* (3.86)	−.0052 (−.08)

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TABLE 2

(CONTINUED)

Variable	Whites			Blacks		
	Male	Female	$\Delta\beta$	Male	Female	$\Delta\beta$
SMSA 750+	.1972* (13.45)	.2543* (12.27)	.0571* (2.31)	.2452* (6.95)	.3888* (10.39)	.1436* (2.80)
Region						
North East	.0655* (4.73)	.1129* (5.69)	.0474* (2.01)	.1704* (8.97)	.2268* (11.07)	.0564* (2.02)
North Central	.0790* (5.91)	.0685* (3.52)	−.0105 (−.46)	.2255* (13.56)	.1996* (10.57)	−.0259 (−1.03)
South	—	—	—	—	—	—
West	.1111* (7.49)	.1174* (5.43)	.0063 (.25)	.2889* (13.44)	.3027* (12.56)	.0138 (.43)
F Statistic for Joint Test of Significance	213.29*	67.51*	45.05*	103.93*	132.01*	58.14*
R^2	.34	.22		.33	.43	
Standard Error of Estimate	.43	.49		.39	.40	
Number of Observations	8,123	4,962		3,897	3,502	

[a] *t* values in parentheses.

* Significant at the 5% level.

TABLE 3

THE EFFECTS OF DISCRIMINATION ESTIMATED FROM THE FULL-SCALE WAGE REGRESSIONS

Item	Whites				Blacks			
	Female Regression Weights		Male Regression Weights		Female Regression Weights		Male Regression Weights	
	(1)[a]	(2)[b]	(3)[c]	(4)[b]	(5)[a]	(6)[b]	(7)[c]	(8)[b]
Wage differential	.4307	100.0%	.4307	100.0%	.3989	100.0%	.3989	100.0%
Adjustment for sex differences in								
Experience	−.0056	−1.3	−.0074	−1.7	−.0009	−0.2	−.0017	−0.4
Education	−.0051	−1.2	−.0037	−0.9	+.0170	+4.3	+.0140	+3.5
Class of Worker	−.0218	−5.1	−.0144	−3.3	−.0120	−3.0	−.0418	−10.5
Industry	−.0745	−17.3	−.0901	−20.9	−.0995	−24.9	−.1170	−29.3
Occupation	−.0059	−1.4	−.0338	−7.8	−.0451	−11.3	.0090	−2.3
Health Problems	+.0012	+0.3	+.0017	+0.4	−.0006	−0.2	−.0019	−0.5
Part-time	−.0065	−1.5	−.0273	−6.3	+.0006	+0.2	−.0184	−4.6
Migration	+.0030	+0.7	+.0001	0.0	+.0013	+0.3	−.0002	0.0
Marital Status	−.0078	−1.8	−.0271	−6.3	−.0070	−1.8	−.0157	−3.9
Children	−.0309	−7.2	.0000	0.0	−.0015	−0.4	.0000	0.0
Size of Urban Area	−.0015	−0.3	−.0012	−0.3	−.0030	−0.8	−.0022	−0.6
Region	+.0002	0.0	.0000	0.0	−.0045	−1.1	−.0050	−1.3
	$\ln(\widehat{D+1}) = .2755$ $(\hat{D} = .32)$	63.9%	$\ln(\widehat{D+1}) = .2275$ $(\hat{D} = .25)$	52.9%	$\ln(\widehat{D+1}) = .2437$ $(\hat{D} = .27)$	61.1%	$\ln(\widehat{D+1}) = .2000$ $(\hat{D} = .22)$	50.1%

[a] The adjustment for the j-th variable using female regression weights is $-\hat{\beta}_{fj}\Delta\bar{Z}_j$, and therefore the sum is $-\Delta\bar{Z}'\hat{\beta}_f$. This implies
$$\ln(\widehat{D+1}) = \ln(G+1) - \Delta\bar{Z}'\hat{\beta}_f = -\bar{Z}_m'\Delta\hat{\beta}.$$

[b] Each adjustment is expressed as a percentage of the wage differential.

[c] The adjustment for the j-th variable using male regression weights is $-\hat{\beta}_{mj}\Delta\bar{Z}_j$, and therefore the sum is $-\Delta\bar{Z}'\hat{\beta}_m$. This implies
$$\ln(\widehat{D+1}) = \ln(G+1) - \Delta\bar{Z}'\hat{\beta}_m = -\bar{Z}_f'\Delta\hat{\beta}.$$

TABLE 4

THE EFFECTS OF DISCRIMINATION ESTIMATED FROM THE PERSONAL CHARACTERISTICS WAGE REGRESSIONS

Item	Whites				Blacks			
	Female Regression Weights		Male Regression Weights		Female Regression Weights		Male Regression Weights	
	(1)[a]	(2)[b]	(3)[c]	(4)[b]	(1)[a]	(2)[b]	(3)[c]	(4)[b]
Wage differential	.4307	100.0%	.4307	100.0%	.3989	100.0%	.3989	100.0%
Adjusment for sex differences in								
Experience	−.0072	−1.7	−.0094	−2.1	−.0007	−0.2	−.0028	−0.7
Education	−.0122	−2.8	−.0008	−0.2	+.0351	+8.8	+.0190	+4.8
Health Problems	+.0018	+0.4	+.0022	+0.5	−.0015	−0.4	−.0030	−0.8
Part-Time	−.0227	−5.3	−.0459	−10.7	−.0187	−4.7	−.0314	−7.9
Migration	+.0033	+0.8	−.0002	0.0	+.0024	+0.6	−.0004	−0.1
Marital Status	−.0143	−3.3	−.0380	−8.8	−.0086	−2.2	−.0167	−4.2
Children	−.0460	−10.7	.0000	0.0	−.0052	−1.3	.0000	0.0
Size of Urban Area	−.0017	−0.4	−.0012	−0.3	−.0033	−0.8	−.0029	−0.7
Region	+.0003	+0.1	−.0001	0.0	−.0058	−1.5	−.0069	−1.7
	$\ln(\widehat{D+1}) = .3320$ ($\hat{D} = .39$)	77.1%	$\ln(\widehat{D+1}) = .3373$ ($\hat{D} = .40$)	78.4%	$\ln(\widehat{D+1}) = .3913$ ($\hat{D} = .48$)	98.5%	$\ln(\widehat{D+1}) = .3538$ ($\hat{D} = .42$)	88.7%

[a] The adjustment for the j-th variable using female regression weights is $-\hat{\beta}_{fj}\Delta\bar{Z}_j$, and therefore the sum is $-\Delta\bar{Z}'\hat{\beta}_f$. This implies

$$\ln(\widehat{D+1}) = \ln(G+1) - \Delta\bar{Z}'\hat{\beta}_f = -Z_m'\Delta\hat{\beta}.$$

[b] Each adjustment is expressed as a percentage of the wage differential.

[c] The adjustment for the j-th variable using male regression weights is $-\hat{\beta}_{mj}\Delta\bar{Z}_j$, and therefore the sum is $-\Delta\bar{Z}'\hat{\beta}_m$. This implies

$$\ln(\widehat{D+1}) = \ln(G+1) - \Delta\bar{Z}'\hat{\beta}_m = -\bar{Z}_f'\Delta\hat{\beta}.$$