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The role of supervisors in the determination of wages and wage gaps

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This article considers labour market discrimination by supervisors as a potential contributor to racial and gender wage gaps. Empirical analysis reveals evidence that all workers, except Hispanic males, earn significantly higher hourly wages when working for a supervisor of the same race and sex as themselves. Furthermore, the results suggest that sex has a larger impact on wages than race for workers with white supervisors, while race has a larger impact on wages than sex for workers with minority supervisors. Based on past research, we theorize that the degree of labour discrimination workers face may also be dependent upon the location and size of the firm in which they are employed. However, decomposing the samples by firm location and size suggests that these two factors cannot adequately explain the observed matched supervisor–worker wage effects, which supports the notion that these wage effects are largely driven by factors other than supervisor discrimination.

Keywords: labour discrimination; wage gaps; supervisor; race; gender

JEL Classification: J15; J16; J31; J71

I. Introduction

Achieving racial and gender equality has been one of the major goals of US labour policy for more than 50 years. The Equal Pay Act of 1963 and the Civil Rights Act of 1964 attempted to redress racial and gender discrimination in the labour market. The Equal Pay Act and its subsequent amendments prohibit wage discrimination by employers on the basis of sex. Similarly, Title VII of the Civil Rights Act prohibits discrimination by employers on the basis of race, colour, religion, sex and national origin. These federal regulations imply that workers of equal skill and ability performing equal jobs under equal working conditions should receive equal pay, regardless of their race or sex. Therefore, all else equal, race and sex should not be significant wage determinants.

The decline in gender and racial earnings gaps over the past few decades provides at least some evidence of the success of federal antidiscrimination policy. According to the US Census Bureau (2009), white female median income was 59% of white male median income in 2006 compared to only 35% in 1974. Over the same period of time, African American female median income rose from 51% to 76% of African American male median income and Hispanic female median income rose from 47% to 67% of Hispanic male median income. Thus, females have gained much ground on their male counterparts in recent years. African Americans have also gained ground on

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whites with the median earnings differential between white and African American males declining by 12% over the period 1974 to 2006 and the median earnings differential between African American females and white females declining by 5% over the same period. Hispanics, however, have seen their earnings decline relative to whites over the past three decades. The median earnings gap between white and Hispanic men increased by 4% from 1974 to 2006, while the median earnings gap between white and Hispanic women increased by 19%.

With the possible exception of Hispanic workers, federal regulations appear to have been relatively successful in promoting racial and gender equality in the labour market. Despite this achievement, studies find continued evidence of racial and gender wage gaps. Differences in pre-market skills, training and education account for at least part of these wage gaps (Loury, 1977, 1981, 1998; Heckman, 1998). Yet, many researchers contend that labour market discrimination may remain a primary source of these differentials (e.g., see Stratton, 1993; Black, 1995; Mason, 1995, 1999, 2000; Bratsberg and Terrell, 1998; Darity and Mason, 1998; Alkadry and Tower, 2006; Charles and Guryan, 2008). This article examines one potential contributor to persisting racial and gender wage gaps – supervisor discrimination.

II. Theoretical Background

In his seminal work on labour market discrimination, Becker (1971) lays the foundation for multiple theories that help to explain how certain prejudices influence wages and other labour market outcomes. One of those theories discussing discrimination by employers is particularly relevant to this study. To the extent that supervisors have some discretion in hiring, promotion and setting wages of workers under their supervision, Becker's (1971) theory of employer discrimination can be adapted to supervisors. Following Becker (1971), if an employer has a 'taste for discrimination', they have some positive willingness to pay, either directly or in the form of reduced profits, to be associated with one group of people instead of another. It follows that employers with discriminatory preferences will be less likely to hire, promote or pay fair wages to workers that they prefer to avoid. Adapting this to supervisors implies that a racial/gender mismatch between a worker and a supervisor with discriminatory preferences would result in the worker potentially being subjected to discriminatory wage setting practices. Becker's (1971) theory predicts that those workers belonging to the majority group would be less likely to face such labour market inefficiencies because they would be more likely to find employment with nondiscriminatory supervisors. However, regardless of a worker's race or sex, they may suffer from working under a discriminatory

supervisor that dislikes association with their race or sex. In the context of this study, race-based supervisor discrimination implies that workers may earn a wage premium when working for a supervisor of the same race as themselves and suffer a wage penalty when working for a supervisor of a different race. Similarly, sex-based supervisor discrimination implies that workers may earn a wage premium when working for a supervisor of the same sex as themselves and suffer a wage penalty when working for a supervisor of a different sex.

The sex and race of a worker's supervisor may influence their wages through various other labour market outcomes as well, which may also be reflective of supervisor discrimination. Supervisors may provide more support and mentorship to workers of their own race and sex, which translates into higher promotion rates and, thus, higher wages for those workers (Athey *et al.*, 2000; Cardoso and Winter-Ebmer, 2010). Bates (1994), Giuliano (2003), Stoll *et al.* (2004) and Carrington and Troske (1995, 1998) have all shown that supervisors are more likely to hire workers of the same race and sex as themselves. It is also possible that the racial and gender match between supervisors and workers impacts worker productivity. For example, working for a supervisor of a different race or sex may lower a worker's morale (Blau and Ferber, 1992). It may also be that a supervisor knows better how to motivate a worker of the same race and sex as themselves because of cultural differences or differences in communication styles (Lang, 1986; Tannen, 1994).

In addition to the theories discussed above, the empirical formulation employed in this study allows us to test two other, more specific, theories of supervisor discrimination. First, as hinted above, Becker (1971) notes that the wage differential between majority and minority groups will be greater when the minority group has greater representation. If the supply of minority workers is relatively low, then a greater number of minority workers will find a job with nondiscriminatory employers than if the supply of minority workers is relatively high. The degree of prejudice that discriminatory employers have against minority workers also impacts the wage differential. Together, these two factors may explain why some studies find that the wage gap between white and African American workers is largest in the southern US African Americans make up a much larger portion of the workforce in southern states than in any other region. The south also has a more prevalent history of racial discrimination. Therefore, African American workers are in larger supply and may also be in relatively lower demand because of a historically greater taste for discrimination in the region.

The other hypothesis we test is that of Carrington and Troske (1998) who examine gender segregation in the US manufacturing industry using the 1990 Worker Establishment Characteristics database. The authors find a significant positive relationship between the size of the

firm and the share of female employees. They suggest that large firms may feel more pressure from federal antidiscrimination laws than small firms, and thus, there may be an inverse relationship between the size of the firm and the amount of discrimination faced by females. Thus, the combined hypotheses of Becker (1971) and Carrington and Troske (1998) suggest that the degree of potential labour market discrimination faced by females and minorities is dependent on firm location and size. From Becker (1971), it follows that race-based wage discrimination would be more readily observable in southern firms than elsewhere because of the large minority population in the south[1]; and from Carrington and Troske (1998), it follows that both race- and gender-based wage discrimination would be more readily observable in small firms than in large firms, which are subject to more stringent federal antidiscrimination regulation. Our study tests these combined hypotheses by disaggregating the sample according to the worker's geographical location and the size of the firm in which they are employed.

III. Previous Empirical Findings

Despite a large and expanding literature concerning racial and gender wage differentials, few studies have examined the relationship between a worker's earnings and the demographic characteristics of their supervisor. Ferber and Spaeth (1984) were the first to examine the relationship between supervisor sex and worker earnings. Using data obtained from telephone interviews of men and women living in the state of Illinois in 1982, they find that both male and female workers earn significantly higher wages when working for a male supervisor. Using the same data set, Ferber *et al.* (1986) find that female wages are positively influenced by having a male supervisor, but male wages are independent of the sex of their supervisor. Ferber and Green (1991) use an augmented version of these same data to find that working for a male supervisor has a positive and significant impact on the earnings of both men and women; however, the positive impact on earnings is greater for women than men.[2]

Rothstein (1997) examines the impact of supervisor sex on worker earnings using the 1979 National Longitudinal Survey of Youth (NLSY). Consistent with Ferber and Spaeth (1984) and Ferber and Green (1991), she finds that workers with male supervisors earn significantly higher wages than otherwise equal workers with female supervisors. Ragan and Tremblay (1988) consider

supervisor sex as a wage determinant as well, but this is also, to the best of our knowledge, the only study to date that has considered supervisor race as a wage determinant. The authors estimate wage equations for white, African American and Hispanic males and females using data from the 1979 NLSY. They find that having a non-African American supervisor has a significant positive impact on the wages of African American females. Similarly, having a male supervisor has a significant positive impact on the wages of white females.

More recently, Cardoso and Winter-Ebmer (2010) use linked employer–employee longitudinal data on Portuguese workers to examine the impact of female supervisors on the wages of male and female workers. Controlling for firm fixed effects, the authors find that female workers earn a wage premium and male workers suffer a wage penalty when working under a female supervisor. Hirsch (2013) employs fixed effects estimation as well to analyse the relationship between supervisor sex and workers' wages in Germany. Similar to Ferber and Green (1991), the author not only accounts for the sex of a worker's supervisor but also accounts for the sex of the individual directly above the worker's supervisor. The results of the study reveal that female workers' wages are generally positively impacted by the presence of a female supervisor, while male workers' wages are negatively impacted. Finally, Sicilian and Grossberg (2014) also employ fixed effects estimation to control for selection bias associated with workers self-selecting into working with a supervisor of a certain sex. In contrast to the majority of previous literature, the authors find that the impact of having a female supervisor on workers' wages is essentially zero for females and negative, but extremely small, for males.

With the exception of Sicilian and Grossberg (2014), the general conclusion from previous work is that female and, to a lesser extent, male workers both earn higher wages when working for a male supervisor. As suggested by Rothstein (1997) and Ferber and Green (1991), these findings may be due to occupational crowding. Bergmann (1986) argues that if the labour market is not competitive and barriers to entry exist, then some groups of workers may be overrepresented in low paying occupations. This 'crowding effect' would serve to drive wage rates down for the disadvantaged groups relative to what they would be in a more competitive labour market. Thus, the negative impact associated with having a female supervisor may be the result of female supervisors being crowded into low paying occupations.

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[1] In our sample, 53% of employees are African American or Hispanic in the southern United States compared to 38% in the northeast, 34% in the west and 25% in the north central United States.

[2] The augmented data set accounts for the sex of the individual with authority over a worker's supervisor. The authors theorize that even if a worker's immediate supervisor has discriminatory gender preferences, those preferences may be nullified if their supervisor's supervisor is not the same sex. For example, a female working under a discriminatory male supervisor may be spared from suffering labour market discrimination if her male supervisor has a female supervisor.

In this article, we examine the question of supervisor discrimination from a different perspective. Previously, researchers have tested whether a supervisor's race and sex affects employees' wages. For instance, all else equal, do female workers earn more when working for male supervisors or female supervisors? However, if the race and sex of a worker's supervisor is an endogenous variable such that workers are sorted into different supervisor groups based on worker quality, then little can be learned about potential supervisor discrimination from this strategy because it is unclear whether the researcher is observing a discrimination effect or a labour quality effect (Hirsch and Macpherson, 2004). To overcome this potential endogeneity issue, we sort workers into different supervisor groups and test whether an *employee's* race and sex affects their wages when working for a given category of supervisor.[3] Furthermore, we control for selection bias arising from workers with different characteristics having different propensities to work for different supervisors using a Heckman selection model.

IV. Data and Estimation

The data for this study comes from the 2006–2008 waves of the 1997 NLSY. These data are particularly appropriate to address supervisor discrimination for two reasons. First, it is a relatively new data set and thus provides the benefit of examining labour market outcomes by observing data on young workers. The results therefore may better reflect current and future trends in the labour market, as argued by Loury (1997) and Blackburn *et al.* (1990). Second, since these workers are relatively young – between 21 and 26 years old in 2006 – it is not likely that their wages have been influenced by a multitude of previous supervisors.

To effectively analyse the impact of a worker's sex and race on wages, the sample is limited over several dimensions. Individuals working in a military/government occupation or industry are excluded from the sample as it is likely their wages are based on a pay scale over which

their immediate supervisor has little control. Similarly, self-employed workers are also excluded from the sample, which effectively eliminates the majority of workers in an agricultural occupation or industry. Individuals of a race/ethnicity other than white, African American or Hispanic are also excluded because those minority groups constitute a very small portion of the overall sample. For similar reasons, individuals with a supervisor of a race/ethnicity other than white, African American or Hispanic are excluded as well. Finally, following Ragan and Tremblay (1988) and Green and Ferber (2005), we exclude those individuals who report an hourly wage less than $1 or greater than $500 from our sample. The 1997 NLSY data set is summarized in Table 1. We decompose these data into human capital measures, personal attributes, location variables and job characteristics, including industry and occupational controls.

Years of education and job tenure are included as human capital measures. In addition, we observe each individual's score on the Armed Forces Qualification Test (AFQT).[4] A number of personal characteristics are accounted for as well, including marital and health status and a poverty ratio variable defined as the ratio of the individual's household income in 1997 to the federal poverty level for that household size. Several job characteristics are also included in the model. These data include a set of industry and occupational controls and whether the individual is employed in a part- or full-time capacity. Also, the number of co-workers at each individual's job is used to control for firm size wage effects (e.g., see Ragan and Tremblay, 1988). Finally, we deal with a source of selection bias in the wage equation arising from an individual's propensity to take a job with a specific type of supervisor.[5] We estimate the following selection equation to control for selection into jobs with supervisors of a particular race and sex.[6] For example, when estimating the wage equation for workers with white male supervisors, the selection equation is given by

$$\Pr(\text{White Male Supervisor}_{it} = 1) = \beta_1 + \beta_2 X_{it} + \beta_3 Y_{it} + \beta_4 Z_{it} + \varepsilon_{it} \tag{1}$$

[3] A similar strategy is employed in the racial profiling literature (e.g., see Close and Mason, 2006, 2007; Antonovics and Knight, 2009).

[4] Scores on the AFQT have been the subject of much debate in the literature. Some see scores on the test as a measure of cognitive skills or natural ability (O'Neill, 1990; Farkas and Vicknair, 1996; Neal and Johnson, 1996), while Betts (1995) argues that the test is a measure of school quality, and Cordero-Guzmán (2001) suggests that test scores account for differences in family background characteristics and pre-employment resources and that the test is biased against minorities. We attempted to remedy this problem by following the technique proposed by Rodgers and Spriggs (1996, 2002) and obtaining an adjusted AFQT score; however, the results were not considerably different from those including the unadjusted AFQT score. Hence, we only report the results with the unadjusted AFQT score here.

[5] Additionally, we considered bias due to selection into the labour force. However, the inverse mills ratio was insignificant in all of our regressions. Hence, we exclude the correction for labour force selection from the final results reported here. Our analysis shows that correcting for selection into different jobs also seems to correct for selection into the labour force.

[6] An alternative way to deal with possible selection into jobs with different supervisors is to run a regression including fixed effects by individual. We run that specification (not included in this article and available upon request) and the results were similar. We find evidence that workers of the same race and sex as their supervisor earn significantly higher hourly wages than otherwise equal workers of a different race or sex.

Table 1. Descriptive statistics

Variable	White male supervisor	White female supervisor	African American male supervisor	African American female supervisor	Hispanic male supervisor	Hispanic female supervisor
Human capital characteristics						
AFQT	0.476 (0.293)	0.509 (0.282)	0.294 (0.251)	0.338 (0.258)	0.346 (0.260)	0.340 (0.247)
Education	13.908 (2.449)	14.506 (2.421)	13.207 (2.349)	13.808 (2.398)	13.152 (2.410)	13.666 (2.517)
Tenure	2.053 (2.066)	1.885 (1.849)	1.829 (1.970)	1.654 (1.792)	1.924 (1.986)	2.010 (1.984)
Personal characteristics						
Poverty ratio	3.310 (3.164)	3.241 (3.068)	2.374 (2.852)	2.329 (2.729)	2.373 (2.623)	2.109 (2.286)
Married	0.249 (0.432)	0.271 (0.445)	0.145 (0.352)	0.190 (0.392)	0.265 (0.442)	0.341 (0.475)
Health problems	0.070 (0.255)	0.086 (0.281)	0.092 (0.288)	0.105 (0.307)	0.099 (0.300)	0.118 (0.322)
Northeast	0.171 (0.377)	0.158 (0.365)	0.140 (0.347)	0.123 (0.328)	0.168 (0.374)	0.151 (0.359)
North Central	0.246 (0.431)	0.246 (0.431)	0.134 (0.341)	0.144 (0.351)	0.072 (0.259)	0.076 (0.265)
West	0.200 (0.400)	0.220 (0.414)	0.107 (0.309)	0.082 (0.274)	0.439 (0.497)	0.479 (0.500)
South	0.383 (0.486)	0.377 (0.485)	0.619 (0.486)	0.651 (0.477)	0.322 (0.468)	0.293 (0.456)
MSA	0.954 (0.209)	0.953 (0.211)	0.949 (0.220)	0.966 (0.180)	0.971 (0.169)	0.972 (0.166)
Children	0.643 (0.881)	0.753 (0.938)	0.762 (0.962)	1.053 (1.109)	0.807 (0.984)	1.180 (1.083)
Mother's education	11.493 (2.534)	11.516 (2.563)	10.978 (2.079)	10.849 (2.346)	10.361 (2.753)	10.060 (2.812)
Father's education	11.245 (3.431)	11.245 (3.406)	10.242 (2.986)	10.318 (2.763)	9.290 (4.009)	8.991 (3.945)
White male	0.457 (0.498)	0.177 (0.382)	0.114 (0.317)	0.060 (0.238)	0.257 (0.438)	0.085 (0.280)
White female	0.240 (0.427)	0.506 (0.500)	0.069 (0.254)	0.127 (0.333)	0.125 (0.331)	0.306 (0.462)
African American male	0.126 (0.332)	0.058 (0.234)	0.522 (0.500)	0.219 (0.414)	0.135 (0.342)	0.041 (0.199)
African American female	0.073 (0.260)	0.165 (0.371)	0.241 (0.428)	0.541 (0.499)	0.055 (0.227)	0.123 (0.329)
Hispanic male	0.068 (0.252)	0.022 (0.148)	0.032 (0.177)	0.017 (0.129)	0.312 (0.464)	0.079 (0.270)
Hispanic female	0.036 (0.186)	0.072 (0.258)	0.022 (0.147)	0.037 (0.188)	0.117 (0.322)	0.366 (0.482)
Industry controls						
Professional	0.331 (0.470)	0.518 (0.500)	0.335 (0.472)	0.549 (0.498)	0.302 (0.460)	0.514 (0.501)
Public administration	0.027 (0.163)	0.022 (0.146)	0.044 (0.205)	0.031 (0.174)	0.037 (0.189)	0.028 (0.166)
Service	0.203 (0.402)	0.202 (0.402)	0.199 (0.400)	0.183 (0.387)	0.168 (0.374)	0.186 (0.390)
Transportation	0.035 (0.183)	0.019 (0.136)	0.079 (0.270)	0.022 (0.146)	0.060 (0.239)	0.013 (0.112)

(continued)

Table 1. Continued

Variable	White male supervisor	White female supervisor	African American male supervisor	African American female supervisor	Hispanic male supervisor	Hispanic female supervisor
Retail	0.154 (0.361)	0.162 (0.368)	0.129 (0.335)	0.141 (0.348)	0.181 (0.386)	0.177 (0.382)
Wholesale	0.028 (0.165)	0.015 (0.120)	0.031 (0.172)	0.011 (0.105)	0.018 (0.131)	0.025 (0.157)
Manufacturing	0.093 (0.290)	0.042 (0.201)	0.090 (0.286)	0.043 (0.204)	0.094 (0.292)	0.047 (0.213)
Construction	0.129 (0.335)	0.020 (0.140)	0.094 (0.292)	0.020 (0.140)	0.140 (0.348)	0.009 (0.097)
Occupation controls						
Management	0.068 (0.252)	0.064 (0.245)	0.041 (0.198)	0.050 (0.219)	0.037 (0.189)	0.082 (0.275)
Professional	0.138 (0.345)	0.167 (0.373)	0.088 (0.284)	0.150 (0.357)	0.080 (0.271)	0.126 (0.333)
Medical	0.027 (0.163)	0.120 (0.325)	0.034 (0.181)	0.095 (0.293)	0.029 (0.169)	0.085 (0.280)
Service	0.190 (0.392)	0.210 (0.407)	0.275 (0.446)	0.241 (0.428)	0.209 (0.407)	0.262 (0.440)
Sales	0.122 (0.328)	0.141 (0.348)	0.102 (0.302)	0.140 (0.347)	0.103 (0.305)	0.126 (0.333)
Administrative	0.137 (0.344)	0.213 (0.409)	0.132 (0.339)	0.216 (0.411)	0.162 (0.369)	0.237 (0.426)
Construction	0.108 (0.310)	0.014 (0.118)	0.079 (0.270)	0.018 (0.135)	0.129 (0.335)	0.009 (0.097)
Production	0.115 (0.319)	0.036 (0.185)	0.088 (0.284)	0.050 (0.217)	0.138 (0.346)	0.028 (0.166)
Transportation	0.094 (0.292)	0.036 (0.186)	0.162 (0.368)	0.040 (0.196)	0.113 (0.317)	0.044 (0.206)
Job characteristics						
Part-time	0.226 (0.418)	0.306 (0.461)	0.175 (0.380)	0.240 (0.427)	0.187 (0.390)	0.268 (0.444)
Firm size	332.526 (2640.014)	359.562 (2188.995)	330.710 (1389.034)	390.639 (1878.802)	319.200 (1200.208)	352.845 (1658.909)
Hourly wage	18.812 (27.814)	16.483 (23.916)	18.378 (31.921)	14.817 (24.723)	16.554 (19.411)	17.813 (34.390)
Log hourly wage	2.669 (0.613)	2.556 (0.588)	2.554 (0.682)	2.439 (0.576)	2.591 (0.583)	2.578 (0.611)

Note: SDs are in parentheses beside the means.

where White Male Supervisor$_{it}$ defines whether individual i works for a white male supervisor in year t, X is a vector of individual human capital measures, Y is a vector of characteristics of the individual's current job, Z is a vector of personal attributes, the β's are parameters to be estimated and ε_{it} is a random error term. The same selection equation is employed when estimating wage equations for workers with white female, African American male, African American female, Hispanic male and Hispanic female supervisors to control for selection into having a supervisor of that race and sex. The results for the selection equations are shown in Appendix 1. As discussed by Heckman (1990) and Card (1994), selection equations must include at least one variable not included in the wage regression. It proved difficult to find variables that are strongly correlated with supervisor selection but not wages; however, our analysis revealed that parents' education and number of children are satisfactory variables to include in the supervisor selection equation but not the wage equation. These variables are insignificant in the wage regressions but often significant in the supervisor selection regressions. Theoretically, the education of a worker's parents is largely accepted as a control for family background characteristics and access to resources in the pre-employment years. Hence, the education of a worker's father and mother are correlated with the type of job a worker is likely to perform and, therefore, the race of the supervisor they are likely to work under, particularly father's education as shown in Appendix 1. Similarly, the number of children a worker has is largely accepted as a control for the type of employment, particularly female workers, are likely to have and, therefore, the sex of the supervisor a worker is likely to work for. Thus, we use the predicted inverse mills ratio for each observation in our wage regressions to control for bias arising from selection into having a supervisor of a particular race and sex.[7] We estimate the following wage equation in our analysis:

$$\ln W_{it} = \beta_1 + \beta_2 X_{it} + \beta_3 Y_{it} + \beta_4 Z_{it} \\ + \beta_5 \lambda_{it} + \beta_6 \gamma_t + \varepsilon_{it} \tag{2}$$

where W_{it} is the hourly wage rate for individual i observed in year t, λ_{it} is the inverse mills ratio from Equation 1, γ_t are fixed effects by year and all other variables and parameters are as previously defined.

Equation 2 is estimated for workers with various types of supervisors – white male, white female, African American male, African American female, Hispanic male and Hispanic female. We then further decompose the samples by firm size and location to test for potential labour market discrimination by supervisors in accordance with the hypotheses of Becker (1971) and Carrington and Troske (1998). These subsamples include workers employed by large and small southern firms, as well as large and small non-southern firms. Workers with African American or Hispanic supervisors constitute a small portion of the overall sample, which creates problems in estimation when the samples are decomposed by firm size and location. Hence, for this analysis, the African American and Hispanic supervisor categories are combined into a single minority supervisor category.

V. Regression Results

Each regression equation is estimated by using a Heckman selection model and the results are shown in Table 2. Since significant evidence of heteroscedasticity is found in the data, White's robust SEs are reported. Columns 2 and 3 of Table 2 list the results for the white male and white female supervisor samples, columns 4 and 5 list the results for the African American male and African American female supervisor samples, and columns 6 and 7 list the results for the Hispanic male and Hispanic female supervisor samples. The inverse mills ratio (lambda) from Equation 1 is significant in all but one of the wage regressions, indicating that there is significant bias arising from selection into having a certain type of supervisor.

The results of the wage regressions relative to the human capital characteristics of education and tenure are largely similar to previous work. In all of the supervisor samples except for the Hispanic female supervisor sample, an additional year of tenure leads to higher wages.[8] Also, the results of the wage equations show that only the wages of workers with African American female and Hispanic male supervisors are not significantly impacted by cognitive ability, as measured by AFQT scores. Similarly, only the wages of workers with African American and Hispanic female supervisors are not significantly impacted by educational attainment. Our findings suggest that being raised in poverty has a negative impact on the wages of workers with white and African American supervisors but not

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[7] The selection equations presented in Appendix 1 also show that individuals are significantly more likely to work under a supervisor of the same race and sex as themselves. Furthermore, individuals with high cognitive ability, as measured by AFQT scores, are less likely to work for African American or Hispanic supervisors. Individuals with more tenure are more likely to work for white male supervisors. Part-time workers are more likely to have a white or African American female supervisor and less likely to have a white male supervisor. Hence, in addition to controlling for supervisor and labour force selection, these selection equations also seem to assist in controlling for the occupational crowding discussed by Bergmann (1986).

[8] For example, given the statistical significance of the squared tenure term, workers with a white male supervisor can expect about 8.6% higher hourly wages after working 1 year with a firm, other things equal. After 2 years of tenure, the impact falls to 7.4% and so on.

Table 2. Ordinary least squares results

Variable	White male supervisor	White female supervisor	African American male supervisor	African American female supervisor	Hispanic male supervisor	Hispanic female supervisor
Constant	1.526*** (0.067)	0.641*** (0.085)	−0.609** (0.259)	−0.230 (0.213)	1.117** (0.523)	−0.278 (0.517)
AFQT	0.192*** (0.035)	0.271*** (0.042)	−0.375*** (0.107)	0.089 (0.087)	−0.148 (0.117)	−0.389* (0.209)
Education	0.025*** (0.005)	0.042*** (0.005)	0.033*** (0.012)	0.017 (0.011)	0.057*** (0.016)	0.018 (0.022)
Tenure	0.098*** (0.008)	0.055*** (0.010)	0.158*** (0.029)	0.064*** (0.018)	0.094*** (0.029)	−0.007 (0.042)
Tenure squared	−0.006*** (0.001)	−0.004*** (0.001)	−0.017*** (0.005)	−0.007*** (0.002)	−0.003 (0.004)	0.009 (0.006)
Poverty ratio	0.017*** (0.003)	0.008** (0.003)	0.031*** (0.009)	0.014* (0.007)	0.013 (0.009)	0.014 (0.016)
Married	0.074*** (0.018)	0.041* (0.021)	−0.001 (0.059)	0.152*** (0.042)	0.125** (0.053)	−0.006 (0.086)
Health problems	−0.142*** (0.032)	−0.045 (0.032)	−0.054 (0.084)	−0.088 (0.060)	−0.009 (0.073)	0.040 (0.109)
Part-time	−0.092*** (0.021)	−0.047** (0.022)	−0.121* (0.068)	−0.080* (0.047)	−0.133* (0.077)	0.008 (0.095)
White female	−0.384*** (0.024)	0.362*** (0.032)	−0.258*** (0.084)	0.087 (0.075)	0.077 (0.090)	0.188 (0.127)
African American male	−0.311*** (0.029)	−0.072* (0.042)	0.955*** (0.099)	0.608*** (0.092)	0.143* (0.086)	−0.264 (0.165)
African American female	−0.599*** (0.037)	0.146*** (0.037)	0.502*** (0.088)	0.840*** (0.099)	−0.130 (0.107)	0.141 (0.125)
Hispanic male	−0.101*** (0.033)	−0.023 (0.058)	0.136 (0.113)	0.118 (0.110)	−0.050 (0.136)	0.365*** (0.138)
Hispanic female	−0.487*** (0.045)	0.194*** (0.044)	−0.127 (0.136)	0.256** (0.100)	−0.201* (0.115)	0.723*** (0.162)
Lambda	0.609*** (0.024)	0.671*** (0.027)	1.022*** (0.060)	0.809*** (0.062)	−0.042 (0.193)	0.854*** (0.151)
Observations	6720	4873	1180	1248	513	317

Notes: White's robust SEs are in parentheses beside the coefficients. Eight industry Controls, nine occupation controls, four regional/location controls, a control for firm size and fixed effects by year are included in each of these regressions, but their coefficients are not reported to save space.
* Significant at the 10% level; ** Significant at the 5% level; *** Significant at the 1% level.

those with Hispanic supervisors. Also, it is generally the case that married workers tend to earn higher wages, while workers with health issues and part-time jobs rather than full-time jobs tend to earn lower hourly wages, all else equal.

The results discussed above are interesting and support the chosen control variables, but the important results of these regressions pertain to the worker sex and race variables. For the most part, our results are consistent with the theoretical assertions and empirical findings put forth by Becker (1971), Lang (1986), Blau and Ferber (1992), Bates (1994), Tannen (1994), Carrington and Troske (1995, 1998), Athey *et al.* (2000), Giuliano (2003), Stoll *et al.* (2004) and Cardoso and Winter-Ember (2010). In particular, we find strong evidence that workers of the same race and sex as their supervisor earn significantly higher hourly wages than otherwise equal workers of a different race or sex. This is true in all of the samples examined in this study except for the Hispanic Male Supervisor sample. Also interesting is that the effect of race and sex on wages is largest for those workers with minority supervisors. For example, African American male workers earn about 95% higher hourly wages than white males when working for an African American male supervisor, African American female workers earn about 84% higher hourly wages than white males when working for an African American female supervisor and Hispanic female workers earn about 72% higher hourly wages than white males when working for a Hispanic female supervisor. Meanwhile, white female workers only earn about 36% higher hourly wages than white males when working for a white female supervisor. White males earn a wage premium when working for a white male supervisor compared to workers from all other groups. This premium ranges from 10% compared to Hispanic males to 60% compared to African American females.

Another interesting pattern to the results presented in Table 2 is that sex appears to be more important to white supervisors, while race is more important to minority supervisors. The results in column 2 of Table 2 show that both African American and Hispanic males suffer a lower wage penalty than female workers when working for a white male supervisor. Similarly, column 3 of Table 2 shows that all female workers earn higher wages than white males when working for a white female supervisor. Hence, sex is a more important wage determinant than race for workers with white supervisors. The results shown in column 4 of Table 2, however, reveal that African American female workers earn more than otherwise equal white male workers when working for an African American male supervisor. Similarly, column 5 of Table 2 shows that African American male workers earn a wage premium higher than white and Hispanic female workers when working for an African American

female supervisor. Also, column 7 of Table 2 indicates that Hispanic male workers earn a wage premium higher than white and African American female workers when working for a Hispanic female supervisor. Therefore, excluding Hispanic male supervisors, we can conclude that race is a more important wage determinant than sex for workers with minority supervisors.

Following Athey *et al.* (2000) and Cardoso and Winter-Ebmer (2010), white supervisors may provide more support and mentorship to workers of their own sex, while minority supervisors may tend to provide more support and mentorship to workers of their own race. Alternatively, Blau and Ferber (1992), Lang (1986) and Tannen (1994) would suggest that white supervisors know better how to motivate workers of their own sex, while minority supervisors know better how to motivate workers of their own race. Either of the above two explanations may or may not derive from supervisor discrimination. However, Becker's (1971) theory of supervisor discrimination suggests that white supervisors have a taste for working with individuals of their own sex and thus reward those workers with higher wages, while minority supervisors have a taste for working with individuals of their own race and thus reward those workers with higher wages.

Considering the historical discrimination against minorities and females in the US, all three of the above explanations likely offer some explanatory power for our results. Initially in US labour markets, minorities and females were considered by many to be imperfect substitutes for white male labour. Thus, this may have created a situation where equal rights for sexes was more important to whites, while equal rights for races was more important to minorities. As the labour market opened up to both females and minorities, it seems as though minority men were quicker to be viewed as a substitute for white male labour than white females. This is supported by the fact that minority men *legally* earned the right to vote 50 years before white women. Yet, all things considered, the degree of historical prejudice against minority men is much greater than that against white women. It is important to note that both race and sex are often important wage determinants in our supervisor samples; however, the history of racial and gender discrimination in the US may help to explain why sex is more important for those with a white supervisor and race is more important for those with a minority supervisor. If white workers are more likely to have been exposed to gender discrimination than racial discrimination, then white supervisors may indeed know better how to mentor and motivate workers of their own sex, and they may have a taste for supervising workers of their own sex. Similarly, if minority workers are more likely to have been exposed to racial discrimination than gender discrimination, then minority supervisors may

Table 3. Ordinary least squares results by firm location and size

Worker race and sex	Small southern firm	Small non-southern firm	Large southern firm	Large non-southern firm
White male supervisor				
White female	−0.082 (0.077)	−0.488*** (0.067)	−0.358*** (0.042)	−0.105*** (0.033)
African American male	−0.011 (0.100)	−0.447*** (0.098)	−0.257*** (0.044)	−0.054 (0.041)
African American female	0.037 (0.126)	−0.436*** (0.104)	−0.672*** (0.056)	−0.041 (0.064)
Hispanic male	0.076 (0.101)	0.005 (0.084)	−0.049 (0.057)	0.000 (0.043)
Hispanic female	0.056 (0.152)	−0.338*** (0.092)	−0.556*** (0.103)	−0.143** (0.060)
White female supervisor				
White female	−0.209* (0.114)	0.590*** (0.091)	−0.017 (0.056)	0.277*** (0.038)
African American male	−0.044 (0.112)	−0.163 (0.129)	0.133** (0.060)	−0.156** (0.075)
African American female	−0.087 (0.126)	−0.056 (0.117)	−0.045 (0.053)	0.221*** (0.052)
Hispanic male	0.127 (0.154)	0.045 (0.147)	0.044 (0.107)	0.027 (0.075)
Hispanic female	−0.176 (0.119)	0.315*** (0.109)	0.017 (0.085)	0.153*** (0.057)
Minority male supervisor				
White female	−0.258 (0.263)	−0.160 (0.160)	−0.040 (0.086)	0.061 (0.084)
African American male	1.280*** (0.289)	0.930*** (0.217)	−0.121 (0.103)	−0.117 (0.083)
African American female	0.127 (0.213)	0.536** (0.233)	−0.186** (0.087)	−0.137* (0.076)
Hispanic male	0.939*** (0.268)	1.087*** (0.273)	−0.100 (0.112)	−0.196** (0.080)
Hispanic female	−0.165 (0.409)	0.373 (0.237)	−0.411** (0.167)	−0.069 (0.116)
Minority female supervisor				
White female	0.287** (0.135)	−0.194 (0.259)	−0.067 (0.081)	0.107 (0.115)
African American male	0.255* (0.139)	−0.287 (0.359)	−0.080 (0.095)	0.228* (0.128)
African American female	−0.108 (0.191)	−0.430 (0.379)	−0.131 (0.095)	0.407*** (0.151)
Hispanic male	0.370** (0.146)	0.155 (0.380)	−0.138 (0.134)	0.205 (0.130)
Hispanic female	−0.273 (0.214)	−0.057 (0.281)	−0.089 (0.104)	0.453*** (0.154)

Note: White's SEs are in parentheses beside the coefficients.
*Significant at the 10% level; ** Significant at the 5% level; *** Significant at the 1% level.

know better how to mentor and motivate workers of their own race, and they may have taste for supervising workers of their own race.

According to Becker (1971), evidence of discrimination would likely be observed in the south because minority workers are in larger supply and may also be in relatively lower demand because of historically greater tastes for discrimination in the region. Also, according to Carrington and Troske (1998), evidence of discrimination would likely be observed in smaller firms as it is expected that larger firms are under greater pressure from state and federal authorities to avoid racial and gender labour market discrimination. Hence, in the next section, we disaggregate our sample by firm size and location to examine where these disparities exist and to conduct a generalized test of supervisor discrimination.

VI. Location and Firm Size Results

To investigate the importance of the location and size of a firm, we examine four subsamples of the white and minority male and female supervisor samples[9]: those working in small southern firms (column 2 of Table 3), small non-southern firms (column 3 of Table 3), large southern firms (column 4 of Table 3) and large non-southern firms (column 5 of Table 3).[10] The coefficients pertaining to a worker's race and sex are reported in Table 3. Becker's (1971) theory predicts that race would be a more important determinant of wages in columns 2 and 4, while Carrington and Troske's (1998) theory suggests race and sex would be more important determinants of wages in columns 2 and 3. Following both theories, race and sex should be the least important in column 5.[11]

[9] As stated previously, the African American and Hispanic supervisor categories are combined into a single minority supervisor category for these purposes because of small sample sizes when disaggregating by firm size and location.

[10] Small firms are defined as those with fewer than 15 workers and large firms are defined as those with 15 or more workers. Current Federal Equal Employment Opportunity legislation does not cover firms with fewer than 15 employees. In other words, businesses with fewer than 15 employees are not covered by discrimination laws. This information is available at http://www.eeoc.gov/employees/coverage_private.cfm

[11] Cardoso and Winter-Ebmer (2010) also split their sample by firm size and analyse the impact of having a female supervisor on male and female wages in Portugal. They arbitrarily define small firms as those with 100 or fewer workers and large firms as those with more than 100 workers. Their analysis suggests that female workers profit more from a female supervisor in small firms than large firms.

Focusing first on the results for workers with white male supervisors, the results are inconclusive at best in regards to Becker's (1971) predictions. We would expect a worker's race to have a larger impact on their wages in small southern firms than small non-southern firms. However, the opposite is true. Yet, the results do show that race has a larger impact on wages in large southern firms than large non-southern firms as Becker's (1971) theory predicts. The findings are similar concerning Carrington and Troske's (1998) predictions. Based on their suggestions, we would expect a worker's race and sex to have a larger impact on their wages in small southern firms than large southern firms. However, our results do not support this. Yet, the results do support a worker's race and sex being more important wage determinants in small non-southern firms than large non-southern firms.

The results for workers with white female supervisors are also inconclusive. Once again, we find the unexpected result that race has a larger impact on wages in small non-southern firms than small southern firms, especially among white and Hispanic females. Comparing those workers in large southern firms to those in large non-southern firms shows that African American males actually earn significantly higher hourly wages than white males when working for a white female supervisor in a large southern firm, but they earn significantly less than white males in large non-southern firms. However, African American and Hispanic females receive a wage premium in large non-southern firms that they do not receive in large southern firms when working for a white female supervisor. The results for workers with white female supervisors do seem to suggest that the wage premium received by white females when working for a white female supervisor is driven by non-southern firms (small and large).

The results for workers with minority supervisors are also inconsistent in regards to their support for Becker's (1971) predictions. For instance, minority workers with minority female supervisors do seem to earn higher wages than otherwise equal white male workers with minority female supervisors in large non-southern firms but not in large southern firms as Becker's (1971) theory predicts. However, we find that minority workers with minority female supervisors also earn higher wage premiums in small southern firms than small non-southern firms, which disagrees with Becker's (1971) predictions.

The results for workers with minority supervisors, however, are more consistent with Carrington and Troske's (1998) predictions than the results for workers with white supervisors. When a worker's race and sex are significant wage determinants in the minority male supervisor samples, it is always positive in small firms and negative in large firms, precisely as Carrington and Troske (1998) suggest. Furthermore, white females, African American males and Hispanic males all receive a wage premium over similar white males when working for a minority female supervisor in a small southern firm. Yet, these results are not entirely in agreement with Carrington and Troske (1998) either. African American and Hispanic females actually receive a wage premium over white males when working for a minority female supervisor in a large non-southern firm that they do not receive when working for a minority female supervisor in a small southern firm. Finally, the results for workers with minority male supervisors show that the matched supervisor–worker wage effects shown in Table 2 are largely driven by small firms (both southern and non-southern) for workers with minority male supervisors and large non-southern firms for workers with minority female supervisors.

There are a couple of interesting observations concerning these results. First, the results in Table 3 are mostly similar to those in Table 2. Regardless of firm size and location, it appears that a worker's sex tends to be a more important wage determinant than their race when working for a white supervisor and a worker's race tends to be a more important wage determinant than their sex when working for a minority supervisor. Another interesting observation, which disagrees with both Becker (1971) and Carrington and Troske (1998), is that race and sex tend to be less important in small southern firms than large non-southern firms, especially for workers with white supervisors. Yet these results may be encouraging for minority workers, particularly African American workers since a large portion of the African American population resides in the southern US, because they could be interpreted as suggesting that racial prejudice has subsided significantly in the south over previous decades.

A final potential explanation for these results is that, contrary to Carrington and Troske's (1998) predictions, working in a large firm may actually make it easier for supervisors to discriminate. In larger firms, supervisors may be more removed and have less interaction with the workers whom they supervise, which may translate into them relying more on race and sex as indicators of productivity. However, in smaller firms, supervisors may be more likely to closely monitor workers and build personal relationships with the workers that they supervise, which allows them to better evaluate worker productivity. Such an argument is consistent with statistical discrimination, which arises from imperfect information rather than prejudice (Dickinson and Oaxaca, 2009). It is also true that white and African American workers in the south, particularly young workers as represented in this sample, are significantly more likely to have been raised attending school, living near and working with each other than white and African American workers outside of the southern United States.

We conclude that while our results do provide much support for matched supervisor–worker wage effects as shown in Table 2, the results provided in Table 3 suggest

that these effects cannot be adequately explained by the geographical location and size of a worker's firm.[12]

VII. Summary and Conclusion

The issue of racial and gender wage gaps has been examined numerous times. In this article, we re-examine the issue and focus on the role that supervisors may play in the determination of wages and wage gaps between white, African American and Hispanic males and females. The data for the study is taken from the 1997 NLSY. In our analysis, we estimate wage equations for workers with white male supervisors, white female supervisors, African American male supervisors, African American female supervisors, Hispanic male supervisors and Hispanic female supervisors. We control for selection into different jobs using a Heckman selection model.

We find significant evidence that all workers, except Hispanic males, earn a wage premium when working for a supervisor of the same race and sex as themselves. Furthermore, the results suggest that sex has a larger impact on wages for workers with white supervisors, while race has a larger impact on wages for workers with minority supervisors. We propose that this is consistent with historical discrimination against females and minorities. Further investigating this issue, we decompose the samples by firm location and size to test the hypotheses of Becker (1971) and Carrington and Troske (1998). Becker (1971) suggests that discrimination may be more prevalent in southern firms because of historically greater tastes for discrimination in the region, and Carrington and Troske (1998) suggest that discrimination may be more prevalent in smaller firms since larger firms are under greater pressure from state and federal authorities to not engage in labour market discrimination. Our findings indicate that neither theory of supervisor discrimination can satisfactorily explain all the results.

The fact that the theories regarding supervisor discrimination are inadequate in explaining why workers receive a wage premium when working for a supervisor of the same race and sex as themselves may indicate that supervisor discrimination is not the culprit. Rather, as suggested by Lang (1986) and Tannen (1994), it may be that supervisors are simply better at motivating workers of the same race and sex as themselves because of cultural differences or differences in communication styles. At the very least, our findings show that supervisor discrimination is not well detected or explained on an aggregate level by the size and geographical location of a worker's firm.

Future research on this topic would benefit from more detailed data allowing the researcher to better control for the degree to which a supervisor has control over wage setting policies and the amount of interaction a worker has with their supervisor. For example, firm-specific data for each of the four firm types examined in this study (small southern firm, small non-southern firm, large southern firm and large non-southern firm) may allow the researcher to better test the theories put forth by Becker (1971) and Carrington and Troske (1998) and better evaluate potential supervisor discrimination.

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[12] One caveat concerning the results in Table 3 which we must mention is that some of the regression results are obtained from a small number of observations, which may impact the preciseness of the regression estimates. In general, this is not a concern for workers with white male or white female supervisors but more problematic for workers with minority male and minority female supervisors, particularly among Hispanic workers. For example, as shown in Appendix 2, there are only eight Hispanic females who work for a minority male supervisor in a small southern firm. Furthermore, there are only five Hispanic males who work for a minority female supervisor in a small southern firm and two Hispanic males who work for a minority female supervisor in a small non-southern firm. In these few instances, the results should be interpreted with caution.

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Appendix 1. Supervisor selection equation results

Variable	White male supervisor	White female supervisor	African American male supervisor	African American female supervisor	Hispanic male supervisor	Hispanic female supervisor
Constant	0.312*** (0.104)	−1.000*** (0.108)	−1.354*** (0.162)	−1.733*** (0.167)	−1.682*** (0.235)	−2.270*** (0.290)
AFQT	0.078 (0.049)	0.263*** (0.052)	−0.410*** (0.082)	−0.229*** (0.080)	−0.257*** (0.100)	−0.505*** (0.119)
Education	−0.008 (0.006)	0.014** (0.006)	−0.011 (0.010)	−0.012 (0.010)	−0.001 (0.012)	0.021 (0.014)
Tenure	0.026*** (0.005)	−0.022*** (0.006)	0.014 (0.009)	−0.024*** (0.009)	−0.016 (0.011)	0.001 (0.013)
Poverty ratio	0.009** (0.004)	−0.005 (0.004)	0.011 (0.007)	0.001 (0.007)	−0.009 (0.009)	−0.023* (0.013)
Married	0.027 (0.026)	−0.027 (0.027)	−0.079* (0.046)	0.002 (0.041)	0.044 (0.053)	0.080 (0.059)
Health problems	−0.088** (0.040)	0.076* (0.040)	0.031 (0.059)	0.015 (0.056)	0.029 (0.074)	0.103 (0.087)
Part-time	−0.053** (0.027)	0.105*** (0.027)	−0.011 (0.044)	0.078* (0.041)	0.036 (0.054)	0.074 (0.060)
White female	−0.725*** (0.030)	0.758*** (0.031)	−0.151** (0.063)	0.168*** (0.063)	−0.256*** (0.069)	0.320*** (0.089)
African American male	−0.711*** (0.038)	−0.161*** (0.044)	1.154*** (0.056)	0.873*** (0.062)	−0.015 (0.075)	−0.129 (0.126)
African American female	−1.112*** (0.041)	0.340*** (0.041)	0.650*** (0.059)	1.263*** (0.062)	−0.379*** (0.099)	0.110 (0.111)
Hispanic male	−0.284*** (0.051)	−0.175*** (0.063)	0.049 (0.090)	0.093 (0.108)	0.790*** (0.076)	0.287** (0.118)
Hispanic female	−0.810*** (0.055)	0.494*** (0.054)	−0.039 (0.100)	0.317*** (0.093)	0.194** (0.094)	0.907*** (0.100)
Children	−0.004 (0.012)	−0.008 (0.010)	−0.035** (0.014)	0.022 (0.013)	0.035 (0.025)	0.094*** (0.021)
Mother's education	−0.002 (0.004)	0.001 (0.004)	0.004 (0.006)	−0.012* (0.006)	−0.006 (0.013)	−0.015 (0.009)
Father's education	0.010*** (0.003)	0.003 (0.003)	−0.011*** (0.004)	0.001 (0.004)	−0.019** (0.008)	−0.017** (0.007)

Notes: White's robust SEs are in parentheses beside the coefficients. Eight industry Controls, nine occupation controls, four regional/location controls, a control for firm size and fixed effects by year are included in each of these regressions, but their coefficients are not reported to save space.
* Significant at the 10% level; ** Significant at the 5% level; *** Significant at the 1% level.

Appendix 2. Sample sizes by firm location and size

Worker race and sex	Small southern firm	Small non-southern firm	Large southern firm	Large non-southern firm
White male supervisor				
White male	290	667	682	1430
White female	175	255	423	761
African American male	103	72	396	275
African American female	68	56	218	149
Hispanic male	57	88	104	209
Hispanic female	24	69	34	115
Total observations	717	1207	1857	2939
White female supervisor				
White male	49	160	182	472
White female	249	492	563	1160
African American male	36	22	126	100
African American female	117	52	375	260
Hispanic male	15	12	22	60
Hispanic female	32	70	69	178
Total observations	498	808	1337	2230
Minority male supervisor				
White male	24	34	65	168
White female	14	30	54	58
African American male	144	68	316	163
African American female	36	29	168	81
Hispanic male	26	44	35	94
Hispanic female	8	22	19	38
Total observations	252	227	657	602
Minority female supervisor				
White male	11	11	32	51
White female	21	42	84	122
African American male	20	37	159	72
African American female	146	70	367	136
Hispanic male	5	2	10	29
Hispanic female	21	23	39	82
Total observations	224	185	691	492