EVERYONE LOSES: HOW WAGE DISCRIMINATION AGAINST FEMALE NON-MANAGERIAL WORKERS AFFECTS THE WAGES OF MANAGERS AND MALE COWORKERS

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A data appendix with additional results, and copies of the computer programs used to generate the results presented in the paper, are available from Daniel Matthew Custance Lawson at the Economics Department, Drew University, 36 Madison Avenue, Madison, NJ 07940.

Abstract

To explore firms' claim that rogue managers act against company policy in perpetuating sex discrimination, this study develops a principal/agent model of manager discrimination, which predicts that discrimination reduces managerial pay. It tests this hypothesis with 2000 Census data to find the effect of wage discrimination against female non-managerial workers on the wages of their managers and male coworkers. This study uses the unexplained portion of the decomposed wage gap to approximate wage discrimination against female non-managerial workers. Under a reasonable set of assumptions, for every one percent discriminatory decrease in the wages of female non-managerial workers, the wages of their male coworkers in the same geographic area fall by at least 0.227% and the wages of managers fall by at least 0.531%, which is consistent with the proposed model.

Firms facing accusations of discrimination often respond by claiming that rogue managers engaged in discriminatory conduct on their own, contrary to company policy. This study tests this claim for firms in general by developing a model of discrimination in which managers act to maximize their own utility and not company profits. To test this model against the many existing models of wage discrimination, this study examines the effect of discrimination against female workers on the wages of their managers and male coworkers.

Clearly, discrimination against female workers reduces their wages. The various theoretical models of wage discrimination, however, predict contradictory effects of this discrimination on the wages of their managers and male coworkers. Because the theory literature makes conflicting claims about whose wages benefit or are hurt by wage discrimination, measuring these effects can help differentiate between the different theories in operation. This study uses 2000 Census data to measure these effects and determine whether the data support this paper's model of manager discrimination or some other model or models.

Several features set this study apart from the few previous studies that have been able to differentiate among models of discrimination: first, this study develops a heretofore undeveloped model of persistent discrimination driven by the preferences of managers. Secondly, the theoretical model developed here calls for separate empirical analysis of the impact of discrimination on wages of managers, something done rarely in previous studies of discrimination. Finally, this study is distinct from previous work because it compares the predictions of the various theories of sex discrimination using data available from real labor markets.

Claims of manager discrimination

Perhaps unsurprisingly, firms facing discrimination lawsuits often claim that discrimination happens not because of company policy but because of the discriminatory actions of individual managers. In such scenarios, firms claim to be against discrimination and to have policies to that effect, while individual managers violate such policies, bringing about discriminatory results that are not the fault of the firm.

In January 2001, computer software company Microsoft faced a $5 million racial discrimination lawsuit, claiming systemic deficiencies in the promotion and pay of black employ-

ees relative to white employees. Microsoft's head of human relations, Deborah Willingham, replied that "Microsoft has a zero-tolerance policy towards discrimination in the workplace," suggesting that discrimination was not due to company policy, but rogue managers acting contrary to company policy (New York Times 2001).

In March 2001, food and facilities-management company Sodexho faced a lawsuit on behalf of 2,600 current and former black employees alleging discrimination in promotion. Sodexho spokesperson Leslie Aun and Sodexho court filings called the cases of discrimintion "isolated"; Aun continued, "When you have a company that is the size of 100,000 people, do you have people who act inappropriate? Yes.... We have the same issues as a town of 100,000. But is that reflective of the culture or the kind of company you're trying to build? No. We've been very aggressive about taking a stand on these issues." (Shin 2004) The claim here is again that discrimination is perpetuated not by company policy but by individual managers acting contrary to company interests.

A September 2003 federal anti-discrimination lawsuit accused managers at New York's Plaza hotel of discriminating against Muslim staff members after terrorist attacks in New York City. Plaza spokesperson Amanita Duga-Carroll acknowledged some discriminatory behavior on the part of managers, but claimed that it was contrary to company policy, and noted that the company terminated or suspended the offending management staff (Padgett 2003).

A sex-discrimination class action lawsuit against aerospace corporation Boeing went to trial in May 2004. Boeing was accused of benefitting from paying women less than men. Boeing's lead counsel Barbara Berish Brown claimed that Boeing's policies specifically prohibit salary discrimination on the base of sex, explicitly blaming the claims of discrimination on "a few rogue managers." (Bowermaster 2004)

Jewelry store chain Friedman's Inc. faced a class-action suit in 2003 claiming hiring and promotion discrimination against blacks. Freidman's Inc attorney Denis Shanagher identified the chain as "an equal opportunity employer [that] does not tolerate employment discrimination of any kind." (Jewlers' Circular-Keystone 2003) Shanagher noted that outrageously

discriminatory action by one single manager was found, and the company terminated that manager's employment as a result.

If one takes these claims at face value that firms find discrimination undesirable (because of either natural inefficiency, reputation damage, or legal costs resulting from discrimination), but some managers desire to discriminate, and thus persist in this behavior even in the face of lower expected wages (either probabilistically because of the risk of firing or deterministically as in the pay schemes linking pay to diverse hiring), an economic model should be able to reflect this dynamic. Such a model would be directly opposed to a "statistical discrimination" model, in which discrimination is efficient for the firm. Evidence that managers are penalized for discriminating is not consistent with profit maximization if discrimination contributes to profit maximization. Arrow (1998) noted that a model in which discriminating managers are paid less had never been developed or tested, but suggested that such effects were unlikely to actually exist.

Several firms have explicitly adopted policies linking managerial pay to hiring records, suggesting that the theory is not as far-fetched as previously thought, and deserves further study. Some firms have responded to discrimination lawsuits with policies that explicitly link managerial pay with the diversity of managers' hiring records. According to the Wall Street Journal (Mehta 1996), firms implementing such pay policies include Marriott International Inc., Deloitte & Touche, Tenneco, and Hoechst Celanese Corp.

In June 2004, the United States' largest employer, Wal-Mart, announced that it would link the bonuses of its top executives to their ability to meet diversity goals. This move came in response to lawsuits alleging wide-spread gender through the Wal-Mart chain. Wal-Mart CEO Lee Scott announced up to 7.5% cuts in bonuses for all top executives, including himself, if a smaller proportion of women and minorities were promoted than applied for management positions. (Foster 2004)

Firms explicitly linking pay to a manager's record of diversity in hiring and promotion are rare but include some large and influential firms. Representatives of the firms interviewed in the article, however, claimed that their firms believed that diversity in hiring benefited

the firms' bottom lines. If diversity in hiring does indeed benefit profitability, as in the model developed in this study, then firms explicitly linking diversity in hiring to managerial pay capture only the tip of the iceberg: if diversity in hiring is good for profitability either inherently (in the absence of statistical benefits from discrimination) or because of legal costs of discriminating, any firm that links managerial pay with performance would penalize managers for discriminating.

Note that finding support for the claim that discrimination is driven by managers' preference to hire males does not necessarily imply that discrimination is solely the fault of rogue managers. In the profit-neutral version of the model in this study, firms pay managers according to their marginal revenue product for the owners, giving the firm no incentive to promote discrimination. However, a divide-and-conquer model in which owners cultivate a preference for discrimination among their managers so they can pay them less could also be consistent with these findings, particularly in a model with internal labor markets for managers. To test for the distinction between a "profit-neutral" manager discrimination model and a "profit-advantageous" manager discrimination model (and to examine the owners' incentive for hiring discriminating managers), one would need data on localized profit rates.

Who Pays for Sex Discrimination?

Managers working for firm owners often act as their agents in hiring, firing, and wage determination decisions. Many economic models of wage discrimination assume that a firm's potentially discriminatory decisions either maximize owner utility (Becker 1957) or profits (Arrow 1973; Phelps 1972; Reich 1984). A model in which hiring decisions maximize the managers' utility rather than the firm's profits predicts a different effect of discrimination on managers' wages than many models that ignore this principal/agent distinction.

Becker (1957) argued that discrimination is not stable in the long run because of a zero-profit condition; an employer who indulges a taste for discrimination incurs additional costs that non-discriminating employers do not incur. Basic dynamics in competitive markets will drive out any firm with higher than normal costs.

Becker's basic model of employer discrimination accounts for discrimination in the short

run, but predicts that in competitive product markets, in the long run discrimination should disappear due to market forces alone. (Becker 1957; Blau and Kahn 2000). Prior to Becker's formulation of his theory, competitive product markets existed; firms had been formed and had gone out of business, and still, discrimination was, as Kenneth Arrow quotes Samuel Johnson, "too evident for detection and too gross for aggravation" (Arrow 1998). In other words, when Becker developed his model predicting that competitive markets eliminate wage discrimination, facts indicated that competitive markets had not eliminated wage discrimination even at firms that had survived multiple long-run market adjustments. Thus, while Becker's basic model opened the door to economic modeling of wage discrimination, it did not explain persistent wage discrimination in competitive markets.

If discrimination persists, either something must protect discriminating firms from long-run competition, or discrimination must be efficient for the firm. Statistical discrimination models (Arrow 1973; Aigner and Cain 1977; Phelps 1972) claim that discriminating firms take advantage of all available information, and thus are efficient. Strategic segmentation models (Reich 1984) argue that firms can lower payroll costs across the board by maintaining two groups of workers at odds with one another.

Others argue that although discrimination is inefficient, it can persist in competitive product markets despite that inefficiency because someone other than the firm bears the cost of discrimination. Customer discrimination models (Blau, Ferber, and Winkler 1992, p. 226) explain the ongoing "inefficiency" by customers who are willing to pay more for services rendered by people who are not in a group they dislike. Coworker discrimination models (Blau, Ferber, and Winkler 1992, p. 224) project that some workers would forego a portion of wages in order to not have to work with workers in a group they dislike.

Manager discrimination extends the coworker discrimination model to consider managers in a firm as agents of the employer who make hiring decisions but seek to maximize their own utility, not firm profitability. This principal/agent situation allows for "bosses" to perpetuate discrimination and yet not hurt the firm's bottom line, thus negating the push of market forces that would have otherwise driven discriminating firms out of business.

Discriminating Managers as Dollar Store Merchandise

In the manager discrimination model, the assumptions of Becker's original model hold with one exception. Some people who run a company experience psychic disutility from hiring female employees. If enough people making hiring decisions prefer to hire males to females, *ceteris paribus* this reduces demand for female employees, causing the going wage for female employees to fall below that of male employees, as in the Becker model.

In this model, as in Becker's, managers who discriminate (either fully by not hiring females at all, or partially by hiring fewer females) are less efficient than those who do not. The difference lies in long-run adjustments. Firm owners reviewing these managers find they are not maximizing profits: the agent does not represent the principal well. To actually represent the interest of the principal well (by hiring in a non-discriminatory manner) would incur psychic disutility for the agent. If firms compensate managers according to their marginal revenue product, a discriminating manager would earn less money than a non-discriminating manager because the discriminating manager does not hire efficiently. This model predicts that where levels of discrimination are higher, manager pay is lower. Discriminating managers are like low-quality manufacturing equipment or dollar store merchandise: they do not perform as well as higher-quality managers, but they also cost less.

A manager discrimination model would suggest that managers under-hire or underpay female workers because of their own distaste for female workers, and not because of pressure from the owners. If managers make hiring and firing decisions and set pay, then by definition, managers will carry out wage discrimination. The mere fact that managers are the ones carrying out the discrimination does not differentiate a model of "manager discrimination" from Becker's 1957 model of "owner discrimination." If owners do not want to employ women because doing so would be a source of disutility, and the firm's managers do not hire women to please the owners, the agents (managers) simply accommodate the principals (owners), and the original Becker (1957) model applies. If the owners of a firm want to strategically divide male and female workers to segmenting the labor force, as in racial divides in Reich (1984), a manager who systematically underpays or under-promotes women in this context

would simply act as a good agent, and traditional segmentation models would apply.

This distinction between managers discriminating on behalf of owners and managers discriminating because of their own tastes is not trivial. On June 22, 2004, Federal Judge Martin J. Jenkins of the United States District Court in San Francisco certified 1.6 million female current and former Wal-Mart employees for a class-action discrimination lawsuit against Wal-Mart. The suit claims that Wal-Mart systematically paid and promoted women less than men. Wal-Mart appealed the class-action certification, claiming that discrimination was not due to systemic corporate policy (pressure from the principals), but rather the tastes of the individual managers (Greenhouse and Hays 2004). Even if managers' tastes drive discrimination, owners could strategically choose to hire discriminating managers in an attempt to capture rents.

Note that in a manager discrimination model, managers do not "lose" in an absolute sense; they lose wages. While their wages are lower than those of non-discriminating managers, discriminating managers make up in psychic utility gained from being able to discriminate at least what they lose in wages; if not, they would act like non-discriminating managers.

Assume that firms in an industry face two perfectly substitutable factors of production, male and female labor, and that the production function of any firm is the same:

$$Y = F(L) \tag{1}$$

where in Equation (1), Y is the output of the firm and L is the input of generic factor of production Labor, composed as follows:

$$L = L_m + L_f \tag{2}$$

where L_m represents the quantity of male labor and L_f represents the quantity of female labor.

A profit-maximizing firm would maximize π where

$$\pi = P_y F(L_m + L_f) - L_m W_m - L_f W_f \tag{3}$$

where in Equation (3), P_y represents the price of the good produced, a constant in a perfectly competitive product market and a function of Y in a imperfectly competitive market.

Let $r = \frac{L_f}{L}$.

$$\pi^* = \max_{L,r} \pi = \max_{L,r} P_y F(L) - L(1-r)W_m - LrW_f \tag{4}$$

If an individual firm maximizes profits and L_f is perfectly substitutable for L_m, if $W_f < W_m$, the profit maximizing firm would hire only female labor (i.e. $r = 1$) at the quantity L^* where $P_y \frac{dF(L^*)}{dL} = W_f$.

If managers rather than owners make the hiring decisions, managers do not necessarily maximize π, but rather their own utility, U_b, where r, the fraction of female employees, and W_b, the manager's wages both affect managers' utility. Assume a separable form of the utility function:

$$U_b = G(W_b) - D(r) \tag{5}$$

If a manager makes inefficient decisions, the firm loses Λ, the additional amount the firm would have earned had the manager maximized profits. Let $\Lambda \equiv \pi - \pi^*$ where π is the actual level of profits earned under the manager, and π^* is the level of profits that would have been earned had the manager maximized profits. Thus, $\Lambda = \Lambda(r)$. Let the manager's pay W_b be a function of lost profits.

$$W_b = W_b(\Lambda) \tag{6}$$

Thus, the utility-maximizing condition for a manager is

$$\frac{\partial}{\partial r} G\big(W_b(\Lambda(r))\big) = \frac{\partial}{\partial r} D(r) \tag{7}$$

which decomposes to

$$\frac{\partial G}{\partial W_b} \frac{\partial W_b}{\partial \Lambda} \frac{\partial \Lambda}{\partial r} = \frac{\partial}{\partial r} D(r) \tag{8}$$

In decomposed form, $\frac{\partial G}{\partial W_b}$ represents the marginal utility of money to a manager. The term $\frac{\partial W_b}{\partial \Lambda}$ represents how firms penalize managers for lost profits. In the profit-neutral case,

$\frac{\partial W_b}{\partial \Lambda} = 1$. If managers had market power and their leadership wanted to reward discriminatory managers, $\frac{\partial W_b}{\partial \Lambda}$ could be less than one. If firms have bargaining or information advantages over managers, it could be the case that $\frac{\partial W_b}{\partial \Lambda} > 1$, meaning that firms over-penalize discriminating managers, extracting more profits from such operations. The term $\frac{\partial \Lambda}{\partial r}$ can be solved algebraically, and represents the loss in profits caused by changing r from its optimal value of $r^* = 1$. Finally, $\frac{\partial}{\partial r} D(r)$ represents the marginal disutility to a manager of increasing r.

The model indicates that firms' demand for female labor would be depressed. This model alone would predict that as $\frac{\partial}{\partial r} D(r)$ increases (i.e. the disutility of a higher fraction of female labor in the workforce increases, or managers have stronger tastes for *not* hiring female labor), r will fall, and as long as $\frac{\partial W_b}{\partial \Lambda} > 0$ (i.e. firms do not reward managers for losing money and punish them for increasing the firm's profitability), managers would earn less money. The wages for female labor, W_f would be lower than their non-discriminatory value, and the wages for male labor, W_m would be higher than their non-discriminatory value.

It would be likely that the tastes of managers are not entirely disconnected from the tastes of male non-managers in the same geographic area. This model could combine with a standard employee discrimination model(Becker 1957, p. 46) to predict that both managers and non-manager male workers would lose wages due to discrimination. In the simplest form of such a combination, assume an economy with multiple industries, some of which were governed by the manager discrimination model and others governed by the employee discrimination model; more complex (and realistic) combinations could also produce the same results.

Measuring Discrimination

This study uses individual workers in the non-target groups as the unit of analysis. With this approach, the measured wage of each worker is the dependent variable, while individual levels of various forms of human capital, other determinants of pay, and the level of discrimination in the labor market containing that individual are the independent variables. Ordinary least-squares (OLS) regression could determine the relationship between

the level of wage discrimination against a target group in a given labor market and the wages of non-target group members in that labor market. Using this approach, the standard errors need adjustment because of the market-by-market clustering of our independent variable of interest. This would offset some of the benefit to standard error gained by the large sample size, although measurements of the control variables would still improve in accuracy.

$$W_i = \alpha + \beta H_i + \gamma O_i + \theta M_j + \delta D_j + \epsilon_{i,j} \tag{9}$$

In Equation (9), W_i is the wage of male worker i, who works in labor market j, H_i is worker i's level of human capital, O_i is a measurement of other determinants of the wages of worker i, M_j are other determinants of the wages of all workers in labor market j, D_j is the level of wage discrimination against women in labor market j, ϵ_i is the residual term for individual i, and u_j is the residual term for labor market j.

As in Rogers (1993), this study uses ordinary least squares regressions to find the effect of the unexplained wage gap on the wages of male non-managerial workers and managers, but adjusts the variances according to a modified Huber-White technique to account for the clustering in the error term. Repeating the study using a maximum-likelihood estimation of an error composition model changes the magnitude of the coefficients slightly, but the sign and significance of the variables of interest remain the same, as do the implications of the results.

This study will employ Oaxaca's decomposition technique (Oaxaca and Ransom 1999) in every geographic labor market ("Place of Work Public Use Microdata Area," or POWPUMA as defined by the United States Census Bureau) to measure the size of the pay gap between males and females that productivity proxies do not explain.

In a Oaxaca decomposition of the gap between the mean log wages of two groups, one performs two wage regressions: one for each group. One can decompose the wage gap, the difference in mean log wages between the two groups, into the "explained" portion and the "unexplained" portion.

The portion of the gap explained by each observable characteristic is the product of

the difference between the second group's mean value and the first group's mean value multiplied by the first group's coefficient for that characteristic. The sum of this value for all characteristics is the portion of the wage gap that differences between the two groups' observable characteristics explain. The unexplained portion of the gap equals the total gap minus the portion of the gap explained by differences in observable characteristics.

$$G^U = (\bar{W}_M - \bar{W}_F) - (\bar{X}_M - \bar{X}_F)B_M \tag{10}$$

This calculation takes place with males as the first group and females as the second group. The unexplained gap serves as a proxy for the wage gaps due to sex discrimination. For each locale, a Oaxaca decomposition split by sex determines the unexplained sex wage gap (a proxy for the wage gap due to discrimination by sex). Using the general method of Oaxaca decomposition described above, the wage regression is:

$$\begin{aligned}\ln W_i =& \alpha + \beta_1 A_i + \beta_2 A_i^2 + \beta_3 A_i^3 + \beta_4 A_i^4 + \\ & \beta_5 E1_i + \beta_6 E2_i + \beta_7 E3_i + \beta_8 E4_i + \beta_9 E5_i + \beta_{10} B_i + \\ & \beta_{11} S1_i + \beta_{12} S2_i + \epsilon_i \end{aligned} \tag{11}$$

In Equation (11), A_i is the age of individual i, $E1_i$ through $E5_i$ are dummy variables for education, B_i is a dummy variable for black workers, and $S1_i$ and $S2_i$ are dummy variables for extractive and manufacturing industries, respectively, with the baseline being the service sector.

The variable A_i (or potential experience) serves as a proxy for human capital due to actual experience (and on-the-job training), and the various education dummy variables attempt to capture human capital due to education. This will over represent discrimination to the extent that there are productivity characteristics correlated with race or gender that the human capital proxies (such as quality of school system) do not capture. Measurements of educational attainment rather than years of schooling (or dummies for various sheepskin

effects) have been demonstrated in the context of race to be helpful in measuring human capital (Neal and Johnson 1996).

This specification of the Oaxaca decomposition will under represent discrimination because discrimination causes selection bias (wages are only observed for those actually in the workforce) and reduced levels of education for minority groups. Nevertheless, this study shall interpret the decomposition of the sex wage gap to proxy for the wage gap due to sex discrimination in locale j. The method also leaves out other forms of compensation which could bias results. Non-wage compensation behaves dramatically differently for women and men (Ghilarducci 1985; Ghilarducci and Lee 2004), suggesting that wage might not accurately proxy total hourly compensation in studies exploring the wage gap between women and men. It would thus be quite desirable to expand this study to consider total hourly compensation as an alternative dependent variable to wage, but available data do not allow this.

The gap and the magnitude of discrimination are not the same

Even if the unexplained wage gap were entirely due to discrimination and not at all due to unmeasured productivity differences, the unexplained wage gap and the level of discrimination against female workers are not the same thing. The next subsection shall derive the relationship between the effect of the unexplained wage gap on the wages of male non-managerial workers and the effect of the level of discrimination against female workers on the wages of male non-managerial workers under the naïve case that the unexplained wage gap is entirely due to discrimination. The subsequent subsection will then expand this treatment to include the case where both discrimination and unmeasured productivity differences between men and women cause the unexplained wage gap.

Even if the explained portion of the wage gap perfectly captured productivity differences between men and women, leaving the unexplained portion of the wage gap entirely due to discrimination, there would be a difference between the unexplained wage gap and the measurement of the effect of discrimination on women's wages. The unexplained wage gap would measure the effect of discrimination on women's wages and the effect of discrimination

on men's wages. Examining the effect of the wage gap on the men's wages disentangles these effects.

Let D be the level of wage discrimination against women:

$$D \equiv W_f^* - W_f \tag{12}$$

where in Equation (12) W_f is the actual level of women's pay and W_f^* is the wage women would receive in the absence of discrimination. Similarly for men, let

$$W_m = W_m^* + E(D) \tag{13}$$

where in Equation (13) $E(D)$ is the effect of discrimination against women on men's wages.

The wage gap between male and female workers, $W_m - W_f$, can thus be decomposed

$$W_m - W_f = W_m^* + E(D) - (W_f^* - D) = W_m^* - W_f^* + E(D) + D \tag{14}$$

where $W_m^* - W_f^*$ represents the wage gap not due to discrimination and G, the wage gap due to discrimination, can be expressed

$$G = E(D) + D \tag{15}$$

$E(D)$ is some function of D. A first order polynomial approximation of this function would be $E(D) \approx \mu D$, by Taylor series expansion. Recombining the terms,

$$G \approx D + \mu D \tag{16}$$

and

$$D \approx \frac{1}{(1+\mu)} G \tag{17}$$

If $\psi \equiv \frac{\mu}{(1+\mu)}$, then

$$E(D) \approx \psi G \tag{18}$$

Substituting Equation (18) into Equation (13),

$$W_m \approx W_m^* + \psi G \tag{19}$$

If μ is the quantity actually being studied, but ψ can be obtained from linear regression, algebraic manipulation reveals μ as a function of ψ thusly:

$$\mu = \frac{\psi}{(1-\psi)} \tag{20}$$

The variable μ represents the effect of discrimination against women on the wages of men. Because decomposition reveals the unexplained wage gap and not the portion of the gap that affects women's wages, linear regression cannot identify μ. Nonetheless, with a Taylor series approximation, μ can be expressed as a function of ψ, which linear regression can identify. Thus, a ψ between zero and one indicates that where there is more discrimination, male coworkers earn more money. A ψ less than zero indicates that where there is more discrimination, male coworkers earn less money. A ψ greater than one would indicate the unlikely result that discrimination against women reduces men's wages more than it reduces women's wages.

Discrimination measurements revisited

The discussion in the previous section assumed that W_m^* and W_f^* represented the log wage levels that men and women, respectively, would earn in the absence of discrimination while $E(D)$ and D represent the effect of discrimination on male log wages and the reduction in female log wages due to discrimination. More accurately, W_m^* and W_f^* represent the log wage levels for men and women predicted by levels of observed non-discriminatory explanatory variables, while D is the reduction in women's wages due to discrimination and differences in unobserved non-discriminatory determinants of wages.

$$D_j = \delta_j + \Delta_j \tag{21}$$

In Equation (21), δ_j represents reduction in the pay of female workers due to actual discrimination in locale j, while Δ_j represents the difference in male and female pay in locale j due to unobserved skill differences. $E(D)$ is still the effect of D on male wages, but not all the assumptions made in the previous section continue to make sense.

Holzer and Neumark (2000) argue that while the size of share of the male-female wage gap due to discrimination is still open to some empirical dispute, discrimination does exist and accounts for some positive portion of that gap. Holzer and Neumark's argument puts certain bounds on the terms of Equation (21). In particular, $\forall j, \delta_j > 0$. This implies that there may be a gap in unobserved non-discriminatory determinants of wages, but that gap neither explains the entire male-female pay gap nor does it over explain it.

Donald and Hammermesh (2004) suggest that in the presence of customer preferences for goods or services produced by one group of workers over another where such customers are willing to pay a premium for (in this case) goods or services from male workers over female workers, the sex of a worker becomes an actual factor in that worker's marginal revenue product for the firm. In this case, it is impossible to separate discrimination from productivity differences by looking at the inputs because the same input (sex) is the source of both potential discrimination by managers or coworkers and at the same time differences in productivity (because customers may be willing to pay more for goods or services from male workers). If these theorized effects exist, decomposition cannot separate "productive differences" from "discriminatory differences" in the pay gap.

Such a possibility highlights the need for the approach used in this study. If local differences in customer taste for male workers drive the pay gap, and managers everywhere pay according to marginal revenue product, there should be no relationship between the pay gap and manager pay. If manager response to customer taste for male workers drive the pay gap (the taste exists everywhere, but some managers have a sense of fairness or fear of anti-discrimination laws and thus pay more equally even though marginal revenue product is different for male and female workers), managers should earn more where there is more discrimination. If managers earn less in the presence of more discrimination, ceteris paribus, this implies that manager tastes and not customer tastes or other differences in marginal revenue product between men and women drive the gap.

If customer taste or other differences in marginal product combine with manager taste and coworker taste, the two effects are opposite in direction. The regression would then indicate

which effect is dominant, but the magnitude of the effect would actually be stronger than its apparent magnitude because the countervailing effect would mask part of the dominant effect. If the gap cannot be decomposed into discrimination by the firm and productivity differences, examining whether managers or coworkers reveal a preference for discrimination by taking lower pay in the presence of more discrimination helps identify the source of the pay gap.

Thus, if D_j contains two components, only one of which is discrimination, under a reasonable set of assumptions, unmeasured productivity differences masking as discrimination will make the effect of apparent discrimination on the wages of privileged groups appear to be more positive than it actually is. If the apparent effect of discrimination on non-target groups is negative, the magnitude of the effects found under the earlier assumptions will change, but the sign should stay the same. The better the unexplained wage gap measures the male-female wage gap due to discrimination, the better the magnitudes calculated will accurately measure the magnitudes of the effects of wage discrimination against female non-managerial workers on the wages of male non-managerial workers and managers.

The Effect of Discrimination

This study uses data from the United States Census of Population and Housing, 2000. The decennial census in the United States attempts to question the entire population of the United States. The long form questionnaire, however, which contains most information of value to economists, goes out to one sixth of United States households, or about 16.7% of the population. The Census Bureau does not release the data collected in the decennial census in a way that could identify respondents. Microdata, or individual responses to select questions, is available, however, with geographic identifiers broad enough that individual respondents cannot be identified. The microdata release used in this study is the 2000 1% Public Use Microdata Sample, or 1% PUMS release. This sample includes observations of 2,818,644 individuals.

In the case of male non-managerial workers, using the same population to estimate the unexplained wage gap and its effect on their wages leads to statistical bias. If Equation (22)

determines the wages w for a male worker i,

$$\ln w_i = W_i = X_i B_M + \epsilon_i \tag{22}$$

and (23) represents a Oaxaca decomposition,

$$\begin{aligned} G^U =& (\bar{W}_M - \bar{W}_F) - (\bar{X}_M - \bar{X}_F) B_M \\ =& \frac{1}{N_M} \sum_{i=1}^{N_M} (W_i - X_i B_M) - \bar{W}_F + \bar{X}_F B_M \end{aligned} \tag{23}$$

then (24) shows that the unexplained wage gap G^U includes the error term ϵ_i of each individual male worker.

$$G^U = \frac{1}{N_M} \sum_{i=1}^{N_M} \epsilon_i - \bar{W}_F + \bar{X}_F B_M \tag{24}$$

This means that if in a subsequent regression G^U were used as a explanatory term, this would violate the regression assumption that the explanatory variables and the error term are uncorrelated.

This study avoids this problem by using four distinct samples: a sample of non-managerial male workers to estimate the effect of discrimination on their wages, a sample of managers to estimate the effect of discrimination on their wages, and samples of male and female non-managerial workers to measure the unexplained wage gap.

Lettau (1997) found that similar part and full time workers have large wage differentials for identical jobs. Examining the effect of part time workers would be an important extension to this research, but for this study simply recognizes that part time workers receive different returns for their skill and experience than full time workers, and thus exclude workers working less than 30 hours a week from the sample.

In each discrimination model, the profit maximization motive plays an important role in predicting firm behavior. For this reason, military and government workers are excluded from the sample.

In the first specification, the dependent variable is the hourly wages of male non-managerial workers. In the second specification, the dependent variable is the hourly wages of managers

in another. The unexplained sex wage gap in locale j is the independent variable of interest in both specifications; Figure 1 shows this variable in the various POWPUMAs.

This study also controls for a fourth-degree polynomial of the respondent's age, educational attainment dummy variables, race, sex (manager regression only), sector of employment, the percentage of workers in the POWPUMA with varying levels of education, the unemployment rate for people who live within the geographical territory of the POWPUMA, the average rental rate for individuals who live in rented housing within the geographical territory of POWPUMA, and the percentage of workers in each industrial sector in the POWPUMA.

Results and Interpretation

OLS regression of the wages of male non-managers with Rogers' cluster-correlation standard error adjustment shows that the unexplained male-female log wage gap on the log wages of male non-managerial workers has a coefficient of -0.292. If the unexplained male-female wage gap grows by 1%, wages for male non-managerial workers fall by 0.290%. Subsequent analysis of this result and its theoretical implications will depend primarily on the finding that the effect of the log wage gap on male workers' log wages is negative. Using the cluster-adjusted standard errors, one can be 98% confident that this effect is, in fact, negative. If the log gap's coefficient on male wages is 0.292, Equation (20) implies the effect of the proxy for discrimination on male wages has a coefficient of -0.226.

The unexplained male-female log wage gap has a coefficient of -0.410 on managers' log wages. If the unexplained male-female wage gap grows by 1%, managers' wages fall by 0.407%. Subsequent analysis of this result and its theoretical implications will also depend primarily on the finding that the effect of the gap on managers' log wages is negative. Using the cluster-adjusted standard errors, one can be 98.6% confident that this effect is negative.

Log wages for female non-managerial workers would have been at W_f^* in the absence of discrimination and unmeasured productivity differences and are observed at $W_f \equiv W_f^* - D$ in the presence of discrimination and unmeasured productivity differences. When the reduction in female pay due to discrimination and unmeasured productivity differences increases by

1%, male wages fall by 0.227%. Discrimination depresses the wages of both male and female non-managerial workers.

These results illustrate the importance of multivariate regression for this problem. By pair-wise correlation alone, the unexplained wage gap has a positive correlation with log wages of both male non-managerial workers and managers. Dismissing the possibility of second-order effects, the temptation exists to conclude that a larger unexplained sex wage gap caused higher wages for male non-managerial workers and managers. Multivariate regression reveals that the opposite is true in both cases.

All non-managers earn less in the presence of discrimination. This is consistent with coworker taste discrimination models, divide-and-conquer models, and manager taste discrimination models. In a "neutral" coworker taste model, the presence or absence of discrimination would not affect managers' pay. In a "neutral" model, any loss in productivity due to discrimination would be made up by the reduction of payroll costs. A manager who hires discriminating workers (and pays them less) would be no more or less efficient than a manager who pays a premium for non-discriminating workers who are more productive. Thus, a neutral model would predict no significant effect of discrimination against female workers on managers' wages.

In one form of divide-and-conquer model, the reductions in payroll costs due to discrimination more than offset the reduction in productivity due to discrimination. Firms would thus find it desirable to pursue a policy of hiring discriminating workers as a form of cost minimization. Managers who hire discriminating workers (or cultivate a taste for discrimination among their workforce) would thus be more productive managers (cost-cutting) than managers who hire non-discriminating workers. Thus, these models would predict managers in localities with higher discrimination would make more money than managers in localities with less discrimination. If, however, managers are just another kind of worker, a divide-and-conquer model that includes dividing and conquering the managers would predict results identical to a manager discrimination model (indeed, owners would cultivate manager discrimination in such a model). The only way to distinguish between a shareholder-indifferent

manager discrimination model and a shareholder-supported manager discrimination model would be to have data on rates of return on investment in each of these localities, which is not available in this dataset.

A manager taste discrimination model would predict that the desire of managers to not hire female workers drives discrimination at least in part. Managers are willing to take a pay cut to be able to hire fewer female workers. Thus, a manager discrimination model would predict that discrimination against female non-managerial workers would have a negative effect on managers' wages.

The estimation of the manager model revealed that the effect of the unexplained gap in log wages by sex on the log wages of managers can be represented linearly with a coefficient of -0.401. The transformation from Equation (17) implies that when wage discrimination against female non-managerial workers increases by 1%, under the assumptions outlined above, managers' wages fall by more than 0.531%.

Conclusions

Sex discrimination depresses the wages of managers and male coworkers. These findings imply three real-world conclusions.

First, the results indicate that manager taste for hiring male workers at least partly drives the sex wage gap. Managers thus appear to pay for wage discrimination against female workers with foregone wages. This is consistent with the hypothesis that manager tastes cause at least some part of wage discrimination.

Secondly, the fact that the data support a model of discrimination that can persist in competitive product markets supports a theory that competes with Becker's claim (1957) that competitive markets drive out discrimination in the long run. This means that even in the long run, eliminating discrimination could require intervention and cannot be left to competitive markets.

Finally, this study does not have the data to conclude whether firms benefit from discriminating managers' foregone wages or if the productivity losses from the discrimination offset the managers' wage reduction. If firms can reduce the pay of discriminating managers by

more than their lost profits from discriminatory hiring, firms have an incentive to promote tastes for sex discrimination, as in the divide-and-conquer models. If, on the other hand, as in the competitive model, firms simply recoup their losses due to managers' tastes for discrimination, firms have no incentive to promote discrimination. Future research should attempt to answer this question to help determine whether anti-discrimination campaigns should target individual managers' tastes for hiring female workers or need to target firms.

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Tables and Figures

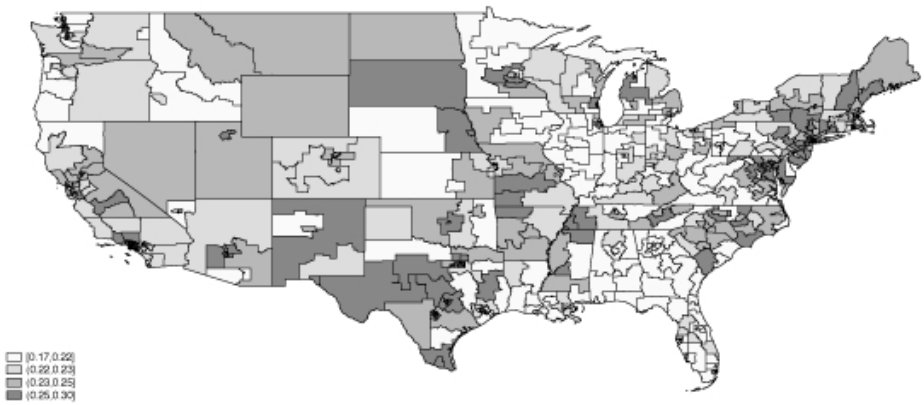

Figure 1: Unexplained Sex Wage Gap in Each POWPUMA in the Continental U.S., 2000

TABLE 1

DETERMINANTS OF LOG WAGES OF FULL-TIME WORKERS

UNITED STATES, 2000

	Male non-managers		**Managers**	
Variable	**Coeff.**	**(Std. Err.)**	**Coeff.**	**(Std. Err.)**
†Unexplained Wage Gap	-0.292**	(0.125)	-0.410**	(0.166)
Age	0.137***	(0.007)	0.129***	(0.017)
Age^2	-0.003***	(0.000)	-0.002***	(0.001)
Age^3	0.000***	(0.000)	0.000*	(0.000)
Age^4	0.000***	(0.000)	0.000	(0.000)
Some HS	0.124***	(0.009)	0.029	(0.027)
HS Diploma	0.247***	(0.011)	0.111***	(0.026)
Some College	0.338***	(0.013)	0.231***	(0.026)
College Diploma	0.582***	(0.014)	0.473***	(0.027)
Graduate Degree	0.815***	(0.014)	0.624***	(0.026)
Black	-0.128***	(0.006)	-0.104***	(0.011)
Female			-0.240***	(0.005)
Mining	0.422***	(0.019)	0.773***	(0.052)
Utilities	0.503***	(0.014)	0.720***	(0.025)
Construction	0.267***	(0.012)	0.568***	(0.017)
Manufacturing	0.312***	(0.013)	0.694***	(0.017)
Wholesale Trade	0.247***	(0.013)	0.605***	(0.019)
Retail trade	0.127***	(0.012)	0.525***	(0.018)
Trans. and warehousing	0.256***	(0.013)	0.546***	(0.020)
Information	0.365***	(0.016)	0.662***	(0.019)

TABLE 1 (CONT.)

	Male non-managers		Managers	
Variable	**Coeff.**	**(Std. Err.)**	**Coeff.**	**(Std. Err.)**
Finance and Ins.	0.441***	(0.020)	0.703***	(0.019)
Real Est, Rental, & Leasing	0.185***	(0.016)	0.433***	(0.021)
Prof., Sci., and Tech. Services	0.406***	(0.013)	0.662***	(0.018)
Management	0.497***	(0.063)	0.761***	(0.044)
Admin., Support, & Waste Mgt.	0.042***	(0.013)	0.504***	(0.020)
Education	0.121***	(0.013)	0.407***	(0.017)
Health Care & Soc. Asst.	0.299***	(0.014)	0.477***	(0.017)
Arts and Entertainment	0.061***	(0.018)	0.401***	(0.026)
Accom. &Food Services	-0.074***	(0.014)	0.235***	(0.016)
Other Services	0.026*	(0.013)	0.382***	(0.019)
†Some HS	0.540*	(0.313)	-0.063	(0.392)
†HS Diploma	0.655***	(0.179)	-0.497*	(0.256)
†Some College	0.663***	(0.195)	-0.530**	(0.260)
†College Diploma	0.618***	(0.232)	-0.337	(0.305)
†Graduate Degree	1.176***	(0.397)	0.477	(0.452)
†Unemp. Rate	1.147***	(0.196)	0.741***	(0.260)
†Avg. Rental Cost	0.000***	(0.000)	0.000***	(0.000)
†Mining	0.463*	(0.246)	0.371	(0.287)
†Utilities	0.809	(0.550)	0.461	(0.757)
†Construction	0.555**	(0.280)	0.664**	(0.297)
†Manufacturing	0.457***	(0.134)	0.700***	(0.176)
†Wholesale Trade	0.804*	(0.457)	0.983*	(0.505)
†Retail Trade	-0.525**	(0.258)	0.425	(0.319)

TABLE 1 (CONT.)

	Male non-managers		Managers	
Variable	**Coeff.**	**(Std. Err.)**	**Coeff.**	**(Std. Err.)**
†Trans. and Warehousing	0.515**	(0.247)	0.902***	(0.248)
†Information	-0.371	(0.383)	0.407	(0.503)
†Finance and Ins.	0.859***	(0.246)	1.342***	(0.228)
†Real Est, Rental, & Leasing	0.050	(0.803)	0.718	(0.867)
†Prof., Sci., and Tech. Services	0.348	(0.337)	0.789**	(0.316)
†Management	9.887	(6.493)	17.447**	(7.289)
†Admin., Support, & Waste Mgt.	0.093	(0.465)	1.919***	(0.521)
†Education	-0.430*	(0.260)	-0.112	(0.288)
†Health Care & Soc. Asst.	-0.126	(0.223)	0.538*	(0.296)
†Arts & Entertainment	0.960***	(0.359)	1.933***	(0.378)
†Accom. &Food Services	-0.561	(0.364)	-0.887**	(0.379)
†Other services	0.216	(0.406)	-0.031	(0.503)
Intercept	-1.218***	(0.195)	-0.612**	(0.284)
N	293323		111989	
R^2	0.281		0.289	

Significance levels : $*$: 10% $**$: 5% $***$: 1%

Variables marked with a "†" symbol refer are observed of a worker's POWPUMA.