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The Gender Pay Differential: Choice, Tradition, or Overt Discrimination?

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ABSTRACT

No one disputes that a male-female gender wage differential favoring men exists. This study seeks to unearth not only the sources of this differential but also the relative degrees to which the various sources impact the differential. The theories proposed by current literature suggest three principal causes: differences in human capital, crowding discrimination, and other forms of discrimination. This study estimates separate equations for men and women and then uses the regression results to decompose the gender wage differential into the three aforementioned components. We find, after isolating the effects of differences in individual human capital and choice characteristics as well as differences due to crowding, the residual surprisingly accounts for the largest proportion of the gender wage gap. Because the residual is so large, we believe that basic discrimination models must still be necessary and useful. Moreover, when one considers that the human capital differences that do exist may be reflecting feedback effects, the justification for combating societal stereotyping of gender roles becomes even stronger, to promote not only equity but also efficiency in today's labor market.

> *The feminist view of women's situation comes to this: across time and space, there is too much variation in women's status, role, and treatment for it to be biological and too little variance for it to be individual. (MacKinnon 1987, 25)*

I. INTRODUCTION

It is well known that women have traditionally been segregated into certain types of jobs. Only in the last few decades have women made great strides in both narrowing the pay gap within professions and increasing their numbers within traditionally male-dominated fields, such as medicine, law, business management and engineering. Recent studies confirm that both occupational segregation and pay differentials are declining (see Thornborrow and Sheldon 1995 or Blau, Ferber and Winkler 1998). Nonetheless, pay differentials between men and women remain substantial.

There are two fundamental sets of explanations for the gender pay differential. The first set revolves around the basic human capital theory of labor. If one person earns lower wages than another person in the same job, the differential must be due to differences in the two individuals' human capital, that is an individual's income-producing skill and knowledge. Individuals acquire human capital through investments in education, work experience, on-the-job training, and so on. However, even the most meticulous studies using differences in a large number of productivity-related characteristics have been unable to explain much more than half of the differential. Thus, one is compelled to also consider discrimination theories.

This paper seeks to explore causes of the gender wage gap. Ultimately, we break the wage differential into three components: that due to individual human capital characteristics; that due to occupation, and specifically how female-dominated the individual's occupation is; and a residual, which we posit is largely comprised of discrimination effects. Section II provides the theoretical framework with seemingly opposing arguments, which we contend are not mutually exclusive. Section III delineates the empirical model and describes the data. Section IV discusses the regression results. Section V decomposes the regression results into the aforementioned three components. Section VI places the results in the context of policy issues. Finally, Section VII provides some concluding remarks.

II. THEORY

A. Human Capital Theory

The supply-side explanation for gender differentials in economic outcomes revolves around the human capital theory of labor. Human capital theory focuses on the observation that men and women may come to the labor market with different tastes and with different qualifications, such as education, formal training, experience, and other productivity-related characteristics. Gender differences in tastes might mean, for example, that one group or the other has greater tolerance for an unpleasant, unhealthy, or dangerous environment; for longer work hours or inflexible work schedules; for physical strain; or for repetitive tasks. If men are more willing to accept any or all of these conditions in return for higher wages, then such differences in tastes for different types of work could cause women to earn less and to be concentrated in different occupations. Moreover, if men come to the labor market with more education and work experience, they will be compensated with higher wages.

In this context, the theory seemingly accounts for male-female earnings differentials vis-à-vis historical trends in human capital characteristics (see Goldin 1990 or Treiman and Hartmann 1981). For instance, women have historically been less likely to have completed college and gone on to postgraduate education. However, since trends in higher education reveal fast declining differences among younger cohorts, one would predict that differences in educational attainment would not have as large an impact on the earnings differential as it might have in the past.

A number of researchers (Mincer and Polachek 1974; Zellner 1975; Landes 1977) focus on women's "household responsibilities" as the chief explanation for lower earnings in female occupations and for women in general. Women expect only intermittent labor force participation. Hence, they will opt for jobs requiring less investment in human capital and/or jobs requiring skills that do not depreciate as much during periods of absence. Furthermore, human capital theory suggests that the weaker attachment to the labor force of women following traditional roles means that they will acquire less of this valuable on-the-job training. Likewise, women may expend less energy on their market work simply because they put more effort into housework even when they are employed full time (Becker 1993).

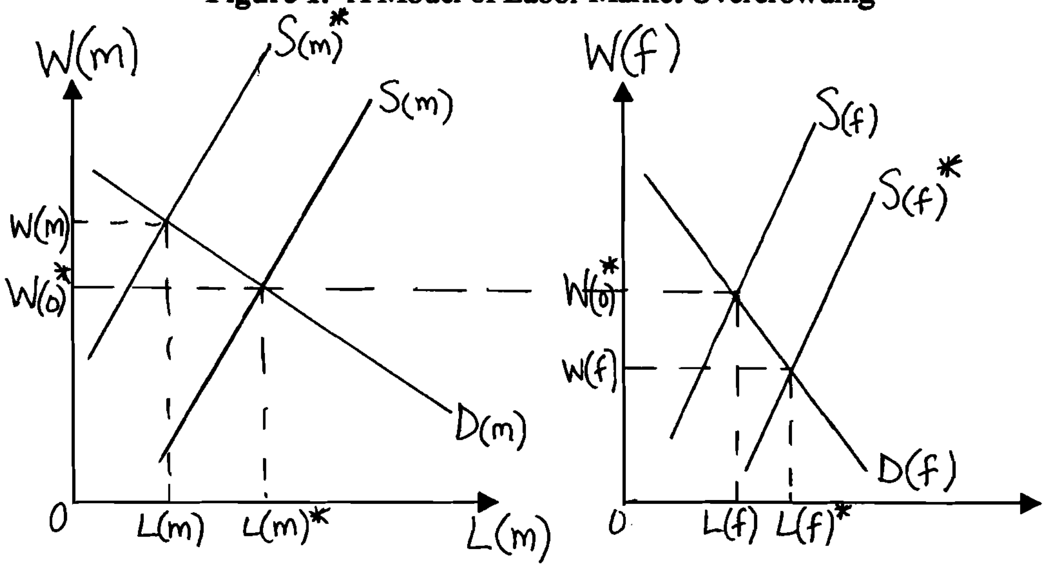
Available data indicate that, on average, women in the labor market have less work experience than men (Smith and Ward 1984). In 1984, for example, among employed workers aged 21 to 64, women averaged 5.2 years less labor market experience than men: 2.4 fewer years with their current employer and 2.8 fewer years of prior work experience. Information on recent trends in work experience does suggest that gender differences may be narrowing (1967 and 1992 BLS report). However, the cultural trend remains that women are more likely to take time off from participation in the labor force, especially when they begin to have children.

B. The Overcrowding Model

Labor market discrimination occurs whenever men and women of equal productivity and aspirations are treated differently in hiring, retention, training, and promotion practices. Barbara Bergmann's model of labor market overcrowding potentially captures most of these effects (Bergmann 1974). Thus, Bergmann's model serves as a key part of the framework of this study.

Bergmann argues that stereotypes and society's perceptions about what is "normal" actually divide labor markets into two separate labor markets—one for males and the other for females—in which the individuals are perfect substitutes. Society dictates that women should be caring and nurturing; thus, acceptable occupations for them emphasize these stereotypical female characteristics. As a result, women are crowded into these fields. One could argue that crowding could be due to different tastes and preferences between men and women. For women who would not choose these traditionally female occupations, though, crowding becomes a form of discrimination. Bergmann's theory is summarized in Figure 1 (Blau, Ferber and Winkler 1998, 210).

Figure 1. A Model of Labor Market Overcrowding



Suppose there is an undiscriminating market in which men and women earn the same average wage, wage w_0. With this as the starting point, now suppose that, for reasons described above, this market experiences discrimination and divides into a market for those discriminated against (**f**) and one for the preferred co-workers (**m**). Demand is no longer the same for men and women, giving an equilibrium wage w_0, but rather divides into **DEMAND$_f$** and **DEMAND$_m$**.

Jobs in the separate market **(m)** are filled by a restricted supply of labor **(m)** and wages for **(m)** increase. Also, members of **(f)** must "crowd" into a restricted number of positions if they want to remain in the market. As Figure 1 illustrates, pay differentials will develop whenever, relative to their respective supplies, $\mathbf{DEMAND_m}$ is greater than $\mathbf{DEMAND_f}$. More females are "crowded" into a market that faces less demand, relative to the supply of labor in that market. Moreover, lower wages for females result from each individual being less productive because she has less capital with which to work. Consequently, those who remain in market **(m)** not only receive higher wages due to the laws of supply and demand, but they are also more productive because each has more capital to work with. Thus, both groups are paid according to their productivity.

This is not to say that wage differentials do not exist in male-dominated occupations. In 1995, women employed in professional occupations earned only 49.2 percent of what men in professional occupations earned (Stanley and Danko 1996, 180). For example, female physicians earned only 52 percent of what male physicians earned; female lawyers, 57.5 percent. However, traditional female occupations exhibit an overall discrimination effect due to the very fact that they are female dominated. In fact, studies done by Killingsworth (1990) and Macpherson and Hirsch (1995) found that both men and women earn less as an occupation becomes more "female."

C. Becker's Discrimination Theory

On the demand side, labor market discrimination exists when two equally qualified individuals are treated differently solely on the basis of their gender (Becker 1971). In the absence of discrimination, profit-maximizing employers in a competitive labor market will pay workers in accordance with their productivity. However, if labor market discrimination exists, it is expected to adversely affect the economic status of women by producing differences in pay between men and women that are not accounted for by differences in productivity-related characteristics or qualifications. In some models, this inequality occurs because women are paid less than their marginal products due to discrimination. In other views of this process, labor market discrimination directly lowers women's productivity as well as their pay, as for instance, when a woman is denied access to an employer-sponsored training program or when customers are reluctant to patronize a female salesperson.

There are many different forms of labor market discrimination. The most "true" and basic model is the "taste for discrimination" model. In the context of gender, this model is based on the pure dislike of working with someone of the opposite sex. "Tastes" for discrimination can be on the part of employers themselves, fellow employees who refuse to work with someone of the opposite sex, or customers. The result of such "tastes" for discrimination are that employers, employees, and customers are willing to pay something either directly or in the form of a reduced income to be associated with some persons instead of others. Employers and customers perceive net wages and net prices as relatively higher because they are "paying" for undesirable associations with the discriminated-against person. Likewise, discriminating employees require higher net wages if they must work with the discriminated-against co-worker.

On the other hand, it is possible that discrimination is not just the result of discriminatory "tastes" or human capital choice. Rather, it may be the result of a market failure: imperfect information. The model of *statistical discrimination* assumes that employers and/or consumers face imperfect information and uncertainty regarding individuals' potential productivity (Blau, Ferber and Winkler, 176). As they make hiring or promotional decisions, employers project their "average" beliefs about a particular group onto an individual applicant who belongs to that particular group. As a result, individuals are discriminated against because the broader group to which they belong are believed all to share some undesirable, stereotypic characteristic. The result is that some qualified applicants are erroneously excluded from employment.

In many cases, employers may believe that females do not have as high of an expected employment life as do their male counterparts and decide not to grant females the same opportunities of firm-specific training, job assignments, or promotion that they offer to males. For instance, a historical form of statistical discrimination has been against married women. Employers perceive that, on average, married women are more likely to withdraw from the labor force at some point than men are because they will want to have children. As a result of this trend, employers may be unsure as to the returns they will receive from training or promoting married women and therefore be less willing to do so.

Unfortunately, this type of discrimination is largely immeasurable and ultimately becomes an institutional factor, especially when one considers feedback effects. *Feedback effects* occur when productivity differences among workers reflect, in part, the decisions they make whether or not to invest in human capital. Anticipated labor market discrimination can affect women's economic status by lowering their incentives to continue their schooling, participate in a training program, remain continuously in the labor market, and so on. Quite rationally, many women doubt the marginal benefits of investing in themselves, especially if they believe it will not procure as great an economic reward than if they were men. Hence, gender differences in productivity-related characteristics may reflect not only the voluntary choices of men and women based on personal preference and social norms but also the indirect effects of labor market discrimination.

III. EMPIRICAL MODEL

The data set used is the 1997 version of the National Longitudinal Survey of Youth (NLSY), a cross-sectional database which interviews all individuals used in this study every year from 1979-1996, excluding 1995 for budget reasons. The individuals were between the ages of 14-21 in 1979. This study uses 1996 data for all variables. The three-digit Census occupational codes from the NLSY for the respondents' current occupations in 1996 were merged with data found in the January 1997 edition *Employment and Earnings* on the percentage of employees who were females in each occupation for 1996. The result of merging these data is the PERCF variable, which represents the national percentage of women in each individual's occupation. After removing all missing values, there were 2,966 men left in the study, and 2,698 women.

The purpose of this study is to identify the causes of the gender wage gap. The theory suggests three principal components: individual productivity-related characteristics, differences in pay between "men's work" and "women's work" resulting from the crowding effect, and the residual, which Becker's theory posits is largely comprised of other discrimination effects beyond that of crowding. To obtain the estimates needed to perform the decomposition, we regress separate equations for men and women. Then, by plugging in the mean of values of women into the male structural equation (or vice versa), one can ascertain what women's wages would be if they had the same reward structure (e.g., the same coefficients) as men (and vice versa). The decomposition is further explained in Section V. At this point, we estimate the regression equations as:

$$(1)\quad W_m = \alpha_{0m} + \alpha_{1m}(EDU_m) + \alpha_{2m}(ONJOBEDU_m) + \alpha_{3m}(MARDUM_m) + \alpha_{4m}(WORKEXP_m) + \alpha_{5m}(KIDSINHH_m) + \alpha_{6m}(KIDSDUM_m) + \alpha_{7m}(RACE_m) + \alpha_{8m}(HOURS96_m) + \alpha_{9m}(PERCF_m)$$

$$(2)\quad W_f = \alpha_{0f} + \alpha_{1f}(EDU_f) + \alpha_{2f}(ONJOBEDU_f) + \alpha_{3f}(MARDUM_f) + \alpha_{4f}(WORKEXP_f) + \alpha_{5f}(KIDSINHH_f) + \alpha_{6f}(KIDSDUM_f) + \alpha_{7f}(RACE_f) + \alpha_{8f}(HOURS96_f) + \alpha_{9f}(PERCF_f)$$

Equation (1) represents the structure of the male pay system; equation (2) represents the structure of the female pay system. The advantage of estimating separate equations for men and women is that we can observe whether any of the variables have opposite effects on men and women. Moreover, we have the advantage of being able to see if the coefficients for each variable reveal structural differences in the variables' significance and size of impact on the genders' respective wages. Variable definitions and predicted signs are in Table 1.

Table 1: Variable Definitions and Predicted Signs

Variable	Predicted Sign, Women	Predicted Sign, Men	Definition
1996 Income	Dependent variable	Dependent variable	Annual wages and salary $s
EDU	+	+	Highest grade completed
ONJOBEDU	+	+	Training provided on the job?
WORKEXP	+	+	Work experience index
HOURS96	+	+	Hours worked in past year
KIDSINHH	-	+	# of children in household
KIDSDUM	-	+	Does he/she have children?
MARDUM	-	+	Is he/she married?
PERCF	-	-	%female in occupation
RACE	+	+	Is individual white?

The model includes the traditional human capital variables: years of education (EDU) achieved by 1996, a dummy variable for whether the individual received on-the-job training or other educational experiences (ONJOBEDU), an index for prior work experience (WORKEXP), and the number of hours the individual worked in 1996 (HOURS96). We had to construct an index for work experience because not every individual was interviewed each year. Instead of losing all those cases, which were coded as missing values, we compared the number of known years worked to the number of known years of work status. This index is explained in more detail in the Appendix. According to traditional theory, all of these human capital variables are expected to have positive coefficients for both men and women.

Another vector of variables represents individual life choices which affect earnings, but are not exactly human capital variables. Theory suggests that these variables will have opposite effects on male and female earnings. For instance, a dummy variable for marital status—either married or not—is included. Based on historical norms, one might expect men's wages to increase after marriage, while women's will decrease. One might assume that single women have more flexibility to pursue a professional career and career advancement. Since this norm is changing, though, we might find that women's wages do not drop when they get married.

If indeed the regressions show that women's wages do still decrease upon marriage, this effect should be even stronger when children are present. As such, the model includes a dummy variable for whether or not children are present. According to theory and historical trends, women are more likely to be the primary caretakers of children. Moreover, a more dramatic effect will most likely occur after the first child is born, for the female will already either be at home or will have decreased her hours by the time subsequent children come along. Nonetheless, we might expect to find that women's wages will continue to drop with additional children; thus, a continuous variable for number of children is also included. With all of these "choice" variables, we expect the female coefficient to be negative. However, the expected sign for men is positive. If women are earning less when they get married and/or have children, to compensate for the female's foregone income, the men must earn more.

Of principle concern is how the measure of the concentration index (how female-dominated the individual's occupation is) affects earnings. The PERCF variable represents the percentage of female workers in the individual's occupation in 1996, as defined by the three-digit Census codes. The intent of this variable is to capture the discriminatory effects of crowding on female wages, as well as the effect on males who are in female-dominated occupations. According to Bergmann's crowding theory, the PERCF variable will be negative for both men and women.

Finally, a dummy variable for race is also included to control for any racial discrimination. All of the aforementioned variables serve as explanatory variables for the dependent variable: individual wages and salary in the past calendar year (1996). Additional information on how the variables were extracted from the database and constructed is outlined in Appendix A.

To summarize, the hypotheses are:

1. **That the human capital variables (e.g., EDU, ONJOBEDU, WORKEXP, HOURS96) will all have positive coefficients for men and women.**

2. **That the marital and family choice variables (e.g., KIDSINHH, KIDSDUM, MARDUM) will have negative coefficients for women, but positive coefficients for men.**

3. **That the coefficient for the PERCF variable will be negative for both sexes.**

IV. REGRESSION RESULTS

The separate equations for men and women were both estimated according to OLS regression. Table 2 summarizes the findings. The adjusted R-squared value for the male regression is .336; the female regression, .349.

Table 2: Regression Results

	Men		*Women*	
Independent Variable	*Coefficient*	*T-stat*	*Coefficient*	*T-stat*
(Constant)	-52,723.18	-20.261***	-26,122.12	-11.941***
EDU	3,808.04	20.964***	2,492.16	18.145***
ONJOBEDU	6,910.22	8.105***	4,012.17	6.342***
WORKEXP	8.30	10.533***	7.26	11.613***
HOURS96	6.39	12.895***	5.13	13.723***
KIDSINHH	599.15	1.111	516.35	1.362*
KIDSDUM	1,911.38	1.260	-2,701.31	-2.630**
MARDUM	3,422.24	3.122**	866.72	1.322*
PERCF	-55.97	-3.163**	-98.80	-8.218***
RACE	2,789.75	3.321**	565.19	.903

***Results are significant beyond the .001 level.
**Results are significant beyond the .01 level.
*Results are significant at the .1 level.

As expected, the control for race indicates that being white translates into higher wages. The proxies for education, hours worked in the past calendar year, work experience, and the dummy variable for whether or not education and training is available on the job—all of the strictly human capital variables—yielded highly significant, positive coefficients for both men and women.

However, there are some notable differences in effect. For instance, the regression estimates that for each additional year of education, men's wages will, on average, increase by \$3,808.04. Yet, for women, each additional year only brings about an additional \$2,492.16. Since the model controls for occupational choice, this result is highly interesting. This means that men are getting greater returns on their educational investments than women, *ceteris paribus*. This could be due to discrimination effects. In turn, if women know the statistics and believe that educational training does not yield as great a return for them as it does for men, they may be less inclined to pursue higher education. This is one type of feedback effect.

Differences in returns to human capital emerged for other variables as well. For an additional five hours worked each week, men made an additional \$1,661.40, while women only earned an additional \$1,333.80. For men who worked at a job where training and education were provided, the benefit is an additional \$6,910.22 a year. For women, however, that same benefit only yields an extra \$4,012.17, on average. The last human capital variable is the proxy for work experience. As Table 2 reveals, once again, the same percentage increase in work experience yields a greater marginal effect for men than women.

Perhaps the most interesting vector of variables is the individual choice variables. The most significant variable, both in terms of the T-statistic and the sheer magnitude of the coefficients, is the dummy for whether children are present in the home. As to be expected, the female equation suggests that earnings drop dramatically once that first child is born for women; however, the male equation suggests the opposite. Having children has a positive effect on men's wages. Though the effect from this dummy variable is highly significant for women, and not for men, the results are nonetheless both consequential and rational. Cultural tradition dictates that women be the primary domestic caretakers. It is true that these roles are becoming less stringent over time; yet, the tradition persists, especially when children are present. Consequently, women oftentimes either reduce their hours or quit working altogether when that first child arrives. With the loss of this income, men must compensate for their lost income by earning more.

Somewhat surprising is the positive coefficient attached to the continuous variable for how many children are in the household in the female equation. However, when one looks at the effect on the dummy variable for children combined with the continuous variable, the net effect on women's wages remains negative up to six children. One could interpret this to indicate that by the time a woman has six children, the older children are capable of caring for the younger children, thereby allowing the mother to work outside of the home. Moreover, it may be that the woman will have to work in order to provide for that many children, whether married or not.

As for the marriage dummy variable, as previously discussed, historical norms would lead one to expect to find that getting married has a negative impact on women's wages. However, times are changing. Running the regressions in several different ways yielded a positive marriage coefficient every time for both men and women. Considering recent social changes, though, this effect makes sense. In the early decades of this century, it was against the law for married women to work. Not only have those laws been removed, but also, there is no longer the societal expectation that a woman will quit her job when she gets married. Ultimately, though, the net effect of the marriage dummy and the children variables is negative.

Finally, as previous studies found and Bergmann's overcrowding model predicted, the PERCF variable has a negative impact on wages. The more female-dominated an occupation is, the less the average worker in that occupation will earn. As expected, this is true for both men and women. However, the negative effect is much greater for women, and much more significant. So, not only does "women's work" compensate with lower wages and salaries on average, but there are also continued wage differences within these female-dominated fields.

V. DECOMPOSITION

The question now concerns the magnitude of the effects of each of these variables on the gender wage differential. In this section, we decompose the overall gap into three components—human capital; the crowding effect, represented by PERCF; and a residual. We derived the basic model from a similar one used by Oaxaca (1973). However, this paper's decomposition serves as an extension of the original Oaxaca method. Since the purpose of the decomposition is to calculate percentages for each of the three causes, we include an extra step to measure the effects of PERCF.

There have been some criticisms of the Oaxaca approach. Brown et al (1980) argue that Oaxaca's method is unsatisfactory because he does not include occupational attainment in his equations and therefore the decomposition. Occupational attainment is indirectly built into our PERCF variable. Furthermore, Kidd and Shannon (1996) question the Brown approach insofar that their occupational classifications are too broad. Kidd and Shannon narrow the classifications and prove that the conclusions are more valid by doing so. Thus, this paper uses the narrowest Census occupational codes available.

The following subsections derive the proportion of the total wage differential explained by each of the three components. One can easily calculate the real-world wage differential from the descriptive statistics in Table 3. We denote the actual male-female wage differential as the average male wage ($32,200.40) minus the average female wage ($21,135.69). Thus, the gap between average male wages and average female wages is $11,064.71. It is this gap that the subsequent sections aim to explain.

Table 3: Cross-sectional Descriptive Statistics from the Data

	Men		Women	
	Mean	**Std. Dev.**	**Mean**	**Std. Dev.**
1996 Income	$32,200.40	$26,550.42	$21,135.69	$19,247.27
Education level	13.10	2.49	13.37	2.34
On the job training?	.48	.50	.53	.50
Work experience index	1650.74	562.66	1296.09	551.51
Hours worked in 1996	2251.95	866.19	1821.53	868.34
# of children in household	1.18	1.28	1.53	1.22
If have kids at all (dummy)	.56	.50	.75	.44
Married? (dummy)	.58	.50	.55	.50
% female in occupation	28.32	23.89	65.55	25.02
Race (dummy)	.54	.50	.51	.50

Our overall goal is to explain the overall wage gap ($W_m - W_f$), as it is equal to the sum of the three separate components:

(3) 100% of ($W_m - W_f$) = % due to IC differences + % due to crowding + residual

A. Percentage due to Differences in Individual Characteristics (IC)

The equations used to isolate the effects due to differences in individual characteristics are the following:

(4) $W_m = \alpha_m + \beta_m IC_m + \delta_m PERCF_m$ = \$32,200.40

(5) $W_f = \alpha_f + \beta_f IC_f + \delta_f PERCF_f$ = \$21,235.69

Equation 4 and equation 5 are simply condensed versions of the original male and female structural equations (1 and 2). The vector of variables represented by IC includes all of the estimated individual characteristics, including human capital variables (EDU, ONJOBEDU, WORKEXP, HOURS96), life choice variables (KIDSINHH, KIDSDUM, MARDUM), and race.

Equation 4 represents the male estimated variables; equation 5, the female estimated variables. The following equation then represents what women's wages would be if they were rewarded the same as men for their investments in human capital:

(6) $W_f^* = \alpha_m + \beta_m IC_f + \delta_m PERCF_m = \$28,290.43$

Subtracting equation 6 from equation 4, we obtain equation 7:

(4) $W_m = \alpha_m + \beta_m IC_m + \delta_m PERCF_m = \$32,200.40$
(6) $\underline{W_f^* = \alpha_m + \beta_m IC_f + \delta_m PERCF_m = \$28,290.43}$

(7) $(W_m - W_f^*) = \beta_m(IC_m - IC_f) = \$3,909.97 = 35.34\%$ of the wage differential

Thus, 35.34% of the overall gender wage gap is due to differences in individual characteristics, including human capital endowments and life choices regarding marriage and children. The following equation represents the remaining factors:

(8) $(W_f^* - W_f) = (\alpha_m - \alpha_f) + (\beta_m - \beta_f)IC_f + (\delta_m PERCF_m - \delta_f PERCF_f) = \$7,154.74 = 64.66\%$

This equation represents the effects due to different reward structures to human capital as well as differences in the average percentage of females in the individual's occupation (PERCF).

B. Crowding Effect (PERCF)

We now need to decompose the remaining differential (64.66%) into that due to crowding discrimination and a residual. To isolate the effects of crowding, we simply look at the difference between women's wages given the male PERCF average (28.32%), represented by W_f^*, and wages given the female PERCF average (65.55%), which we code as W_f^{**}:

(9) $Wf^{**} = \alpha_m + \beta_m IC_f + \delta_m PERCF_f = \$26,206.66$

Notice that the only difference between W_f^* and W_f^{**} is this change in the PERCF variable in the regression equation from 28.32% to 65.55%. To isolate the effects of crowding, we take the difference between Wf^* and Wf^{**}:

$$\underline{(6)} \quad W_f^* = \alpha_m + \beta_m IC_f + \delta_m PERCF_m = \$28{,}290.43$$
$$(9) \quad \underline{Wf^{**} = \alpha_m + \beta_m IC_f + \delta_m PERCF_f = \$26{,}206.66}$$

$$(10) \quad (Wf^* - Wf^{**}) = \delta m(PERCF_m - PERCF_f) = \$2{,}083.77 = 18.83\% \text{ of the wage gap}$$

The resulting proportion due to crowding effects is 18.83 percent.

C. The Residual

The remaining proportion—that is, the part of the differential that cannot be explained by differences in human capital variables or crowding—is the residual. We can compile the separate components to derive an overall equation and solve for the residual. Combining Equation (5) and Equation (6), we find that the overall gender wage gap equals:

$$(11) \qquad \frac{(W_m - W_f^*) + (W_f^* - W_f^{**}) + \text{Residual}}{(W_m - W_f)} = 100\%$$

More simply, we can use our answers in the above sections to compute the residual effect. Rearranging Equation (3), we obtain:

$$(12) \qquad 100\% - \%\text{ due to IC} - \%\text{ due to crowding} = \text{residual}$$

The result is:

$$(12) \qquad 100\% - (35.34\% + 18.83\%) = 45.83\%$$

Thus, 45.83 percent of the overall gender wage gap is unaccounted for. Mathematically, the residual represents that portion of the wage differential due to differences in coefficients—that is, differences in reward structures for men and women. The residual could include possible effects due to omitted human capital variables, extenuating circumstances which are not easily measurable, and imperfectly measured variables in the regression. For instance, the residual could be catching effects due to crowding found *within* a broader classification of occupations. However, the residual is too large to dismiss as the effects of errors. Becker would argue that the large residual is reflecting pure "tastes" for discrimination. Given the fact that previous proportions have already accounted for not only human capital differences but also life choices, including marriage, children, and occupational choice, pure discrimination is very likely a significant factor in the residual and thus in the gender wage gap.

Overall, the decomposition reveals that all three components are important. Differences in individual characteristics comprise a substantial component of the gender wage differential. However, this proportion is surprisingly small considering that more than just human capital variables are included. Furthermore, we cannot measure the extent to which human capital differences reflect choice, tradition, or barriers to obtaining human capital itself. Secondly, crowding, a form of discrimination, accounts for a substantial portion of the gender wage differential. Finally, the surprisingly large residual strongly supports the assertion that Becker's traditional discrimination theories still apply to today's labor market, for the most likely explanation for a large residual is continuing demand-side discrimination.

Appendix B enumerates the results if the decomposition had been carried out using male means and the female structural equation.

VI. POLICY IMPLICATIONS

One can justify government policies to confront and abate labor market discrimination against women on two grounds. The first is equity, or fairness. The second is that unequal treatment may result in an inefficient allocation of resources. When equally productive men and women are hired for different jobs, and women's jobs on average pay less, then prices are not serving as accurate indicators of social costs. The crowding effect causes society to produce too much of the outputs that uses "underpriced" female labor since the contribution of equally productive labor is valued more highly in the male sector. In turn, such overproduction leads to a simple supply and demand dilemma for female labor: supply exceeds demand and price falls even further.

As Edward Potter and Judith Youngman asserted in their important book on how to keep the US competitive as the next century approaches, "America's competitiveness suffers when skilled workers from any segment…are excluded arbitrarily from employment opportunities or prevented from working up to full potential because of discriminatory employment practices, hostile workplace environment, or unnecessary inflexible employment policies" (1995, 342). Employers who expect to be competitive cannot afford to overlook necessary skills and experience merely because of race, gender, or ethnic background. In this regard, the principles underlying efforts to attract a diverse work force are closely related to principles underlying our equal employment opportunity laws.

The Equal Employment Opportunity Commission (EEOC) is the federal agency charged with enforcing the Equal Pay Act (1963) and Title VII (1964), both of which prohibit various types of discrimination against women on the firm level. Other laws protect "women's rights" in specific categories. Unfortunately, the Equal Pay Act has relatively little real impact, mostly because it only requires equal pay for "equal" work. In reality, men and women rarely do the same kind of work in the same firm.

Nonetheless, this study has found that discrimination (in the form of crowding) persists as a key component of the gender wage differential. Therefore, anti-discrimination policies are still necessary, in some form. Because the civil rights agencies can promote work force diversity and equity by effectively enforcing existing nondiscrimination laws and affirmative action requirements, the prudent course of action seems to be to clarify and streamline the existing laws and regulations.

Perhaps the most serious challenge that today's federal policymakers face in the area of equal employment opportunity and affirmative action is not the requirements themselves but rather, how these policies are perceived. Many people even debate just who the "victims" of many of these government policies are. The most hotly debated program continues to be Affirmative Action. For example, when a woman or a minority attains a position, observers may leap to the conclusion that the individual is an "affirmative action hire," which may or may not be true. Those who did not receive the job may feel that it was "because" of affirmative action. A second reason for the upsurge in public opinion against this policy in the last few years is that, in times of an uncertain labor market such as we experienced in the late 1980s and early 1990s, affirmative action becomes an easy scapegoat.

Unfortunately, if women believe they are obtaining jobs only to fill a company's quota, this lowers their self-confidence and thus their productivity, culminating in a vicious cycle. However, if we can educate the public to believe that government policies are needed not only to "equalize" the fairness of the labor market, but also to provide a more efficient allocation of resources, then people may be less willing to flippantly use affirmative action as a scapegoat. In turn, this could have a positive feedback effect (for once!), boosting women's confidence that they were hired because they were qualified and thereby enable them to be more effective on their jobs.

Moreover, beyond the equity issues, efficiency arguments also work in favor of improving the image of equal opportunity employment laws. It has become all too common to characterize EEO and affirmative action as concepts that have no connection to the company's bottom line. To some extent, the enforcement agencies and their inability to communicate to the public the relationship between a productive workplace and nondiscriminatory selection decisions are to blame for this negative perception. Therefore, the ultimate task of policymakers is to understand the common threads that connect EEO and affirmative action requirements to good business practices so that they can then begin to improve the tarnished image of affirmative action.

VII. CONCLUDING REMARKS

This study has searched for an explanation for the gender wage differential and found that the residual surprisingly accounts for the majority of the gap. Though the effects of crowding discrimination and differences due to individual characteristics also carry considerable influence, there can be little doubt that labor market discrimination against women persists. Moreover, we may never know the (large and largely immeasurable) extent to which feedback effects influence women's decisions to obtain higher education, work longer hours, or pursue traditionally male-dominated jobs.

Once a woman decides to invest in education, though, and enter the occupation of her choice, Equal Opportunity Employment laws can still play a beneficial role in human resource practices. Such laws will always have a role as long as discrimination persists. The key, though, is to continue the societal advances which are finally beginning to tell women that it is okay to be a doctor, a lawyer, a CEO or an engineer. The more confident women are in their abilities, the greater the positive feedback effects, the more productive they will be, the more they will be able to combat societal discrimination, and hopefully, the more the gender wage differential will continue to decline.

Appendix A

The Data Base and Adjustments of the Raw Values

As mentioned in the text, the data base used in this study is the National Longitudinal Survey of Youth (NLSY). The data set begins in 1979, when the respondents were between the ages of 14-21. Since then, the interviewers have updated and added questions each year, excluding 1995. The 1997 edition, which is the one used in this paper, interviews through the year 1996. The following explanation reviews how the variables were extracted, sorted, and constructed.

The dependent variable is fairly straightforward. The actual variable extracted from the database was "total income from wages and salary in the past calendar year," the past calendar year being 1996 for this study. All the missing values, coded as either -5 or -4, were eliminated—not by hand, but rather via an SPSS command. These figures are denominated in dollars.

The education variable extracted was "highest grade completed." It records grade levels directly; 16 years equals an undergraduate education; 18, a masters; more than 18, an advanced degree. Once again, 1996 answers were used and missing values were eliminated.

"Hours worked in the past calendar year" (1996) is also a straightforward variable. It is a constructed variable within the database itself, already annualized from the question asked regarding number of hours worked per week.

The on-the-job training variable is a dummy variable both in the NLSY and in this study. An answer of 1 indicates that the respondent does receive training on the job; of 0, that he or she does not. There were no manipulations done to this variable.

The WORKEXP variable is a constructed variable for this study. I extracted the number of hours worked in each year from 1979-1995, inclusive. However, because of missing values or non-interviews in some years, I had to construct an index. Thus, the index equals the total number of hours worked in years accounted for divided by the number of years accounted for.

The "kids in household" was taken directly from the database. The dummy variable for children was constructed from the "kids in household" variable by recoding: 0 represents no children in the household; 1 equals children. The marriage variable was recoded in a similar fashion: 0 represents a single, widowed or divorced respondent; 1 represents a married respondent.

The race variable was also recoded. In the database, race is coded as such: 1 signifies Hispanic origin; 2 represents African-Americans; and 3 represents non-Hispanic or non-black. I translated the latter to mean white, though it could very well mean other classifications, such as Asian. I recoded the variables into just 2 values: 0 to equal minority (black or Hispanic) and 1 to signify non-minority.

Finally, the most interesting variable to construct was PERCF. The NLSY records respondents' occupations according to 1980 Census codes. I then merged these codes with the female percentages for each occupational listing found in *Employment and Earnings* (January 1997, pp. 171-76). I entered these values by hand onto the spreadsheet. The 8.0 version of SPSS provided the spreadsheet for all the regressions and decomposition calculations.

Appendix B

Reverse Decomposition, using the female structural equation

Initially, we used the male structural equation to carry out the decomposition because it made more sense conceptually. Interestingly, when we carried out the decomposition using the female equation instead of the male structural equation, we reached the same basic conclusions. All three components still accounted for significant portions of the gender wage gap.

The effect due to differences in individual characteristics is so near to the outcome from the method using the male structural equation, that any divergence is virtually negligible. The most significant difference in this "reverse decomposition" is that the percentage of the wage gap due to crowding nearly doubled, due to the significantly smaller coefficient for women regarding the PERCF variable. Therefore, the residual decreases by the same percentage points that the crowding effect increases. The following delineates the steps taken in this "reverse decomposition" and the resulting percentage effects attributed to each of the three components:

Step #1: For the reverse decomposition, we use the female equation:

(2) $W_f = \alpha_{0f} + \alpha_{1f}(EDU_f) + \alpha_{2f}(ONJOBEDU_f) + \alpha_{3f}(MARDUM_f) + \alpha_{4f}(WORKEXP_f) + \alpha_{5f}(KIDSINHH_f) + \alpha_{6f}(KIDSDUM_f) + \alpha_{7f}(RACE_f) + \alpha_{8f}(HOURS96_f) + \alpha_{9f}(PERCF_f)$

Step #2: Look at descriptives and simulate wages:

variable	fem coeff	fem mean	male mean	W(m)*	W(m)**
constant				-26122.12	-26122.12
EDU	2492.16	13.37	13.10	32647.30	32647.30
ONJOBEDU	4012.17	0.53	0.48	1925.84	1925.84
WORKEXP	7.26	1296.09	1650.74	11984.37	11984.37
HOURS96	5.13	1821.53	2251.95	11552.50	11552.50
KIDSINHH	516.35	1.53	1.18	609.29	609.29
KIDSDUM	-2701.31	0.75	0.56	-1512.73	-1512.73
RACE	565.19	0.51	0.54	305.20	305.20
MARDUM	866.72	0.55	0.58	502.70	502.70
PERCF	-98.80	65.55	28.32	-6476.34	-2798.02
				25416.01	**29094.34**

Step #3: Summarize equations

$$W_m = \alpha_m + \beta_m IC_m + \delta_m PERCF_m = \$32,200.40$$
$$W_f = \alpha_f + \beta_f IC_f + \delta_f PERCF_f = \$21,135.69$$
$$W_m^* = \alpha_f + \beta_f IC_m + \delta_f PERCF_f = \$25,416.01$$
$$W_m^{**} = \alpha_f + \beta_f IC_m + \delta_f PERCF_m = \$29,094.34$$

% due to differences in individual characteristics

$$\frac{(W_f - W_m^*)}{(W_f - W_m)} \times 100 = 38.68\%$$

Step #4: % due to Crowding Discrimination

$$\frac{(W_m^* - W_m^{**})}{(W_f - W_m)} \times 100 = 33.24\%$$

Step #5: Residual

$$\frac{(W_m^{**} - W_f)}{(W_f - W_m)} \times 100 = 38.08\%$$

References

Becker, Gary S. *The Economics of Discrimination*, 2nd ed. Chicago: University of Chicago Press, 1971.

Becker, Gary S. *Human Capital*, 3rd ed. Chicago: University of Chicago Press, 1993.

Bergman, Barbara R. "Occupational Segregation, Wages and Profits When Employers Discriminate by Race or Sex." *Eastern Economic Journal*. April 1974, 103-10.

Blau, Francine D., Marianne A. Ferber and Anne E. Winkler. *The Economics of Women, Men, and Work*, 3rd ed. Upper Saddle River, New Jersey: Prentice Hall, 1998.

Brown, Randall S., Marilyn Moon and Barbara S. Zoloth. "Incorporating Occupational Attainment in Studies of Male/Female Earnings Differentials." Journal of Human Resources. Vol. 15, No. 1. Winter 1980, pp. 3-28.

Bureau of Labor Statistics, U.S. Department of Labor, "Job Tenure of Workers, January 1966, " Special Labor Force Report No. 77, 1967.

Bureau of Labor Statistics, U.S. Department of Labor, "Employee Tenure and Occupational Mobility in the Early 1990s, June 16, 1992.

Employment and Earnings. U.S. Department of Labor. Bureau of Labor Statistics. January 1997.

Goldin, Claudia. *Understanding the Gender Gap: An Economic History of American Women*. Oxford University Press: New York, New York, 1990.

Kidd, Michael P. Kidd and Michael Shannon. "Does the level of occupational aggregation affect estimates of the gender wage gap?" *Industrial and Labor Relations Review*. Vol. 49, No. 2. January 1996, pp. 317-329.

Killingsworth, Mark R. *The Economics of Comparable Worth*. W.E. Upjohn Institute for Employment Research: Kalamazoo, Michigan, 1990.

Landes, Elizabeth M. "Sex Differences in Wages and Employment: A Test of the Specific Capital Hypothesis." *Economic Inquiry*. Vol. 15, No. 4, October 1997, pp. 523-38

MacKinnon, Catharine A. *Feminism Unmodified: Discourses on Life and Law*. Harvard University Press: Cambridge, Massachusetts, 1987.

Macpherson, David A. and Barry T. Hirsch. "Wages and Gender Composition: Why Do Women's Jobs Pay Less?" *Journal of Labor Economics*. Vol. 13, No. 3. July 1995, pp. 426-71.

Mincer, Jacob and Solomon Polachek. "Why the Gender Gap in Wages Narrowed in the 1980s." *Journal of Labor Economics*. Vol. 11, No. 1. January 1993, pp. 205-28.

Oaxaca, Ronald. "Male-Female Wage Differentials in Urban Labor Markets." *International Economic Review*. Vol. 14, No. 3. October 1973, pp. 693-709.

Polachek, Solomon W. "Occupational Segregation among Women: Theory, Evidence and a Prognosis." *Women in the Labor Market,* ed. by Cynthia B. Lloyd, Emily Andrews, and Curtis Gilroy. Columbia University Press: New York, 1979.

Potter, Edward E. and Judith A. Youngman. *Keeping America Competitive: Employment Policy for the Twenty-first Century*. Glenbridge Publishing: Lakewood, Colorado, 1995.

Smith, James P. and Michael P. Ward. "Women's Wages and Work in the Twentieth Century." RAND, r-3119-nichd, 1984.

Stanley, Thomas J. and William D. Danko. *The Millionaire Next Door*. Longstreet Press: Atlanta, Georgia, 1996.

Thornborrow, Nancy M. and Marianne B. Sheldon. "Women in the Labor Force." *Women: A Feminist Perspective*, 5th ed. Ed. Jo Freeman. Mayfield Publishing Company: Mountain View, California, 1995, pp. 197-219.

Treiman, Donald J. and Heidi I. Hartmann, eds. *Women, Work, and Wages: Equal Pay for Jobs of Equal Value*. National Academy Press: Washington, D.C., 1981.

Zellner, Harriet. "The Determinants of Occupational Segregation." *Sex Discrimination and the Division of Labor*. Cynthia B. Lloyd, ed. Columbia University Press: New York, New York, 1975, pp. 125-45.