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The Gender Wage Ratio: Does it Differ Between Races?

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I. Introduction

In 1964 the Civil Rights Act made it illegal for employers to discriminate against individuals on the basis of race, color, religion, sex, and national origin (Coleman, 2003). This act was passed to help bring equality to men and women of all races; however, a gender wage gap still exists. Up until the 1970s it was estimated that women made only 60% compared to their male counterparts in earnings. Since then the wage difference between men and women has continually decreased due to the large number of women entering the labor force, the outlawing of gender discrimination, and an increase in the number of women attending colleges and professional schools (Stone, 2004). According to Blau, in 2003 women earned 76% of men's wages (2006).

An even more interesting aspect of the gender wage gap is the way it differs between blacks and whites. For instance, in 1975 white women earned 42.5% less than white men, while today white women earn only 21% less than white men (Green, 2005). Similarly, black women also earn less than black men, but not by as much of a margin. In fact, in 1975 black women earned 24.9% less than black men and in 2003 they earned only 10.7% less (Green, 2005). Although there have been many studies to understand why the gender wage gap exists, there have been few studies done to understand how the gap differs across racial groups and the role that labor force attachment plays in explaining the female-male wage ratio.

This study examines the effects of labor force attachment in determining wages for black women, black men, white women, and white men. It follows a cohort of black and white men and women from 1980 through 2002 in order to explore the effect of labor force attachment on the female-male wage ratio. Section II reviews the related literature,

section III explains the empirical model, section IV reveals the results, and section VI conducts counterfactual analysis of the results.

II. Review of the Literature and Theory

From the work of many economists, two main theories have been developed to explain gender and racial wage gaps. The first is the human capital theory which states that a worker's productivity is based on his or her skills and qualifications, which are otherwise known as his or her human capital (Borjas, 2000). According to the human capital theory, workers with the same human capital will earn the same wages (Borjas, 2000). To increase their wages, individuals can invest in their human capital now which will increase their productivity in the future (Blau, 2006). Examples of human capital investments include education, labor force experience, and job tenure (Tomaskovic-Devey, 1993).

Within the human capital theory there have been some differing views among economists. For instance, some economists argue that individuals, specifically men and women, are not perfect substitutes in the labor force (Blau, 1994). They argue that women make less because, on average, they have fewer skills than men and perform differently in the marketplace. According to Polachek, "women invest in different amounts and types of education and training because they expect to participate in the labor force intermittently" (Green, 2005). This difference in investments between men and women can translate into a difference in skills or human capital.

Some economists think the human capital theory does not hold because of discrimination in the workforce. Discrimination in the labor market is the second theory

used to explain gender and racial wage gaps. This theory was developed after many economists discovered there was still a gender and racial wage gap after controlling for human capital variables such as skills and education. In fact, many new studies show that as much as thirty-eight percent of the gender wage gap is not accounted for by human capital variables (Green, 2005). Some economists attribute the unexplained differences in the gender wage gap to discrimination in the work place.

In addition to contributing to the gender wage gap, discrimination can also cause the wages between blacks and whites to differ. According to Becker's taste theory, discrimination in the labor market is relevant for both the race and gender wage gap (Green, 2005). For example, in a survey done by Kirshenman and Neckerman (1991) given to Chicago based employers, many employers admitted to discriminating against inner city workers and blacks (Coleman, 2003). Their study is one of many that demonstrate how discrimination may be the cause of gender and racial wage gaps.

One of the most notable human capital differences between women and men is their labor force attachment. According to Mary Corcoran and Greg J. Duncan, women in the 1970s spent significantly less time in the labor force than men (1979). Even though women were increasing their total labor force participation compared to earlier generations, there were few who participated continuously and worked full-time as most men did (Moen & Smith, 1986). Instead, they often left the labor market in order to bear or raise children in their early years of employment (Corcoran, 1978).

In contrast, today more women are choosing to stay in the labor market either full-time, intermittently, or part-time (Blank, 1989). This increase in labor force attachment can best be seen in the changing trends among female labor force behaviors. For

example, women are now much more likely to work while pregnant, which increases their labor force attachment. In the 1960s, only 44% of women worked while pregnant compared to 67% of women who work while pregnant today (Blau, 2006). In addition, women are also more likely to return to work after having a child. For instance, in the 1960s, 17% of women would be back to work in three months and 21% of women would be back in six months compare to the 58% who would be back to work in three months and 70% of women who would be back to work in six months today (Blau, 2006). This change in attachment may be the result of changing attitudes toward work. In the 1970s most women who worked did so because of financial need, whereas in the 1980s and 1990s more women who worked did so because of a preference to work (Herring & Wilson-Sadberry, 1993).

While women's attitudes to keep working after marriage and childbirth have changed, women who choose to leave the labor force even for short periods of time still face detrimental long term effects to their human capital. According to Blau, the "[h]uman capital theory suggests that the weaker attachment to the labor force of women who follow traditional gender roles means they will acquire less... valuable on-the-job training" (2006). More specifically, leaving the labor force affects women in three main ways: their human capital may decline, those who plan to leave may actually postpone job training until their return, and they may receive less job tenure, total work experience, and seniority (Corcoran and Duncan, 1979). As a result of these effects, women who participate intermittently or part-time may receive lower wages than their male counterparts who historically do not take such leaves from the marketplace. In fact, the average woman's wages can be as much as 19% lower immediately following a reentry

than before leaving (Corcoran, 1978). This drop in wages might never be regained by women. In fact, according to Blau, the gender wage gap actually increases as individual men and women progress through their career because women usually receive less work experience than men (2006).

Although women in general have become more attached to the labor market, the level of attachment differs between black and white women. For instance, black women have traditionally been more attached to the labor force than white women because black women are more likely to be single family heads, and therefore solely responsible for the family's income (Blau, 2006). Also, according to Herring and Wilson-Sadberry, black women have traditionally not had the privilege of a "solo high income model" and have therefore had to work (1990). Similarly, the effects of labor force intermittency are different between black females and white females. For instance, each year out of the labor force reduces an average black female's wages by 1.9% (Antecol & Bedard, 2002). In contrast, a white female's wages are decreased by 4.8% for every year absent from the labor force (Antecol & Bedard, 2002). Therefore, although all females are less attached than males, white females may be at more of a relative disadvantage to white males than black females to black males because black females are more attached and less affected by labor force intermittency.

It is also true that the labor force attachment rates are different for black men and white men. Although participation rates for all males have decreased, the decrease has been much more significant for black males (Blau, 2006). Blau attributes some of this decrease to an expansion of government disability programs, the lack of incentives for blacks to invest in education, an increase in the incarceration of black males, and stricter

enforcement of child support laws (2006). All of these changes negatively affect black male market participation and, therefore, labor force attachment. However, even those blacks who do participate in the labor market consistently still may not have the same opportunities as white males. In fact, Shapiro points out that the average black male receives significantly less on-the-job training than a white male counterpart (1984). Therefore, because black males receive less training their wages will experience a slower growth rate than those of white males (Shapiro, 1984).

From the above literature review six main facts arise that have direct implications on the female-male wage ratio and how it differs between races. First, black females' labor force attachment has increased. Second, black females are more attached to the labor force than white females. Third, white females face more wage penalties from withdrawing from the labor force than black females. Fourth, employed black males, on average, receive less on-the-job training than employed white males and have become less attached to the labor market. Fifth, the female-male wage ratio decreases over time because women are traditionally less attached to the labor force than men. Finally, many economists have cited discrimination as a cause for the gender and racial wage gaps.

Based on these facts and the human capital theory I have made two main hypotheses:

- Hypothesis 1: The female-male wage ratio for blacks will be higher than the female-male wage ratio for whites
- Hypothesis 2: Over time, the female-male wage ratio will decrease at a slower rate for blacks than for whites

IIV. Empirical Model

The purpose of this research is to examine differences in the female-male wage ratios for blacks and whites and to determine the effects of labor force attachment on the female-male wage ratios. To test the two hypotheses, I will examine four different cohorts using the National Longitudinal Survey of Youth (NLSY) data set which is constructed from in-person interviews with 12,686 individuals thirteen through twenty-one years old in 1979. The survey interviewed the individuals every year through 1996 and every other year after 1996. This study uses data for every other year from 1980 through 2002. The model will examine individuals' highest grade completed, hours worked in the current year, and labor force attachment to determine each group's total wages, salary and tips. This study only includes individuals for whom there is data for all variables in the time periods examined. Although this may bias my study because those who chose not to participate in the survey may be unemployed or not in the labor force, there was no other way to conduct my analysis. Table 1 shows the number of individuals in each group.

Table 1: Number of Individuals in each Regression Group

	1986	1994	2002
Black Females	783	1,033	1,079
Black Males	685	947	999
White Females	1,422	1,808	1,897
White Males	1,239	1,699	1,749
Total	4,129	5,487	5,724

OLS regressions are used to test my hypothesis. My regression equation takes the following form and is run for years 1986, 1994, and 2002:

$$\text{WAGE} = \alpha + \beta_1 \text{HRSWRK} + \beta_2 \text{HIGHGRAD} + \beta_3 \text{SUMDISCON}$$

Separate regressions were run for black females, black males, white females, and white males, who were between the ages of twenty-one to twenty-nine in 1986, twenty-nine to thirty-seven in 1994, and thirty-seven to forty-five in 2002. All individuals are included regardless of their employment status since one of the main variables being tested is labor force attachment.

The WAGE variable is the dependent variable for this study and consists of the total wages, salary, and tips that an individual received for the current year. The wages for each time period are inflated to 2002 dollars. WAGE is regressed against total hours worked for the calendar year (HRSWRK), highest grade completed (HIGHGRAD), and the proxy variable for labor force attachment (SUMDISCON). The predicted signs of coefficients and variable definitions can be found in Table 2.

Table 2: Variable Definition and Expected Signs

Variable	Type	Explanation	Expected Sign
WAGE	Dependent	Total Income from wages, salary, and tips for the calendar year, adjusted to 2002 dollars.	
SUMDISCON	Independent	Proxy variable used to measure labor force attachment, specifically discontinuity. Calculated by summing the total number of years an individual was considered to have discontinuous labor force attachment for the previous six years.	Negative
HIGHGRAD	Independent	Highest grade completed by the individual.	Positive
HRSWRK	Independent	Total hours worked for the calendar year.	Positive

SUMDISCON is the proxy variable created to measure labor force attachment. It is calculated by summing the total number of years an individual had discontinuous labor force attachment for the previous six years. Each individual was considered to have discontinuous labor force attachment if she or he was unemployed or out of the labor force for four or more weeks during the year.

HIGHGRAD is the highest grade completed by the individual at the time of the study and ranges from 1 to 12 for each year in elementary and high school and 13 to 21+ for those pursuing additional degrees. Highest grade completed serves as a standard measure of human capital acquired through formal schooling and is used because there are often variations in the amount of formal schooling completed, even among individuals of the same gender and race.

HRSWRK is the total hours worked by the respondent in the calendar year. This variable serves as a proxy variable for each individual's current labor force attachment. It allows me to examine the returns to one hour of labor force participation after controlling for educational attainment and previous labor force attachment.

IV. Results

The key results of the regression are summarized in Table 3. All of the variables have the predicted coefficient signs and are significant.

Table 3: Regression Coefficients and T-Statistics

	CONSTANT	SUMDISCON	t-stat	HIGHGRAD	t-stat	HRSWRK	t-stat	Adj. R ²	N
Black Females									
1986	-5189	-2379	-8.69	955	7.38	7.95	26.47	0.666	783
1994	-14699	-2793	-8.29	1917	11.22	7.43	18.93	0.594	1033
2002	-28797	-7242	-4.58	3031	12.68	7.38	11.86	0.389	1079
Black Males									
1986	-10651	-3565	-7.59	1696	7.79	8.65	17.12	0.480	685
1994	-22321	-3621	-7.73	2708	11.92	8.75	16.48	0.519	947
2002	-65193	-8310	-2.79	6406	14.45	8.09	8.05	0.328	999
White Females									
1986	-10900	-1379	-5.14	1160	9.05	9.83	29.36	0.507	1422
1994	-15821	-3325	-9.89	1823	12.89	10.64	26.64	0.517	1808
2002	-30626	-6309	-3.54	2978	12.61	10.70	15.22	0.266	1897
White Males									
1986	-6150	-2996	-7.32	1250	6.89	10.18	20.06	0.345	1239
1994	-30632	-5253	-7.45	3424	13.34	12.10	14.48	0.286	1699
2002	-84698	-10115	-2.16	8188	19.46	12.37	9.78	0.256	1749

The coefficients for highest grade completed (HIGHGRAD) are positive and significant for each year. However, the coefficients differ by group as shown in Table 4 which displays the returns to education for each group. Table 4 shows the amount of additional yearly earnings an individual would receive for completing another year of schooling after controlling for previous labor force attachment and total hours worked in the calendar year. According to Table 4, both black males and white males have higher returns to formal education than black females and white females. In addition, the female-male ratio for returns to education is higher for blacks in 1994 and 2002, but is only higher for whites in 1986. These results may help support my first hypothesis that the female-male wage ratio will be higher for blacks than for whites, mainly because a

higher return to education increases an individual's wages. However, the results for other variables in the equation must be examined.

Table 4: Rewards for Education (HIGHGRAD Coefficient)

	1986	1994	2002
Black Females Returns to Education	\$955	\$1,917	\$3,031
Black Males Returns to Education	\$1,696	\$2,708	\$6,406
Black Female-Male Ratio for Returns to Education	0.56	0.71	0.47
White Females Returns to Education	\$1,160	\$1,823	\$2,978
White Males Returns to Education	\$1,250	\$3,424	\$8,188
White Female-Male Ratio for Returns to Education	0.93	0.53	0.36

As predicted, the coefficients to the proxy variable for labor force participation (SUMDISCON) are significant (Table 3). According to the results, all individuals are penalized for past discontinuous labor force participation. Table 5 shows the decrease in yearly earnings an individual would receive for every year they were discontinuous from the labor force after controlling for highest grade completed and hours worked in the calendar year. According to the table, black females are always less penalized than black males for labor force intermittency and white females are less penalized than white males for labor force intermittency in all time periods examined. These differences in past labor force intermittency penalties may be the result of females choosing occupations with minimum penalties for discontinuous labor force participation. It may also be why females are less attached to the labor market; because they are less penalized for leaving the market, they may choose to leave more often than males.

In addition, for all periods black females are penalized differently relative to black males than white females are relative to white males. The black female-male penalty

ratio for discontinuous labor force participation is higher than the white female-male penalty ratio for discontinuous labor force participation, as shown in the female-male penalty sections of Table 5. In other words, black females are less penalized relative to black males for discontinuous labor force participation than white females are relative to white males for past labor force participation. Therefore, the effects of labor force participation on the gender wage ratios are different for blacks and for whites which may help support my first hypothesis. However, the results for HRSWRK should still be explained.

Table 5: Penalty for Past Discontinuous Labor Force Participation (SUMDISCON Coefficient)

	1986	1994	2002
Black Females Penalty	-\$2,379	-\$2,793	-\$7,242
Black Males Penalty	-\$3,565	-\$3,621	-\$8,310
Black Female-Male Penalty Ratio	0.67	0.77	0.87
White Females Penalty	-\$1,379	-\$3,325	-\$6,309
White Males Penalty	-\$2,996	-\$5,253	-\$10,115
White Female-Male Penalty Ratio	0.46	0.63	0.62

The coefficient to HRSWRK is also positive and significant for all groups and time periods. As mentioned before, HRSWRK is the total hours worked by the respondent in the calendar year and serves as a proxy variable for each group's current labor force attachment. By looking at the coefficients of this variable, I can determine whether, even after controlling for previous labor force attachment and educational attainment, black and white females are rewarded equally for each hour worked as are black and white males. Table 6 shows the wage per hour that an individual receives for

the current year after controlling for highest grade completed and previous labor force attachment. From Table 6, it is easy to see that, *ceteris paribus*, both black females and white females earn less per extra-hour worked than black males and white males.

Table 6: Reward for Hours Worked (HRSWRK Coefficient)

	1986	1994	2002
Black Females Returns for Hours Worked	\$7.95	\$7.43	\$7.38
Black Males Reward for Hours Worked	\$8.65	\$8.75	\$8.09
Black Female-Male Reward Ratio for Hours Worked	0.92	0.85	0.91
White Females Reward for Hours Worked	\$9.83	\$10.64	\$10.70
White Males Reward for Hours Worked	\$10.18	\$12.10	\$12.37
White Female-Male Reward Ratio for Hours Worked	0.97	0.88	0.86

The previous discussion on hours worked shows that females are at a double disadvantage in the labor market. Not only are they less attached to the labor market than males, but they are rewarded less for the hours they do work. However, the difference varies according to race. The gender reward ratio for earnings per hour is higher for blacks in 2002, but is higher for whites in 1986 and 1994. The black female-wage ratio is between .85 to .92 and the white female-male wage ratio is between .86 and .97 for all periods. The female-male wage ratio in Table 6 shows that even after controlling for educational attainment (HIGHGRAD) and previous labor force attachment (SUMDISCON), an additional hour of work produces more income for males than for females. One explanation for the difference in rewards is marketplace discrimination.

In order to determine whether the female-male ratio is higher for blacks than for whites, the wages for each group were computed by inputting the means for each group into their respective equation. The means for each group can be found in Table 7.

Table 7: Means for Each Group

	SUMDISCON	HIGHGRAD	HRSWRK
	(Years)	(Grade Level)	(Hours)
Black Females			
1986	2.2	12.7	1172
1994	1.6	12.8	1332
2002	0.2	13.1	1657
Black Males			
1986	2.1	12.3	1495
1994	1.3	12.5	1688
2002	0.2	12.6	1893
White Females			
1986	1.8	13.1	1406
1994	1.3	13.4	1466
2002	0.2	13.7	1543
White Males			
1986	1.6	13.2	1941
1994	0.8	13.4	2187
2002	0.1	13.6	2248

The calculated wages are shown in Table 8. Because the average wages were calculated using the means for each group, the calculated wages are very similar to this data set's actual average wages. For all groups, the actual wages are within \$50 of the estimated wages.

Table 8: Wage Estimates from OLS Regressions

		1986	1994	2002
Black Females	1986	\$10,963	\$15,307	\$21,510
Black Males	1986	\$15,650	\$21,739	\$29,417
White Females	1986	\$15,625	\$20,041	\$25,501
White Males	1986	\$25,262	\$37,740	\$53,500

Next, the female-male wage ratio was calculated for each racial group by dividing the estimated female wage by the estimated male wage. The estimated wage ratios can be found in Table 9. Because the estimated wages were so similar to the actual wages, these calculated ratios are also very similar to the actual female-male wage ratios for this dataset.

Table 9: Estimated Female-Male Wage Ratios

	1986	1994	2002
Black Female-Male Wage Ratio	0.70	0.70	0.73
White Female-Male Wage Ratio	0.62	0.53	0.48

According to Table 9, the female-male wage ratio is higher for blacks than for whites. Over the years, the average black woman earned 70% of what the average black man made in 1986, 70% of what the average black man made in 1994, and 73% of what average black man made in 2002. In contrast, the average white woman only made 62% of what the average white man made in 1986, 53% of what the average white man made in 1994, and 47% of what the average white man made in 2002. Therefore, my first hypothesis that the female-male wage ratio is higher for blacks than for whites is supported.

In addition to supporting my first hypothesis that the female-male wage ratio will be higher for blacks than for whites, this analysis also partially supports my second hypothesis that there will be a slower decrease in the female-male wage ratio for blacks compared to whites over time. Table 9 shows that although there is a decrease in the female-male wage ratio for whites as predicted, there is no decrease in the female-male

wage ratio for blacks. In fact, the female-male wage ratio for blacks actually increases over time. This may be because, as mentioned earlier, the average black man receives significantly less on-the-job training so his wage may experience a slower growth rate compare to the average white male. However, this is only one of many possible explanations as to why the female-male wage ratio does not decrease for blacks over time. It may also be the result of an increase in black females' labor force attachment or decreases in black males' labor force attachment.

These results for the black female-male wage ratio go directly against Blau's findings that the female-male wage ratio decreases over time. One possible explanation could be that in most studies done on the gender wage gap minorities are often underrepresented, so when results are produced, they often represent trends common among the majority. Therefore, although in Blau's study the female-male wage ratio may have decreased over time when all races were included, in my study it did not for blacks because they were examined separately. This discrepancy in results shows the importance of studying the gender wage ratios individually for each race.

V. Counterfactual

In order to further understand the female-male wage ratio, I examined whether the gender disparities in wages would diminish if women had the same earning equation as men. To simulate this situation, I input the black and white females' mean SUMDISCON, HIGHGRAD, and HRSWRK into the black and white male equations to compute a new average black and white females' total wage for each year. Then I compared the estimate to the average male earnings and determined a new female-male

wage ratio by dividing the new female earnings by the original male earnings. The results can be seen in Table 10.

Table 10: New Female Calculated Wages and Female-Male Wage Ratio

	1986	1994	2002
Black Females	\$13,103	\$18,269	\$30,284
Black Males	\$15,650	\$21,739	\$29,417
White Females	\$19,112	\$26,431	\$44,811
White Males	\$25,262	\$37,740	\$53,500
Black Gender Wage Ratio	0.84	0.84	1.03
White Gender Wage Ratio	0.82	0.82	0.66

Table 10 shows that if women had the same earning equation as men the female-male wage ratio for both racial groups would increase. In fact, by 2002 the female-male wage ratio would be about equal for blacks. When compared to the original estimated female-male ratios in Table 9, the female-male wage ratios increased by between .13 and .26 for blacks and .13 to .36 for whites. These results show that differences in the earning equation for females and males greatly affect the female-male wage ratio. The fact that males are rewarded more than females for continuity of past labor force participation, current labor force participation, and additional years of schooling explains a large amount of the gender wage gap. This difference in rewards may be the result of gender discrimination.

VI. Conclusion

This research study showed that the gender wage ratios do differ between blacks and whites. Specifically, it supported my hypothesis that that the female-male wage ratio

is higher for blacks than for whites by comparing the female-male wage ratios for each group. In addition, by examining the same ratios, it showed that the female-male wage ratio decreases for whites over time but increases for black over time. Also, by looking at the coefficient for HRSWRK and HIGHGRAD, the study supported the argument that females receive less of a reward for additional hours worked and grades completed. In addition, the study showed that females are often times less penalized than males for labor force intermittency. Finally, through the counterfactual analysis, this study showed that the female-male wage ratio would be higher if females had the same earning equations as males.

From these findings, some further areas of study arise. As an extension to this research, additional variables such as number of children, presence of young children, marital status, test scores, job tenure, or industry of employment could be added to the empirical model. These variables might give a more insightful view into what is actually causing differences in the gender wage ratio. In addition, because the female-male wage ratio increases when women have the same earning equation as men, studies should be done to examine why the gender earning equations differ. Specifically, discrimination in the marketplace should be explored as a cause for differences in the earning equations.

Additional studies may also seek to examine why individuals are leaving the labor market because although some women may be leaving to bear children, others may be leaving to pursue additional schooling or training. Therefore, the reasons for withdraw may have differing effects on wages. In addition, further studies could explore if changes in labor force attachment and wages are the result of aging subjects or a changing environment. As shown in Table 3, the R^2 decreases for each time period examined.

This decrease indicates that the model is not as accurate at explaining the dataset at later periods in time. Therefore, additional research should be done to explain why all the data from the same cohort is not as accurately explained by the same model. In addition, variables such as age could be included to determine if the cause is the result of an aging labor force. Finally, different cohorts could also be examined to see if they depict the same trends over time.

From the results of this study some policy implications arise. For instance, because women are at a double disadvantage in the labor force because they are less attached than men and are less rewarded for the current hours worked, incentives should be put in place to encourage females to stay attached to the labor market and obtain more on-the-job training and job tenure. In addition, because the returns to black male's education are so high, black males should be encouraged to seek higher education and stay attached to the labor market. Finally, programs should also be set in place to equalize the reward for labor force attachment and educational attainment across all race and gender groups. These programs may help minimize the differences in earning equations between female and males. Only then will the earning equations for all groups be equalized and individuals will be rewarded based on personal decisions for human capital attainment rather than biased earning equations.

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