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Wealth Discrimination Theory

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Abstract

One approach to analyzing inequality is to compare average economic choices from a classical theoretical framework. Another approach considers the impact of the formation of society, through statutes and institutions, on average economic outcomes. This paper studies the effects of slavery on black-white wealth inequality upon the emancipation of slaves in the US using historical data.

The purpose of wealth has varied from over time. From an economics perspective, wealth is the accumulation of resources that have market value and can be liquidated for present and future consumption. This study proceeds based on the most measurable assumption: households reside in a country with a mixed economy of markets and social planning, such that they have an incentive to accumulate material wealth for intertemporal household consumption and social influence. Becker (1957) and Arrow (1972) developed the most general theories of wage discrimination and favoritism. Oaxaca (1973) and Blinder (1973) have mechanized their theories for empirical analysis. While their findings are insightful, they cannot be directly applied to studying wealth differences since wealth is a complex combination of wages and other variables.

Finally, since unexplained differences in states that abolished slavery after the Civil War were 10 percent higher than unexplained effects in states that abolished slavery well before the Civil War and the magnitudes of the unexplained effects were similar over the long-run, we cannot reject the existence of a negatively bounded correlation between the duration of time from enslavement and the magnitude of unexplained differences in wealth.

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Keywords: wealth discrimination, economic inequality

1. Introduction

Many individuals look to a higher source of power, such as the holiness expressed in the King James Version of the Holy Bible, for a source of direction (i.e., Genesis 1:1; Genesis 1:27; Exodus 20:2-17; John 1:1; Romans 3:23-25, 1 Corinthians 6:12a), strength (i.e., Philippians 4:6,13; Hebrews 11:1), purpose (i.e., Jeremiah 29:11; 1 Corinthians 13:13), and provision (i.e., Matthew 6:33; Philippians 4:11; Hebrews 11:6). Since the days of old, differences in creation existed, for instance, the Holy Bible reads "Servants be obedient" (Ephesians 6:5). But it also reads "ye Masters, do the same … knowing your Master also is in heaven; neither is there respect of persons with him" (Ephesians 6:9). Seemingly juxtapositional scriptures, as read, suggest the issue of inequality in provisions among creation is monitored by the divinity expressed in holy documents, such as the Holy Bible. This produces an incentive to derive robust explanations for experiential differences in observed phenomena among creation and recommendations for progress.

The following is a skeleton review of literature, with supplemental discussions in Appendix C; a definition and theory of economic discrimination, with supplemental discussions in Appendix A and Appendix B; econometrics; measurements of economic discrimination; regression decomposition results; conclusions; and references.

2. Literature

Entering the 21st Century, Table 1 shows Blacks, Hispanics and women still have reduced labor market experiences relative to white men.

Table 1. Recent labor market statistics across race, ethnicity & gender

	Males			Females		
	White	Black	Hispanic	White	Black	Hispanic
1995 % of White Male:						
Hourly Wage	$ 19	66%	64%	65%	54%	58%
Annual Earnings	$36,200	65%	57%	57%	49%	43%
Weeks Worked	42	81%	91%	81%	74%	62%
Hours/Week Worked	38	79%	90%	73%	69%	58%
1997 Percentage:						
LFP Rate	78%	72%	84%	60%	64%	57%
Unemployment Rate	4%	9%	6%	4%	9%	8%
College Degree +	27%	13%	11%	22%	14%	10%

Source: Calculations from 1995 CPS data reported in Table 1 on page 3147 from Altonji and Blank, “Race and Gender in the Labor Market,” in Handbook of Labor Economics edited by Ashenfelter and Card, 1999; Borjas, 1999, p. 343.

Modern economic progress is slowing for blacks relative to whites. Table 1 shows the unemployment rate of black males doubled the rate of white males and the unemployment rate of black females doubled the rate of white females. Juhn, Murphy and Pierce (1991) also show a slowdown in black-white wage convergence: in the Mid-1960’s, Blacks earned 55% of white hourly wages; in the late 1970’s: Blacks earned 70% of white hourly wages; and in the late 1980’s, Blacks earned 70% of white hourly wages.

New evidence from James Curtis Jr in Figure 1 and Figure 2 demonstrates persistent black-white differences in wealth & homeownership. Figure 1 demonstrates convergence in wealth levels through most of the 20th century until the start of the 21st century, when stagnation in convergence is observed.

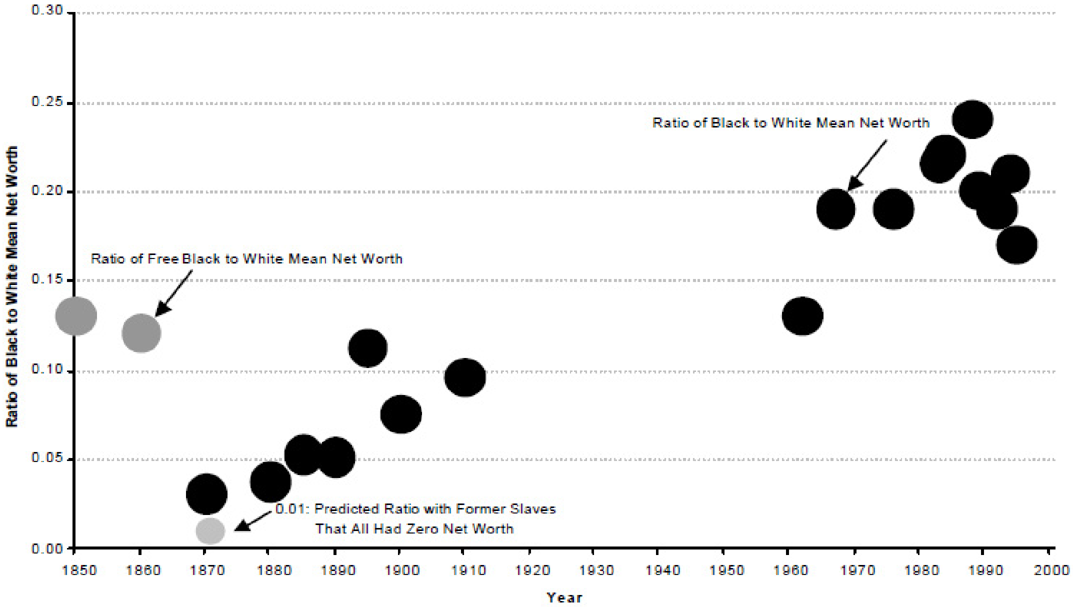

Figure 1. Ratio of black to white wealth/net worth, 1850-2000

Source: Metafile of Black-White Wealth Studies; 1850-70 IPUMS Data, James Curtis Jr.

Furthermore, stagnation in homeownership convergence occurred upon the beginning of the 21st century.

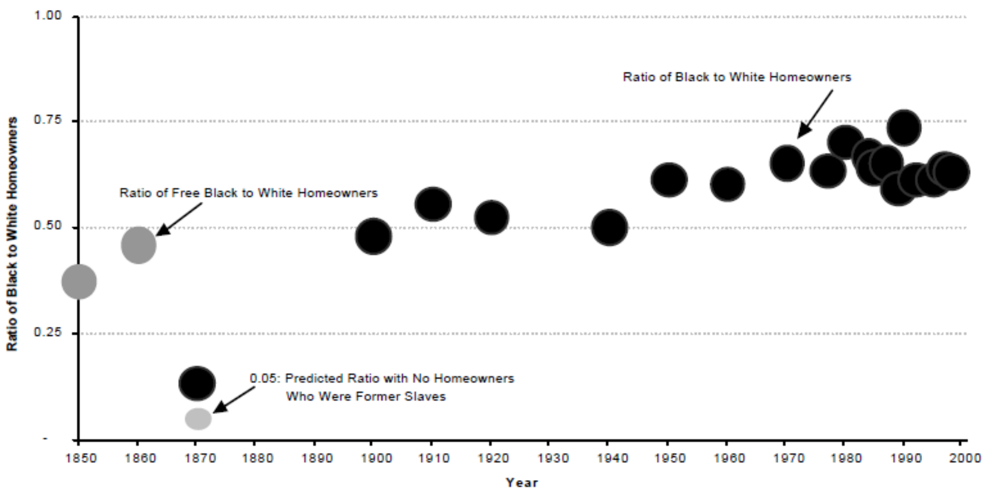

Figure 2. Ratio of black to white homeowners, 1850-2000

Source: Metafile of Homeownership Studies; 1850-70 IPUMS Data, James Curtis Jr.

Furthermore, Table 2 demonstrates observations by Melvin Oliver and Thomas Shapiro: large late-20th century differences in wealth among blacks and whites occurred across income groups.

Table 2. Wealth across income & race

Income Groups As % of White	White Mean ($ 000)	White Median ($ 000)	Black Mean Ratio	Black Median Ratio
1983 Net Worth:				
Less than 10,799	$ 35	$ 11	0.25	0.01
10,800 – 24,999	53	29	0.35	0.15
25,000 – 49,999	77	50	0.42	0.36
More than 50,000	197	114	0.39	0.49
1983 Net Financial Assets:				
Less than 10,799	$ 14	$ 0	0.05	0.00
10,800 – 24,999	23	3	0.15	0.00
25,000 – 49,999	33	6	0.20	0.00
More than 50,000	126	37	0.25	0.18

Source: 1983-1984 CPS data reported in Table 6 on page 19 from Oliver and Shapiro, "Race and Wealth" in the Review of Black Political Economy, Spring 1989.

Juhn, Murphy and Pierce (1991) observed a sustained gap among blacks and whites with college degrees: in 1965: 13.9 percent of whites, compared to 4.6 percent of blacks had college degrees, producing a 9.3 percent gap; in 1975: 19.7 percent of whites, compared to 7.4 percent of blacks had college degrees, producing a 12.3 percent gap; and in 1985: 25.2 percent of whites, compared to 13.4 percent of blacks had college degrees, producing 11.8 percent gap. Many researchers suggest these type of schooling gaps explain differences in measured economic outcomes. However, Table 3 demonstrates large black-white wealth differences even when controlling for schooling differences.

Table 3. Wealth across age, income, education & race

Ratio of Black to White Wealth Across Income & Education Groups	Age of Head of Household: Under 35	35 - 54	55 - 64	Over 65
$5,000 in Family Income in 1967:				
High School Diploma	0.22	0.12	0.17	0.16
Some College	0.22	0.18	0.32	0.19
College Degree + *(less than 3% of blacks)*	0.53	0.44	0.62	0.56
$10,000 in Family Income in 1967:				
High School Diploma	0.25	0.14	0.20	0.18
Some College	0.25	0.21	0.36	0.22
College Degree + *(less than 1% of blacks)*	0.63	0.50	0.71	0.64
$25,000 in Family Income in 1967:				
High School Diploma	0.30	0.17	0.24	0.22
Some College	0.30	0.25	0.44	0.26
College Degree + *(less than 1% of blacks)*	0.73	0.61	0.86	0.77

Source: 1967 SEO data reported in Table 5 on page 376 from Terrell, Wealth Accumulation of Black and White Families: The Empirical Evidence, Journal of Finance, 1971.

3. The Definition and Theory of Economic Discrimination

3.1 Discrimination

Gregory Mankiw defines Discrimination as the offering of different opportunities to similar individuals who differ by color of skin, ethnicity, gender, age or other characteristic (Mankiw, 1997, p. 408).

3.2 Statistical Discrimination

Statistical Discrimination is making predictions about a person based on membership in a certain group (Stockton, 1999, p. 434), or using an individual's membership in a certain group as information on the individual's skill and productivity (Borjas, 2000, p. 357).

3.3 Economic Discrimination [Practical Labor Market Discrimination]

Practical labor market discrimination is based on observed and quantified outcomes in the economy; wide disparity in income, earnings, and wage rates among a variety of demographic groups, classified by gender, color, ethnicity and other characteristics. The disparities are systematic, persistent and considered by most observers to be inequitable (Cain, 1986, p. 694).

3.4 Economic Discrimination [Theoretical Labor Market Discrimination]

Theoretical labor market discrimination is the analysis under what conditions will essentially identical goods have different prices in the competitive markets? Discrimination in the labor market takes labor services as the good in question and the wage rate as the price. Labor services are considered essentially identical if they have the same productivity in the physical or material production process; a consideration that excludes the effect of the laborer on the psychic utility (or disutility) of his or her coworkers or employers (Cain, 1986, p. 695).

3.5 Economic Discrimination [Becker Definition of Economic Discrimination]

Gary Becker defines economic discrimination as the following: If an individual has a "taste for discrimination", he must act as if he were willing to pay something, either directly or in the form of reduced income, to be associated with some persons instead of others. Different levels of discrimination against a particular group are associated with: [a] different levels of social and physical distance from that group [which is the sociological analysis], [b] different personality types [which is the psychological analysis], and [c] separate factors of production. All persons who contribute to the production process in the same way are put into one group, such as the sale of labor services [which as the economic analysis] (Becker, 1957, p. 14).

Gary Becker presents a discrimination coefficient (d), which is defined as "tastes for discrimination" for different factors of production, employers and consumers. The money costs of a transaction do not always completely measure net costs and a discrimination coefficient acts as a bridge between money and net costs (Becker, 1957, p. 14). For instance, [a] A factor of production (or an employee) is offered a net money wage [$w - d$], [b] Employers pays a net rental rate of capital [$r + d$], or [c] Consumers pay a net commodity price [$p + d$].

Gary Becker also presents a market discrimination coefficient (MDC), which is the proportional difference in wage rates due to discrimination (Becker, 1957, p. 17). Consider the example of **imperfect substitutes**, where there are two groups, one and two, who are imperfect substitutes in the production process. Then, they may receive different wage rates even in the absence of discrimination [$w_1^* \neq w_2^*$]. A more general definition of the MDC sets the MDC equal to the difference between the ratio of two group's wage rates with discrimination [$w_1 \neq w_2$] and without discrimination (Becker, 1957, p. 17). Then: $MDC = w_1/w_2 - w_1^*/w_2^*$.

Also, consider the example of **perfect substitutes**. Suppose there are two groups, one and two, whose members are perfect substitutes in the production process. In the absence of discrimination and nepotism and if the labor market were perfectly competitive, their equilibrium wage rates would equal [$w_1^* = w_2^*$]. However, equilibrium wage rates with discrimination cause wages not to equal [$w_1 \neq w_2$] (Becker, 1957, p. 17). Then, $MDC = w_1/w_2 - w_1^*/w_2^* = w_1/w_2 - w_2^*/w_2^* = w_1/w_2 - 1$.

We can rationally analyze labor market discrimination using economic theory, in the form of linear programming and the firm's optimization problem:

Equation 1a: A presentation of the arrow model of discrimination

- Consider the following model, formalized by Arrow (1972), where owners of firms seek to maximize their utility, which includes short-run profits & types of labor:
  - Let:
    - y = output produced by the firm
    - p_y = competitive market output price
    - K_o = fixed quantity of capital
    - r = competitive rental rate of capital
    - L_1 = labor demanded from group one
    - w_1 = wage paid to group one laborer
    - L_2 = labor demanded from group two
    - w_2 = wage paid to group two laborer
    - π = profit earned by the firm
    - U = utility from earning profits (+) and employing members of group one (+) and group two (-)
  - Firms choose L_1^* and L_2^* to:

$$\text{Max } U(\pi, L_1, L_2)$$
$$\text{s.t. } \pi = p_y y - rK_o - w_1L_1 - w_2L_2$$
$$\text{where } y = f(K_o, L)$$
$$L = L_1 + L_2$$
$$\partial U/\partial L_1 \geq 0 \text{ and } \partial U/\partial L_2 \leq 0$$

$$\Rightarrow \text{Max } U(p_y f(K_o, L_1+L_2) - rK_o - w_1L_1 - w_2L_2, L_1, L_2)$$

Equation 1b: The first order condition of the arrow model of discrimination for group 1

- First Order Condition for group one (+):

$$\frac{\partial U}{\partial L_1}: \frac{\partial U}{\partial \pi}\left[\frac{\partial \pi}{\partial f} * \frac{\partial f}{\partial L_1} - \frac{\partial \pi}{\partial L_1}\right] + \frac{\partial U}{\partial L_1} = 0$$

$$\frac{\partial U}{\partial \pi}\left[(p_y)(MPL_1) - (w_1)\right] + \frac{\partial U}{\partial L_1} = 0$$

$$\left[(p_y)(MPL_1) - (w_1)\right] = -d_1$$

$$\text{where } d_1 = \frac{\partial U}{\partial L_1} \Big/ \frac{\partial U}{\partial \pi} \geq 0$$

$$\text{Given: } \left[(p_y)(MPL_1) - (w_1)\right] = -d_1$$

$$\text{Then: } p_y MPL_1 = w_1 - d_1$$

$$\text{For example: } 50 = 60 - 10$$

$$\text{Thus: Value of } MPL_1 < w_1$$

Equation 1c: The first order condition of the arrow model of discrimination for group 2

- First Order Condition for group two (-):

$$\frac{\partial U}{\partial L_2}: \frac{\partial U}{\partial \pi}\left[\frac{\partial \pi}{\partial f} * \frac{\partial f}{\partial L_1} - \frac{\partial \pi}{\partial L_2}\right] + \frac{\partial U}{\partial L_2} = 0$$

$$\frac{\partial U}{\partial \pi}\left[(p_y)(MPL_2) - (w_2)\right] + \frac{\partial U}{\partial L_2} = 0$$

$$\left[(p_y)(MPL_1) - (w_2)\right] = -d_2$$

$$\text{where } d_2 = \frac{\partial U}{\partial L_2} \Big/ \frac{\partial U}{\partial \pi} \leq 0$$

$$\text{Given: } \left[(p_y)(MPL_2) - (w_2)\right] = -d_2$$

$$\text{Then: } p_y MPL_2 = w_2 - d_2$$

$$\text{For example: } 50 = 40 - (-10)$$

$$\text{Thus: Value of } MPL_2 > w_2$$

Equation 1d: The interpretation of the arrow model of discrimination

- Wages - the discriminating firm offers wage rates s.t.:

  $w_1 >$ *value of marginal product of labor* $> w_2$

  i.e. $60 > 50 > 40$

  or the discriminating firm offers members of group one a wage that exceeds the wage offered to members of group two even though the value of their marginal products are the same.

- Profits - Comparing profits from the discriminating firm (π_d) and non-discriminating firm (π^*),

  Given: $\pi = p_y y - rK_o - w_1L_1 - w_2L_2$

  $p_y MPL_1 = w_1 - d_1$ where $d_1 \geq 0$
  $p_y MPL_2 = w_2 - d_2$ where $d_2 \leq 0$

  Then:

$$\pi_d = p_y y - rK_o - (p_y MPL_1 + d_1)L_1 - (p_y MPL_2 + d_2)L_2$$

$$\pi^* = p_y y - rK_o - (p_y MPL_1 \quad)L_1 - (p_y MPL_2 \quad)L_2$$

$$\pi_d - \pi^* = -(d_1 L_1 + d_2 L_2)$$

$$-(\ [+] \ + \ [-]\ )$$

$$[-] \ + \ [+]$$

Equation 1e: The profit conditions of the arrow model of discrimination

Case 1: No additional profits to discriminating ($\pi_d = \pi^*$)

In this case, $d_1 L_1 = - d_2 L_2$ and discrimination results in a transfer of resources from group two to group one *(Arrow, 1972, p. 188).*

Case 2: Negative profits due to discriminating ($\pi_d < \pi^*$)

In this case, $d_1 L_1 > - d_2 L_2$ and discrimination not only results in a net transfer of resources from group two to group one, but also a loss to owners of firms due to relatively larger preferences in favor of group one and the additional costs associated with these preferences.

Case 3: Positive profits due to discriminating ($\pi_d > \pi^*$)

In this case, $d_1 L_1 < - d_2 L_2$ and discrimination not only results in a transfer of resources from group two to group one, but a transfer of resources from group two to owners of firms due to relatively larger disutility from employing group two and the lower costs associated with this larger disutility.

Note that competition may encourage group two workers to work elsewhere and ultimately result in zero or negative profits for the discriminating firm. But employers may actually gain in pecuniary terms by their discrimination. Any individual employer would gain by a reduction in discrimination, but it is at least plausible that employers collectively gain by discrimination *(Arrow, 1972, p. 189).*

4. Econometrics

4.1 Definition of Econometrics

Econometrics "attempts to quantify economic reality and bridge the gap between the abstract world of economic theory and the real world of human activity ... Econometrics allows us to examine data and quantify the actions of firms, consumers and governments" (Studenmund, p. 3).

4.2 Economic Theory

Economic theory tells us about the anticipated direction (+/-) of changes in the economic environment. For example, theory suggests: An increase in income increases demand for goods; an increase in price decreases demand for goods.

4.3 Econometric Modeling

Econometric modeling allows us to measure the specific amount, or the magnitude of the change.

Consider following example: Let: $c^* = [a/(a + b)]\ [I/p]$ (from utility maximization); Then, $ln(c) = ln[a/(a + b)] + ln(I) – ln(p)$ such that the econometric or regression model is $ln(c) = B_o + B_1^* ln(I) – B_2^* ln(p)$ + error.

Simple Regression Model versus the Multivariate Regression Model

The simple regression model implies a dependent variable (c) is only explained by one independent variable, which is not realistic. For example, quantity (c) consumed is not just explained by price (p). The multivariate regression model implies a dependent variable (c) is explained by more than one independent variable, which is more realistic. For example, the combination of price (p) and income (I) explain quantity consumed (c).

Slopes (B_s)

The only difference between the simple and multivariate regression models is the calculation and the interpretation of the slope. The slope (B_k) from the multivariate regression model is the change in the dependent variable associated with a one-unit change in the independent variable, *holding constant the other independent variables in the equation*: $ln(\text{c}) = B_o + B_1^* \, ln(\text{I}) + B_2^* \, ln(\text{p})$ + error.

When using logs of the dependent variable, a slope becomes the elasticity and units become percentages.

4.4 Hypothesis Testing

Hypothesis Testing are statistical tests, such as t-tests, on the accuracy of slopes calculated in an econometric model before accepting the results. In the way in which the FDA withholds approval of a new medication that has a side effect more frequently than expected, economists withhold "accepting" a calculated coefficient until it pasts certain statistical or hypothesis tests (Studenmund, 1999, p. 126).

4.4.1 Sample Survey Data

A hypothetical survey is two questions to six families: How many meals does your family consume at restaurants per year? What is you annual family income? The hypothetical results of the survey are presented in Table 4.

Table 4. A Hypothetical survey of 6 families, annual income and restaurant meals/year

Family No.	No. of Restaurant Meals Per Year	Annual Income ($1000)
1	50	12
2	70	13
3	70	14
4	50	9
5	80	16
6	40	8

4.4.2 Least Squares

The line that "best fits" the data minimizes difference between the fitted line and the data. Let e_i be the difference between the one point on the line and one data point, then the smallest sum of e_i's seems to produce the best fitted line. But the smallest sum of e_i's can produce more than one estimate of the slope the line. Instead, by summing the square of each e_i, we can obtain one estimate of the slope. Hence, the line that "best fits" the data is a "least squares" regression line that minimizes the sum of squared error.

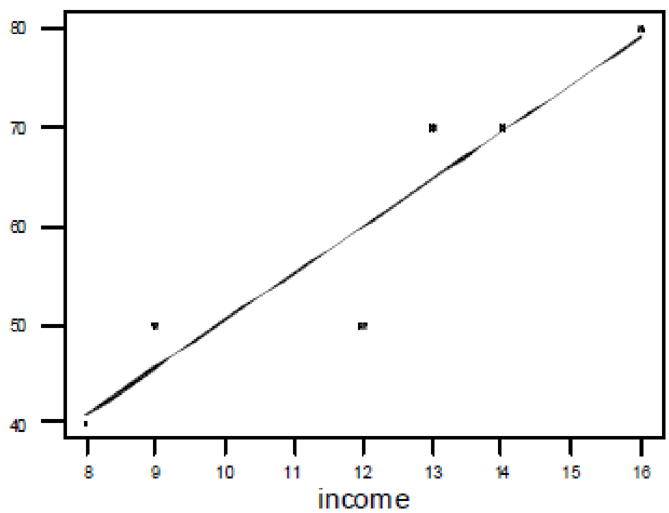

Figure 3. The fitted line from the hypothetical survey which minimizes the sum of squared error

Source: Data Analysis from James Curtis Jr (2001).

From utility maximization $c^* = [a/(a + b)] [I/p]$ such that $ln(c) = ln[a/(a + b)] + ln(I/p)$. Normalizing the price to 1, and analyzing the data in levels produces $c = B_o + B_1 I$ + error, where B_o is the y-intercept or "constant": The constant tells us how many restaurant meals that we would still consume if we have zero income (I = 0). B_1 is the slope of the fitted line: The slope tells us the change in the number of restaurant meals consumed we could expect with a one unit change in the value of annual income.

4.5 Empirical Results

Empirical results are the output from the econometric model and statistical software (or calculations using a calculator), where $c = 2.6 + 4.78 I$ and where estimated $B_o = 2.6$. Thus, we can predict that families will visit restaurants 2.6 times annually even if they have zero annual income. Estimated $B_1 = 4.78$. Thus, we can predict that the number of annual restaurant visits increase by 4.78 with one unit (one thousand dollar) increase in annual income.

5. Measurements of Economic Discrimination

We can apply these lessons from econometrics to measure economic discrimination. Ronald Oaxaca (1973) mechanized empirical analysis of economics discrimination even though we do not have direct data on preferences in favor of group one, or the disutilities of employing group two. Oaxaca (1973) used Becker's (1957) market discrimination coefficient to conduct regression decomposition, known as the Oaxaca decomposition. The market discrimination coefficient (MDC) can be analyzed in terms of wages and income when members of group one and group two are perfect substitutes. Given: $MDC = (w_1 - w_2)/w_2 = w_1/w_2 - 1$, then: $ln\ (MDC) = ln\ (w_1) - ln\ (w_2)$. Differences in wealth can be analyzed using the MDC with additional theoretical considerations (Curtis Jr, 2002).

Using an econometric model for wages, income or wealth (w_i), then $ln(w_1) = B_{o1} + B_{11}Z_1 + error_1$ and $ln(w_2) = B_{o2} + B_{12}Z_2 + error_2$ where Z is a matrix of variables that determine wages, income or wealth. To form the regression decomposition, combine the log MDC and the econometric model.

Equation 2a: A presentation of regression decomposition based on the arrow theory of economic discrimination

- To form the regression decomposition, combine the log MDC and the econometric model such that:

Given: $ln\ (MDC) = ln\ (w_1) - ln\ (w_2)$

$$ln\ (w_i) = B_{oi} + B_{1i}Z_i + error_i$$

Then:
$$ln\ (MDC) = (B_{o1} + B_{11}Z_1 + error_1) - (B_{o2} + B_{12}Z_2 + error_2)$$

$$ln\ (MDC) = (B_{o1} - B_{o2}) + (B_{11}Z_1 - B_{12}Z_2) + (error_1 - error_2)$$

Let:
$$B_{11} = B_{12} + (B_{11} - B_{12})$$
$$Z_2 = Z_1 + (Z_2 - Z_1)$$

Then:
$$ln\ (MDC) = (B_{o1} - B_{o2}) + [B_{12} + (B_{11} - B_{12})]Z_1 - B_{12}[Z_1 + (Z_2 - Z_1)] + (error_1 - error_2)$$

Equation 2b: The interpretation of regression decomposition based on the arrow theory of economic discrimination

Then:
$$ln\ (MDC) = (B_{o1} - B_{o2}) + B_{12}Z_1 + (B_{11} - B_{12})Z_1 - B_{12}Z_1 + B_{12}(Z_2 - Z_1)] + (error_1 - error_2)$$

Then:
$$ln\ (MDC) = (B_{o1} - B_{o2}) + (B_{11} - B_{12})Z_1 + B_{12}(Z_2 - Z_1) + (error_1 - error_2)$$

where $(B_{11} - B_{12})Z_1$

= Unexplained differences in wages, income or wealth (due, in part, to discrimination)

where $B_{12}(Z_2 - Z_1)$

= Explained differences in wages, income or wealth (due to differences in skills)

6. Regression Decomposition Results

Empirical results of differences in economic outcomes between enfranchised groups and disenfranchised groups demonstrate significant unexplained differences in economic outcomes, even when controlling for classical choice characteristics.

6.1 Male and Female Wages

Oaxaca (1973) found 53 percent to 78 percent of wage differences among white males and white females in the United States were unexplained and 50 percent to 99 percent of wage differences among black males and black females in the United States were unexplained.

6.2 Black and White Wages

Determinants of gender and ethnic wages differences are comparable. Binder (1973) found 30 percent to 45 percent of wage differences among males and females in the United States were unexplained. Similarly, 20 percent to 35 percent of wage differences among blacks and whites in the United States were unexplained. Furthermore, Carlstom and Rollow (1998) found 37 percent to 39 percent of wage differences among blacks and whites in the United States were unexplained.

Carlstrom and Rollow (1998) also observed fair wage premium for blacks residing in non-southern states: they found 37 percent of wage differences among non-southern blacks and non-southern whites in the United States were unexplained, 44 percent of wage differences among southern blacks and southern whites in the United States were unexplained.

Nevertheless, this is preliminary evidence that the fair wage issue for females is, at least, proportional to the fair wage issue for blacks.

6.3 Black and White Housing Prices

Differences in the determinants of housing values were also observed and blacks and whites in the United States: 41 percent to 42 percent of differences in housing values among blacks and whites in the United States were unexplained (Long & Caudill, 1992).

6.4 Black and White Wealth

The analysis of differences in the determinants of the wealth by ethnicity is, at least as revealing or, more revealing than the analysis of wages and income. Becker (1957) and Arrow (1972) developed the most general theories of wage discrimination and favoritism. Oaxaca (1973) and Blinder (1973) have mechanized their theories for empirical analysis. While their findings are insightful, they cannot be directly applied to studying wealth differences since wealth is a complex combination of wages and other variables.

The purpose of wealth has varied from over time. From an economics perspective, wealth is the accumulation of resources that have market value and can be liquidated for present and future consumption. This study proceeds based on the most measurable assumption: households reside in a country with a mixed economy of markets and social planning, such that they have an incentive to accumulate material wealth for intertemporal household consumption and social influence. Appendix A contextualizes wealth regression decomposition results with models of grouped household decisions and social planner decisions. Appendix B contextualizes wealth regression decomposition results with models of a group-specific analysis of household wealth.

Most academic research has found that three out of every four US dollars of wealth held by white households represents the difference among blacks and whites in the United States which is unexplained. Blau and Graham (1990) found that 78 percent of differences in wealth among blacks and whites in the United States were unexplained in the late 20th Century. Similarly, Altonj, Doraszeski and Segal (2000) found that 70 percent to 94 percent of differences in wealth among blacks and whites in the United States were unexplained. Furthermore, Gittleman and Wolff (2000) found that 68 percent to 72 percent of differences in wealth among blacks and whites in the United States were unexplained.

James Curtis Jr (December, 2002) confirms that the source of contemporary black-white wealth differences have historical roots: 82 percent to 86 percent of differences in wealth among blacks and whites in the United States were unexplained by classical choice characteristics in the mid-19th century. Curtis Jr (2002) also observed a quasi-fairness wealth premium for blacks residing in non-southern states (i.e., states which abolished slavery before mass emancipation of southern slaves or states which never officially instituted slavery as a social practice): 78 percent of differences in wealth among blacks and whites in the non-southern states in the United States were unexplained while 88 percent of differences in wealth among blacks and whites in former southern slave states in the United States remained unexplained by classical choice characteristics.

Much like "the plight of the antebellum free black American, which, in hindsight, illuminated the path of the average black American after emancipation" (Curtis Jr, February, 2002), the experience of blacks in non-southern states, as early as 1870, provided insight to the experience of the contemporary Americans of diverse experiences attempting achieve the pursuit of happiness.

7. Reflections and Conclusions

Historical black-white differences in wealth were estimated using regression decomposition. This technique decomposes economic differences into the portion explained by differences in characteristics and the unexplained portion due to different returns to a set of characteristics (See, e.g., Blinder, 1973; Oaxaca, 1973). Reflecting on the analyses of James Curtis Jr (2002), results confirm that we cannot reject that the claim that, when comparing the wealth of ex-slaves to the wealth whites, differences in wealth due to unexplained (or discrimination) effects dominate the portion due to classical characteristic differences.

Furthermore, the size and source of contemporary black-white wealth differences have historical roots: In 1870, at least 75 percent of white-black wealth differences were not explained by characteristic differences described by the classical model when employing the primary index. This is consistent with wealth decompositions of late twentieth century data that shows that three-quarters of white-black differences in wealth were unexplained (See, e.g., Blau & Graham, 1990).

Finally, since unexplained differences in states that abolished slavery after the Civil War were 10 percent higher than unexplained effects in states that abolished slavery well before the Civil War and the magnitudes of the unexplained effects were similar over the long-run, we cannot reject the existence of a negatively bounded correlation between the duration of time from enslavement and the magnitude of unexplained differences in wealth.

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Appendix A

Agent-Specific Constraints

$\mathbf{MAX}\{\mathbf{x}_{nij} \geq 0\}\ \mathbf{U} = \gamma_{\mathbf{U}}\prod_{SP=1}\boldsymbol{U}_{SP}^{\theta(SP)}$

subject to $\mathbf{X}_{ijSP} \leq \mathbf{E}_{ijSP}$

Let: $\boldsymbol{U}_{SP} = \gamma_{\boldsymbol{U}(SP)}\prod_{j=1}(\prod_{i=1}\boldsymbol{u}_{ij(SP)}^{\theta_{ij(SP)}})$

such that $\mathbf{U} = \boldsymbol{\gamma}^{*}\prod_{SP=1}[\prod_{j=1}(\prod_{i=1}\boldsymbol{u}_{ij(SP)}^{\boldsymbol{\theta}^{*}})]$

where $\boldsymbol{\gamma}^{*} = \gamma_{\mathbf{U}}\prod_{SP=1}\gamma_{\boldsymbol{U}(SP)}$

$\boldsymbol{\theta}^{*} = \theta_{ij(SP)}\theta_{(SP)}$

Further, let: $\boldsymbol{u}_{ijSP} = \gamma_{\boldsymbol{u}ijSP}\prod_{n=1}(\boldsymbol{x}_{(n)ij}-s_{\mathbf{x}(n)ijSP})^{\alpha(n)}$

such that $\mathbf{U} = \boldsymbol{\gamma}'\prod_{SP=1}[\prod_{j=1}(\prod_{i=1}(\prod_{n=1}(\boldsymbol{x}_{(n)ij}-s_{\mathbf{x}(n)ijSP})^{\boldsymbol{\alpha}(\mathbf{n})'}))]$

where $\boldsymbol{\gamma}' = \gamma_{\mathbf{U}}[\prod_{SP=1}\gamma_{\boldsymbol{U}(SP)}(\prod_{j=1}(\prod_{i=1}\gamma_{\boldsymbol{u}ijSP}))]$

$\boldsymbol{\alpha}(\mathbf{n})' = \alpha(n)\theta_{ij(SP)}\theta_{(SP)}$

Further, let: $\mathbf{E}_{ijSP} = \sum_{n=1}\boldsymbol{p}_{\mathbf{x}(n)}e_{\mathbf{x}(n)ijSP} + \boldsymbol{p}_{\mathbf{x}(l)}e_{\mathbf{x}(l)ij} + e_{ijSP}$ *for all n = 1,2,..,E ≠ l*

Further, let: $\mathbf{X}_{ij} = \sum_{n=1}\boldsymbol{P}_{\mathbf{x}(n)j}\boldsymbol{x}_{(n)ij} + \boldsymbol{p}_{\mathbf{x}(l)j}\boldsymbol{x}_{(l)ij}$

where $\boldsymbol{P}_{\mathbf{x}(n)j} = \boldsymbol{p}_{\mathbf{x}(n)}(1+\delta_{\mathbf{x}jg}+\sum_{q=1}t'_{q\mathbf{x}(n)})$

$\boldsymbol{P}_{\mathbf{x}(E)} = \eta(\mathrm{B})$

Therefore, the decision becomes:

$\mathbf{MAX}\{\mathbf{x}_{nij} \geq 0\}\ \mathbf{U} = \gamma'\prod_{SP=1}[\prod_{j=1}(\prod_{i=1}(\prod_{n=1}(\boldsymbol{x}_{nij}-s_{\mathbf{x}(n)ijSP})^{\boldsymbol{\alpha}(\mathbf{n})'}))]$

subject to $\sum_{n=1}\boldsymbol{P}_{\mathbf{x}(n)j}\,\boldsymbol{x}_{(n)ij} + \boldsymbol{p}_{\mathbf{x}(l)j}\boldsymbol{x}_{(l)ij} \leq \sum_{n=1}\boldsymbol{p}_{\mathbf{x}(n)}e_{\mathbf{x}(n)ijSP} + \boldsymbol{p}_{\mathbf{x}(l)}e_{\mathbf{x}(l)ij} + e_{ijSP}$

Further, let: $\sum_{n=1}\boldsymbol{p}_{\mathbf{x}(n)}e_{\mathbf{x}(n)ijSP} + \sum_{v=1}\boldsymbol{w}_{\boldsymbol{v}}\boldsymbol{h}_{\boldsymbol{v}ij} = \mathbf{W}_{ij}$

where $\boldsymbol{w}_{v} = \boldsymbol{p}_{\mathbf{x}(l)}$

$\boldsymbol{h}_{vij} = e_{\mathbf{x}(l)ij} - \boldsymbol{x}_{(l)ij}$

One Universal Constraint

$\mathbf{MAX}\ \{\mathbf{x}_{nij} \geq 0\}\ \mathbf{U} = \gamma_{\mathbf{U}}\prod_{SP=1}\boldsymbol{U}_{SP}^{\theta(SP)}$

Subject to $\mathbf{X} \leq \boldsymbol{\varepsilon}$

Further, let: $\boldsymbol{\varepsilon} = \sum_{SP=1}\boldsymbol{E}_{SP} + \boldsymbol{e}$

$\boldsymbol{E}_{SP} = \sum_{i=1}\sum_{j=1}\boldsymbol{E}_{ijSP} + \boldsymbol{e}_{SP}$

$\boldsymbol{E}_{ijSP} = \boldsymbol{E}_{\mathbf{x}(n)ijSP} + \sum_{i=1}\sum_{j=1}\boldsymbol{p}_{\mathbf{x}(l)}e_{\mathbf{x}(l)ij} + e_{ij}$ *for all n = 1,2,..,E ≠ l*

$\boldsymbol{E}_{\mathbf{x}(n)ijSP} = \sum_{n=1}\boldsymbol{p}_{\mathbf{x}(n)}e_{\mathbf{x}(n)ijSP}$

such that $\boldsymbol{\varepsilon} = \sum_{i=1}\sum_{j=1}\sum_{n=1}\boldsymbol{p}_{\mathbf{x}(n)}e_{\mathbf{x}(n)ijSP} + \sum_{i=1}\sum_{j=1}\boldsymbol{p}_{\mathbf{x}(l)}e_{\mathbf{x}(l)ij} + \mathbf{e}^{*}$

where $\mathbf{e}^{*} = \boldsymbol{e} + \sum_{SP=1}\boldsymbol{e}_{SP} + \sum_{i=1}\sum_{j=1}e_{ij}$

Further, let: $\mathbf{X} = \sum_{i=1}\sum_{j=1}\sum_{n=1}\boldsymbol{P}_{\mathbf{x}(n)j}\boldsymbol{x}_{(n)ij} + \sum_{i=1}\sum_{j=1}\boldsymbol{p}_{\mathbf{x}(l)j}\boldsymbol{x}_{(l)ij}$

where $\boldsymbol{P}_{\mathbf{x}(n)j} = \boldsymbol{p}_{\mathbf{x}(n)}(1+\delta_{\mathbf{x}jg}+\sum_{q=1}t'_{q\mathbf{x}(n)})$

$\boldsymbol{P}_{\mathbf{x}(E)} = \eta(\mathrm{B})$

Therefore, the decision becomes:

$\mathbf{MAX}\{\mathbf{x}_{nij} \geq 0\}\ \mathbf{U} = \gamma'\prod_{SP=1}[\prod_{j=1}(\prod_{i=1}(\prod_{n=1}(\boldsymbol{x}_{nij}-s_{\mathbf{x}(n)ijSP})^{\boldsymbol{\alpha}(\mathbf{n})'}))]$

subject to $\sum_{i=1}\sum_{j=1}\sum_{n=1}\boldsymbol{P}_{\mathbf{x}(n)j}\boldsymbol{x}_{(n)ij}+\sum_{i=1}\sum_{j=1}\boldsymbol{p}_{\mathbf{x}(l)j}\boldsymbol{x}_{(l)ij} \leq \sum_{i=1}\sum_{j=1}\sum_{n=1}\boldsymbol{p}_{\mathbf{x}(n)}e_{\mathbf{x}(n)ijSP}+\sum_{i=1}\sum_{j=1}\boldsymbol{p}_{\mathbf{x}(l)}e_{\mathbf{x}(l)ij}+\mathbf{e}^{*}$

Let: $\sum_{i=1}\sum_{j=1}\sum_{n=1}\boldsymbol{p}_{\mathbf{x}(n)}e_{\mathbf{x}(n)ijSP} + \sum_{v=1}\sum_{i=1}\sum_{j=1}\boldsymbol{w}_{\boldsymbol{v}}\boldsymbol{h}_{\boldsymbol{v}ij} = \sum_{i=1}\sum_{j=1}\mathbf{W}_{ij}$

where $\boldsymbol{w}_{v} = \boldsymbol{p}_{\mathbf{x}(l)}$

$\boldsymbol{h}_{vij} = e_{\mathbf{x}(l)ij} - \boldsymbol{x}_{(l)ij}$

A Model of Wealth

Let: $\mathbf{W}_{ij} = (1-g-\sum_{q=1}t_{q\mathbf{I}})\mathbf{I}_{ij} + \mathbf{A}_{ij} + (1-g)(\sum_{q=1}\mathrm{S}_{qij} + \mathrm{C}_{ij}) - \mathrm{G}_{ij}$

$\mathbf{I}_{ij} = \sum_{v=1}\boldsymbol{w}'_{m}\,\boldsymbol{h}'_{kij}$

$\boldsymbol{w}'_{m} = \boldsymbol{w}_{k} - \delta_{w(m)jg} - \sum_{q=1}t'_{q}$

$\boldsymbol{h}'_{mij} = \boldsymbol{h}_{mij} - \delta_{h(m)jg}$

where

$$\mathbf{A}_{ij} = [\,\mathbf{A}_{0ij}(1-g-\textstyle\sum_{q=1} t_{qA(0)}) + \sum_{a=1} N_{(1,a)ij}\,(1-g-\sum_{q=1} t_{qN(1,a)}) + \sum_{m=1}\gamma_{\pi(m)ij}\,\boldsymbol{\pi}_{Z(m)ij}(1-g)\,]\,(1+\gamma_{\rho_{ij}}\rho)(1-\sum_{q=1} t_{q\rho}) + \sum_{b=1} N_{(2,b)ij}\,(1-g-\sum_{q=1} t_{qN(2,b)}) - G_{\rho_{ij}} - \delta_{Ajg}(\rho,\mathbf{A}_{0ij})\,]$$

$$\mathbf{A}_{0ij} = A_{0ij}(\boldsymbol{x}_{n0},\gamma_{\mathbf{W}(0)ijF}\mathbf{W}_{0F}(I_0(\boldsymbol{w}_0,\boldsymbol{h}_0,S_0),A_0(A_{(-1)},N_0,\gamma_{0\,\pi}\pi_{0Z}),t_{0q},\delta_{0g},\gamma_{0\rho}))$$

$$\boldsymbol{\pi}_{Zij} = (\mathbf{P}_{Zj}\mathbf{Z}_{ij} + \textstyle\sum_{q=1} S_{qZij} - \sum_{d=1}\boldsymbol{P}_{Z(d)j}\boldsymbol{X}_{Z(d)ij})\,(1 - \sum_{q=1} t_q\,\pi)$$

$$\boldsymbol{P}_{Z\,j} = \boldsymbol{p}_{Z}(1 - \delta_{Zjg} + \textstyle\sum_{q=1} t'_{qZ})$$

$$\mathbf{Z}_{ij} = \gamma_{Zij}\textstyle\prod_{d=1}\boldsymbol{X}_{Z(d)ij}^{\;\beta(d)}$$

$$\boldsymbol{P}_{Z(d)\,j} = \boldsymbol{p}_{Z(d)}(1 - \delta_{Z(d)jg} - \textstyle\sum_{q=1} t'_{qZ})$$

$$\boldsymbol{X}_{Z(d)ij} = \boldsymbol{x}_{Z(d)ij} - \delta_{Z(d)jg}$$

Appendix B

A Model of Wealth Favoritism

To understand the determinants of wealth by groups, consider the following wealth identity:

[1]
$$W_{w,t} = exp\{(1+i_w)W_{w,t-1} + (r_{w,t}h_{w,t} - p_t c_{w,t})\}$$

where $W_{w,t}$ represents the portfolio of wealth for members of group w, at time t=1…T ; $W_{w,t-1}$ represents the previous period portfolio of wealth for members of group w, at time t=0…T-1 ; i_w represents the average interest rate earned on previous period portfolio of wealth for members of group w, at time t=1…T; $r_{w,t}$ represents the wages for group w, at time t=1…T; $h_{w,t}$ represents the number of hours worked for members of group w, at time t=1…T; p_t represents prices for goods consumed at time t=1…T; and $c_{w,t}$ represents the goods consumed by members of group w, at time t=1…T; such that:

[2]
$$W_{w,t} = exp\left\{\sum_{\tau=1}^{t}(1+i_w)^{t-\tau}(r_{w,\tau}h_{w,\tau} - p_\tau c_{w,\tau}) + (1+i_w)^t W_{w,o}\right\}$$

where $W_{w,o}$ are the initial assets of whites.

Now consider the wealth identity with discrimination or, more specifically, favoritism in favor of members of group w. Let $\delta_{k,w,\tau}$ represent the variable k favoritism coefficient for members of group w, at time τ=1…T, where $\delta_{k,w,\tau}>0$ for all variables, such that equation [2] becomes:

[3] $$W_{w,t} = exp\{\widetilde{W}_{w,t} + F_{w,t}\}$$

where

$$\widetilde{W}_{w,t} = \sum_{\tau=1}^{t}\left(1+\tilde{i}_w\right)^{t-\tau}\left(\tilde{r}_{w,\tau}\tilde{h}_{w,\tau} - p_\tau \tilde{c}_{w,\tau}\right) + \left(1+\tilde{i}_w\right)^{t}\widetilde{W}_{w,o}$$

$$F_{w,t} = \delta_{i,w}\sum_{m=1}^{t-\tau}\sum_{s=1}^{t-\tau}\left(1+\tilde{i}_w+\delta_{i,w}\right)^{t-m-1}\left(1+\tilde{i}_w\right)^{s-1}\cdot$$

$$\cdot\left(\tilde{r}_{w,\tau}\tilde{h}_{w,\tau} + \tilde{r}_{w,\tau}\delta_{h,w,\tau} + \delta_{r,w,\tau}\tilde{h}_{w,\tau} + \delta_{r,w,\tau}\delta_{h,w,\tau} - p_\tau\left(\tilde{c}_{w,\tau} + \delta_{c,w,\tau}\right)\right)$$

$$+\delta_{i,w}\sum_{m=1}^{t}\sum_{s=1}^{t}\left(1+\tilde{i}_w+\delta_{i,w}\right)^{t-m}\left(1+\tilde{i}_w\right)^{s}\left(\widetilde{W}_{w,o} + \delta_{W_o,w}\right)$$

$$+\sum_{\tau=1}^{t}\left(1+\tilde{i}_w\right)^{t-\tau}\left(\delta_{r,w,\tau}\left(\tilde{h}_{w,\tau}+\delta_{h,w,\tau}\right) - p_\tau\delta_{c,w,\tau}\right) + \left(1+\tilde{i}_w\right)^{t}\delta_{W_o,w}$$

where tilda represents the variable in absence of discrimination such that $\widetilde{W}_{w,t}$ is group w in absence of discrimination (favoritism) at time τ=1…T, and $F_{w,t}$ is the difference between the observed wealth and wealth in absence of discrimination due to favoritism for members of group w at time τ=1…T. The following comparative static analysis shows what happens to wealth with an increase in discrimination, such that:

[4] $$\frac{\partial \ln W_{w,t}}{\partial \delta_{r,w,\tau}} = \left[\sum_{\tau=1}^{t}\left(1+\tilde{i}_w\right)^{t-\tau} + \delta_{i,w}\sum_{m=1}^{t-\tau}\sum_{s=1}^{t-\tau}\left(1+\tilde{i}_w+\delta_{i,w}\right)^{t-m-1}\left(1+\tilde{i}_w\right)^{s-1}\right]h_{w,\tau} \qquad > 0$$

$$[\,5\,]\quad \frac{\partial\, ln\, W_{w,t}}{\partial \delta_{h,w,\tau}} = \left[\sum_{\tau=1}^{t}\left(1+\tilde{i}_w\right)^{t-\tau} + \delta_{i,w}\sum_{m=1}^{t-\tau}\sum_{s=1}^{t-\tau}\left(1+\tilde{i}_w+\delta_{i,w}\right)^{t-m-1}\left(1+\tilde{i}_w\right)^{s-1}\right] r_{w,\tau} \qquad > 0$$

$$[\,6\,]\quad \frac{\partial\, ln\, W_{w,t}}{\partial \delta_{c,w,\tau}} = -\left[\sum_{\tau=1}^{t}\left(1+\tilde{i}_w\right)^{t-\tau} + \delta_{i,w}\sum_{m=1}^{t-\tau}\sum_{s=1}^{t-\tau}\left(1+\tilde{i}_w+\delta_{i,w}\right)^{t-m-1}\left(1+\tilde{i}_w\right)^{s-1}\right] p_{\tau} \qquad < 0$$

$$[\,7\,]\quad \frac{\partial\, ln\, W_{w,t}}{\partial \delta_{W_o,w}} = \left(1+\tilde{i}_w\right)^{t} + \delta_{i,w}\sum_{m=1}^{t}\sum_{s=1}^{t}\left(1+\tilde{i}_w+\delta_{i,w}\right)^{t-m}\left(1+\tilde{i}_w\right)^{s} \qquad > 0$$

$$[\,8\,]\quad \frac{\partial\, ln\, W_{w,t}}{\partial \delta_{i,w,\tau}} = \sum_{\tau=1}^{t}\left(t-\tau+1\right)\left(1+\tilde{i}_B+\delta_{i,w}\right)^{t-\tau}\left(r_{w,\tau}h_{w,\tau} - p_{\tau}c_{w,\tau}\right)$$

$$+\sum_{\tau=1}^{t}\tau\left(1+\tilde{i}_w+\delta_{i,w}\right)^{\tau-1}W_{w,o} \qquad > 0$$

Equation [4] shows that the size of the increase in log wealth due to a unit increase in wage favoritism depends on the size of the rate of return, compounded through time, and the number of hours worked. Similarly, equation [5] also shows that the size of the increase in log wealth due to a unit increase in hours-worked favoritism depends on the size the wage rate and the compounded rate of return. Furthermore, equation [6] shows that the size of the reduction in log wealth due to a unit increase in consumption favoritism depends on the size of the price of commodity consumption and the compounded rate of return. Note that equation [7] shows that the size of the increase in log wealth due to a unit increase in initial wealth discrimination depends solely on the size of the compounded rate of return. Finally, equation [8] shows that the size of the increase in log wealth due to a unit increase in interest rate discrimination depends on the size of initial wealth, periodic savings, and the compounding rate of return.

A Model of Wealth Discrimination

Analogous to equation [2], we can write for blacks:

[9]
$$W_{B,t} = exp\left\{\sum_{\tau=1}^{t}(1+i_B)^{t-\tau}(r_{B,\tau}h_{B,\tau} - p_\tau c_{B,\tau}) + (1+i_B)^t W_{B,o}\right\}.$$

where $W_{B,t}$ represents the portfolio of wealth for black, B, at time t=1…T ;

$W_{B,t-1}$ represents the previous period portfolio of wealth for blacks, B, at time t=0…T-1 ;

i_B represents the average interest rate earned on previous period portfolio of wealth for blacks, B, at time t=1…T; $r_{B,t}$ represents the wages for blacks, B, at time t=1…T; $h_{B,t}$ represents the number of hours worked for blacks, B, at time t=1…T; p_t represents prices for goods consumed at time t=1…T; and $c_{B,t}$ represents the goods consumed by blacks, B, at time t=1…T, and where $W_{B,o}$ is the initial assets of blacks.

Now consider the wealth identity with discrimination or, more specifically, pure discrimination in against members of group B. Let $\tilde{\delta}_{k,B,\tau}$ represent the variable k favoritism coefficient for members of group B, at time τ=1…T, where $\tilde{\delta}_{k,B,\tau}<0$ for all variables, such that equation [4] becomes[2]:

[2] Let $\tilde{\delta}_{k,B,\tau} = -\delta_{k,B,\tau}$ where $\delta_{k,B,\tau} > 0$

$$[12] \quad \frac{\partial \ln W_{B,t}}{\partial \delta_{h,B,\tau}} = -\left[\sum_{\tau=1}^{t}\left(1+\tilde{i}_B\right)^{t-\tau} - \delta_{i,B}\sum_{m=1}^{t-\tau}\sum_{s=1}^{t-\tau}\left(1+\tilde{i}_B-\delta_{i,B}\right)^{t-m-1}\left(1+\tilde{i}_B\right)^{s-1}\right] r_{B,\tau} \quad > 0$$

$$[13] \quad \frac{\partial \ln W_{B,t}}{\partial \delta_{c,B,\tau}} = \left[\sum_{\tau=1}^{t}\left(1+\tilde{i}_B\right)^{t-\tau} - \delta_{i,B}\sum_{m=1}^{t-\tau}\sum_{s=1}^{t-\tau}\left(1+\tilde{i}_B+\delta_{i,B}\right)^{t-m-1}\left(1+\tilde{i}_B\right)^{s-1}\right] p_{\tau} \quad > 0$$

$$[14] \quad \frac{\partial \ln W_{B,t}}{\partial \delta_{W_o,B}} = -\left[\left(1+\tilde{i}_B\right)^{t} - \delta_{i,B}\sum_{m=1}^{t}\sum_{s=1}^{t}\left(1+\tilde{i}_B+\delta_{i,B}\right)^{t-m}\left(1+\tilde{i}_B\right)^{s}\right] \quad < 0$$

$$[15] \quad \frac{\partial \ln W_{B,t}}{\partial \delta_{i,B,\tau}} = -\sum_{\tau=1}^{t}(t-\tau+1)\left(1+\tilde{i}_B-\delta_{i,B}\right)^{t-\tau}\left(r_{B,\tau}h_{B,\tau} - p_{\tau}c_{B,\tau}\right)$$

$$-\sum_{\tau=1}^{t}\tau\left(1+\tilde{i}_B-\delta_{i,B}\right)^{\tau-1}W_{B,o} \quad < 0$$

Equation [11] shows that the size of the decrease in log wealth due to a unit increase in wage discrimination depends on the size of the rate of return, compounded through time, and the number of hours worked. Similarly, equation [12] also shows that the size of the reduction in log wealth due to a unit increase in hours-worked discrimination depends on the size the wage rate and the compounded rate of return. Note that equation [13] shows that a unit increase in consumption discrimination can overstate wealth, especially if consumption is forced below subsistence. The size of this effect depends on the price of the commodity and the compounded rate of return from savings in each period

Furthermore, equation [14] shows that the size of the decrease in log wealth due to a unit increase in initial wealth discrimination depends solely on the size of the compounded rate of return. Finally, equation [15] shows that the size of the decrease in log wealth due to a unit increase in interest rate discrimination depends on the size of initial wealth, periodic savings, and the compounding rate of return.

A Model of Relative Wealth

In theory, the average wealth of group *B* is some proportion of the average wealth of group *w*, such that,

[16]
$$\overline{W}_{w,t} = \left(\frac{1}{\phi}\right)\overline{W}_{B,t}$$

where $1/\phi$ is the theoretical proportion of wealth. If ϕ equals one, then the average wealth of group *B* is the same the average wealth of *w*. As ϕ goes to zero, the average wealth of *w* becomes infinity times the average wealth of group *B*. As ϕ goes to infinity, the average wealth of group *w* becomes an infinitesimal proportion of the average wealth of the average wealth of group *B*. Let $\phi = e^{-(\lambda\Gamma+\gamma\Lambda)}$, then,

[17]
$$\frac{\partial\overline{W}_{w,t}}{\partial\Gamma} = \lambda\phi\overline{W}_{B,t}$$

[18]
$$\frac{\partial\overline{W}_{w,t}}{\partial\Lambda} = \gamma\phi\overline{W}_{B,t}$$

such that,

[19]
$$\lambda = \sigma + \gamma$$

$$where\ \sigma = \phi\overline{W}_{B,t}\left(\frac{\partial\overline{W}_{w,t}}{\partial\Gamma} - \frac{\partial\overline{W}_{w,t}}{\partial\Lambda}\right)$$

Appendix C

Studies of Late 20th Century Data

Andrew Brimmer (1988) found that blacks held 7.2 percent of US aggregate income, but only 3 percent of US aggregate wealth in 1984. This large disparity in wealth have persisted throughout the twentieth century: Between 1940 and 1988, the black mean was 13 to 23 percent of white mean, and the black median 4 to 10 percent of white median (Wolff, 1992). But the origin of these differences has not been researched. Several studies (See, e.g., Pennsylvania Abolitionist Society, 1838; Society of Friends, 1849; Dubois, 1899; Jackson, 1939; Soltow, 1972; Soltow, 1975; Berlin, 1979; Higgs, 1982; Spriggs, 1984; Margo, 1984; Hornsby, 1989; Eggert, 1997; Hershberg, 1997; Bodenhorn, 1999) have addressed historical differences in wealth. However, their results are often limited by non-representative local samples, small samples, or descriptive analyses that do not employ potential explanatory variables.

Lee Soltow (1972, 1975) conducted one of the first in-depth studies of overall mid-nineteenth century wealth accumulation patterns using the census population schedules. Note that these schedules were originally stored on microfilms. He spun the microfilm half-turns to collect random, cross-sectional samples from 1850-1870. Soltow used Gini coefficients to find that black wealth was less equally distributed among blacks than white wealth among whites. He finds that "their inequality levels are strangely similar in the sense that a few held wealth" (Soltow, 1975, p. 145). Note that Soltow employs a small sample of 393 non-whites (1975) and 151 blacks (1972) to calculate his results.

Studies of 19th Century and Early 20th Century Data

Several studies have analyzed the experience blacks prior to the mass emancipation of southern slaves. John Hope Franklin (1943), Leon Litwick (1961) and Ira Berlin (1974) provide comprehensive accounts of free blacks. Furthermore, Philadelphia Abolitionist Society (1838), Society of Friends (1849), Dubois (1899), Eggert (1997) and Hershberg (1997) provided original studies on free black wealth in localities within Pennsylvania. Also, Bodenhorn (1999) studied racial inequality by analyzing wealth differences among darker and lighter free blacks in Maryland, Virginia, North Carolina, Kentucky and Louisiana. But free blacks were only two percent of the US population at any given time period.

Several studies have analyzed black-white wealth differences among in the south well after emancipation. Robert Higgs (1982), Robert Margo (1984) and Anne Hornsby (1989) used tax records to analyze southern black-white wealth differences between 1865 and 1915. They found strong yet limited wealth grains among blacks after emancipation although their results are limited the southern economy. Researchers have also studied different aspects of white-black wealth differences using contemporary data For instance, several studies have focused on white-black wealth differences due to differences in inheritance (See, e.g., Kotlikoff & Summers, 1981; Menchik & Jianakopolis, 1997; Wolff, 1998; Altonji, Doraszelski, & Segal, 2000). Other studies have focused on white-black wealth differences due to differences in income, savings and preferences (See, e.g., Terrell, 1971; Franklin & Smith, 1977; Oliver & Shapiro, 1989; Wolff, 1992; Oliver & Shapiro, 1997; Conley, 1999; Keister, 2000a; Keister, 2001; Wolff, 2001). Additional studies have focused on white-black wealth differences due to differences in assets and homeownership (See, e.g., Terrell 1971; Birmbaum & Weston, 1974; Brimmer, 1988; Snyder, 1989; Wolff, 1992; Wolff, 1998; Hurst, Luoh, & Stafford, 1998; Chiteji & Stafford, 1999; Keister, 2000b).

Several studies attempt assess the dominant source of wealth and wealth differences. Kotlikoff and Summers (1981) produced a foundational study on aggregate wealth and found that intergenerational transfers were the most significant factor in wealth accumulation. Conely (1999) proposed that legal and class barriers were the source of black-white wealth differences.1. Blau and Graham (1990) produced a seminal study of racial wealth inequality using regression decomposition. After controlling for income and demographic variables, they found that 78 percent of the wealth gap remained unexplained in 1976.

These studies have made significant contributions to our understanding of economic discrimination in terms of modern wealth differences. This study will build upon their findings by analyzing white-black wealth differences directly after the Civil War and mass emancipation of southern slaves to obtain new insights into the historical and intertemporal dimensions of the white-black wealth gap.

James Curtis Jr (2002) Studies of 19th Century Wealth Using the United Stated Census

The 1870 census manuscripts contain responses to important socioeconomic inquiries including age, sex, color, marital status, literacy status, whether the individual attended school during the year, occupation, state or country of birth, value of real estate, and value of personal estate (other forms of wealth) for all individuals in a given household.

Real estate value was enumerated based on guidelines specified in the Circular to Marshals. It specified that "under heading 8 insert the value of real estate owned by each individual enumerated. You are to obtain the value of real estate by inquiry of each individual who was supposed to own real estate, be the same located where it may, and insert the amount in dollars. No abatement of the value is to be made on account of any lien or encumbrance thereon in the nature of debt" (Magnuson, 1995, p347). Personal estate value (other wealth) was also enumerated based on guidelines that specified "Personal estate is to be inclusive of all bonds, stocks, mortgages, notes, live stock, plate, jewels, or furniture, but exclusive of wearing apparel" (p. 349). For more on the quality of historical census data (see Wright, 1900; Steckel, 1991; Magnuson, 1995).

Note that sample includes the reported wealth of household heads. Enumerators only recorded the value of wealth if an individual had more than 100 dollars in nominal wealth. Furthermore, zero wealth is not equivalent to zero dollar-wages per hour, where one must account for the participation decision to obtain robust estimates. Instead, not having any initial wealth, savings, and assets leads to one possessing zero wealth.