Male White-Black Wage Gaps, 1979-1994: A Distributional Analysis

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Running Head: Male White-Black Wage Gaps, 1979-1994

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Abstract

This paper examines whether the "stretching" (increased variance of wages) of the skill distribution during the 1980s explains the growth in within group white-black wage gaps. The paper also develops a skill-specific decomposition that measures the stretching's contribution to the wage gap's growth at various skill levels of the distribution.

The "local" nature of the skill-specific decomposition breaks the correlation between changes in the position of blacks in the white residual distribution and changes in the variance of wages, thus yielding unbiased estimates of the degree to which the stretching explains changes in the wage gap.

The paper shows that if the wage distribution's stretching is an important contributor to the overall wage gap's growth, its greatest impact is at the middle and upper portions of the skill distribution. For wage gaps within education and experience categories, the stretching's contribution is greatest at the tails of the skill distributions.

1. Introduction

Numerous studies show that during the 1980's the mean white-black wage gap among new entrant (0 to 10 years of potential experience) males expanded.[1] Juhn et al. (1991) attribute the mean gap's expansion to a widening of the overall U.S. wage distribution due to a host of economy-wide race-neutral changes that led to labor demand shifts toward better educated and better skilled workers regardless of race. Since African Americans tend to be at lower levels of the overall skill distribution, the shifts adversely impacted African American men worse than white men, leading to an expansion in the mean wage gap.

To arrive at this conclusion, Juhn et al. decompose the expansion in the mean new entrant wage gap into four components. The first two components measure the wage gap's increase due to a widening in observable racial differences in measured characteristics and their prices (e.g., educational attainment and the returns to education). The third component captures the contribution of growing racial discrimination and widening differences in unmeasured skills to the wage gap's expansion. This term's contribution is measured by the drop in the mean percentile rank of blacks in the white residual wage distribution. The fourth component identifies the role of increases in the prices of unmeasured skills and is measured by the increase in the variance of the white residual wage distribution.

When applied to the March Annual Demographic files of the Current Population Survey, Juhn et al. find that from 1979 to 1987 increases in the price of unmeasured skills explain all of

the new entrant mean wage gap's expansion, indicating that factors that adversely impacted less-skilled workers regardless of race are the primary cause of the wage gap's expansion.

In related work, Reardon (1997) uses a national sample of white and African American men from the 1980 and 1990 decennial censuses and shows that the mean racial wage gap's expansion is due to increased variance in the distribution of residual wages, generated by labor demand shifts toward high-skilled whites and away from middle-skilled white and high-skilled African American men. The wage gap expands because high-skilled African American men earn wages that are similar to whites in the middle and upper third of their wage distribution. The labor demand shifts led to a stretching or increased variance in the wage distribution that favored high-skilled whites relative to high skilled African Americans and medium-skilled whites.

This paper makes several contributions to the literature on racial wage gaps and the technical literature on wage decompositions. First, I examine whether Juhn et al's results hold up when the analysis is disaggregated by experience and educational attainment. This is an important extension for two reasons. Bound and Freeman (1992), Rodgers (1997a) and others have found that the racial wage gap among high school graduates, particularly among college graduates expanded significantly after the late 1970s. Over the same time period, the variance of wages within these educational categories increased. Second, it is important to determine the extent to which racial inequality that was generated while a cohort was a new entrant persists as it ages.

The paper's technical innovation is the development of a distribution or skill-specific decomposition that identifies whether the stretching of the white wage distribution uniformly contributes to an expansion in racial inequality at all skill levels or quantiles of the wage distribution, or whether the contribution of the wage distribution's stretching is specific to a skill level. For example, does the increase in the price of unmeasured skills explain a greater portion of the increase in the racial wage gap between high-skilled African Americans and whites than it does between middle-skilled African Americans and whites?

An additional benefit of the skill-specific decomposition is its ability to address the concern's outlined in Seun (1997). If the fall in the position of the average black in the white distribution is correlated with a stretching of the white wage distribution, the JMP decomposition overstates the importance of the prices of unmeasured skills in explaining the mean white-black wage gap's expansion. It understates the role of unobservable skills. The bias is due to the fact that when wage inequality expands, "the mean percentile rank of low-wage groups will rise simply because more dispersed distributions have thicker tails"(Seun, 1997, p. 560). Decomposing the change in the wage gap at specific skill levels or quantiles (e.g., median) should weaken this relationship and yield unbiased estimates of each component's contribution to changes in racial wage inequality.

The third contribution of this paper is to explore whether JMPs results generalize to another data source. Instead of using the Current Population Survey (CPS) March Annual Demographic files as Juhn et al. do, I use the CPS Outgoing Rotation Group (ORG) files. The benefit of using the ORG files is that they contain three times the number of individuals as the CPS March Annual Demographic files, thus allowing for more precise within-group (e.g., categories of educational attainment) wage gap estimates. Further, the ORG files contain a direct measure of hourly, weekly wages and usual hours worked per week. This lessens the measurement error that may be present in hourly and weekly wages constructed from the March files' data on annual earnings, hours and weeks worked. The ORG is not without disadvantages. The data is first available in 1979. However, this presents no problem because prior to 1979, JMP find that the wage gap narrowed.[2] My primary focus is on the period of the wage gap's expansion, the first half of the 1980s.

The paper's findings can be summarized as follows. From 1979 to 1985, the mean white-black wage gap among new entrant men in the ORG data expanded. A JMP decomposition of the wage gap's expansion indicates that it is best explained by an increase in the prices of unmeasured skills and a decline in the relative position of blacks in the white wage distribution. From 1985 to 1994, the mean wage gap among new entrants continued to expand. JMP decompositions indicate that the expansion is best explained by a relative worsening in the observable characteristics of African Americans and an increase in the prices of unmeasured skills. These adverse changes more than offset the improvement of the mean black in the white residual wage distribution.

For older men, the mean wage gap exhibits a different pattern. From 1979 to 1985, the mean wage gap remained the same. From 1985 to 1994, the period during which new entrants moved into the older male category, the gap expanded. This pattern suggests that racial inequality that emerged within the cohort of new entrants that entered the labor market in the early 1980s continued to expand as they aged.

The distributional decompositions yield similar findings as in Reardon. From 1979 to 1985, increased variance in new entrant wages explains racial inequality's expansion among middle and higher skilled new entrant blacks and whites. The decomposition of the change in the median white-black wage gap probably provides the best estimate of the contribution of increased variance in wages to the white-black wage gap's expansion. Unlike the decompositions of the changing gaps at the distribution's tails, the median decomposition is less sensitive to the potential dependence of increases in the prices of unmeasured skills and percentile ranks.

Among older men, the median decomposition indicates that increased variance explains none of the wage gap's widening. The decompositions of the gaps at the tails of the distribution indicate that increased variance plays a role in the wage gap's expansion, but are probably biased due to the dependence of increases in the prices of unmeasured skills and percentile ranks of

blacks in the white residual wage distribution. For example, increased variance over predicts the actual wage gap's expansion among less-skilled older men.

Within categories of educational attainment, increased variance plays a minor role in contributing to growing racial wage inequality, especially among black and white college graduates.

The paper proceeds as follows. Section 2 describes the methodology. Section 3 describes the data. Section 4 presents the results. Section 5 summarizes the main results and relates them to the literature on white-black wage gaps.

2. Methodology

In this section I first describe the regression specifications used to estimate white-black wage gaps at the mean and quantiles (e.g., the median) in the distribution. Second, I summarize the Juhn et al. mean-based wage decomposition technique, Seun's argument as to why the mean-based decomposition leads to an upward bias in the contribution of rising inequality to increases in the wage gap, and then describe the distribution-based decomposition technique that I developed.

To estimate the regression-adjusted mean white-black wage gap (i.e. residual), researchers typically write the model for the *ith* individual in year *t* as:

$$E(y_i \mid X_i, R_i) = X_i'\beta + R_i\gamma, \tag{1}$$

where y_i is the *ith* individual's log wage, X_i is a *k x 1* vector of predictor variables for the *ith* individual, R_i is a race indicator variable that equals *1* if the individual is white and zero if the individual is black, and β and γ give the coefficients on these variables. The notation $E(y \mid X, R)$ denotes the mean of the conditional distribution of *y* given *X* and *R*.

To estimate the regression-adjusted white-black wage gap at various quantiles (e.g., median) of the wage distribution in year *t*, the basic quantile regression model introduced in Koenker and Bassett (1978, 1982), and further developed by Powell (1984, 1986) is used.[3,4] More recently, Buchinsky (1998) provides a detailed discussion of the practical issues related to estimating quantile regressions. The model for the *ith* individual may be written as:

$$Quant_q(y_i \mid X_i, R_i) = X_i'\beta_q + R_i\gamma_q, \tag{2}$$

where β_q and γ_q give the coefficients on the variables for the *qth* quantile.[5] The notation $Quant_q(y \mid X, R)$ denotes the *qth* quantile of the conditional distribution of *y* given *X* and *R*. For

example, if q equals 0.50, γ_q measures the white-black wage gap at the median and $Quant_{0.50}(y / X, R)$ denotes the median of the conditional distribution of y given X and R.

Equations (1) and (2) are used to estimate regression-adjusted mean and median wage gaps for 1979 to 1994. The specification comes from Bound and Freeman (1992). Education is linear until 7 completed years, and then is unconstrained from 8 to 18. Specifically, X_i contains an education variable which takes the actual value of education if it is less than 8, and 0 if education exceeds 7, and the following dummy variables: ≤8, 9, 10, 11, 13, 14, 15, 16, 17 and 18. Respondents with 12 completed years of schooling are the excluded group. Dummy variables for individual years of potential experience and region of residence are included in X_i.[6]

The specification used to estimate Equation (2) in the distributional-specific decomposition of changes in the white-black wage gap among sub-groups (e.g., new entrant high school graduates) lets X_i contain dummy variables for high school graduate (years of schooling = 12) and college graduate (years of schooling ≥ 16), with high school dropouts (years of schooling < 12) are the excluded group.[7] For new entrants, I include a dummy variable that equals 1 if potential experience is 1 to 10 years, and 0 if potential experience is 11 to 20 years. I use this more parsimonious specification because these categories are the typical sub-groups that JMP and others examine, particularly those with less than 10 years of potential experience. I also use this specification because it reduces slightly the computational costs associated with bootstrapping the standard errors.

To decompose the residual gap into two components: changes in discrimination and/or changes in racial differences in unobservable skills; and changes in white wage inequality, Juhn et al. start with estimating Equation (1) for whites in year t:[8]

$$E(y_{iwt} \mid X_{iwt}) = X'_{iwt}\beta_t. \tag{3}$$

The residual, which is assumed to have mean zero and variance one is rewritten as the product of a standardized normal θ_{it} variate and the residual standard deviation of white male wages for the regression σ_t. The actual wage gap between white and African American men in year t is then

$$D_t = \bar{y}_{wt} - \bar{y}_{bt} = \Delta X_t \beta_t + \sigma_t \Delta\theta_t, \tag{4}$$

where $\Delta\theta_t \equiv \theta_{wt} - \theta_{bt} \equiv -\theta_{bt} \equiv \frac{\varepsilon_{bt}}{\sigma_t}$. The term $\Delta\theta_t$ denotes the difference in the average standardized residuals of white and black males. The decomposition can be repeated for a second year t'. A narrowing or widening in the white-black wage gap from year t to t', can be written as

$$D_{t'} - D_t = (\Delta X_{t'} - \Delta X_t)\beta_t + \Delta X_{t'}(\beta_{t'} - \beta_t) + (\Delta\theta_{t'} - \Delta\theta_t)\sigma_t + \Delta\theta_{t'}(\sigma_{t'} - \sigma_t). \tag{5}$$

Equation (5) decomposes the change in the actual wage gap into four components:

(1) changes in measured characteristics holding the coefficients or prices fixed, $(\Delta X_{t'} - \Delta X_t)\beta_t$

(2) changes in prices holding characteristics fixed, $\Delta X_{t'}(\beta_{t'} - \beta_t)$

(3) the contribution of shifts in central tendency or the movement of the average black in the white distribution, $(\Delta\theta_{t'} - \Delta\theta_t)\sigma_t$,

(4) the contribution of shifts in spread, or changes in the variance of wages, $\Delta\theta_{t'}(\sigma_{t'} - \sigma_t)$.[9]

Reporting the third and fourth terms separately shows how much of the change in the total residual gap (components 3 and 4) is due to "blacks moving up or down within the distribution of whites" for any given set of observables (component 3) and how much is due to general changes in wage inequality which affect blacks because their residual wages (constructed from the white coefficients) do not have the same distribution as whites (component 4) (Juhn et al. 1991, p. 126). Specifically, Juhn et al. note that if the variance in the distribution of wages is increasing within each observable skill category, as it was during the 1980s, this will adversely affect African Americans even in the absence of other changes because African Americans are already concentrated in the lower part of the earnings distribution.

The decomposition in Equation (5) contains the familiar index number problem. I could have derived similar decompositions using different base years or by substituting the estimated white prices with the black prices. I use the average across all years as the base to avoid possible extremes within any given year. Thus, the year t' terms correspond to mean quantity differences and "white prices" across the 16 year sample.

Seun (1997) demonstrates that the JMP mean procedure generates biased results if wage inequality and the percentile ranks are not independent of one another. As wage inequality expands, the term that measures the contribution of unobservable prices will increase, while the term capturing movements in the position of blacks will fall. Seun asserts that this problem is greatest at the tails of the distribution. As inequality rises, the tails become fatter artificially moving blacks up in the white distribution. The bias will be larger at the lowest percentiles because of the skewed shape of wage distributions, but bias could be present at segments of the distribution where mass points exist, wages that are common to a significant portion of the population.

To construct an unbiased estimated of the increased variance's contribution to white-black wage gap's expansion, I construct the actual change in the white-black wage gap between two periods and the predicted change in the wage gap due to increases in the price of unobservable skills. The predicted change is the growth in the wage gap assuming that the percentile position of blacks remain constant over time. I then create a ratio of the predicted and

actual changes. A value of 1 indicates that the predicted change equals the actual change, implying that the stretching of the white wage distribution at that quantile explains all of the gap's actual change at that quantile. To assess whether the increased variance hypothesis explains expanding wage gaps within sociodemographic groups (e.g., new entrant college graduates), I utilize the quantile regression model in Equation (2) to build conditional wage distributions.

At the median, the residual wage procedure starts with estimating a log wage equation for year *t* using only whites with the specification in Equation (1). I then use the estimated coefficients to construct white and black residual distributions. With these distributions, I find the white residual wage that equals the median black wage. This location is denoted as the *qth* quantile. Now using the year *t′* white residual distribution, I find the white residual which corresponds to the *qth* quantile. This residual is interpreted as the predicted year *t′* black wage residual assuming that the median black's initial year *t* position is preserved. The actual change, predicted change and the ratio of the two are then constructed.

Analytically, we can think of the procedure as follows. In year *t*, we have a log wage equation for the *ith* white individual:

$$E(y_{iw} \mid X_{iw}) = X'_{iw}\beta_w, \tag{6}$$

where X_{iw} is a *k x 1* vector containing the observable characteristics of the *ith* white male, and β_w gives the coefficients on these characteristics. The *ith* white residual is the following:

$$\varepsilon^t_{iw} = y_{iw} - X'_{iw}\beta_w, \tag{7}$$

and the *ith* black residual, if he is paid like a white, is:

$$\varepsilon^t_{ib} = y_{ib} - X'_{ib}\beta_w. \tag{8}$$

The median African American residual wage, $Med(\varepsilon_b)$, is found in the African American residual wage distribution. Let $\varepsilon^t_{b,.5}$ denote the value of the year t median African American residual wage. Now find the quantile, q^*, where $\varepsilon^t_{b,.5}$ is located in the white residual distribution. This is where $\varepsilon^t_{w,q*} = \varepsilon^t_{b,.5}$.

Using the year t' data, estimate Equation (6) for whites. Construct the white and black residuals in Equations (7) and (8). Now find $\varepsilon^{t'}_{w,q^*}$. This is the year t' white residual wage at the quantile q^*, or the predicted year t' black residual wage. Also calculate $\varepsilon^{t'}_{w,.5}$ and $\varepsilon^{t'}_{b,.5}$, the year t' white and black median residual wages, respectively. The residuals $\varepsilon^{t}_{w,.5}$, $\varepsilon^{t}_{b,.5}$, $\varepsilon^{t'}_{w,q^*}$, $\varepsilon^{t'}_{w,.5}$ and $\varepsilon^{t'}_{b,.5}$ are used to construct the year t and t' actual gaps, and the year t' predicted median gap. They are the following:

$$AGAP_t = \varepsilon^{t}_{w,.5} - \varepsilon^{t}_{b,.5}, \tag{9}$$

$$AGAP_{t'} = \varepsilon^{t'}_{w,.5} - \varepsilon^{t'}_{b,.5}, \tag{10}$$

$$PGAP_{t'} = \varepsilon^{t'}_{w,.5} - \varepsilon^{t'}_{w,q^*}. \tag{11}$$

To decompose the actual gap's change, I form the ratio of the predicted and actual changes. The ratio determines the extent to which the expansion in the median white-black wage gap is due to increased variance in the distribution of wages as opposed to q^*. I also evaluate the ratio at the 10th, 25, median, 75th and 90th percentiles.[10]

$$RATIO = \frac{PDGAP}{ADGAP} = \frac{PGAP_{t'} - AGAP_t}{AGAP_{t'} - AGAP_t}. \tag{12}$$

To assign statistical meanings to *RATIO*, *PDGAP* and *ADGAP*, I use bootstrap methods to construct standard errors.[11]

Since the variance of white wages increased within categories of educational attainment and the relative positions of black men fell within each category, thus contributing to within group increases in the black-white wage gap, I construct estimates of *RATIO*, *PDGAP* and *ADGAP* for high school and college graduates by experience.[12]

Along with being less sensitive to the statistical artifact shown in Seun, another key difference between the distribution-specific and the Juhn, et al. technique is the assumption of a fixed distribution. The distribution-specific decompositions use 1979 and 1985 as the base years, while the Juhn, et al. decomposition uses the average distribution over all years of the sample. An obvious disadvantage to using 1979 and 1985 as the end points (base years) is that the decompositions are potentially sensitive to this choice. As a robustness check, I perform the distribution-specific decomposition but locate blacks in a white distribution that pools the 1979 and 1985 distributions.[13] I obtain qualitatively similar results.

3. The Data

The data come from the 16 consecutive CPS Outgoing Rotation Group files from 1979 to 1994. The samples consist of full-time black and white males with 0 to 20 years of potential experience,[14] who fit the following criteria: (1) at least 18 years of age, (2) Monthly Labor Force Record is either working or on layoff,[15] (3) employed in either the public or private sector (excludes the self-employed), and (4) usual hours worked per week is greater than or equal to 35, or less than or equal to 99.

It is important to note that from 1979 to 1994, the sample sizes of new entrant men fall. In isolation, one might attribute the fall to sample selection, and thus use decomposition techniques developed in Reimers (1983) and Hoffman and Link (1983) to remove the potential bias. However, if we examine the sample sizes of older men, we see that they increased during this period. I attribute the shifts in samples to the movement of the baby boom generation through the zero to 10 years of potential experience category to the 11 to 20 years of experience category. In 1979, there are 29,629 new entrants and 19,372 older men. By 1985, the number of new entrants falls to 26,646, while the number of older men increases to 23,412. The shifts continue until 1987, after which they level off. After 1990, the number of new entrants and older men both decline. This is due to the Census Bureau's switch to the 1990 decennial census on which the CPS sample is based, as well as to changes in collection methods.[16]

The empirical analysis focuses on decomposing changes in the white-black log hourly wage gap.[17] My results will differ from Juhn et al. for several reasons. Juhn et al. decompose the change in the log weekly wage gap, which is constructed from annual wages and salary and weeks worked. First, measurement error may be a greater problem in their analysis. Second, even though they restrict their samples to year-round, full-time men, their results may still have a weeks and hours worked impact imbedded in them.[18] I find in the ORG files that full-time African American men work on average two hours less than white men, and the difference has grown since 1979.[19] If this trend exists in Juhn et al., then their estimates overstate the role that increased variance in the distribution of wages play in explaining changes in the gap.[20]

4. Empirical Results

This section first describes the broad trends in white-black wage gaps from 1979 to 1994. Table 1 displays regression-adjusted mean and median log hourly wage gaps for men with 0 to 10 and 11 to 20 years of potential experience. These figures are estimates of the γ's in Equations (1) and (2). The timing of the changes in each experience group's gap suggests that African Americans who entered the labor market early in the 1980s carried their losses with them as they aged, and their losses continued to grow even as the macroeconomy moved toward its peak in 1989 and recession and recovery in the early 1990s.[21] The typical pattern of the new entrant gaps is expansion from 1979 to 1985, and narrowing from 1985 to 1994. For older men, the pattern is the reverse, with 1985 serving as the breakpoint for both experience groups.

Over the 16-year period of analysis, the new entrant mean and median gaps exhibit the same pattern. From, 1979 to 1985 the mean gap expands from 10 to 15 percent and the median gap expands from 12 to 18 percent. Although modest, both narrow by 3 percentage points from 1985 to 1994. Table 1 shows that as this cohort began to comprise a larger share of the more experienced group, the wage gaps among men with 11 to 20 years of potential experience expanded. From 1979 to 1985, the mean gap remained at 16.0 percent, while median gap increased from 17.0 to 19.0 percent. From 1985 to 1994, the gaps peaked at around 20 percent.

The table also displays the regression-adjusted mean and median wage gaps by educational attainment and potential experience. The high school dropout gaps show considerable variation from 1979 to 1994. The gaps expand during the first half of the 1980s and narrow during the second half of the 1980s. They continue to narrow during the early 1990s. The narrowing after 1990 is consistent with the selective withdrawal hypothesis that a larger portion of less skilled African Americans lost their jobs during the 1990s recession and weak jobs recovery. The gap's narrowing is also consistent with the increase in the federal minimum wage having a greater impact on the relative wages of blacks. The new entrant high school graduate gap follows the same path as the "total" gap, expanding from 1979 to 1985 and contracting from 1985 to 1994. The gaps among older high school graduate men expanded slightly prior to 1985, but the growth accelerated after 1985.

The growth in the wage gap among college graduates shows the most dramatic expansion. The gap starts out at zero in 1979 and finishes at 16.0 percent in 1994. During the first half of the 1980s, the mean and median wage gaps among new entrants expanded by on 3.0 and 1.0 percentage points, respectively. From 1985 to 1994, the mean and median gap's expansion accelerates, growing by 9.0 and 17.0 percentage points. For older college graduate men, the gap starts the 1980s at around 10.0 percent and exhibits little change through the decade's first half. It expands by 13 percentage points from 1985 to 1994.

The important contribution of this section is the identification of the growth in the new entrant wage gap from 1979 to 1985, the growth in the older men's wage gap from 1985 to 1994, the dramatic expansion of the college graduate black-white wage gap, and the suggestion that the wage gap did not dissipate as the new entrants aged.

I now show that even when JMP's techniques are applied to the ORG CPS files similar results are obtained. Table 2 first presents the positions of the 10^{th}, 25^{th}, median, 75^{th} and 90^{th} percentile blacks in the white residual hourly wage distribution.[22] These figures are used to develop the third term in the JMP decomposition. The wage residuals are constructed using education and potential experience coefficients from the white regression line estimated in Equation (6). Each potential experience group has its own regression line. To assign a statistical interpretation to the positions, I use bootstrap methods to construct standard errors. Even though this procedure and standard errors creates more information to analyze and interpret, it has the

advantage of showing whether changes in the relative positions of blacks were uniform throughout the white wage distribution, or the movements were concentrated in particular segments.[23]

The shifts in the positions of new entrant and older African Americans coincide with the changes in the wage gaps that are shown in Table 1. The changes in position are greatest at the median and 75th percentile, with notable changes at the 25th and 90th percentiles. For example, from 1979 to 1985, the new entrant median African American fell from the 34th percentile of the white residual wage distribution to the 31st percentile. During this period, the median older male's position fell slightly from the 38th to the 36th percentile. The reverse occurs from 1985 to 1994. The median new entrant African American's position improved to the 36th percentile, while the median older African American's position remained virtually unchanged. The drop in the relative status is due to the 75th and 90th percentile blacks falling in the wage distribution.

Instead of rising in the white residual wage distribution, the position of blacks at the upper tail of the white distribution actually worsens. According to the logic in Seun, this means that the erosion in the position at the upper tails is an underestimate of the change in location. For example, instead of the 90 percentile older black falling from the 85th to the 81st percentile, the drop may have been to a percentile below the 81st percentile. The movement of the median black in the white residual wage distribution provides a better representation of the roles that worsening discrimination and the relative decline in the unobservable skills of blacks play in causing the wage gap to expand.

Table 2 also reports the positions of African American high school dropouts, graduates and college graduates in their respective white residual wage distributions. They too, are consistent with the changes in the wage gaps in Table 1. African American high school dropouts and graduates lost ground from 1979 to 1985. The reverse occurs after 1985, particularly for new entrant high school dropouts and graduates. Table 2 shows the large erosion in the relative status of African American college graduates that started after 1985. New entrant black college graduates fell from the 52nd percentile to the 38th percentile.

Except for older black college graduates, the movement of older black high school dropouts and graduates in the white residual distribution is less pronounced. The experience of these older men partially insulates them from the economic downturns that occurred in the early 1980s and 1990s. The figures in Table 2 provide a mixed message. The position of black high school dropouts and graduates is stable from 1979 to 1985, but after 1985, the position of the 10th percentile and median blacks improves, while the positions of the 75th and 90th percentile blacks worsen. The relative position of black college graduates exhibits a modest decline from 1979 to 1985 and a dramatic decline from 1985 to 1994. For example, the median black college graduate fell from the 51st percentile to the white median and then to the 38th percentile by 1994.

To provide the distribution-specific decompositions developed in Equations (6) to (12) with a point of comparison, I construct the JMP decompositions for 1979 to 1994, with a breakpoint in 1985. The motivation for setting the breakpoint in 1985 instead of 1987, which JMP uses comes from the evidence presented in Table 2. The decline in the relative position of non-college graduate black men typically reaches a maximum in 1985 and the decline in the relative position of black college graduates starts in 1985.

Table 3 reports estimates of the average annual rates of change in each component by estimating a linear spline with 1985 as the breakpoint.[24] Changes in unobservable prices matter, but not to the degree as found in JMP. I attribute this difference to my use of the CPS ORG data and not the Annual Demographic files of the CPS that JMP use in their analysis. Additionally, the trend analysis in this paper is done for 1979 to 1994, with a breakpoint in 1985, while the JMP trend analysis is done for 1963 to 1987, with breakpoints in 1970 and 1979.

From 1979 to 1985, the new entrant actual mean wage gap expanded at 0.25 percent per year.[25] Changes in unobservable prices account for only 40 percent of the actual gap's increase. From 1985 to 1994, the new entrant gap continued to expand at 0.60 percent per year. Changes in unobservable prices lead to the gap's increasing by 0.18 percent per year. For older men, during the first half of 1980, the actual wage gap expanded at 0.14 percent per year; however, the estimate is not measured with precision. From 1985 to 1994, the gap grew by 1.18 percent per year. The role of unobservable prices is modest, contributing an average annual increase of 0.18 percent.

Table 3 reports the mean decompositions by educational attainment. For new entrant and older male high school dropouts, the most notable result is a narrowing in each gap from 1985 to 1994. The new entrant gap narrowed by 0.87 percent per year and the wage gap among older men narrowed at a rate of 0.66 percent per year. For new entrants, while relative improvements in observable prices and unobservable skills/discrimination helped to lessen the overall wage gap, changes in unobservable prices still acted to increase the gap.

The new entrant high school graduate gap expanded by 0.66 percent per year from 1979 to 1985 and contracted by 0.39 percent per year from 1985 to 1994. One half of the widening was due to a decline in the relative education and experience of black men. The other half was due to changes in residual wage inequality, with unobservable prices contributing 0.12 percentage points to the overall gap's expansion. After 1985, albeit in a smaller role, changes in unobservable prices still act to expand the gap. During the first half of the 1980s, the trend among older men is similar to new entrants. After 1985, the gap continues to expand at 0.20 percent per year. One half of the growth is due to changes in unobservable prices.

Table 3's most startling results are for black college graduates. The decompositions indicate that from 1979 to 1985 the new entrant gap expands by 0.91 percent per year and that changes in unobservable prices explain very little of this change. The major contributor to the

gap's expansion is the decline in the relative position of African American college graduates in the white college graduate residual wage distribution: a 0.82 percent annual increase in the gap. This was clearly seen in Table 2. From 1985 to 1994, the new entrant gap continued to expand at 0.56 percent per year and the mean position of blacks continued to fall in the white distribution at 1.39 percent per year. A relative narrowing in the observable skills of black and white college graduates of 0.79 percent per year helped to offset the drop in the white distribution.

A similar pattern occurs among older college graduates. The wage gap expands at 1.34 percent per year from 1979 to 1985. A decline in the location of African Americans in the white distribution is the primary source of the divergence in earnings. From 1985 to 1994, the gap continued its expansion at an average annual rate of 0.73 percent. During this sub-period, unobservable prices explain very little of the actual gap's expansion. Although estimated with modest precision the drop in the relative position of African American college graduates explains 82 percent of the mean wage gap's expansion.

The mean decompositions in Table 3 confirm the importance of decomposing changes in the overall wage gap into the contribution due to changes in observable skills and prices, but also decomposing the residual wage gap into the contribution of changes in unobservable prices and skill. However, it is not possible to determine whether the contribution of changes in unobservable prices to the mean wage gap's expansion is greatest at the upper segments of the skill distribution. Further, if the mean position of blacks in the white residual wage distribution and white wage inequality are dependent, then the estimates in Table 3 of the "Gap" and "Unobservable Prices" terms are biased. The "Gap" term is biased downward and the "Unobservable Prices" term is biased upward. Growing inequality artificially raises the position of blacks, particularly at the tails of the distribution.

To assess whether the contribution of changes in unobservable prices to the mean wage gap's expansion is greatest at the upper segments of the residual wage distributions and the extent to which the JMP decompositions are biased, Table 4 presents statistics from my distribution-specific residual log hourly wage technique. The decompositions are for the white-black wage gaps at the 10^{th}, 25^{th}, median, 75^{th} and 90th percentiles.

The decompositions in Table 4 suggest that the JMP decompositions of the residual wage gap are consistent with Reardon. The increased variance explanation is most important at the middle and upper tails of the residual wage distribution (i.e. middle and upper skilled workers). For new entrants, the change in the mean actual wage gap from 1979 to 1985 is 5.3 percent, which corresponds to a 0.76 average annual increase from 1979 to 1985, similar to the average annual increase of 0.47 percent in the JMP decomposition.[26] The average predicted change is 1.7 percent, generating a ratio of 32 to 34 percent. This ratio is slightly higher than the 22 percent contribution of changes in unobservable prices found in Table 3 of the JMP decomposition. The median decomposition indicates that growing inequality has a greater contribution to the wage gap's expansion, but this is because the change in the median gap is smaller than the change in

the mean gap. The similar predicted change at the median and mean indicates that growing wage inequality played a similar role in causing the actual wage gap to grow.

Across the distribution, changes in the actual gaps (ADGAP) calculated from the sample range from 5.7 percent at the 10^{th} percentile to 6.8 percent at the 75^{th} percentile, corresponding to average annual increases in the wage gap of 0.81 to 0.90 percent. The predicted changes are the expected signs at every percentile except the 10^{th} percentile. Although the ratios indicate that growing wage inequality plays a role among highly skilled blacks and whites, estimates of the RATIO indicate that the predicted change has its greatest explanatory power at the median. Again, this is largely due to the fact that the actual change in the median wage gap is smaller than the actual change in the wage gaps at the 25^{th}, 75^{th} and 90^{th} percentiles.

Table 4 reports the distribution-specific decompositions of changes in older male wage gaps from 1985 to 1994. Inequality growth matters at the tails of the distribution; however, since the ratios at the 10^{th} and 25^{th} percentiles exceed one, these estimates probably represent an upper bound on inequality growth's contribution to the wage gap's expansion.

The bootstrapped predicted and actual changes are virtually identical to the sample values and the asymptotic standard deviations indicate that the actual and predicted changes are measured with a high degree of precision.[27] However, in several cases, the bootstrapped RATIOs perform poorly. They either have little precision or outliers generate ratios that differ from creating the RATIO from the bootstrap mean values of the actual and predicted changes.

Table 5 reports the distribution-specific decompositions by educational attainment and potential experience. The actual change in the high school graduate wage gap ranges from 6.4 percent at the 10^{th} percentile to 11.2 percent at the 90^{th} percentile. The predicted changes are of the hypothesized sign at the 10^{th}, 75^{th} and 90^{th} percentiles. Because of this, the ratio is only positive at these segments of the distribution. The contribution of growing wage inequality is greatest at the 90^{th} percentile. If the increased variance explanation contributes to the widening of the high school graduate racial wage gap then it occurs among the least and highest skilled high school graduates, with both potentially subject to the bias associated with the dependence between wage inequality growth and the position of blacks in the white distribution.

The estimates for new entrant college graduates are consistent with the prediction that if wage inequality growth plays a role in the wage gap's expansion, its contribution is among the highest skilled blacks and whites. Increased variance in the distribution of wages explains a portion of the gap's change at the 75th and 90th percentiles. It explains one-half of the gap at the 75^{th} percentile and over predicts the change in the gap at the 90^{th} percentile. A portion of the growth in the disadvantage of high skilled new entrant black college graduates can be attributed to growing wage inequality among highly skilled college graduates.

Shifting to decomposing the actual change in the wage gap among older men for the 1985 to 1994 period reveals that growing inequality is most important in explaining the high school graduate wage gap's change at the 90th percentile. For older male college graduates, the contribution of increased variance in the distribution of wages occurs at the 10^{th}, 25^{th} and 75^{th} percentiles. In summary, disaggregating by educational attainment and skill reveals the limited ability to globally conclude that the increased variance explanation is the major contributor to the racial inequality that emerged after 1985. Inequality growth either plays a role in expanding wage gaps among the least skilled whites and blacks and the highest skilled blacks and whites. Given the work of Seun, we must be cautious in how much weight we put on inequality growth's contribution among the least-skilled.

5. Conclusions

Wage decompositions are useful techniques for describing racial wage gaps in both levels and their changes over time.[28] Focusing on explaining changes over time, Juhn et al. adds to this literature by decomposing changes in the residual wage gap into a portion that measures the impact that changes in the position of blacks in the white distribution have on changes in the mean wage gap, and a portion that measures changes in the prices of unobservable skills.They find that the increased variance in the distribution of wages is quite important for explaining the erosion in the relative wages of new entrant blacks during the first half of the 1980s. In fact, their results suggest that the erosion had little to do with growing racial discrimination and/or a widening of racial differences in unmeasured skills, and more to do with general changes in the wage structure that put lower-skilled men regardless of race at a greater disadvantage.

Using different data and years, Reardon shows that the general inequality story is most important in explaining racial inequality growth among high skilled blacks and whites. Further, Seun, shows analytically that JMPs decomposition technique biases upward the contribution of changes in unobservable prices, and biases downward the role of unobservable skills. As inequality widens, the mean position of blacks in the white distribution improves.

This study builds on this past work by developing methods that decompose changes in the wage gap by time period, by level of experience and educational attainment. The disaggregation and technical innovation are important for the following reasons. Applying the JMP and distribution-specific decompositions to the disaggregated data and segments of the skill distribution indicates that general inequality growth can't be used as a general explanation for the wage gap's expansion, overall and within categories of educational attainment. The skill-specific decompositions are unbiased as long as there is little statistical dependence between increasing inequality and changes in the position of blacks in the white wage distribution. For example, as long as there is no link between movements in the position of the median black and increasing white wage inequality growth in the 30 to 40^{th} percentiles of the distribution, then the median decomposition provides a useful representation of the contribution that general inequality growth plays in explaining the median white-black wage gap's expansion.

Much of the work on male racial inequality focuses on describing and explaining the new entrant wage gap because this demographic is most sensitive to macroeconomic and structural change. However, the inclusion of decompositions of changes in the white-black wage gap among slightly older men provides additional insight to understanding the 1980s expansion. The decompositions presented in this paper indicate that the mean wage gap among older men continued to expand after 1985. Its expansion appears to be largely driven by the movement of new entrants that joined the labor market in the early 1980s into the potential experience category of 11 to 20 years of potential experience. One interpretation of this pattern is that the adverse labor market conditions of the 1980s recession that this cohort of African Americans faced placed them on lower relative lifetime earnings paths than observationally equivalent white men.

What are these adverse conditions? No one factor can receive all of the blame. First, a well-developed literature finds that blacks, especially those with the least education and potential experience bear the brunt of recessions.[29] Second, the evidence on industry-shifts and skill-biased technological change found in Bound and Freeman (1992), Bound and Holzer (1996), and Reardon (1997) all play a role. All of these more general factors placed African American men, even African American college graduates who entered the labor market in the early 1980s at an even greater initial disadvantage than white men.

As these men accumulated labor market experience, why did the relative value of their skills continue to deteriorate after 1985? The selective withdrawal of the least skilled African Americans would cause the gap to narrow, which is not the case. Thus, I speculate that the early disadvantages had an impact on their abilities to receive promotions, as well as to participate in and receive similar payoffs to job training.[30] Longitudinal data must be used to rigorously verify this conclusion.

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Table 1: Estimated Log Hourly Black-White Wage Gaps, 1979 to 1994 by Potential Experience and Educational Attainment

Panel A: New Entrants	All		High School Dropouts		High School Graduates		College Graduates	
Year	Mean	Median	Mean	Median	Mean	Median	Mean	Median
1979	0.102	0.124	0.127	0.176	0.122	0.144	0.041	-0.019
1980	0.130	0.163	0.158	0.173	0.150	0.182	0.009	0.054
1981	0.119	0.136	0.136	0.156	0.153	0.160	0.001	-0.015
1982	0.122	0.137	0.146	0.139	0.137	0.157	0.026	0.000
1983	0.106	0.134	0.123	0.123	0.116	0.135	0.029	0.075
1984	0.115	0.140	0.147	0.198	0.134	0.144	0.076	0.143
1985	0.157	0.178	0.180	0.213	0.176	0.202	0.072	-0.009
1986	0.132	0.159	0.159	0.174	0.156	0.187	0.101	0.174
1987	0.138	0.169	0.153	0.143	0.154	0.182	0.109	0.111
1988	0.120	0.145	0.166	0.178	0.117	0.141	0.079	0.042
1989	0.151	0.169	0.144	0.155	0.148	0.167	0.169	0.216
1990	0.124	0.128	0.112	0.164	0.140	0.137	0.138	0.140
1991	0.125	0.139	0.079	0.079	0.139	0.182	0.168	0.151
1992	0.112	0.125	0.087	0.120	0.138	0.161	0.106	0.091
1993	0.118	0.138	0.155	0.177	0.141	0.152	0.079	0.115
1994	0.127	0.141	0.131	0.100	0.119	0.143	0.159	0.167

Notes: Author's calculations from the Outgoing Rotation Groups of the Current Population Survey files, 1979 to 1994. New entrants have no more than 10 years of potential experience. The standard errors for the mean coefficients range from 0.009 to 0.012 (All), 0.019 to 0.051 (High School Dropouts), 0.013 to 0.017 (High School Graduates), and 0.026 to 0.046 (College Graduates). The standard errors for the median coefficients range from 0.008 to 0.014 (All), 0.021 to 0.045 (High School Dropouts), 0.001 to 0.017 (High School Graduates), and 0.029 to 0.068 (College Graduates).

Table 1 cont.: Estimated Log Hourly Black-White Wage Gaps, 1979 to 1994 by Potential Experience and Educational Attainment

Panel B: Older Men	All		High School Dropouts		High School Graduates		College Graduates	
Year	Mean	Median	Mean	Median	Mean	Median	Mean	Median
1979	0.158	0.171	0.179	0.186	0.158	0.146	0.106	0.115
1980	0.139	0.160	0.191	0.230	0.132	0.134	0.145	0.097
1981	0.142	0.153	0.133	0.162	0.149	0.166	0.255	0.236
1982	0.147	0.173	0.172	0.191	0.164	0.207	0.131	0.079
1983	0.139	0.159	0.197	0.233	0.156	0.182	0.083	0.053
1984	0.126	0.143	0.186	0.227	0.129	0.151	0.116	0.084
1985	0.166	0.192	0.198	0.204	0.167	0.196	0.103	0.086
1986	0.137	0.140	0.156	0.177	0.163	0.157	0.042	0.049
1987	0.162	0.195	0.141	0.185	0.189	0.220	0.180	0.193
1988	0.153	0.181	0.155	0.189	0.181	0.198	0.094	0.122
1989	0.185	0.192	0.192	0.230	0.183	0.202	0.185	0.178
1990	0.193	0.197	0.154	0.201	0.181	0.197	0.230	0.223
1991	0.192	0.195	0.187	0.199	0.192	0.205	0.250	0.229
1992	0.206	0.226	0.196	0.205	0.186	0.220	0.258	0.269
1993	0.223	0.237	0.123	0.135	0.221	0.262	0.281	0.277
1994	0.194	0.212	0.140	0.144	0.180	0.223	0.232	0.213

Notes: Author's calculations from the Outgoing Rotation Groups of the Current Population Survey files, 1979 to 1994. Older men have 11 to 20 years of potential experience. The standard errors for the mean coefficients range from 0.010 to 0.013 (All), 0.022 to 0.036 (High School Dropouts), 0.014 to 0.019 (High School Graduates), and 0.024 to 0.080 (College Graduates). The standard errors for the median coefficients range from 0.010 to 0.017 (All), 0.026 to 0.047 (High School Dropouts), 0.010 to 0.025 (High School Graduates), and 0.025 to 0.137 (College Graduates).

Table 2: Location of Black Men in White Residual Wage Distribution

Panel A: All Men	**New Entrants (Potential Experience 1 to 10 Years)**					**Older Men (Potential Experience 11 to 20 Years)**				
Year	**10**	**25**	**50**	**75**	**90**	**10**	**25**	**50**	**75**	**90**
1979	7	15	34	64	85	6	14	38	68	84
	(0.48)	(0.70)	(1.38)	(1.37)	(0.99)	(0.30)	(0.70)	(1.05)	(0.81)	(0.68)
1985	5	13	31	58	81	6	15	36	66	83
	(0.37)	(0.64)	(1.30)	(1.55)	(1.59)	(0.24)	(0.47)	(0.97)	(0.97)	(0.53)
1987	5	15	33	61	81	6	15	37	67	85
	(0.49)	(0.78)	(1.26)	(1.61)	(1.19)	(0.36)	(0.68)	(1.16)	(0.79)	(0.55)
1994	9	19	36	59	78	7	16	37	63	81
	(0.77)	(0.93)	(1.27)	(1.42)	(1.16)	(0.33)	(0.51)	(0.86)	(0.84)	(0.71)
Panel B: High School Dropouts										
Year	**10**	**25**	**50**	**75**	**90**	**10**	**25**	**50**	**75**	**90**
1979	7	13	26	59	83	7	13	35	65	85
	(0.96)	(1.28)	(2.48)	(3.50)	(2.74)	(0.49)	(0.94)	(2.01)	(1.84)	(1.24)
1985	6	12	25	45	72	7	14	33	63	86
	(1.11)	(1.60)	(2.86)	(3.75)	(7.91)	(0.53)	(1.06)	(1.84)	(2.24)	(1.60)
1987	5	14	30	54	78	7	17	37	67	88
	(1.03)	(2.04)	(2.86)	(3.67)	(6.06)	(0.73)	(1.49)	(2.06)	(2.33)	(1.44)
1994	17	26	40	53	65	11	19	38	64	84
	(4.70)	(3.78)	(3.94)	(3.83)	(4.15)	(1.37)	(1.73)	(2.12)	(3.08)	(2.34)

Notes: Author's tabulations from the Current Population Survey Outgoing Rotation Group files. Entries represent the bootstrapped location of black men in the white residual log hourly wage distribution. The residual distributions are constructed using education and potential experience coefficients from the white regression line. Separate regressions are estimated for each potential experience group. The bootstrap statistics are based on 500 random samples of the population. All bootstrap entries are the sample mean of the given statistic. The asymptotic standard deviations are reported in parenthesis.

Table 2 cont.: Location of Black Men in White Residual Wage Distribution

Panel C: High School Graduates	**New Entrants (Potential Experience 1 to 10 Years)**					**Older Men (Potential Experience 11 to 20 Years)**				
Year	**10**	**25**	**50**	**75**	**90**	**10**	**25**	**50**	**75**	**90**
1979	6	13	32	62	84	5	13	37	66	83
	(0.49)	(1.06)	(1.56)	(2.22)	(1.32)	(0.30)	(0.86)	(1.58)	(1.49)	(1.24)
1985	5	12	29	56	78	5	14	34	63	83
	(0.49)	(0.87)	(1.68)	(1.82)	(2.14)	(0.28)	(0.79)	(1.31)	(1.22)	(0.78)
1987	5	14	31	57	78	5	13	34	65	84
	(0.59)	(0.94)	(1.74)	(2.17)	(2.01)	(0.31)	(0.91)	(1.01)	(1.36)	(0.98)
1994	10	18	34	57	79	8	15	34	62	82
	(0.95)	(1.26)	(1.82)	(1.98)	(2.55)	(0.34)	(0.65)	(0.91)	(1.54)	(1.11)
Panel D: College Graduates										
Year	**10**	**25**	**50**	**75**	**90**	**10**	**25**	**50**	**75**	**90**
1979	8	22	51	72	86	9	22	51	73	84
	(3.15)	(4.53)	(6.60)	(4.08)	(4.79)	(2.19)	(4.52)	(4.94)	(2.70)	(3.01)
1985	4	19	52	71	86	8	19	49	69	82
	(1.44)	(7.14)	(5.06)	(3.95)	(3.66)	(1.53)	(3.91)	(3.35)	(2.61)	(2.32)
1987	5	16	40	68	87	5	15	41	67	83
	(1.88)	(3.35)	(5.66)	(4.61)	(3.08)	(1.06)	(2.35)	(3.36)	(2.93)	(2.61)
1994	4	15	38	64	80	5	14	38	60	78
	(1.16)	(2.10)	(2.70)	(2.63)	(2.49)	(0.63)	(1.16)	(1.57)	(1.61)	(1.49)

Entries represent the bootstrapped location of black men in the white residual log hourly wage distribution. The residual distributions are constructed using education and potential experience coefficients from the white regression line. Separate regressions are estimated for each potential experience group. The bootstrap statistics are based on 500 random samples of the population. All bootstrap entries are the sample mean of the given statistic. The asymptotic standard deviations are reported in parenthesis.

Table 3: White-Black Log Hourly Wage Gap Decompositions, 1979-1994

	All			High School Dropouts			High School Graduates			College Graduates		
Panel A: Young Men	**1979-94**	**1979-85**	**1985-94**	**1979-94**	**1979-85**	**1985-94**	**1979-94**	**1979-85**	**1985-94**	**1979-94**	**1979-85**	**1985-94**
Total	0.477	0.2532	0.603	-0.3932	0.4615	-0.8746	-0.0119	0.6566	-0.3884	1.099	0.9061	0.5637
	(0.1136)	(0.3313)	(0.2096)	(0.1691)	(0.4344)	(0.2749)	(0.1088)	(0.2557)	(0.1618)	(0.4132)	(0.2223)	(0.6531)
Observable Quantities	0.3214	-0.2177	0.6251	0.0591	0.2066	-0.024	0.1318	0.3478	0.0101	0.5925	0.0949	-0.7887
	(0.0820)	(0.1843)	(0.1166)	(0.0625)	(0.1806)	(0.1143)	(0.0360)	(0.0860)	(0.0544)	(0.1719)	(0.1268)	(0.2716)
Observable Prices	0.114	0.0052	0.1753	-0.2509	-0.1481	-0.3087	-0.0808	-0.0516	-0.0973	-0.1495	-0.1161	-0.0569
	(0.0234)	(0.0616)	(0.0390)	(0.0405)	(0.1166)	(0.0738)	(0.0246)	(0.0727)	(0.0460)	(0.1033)	(0.0552)	(0.1633)
Gap	-0.1122	0.3645	-0.3806	-0.2677	0.5048	-0.7028	-0.1427	0.2367	-0.3564	0.5009	0.8194	1.3851
	(0.0816)	(0.1974)	(0.1249)	(0.1570)	(0.4071)	(0.2576)	(0.0924)	(0.2507)	(0.1587)	(0.3134)	(0.1758)	(0.4953)
Unobservable Prices	0.1537	0.1012	0.1833	0.0663	-0.1017	0.1609	0.0799	0.1237	0.0552	0.155	0.1079	0.0242
	(0.0174)	(0.0493)	(0.0312)	(0.0500)	(0.1402)	(0.0887)	(0.0142)	(0.0403)	(0.0255)	(0.0329)	(0.0194)	(0.0520)
Panel B: Older Men												
Total	0.8046	0.1413	1.1782	-0.4364	-0.039	-0.6602	0.3159	0.5206	0.2006	1.6889	1.344	0.7315
	(0.1560)	(0.4204)	(0.2660)	(0.1121)	(0.3120)	(0.1974)	(0.0756)	(0.2164)	(0.1370)	(0.3682)	(0.2050)	(0.5818)
Observable Quantities	0.1621	-0.1917	0.3613	-0.1278	-0.0436	-0.1752	0.071	0.064	0.075	0.0448	0.0344	0.0159
	(0.0567)	(0.1321)	(0.0836)	(0.0245)	(0.0684)	(0.0433)	(0.0087)	(0.0258)	(0.0163)	(0.0624)	(0.0332)	(0.0986)
Observable Prices	0.1755	0.1939	0.1652	-0.2899	0.0764	-0.4963	-0.0621	0.1277	-0.169	-0.0193	0.0143	0.0739
	(0.0247)	(0.0733)	(0.0464)	(0.0496)	(0.0999)	(0.0632)	(0.0235)	(0.0416)	(0.0264)	(0.0491)	(0.0268)	(0.0776)
Gap	0.2906	-0.0364	0.4748	-0.0698	-0.1957	0.0011	0.1565	0.0951	0.1911	1.4963	1.1724	0.5972
	(0.0880)	(0.2432)	(0.1539)	(0.1154)	(0.3410)	(0.2158)	(0.0770)	(0.2281)	(0.1443)	(0.3128)	(0.1758)	(0.4943)
Unobservable Prices	0.1764	0.1755	0.1769	0.0511	0.1239	0.0101	0.1505	0.2338	0.1035	0.1672	0.123	0.0444
	(0.0162)	(0.0482)	(0.0305)	(0.0185)	(0.0508)	(0.0321)	(0.0175)	(0.0459)	(0.0290)	(0.0234)	(0.0147)	(0.0369)

Notes: See text for detailed description.

Table 4: Residual Log Wage Procedure for Changes in Gaps by Potential Experience Category

	New Entrants from 1979 to 1985		Older Men from 1985 to 1994	
Variable	**Sample**	**Bootstrap**	**Sample**	**Bootstrap**
$PDGAP_{AVG}$	0.0169	0.0164	0.0010	0.0007
		(0.0031)		(0.0023)
$ADGAP_{AVG}$	0.0534	0.0530	0.0146	0.0154
		(0.0139)		(0.0103)
$RATIO_{AVG}$	0.3166	0.3437	0.0672	0.0745
		(0.1750)		(2.1426)
$PDGAP_{10}$	-0.0113	-0.0134	0.0283	0.0312
		(0.0049)		(0.0051)
$ADGAP_{10}$	0.0569	0.0573	0.0103	0.0152
		(0.0185)		(0.0144)
$RATIO_{10}$	-0.1990	-0.2249	2.7442	2.6708
		(1.1545)		(16.2600)
$PDGAP_{25}$	0.0117	0.0109	0.0445	0.0420
		(0.0044)		(0.0040)
$ADGAP_{25}$	0.0517	0.0536	0.0362	0.0339
		(0.0152)		(0.0137)
$RATIO_{25}$	0.2271	0.2215	1.2295	1.3364
		(0.1186)		(6.9200)
$PDGAP_{50}$	0.0202	0.0208	-0.0028	-0.0025
		(0.0041)		(0.0038)
$ADGAP_{50}$	0.0376	0.0394	0.0006	0.0028
		(0.0190)		(0.0166)
$RATIO_{50}$	0.5370	0.4542	-4.4837	-0.1457
		(8.3946)		(1.6662)
$PDGAP_{75}$	0.0077	0.0067	-0.0185	-0.0178
		(0.0040)		(0.0032)
$ADGAP_{75}$	0.0631	0.0675	0.0226	0.0206
		(0.0197)		(0.0159)
$RATIO_{75}$	0.1216	0.1079	-0.8180	-0.7905
		(0.0984)		(8.2098)
$PDGAP_{90}$	0.0129	0.0103	0.0134	0.0151
		(0.0050)		(0.0035)
$ADGAP_{90}$	0.0586	0.0584	0.0421	0.0390
		(0.0265)		(0.0157)
$RATIO_{90}$	0.2204	-0.4521	0.3182	0.1730
		(11.9617)		(6.0366)

Notes: Author's calculations from the CPS ORG files. The bootstrap statistics are based on 500 random samples of the population. PDGAP denotes the predicted change in the white-black wage gap given that the black position in the white wage distribution does not change. ADGAP denotes the actual change in the gap. RATIO measures the increase in the variance of wage's contribution to the gap's actual change. The subscripts denote percentiles. All bootstrap entries are the sample mean of the given statistic.

Table 5: High School and College Graduate Decompositions for 1979 to 1985 and 1985 to 1994

Panel A: New Entrants 1979 to 1985

	High School Graduates		College Graduates	
Variable	**Sample**	**Bootstrap**	**Sample**	**Bootstrap**
$PDGAP_{10}$	0.0253	0.0283	-0.0046	-0.0012
		(0.0167)		(0.0263)
$ADGAP_{10}$	0.0679	0.0685	0.0902	0.0592
		(0.0213)		(0.0692)
$RATIO_{10}$	0.3730	0.4809	-0.0512	0.1219
		(0.4366)		(1.2773)
$PDGAP_{25}$	0.0290	0.0324	0.0101	0.0188
		(0.0148)		(0.0280)
$ADGAP_{25}$	0.0896	0.0819	0.0782	0.0612
		(0.0185)		(0.1007)
$RATIO_{25}$	0.3235	0.4428	0.1285	-0.1038
		(0.2792)		(2.1769)
$PDGAP_{50}$	0.0129	0.0144	-0.0126	-0.0054
		(0.0113)		(0.0172)
$ADGAP_{50}$	0.1013	0.0885	0.0080	0.0019
		(0.0276)		(0.0696)
$RATIO_{50}$	0.1274	0.1895	-1.5814	2.1277
		(0.2772)		(20.3625)
$PDGAP_{75}$	-0.0012	0.0106	0.0342	0.0318
		(0.0164)		(0.0240)
$ADGAP_{75}$	0.0972	0.0923	0.0604	0.0482
		(0.0316)		(0.0472)
$RATIO_{75}$	-0.0125	0.1388	0.5662	-0.5903
		(0.2982)		(13.5716)
$PDGAP_{90}$	0.0370	0.0296	0.0300	0.0213
		(0.0160)		(0.0230)
$ADGAP_{90}$	0.0726	0.0689	0.0179	0.0307
		(0.0362)		(0.0757)
$RATIO_{90}$	0.5091	0.5155	1.6809	-0.2200
		(0.4396)		(3.2912)

Notes: See end of table for description.

Table 5 cont.: Quantile Regression Procedures for 1979 to 1985 and 1985 to 1994

Panel B: Older Men from 1985 to 1994				
	High School Graduates		**College Graduates**	
Variable	**Sample**	**Bootstrap**	**Sample**	**Bootstrap**
$PDGAP_{10}$	-0.0206	-0.0316	0.0206	0.0142
		(0.0260)		(0.0321)
$ADGAP_{10}$	-0.0385	-0.0301	0.0570	0.0905
		(0.0421)		(0.0481)
$RATIO_{10}$	0.5342	-1.0037	0.3614	0.2184
		(7.1077)		(0.5426)
$PDGAP_{25}$	-0.0358	-0.0422	0.0134	0.0138
		(0.0164)		(0.0313)
$ADGAP_{25}$	-0.0214	-0.0218	0.1266	0.1503
		(0.0295)		(0.0739)
$RATIO_{25}$	1.6737	2.6184	0.1058	0.0912
		(12.1091)		(0.9785)
$PDGAP_{50}$	-0.0125	-0.0109	-0.0098	-0.0038
		(0.0171)		(0.0139)
$ADGAP_{50}$	-0.0288	-0.0169	0.1761	0.1719
		(0.0276)		(0.0545)
$RATIO_{50}$	0.4327	0.2621	-0.0558	-0.0268
		(8.6648)		(0.1161)
$PDGAP_{75}$	0.0063	0.0235	0.0270	0.0343
		(0.0148)		(0.0233)
$ADGAP_{75}$	-0.0032	-0.0035	0.1787	0.1686
		(0.0265)		(0.0427)
$RATIO_{75}$	-1.9711	0.5995	0.1511	0.2369
		(8.9206)		(0.1941)
$PDGAP_{90}$	0.0268	0.0276	-0.0065	-0.0022
		(0.0153)		(0.0238)
$ADGAP_{90}$	0.0237	0.0138	0.1273	0.1126
		(0.0388)		(0.0564)
$RATIO_{90}$	1.1335	-2.4691	-0.0508	0.0508
		(30.9925)		(0.7731)

Notes: Author's calculations from the CPS ORG files. The bootstrap statistics are based on 100 replications of the procedure. Random samples of the population are created in each bootstrap sample. PDGAP denotes the predicted change in the white-black wage gap given that the black position in the white wage distribution does not change. ADGAP denotes the actual change in the gap. RATIO measures the increase in the variance of wage's contribution to the gap's actual change. The subscripts denote percentiles.

Data Appendix

Construction of Years of Schooling:

Prior to 1992, respondents were asked, "What is the highest grade or year of regular school...has ever attended?" and "Did...complete the grade?"[31] In 1992, the CPS switched to a credential oriented measure of attainment. With this new information, potential experience cannot be constructed. Information in the February 1990 CPS provides a potential solution to this problem. During this month, respondents were asked both questions. To predict years of schooling and potential experience for respondents in the 1992 to 1994 files, I use the average years of schooling in the February 1990 CPS by education level.

The mean values which come from a regression of years of schooling on a series of dummy variables are as follows: Education = 5 to 6, 2.642; Education = 7 to 8, 6.732; Education = 9, 8.446; Education = 10, 9.389; Education = 11, 10.369; Education = 12, 11.042; High School Graduate, 11.480; Some College, 12.937; AA Degree-Vocational, 13.599; AA Degree-Academic, 13.861; BA Degree, 15.646; MA Degree, 17.164; Professional Degree, 17.203; Doctoral Degree, 17.288; Constant, 0.515. To construct potential experience, I rounded the cell means to their closest integer. Reardon (1997) uses this cell mean approach. I also constructed predictions based on coefficients from a regression of years of schooling on dummy variables for education category, race, sex, region of residence, class of work, union membership, urban residence, industry and occupation of affiliation, and marital status. The addition of these sociodemographic variables had no impact on the constructed years of schooling distributions. These additional results are available upon request from the author.

Construction of Log Hourly Wages:

From 1979 to 1988, weekly wages are topcoded at $999. In 1989, the topcode is raised to $1,923. If a smaller share of black men's wages is topcoded, then the mean gap is biased downward. To adjust for this potential bias, researchers typically impute wages for individuals at the $999 topcode. For example, Bound and Freeman (1992) use their sample of new entrants at the $999 cap in 1989 to calculate the geometric mean of weekly wages. The value was $1,227. They assign this value to men in all years. Instead of using this adjustment, I use an alternative measure of central tendency: the median. The advantage of the estimating median gaps is that they are robust to topcoding and less sensitive to the increased variance in wages. A disadvantage of using median gaps will be their greater sensitivity to mass points or spikes in the data.

ENDNOTES

1. See, for example, Bound and Freeman (1992) and Rodgers (1997a, b).

2. Convergence in racial differences in observable characteristics and relative improvements in the mean position of blacks in the white residual distribution swamped the influence of unobservable prices.

3. Chamberlain (1991) and Buchinsky (1991) utilize quantile regression techniques to examine the union relative wage effect, and how the returns to schooling have changed since 1964. The Chamberlain and Buchinsky studies provide a more detailed description of the conditional distribution of wages than standard mean regression, because the wage effect and returns are allowed to vary across the wage distribution.

4. Juhn et al. (1991) do not estimate quantile regression models, but for a given percentile, calculate the difference in real wage growth between high school and college graduates who have 1 to 10 years of potential experience (Figure 4-4, p. 116). A quantile regression of the logarithm of real wage growth on a constant and an educational dummy (coded 1 if the individual is a college graduate, and 0 if the individual is a high school graduate) yields their difference.

5. The β_q's and γ_q's are obtained from the following minimization problem:

$$\min_{\beta,\gamma} \frac{1}{n} \sum_{i=1}^{n} | y_i - X_i'\beta - R_i\gamma | h_i , \qquad \text{(A1)}$$

where $h_i = q$ if $(y_i - X_i'\beta - R_i\gamma) > 0$, and $h_i = (1-q)$ if $(y_i - X_i'\beta - R_i\gamma) \leq 0$. Equation (A1) is minimized with STATA, Version 5.0, which uses linear program techniques developed in Armstrong, Frome and Kung (1979). Homoscedastic standard errors are estimated as suggested in Koenker and Bassett (1982).

6. The divisions are New England, Mid-Atlantic, East North Central, West North Central, South Atlantic, East South Central, West South Central, Pacific. The Mountain divisional identifier is excluded.

7. Note that I exclude individuals with some college from the analysis.

[8] The exposition borrows heavily from Rodgers (1997) and Zveglich, Rodgers and Rodgers (1997).

9. See Juhn et al. for a detailed description of how these components are constructed.

10. Rodgers (1997b) conducts the procedure for each quartile of the wage distribution. For

example, at the lowest quartile (5^{th} to 25^{th} percentiles), I locate the positions of the 5^{th} and 25^{th} percentile African Americans in the year t white residual wage distribution and then find year t' white residuals which correspond to these percentiles. The mean of these residuals is the year t' average predicted wage for African Americans at the lowest quintile, assuming that their year t positions in the wage distribution are preserved. I then compute the year *t* and year *t'* averages of the white 5^{th} to 25^{th} percentile residual wages. The ratio is the difference between the predicted year t' mean gap and the actual year t mean gap divided by the change in the actual year t' and year t mean black-white wage gaps.

11. To assess the estimates' level of precision, I calculated the asymptotic standard deviations. I also constructed the implied standard deviations based on 95, 90, and 80 percent confidence intervals using the percentile method. For example, to construct a 95 percent confidence interval based on a bootstrap sample of 500, I found the 13th smallest and 488th largest values in the sample. The values of 13 and 488 come from multiplying 500 by .025 and .975. To compute the standard deviation, I took the difference between these two values and divided by 2.564, which is 2 times 1.645, the critical value for a 95 percent level of significance. I define precision as the relative size of the bootstrap sample mean to its standard deviation.

12. For example, the procedure at the median starts with the estimation of separate year *t* median black and white regressions. I construct the predicted black and white median wages for a reference set of characteristics (X^*). I then perform a search over the white quantile regressions to find the q^*th quantile, where the white predicted wage equals the predicted black median wage. This q^* denotes the location of the median black in the year *t* white distribution. Using year t' data, I estimate the white quantile regression at quantile q^*. These coefficients, along with the X^*, are used to construct the predicted year t' q^*th quantile white wage, which I interpret as the predicted year t' black median wage conditional on characteristics equal to X^*. The predicted year t' gap equals the difference between the conditional white median wage and the predicted black wage (conditional q^*th quantile of the white wage distribution). The actual gap equals the difference between the conditional white and black median wages. I use these gaps to calculate the ratio of the predicted and actual changes. To allow for a statistical interpretation of the changes in the actual and predicted gaps, and the ratio, I performed the procedure 100 times. The smaller sample size reflects the greater computational costs of the quantile regression procedure.

13. I constructed the composite distribution by pooling all of the years from 1979 to 1985. Results from these models are available from the author upon request.

14. Potential Experience = Min(Age - 18, Age - Education - 6).

15. Prior to 1994, the variable is "major activity last week". In 1994, the CPS switched to the "mlr" variable to determine an individual's labor force status. The Unicon Research Corporation files that we use contain a variable that is comparable across time.

16. Polivka (1996) focuses exclusively on describing the redesign of the questionnaire and its impact; however, in footnote 3, Polivka mentions that the switch to the 1990 decennial census occurred at approximately the same time that the new questionnaire began to be used.

17. An individual's hourly wage corresponds to his usual earnings. For workers who are paid an hourly rate, their wage equals their usual hourly wage. For workers paid a weekly rate, their hourly wage equals the ratio of their usual weekly wage and usual hours worked.

18. Juhn et al.'s samples consist of black and white males who meet the following criteria: (1) less than 10 years of potential experience, (2) worked at least one week during the calendar year, (3) usually full-time, and (4) participated in the labor force for at least thirty-nine weeks.

19. For new entrants, in 1979 full-time white men worked on average 1.9 hours more per week, 2.1 hours more in 1989, and 2.6 hours more in 1994.

20. Descriptive statistics for all other years are available from the author upon request.

21. From 1985 to 1989, the U.S. unemployment rate fell from 7.2 to 5.3 percent. White unemployment rates fell from 6.2 to 4.5 percent, and black unemployment rates fell from 13.7 to 10 percent.

22. The complete series are available from the author upon request.

23. Another interpretation of the results is as follows. A growing body of literature finds that the greater selective withdrawal of African Americans from the labor force as developed in Butler and Heckman (1977) could explain the expansion in the gap. Neal and Johnson (1996), Chandra (2000, 2003) and Juhn (1998) find evidence to the contrary of Smith and Welch (1989) and Hoffman and Link (1984).

24. In the interest of space, I only report the relevant findings. As a robustness check and to allow for a direct comparison with Juhn et al.'s results for the 1979 to 1987 sub-period, I set the breakpoint at 1987. The results are quite similar. Detailed tables are available from the author upon request.

25. From 1979 to 1987, the gap expanded at .75 percent per year, and unobservable prices account for 5.5 percent of the actual gap's increase.

26. These calculations are not exactly equal to the total change shown in Table 3 because they are computed using the endpoints (e.g., 1979 and 1985), while the total changes in Table 3 also use intervening years.

27. The precision (e.g., the size of the bootstrap mean relative to its standard deviation) improves when we switch to the implied standard deviations based on confidence intervals from the percentile method. These standard errors are available from the author upon request.

28. See, for example, Oaxaca and Ransom (1994), Smith and Welch (1989), Cotton (1988), Flanagan (1973), Hoffman and Link (1984), and Corcoran and Duncan (1979).

29. See, for example, Reich (1981), Blank (1989), Bound and Freeman (1989).

30. Studies by Duncan (1992), Duncan and Hoffman (1979) and Sexton and Olsen (1994) that use data prior to 1985 find that racial differences in training lead to a divergence in the age-earnings profiles of black and white workers. Future research should focus on updating this literature.

31. Kominski and Siegel (1993) provide an excellent discussion of the pros and cons associated with changing the educational attainment question.