Early Career Wage Growth of White and Black Women

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February, 2005

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Abstract

The wage differential between white and black women has been widening in the last two decades. This trend has been attributed to the race-based gap in schooling. However, a substantial wage differential still remains unaccounted for in cross-sectional wage studies comparing black and white female workers of similar educational levels. This "unexplained" white-black wage gap may result from both unmeasured earnings-enhancing attributes favoring whites, as well as market discrimination against blacks. To disentangle these two effects, we estimate a within-cohort fixed-effect model that assesses the race-based gap in wage *growth* within four educational levels: high school dropout, high school graduates, those with some college, and college graduates. Using data from the NLSY Work History file we depict the diverging wage trajectories of women's first post-schooling decade. The results indicate that while wage growth of black women who attend college is similar to that of whites, the less-educated black women, i.e. high school graduates and high school dropouts, do not experience similar rates of wage growth as their white counterparts. Since we control for group differences in time-invariant unmeasured attributes these estimates capture, either (or both) the effects of time-variant unmeasured attributes, or the degree to which labor market treatment (i.e., discrimination) contributes to the growing wage disparities between less educated black and white young women. Possible explanations for our results are discussed.

Introduction

While race-based wage differentials among men were extensively studied, we know very little about similar differences among women (Bound and Dresser 1999; Browne 1999). Although earning differentials between white and black women have increased in the past 20 years, these rising gaps are still under-investigated (Altonji and Blank, 1999). Our study is designed to fill this gap. Specifically, since recent research on men has pointed to growing skills-based disparities among them (Bound and Freeman 1992), we assess the skill-related wage dynamics of black and white women.

Based on narrowing wage gaps between black and white women during the early to mid-1970s, researchers inferred a declining significance of race for women's economic fortunes (England and Browne, 1992). However, recent indicators reveal appreciable wage disparities between minority and white women (Blau, 1998; Bound and Dresser, 1998; Browne, 1998). While wages of white women have risen steadily since 1980, black women experienced little wage growth (Altonji and Blank, 1999). The major reason cited for this widening wage differential between blacks and whites is the skill gap between the two groups, usually measured by educational attainment.

The most widely used type of explanations for the skill-related race wage gap can be labeled "compositional." According to these explanations, the wage differential between two groups of workers can stem from one out of two reasons (or from both). First, if the proportion of highly educated workers within one group grows faster than in the other group (holding returns to higher education constant), then the wage differential between these two groups should widen. Second, if the returns for higher education rise (holding the difference in proportions of the highly

educated within groups constant) wage differentials between the two groups should widen as well.

Indeed, the gaps in wages between more- and less-educated workers have risen quite substantially during the 1970's and 1980's (Katz and Murphy, 1992). The main reason offered for that in the literature is the changes in the relative demand for workers at different educational levels (e.g., Gottschalk, 1997). The labor market, due to industrial restructuring, technological development and shifts in international trade patterns, favors the more educated. Others suggest that changes in the supply of workers at different educational levels and changes in the average level of productive ability of workers of different educational groups are the main reasons for the widening gap between more and less educated workers (Blackburn and Neumark, 1993).

There is general consensus among those adapting the "compositional" framework that large racial disparities in educational attainment during a period of rising returns to schooling are primarily responsible for rising wage gaps among women (Anderson and Shapiro, 1996; Blau and Kahn, 1997; Bound and Dresser, 1998). The widening wage inequality and changes in the returns to skills over the 1980s have benefited white more than black females. Since blacks are more heavily concentrated among the less-educated, they have disproportionately suffered from the earning loses experienced by the less-educated workers (Altonji and Blank, 1999).

An interesting question remaining is whether there are *other* processes contributing to the white-black widening wage gap among women. There is evidence to suggest that the lower educational attainment of blacks accounts for some but not the entire wage gap between them and whites. Moreover, even when compared to whites with similar levels of education, blacks earn lower wages (Holzer, 2000).

In most research the remaining residual of unexplained wage differences is treated as evidence for market discrimination against blacks. However, it is possible that the wage models yielding these results do not capture unmeasured group differences in skills that are relevant to labor market performance. This problem is especially likely in cross-sectional studies of earnings differentials between groups. To rule out this possibility, we estimate a within-cohort fixed-effect model that assesses the race gap in wage *growth* within educational levels. Such a model allows us to assess the remaining component in the race wage gap among women that is unexplained by measured and unmeasured attributes. We then examine if this component reflects market discrimination against black women, or other labor market processes.

We are interested in two, interrelated questions about racial differences among women in returns to schooling. First, we are interested in studying the race gap in wage growth among women with similar levels of educational attainment. This is a *between* race-group question. Second, as a backdrop to the first question, we also assess whether the returns for schooling, measured by wage growth, are similar for white and black women. This is a *within* race-group question. Our focus is on women's early years in the labor market - right after leaving school as these are the most crucial years for launching labor market careers and shaping life-time earnings. Moreover, the extent and pace of black-white inequality in age-earnings profiles are greatest among the young, as their employment and wages reflect changing economic conditions and constraints better than the labor market outcomes of older women (Blau, 1998). We use data from the NLSY Work History file to analyze the diverging wage trajectories of white and black women during their first post-schooling decade.

The Female Racial Wage Gap

After several decades in which black women's economic fortunes had improved greatly relative to whites, recent research has recorded a divergence in black-white female earnings over the past 20 years (Altonji and Blank 1999; Bound and Dresser 1999; Corcoran 1999). Bound and Dresser (1999) report that the relative wages of black women declined substantially beginning in the mid-1970s and continuing throughout the 1980s. Between 1979 and 1991 the overall gap in hourly wages between young black and white women widened so that by 1991 young black women's average wages were 14 percent lower than those of young white women. This relative decline is larger than the comparable erosion of black men's wages relative to white men (Altonji and Blank 1999; Bound and Dresser 1999).

As educational attainment is the key determinant of wage opportunities, group-based disparity in educational attainment clearly contributes to the race gap in earnings. This is even more so because of the noted increase in the returns to higher education since the 1980s (Katz and Murphy, 1992). Parallel to trends found among men (Juhn, Murphy and Pierce 1993; Katz and Murphy 1992), education-based wage differentials widened among women in the 1980s and early 1990s. While real wage gains between 1969 and 1994 were 20.3 percent for female college graduates and 8 to 9 percent for women with high school degrees or some college, real wages fell by 2.2 percent for high school dropouts (Blau 1998). The deterioration in the economic position of less educated women, particularly high school dropouts is, of course, the most disturbing evidence of all.

Since black women acquire less schooling than white women, it is not surprising that they have suffered disproportionately from the earnings losses experienced by the less-educated workers. However, the combination of the widening

gap in educational attainment and the rising value of education explain about 10 percent of the widening earning gap between young black and white women (Bound and Dresser 1999). Even when compared to whites with similar levels of education, blacks earn less than do whites (Holzer, 2000).[1]

We have already stressed that the "unexplained" black-white wage differences produced by cross-sectional studies of black and white workers of similar educational levels (and other measured attributes) may result from both unmeasured earnings-enhancing attributes favoring whites, as well as market discrimination against blacks. Cross-sectional studies designed to explain group-based wage differentials *cannot* separate these two effects from one another. A within-cohort fixed-effect model that assesses the race gap in wage *growth* within educational levels allows us to isolate the ”unexplained” component from the effect of unmeasured attributes. Our comparisons are longitudinal- "within cohort" and as such they capture true changes in opportunities or behaviors and not simply compositional effects - contrary to using a few over-time cross-section analyses. Our analytical strategy overcomes a major problem embedded in cross-section analyses, where deteriorating relative economic position of the less-educated black workers may reflect shifts in the composition of the labor market—in terms of education, skills, industry or occupation—rather than changes in the opportunities or behaviors of this group. This is important because findings strongly suggest that compositional shifts do not entirely account for the deteriorating economic position of the less educated women (Blau, 1998).

The Model

The standard model used for estimating a group effect on earnings is as follows (Altonji and Blank, 1999; Cain, 1986; Darity and Mason, 1998):

$$y_i = \underline{X_i}'\underline{B} + b_1 (G_i) + e_i \qquad (1)$$

where y_i is the (ln) earnings of the ith subject, $\underline{X_i}$ is a vector of earnings determinants, $\underline{B}$ is a vector of their coefficients, G is a group indicator (race in our case, coded as '1' = white), and e is an error term. The coefficient b_1 serves as an estimate of the group effect on earnings so that researchers test for $b_1>0$. If indeed this is the case, it serves as an indication for group effect on earnings ("discrimination").[2]

However, we can never be sure if such an effect is the sole result of a differential treatment of groups by the market. It is quite possible that the earnings model is misspecified and does not include the entire set of relevant earnings determinants. In fact, recent evidence suggests that an improved model specification can reduce the group ("unexplained") effect for blacks and for women (Altonji and Blank 1999). As a result, the error term ("e") in the standard model might contain not only "well-behaved" random errors, but also unmeasured earnings determinants (e.g., education quality, general ability, cognitive skills, motivation, or preferences) that are correlated with group membership. If indeed this is the case, then the "true" wage model should be specified as follows:

$$y_i = \underline{X_i}'\underline{B} + b_1 (G_i) + u_i + v_i \qquad (2)$$

where: $e_i = u_i + v_i \qquad (2.a)$

u_i represents the unmeasured determinants of the ith individual (and are assumed to be time-invariant), and v_i is the normally-distributed error term.

If indeed $\text{Corr}(G_i , u_i) > 0$, then the estimated b_1 is upwardly biased (Blau, 1998), and we are faced with the risk of incorrect conclusions about group effects on

earnings. In order to derive an unbiased estimated group effect, we can estimate a first differencing model as follows:

$$y_{it2} - y_{it1} = (\underline{X}_{it2} - \underline{X}_{it1})' \underline{B^*} + b_1^* (G_i) + b_2^* (y_{it1}) + u_{it2} - u_{it1} + v_{it2} - v_{it1} \quad (3)$$

where '1' and '2' indicate two time points in which measures of the same individuals are taken. y_{it1} is added to the right hand-side of the equation as a control for possible floor or ceiling effects whereas as b_2^* is its coefficient.[3]

This model does not suffer from a possible bias resulted from omitted variables because each subject serves as a "control" for her unmeasured qualifications, and the u_i (over-time stable) error terms at t_1 and t_2 are cancelled out (see, for example, England et al., 1988). The coefficient b_1^* thus is an unbiased estimate of the group effect on wage growth. If indeed the average rate of wage growth of one group is faster than that of another group of similar average (measured and unmeasured) attributes, this coefficient should be different from zero.

As mentioned above, these models are estimated separately within each educational level. We define four such levels: (1) high-school dropouts; (2) high-school graduates; (3) those with some college; and (4) college graduates. The importance of such disaggregated analyses is suggested by recent research on men (e.g., Juhn, Murphy, and Pierce, 1993). This research has pointed to growing disparities among them on the basis of skills, and it suggests the potential usefulness of a comparable investigation among women (Blau, 1998). Our focal examination in these skill-based analyses is the degree to which black and white women experience similar rates of wage growth *within* each educational level during their early market years (e.g., the wage growth rate of black and white college graduates of similar attributes right

after their graduation). These analyses should indicate to us the impact of market discrimination on age-earnings profiles of black and white women (net of their measured and unmeasured attributes).

Similarly, as a backdrop to the main analysis just described, fixed-effect models are estimated separately for blacks and whites. These estimates should indicate whether the between skill-level earnings-growth structure of the two racial groups are similar (e.g., whether the wage growth rate of college graduates relative to high-school dropouts are the same in both groups). The results will tell us if black and white highly skilled women face similar opportunities relative to their less skilled counterparts of their *own group.*

Data

Sample: We analyze the National Longitudinal Survey of Youth (NLSY), a national probability sample of 12,686 individuals ages 14-21 as of January 1, 1979, who were re-interviewed annually until 1994. We restricted our sample to women, and excluded the nonrandom military and poverty samples.[4] Like Neal and Johnson (1996) and Carneiro, Heckman and Masterov (2005) we analyze respondents born after 1961. This group had neither worked full time in the labor market nor started postsecondary schooling when we first observed them.[5] The analysis is therefore restricted to the younger subset of the NLSY panel, which provides the cleanest estimates of residual wage gaps (Neal and Johnson, 1996). Our sample includes 1156 women with valid earnings information: 746 whites and 410 blacks at the ages of 14-17 in 1979. Analyses were restricted to women with valid earnings information for both the 2nd year after leaving school (t_1) and the 8th year after leaving school (t_2). We primarily focused on the interval between the second and eight post-schooling years.

T_1 and t_2 can take four possible values of calendar year - depending on the respondent's age at time of first interview. We chose to start with the second year after leaving school to allow women to find jobs that are relatively stable. However, to minimize missing cases, we also included 218 cases that lacked either the second or the eighth year of earnings data, but had valid data for the third-and-ninth or for the first-and-seventh post-schooling years. This strategy retains the six-year time-lag for these observations as well.

Data construction: The NLSY Work History file reports weekly employment status for each respondent, which we use to construct a monthly and annually history of primary employment status based on the job in which respondents worked the most hours per month. The fact that respondents average 200 person-months in their work history records enables precise tracking of *all* employment events from ages 16 to 30. For each month we constructed a measure indicating whether the respondent was employed. The women's main job was derived by identifying the job with the most hours worked (in case of dual job holding). These detailed person-month data were used to derive annual measures of labor market behaviors and outcomes.

Variables: The analyses classify each respondent into four education categories indicating the highest level completed by age 30 (HS Dropout; HS Graduate; Some College and College Graduate).[6] All individuals *within* each educational category at t_1 are at the *same* age (regardless of their age at time of the first interview, i.e 14 to 17 years of age). We use the middle point age for a given schooling category (17, 18, 20, and 23, respectively) as the starting age of the interval for each individual within categories.[7] For example, high school dropout women were *all* at the age of 18 at t_1 (2^{nd} year after leaving school) and at the age of 24 at t_2

(the 8th year after leaving school). College educated women were at the age of 24 at t_1 and at the age of 30 at t_2.

All measures of work experience and family formation are measured for the corresponding wage growth interval (2-8, 3-9 or 1-7). To compute *hourly wages* in a certain year, we summed nominal hourly wages for all person-months in that year and divided them by the number of non-missing months with wage information. This approach yields reasonably precise average annual hourly wages for each post-school year. All wages reported are real wages expressed in 1995 prices. Our focal variable – wage growth - was computed for the corresponding wage growth interval (2-8, 3-9 or 1-7).

We also included a precise measure for actual market experience - labor force attachment. It is measured by the percent of time spent in employment: the number of employed months divided by the total number of months in each year (times 100). It has long been agreed that potential experience is a poor proxy for actual experience for women (Anthecol & Bedard 2004). Moreover, this may be particularly important for our question because of demonstrated race differences in labor force attachment among young women (Alon et al., 2001; Alon & Tienda 2005). Finally, we controlled for two variables indicating family responsibility: marital status and number of children.[8] Appendix Table A1 provides detailed definitions of all variables and their descriptive statistics. All descriptive analyses are weighted to adjust for over-sampling, non-response, and attrition.

In sum, we analyzed black-white wage differentials within four educational categories: college graduates, those with some college education, high-school graduates, and high-school dropouts. In addition to the level of education, each group

is relatively homogeneous in its age. Furthermore, the measures used for actual market experience and wages are exceptionally reliable.

Descriptive Results

Table 1, which displays group-specific educational attainment by age 30 concurs with ample evidence showing the disadvantage of black women in graduating from high school and acquiring postsecondary education. 12 percent of black women in our sample of employed women dropped out of high school compared to 9 percent of white women. Conversely, by age 30, 17 percent of blacks obtained a bachelor (or higher) degree compared to almost three out of every ten white women. These disparities in skills and credentials shape women's wage trajectories as they move from school to work.

[Table 1 about here]

To shed some light on the diverging wage trajectories, Table 2 depicts women's (ln) real hourly wages (in1995 prices) in t_1, and their six-year real wage growth, by race category and educational level. As expected, the data reveal that women's wages upon career launching are linearly related to educational attainment for both black and white women. Black women's starting-wages lag behind those of white women, plausibly reflecting their lower educational attainment. However, the results also corroborate Holzer's (2000) finding regarding the enduring race wage gap *within* educational strata. Within all educational levels, black women's starting wage rates are lower than those of their white counterparts.

[Table 2 about here]

Above and beyond differences in starting wages, the findings regarding women's wage growth concurs with Oettinger's (1996) findings of a widening wage

gap among men as they accumulate labor-market experience. Wages of high school dropout women grew 0.16 ln points in the interval of six-years after leaving school compared to 0.26 ln points among women with high school diploma, and 0.28 ln points among college graduates (data not shown). Interestingly, there are race-based differences in the rate of wage growth within each education category. Among the high school dropouts, wages of blacks grew 0.12 ln points only, as compared to 0.19 for white women. A slower-than-white women's pace of wage growth is also evident for black women with a high school diploma or with some college experience, although the race gap in wage growth is attenuated as educational levels rise. College-educated women is the only group where blacks' wage growth exceeds that of their white educational counterparts. Put differently, the wage growth of the low-educated women is slower among blacks, and the wage growth of the highly-educated women is faster among blacks. Combined together, these results suggest that education-related wage differentials among black women get larger in a faster pace than among whites.

These results suggest a pattern where low-skilled black women, namely those without any college experience, not only face the expected lower starting wages compared to their skilled same-race counterparts, but also suffer from a slower wage growth than white workers of similar credentials. Put differently, an examination of the average wage growth of the various race-and-education groups indicates that the starting wage differential between white and black low-skilled women right after they leave school is getting wider with the years. This pattern can reflect observed and unobserved labor market qualifications, but it can also be indicative of discriminatory processes against low-skilled black women. Our multivariate analysis is designed to disentangle these effects.

Multivariate Analysis

We start with baseline pooled models estimating (ln) wages in t_1, and six-year real wage growth. The cross-sectional model controls for labor force attachment, number of children and marital status while the wage growth model controls for starting wages in addition to changes in market attachment and family characteristics. The cross-sectional results, depicted in column 1 of Table 3, corroborate prior findings about the race gap in wage rates as well as gaps in wages between more- and less-educated workers. They also show that the lower educational attainment of blacks does not account for the entire wage gap between them and whites. Not only that black women lag behind their white counterparts in term of starting wages right out of school (in about 8 ln points), the pace of their wage growth is slower as well. Specifically, the wage growth for black women (column 2 of Table 3) in the first six post schooling years is slower compared to that of whites (in about 11 ln points), controlling for educational level, initial wages, changes in labor force attachment, number of children and marital status. Because we employed a within-cohort fixed-effect strategy, this race gap in wage growth cannot be attributed to group differences in earning-enhancing unmeasured characteristics.

[Table 3 about here]

Results regarding skill-based differences show higher returns to education not only in initial wages but also in terms of the wage trajectory. The initial wage rate for high-school dropouts is the lowest and the pace of their wage growth is the slowest as well. Conversely, college educated women initial wages, right after leaving school, are the highest and they are also able to draw on their skills to receive higher returns to experience. What is still not clear is whether these returns to education are similar for black and white women.

Table 4 presents group-specific models that are identical in structure to those depicted in Table 3. The first two models estimate starting wages whereas the subsequent two models assess wage growth. The results for wages in t_1 suggest a somewhat different wage structure for white and black women, although t-tests for differences between coefficients do not reveal white-black differences that are statistically significant. Moreover, these differences can reflect unmeasured skill-related characteristics that may produce biased skill-based wage gaps among blacks and/or among whites. To account for this possibility we estimate fixed-effect models separately for whites (model 3) and blacks (model 4).

[Table 4 about here]

Controlling for unmeasured attributes, the estimates reveal a lucid pattern of race difference in wage-growth structure. We find that the skill-level wage-growth structures of the two racial groups are not similar. While both groups of high school dropouts lag behind, black dropout women lag behind their college-educated counterparts more than their white counterparts. This difference is statistically significant at .05 level. [9] Since all other white-black differences (i.e. the differences between college educated and those with some college education or with a high school diploma) are not statistically significant, we conclude that only the opportunities of the least educated differ between black and white women.[10] In other words, black and white high school dropout women face different opportunities relative to their more skilled counterparts of their *own group*.

These findings show that a substantial part of the gap in wage growth of the less-educated cannot be attributed to unmeasured skills. To directly assess the "unexplained" black-white wage differentials within education strata we estimate our models (wages in t_1 – at the second post-schooling year, and wage growth between t_1

and t_2) *within* each educational level. These analyses should indicate to us the impact of market discrimination on age-earnings profiles of black and white women (net of their measured and unmeasured attributes). Table 5 depicts these estimates. These models (columns 1-4) show that the race gap in initial wages is statistically significant among skilled women - those with at least some college education. The race gap in initial wages among the less educated (those with high school education or less) does not reach statistical significance. However, as mentioned before, these cross-sectional estimates cannot account for unmeasured group differences. We therefore focus on the black coefficient in the wage growth models as it indicates the degree to which black and white women experience similar wage growth *within* each educational level.

[Table 5 about here]

The results, obtained from fixed-effect within-cohort analyses corroborate and strengthen the pattern of the foregoing descriptive and multivariate analyses: that the less-educated black women do not experience similar rates of wage growth as their white counterparts. Specifically, the race gap in wage-growth is about 20 and 14 ln points among high school dropouts and high school graduates, respectively. Since we control for group differences in unmeasured attributes, these estimates capture an unexplained gap that could result either from the degree to which labor market treatment (i.e., discrimination) contributes to the growing wage disparities between black and white young women, or from the effect of time-variant unmeasured variables. No discernible race gap in wage growth is found among the more-educated women.

Discussion

We began our investigation of the female racial wage gap by looking at the education-related wage dynamics of black and white women. We find that black female workers are more likely than whites to be high school dropouts and less likely to earn a college degree. In a skilled-based labor market these differences are translated into racial differences not only in starting wages but, most importantly, into differences in wage trajectories and consequently, lifetime earning and accumulated wealth. College educated women not only start their career at a higher wage level compared to less educated women, but their premium for college education also manifests itself in a steeper wage growth over the work life.

The story we tell is mostly derived from human capital theory. Most of the racial gap in wages among women can be accounted for by differences in education and skills. However, human capital differences, either observed or unobserved, cannot entirely explain the racial differences in the shapes of age-earnings profiles. The less educated black women – those with high school education or less – not only lag behind their educated black counterparts, but they also fall behind whites with similar depleted qualifications. This situation of low-skilled black women is grim especially since we included in our analysis only those young women who are strongly attached to the labor market—those who worked in both the second and the eighth post schooling years. We believe that the findings presented herein provide convincing evidence that the gap opened by black high school dropouts is a major factor in the rising white-black female gap in average wages. Put differently, the rise in economic inequality between black and white women not only stems from the rise in race-related inequality in education, but also from the rise in wage inequality among the blacks themselves (Blau and Kahn, 1997).

In addition, the wage growth model shows a significant racial gap among the less educated women, even when controlling for unmeasured (time- invariant) differences. Several, not mutually exclusive, explanations are possible. First, we found that at least part of the "unexplained" wage gap between skilled black and white women in starting wages results from an advantage whites have on unmeasured wage determinants. If we assume a similar pattern among the less skilled, then it is possible that the racial equality in starting wages among the less educated reflects a *floor effect*, in which wages cannot go further down. Over time however, as wages go up, employers have more leverage to generate wage differentiation among women, based on differences in unmeasured attributes, and by that to recover their losses caused by overpaying the less educated blacks during the phase of entrance into the labor force.

Second, this pattern may stem from statistical discrimination by employers in the presence of imperfect information about the skills or behaviors of the least educated black women, during the hiring stage (Aigner and Cain, 1977). Oettinger (1996) argues that, indeed, initial uncertainty about productivity might be greater for blacks than for whites. As a result, expected productivity growth rates of less educated black women should be lower than those of whites due to several processes that might take place. For example, a less-than-optimal match between the black workers and the requirements of their jobs resulting from this uncertainty can lead to flatter earnings-experience trajectories for blacks. Another process that might be affected by this lack of reliable information about the productivity of the less-educated blacks is the assignment of workers into training programs. Employers would prefer to invest in white women's training because the risks involved in recovering such investments are smaller.[11]

If indeed such processes take place, then we should find that white and black low-educated women are assigned into different jobs. White women should be found in higher-level jobs where both - a better match between workers and job requirements and investments in training - produce steeper productivity growth profiles. Our examination of the occupational distribution of these two groups right after high school graduation or dropping out of it reveals such differences. While a fraction of white women is found in low-level managerial jobs, and higher proportions of whites perform sales jobs, higher proportions of blacks are assigned into laborers jobs.

Third, our model do not account for time-variant unmeasured wage-enhancing variables. It is quite possible that less educated white women have an advantage on such variables. Job mobility is a good example of how the different wage trajectories of white and black high school dropouts and high school graduates could result from dynamic unobserved (by the researcher) wage determinants that a fixed-effect model similar to the one used here cannot control for. Corroborating this possible explanation are Alon & Tienda (2005) findings. They show that black women average less job mobility than white women, especially if they did not attend college. What is more, unskilled women who experience frequent job changes during the first four post-school years reap positive wage returns for this mobility. They conclude that among unskilled women, race-based wage disparities are partly derived from group differences in the frequency of job changes. These differences can be attributed, among other things, to group differences in the amount and quality of information about "good" job vacancies (Granovetter, 1995; Wilson, 1987; Sullivan, 1989). [12]

Next, there is evidence that black workers not only lag behind whites in terms of years of schooling, but also bring lower levels of general productive skills (as

measured by their AFQT score [13]) to the labor market (Neal and Johnson, 1996; Carneiro, Heckman and Masterov, 2005; O'Neill, 1990; Maxwell, 1994; Blackburn, 2004). These studies show that the effect of AFQT on wages and on the race wage gap is substantial even when controlling for educational attainment. For example, Neal and Johnson (1996) demonstrate that, conditional on AFQT, the estimated black-white wage gaps among women are small, and in most specifications they are statically insignificant. To be sure, AFQT is a very powerful determinant of wage and other socioeconomic outcomes. However, it remains an open question whether it reflects schooling, learned skills, achievements or cognitive ability (Neal and Johnson, 1996; Carneiro, Heckman and Masterov, 2005; Altonji and Blank, 1999; Herrnstein and Murray, 1994; Darity and Mason, 1998). Pertinent to our question is the criticism that the AFQT is racially biased, understating the true skills of minorities relative to whites (Rodgers & Spriggs, 1996).

Moreover, our first-differencing approach should have captured the possible impact of AFQT on wage growth. Nevertheless, to assess whether AFQT reduces the unexplained residual in wage growth we replicated the analysis by education strata and controlled for AFQT. Since the performance of test-takers is contaminated by schooling attainment at the date of the test we adjusted the AFQT scores for age.[14] Since our analyses are conditional on education, this measure captures the extent to which black and white women with the same educational credentials differ in skills as measured by AFQT.[15] Because we use the younger subset of the NLSY panel, the AFQT (administered in 1980) reflects human capital gains of our respondents when they were ages 15-18. As such, the test scores could not be affected by direct labor market discrimination (Neal and Johnson, 1996; Carneiro, Heckman and Masterov, 2005). However, such discrimination might influence the efforts parents exert in

investing in the human capital of their own offspring (Carneiro, Heckman and Masterov, 2005). The results (not shown) demonstrate that, as expected, the AFQT did not show any impact on the wage growth of the high school dropouts, college attendants and graduates. Its possible impact on wage growth has been already captured by the first-differencing approach. Surprisingly however, AFQT did have an impact on the wage growth of high school graduates: controlling for AFQT wiped out most of the unexplained gap among high-school graduates. It is quite possible that the AFQT captures a time variant level of efficiency in transforming high school education into market productivity. Put differently, high AFQT scores reflect a faster transformation process of high-school-acquired skills (i.e., basic skills) into market-relevant skills.

Finally, we cannot rule out entirely the possibility that the labor market treatment of the less educated women varies by race. Less skilled black women are treated less favorably than their white counterparts. Such discrimination could be the result of a less rigorous enforcement of anti-discrimination laws and policies in workplaces employing the least educated and offering dead-end jobs. We think that a more aggressive policy of equal opportunity in job and training assignments is needed in those workplaces offering jobs for the least educated.

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Endnotes

[1] Darity, Guilkey and Winfrey (1996) however, did not find evidence for wage discrimination against black women when comparing them to white women.

[2] Another approach for estimating earnings discrimination is to estimate two separate equations - one for each group, and to decompose the earnings gap into a "legitimate" and a "discriminatory" portions (Oaxaca, 1973). However, the expectation is that both methods should lead to the same conclusions about the presence or absence of earnings discrimination (Darity and Mason, 1998).

[3] We did not include a time trend in our model because the possible range within each schooling category is four years only.

[4] A randomly drawn oversample of black youth is included in the analysis.

[5] Many respondents, especially those ages 18-21 at the first interview, had held one or more jobs that were not accurately reported in the survey. Therefore, we restrict the sample to women who were ages 13-16 as of 1978 in order to minimize problems caused by left censoring of labor force participation (dropping 2,346 women). We also delete 28 women who did not work a single month between ages 16 and 30, and hence were never at risk of experiencing a job or earning wages.

[6] Theoretically, it is possible that individuals attained additional education between t1 and t2. However, only marginal fraction of the sample experienced a change in educational attainment between t1 and t2.

[7] We use these age benchmarks for a given schooling category and not the actual age of school departure because of unreliable enrollment data, including missing data problems and illogical trajectories. Doing so, we assume that there are no major cross-race differences in the timing of school departure.

[8] We also constructed "change" variables for the first-differencing model. For example, changes in marital status were captured by four dummies: married at both time points, unmarried at both time points, married at t_1 and unmarried at t_2, and unmarried at t_1 and married at $.t_2$. Changes in continuous variables were constructed by subtracting the variable value at t_1 from the value of this variable at t_2.

[9] We also tested a wage-growth pooled model of white and black women containing interactions between race and school levels. All main schooling effects were found to be significant, and the race main effect and all interactions were not found to be significantly different from zero. The differences between the results of the simple pooled interaction model and the results presented in Tables 4 and 5 indicate that the need for more detailed and specific analyses, as conducted in this paper, is warranted.

[10] We also tested a specification in which we included women' age at the time of first child bearing, in addition to all other variables. This variable was not statistically significant in all four educational groups and the estimates for the race coefficient remained unchanged.

[11] Employers should not face uncertainty when investing in training of college-educated black women because these women showed that there is no risk involved in such investments.

[12] Another example for a dynamic unobserved wage determinant is the timing and sequence of family formation events, i.e. marriage and child bearing. If low skilled black women are more likely than whites to become single mothers, this may lower blacks' productivity and, consequently, flatten on their wage growth trajectory. Using our data, we explore this issue. We find that indeed single motherhood is more prevalent among blacks, but this pattern is captured for all educational groups.

[13] AFQT (Armed Forces Qualifying Test) is a subset of 4 out of 10 ASVAB tests used by the military for enlistment screening and job assignment. It is the summed score from the word knowledge, paragraph comprehension, mathematics knowledge, and arithmetic reasoning ASVAB tests.

[14] Following Carneiro, Heckman and Masterov (2005) we use age-corrected AFQT which is the standardized residual from a regression of the AFQT score on age at the time of the test.

[15] As opposed to Neal and Johnson (1996) we believe that it is necessary to control for educational attainment, when controlling for AFQT. Ishikawa and Ryan (2002) find that most of the effect of schooling on wages is attributable to the substance of learning in school and not to other benefits of schooling that workers and employers associate with schooling, e.g. sorting or credentialing affects associated with diplomas and degrees. As a result, ignoring schooling may bias our results. AFQT is, no doubt, a determinant of schooling but so is motivation, educational opportunities, financial constraints, knowledge about the education market, etc.

Table 1: Group-Specific Educational Attainment by age 30

	TOTAL	WHITE	BLACK
HSDROP	0.10	0.09	0.12
HS	0.38	0.38	0.37
SCOL	0.27	0.23	0.34
COLL	0.25	0.29	0.17
N	1156	746	410

Table 2: LN Real Wages in t1 and Real Wage Growth between t_1 and t2, by race and education

		TOTAL	HSDROP	HS	SCOL	COLL
WHITE	$LNWGt_2$	2.02	1.77	1.83	1.95	2.40
	ΔLNWG	0.27	0.19	0.27	0.30	0.27
	n	746	69	285	174	218
BLACK	$LNWGt_2$	1.85	1.60	1.74	1.87	2.22
	ΔLNWG	0.25	0.12	0.23	0.28	0.32
	n	410	49	151	141	69

Table 3: OLS Models of Wages in t_1 and Wage Growth between t_1 and t2, All Women
Standard errors in parentheses

	(1)	(2)
	$LNWGt_1$	ΔLNWG
Black	-0.081**	-0.112**
	(0.028)	(0.030)
High-School Dropout	-0.540**	-0.495**
	(0.050)	(0.054)
High-School Completed	-0.505**	-0.358**
	(0.033)	(0.039)
Some College	-0.393**	-0.248**
	(0.035)	(0.040)
$LFAt_1$	0.003**	
	(0.000)	
$Childt_1$	0.012	
	(0.023)	
$Mart_1$	0.013	
	(0.029)	
$LNWGt_1$		-0.632**
		(0.031)
Δlfa		0.001**
		(0.000)
Δchild		-0.112**
		(0.020)
mar_nomar		-0.059
		(0.059)
nomar_mar		0.033
		(0.038)
nomar_nomar		0.055
		(0.039)
Constant	2.127**	1.813**
Observations	1156	1156
R-squared	0.27	0.30

significant at: + p<.10; * p<.05; ** p<.01;
Omitted categories are: white, college educated; mar_mar

Table 4: OLS Models of Wages in t1 and Wage Growth between t1 and t2, by Race
Standard errors in parentheses

	LNWGt1		ΔLNWG		
	(1)	(2)	(3)	(4)	
	white	black	white	black	
High-School Dropout	-0.498**	-0.544**	-0.435**	-0.608**	a
	(0.064)	(0.083)	(0.071)	(0.083)	
High-School Completed	-0.531**	-0.428**	-0.335**	-0.418**	
	(0.039)	(0.063)	(0.049)	(0.064)	
Some College	-0.408**	-0.320**	-0.246**	-0.266**	
	(0.044)	(0.061)	(0.052)	(0.062)	
LFAt1	0.003**	0.002**			
	(0.001)	(0.001)			
Childt1	-0.042	0.049+			
	(0.036)	(0.030)			
Mart1	0.025	0.023			
	(0.035)	(0.056)			
LNWGt1			-0.610**	-0.687**	
			(0.040)	(0.048)	
Δlfa			0.001*	0.002**	
			(0.001)	(0.001)	
Δchild			-0.137**	-0.067*	
			(0.028)	(0.029)	
mar_nomar			-0.073	-0.065	
			(0.074)	(0.102)	
nomar_mar			0.047	-0.051	
			(0.046)	(0.072)	
nomar_nomar			0.079	-0.028	
			(0.049)	(0.067)	
Constant	2.089**	2.024**	1.755**	1.883**	
Observations	746	410	746	410	
R-squared	0.29	0.19	0.28	0.37	

significant at: + p<.10; * p<.05; ** p<.01;
Omitted categories are: college educated; mar_mar
a) The difference between the Black and white coefficients is significant at .05.

Table 5: OLS Models of Wages in t_1 and Wage Growth between t_1 and t_2, by Education
Standard errors in parentheses

		$LNWGt_1$				ΔLNWG		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	hsdrop	hs	scol	col	hsdrop	hs	scol	col
Black	-0.112	-0.033	-0.091*	-0.120+	-0.194*	-0.135**	-0.052	-0.090
	(0.111)	(0.043)	(0.046)	(0.069)	(0.089)	(0.050)	(0.052)	(0.065)
$LFAt_1$	0.001	0.004**	0.003**	0.003*				
	(0.002)	(0.001)	(0.001)	(0.001)				
$Childt_1$	-0.006	0.062+	0.065	-0.129*				
	(0.057)	(0.036)	(0.046)	(0.061)				
$Mart_1$	0.086	-0.038	-0.059	0.099+				
	(0.118)	(0.044)	(0.056)	(0.060)				
$LNWGt_1$					-0.838**	-0.753**	-0.542**	-0.492**
					(0.081)	(0.057)	(0.063)	(0.057)
Δlfa					0.002*	0.001	0.001*	0.003**
					(0.001)	(0.001)	(0.001)	(0.001)
Δchild					-0.125*	-0.104**	-0.147**	-0.085
					(0.053)	(0.034)	(0.036)	(0.053)
mar_nomar					0.081	-0.078	-0.226+	0.056
					(0.150)	(0.095)	(0.117)	(0.132)
nomar_mar					0.043	0.077	-0.081	0.062
					(0.114)	(0.063)	(0.076)	(0.078)
nomar_nomar					0.025	0.116+	-0.080	0.088
					(0.107)	(0.065)	(0.079)	(0.078)
Constant	1.663**	1.544**	1.750**	2.071**	1.696**	1.644**	1.494**	1.441**
Observation	118	436	315	287	118	436	315	287
R-squared	0.03	0.08	0.06	0.07	0.53	0.32	0.24	0.28

significant at: + p<.10; * p<.05; ** p<.01;
Omitted categories are: white; mar_mar

Table 6: OLS Models of Wage Growth between t1 and t2, by Race - With and without age-corrected AFQT
Standard errors in parentheses

	ΔLNWG			
	(1)	(2)	(3)	(4)
	HSDROP	HS	SCOL	COLL
	Before controlling for AFQT			
Black	-0.194*	-0.135**	-0.052	-0.090
	(0.089)	(0.050)	(0.052)	(0.065)
	After controlling for AFQT			
Black	-0.152	-0.021	-0.014	-0.103
	(0.100)	(0.054)	(0.062)	(0.074)
AFQT - age corrected	0.058	0.141**	0.040	-0.013
	(0.061)	(0.031)	(0.035)	(0.034)
Observations	118	436	315	287

significant at: + p<.10; * p<.05; ** p<.01;

Appendix A1: Definitions and descriptive statistics of variables included in the analysis (means or percents)

Variable	Definintion	Mean	sd
$LNWGt_1$	Person-months hourly real wages divided by the number of non-missing months with wage information at t1	1.96	0.49
ΔLNWG	change in real ln wages between t1 and t2	0.26	0.53
Black	Black	0.35	
White	Non Black, Non Hispanic (reference category)	0.65	
HS Drop-out	If R completed less than 12 years of education	0.10	
HS Graduate	If R completed 12 years of education	0.38	
Some College	If R completed 13-15 year of education	0.27	
College Graduate	If R completed 16+ years of education (reference category)	0.25	
$LFAt_1$	Number of employed months out of the total number of months in t1	73.82	31.32
Δlfa	the change in labor force attachment between t1 and t2	9.35	36.17
$Childt_1$	number of children in t1	0.31	0.60
Δchild	the change in number of children between t2 and t8	0.54	0.71
$Mart_1$	if R married at t1	0.29	
mar_mar	married at both t1 and t2 (reference category)	0.23	
mar_nomar	married at t1; not married at t2	0.07	
nomar_mar	not married at t1; married at t2	0.29	
nomar_nomar	not married at t1; not married at t2	0.41	
N		1156	