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Black/White Male Earnings and Employment: 1960–70

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I. INTRODUCTION

Our goal in this paper is to examine several aspects of relative black/white male earnings between 1960 and 1970, using the 1960 and 1970 One-in-100 Samples of the United States Census of Population.[1]

There is absolutely no question that relative earnings of black Americans increased during the decade. There are, however, real questions about root causes of this change. Before summarizing our interpretations of the evidence, we should note that although by historical standards the gain of the sixties is truly prodigious, the absolute magnitude of the change is not overwhelming. In 1959, the average weekly earnings of employed black men came to 57 percent of the amount earned by

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employed white men. The ratio had increased to 64 percent by 1969—i.e., about 16 percent of the wage differential was bridged during the decade.

In accounting for growth in black/white wage ratios between 1960 and 1970, the evidence is, first, that younger, more recent cohorts of blacks gained more than older cohorts. Second, within experience classes, rising schooling levels and migration have contributed to the relative increases in black earnings. But the bulk of our evidence is that most of the gain of the sixties was broad-based. We did not find that gains were confined either to the highly schooled or to those employed by the governmental sector.

Our descriptions of occupation and industry of employment also indicate that the gains accruing throughout the sixties were very broadly based. There was marked black/white convergence of occupational distributions during the period, with the most pronounced change being realized by those blacks we estimate to have entered the work force between 1960 and 1970.

Similarly, for the same group, we found—especially for those who had attended college—that employment is moving from the traditional governmental to the private sector. It also seems that there are quite strong geographical patterns to changing black/white earnings ratios, with stronger gains registered in the South and North Central regions than in the Northeast and West.

Finally, in comparing earnings distributions, we find that there is more variance among black men than among white men. This is true both of observed weekly wages and annual earnings and of our predictions of them based on least-squares regressions. Annual earnings variance is dominated by variance in weeks worked. But location of residence and years of schooling also play an important role.

II. THE 1960s: THE HISTORICAL SETTING

Although our analysis in this paper relies on the 1960 and 1970 censuses, we think it is important first to place that decade in historical perspective. In many ways, the 1960s represented a sharp departure from the previous pattern of relative black/white incomes. It has also been claimed that the data available for the 1970s already indicate that the relative economic position of blacks has started to deteriorate from the position achieved in the late sixties. It is our view that isolating the underlying causes of the improvement during the sixties enables us to better assess whether the

1960s constituted a temporary aberration or whether the gains registered during that decade bode well for changes during the 1970s.

The paucity of good income data by race before 1940 is well known. Apparently, the best available statistics are those contained in the decennial United States Census Reports. These reports give a color breakdown of the occupations of individuals for each Census year since 1890. Gary Becker in his famous work on the economics of discrimination used income weights from the 1940 Census to construct a time series index of the relative occupational position of blacks.[2] Becker concluded that the fifty-year period from 1890 to 1940 was best characterized as one in which the relative economic position of blacks remained remarkably stable. He stated more tentatively that the 1940s were a decade in which the black/white mean ratio finally began to rise. This latter finding was confirmed in a more detailed and careful study of this period by James Gwartney.[3] Gwartney found that the nonwhite/white income ratio rose on average by 12 percent within regions during the 1940s.

Beginning in 1947, annual data for annual incomes are available in the Current Population Reports. Table 1 gives ratios of median incomes of nonwhite to white *families* for each year from 1947 to 1974.[4] Although the post-World War II era is characterized by a definite upward drift in the relative income of blacks, there were sharp cyclic swings. The picture is not of a smooth trend in relative black incomes; rather, the evidence is of a relatively small trend factor imposed on an unstable, cyclically sensitive, series. From 1947 into the mid-1950s, the ratio increased from .51 to .56. There followed a slight downward movement which continued into the early 1960s. Black/white incomes began to climb again after 1963 with a jump between 1965 and 1966 and a steady rise between 1966 and 1970. The dramatic increase between 1965 and 1966 is often used as evidence that the civil rights laws that just preceded this (1964–65) played a large causative role in accounting for the recent improvement in the earnings of blacks. However, year to year changes in the series are often quite irregular, and we think that this inference is not warranted on the basis of this evidence alone. For example, there are two other points (1951–52 and 1958–59) where the increase in the black/white ratio is about as large as the 1965–66 change. In those years, there was, of course, no comparable legislation. This issue of the effect of this legislation is obviously important and we admittedly cannot adequately address it with cross-sectional data for only two years. However, our empirical evidence does cast some doubt on the role of this legislation. First, we are able to attribute the rise in the ratio to factors (schooling, migration) that move more continuously over the period. Second, our single attempt to measure the influence of the governmental sector indicated that its effect was probably small.

TABLE 1 Ratio of Median Income of Black and White Families

Year	Ratio: Black and Other Races to White	Black to White
1974	0.62	0.58
1973	0.60	0.58
1972	0.62	0.59
1971	0.63	0.60
1970	0.64	0.61
1969	0.63	0.61
1968	0.63	0.60
1967	0.62	0.59
1966	0.60	0.58
1965	0.55	0.54
1964	0.56	0.54
1963	0.53	(NA)
1962	0.53	(NA)
1961	0.53	(NA)
1960	0.55	(NA)
1959	0.54	0.52
1958	0.51	(NA)
1957	0.54	(NA)
1956	0.53	(NA)
1955	0.55	(NA)
1954	0.56	(NA)
1953	0.56	(NA)
1952	0.57	(NA)
1951	0.53	(NA)
1950	0.54	(NA)
1949	0.51	(NA)
1947	0.51	(NA)

SOURCE: U.S. Department of Commerce, Social and Economic Statistics Administration, Bureau of the Census.

NOTE: NA = not available. The ratio of black to white median family income first became available from this survey in 1964.

After 1970, and especially if the 1974 data are ignored, black/white relative wages began once again to decline. It is this most recent downturn that has ignited the pessimism about the prospects for the future.

A more detailed representation of the recent period is given in Table 2 which lists ratios of black/white income for males, females, and families

TABLE 2 Relative Black/White Median Income for All Persons 14 Years and Older

	Males		Females		
Year	All Workers	Full-Year Workers	All Workers	Full-Year Workers	Family Income
1974	.61	.70	.90	.91	.58
1973	.60	.67	.90	.85	.58
1972	.61	.68	.93	.86	.59
1971	.60	.68	.88	.88	.60
1970	.59	.68	.91	.82	.61
1969	.58	.68	.84	.80	.61
1968	.59	.67	.79	.76	.60
1967	.57	.64	.78	.74	.59

SOURCE: Current Population Reports, Series P-60.

from 1967 to 1974. The general picture is a sharp rise in the late sixties followed by reasonably constant ratio during the seventies. In the last few years, there apparently was a slowdown in the rate of improvement for blacks. However, in view of the recessionary state of the economy, this slowdown may not contradict our predictions of continued improvement. Business cycle downturns typically reduce black relative wages, so much so, in fact, that the relatively constant ratio of black to white male income, in spite of the current recession, can be taken as evidence that longer-run forces are nullifying downward pressures. For example, a more optimistic view emerges in the relative wages of full-year workers (Table 2), where, presumably, the business cycle factors are better controlled.

At best, the patterns exhibited in Tables 1 and 2 are difficult to interpret. Not only are they confounded by business cycles, but they fail to correct for geographic location, age, schooling, and so on, factors which our analysis of the Census data shows are important determinants of the relative earnings position of blacks. We find little in the published tables now available for the recent past that seriously alters our confidence in the conclusions we derive based on the 1960–70 comparisons. Although our study will deal exclusively with racial comparisons of males, brief mention should be made of the pattern of relative female wages by

race. Both over the more recent period and over the entire postwar period, the gains achieved by black males relative to white males are small compared to those achieved by black women relative to white women.

III. BLACK/WHITE WAGE RATIOS: THE 1960 AND 1970 CENSUSES

Table 3 illustrates the black/white ratios found in the U.S. Census. From among those persons described, we analyze data for only those males with earnings in the two years in question, 1959 and 1969. Self-employed men are excluded, as are men with more than 40 years of imputed work experience. Also excluded are those whose work experience is negative, when calculated as current age minus age of leaving school.[5]

Numbers reported are ratios of averages,[6] i.e., they are average black earnings or weekly wages relative to appropriate averages for whites. The first column gives the black/white wage ratio for six experience classes in 1970. The second column contains the same ratios for 1960, but this column is pushed down by two rows. Thus, the first entry, .510, is black/white earnings for the 1–5-year experience cell in 1960; this cell had 11–15 years of experience by 1970. The trend within an experience cell as a new cohort enters can be read up the diagonal; the within-cohort life cycle trends are illustrated across a row.

A number of patterns are apparent. First, the large earnings differentials that existed in 1960 were partly eroded between 1960 and 1970, but, as of 1970, differences remained large. Second, black/white earnings ratios are highest for those we estimate as having entered the labor market during the sixties, and they are higher for those entering between 1965 and 1970 than for 1960–65 entrants. Among cohorts who were in the labor market in 1960, with the exception of college graduates, we find that by 1970 the relative position of blacks had improved only slightly over 1960 levels. But, among the cohorts whose work experience predates 1960, the pattern exhibited for post-1960 entrants continues to hold: namely, that in comparison to whites, younger cohorts—more recent entrants into the labor market—fare better than their earlier counterparts.

Third, the gains that occurred between 1960 and 1970 are broadly based. With one exception, earnings ratios were higher in 1970 for every cohort than in 1960.[7] This wage growth was fairly uniformly distributed across experience and education cells for white males. This apparent growth neutrality for whites contrasts sharply with the patterns emerging among blacks, where the extent of the gain is positively related to

TABLE 3 Black/White Earnings Ratios for Cohorts in 1960 and 1970

Cohort Experience as of 1970 (Years Out of School)	Average Annual Earnings		Average Weekly Earnings		
	1970	1960	1970	1960	1970/60
I. All School Completion Levels					
1–5	.653	–	.702	–	–
6–10	.648	–	.677	–	–
11–15	.621	.510	.641	.568	.073
16–20	.601	.529	.618	.573	.045
21–30	.594	.545	.616	.585	.031
31–40	.604	.540	.620	.574	.046
II. Elementary School Graduates (8 Years Completed)					
1–5	.835	–	.865	–	–
6–10	.779	–	.802	–	–
11–15	.708	.673	.737	.703	.034
16–20	.710	.688	.717	.713	.004
21–30	.749	.671	.763	.708	.055
31–40	.721	.719	.740	.741	−.001
III. High School Graduates (12 Years Completed)					
1–5	.775	–	.806	–	–
6–10	.769	–	.791	–	–
11–15	.729	.654	.749	.714	.035
16–20	.731	.676	.750	.714	.036
21–30	.678	.655	.698	.685	.013
31–40	.675	.623	.690	.648	.042
IV. College Graduates (16 Years Completed)					
1–5	.716	–	.775	–	–
6–10	.647	–	.692	–	–
11–15	.662	.618	.688	.655	.033
16–20	.654	.559	.675	.582	.093
21–30	.519	.446	.557	.470	.087
31–40	.504	.389	.522	.421	.101

education level. The most spectacular improvement is undoubtedly that of college-educated blacks, although the less skilled also gained relative to whites. Some of the decline in growth rates by experience class in the complete black sample is due to shifting weights toward the less educated

in the older experience groups. The decline in relative black/white wages as education increases becomes somewhat attenuated by 1970, for the older experience groups.

An obvious source of gain between 1960 and 1970 is the improvement in the general level of economic activity that occurred during this period. The U.S. aggregate average unemployment rate, 5.5 percent in 1959, had fallen to 3.5 percent by 1969. The penalties imposed by business contractions are not uniform over education, age, or racial groups, and as business conditions improved over the decade, black earnings would have increased relative to white. Since it is widely acknowledged that the principal cyclical setbacks occur in employment levels rather than in wage structures, the weekly wage comparisons in Table 3 are probably less contaminated by the business cycle than are annual income comparisons.[8] The gains reported by blacks are smaller in the wage than in the annual earning comparisons.

Although there is a presumption in the literature known to us that wage rates are quite insensitive to cyclic vagaries, the empirical basis for this presumption is unclear. A careful analysis of wage flexibility under cyclic fluctuations could go far in relieving our concern that the relative wage gains we document are merely a by-product of improving market conditions.[9] A number of the patterns we find seem to us inconsistent with a purely business-cycle explanation. Other researchers have provided convincing evidence that during recessionary periods those most adversely affected are the less skilled (schooled),[10] yet we find that those blacks who gained most in comparison to whites had the most schooling. Secondly, the change in the real characteristics of people (i.e., schooling or location) observed during the decade would, in the absence of any business-cycle trends, have led to an improvement in the relative income position of blacks. It may be that part of the story of gain in relative black earnings during the sixties is one of business cycles, but there seems to be considerable room for the operation of other factors.

Cohort, Life Cycle, and Calendar Year Effects

One feature common to all cross-sectional comparisons of black/white earnings differences is that younger blacks fare better in comparison to whites than their older counterparts. This fact, in and of itself, is consistent with extreme life cycle or cohort views (and, with a variety of intermediate views) that have very different implications for the future course of black/white differentials. Early theories of labor market discrimination tended toward a life-cycle explanation, holding that on-the-job black earnings increase less rapidly with work experience than

white earnings. These theories of "secondary" labor markets view labor markets as stratified with some groups of workers being less upwardly mobile over their careers than others.

More recent comparisons have contrasted cross-sectional profiles taken at different points in time. If anything, these contrasts tend to support the extreme alternative to the life-cycle view, which is that differences in the cross-section are indicative of cohort differences. For example, in Table 3 the evidence of gains between 1960 and 1970 for blacks relative to whites suggests that given individuals were relatively unaffected. In contrast to the life-cycle view that predicts declining relative black wages between 1960 and 1970 within cohorts as workers aged ten years, the evidence is that wage ratios either remained constant or increased slightly. The aggregate gain stems mainly from changes in composition.

The extreme life-cycle view offers no basis for predictions of future patterns of wage differentials. The cohort view, on the other hand, does provide a basis for predictions if the future course of differences among cohorts conforms to the past. Suppose the evidence of the 1960–70 Census contrasts between cohorts is maintained in examination of the more recent data, the natural extension is to ask why cohort experiences seem so different over time.

There are a number of competing explanations to be scrutinized. These include questions of effects of modern antidiscriminatory legislation, trends in school quality and student achievement, as well as the possibility of secular trends in (front-end) market discrimination per se. But, whatever the explanation, any potential to understand secular forces rests exclusively on an ability to distinguish secular trends from life-cycle and cyclical forces operating in the cross section.

In general, cross-sectional data cannot easily decompose relationships that arise simply from maturation and those that are the result of a person of a particular age being the recipient of a variety of experiences that are unique to his generation. Each individual in a cross section is a member of a distinct cohort at one point on his life-cycle path. If between-cohort effects are important, the data must be adjusted before one has "pure" life-cycle elements. For example, the large secular increases in labor force participation rates for married women suggest that cohort effects could seriously contaminate cross-sectional labor supply studies. Similarly, improvement in school quality or home environment probably has led to a secular increase in the human capital stock of successive generations and thus affects observed cross-sectional wage earnings profiles. Although cohort or generational effects are recognized as important sources of bias in cross-sectional data, most investigators assume simply that empirically observed links between age and earning capacity are only the

results of education and the associated skill acquisition process. By comparing cross sections at different points in time, the potential of distinguishing between those effects is established. For example, Welch [16] found that within each of two cross sections (1960 Census and Survey of Economic Opportunity [SEO]), the income gain associated with an added year of schooling was lower for older workers. But, since these workers were older, they had attended schools in periods in which schools were themselves different, and had entered the labor market when the market afforded different opportunities. By comparing persons of the same cohort (i.e., persons who had gone to similar schools and entered the labor market at similar times) between these cross sections, drawn seven years apart, Welch found little evidence of attenuation over the life cycle in the return to schooling. Evidently, the attenuation observed within each data set referred only to vintage or cohort effects, not to maturation per se.

Comparisons of successive cross sections give potential insight into distinctions between experience and cohort effects, but these comparisons are themselves confounded by calendar year effects. The problem is that conditions of labor demand vary through time. If several cohorts could be observed throughout their careers under constant labor market conditions, vintage and experience effects could more easily be distinguished. But labor markets do not remain stable and prices (wage rates) reflect the market conditions associated with the calendar year in which exchanges occur. Because of the identity that calendar year equals vintage plus years in the labor market, it is never possible to separately identify calendar year, experience, and vintage effects from time series observations of cross sections without explicit parameterization of these effects. But, although the need for explicit parameterization is recognized because several cross sections are observed simultaneously, and because some geographic detail is available to permit analysis of differences between markets at a point in time, the constraints imposed by explicit parameterization are less bothersome than they would be with less data. For example, Rosen [12] has demonstrated that if one is willing to pursue the theoretical implications of life-cycle human capital models in detail, then cohort and life-cycle effects are identified in a single cross section—this, despite the one-to-one correspondence between age and cohort.

First, observe relative wage changes within cohorts. For those who had entered the work force prior to 1960, black relative wages did not fall between 1960 and 1970.[11] In either cross section (reading down a column), black/white wage ratios clearly deteriorate as experience increases or vintage is older, and the rate of decline is more pronounced at higher levels of school completion. But the within-cohort changes

between 1960 and 1970 are the mirror image of patterns exhibited in the cross section. Not only did the relative position of blacks improve as they added ten years of work experience, but this improvement was greatest at higher schooling levels. There are at least two extreme views for reconciling differences between cross-section and time-change patterns. One is that calendar year effects overwhelm the inherent tendencies exhibited in the cross sections. A strong increase in demand for black relative to white labor, coupled with an increased demand for more schooled labor, has this capability. In this view, unless the changes in demand patterns are persistent, more accurate projections of future changes should rely upon cross-sectional patterns. The other view is that changes within cohorts will persist and that the cross-sectional comparisons are dominated by vintage effects.

Table 4 rearranges the data of relative weekly wages to facilitate vintage comparisons. In Table 4, the row comparisons hold work experience constant and allow cohorts to change. The observed pattern is one of persistent cohort improvement in black/white earnings ratios with relatively larger gains accruing to more schooled workers. The data reported in Tables 3 and 4 are not consistent with either a pure life-cycle or a vintage hypothesis. The pure life-cycle explanation predicts that black/white earnings ratios will decline throughout the work career.[12] Between 1960 and 1970 they clearly did not. The simplest vintage model would describe black/white wage ratios as functions only of cohort—of time of entry into the job market. Other factors influencing income that vary after a cohort enters the market would be race neutral so that variation in them would not affect wage ratios. If vintage effects reflect secular change, either through rising relative quality of black labor or declining front-end labor market discrimination, then younger, more recent cohorts of blacks would fare better in comparison to whites than older cohorts, but the differences existing within a given cohort in 1960 would persist to 1970.

As far as career performance is concerned, it is difficult to conceive of relatively simple theories based either upon labor market discrimination or upon investments in skills acquired on the job that predict the observed patterns of increases within cohorts in relative black earnings.[13] Because of this, calendar year effects, i.e., changes in labor markets, emerge as a likely candidate for explaining the observed increases within cohorts. We attribute the rising wages between cohorts to differential vintage effects that favor black males. Our "best guess" for rationalizing the proskill bias in rising black/white wage ratios within cohorts is that most of the explanation lies in improving school quality. There is evidence that nominal attributes such as days attended, school retardation rates, teacher educational levels, and teacher salaries have been improving

TABLE 4 Black/White Ratios of Average Weekly Earnings by Years of Work Experience, 1960 and 1970

Years of Work Experience	Average Weekly Earnings 1970	1960	1970/60
I. All School Completion Levels			
1–5	.702	.568	.134
6–10	.677	.573	.104
11–15	.641	.581	.060
16–20	.618	.587	.031
21–30	.616	.574	.042
31–40	.620	.574	.046
II. Elementary School Graduates (8 Years Completed)			
1–5	.865	.703	.162
6–10	.802	.713	.089
11–15	.737	.724	.013
16–20	.717	.696	.021
21–30	.763	.741	.022
31–40	.740	.710	.030
III. High School Graduates (12 Years Completed)			
1–5	.806	.714	.092
6–10	.791	.714	.077
11–15	.749	.682	.067
16–20	.750	.690	.060
21–30	.698	.648	.050
31–40	.690	.590	.100
IV. College Graduates (16 Years Completed)			
1–5	.775	.655	.120
6–10	.692	.582	.110
11–15	.688	.582	.106
16–20	.675	.517	.158
21–30	.667	.421	.136
31–40	.522	.422	.100

throughout most of this century for black students relative to whites. (See Welch [17].) Possibly more importantly, black students have been switching to integrated, traditionally white-dominated, schools—especially colleges.

IV. ACCOUNTING FOR BLACK/WHITE INCOME DIFFERENTIALS

To sort through the impact of various factors on earnings comparisons, we have estimated regression equations separately for blacks and whites in 1960 and 1970. Our objective is to identify the most important structural differences in black and white wage equations and to account, insofar as possible, for wage differentials, based upon both observed characteristics and parameter differences. Individuals are partitioned according to our estimate of years of work experience. The independent or explanatory variables fall into four groups: (1) school completion; (2) geographic location; (3) government employment; and (4) years of work experience.

There are two variables for school completed. The first ranges from 0 to 12 and indicates years of elementary and secondary schooling. The second measures years of postsecondary schooling. If a person reports a positive number of years of college, the grade-school variable is set equal to 12. This "spline" function is linearly segmented to permit slope coefficients in the partial relation between (log) wages and years of schooling to differ between the first 12 and succeeding years, but the linear segments are constrained to join at 12 years. This specification allowing for nonlinearities in the returns to schooling is useful, since it enables us to discover non-skill-neutral effects of governmental antidiscriminatory policies or improving school quality. Tests of equality for the two coefficients within experience classes show that equality can be rejected in most cases.[14]

Geographic location includes yes/no binary variables indicating residence for the South, North Central and West regions. The omitted (base) class is the Northeastern region. Dummy variables are included if the individual resides in a standard metropolitan statistical area (SMSA) and if the residence is within a central city of the SMSA, so that the omitted class refers to residents of nonmetropolitan areas. A variable is also included indicating years in current residence, to approximate recency of migration.

A number of variables are added indicating whether the individual is an employee of the federal government and whether he works in an industry that is regulated by the federal government.[15] For those who neither work for the federal government nor work in industries regulated by the federal government, two additional variables are added. One represents purchases by the federal government as a fraction of value-added originating in the industry. The other is similarly defined for purchases of state and local governments. With these variables, we attempt to identify wage effects of governmental efforts to enforce antidiscriminatory legislation.

If black relative wages are affected by either working for, or being regulated by, the federal government or are correlated with the government's share of industry product, an argument that this legislation had an effect would seem stronger. Our presumption is that the federal government can have the most immediate and direct impact upon those firms most dependent on it.

The remaining class of variables describes a quadratic in years of work experience. Although regressions are computed within experience classes, these variables are included to allow for correlations within class between wages and work experience. The estimated equations take the form

$$y = x'b_0 + d_1x'\delta_1 + d_2x'\delta_2 + d_1d_2x'\delta_{12} + u \tag{1}$$

where

$$d_1 = \begin{cases} 1 \text{ if black} \\ 0 \text{ otherwise} \end{cases}$$

and

$$d_2 = \begin{cases} 1 \text{ if } 1960 \\ 0 \text{ otherwise} \end{cases}$$

The dependent variable, y, is the logarithm (base e) of the weekly wage in constant Consumer Price Index (CPI) dollars; x represents a vector of the individual's characteristics as described in the above list of explanatory variables; b_0, δ_1, δ_2 and δ_{12} are the associated parameter vectors; and u is the omnipresent residual. Parameter vectors for individual groups in each year are

$$1970\begin{cases} \text{white } b_0 \\ \text{black } b_0+\delta_1 \end{cases} \qquad 1960\begin{cases} \text{white } b_0+\delta_2 \\ \text{black } b_0+\delta_1+\delta_2+\delta_{12} \end{cases}$$

In this form, δ_1 summarizes parameter race effects and is simply the difference between black and white parameters in 1970. Similarly, δ_2 describes year effects and is the difference between 1960 and 1970 parameters for whites. The interaction effect δ_{12} allows the year differences in parameters to vary by race or, equivalently, it allows race differences to vary by year. This fully interactive model yields exactly the same ordinary least-squares (OLS) regression coefficients as would be obtained from the four separate race-by-year regressions. It does, however, give slightly different test statistics since in this pooled form the estimate of residual variance (σ_u^2) is based on the sum of the residual quadratics over the four groups, instead of being estimated

separately for each group.[16] The advantage of this specification is that it simplifies tests of linear hypotheses for race and year coefficient differences.

Estimates of equation 1 appear in Appendix Table A-2. Although the statistics are interdependent, so that sequential tests risk incorrect inference, it is clear from inspection of the *t*-statistics for estimates of the parameters δ_1, δ_2 and δ_{12} that the fully interactive specification of equation 1 is too general in the sense that it allows for parameter differences that apparently do not exist. It is, of course, true that by imposing parameter equality either between races, between years, or both, estimation efficiency is gained.[17] The impression that estimates based on equation 1 are not efficient is strengthened when they are used to "account" for black/white earnings differentials. Too often we find a prediction of a small but statistically "significant" effect (of, as an example, increasing black earnings relative to whites resulting from declining differences in schooling) numerically swamped by a statistically "insignificant" effect (of, say, numerically large but insignificant year differences in schooling coefficients).

Several of the variables suppressed in the constrained estimates are statistically significant in the fully interactive model.[18] But in no case is a variable suppressed nor is race, year, or race-year interaction suppressed when its effect estimated in the fully interactive model is significant in more than two of the six experience classes. Even though the imposed constraints (among the six experience classes, there are 186 coefficients deleted from the fully interactive specification) delete variables that in the main appear insignificant in the fully interactive model, the joint test for significance clearly rejects the null hypothesis.[19] Although the computed F-statistics for the classes are not large by conventional standards (ranging from 1.2 to 2.6), the number of observations is simply too large to permit acceptance of the implied null hypotheses. This problem of an inability to reject hypotheses is common to large samples and has resulted in a number of attempts to weaken test criteria.[20] For our purposes, we note only that the constrained estimators are more efficient and whatever biases they imply are simply biases that we feel are necessary to clarify our estimates of factors contributing to increasing black/white ratios.

Results

The summary of our results and imposed coefficient constraints (suppressed variables) is:

Income differences associated with schooling may vary by school level, an individual's cohort or vintage, his position in the life cycle, the general state of the economy, and perhaps even personal characteristics, like one's race or sex. It is important that evidence of the underlying nature of observed variation be provided since implications of the several potential sources of variance differ dramatically, not only for purposes of describing the likely course of future black/white wage comparisons, but for educational policy as well. For example, the well known cross-sectional deterioration of the returns to schooling with increasing age may be a life-cycle phenomenon that results from a negative correlation between the proportion of income devoted to two types of investment (schooling and on-the-job training) or it may reflect improvement in the schooling quality and home environments of new, more recent cohorts.

For the grade-school variables, the full interactive estimates suggest statistically "significant"[21] race interaction for all six experience classes, with returns to grade school for blacks being lower than for whites. Based on our estimates, the marginal returns to postsecondary schooling are actually higher for blacks in the 1–5-year experience interval. We find no statistically significant difference by race in the college returns in the other experience intervals. If school systems are not an effective means of increasing black incomes, it is clear that the problem lies at the elementary and secondary levels.

Both the unconstrained and constrained estimates of returns to grade schooling show a clear life-cycle pattern, with schooling being a less important discriminator of earnings for older, more experienced workers. In contrast, the estimated returns to college also indicate a declining life-cycle profile, but most of the change occurs between the 1–5 and 6–10 classes, and thereafter the descent is slow relative to the changing returns observed for grade schooling. We consider this an important finding and worth additional research. A number of hypotheses are consistent with this. Quite probably the skills acquired in college are more complementary with job experience than are skills acquired in grade school. Rates of obsolescence of knowledge could differ by skill level with less rapid rates at higher skill levels.[22]

Concentrating on the coefficients that measure secular movements, we found no trend in the returns to grade school for either race between 1960 and 1970. The full interaction estimates of wage returns to college indicate year interaction, with returns lower in 1960 than in 1970 in all classes. The associated t-ratios exceed 2.0 in absolute value in three experience intervals. This rise in returns to college in 1970 may be surprising to many. It was thought that the middle sixties could have been

a critical turning point in the market for educated people. The comparatively well-educated postwar baby-boom cohorts were beginning in the last half of the decade to enter the labor market. This historically unique large increase in the relative supply of educated men combined with some factors reducing the relative demand for skilled labor could have begun the long-awaited decline in the returns to schooling. Using the Census data, this decline in the skill differential had not occurred by 1970. Based on results in the fully interactive model, we impose the following constraints: for grade-school coefficients, all year and race-year interactions are suppressed; for college coefficients, all race-year interactions and all race interactions except the 1–5 experience group are suppressed.

This last finding serves as a benchmark for an important paper by Richard Freeman [4] whose observations are from the published summary tables from the CPS. He claims that by the mid-seventies career paths for college graduates were substantially depressed relative to the past (notably, 1969). His point is illustrated in Table 5. Clearly, on the basis of these published tables, returns to recent college graduates have declined. Although Freeman argues that this observed change is (1) severe and (2) permanent, there is reason for skepticism. Freeman's analysis is restricted to the 1967–73 period and uses only the boundary years for calculations of change. Clearly, using these two years maximizes the decline in the relative income of college graduates. If, for example, 1967 is used as the base, the overall decline is much less pronounced. In fact, with an exception for the youngest age group, there is little evidence of any change at all.

The fact that cyclical factors may explain declining relative earnings of the young is added reason for skepticism about the permanency of "the declining economic value of higher education." It is generally argued that cyclical downturns offer a relative advantage to more skilled workers. This argument is founded on the presumption of "quasi-fixity" or specificity of training on the job being positively correlated with levels of schooling. If it is, the argument goes that the more skilled workers will be stockpiled or hoarded by firms during periods of reduced labor demand with an eye toward recouping any short-run losses during future expansionary periods. The empirical basis for this argument (see Oi [10] and Rosen [11]) is strong, and if it is correct, its counterpart is that if a firm is in the process of hoarding, i.e., underutilizing, its skilled manpower, it surely will not be simultaneously hiring new (young) skilled laborers.

If the theory predicts that skilled workers with job seniority are less vulnerable to cyclic vagaries than others, it must also predict that new entrants to the skilled work force are more vulnerable than others. The large influx of college graduates that coincided with the recent cyclical

TABLE 5 Recent Returns to Education: Mean Income Ratios

Age	1967 HI/EL[a]	1967 C/HI[b]	1969 HI/EL	1969 C/HI	1971 HI/EL	1971 C/HI	1973 HI/EL	1973 C/HI
				Year-Round Full-Time Workers				
Male:								
All Races								
25–34	1.34	1.32	1.22	1.39	1.33	1.29	1.30	1.23
35–44	1.38	1.50	1.38	1.54	1.32	1.50	1.21	1.48
45–54	1.31	1.50	1.32	1.65	1.30	1.64	1.37	1.56
55–64	1.26	1.49	1.32	1.66	1.36	1.48	1.27	1.61
65+	1.12	1.72	1.25	1.42	1.31	–	1.32	1.37
25+	1.27	1.44	1.29	1.53	1.28	1.46	1.24	1.40
Female:								
All Races								
25–34	1.40	1.36	1.45	1.42	1.42	1.38	–	1.34
35–44	1.27	1.64	1.29	1.31	1.31	1.54	1.31	1.49
45–54	1.20	1.48	1.25	1.43	1.35	1.45	1.27	1.37
55–64	1.30	1.40	1.35	1.50	1.38	1.56	1.33	1.39
65+	1.43	–	1.27	–	1.44	–	–	–
25+	1.26	1.46	1.28	1.40	1.34	1.44	1.26	1.36
				All Workers				
Male:								
All Races								
25–34	1.38	1.33	1.24	1.33	1.42	1.27	1.37	1.19
35–44	1.37	1.54	1.41	1.87	1.36	1.55	1.27	1.52
45–54	1.35	1.53	1.36	1.64	1.36	1.66	1.37	1.56
55–64	1.33	1.55	1.39	1.68	1.43	1.59	1.36	1.57
65+	1.34	1.76	1.46	1.58	1.44	1.64	1.36	1.69
25+	1.47	1.47	1.52	1.50	1.53	1.48	1.49	1.41
Female:								
All Races								
25–34	1.22	1.42	1.32	1.54	1.40	1.51	1.35	1.45
35–44	1.30	1.47	1.26	1.37	1.26	1.47	1.33	1.35
45–54	1.33	1.54	1.41	1.54	1.44	1.54	1.45	1.45
55–64	1.51	1.58	1.58	1.69	1.57	1.71	1.58	1.66
65+	1.61	1.90	1.70	1.45	1.49	1.55	1.47	1.43
25+	1.58	1.51	1.60	1.50	1.61	1.50	1.60	1.42

[a]HI/EL is the ratio of high school to elementary.
[b]C/HI is the ratio of college graduates to high school.

downturn seems to have met a predictable fate. Whether their reduced relative wage will persist is uncertain, but the recent experience is a dubious basis for extreme pessimism.

The available evidence is that schooling, especially college, offers earned rates of return to recent cohorts of blacks that are comparable with those earned by whites. This appears not to have been true of earlier cohorts of blacks for whom returns to schooling were sharply lower.

The improved prospects of schooling as a vehicle for increasing black income has had its consequences on school enrollment rates. According to Table 6A there has been a remarkable upsurge since 1965 in school attendance for blacks at both the preelementary and postsecondary levels. College enrollments increased 55 percent, while enrollment rates for whites rose by only 15 percent between 1965 and 1974. Perhaps the most dramatic evidence of this shift is illustrated in Table 6B. During the 1970–74 period, the proportion of black males enrolled in college rose from 16 to 20 percent, while the corresponding proportion for white males fell from 34 to 28 percent.

The historical record suggests that convergent schooling levels have been an important source of increasing income parity for blacks. Whether this is in fact true, requires accurate estimates of the effects of schooling on earnings. Whether schooling will continue to be an important avenue of social and economic mobility depends very much on the future course of the income returns to schooling. If the economic value of higher education is falling, it is important that this evidence be presented. Evidence which "goes the other way" is equally important. This evidence cannot be obtained from summary tabulations without corrections for confounding factors. To interpret the recent experience, it is especially

TABLE 6A Percent Enrolled in School by Age: 1965, 1970, and 1974

	Black			White		
Age	1965	1970	1974	1965	1970	1974
3 and 4 years	12[a]	23	29	10	20	29
5 years	59	72	87	72	81	90
6 to 15 years	99	99	99	99	99	99
16 and 17 years	84	86	87	88	91	88
18 and 19 years	40	40	44	47	49	43
20 to 24 years	9	14	17	20	23	22

SOURCE: U.S. Department of Commerce, Social and Economic Statistics Administration, Bureau of the Census.

[a]Includes persons of "other" races.

TABLE 6B College Enrollment of Persons 18 to 24 Years Old by Sex: 1970 and 1974 (In thousands)

Sex and College Enrollment	Black 1970	Black 1974	White 1970	White 1974
		Both Sexes		
Total persons, 18 to 24 years	2,692	3,105	19,608	22,141
Number enrolled in college	416	555	5,305	5,589
Percent of total	15	18	27	25
		Male		
Total persons, 18 to 24 years	1,220	1,396	9,053	10,722
Number enrolled in college	192	280	3,096	3,035
Percent of total	16	20	34	28
		Female		
Total persons, 18 to 24 years	1,471	1,709	10,555	11,419
Number enrolled in college	225	277	2,209	2,555
Percent of total	15	16	21	22

SOURCE: U.S. Department of Commerce, Social and Economic Statistics Administration, Bureau of the Census.

important that evidence be obtained of interdependencies between age profiles of income returns to schooling and general levels of economic activity.

2. Geographic Location

Even after adjusting for education, experience, and government employment, regional differences in black/white earnings persist. The South is distinguished by low wages for both blacks and whites. Further, compared to the Northeast, black/white earnings ratios are consistently lower in the South. In 1970, white male wages are 8 to 13 percent lower, while black wages in the South range from 15 to 30 percent below those for blacks in the Northeast. These black/white Southern wage ratios decline rapidly with experience. As we mentioned earlier, declining wage ratios with experience can be attributed either to cohort or life-cycle factors, and the South may differ from the rest of the country in both. Although we rejected year interaction for all experience classes, race-year interaction existed for the three classes with up to 15 years of experience. An

interpretation that appeals to us is that there are differential vintage effects favoring black Southern males for the post-World War II labor market entrants. An alternative explanation is that the presumably more intense discrimination in the South against blacks takes the form of restricting blacks from occupations that have rising career wage profiles.

Disparities among the other three regions excluding the South are less pronounced. In the North Central region, for all classes with at least 10 years of experience, blacks and whites receive wages 3 to 5 percent higher than the Northeast benchmark. For these experience classes, the increase is independent of race and year, so that in our constrained estimates we suppress all race, year, and race-year interaction. In the North Central region, for workers with less than ten years experience, black wages were higher in 1970 than for blacks in the Northeast, but no white wage differentials existed between those two regions. Apparently, black/white earnings ratios increased in both the South and North Central regions relative to other areas. For these less experienced North Central workers, the main coefficient and year interaction is suppressed, but race and race-year interaction is permitted. The main coefficient for the West is suppressed for those with more than 15 years of experience. The estimates suggest that earnings of all persons in the West fell from 1.4 to 10 percent between 1960 and 1970, relative to wages in other regions.

3. Government Employment

After adjusting for schooling, experience, and location, employees of the federal government in 1970 have higher wages than others—a differential of 5 to 16 percent for whites and 15 to 30 percent for blacks. This premium for blacks over whites represented a 10 percent decline from an even higher differential in 1960. In fact, the black/white wage ratio did not change for federal employees between 1960 and 1970. The decline relative to the private sector simply notes the approximately 10 percent increase that occurred in the private sector. The variable for direct employment by the federal government is retained with race and race-year interaction, but year interaction is omitted.

Employees of regulated industries earn 8 to 16 percent more than those in the rest of the private sector. Employment in industries regulated by the federal government is included without race, year, or race-year interaction. Between 1960 and 1970, black employment shares of these industries increased, so that regulated industries contributed slightly to rising earnings ratios. The regression coefficients for the shares of industrial products purchased by the government are very large. They predict for whites that earnings in this form of indirect government

employment exceed those of the private sector by one-third to one-half. Since we have similar results for another independently drawn sample,[23] we feel that the estimate cannot be reasonably construed as resulting either from purely random fluctuations or from peculiarities of these samples. Instead, we think they signal real industrial wage differences. We will not speculate here about causes of these differentials, but will note that we feel that industrial wage differentials represent a fruitful area of research about which too little is currently known.

Wage differentials between white employees of federal contractors and those in the private sector are also large, as are the estimated discrepancies in black/white wage ratios between this and other sectors. Where whites fare well, blacks appear to do even better. This, of course, is what we would expect from "affirmative action." The rub is that in these industries implied black/white earnings ratios fall at an average annual rate of 3 to 6 percent per year relative to the private sector (which was rising at about 1 percent per year). We cannot think of a simple and suitable explanation for this decline. Federal shares of industry value added is retained with year interaction being suppressed. All interaction is suppressed for state and local governments' shares of industry product.

4. Experience

All interaction is suppressed for the variables indicating years of work experience and its square.

Accounting for Black/White Earnings Differentials

In this section, we present our attempts to account for the black/white wage ratio as it existed in 1970, and for changes in the ratio between 1960 and 1970. Groups are specified separately by race, year, and work experience. For each (the logarithm of) weekly wages is taken as a linear function of the schooling, location, government employment, and experience variables described earlier so that (the logarithm of) the black/white wage ratio is the difference in the linear expressions and (the logarithm of) the change in the ratio is the difference in differences. For the ratio, R, we have

$$\ln R = y_1 - y_2 = x_1'\beta_1 - x_2'\beta_2 + u_1 - u_2 \tag{2}$$

and

$$\Delta \ln R = (y_1 - y_2) - (y_3 - y_4) = (x_1'\beta_1 - x_2'\beta_2) - (x_3'\beta_3 - x_4'\beta_4) + (u_1 - u_2) - (u_3 - u_4) \tag{3}$$

where x refers to characteristics affecting earnings with associated parameter vectors β. The subscripts are: 1 = blacks, 1970; 2 = whites, 1970; 3 = blacks, 1960; and 4 = whites, 1960. We are concerned with averages and assume that the x's refer to mean vectors for the respective groups. The estimated equations include intercepts, so that estimates are forced through the geometric mean for each group. Henceforth, we refer to OLS regression parameter estimates rather than their conceptual counterparts and omit reference to residual means, which are constrained to zero. In comparing equation 1 to equations 2 and 3 note that

$$b_0 = \beta_2$$

$$\delta_1 = \beta_1 - \beta_2$$

$$\delta_2 = \beta_4 - \beta_2$$

$$\delta_{12} = (\beta_3 - \beta_1) - \delta_2$$

Accordingly, equation 2 is rewritten as:

(2.i) $\ln \bar{R} = (x_1' - x_2')b_0$

(2.ii) $+ x_1 \delta_1$

where the first term on the right-hand side is the main effect of black/white mean characteristic differences, weighted by white parameter values, and the second term (2.ii) adjusts for race parameter interaction.[24] Equation 3 is rewritten as

(3.i) $\Delta \ln \bar{R} = [(x_1 - x_2)' - (x_3 - x_4)']b_0$

(3.ii) $+ (x_1 - x_3)'\delta_1$

(3.iii) $- (x_3 - x_4)'\delta_2$

(3.iv) $- x_3'\delta_{12}$

where the main effects of 1960–70 changes in characteristic differences, evaluated at 1970 white parameter values, is measured by the first term. The second adjusts for race interaction, the third for year interaction, and the fourth for race-year interaction.

In this form, note that the intercept race-year interaction coefficient estimates (with opposite sign) the growth in the black/white wage ratio not explained by changes in characteristics included as explanatory variables. This unexplained residual represents our estimate of skill-neutral relative racial vintage effects. One can only speculate, as we shall, about the factors contributing to the black relative income growth contained in the intercept. It is important, however, that if vintage effects exist, they are obvious candidates for time-related shifts in the intercepts of these wage-determining equations.

Similarly, notice that the year interaction intercept coefficient estimates time-related shifts in real wages of whites. Our estimates among the six experience classes show average annual growth for wages of whites ranging from 2.3 to 2.8 percent. We think these numbers agree with consensus estimates of real wage changes over the period. Similarly, we estimate that neutral wage growth for blacks exceeded that of whites by average annual differentials ranging from 0.62 to 1.08 percent. These estimates are summarized in Table 7, which also contains observed average annual increments in annual earnings and weekly wages for whites and for black/white ratios.

TABLE 7 Observed Growth in Earnings and Black/White Ratios with Residuals from Regression Accounting for Change, 1960–70

Average Annual Percentage Change	Years of Work Experience					
	1–5	6–10	11–15	16–20	21–30	31–40
Annual Earnings (Observed Increase)						
Whites	3.00	2.78	2.99	3.06	3.21	3.15
Black/White Ratio	2.67	2.25	1.75	1.29	1.09	1.09
Weekly Wages (Observed Increase)						
Whites	2.49	2.41	2.66	2.76	2.74	2.64
Black/White Ratio	2.25	1.73	1.06	0.75	0.70	0.68
Weekly Wages (Accounting Residual—Standard Errors in Parentheses)						
Whites	2.81	2.60	2.41	2.30	2.53	2.57
	(.23)	(.19)	(.18)	(.18)	(.13)	(.15)
Black/White Ratio	0.96	0.62	0.75	1.08	0.81	1.02
	(.39)	(.31)	(.24)	(.20)	(.15)	(.18)

Table 8 summarizes the spline function estimates of returns to grade school and college. These coefficients are given special attention because differences in school completion levels seem an important source of black/white wage differentials and because growth in black schooling levels relative to whites appears to be an important source of growth in relative black earnings. Locational effects seem even more important than schooling in the accounting, but the pattern of change vis-à-vis location seems more a result of black/white coefficient differences and of time-related changes in coefficients than a gain due to migration per se. In any case, black/white earning differentials exist in all regions, and the

TABLE 8 Regression Coefficients for Years of Schooling by Work Experience Classes (*t*-statistics in parentheses)

Years of Experience	White, 1970	Interaction		
		Race	Year	Race-Year
Fully Interactive Model: Grade Schooling Coefficients				
1–5	.138	−.046	.012	−.005
	(18.9)	(4.8)	(1.1)	(0.3)
6–10	.107	−.015	−.012	−.011
	(21.4)	(2.3)	(1.7)	(1.2)
11–15	.067	−.013	.004	−.004
	(14.6)	(2.3)	(0.7)	(0.6)
16–20	.061	−.016	−.002	−.004
	(13.9)	(2.8)	(0.4)	(0.6)
21–30	.058	−.028	.001	.001
	(19.9)	(7.3)	(0.3)	(0.1)
31–40	.047	−.019	.007	−.011
	(15.3)	(4.6)	(1.5)	(1.9)
Fully Interactive Model: College Coefficients				
1–5	.123	.039	−.024	−.006
	(25.0)	(3.8)	(3.1)	(0.3)
6–10	.088	.012	−.008	.008
	(20.9)	(1.4)	(1.2)	(0.6)
11–15	.090	.007	−.011	−.011
	(21.9)	(0.9)	(1.6)	(0.9)
16–20	.088	−.001	−.020	−.013
	(19.6)	(0.1)	(2.8)	(0.9)
21–30	.076	.009	−.004	−.021
	(20.2)	(1.2)	(0.6)	(1.7)
31–40	.074	.001	−.025	−.002
	(13.3)	(0.1)	(2.6)	(0.1)
Constrained Estimates: Grade Schooling Coefficients				
1–5	.143	−.046	–	–
	(27.6)	(6.9)		
6–10	.101	−.018	–	–
	(28.3)	(4.0)		
11–15	.069	−.015	–	–
	(22.7)	(4.0)		
16–20	.062	−.019	–	–
	(22.1)	(5.2)		
21–30	.058	−.027	–	–
	(29.4)	(10.7)		

TABLE 8 (concluded)

Years of Experience	White, 1970	Interaction		
		Race	Year	Race-Year
Constrained Estimates: Grade Schooling Coefficients				
31–40	.049	−.023	–	–
	(22.5)	(8.3)		
Constrained Estimates: College Coefficients				
1–5	.124	.034	−.024	–
	(26.9)	(4.2)	(3.8)	
6–10	.093	–	−.011	–
	(26.0)		(2.0)	
11–15	.092	–	−.013	–
	(27.0)		(2.5)	
16–20	.088	–	.023	–
	(23.8)		(4.0)	
21–30	.077	–	−.008	–
	(24.4)		(1.5)	
31–40	.074	–	−.024	–
	(15.2)		(2.9)	

income potential to migration is limited. In contrast, patterns of schooling coefficients and of changing race differences in schooling levels suggest that schooling continues to offer real potential for black income growth.

Table 9 summarizes our regression estimates of factors contributing to black/white earnings differentials as of 1970. In all cases, schooling accounts for a much larger part of the black/white earnings differential than does location, government employment, or work experience. Except for the first experience class, the schooling effect is approximately equally divided between the main effect of lower average completion levels and the effect of lower schooling coefficients. For example, in the class with 1 to 5 years of work experience, the coefficient, −.174, for the main effect of schooling differences indicates that when weighted by schooling coefficients for whites, the black/white difference in average schooling is large enough to predict black wages (approximately) 17.4 percent below whites. The −.49 is an adjustment for the lower returns blacks gain for schooling. This rather large racial interaction effect in 1970 must be considered quite tentative, since we have found it sensitive to model specification.[25] For the other experience intervals, the race interaction term reflects a lower return to black elementary and secondary schooling.

TABLE 9 Black/White Weekly Wage Ratios: Observed Ratios with Regression Accounting for Differentials, 1970

Variable	Main Effects	Race Interaction	Total
Class I: 1–5 Years of Work Experience[a]			
Accounting summary:			
Years of schooling	−.175	−.491	−.666
Geographic location	−.052	.077	.025
Government employment (direct; regulated and supply industries)	−.011	.013	.002
Experience correction	.010	–	.010
Total	−.228	−.401	−.629
Residual = .204			
Class II: 6–10 Years of Work Experience[b]			
Accounting summary:			
Schooling	−.137	−.186	−.323
Location	−.039	.031	−.008
Government	−.010	.005	−.005
Experience	.003	–	.003
Total	−.183	−.150	−.333
Residual = −.107			
Class III: 11–15 Years of Work Experience[c]			
Accounting summary:			
Schooling	−.123	−.154	−.277
Location	−.037	−.008	−.045
Government	−.011	.008	−.003
Experience	.001	–	.001
Total	−.170	−.154	−.324
Residual = −.157			
Class IV: 16–20 Years of Work Experience[d]			
Accounting summary:			
Schooling	−.127	−.185	−.312
Location	−.038	−.027	−.065
Government	−.009	.019	.010
Experience	.000	–	.000
Total	−.174	−.193	−.367
Residual = −.123			

TABLE 9 (concluded)

Variable	Main Effects	Race Interaction	Total
Class V: 21–30 Years of Work Experience[e]			
Accounting summary:			
Schooling	−.131	−.242	−.373
Location	−.029	−.068	−.097
Government	−.008	.020	.012
Experience	.000	–	.000
Total	−.168	−.290	−.458
Residual = −.046			
Class VI: 31–40 Years of Work Experience[f]			
Accounting summary:			
Schooling	−.139	−.178	−.317
Location	−.033	−.049	−.082
Government	−.006	.030	.024
Experience	−.001	–	−.001
Total	−.179	−.197	−.376
Residual = −.137			

[a]Log (base *e*) of observed weekly wage ratio = −.422
[b]Log (base *e*) of observed weekly wage ratio = −.439
[c]Log (base *e*) of observed weekly wage ratio = −.481
[d]Log (base *e*) of observed weekly wage ratio = −.491
[e]Log (base *e*) of observed weekly wage ratio = −.503
[f]Log (base *e*) of observed weekly wage ratio = −.512

Three characteristics—Southern, central city, and metropolitan resident—dominate the geographic location accounting in explaining black/white 1970 wage ratios. The Southern black wages are the single most important locational source of low black relative wages. We find that Southern residence reduces the black/white wage ratio from 3 to 13 percent. This differential grows monotonically with experience and reflects primarily differential coefficients rather than characteristics. The central city variables increase relative black wages by approximately 6 percent. The negative effect of fewer blacks living in central cities is overwhelmed by the positive differential favoring blacks. The metropolitan variable leads to a 2 to 3 percent reduction in the relative black wage. The net effect of all the locational variables is small in the first two experience intervals. In the 11+ experience groups, black wages range from 4 to 9 percent lower because of their locational distribution. The detrimental effect of predominantly Southern residence is simply much more pronounced for older workers.

The systematic earnings determinants with adjustments for race coefficient interaction predict a black/white wage ratio below the one actually observed for those with 1 to 5 years of experience. The discrepancy between predicted and observed ratios is absorbed by intercept-race interaction denoted as the residual in Table 9. For all other experience classes the intercept interaction term is negative, so that the regressions underaccount for black/white wage differences, i.e., relative to whites blacks earn less on the average than predicted by the regression equations.

Table 10 contains our summary accounting for 1960–70 changes in wage ratios. Here, patterns are confounded by interaction. The main effects, those based on changes in characteristic differences (at 1970 white coefficient values) consistently predict rapidly rising wage ratios, with schooling playing the leading role. Thereafter, the lower coefficients on black grade schooling and the 1970 increase in returns to college (where black/white completion differentials are large) take their toll. The most rapid increases in schooling occurred in the earlier decades of this century, but these are still sizable increases, especially for blacks.[26]

Surprisingly, vintage effects—time-based coefficient changes—are evident only for the income returns to college. Considerable data (Welch [15], [16], [17]) exist to suggest that the nominal characteristics of schools which are presumably indicative of "quality" have progressed steadily for whites and even more rapidly for blacks. There is in fact no strong a priori reason to assume that increased quality of schooling will necessarily alter the semilogarithmic coefficients of wages on schooling. First, under stationary labor market conditions, the model of investment in human capital presented by Yoram Ben-Porath [3] clearly makes this point. Second, as markets adjust in response to increased skills associated with increased schooling quality, the returns to education may decline. Finally, the firm-specific theories of investments in human capital on the job and the associated quasi-fixity hypotheses[27] all predict countercyclic movements in returns to schooling, and it is at least within the realm of imagination that the relatively "tighter" labor markets of 1969 in comparison to those of 1959 nullified longer-term tendencies.

Nonetheless, full skill-neutrality of vintage effects derived from secular improvement in quality of schooling is not intuitively obvious and we—at least one of us, who is on record as predicting the opposite result [16]—are surprised by these estimates, at least for grade-school coefficients. Estimates for college do show time-related increases in returns that are not easily explained without reference to vintage hypotheses or to changing patterns of colleges attended by blacks.

Locational effects for those with the least experience are dominated by race-year interaction—a result of rising black earnings ratios in the South

TABLE 10 Average Annual Percentage Increase in Black/White Weekly Wage Ratios, 1960–70: Accounting According to Regression Estimates by Work Experience Class

Variable	Main Effects	Interaction Effects: Race	Year	Race × Year	Total
Class I: 1–5 Years of Work Experience[a]					
Accounting summary:					
Years of schooling	.91	−.40	−.22	–	.29
Geographic location	−.00	.11	−.02	1.02	1.11
Experience correction	.03	–	–	–	.03
Subtotal	.94	−.29	−.24	1.02	1.43
Government employment (direct; regulated and supply industries)	.12	.03	–	−.31	−.16
Total	1.06	−.26	−.24	.71	1.27
Residual = .96					
Class II: 6–10 Years of Work Experience[b]					
Accounting summary:					
Schooling	.76	−.19	−.07	–	.50
Location	.10	.12	.05	.50	.77
Experience	.01	–	–	–	.01
Subtotal	.87	−.07	−.02	.50	1.28
Government	.05	−.01	–	−.21	−.17
Total	.92	−.08	−.02	.29	1.11
Residual = .62					
Class III: 11–15 Years of Work Experience[c]					
Accounting summary:					
Schooling	.40	−.20	−.07	–	.13
Location	.03	.10	.05	.23	.41
Experience	.01	–	–	–	.01
Subtotal	.44	−.10	−.02	.23	.55
Government	−.01	−.01	–	−.23	−.25
Total	.43	−.11	−.02	.00	.30
Residual = .75					
Class IV: 16–20 Years of Work Experience[d]					
Accounting summary:					
Schooling	.23	−.26	−.09	–	−.12
Location	.04	.14	−.04	–	.14

TABLE 10 (concluded)

Variable	Main Effects	Interaction Effects: Race	Year	Race × Year	Total
Experience	−.00	–	–	–	−.00
Subtotal	.27	−.12	−.13	.00	.02
Government	−.00	.00	–	−.33	−.33
Total	.27	−.12	−.13	−.33	−.31
Residual = 1.08					
Class V: 21–30 Years of Work Experience[e]					
Accounting summary:					
Schooling	.46	−.45	−.03	–	−.02
Location	.06	.18	.00	–	.24
Experience	.00	–	–	–	.00
Subtotal	.52	−.27	−.03	.00	.22
Government	−.02	.02	–	−.34	−.34
Total	.50	−.25	−.03	−.34	−.12
Residual = .81					
Class VI: 31–40 Years of Work Experience[f]					
Accounting summary:					
Schooling	.13	−.34	−.05	–	−.26
Location	.05	.15	−.00	–	.20
Experience	−.01	–	–	–	−.01
Subtotal	.17	−.19	−.05	.00	−.07
Government	.01	.03	–	−.30	−.26
Total	.18	−.16	−.05	−.30	−.33
Residual = 1.02					

[a]Observed increase = 2.25
[b]Observed increase = 1.73
[c]Observed increase = 1.06
[d]Observed increase = 0.75
[e]Observed increase = 0.70
[f]Observed increase = 0.68

and North Central regions between 1960 and 1970—and are dominated by the South, where most blacks live. For whites, there was a net migration out of the central city and into the metropolitan areas and the South, but these were so small relative to black migration that almost all the net change in relative wages is caused by black migration and changing coefficients.[28]

Table 11 summarizes these coefficients, which are our "other things equal" estimates of increases in the earnings ratio observed between 1960 and 1970 in the South and North Central regions, relative to the Northeastern base.

TABLE 11 Race and Race-Year Interaction Coefficients for the South and North Central Regions (*t*-statistics in parentheses)[a]

Years of Experience	South		North Central	
	Race	Race-year	Race	Race-Year
1–5	−.017	.152	.075	.082
	(0.5)	(3.6)	(2.4)	(1.7)
6–10	−.097	.045	.141	.123
	(3.7)	(1.4)	(5.6)	(3.2)
11–15	−.158	.044	–	–
	(6.9)	(1.7)	–	–

[a]The sign of the race-year interaction is from the form described in equation 1. (Race-region interaction coefficients are included for reference.)

Between 1960 and 1970 our estimate is that the black/white wage ratio in the South increased by 15.2 percent for those entering the labor market in 1965–69, in comparison to the wage experienced in 1959 by those who entered between 1955 and 1959. The insignificant race interaction for the South suggests that the 15.6 percent rise for those with 1 to 5 years of experience essentially nullified the historically low relative earnings of blacks in the South. For those with 6 to 10 years of experience, there is evidence of growth during the decade, but the 1970 differential is 10 percent below that of the Northeast and Western regions. The black/white wage ratio also appears to have increased in North Central areas during the sixties for younger workers, so that by 1970 black relative earnings are higher there than in other regions. The year interaction effects described in Table 11 reflect a wage decline in the West relative to other regions that apparently occurred during the sixties. In most cases reduction in wages in the West effectively increased the national black/white earnings ratio, which shows only that a larger proportion of whites than blacks live in the West.

In sum, our accounting results for systematic determinants of changes in black/white wage ratios are:

1. Geographic location has the largest and most favorable effect of factors examined here. Locational effects are dominated by

changed earnings ratios within regions, and migration seems of secondary importance.

2. Schooling's role is ambiguous. Black and white completion levels are converging, but returns to grade schooling are less for blacks than whites. For the first three experience classes, with 15 or fewer years of experience, the effect of converging levels is dominant and schooling seems an important source of growth in relative black income. For those with more than 15 years of experience, changed patterns of school completion between the 1960 and 1970 cohorts result in predictions of falling relative wages for blacks. Black schooling gains, as measured by increases in number of years completed, exceed those of whites, but because of differences in returns, the value of the increased schooling of whites (as a proportion of wages) exceeds the estimated value of the schooling of blacks.

V. THE ROLE OF GOVERNMENT: A SUMMARY

There is by now a time-honored tradition in empirical analysis of treating discrimination as a residual: if an income difference exists and cannot be explained by age or schooling, it is "discrimination." It is regrettable that a concept that warrants as much attention as discrimination must be relegated to the "everything else" file in empirical research. Although no real solution is in sight, the advent of affirmative action does offer some interesting possibilities.

Throughout this analysis, we have tried to identify government's role in changing black/white earnings ratios, and were unable to find much of an effect. In the introduction, we noted that Census data are not well suited for this purpose. The data are adequate if one is interested only in the direct effects on those employed by the federal government or in regulated industries, because industry of employment is known. The problems arise in trying to identify effects of government on employment and wages in the private sector. The only method at our disposal was an indirect one—to focus on industries which supply products to governments. Executive Orders Nos. 11246 and 11375 required that large-scale federal contractors comply with the 1964 legislation (or at least supply evidence of why their attempts to comply have failed) or risk losing their contracts. While it is true that interested parties have legal recourse against any firm in violation of civil rights legislation, we felt that the implied threat of pressures on government contractors for "affirmative action" gave us our best chance to observe effects of this legislation.

Adjusting for schooling, experience, and location, white federal employees earn 5 to 8 percent more than other white workers, and this differential doubles late in the work career. In 1970, the premium for blacks was 10 to 15 percent greater than for whites, but this 1970 premium for blacks represented a 10 percent drop from that of 1960. In fact, the black/white wage ratio did not change for federal employees between 1960 and 1970. The decline relative to the private sector simply reflects the approximately 10 percent increase that occurred in the private sector.

In our samples, the fraction of all workers employed by the federal government declined slightly between 1960 and 1970. Although blacks are more likely than whites to be federal employees, the proportion of blacks so employed is falling relative to whites, and the drop is most pronounced for younger workers.

Employees of regulated industries earn 10 to 12 percent more than those in the unregulated private sector. Between 1960 and 1970, black employment shares of these industries increased, so that regulated industries contributed to rising earnings ratios. Earnings in indirect government employment exceed those of the unregulated private sector by one-third to one-half.

We expected large wage differentials between white employees of federal contractors and those in the unregulated sector. Where whites fare well, blacks appear to do even better, conforming to our intuition of the effects of "affirmative action." The rub is that in these industries implied black/white earnings ratios fall at an average annual rate of 3 to 6 percent per year relative to the unregulated private sector (which was rising at about 1 percent per year). The accounting results suggest that none of the government employment variables has an appreciable effect, although the estimated impact of indirect government employment is negative and dominates effects estimated for direct employment (also negative) and for employment in regulated industries (positive).

The Census data indicate that effects of affirmative action during the sixties were probably small. Yet, these data are far from ideal, and we were unable to perform more exacting tests. For example, we did not know whether an individual was employed by a large-scale government contractor. If so, how large was it? (There should be scale economies, since prosecution of a large employer affects more employees.) Is it unionized and what is the union's attitude toward affirmative action? Is it growing, i.e., would increasing the proportion of minority employees require explicit displacement of others? And, most importantly, how dependent is the firm on sales to governments? This final question includes both the government's share of sales and the alternatives available to the firm if the government were not to purchase its product. That

is, we expect that defense contractors are much more dependent on governments than are, say, shoe manufacturers, independent of the fraction of a firm's output of shoes the government happens to buy. The judgment on affirmative action will remain in doubt until these questions are answered.

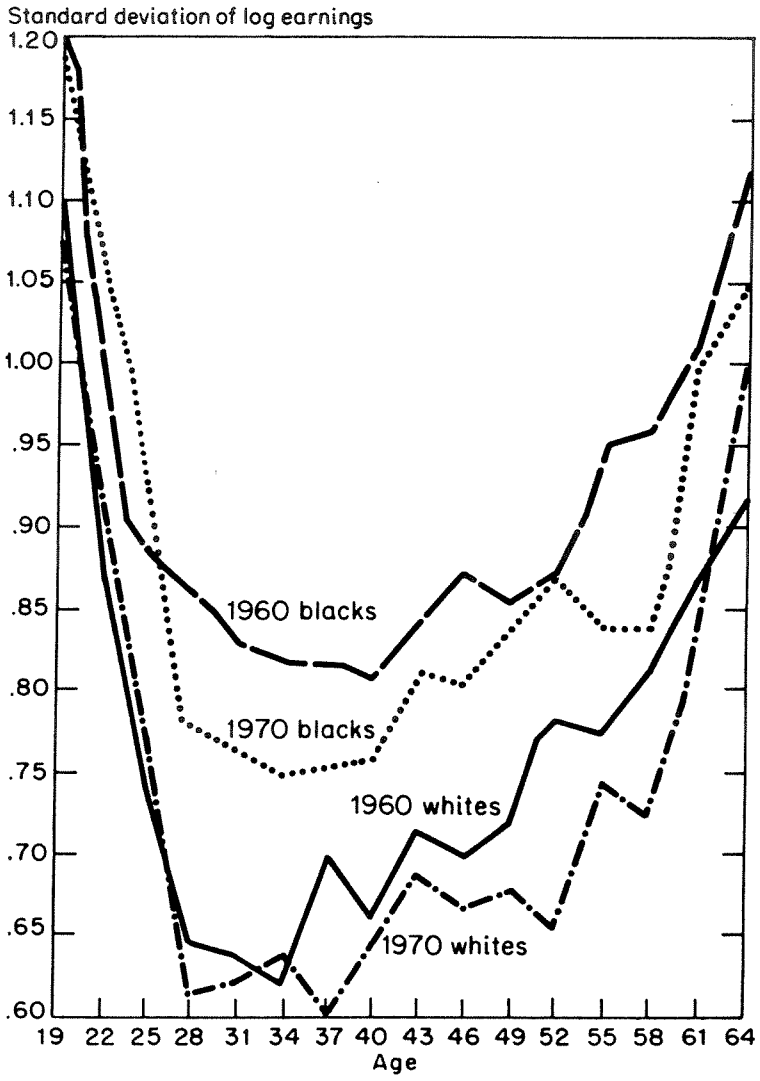
VI. EARNINGS INEQUALITY

Up to this point, we have concentrated on differences in mean earnings and have ignored other attributes of the full earnings distributions. In this section, we deal only with the distribution of market earnings, and are ignoring all nonlabor income. Although this limits any welfare statements one may care to make, this restriction was necessary for empirical and theoretical reasons. It is well known that nonearnings income is inaccurately reported in the Census, so that other data sets are better suited for a study of total income inequality. Moreover, the determinants of earnings are conceptually distinct from the factors causing dispersion in asset income. The incentives to save, inter-generational transfers of wealth, and the distribution of government transfer payments are crucial for nonlabor income. Ignoring this income probably leads to an underestimation of total income at both the lower and upper tails of the income distribution—the lower tail because of government transfers, the upper tail because of nonhuman wealth income. Also, the sample is restricted to non-self-employed males. Including the self-employed would increase inequality and impart a more positive skew to the distribution.

If earnings dispersion were similar for blacks and whites, and if dispersion in 1960 were equal to that of 1970, then an analysis of means would fully describe all changes. Yet, using some conventional statistics, Gini coefficients (Appendix Table A-3) or standard deviations of log earnings (Figure 1), black males' earnings are clearly less evenly distributed than whites' earnings. In fact, earnings of blacks are so much more dispersed than whites' earnings that variance among blacks exceeds total earnings variance even when the total is defined to take black/white differences in means into account.[29]

Lorenz curves for earnings in 1960 and 1970, shown as Figures 2A and 2B, offer a more complete characterization of the two distributions.[30] Although the black curves typically lie outside the ones for whites, indicating greater inequality, they cross in the upper right corner, showing less positive skewness in black distributions. We suspect that it is this concentration of income in the upper 10 percent for whites and a corresponding high proportion of low-income blacks that leads to many of the popular conceptions about racial differences in income inequality.

FIGURE 1 Standard Deviations of Log (Base *e*) Earnings by Age and Race for 1960 and 1970



The crossing of the Lorenz curves means that a unique ranking of inequality by race is not possible. At some parts of the distribution (low and middle income), there exists more relative dispersion for blacks. In the top tail of the distribution, the relative dispersion of white earnings is greater. Those summary measures which weight the bottom tail of the distribution more heavily (i.e., log variances) will tend to rank blacks over whites in inequality. Other measures (e.g., coefficients of variation) could produce the opposite result. Since it has been used frequently by others, we use log variances of earnings as our measure of inequality.

To contrast earnings variance with differences in means, we present indexes of the degree of overlap in the black and white densities in Table 12. These indexes give proportions of blacks whose earnings exceed

FIGURE 2A Lorenz Curves for Black and White Earnings, 1960

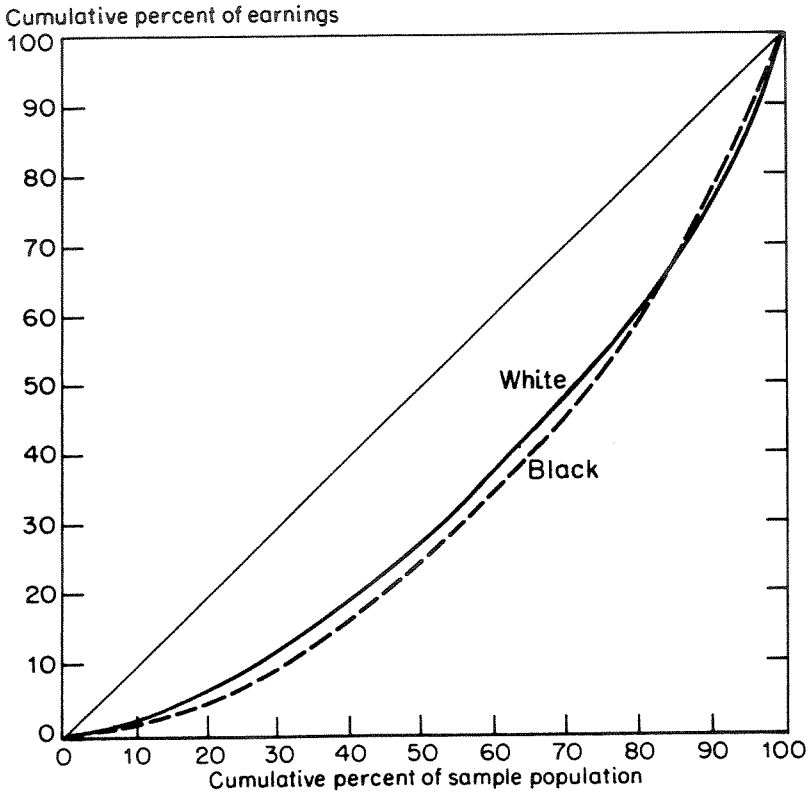


FIGURE 2B Lorenz Curves for Black and White Earnings, 1970

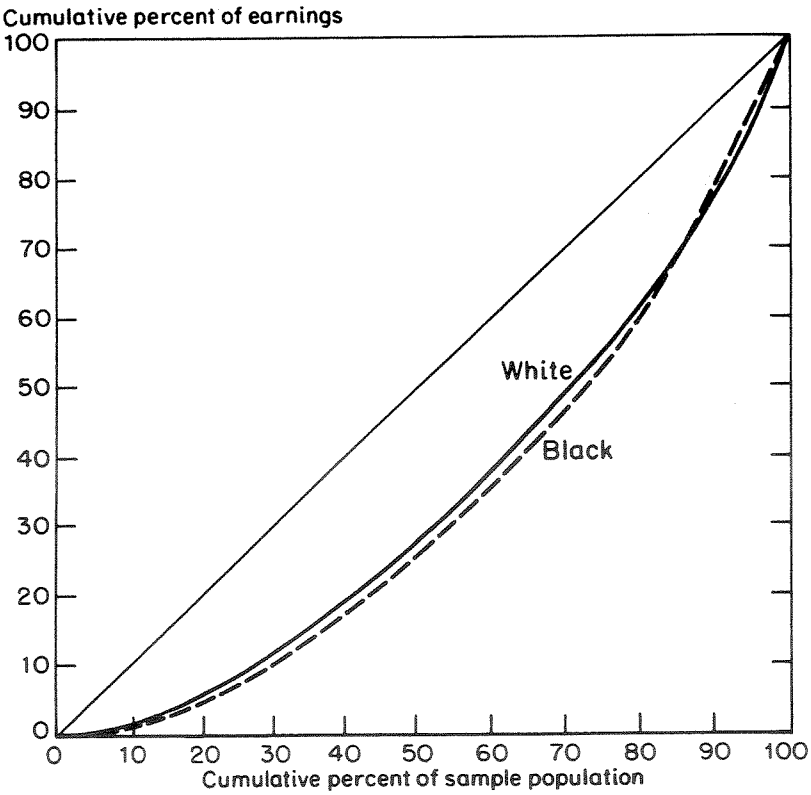


TABLE 12 Proportions of Blacks with Earnings Greater Than Geometric Mean Earnings of Whites and Proportions of Whites with Earnings Less Than Geometric Means of Blacks, by Work Experience: 1970 and 1960

Years of Experience	1970		1960	
	Blacks Exceeding White Geometric Mean	Whites Falling Short of Black Geometric Mean	Blacks Exceeding White Geometric Mean	Whites Falling Short of Black Geometric Mean
	I. Annual Earnings			
1–5	.342	.187	.265	.150
6–10	.261	.139	.184	.111
11–15	.193	.110	.161	.089
16–20	.190	.133	.141	.098
21–30	.187	.109	.174	.102
31–40	.219	.124	.194	.122
	II. Weekly Wages			
1–5	.366	.200	.234	.143
6–10	.269	.139	.185	.108
11–15	.203	.127	.147	.093
16–20	.181	.123	.147	.093
21–30	.199	.127	.156	.108
31–40	.189	.124	.190	.115

geometric means for whites and, similarly, proportions of whites whose earnings fall short of geometric means for blacks. If logarithmic earnings are symmetrically distributed, geometric means are also median earnings. In this case, our indexes of distributional overlap measure the proportion of blacks with earnings greater than that of the "average" white and the proportion of whites with earnings less than that of the "average" black.[31] The increased overlap observed in 1970 suggests that the story told by the convergence in means is not negated by movements in other parts of the distribution (i.e., the decline in variance). Indeed, the increased congruency of black and white earnings distributions exhibited in 1970 as compared to 1960 is additional evidence that the gains achieved by blacks are shared by a sizable fraction of the black population. The observation that in 1970 at least one-third of the blacks with 1–5 years of experience had earnings (measured in terms of annual earnings or weekly wages) in excess of earnings of the average white is a basis for at least guarded optimism.

A complete explanation of the greater inequality in black earnings is beyond the scope of this report, but we can point to some reasons. Recall that in the estimated earnings equation, the dependent variable is the logarithm of the weekly wage, defined as earnings last year divided by weeks worked last year. Our estimates, therefore, are precisely those that would result if the dependent variable were (the log of) earnings, and (the log of) weeks worked were introduced as an explanatory variable whose coefficient is constrained to unity.[32]

Assume then that equation 1 is written for the individual group with annual earnings as the dependent variable and with weeks worked included as an independent variable with unit coefficient

(1′) $$\ln y = x'\beta_i + u$$

Variance (in ln y) explained by the estimated equation is

(4) $$\sigma^2_{\ln y,i} = b_i' V_i(x) b_i$$

where b_i refers to the estimated parameter vector for the ith group and $V_i(x)$ is the associated variance-covariance matrix of characteristics. Consider the following partitioning of the vector of characteristics in equation 1′

(5) $$x' = \{x_1', x_2', x_3', x_4', x_5'\}$$

with

x_1' = schooling (years of grade school, years of college);

x_2' = location (North Central, South West, metropolitan, central city, years in current residence);

x_3' = government employment (federal employee, employee of regulated industry, federal share of industry, state and local governments' share of industry);

x_4' = experience (years of experience, years of experience squared).

and,

x_5' = weeks worked (log of weeks worked).

Omitting the subscript, i, for the group, the part of earnings variance attributed to the jth set of explanatory variables is:

(4.i) $$\sigma^2_{\ln y, V(x_i)} = b_j' V(x_j) b_j$$

where b_j describes the parameter partition conforming to x_j, and $V(x_j)$ is the diagonal block in $V(x)$ describing the variance of x_j. Similarly,

(4.ii) $$\sigma^2_{\ln y, C(x_j, x_k)} = 2 b_j' C(x_j, x_k) b_k$$

where b_j and b_k refer to x_j and x_k, and $C(x_j, x_k)$ is the covariance of x_j, x_k, so that (4.ii) is that part of explained variance attributable to covariance between x_j and x_k.

Results of this variance accounting appear in Table A-4. The two most salient patterns—the *U*-shaped career variance profiles and the higher variances for blacks than whites—hold for both predicted earnings or wage variance and for the estimated residual variances. The variances in log weeks worked have the same *U*-shaped age or experience profiles as log earnings. However, in preliminary analysis we find that more complete control of employment factors tends to eliminate the *U*-shaped character of earnings variances and produce instead continuously rising variance profiles.[33] If eventually confirmed, this would be a disturbing finding because nonmonotonic patterns are more powerful in discriminating among alternative hypotheses about sources of income inequality over life cycles. For example, Mincer [9] uses *U*-shaped variances to refute the stochastic and sorting theories of income distribution. The common theme of the chance or sorting models is that (proportionate) differences among individuals will emerge and persist, producing rising dispersion in income. Human capital theory can rationalize the initial decline in variances as reflecting a weak correlation between earnings capacity and the proportion of earnings invested.

In our measures of explained variance, the partial effect of weeks worked accounts for roughly one-half of all earnings variance.[34] With the business-cycle improvement between the decades, the relative role played by employment declined for both races but at a more rapid rate for blacks. We also investigated the distribution of weekly hours. Except for a slight increase at the youngest ages, average weekly hours remained essentially unchanged between the decades, with whites working about two more hours per week than blacks. The variance in weekly hours declined for black males but showed no trend for whites.[35]

Because each separately increases earnings, the positive correlation between education and weeks worked is another cause of earnings dispersion. Essentially, an elastic labor supply function blesses the same individuals with high wages and hours and spreads out the distribution of income. Because the schooling coefficients and the covariance between education and weeks worked decline, this interaction has its primary influence in the earlier experience intervals. Moreover, it usually has a slightly larger effect among whites and thus does not help explain race differences.[36]

Depending upon one's view of the underlying cause of hours variation, it may be preferable, especially for welfare statements, to partition that part of total earnings dispersion due to hours worked. If the hours decision is voluntary, reflecting the leisure choice of individuals, hours variance should be eliminated so that it does not confound the more fundamental inequality in earnings potential. A preferred measure of the variation in earnings potential would be weekly or hourly wages.

Alternatively, if the principal reason for the larger variance among blacks is that they are subjected with greater frequency to random shocks or spells of unemployment, then at least some of the hours effects should be included to measure the distribution of well-being. But in any case, so long as leisure time has value, earnings fluctuations resulting from fluctuations in time worked should not be viewed as equivalent to variance associated with wage differentials.

Even though employment instability is an obvious cause of inequality, it is important to note that the interracial differences are not due solely to such employment factors. Using the variance in either log weekly or hourly wages as our measure of inequality, the dispersion among blacks still far exceeds that of whites.

For all but the most recent cohorts, schooling is more unequally distributed among black males. There exists a clear secular trend for both races toward less dispersion in schooling and a narrowing of the differentials in variance between races. Combined with estimates of similar average returns to education within experience classes, this larger variance in black schooling would imply more black earnings inequality. However, proportionate variation in human capital as measured only by years of schooling completed accounts for little of the *difference* in inequality. The variance attributed to schooling declines as one increases the experience interval. The lower schooling variances in 1970 also lead to a reduction in inequality for both races.

The regional distribution of blacks, combined with the larger variance in black earnings between geographical units, is a dominant element explaining the higher inequality among blacks. The larger contribution of these regional characteristics in the older experience intervals reflects the widening between-region variance in black/white wages. Part of schooling's contribution to explained variance is captured via covariance between schooling and geographic location. This only summarizes what we have long known: average school completion levels are higher where wages are high. Because of stratification by experience, experience per se plays only a small role within each of the groups. Similarly, government employment is relatively unimportant, accounting for about 10 percent of explained weekly wage variance.

Two cross sections do not provide enough time-series points to analyze secular trends in income inequality. The business-cycle improvement during the decade, by contracting relative wage and employment levels, would alone force one to qualify any statements concerning long-term trends. For those aged 18 to 65, log variances in weekly or yearly earnings rose for white men but remained relatively constant for black men between 1960 and 1970. The lower between-race variance in 1970 was not sufficient to prevent aggregate inequality from rising.[37] For both

races, the total variance is dominated by the within-age-cell variances. Seventy percent of the aggregate white variance consists of within-age-cell variance. This reflects less a steeply graduated age earnings profile for whites. Between-age-cell variance is lower for blacks both absolutely and as a proportion of total variance. During the sixties, within-age-cell variance fell, so the overall rise is due to the larger between-age variances and changing age weights. Using Gini coefficients or log variances, inequality increased at the younger ages for both races. After age 30, earnings inequality decreased within age groups. By and large, an identical pattern emerges by experience, except that there is no change in inequality during the earliest intervals for blacks.

Secular trends in inequality frequently reflect the delayed consequences of past birthrates as differences in birthrates among cohorts transform the observed age distributions. Because of the sharply inverted *U*-shaped characteristic of within-age-cell variances, aggregate inequality will be most sensitive to any changes in the weights given to younger or older age groups. Such changes did occur between 1960 and 1970 and they caused measured inequality to rise. In Table 9, the observed earnings inequality for each sample is contrasted with those that would result with age distributions of the other samples. Table 13 shows the effect of the distribution of men by age on earnings inequality.[38]

TABLE 13 The Effect of the Distribution of Men by Age on Earnings Inequality

	Variance in Log Earnings			
Age Weights	1960 Whites	1960 Blacks	1970 Whites	1970 Blacks
1960 whites	.7267	.9374	.7405	.8658
1960 blacks	–	.9353	–	.8656
1970 whites	–	–	.8126	.9223
1970 blacks	–	–	–	.9326
Uniform	.7656	.9762	.7823	.9087
Actual within age cell	.5755	.8100	.5524	.7656

Undoubtedly, the most fundamental change involved the replacement of the cohorts of the 1930s by those born in the 1940s. The 21–30 age group in 1960 consisted of individuals born during the depression when birthrates were low. These cohorts constituted the 31–40 age group in 1970 and we note a sharp decline in the relative weight assigned to the 31–40 group in 1970. The increased density of the 21–30 age interval in 1970 is, of course, a consequence of the high birthrates of the 1940s.

Compared to the 1960 age distribution, the oldest ages also received larger weight in 1970.

The larger weights given to the younger and older groups in 1970 are a factor leading to increased inequality for both races. If the 1960 age weights were maintained in 1970, the variance in log earnings would have been reduced by .07 for both races. It is interesting that the divergence in age from a uniform distribution reduced inequality in 1960 but increased it in 1970.

In contrast to the recent experience, future changes in age distributions will probably reduce aggregate measures of inequality. By the 1980 Census, the impact of the low birthrates in the late 1950s will be felt. Later still, the subsequent birthrate decline observed during the 1960s will further contribute to a lowering of measured income inequality by reducing the population share of high-earnings-variance young people. Differences between races in existing age distributions explain only a negligible amount of the race difference in earnings inequality.

Table 14 controls for the distribution of men by education level. As education levels rose between the decades, weights given to the lower

TABLE 14 The Effect of the Distribution of Men by Age and Education on Earnings Inequality

Age and Education Weights	Variance in Log Earnings			
	1960 Whites	1960 Blacks	1970 Whites	1970 Blacks
1960 whites	.7267	.9397	.7458	–
1960 blacks	–	.9353	.7759	.8942
1970 whites	–	–	.8126	.8951
1970 blacks	–	–	–	.9326

education groups fell. Because marginal variances by education levels differ, aggregate variances change with altered weights. Empirically, the within-education-group variances are negatively ranked with education at the younger and middle ages, but there is a tendency for this ranking to reverse at older ages.[39] The earlier ranking dominates, so that as education levels increase, average within-cell variances decline. Partly offsetting this is an increase in between-age-cell variances that occurs when education levels rise and the aggregate age earnings profile becomes steeper. If blacks in either 1960 or 1970 had the white education weights, blacks' inequality would have fallen, but only slightly. This relatively small net effect results from a reduction in the within-cell variance of .05 to .06 not being completely offset by a rise in between-cell

variances. Blacks' inequality would have been 4 percent higher in 1970 if the 1960 black education weights had been maintained. There was no net change for whites over time as the reduction in within-cell variance is offset by higher between-cell variance.

Little is known about the causes of the difference in marginal variances by education levels. Some of it (especially the high variances for less educated males at young ages) is caused by larger employment instability. Variation in schooling quality at different schooling levels and ability variation among people completing that level are other explanations.

Because of popular emphasis on between-race differences, there is a tendency to neglect the vast disparities that exist within a race. But blacks apparently live in a world in which the pie, albeit a smaller one, is distributed in a quite uneven manner. In Table A-5 we have listed three conventional indicators of the economic well-being of blacks and whites—years of schooling, health status, and quality of schooling. Not surprisingly, the average levels are lower for blacks. But, *the absolute and proportionate variances are higher for blacks.* Human capital appears to be distributed more unequally among blacks.

The Census data obviously give a very incomplete explanation for the greater dispersion in black income. We would like to free ourselves from these data constraints and speculate about some of the root causes of these differences, but that is a project for another day.

VII. OCCUPATIONAL AND INDUSTRIAL CLASSIFICATIONS

Important changes in occupational and industrial distributions by race appear to have been in process by 1970. There are always elements of ambiguity in any occupational or industrial classification, so that our results can only be viewed as suggestive. Yet, comparisons of this sort offer the potential for an insight into the dynamics of race differences in economic success that cannot be obtained by reference to earnings alone. Suppose, for example, that the income gains documented in the earlier sections had been achieved alongside increasing black-white occupational disparity (segregation) and that blacks were increasingly concentrated in public sectors of the economy, whereas whites were moving toward private sectors. In what sense would we be willing to argue that we are moving toward racial parity? Would we be as sanguine about the viability of income gains achieved in this manner as we would in a situation in which black and white income, schooling, occupational, and industrial distributions were increasingly congruent?

The occupational and industrial classes we use are not standard. The occupational classes are deliberately specified to highlight race differences. Subject to a "manageable" number of classes, we combined the more narrowly defined Census groups with an eye to preserving as much between-group wage variance as possible. These combinations were also designed to retain most of the race differences exhibited in narrower Census classes in 1960. This procedure permits a simple summary of race differences, while preserving the opportunity to observe changes in occupational congruency between 1960 and 1970.

Table 15 presents 1970 occupational distributions according to ten classes, separately for blacks who were in the labor market by 1960, for

TABLE 15 Estimated Permanent Occupational Distributions in 1970 (Percent)

Occupation	Blacks in Labor Market by 1960 (1)	Blacks Entering 1960–69 (2)	All Whites (3)
Professors, scientists, artists	2.1	5.2	9.6
Service professionals	1.9	2.1	3.5
Managers	2.7	8.4	13.9
Skilled clerical and sales	1.2	5.4	7.3
Mechanics, foremen	11.1	12.3	19.4
Craftsmen, apprentices	5.0	10.7	5.6
Low clerical and sales	8.4	9.0	9.5
Operatives	30.9	31.5	19.4
Laborers, service workers	35.3	14.8	10.3
Unknown	1.4	0.6	1.5

NOTE: Index of Distributional Congruency

(1) × (2)	(1) × (3)	(2) × (3)
.875	.722	.901

black entrants between 1960 and 1969, and for all whites. In recognition of life-cycle changes in occupational status, the observed distributions for the first two experience classes have been revised. In examining cohort changes for whites between 1960 and 1970, there is evidence of considerable occupational change for persons with up to 5 years' experience in 1960.[40] There was less dramatic evidence of 1960–70 change for those with 6–10 years of experience in 1960, and little change

for those with more than 10 years' work experience. From this, we infer that although occupational change is often part of the work career, the bulk of this change occurs in the first few years after entering the labor market. To allow for this career-related change, observed occupational distributions for the two cohorts (experience classes 1–5 and 6–10) entering during the sixties are modified according to 1960–70 changes in occupation observed for the corresponding cohorts a decade earlier. This adjustment is given for the *j*th cohort by

$$f^*_{ij,70} \propto f_{ij,70}(f_{ij+2,70}/f_{ij,60})$$

where the index, i, indicates occupation, f^* is the adjusted, and f the observed, proportions of workers in the respective classes.

From Table 15, it is clear that the occupational distribution of blacks entering the labor market in the sixties is sharply different from that of earlier entrants. We computed an index of congruency to contrast the occupational distributions in 1970 of blacks who entered the labor market before 1960 to all whites and to blacks who entered the labor force between 1960 and 1969. Finally, we compared white to black entrants during the sixties. The index of congruency between the *i*th and *j*th groups is defined as

$$I_{ij} = \sum_l f_{il} f_{jl} \Big/ \frac{\sum (f_{il}^2 + f_{jl}^2)}{2}$$

where l indexes the occupation and f refers to proportions such that

$$\sum_l f_{il} = \sum_l f_{jl} = 1$$

This index is bounded by 0 (no overlap in distributions) and 1 (complete congruency) and is a first cousin to a simple correlation coefficient. The main difference is that the denominator is an arithmetic, rather than a geometric, mean.

This index for pre-1960 black entrants and all whites is 0.722. It is 0.875 for pre- and post-1960 black entrants and rises to 0.901 for the comparison of post-1960 blacks to whites. With this measure as our standard, the occupational distribution of black entrants during the sixties is more similar to the distribution of whites than it is to other blacks. We view this as important supplementary evidence of the extent of the gain in relative economic status of blacks realized during the sixties. Table 16 provides black/white indexes of occupational congruency within schooling and experience classes for 1960 and 1970. It further documents the improvement between cohorts exhibited in the earlier wage and earnings comparisons.

TABLE 16 Indexes of Black/White Occupational Congruency by Schooling and Labor Market Experience, 1960 and 1970

Experience in 1970	Years of Schooling Completed: 8–11		12		13–15		16+	
	1970	1960	1970	1960	1970	1960	1970	1960
1–5	.979	–	.896	–	.874	–	.910	–
6–10	.925	–	.895	–	.816	–	.841	–
11–15	.893	.863	.815	.818	.753	.746	.844	.705
16–20	.873	.822	.803	.748	.738	.726	.827	.764
21–25	.871	.819	.774	.755	.735	.714	.832	.850
26–35	.864	.789	.793	.739	.693	.623	.779	.719

Our industrial classes are selected to highlight the potential role of government in eliminating race differences in wages and employment. Accordingly, there are two categories for direct governmental employment—one for the federal government and another for state and local governments. An additional two categories refer to aggregates of industries regulated by federal and by state and local governments. Finally, there are two classes that we hope measure indirect governmental employment. Assignment to indirect governmental employment represents an attempt to identify the role of governments as consumers of products of private industries. Unfortunately, we do not have data indicating if an individual works for a firm with government contracts and if this represents an important part of the firm's business. We do, however, have access to data showing government acquisitions by industry, and we converted these purchases into shares of the respective industry's value added.

When we observe an individual who is not directly employed by a government and does not work in a regulated industry, a random number is drawn from a 0–1 uniform density. If that number is less than the federal share of the industry's product, the worker is dubbed "indirect federal employee."[41] If the random number lies between the federal and the aggregate governmental share, the worker is an indirect state and local government employee. Otherwise, he "works" in the private (private-private?) sector. This assignment scheme is biased and conservative in the sense that black/white changes between 1960 and 1970 are understated. In defense, we note only that we have no clear alternative. We consider it likely that antidiscriminatory legislation is more easily enforced among firms most dependent on governments for sales. Based on variation among industries in government revenue shares, we attempt

TABLE 17 Estimated Employment Distributions by Industry for 1960 and 1970

Employer	No College			Some College		
	1960: All	1970: Entered Labor Force Before 1960	1970: Entered Labor Force 1960–69	1960: All	1970: Entered Labor Force Before 1960	1970: Entered Labor Force 1960–69
I. Blacks						
Private	71.2	64.7	64.4	56.7	59.2	62.4
Federal government						
Direct	4.0	4.0	3.2	15.9	12.5	7.7
Indirect	4.4	4.8	5.4	3.9	5.5	6.3
Regulated	4.2	4.7	3.9	3.3	3.2	3.5
State & local govt.						
Direct	1.1	1.7	1.4	5.6	5.0	5.0
Indirect	3.9	3.7	3.0	2.1	2.2	2.4
Regulated	1.6	2.2	2.0	1.8	2.4	2.3
Unknown	9.6	14.2	16.7	10.7	10.0	10.4
II. Whites						
Private	69.6	67.0	67.4	69.7	69.7	70.4
Federal government						
Direct	2.9	3.1	2.0	5.0	5.2	3.5
Indirect	6.0	6.5	6.4	7.8	7.2	7.2
Regulated	6.4	6.3	5.5	4.2	4.2	4.1
State & local govt.						
Direct	2.3	2.9	2.6	3.4	3.1	3.1
Indirect	4.1	4.1	4.1	3.0	3.3	3.5
Regulated	2.1	2.3	1.6	1.6	1.5	1.5
Unknown	6.6	7.8	10.4	5.5	5.8	6.7
III. Black Relative to White Shares						
Private	1.02	.96	.96	.81	.85	.89
Federal government						
Direct	1.38	1.29	1.60	3.18	2.40	2.20
Indirect	.73	.74	.84	.50	.76	.88
Regulated	.66	.75	.71	.78	.76	.85
State & local govt.						
Direct	.48	.59	.54	1.65	1.61	1.61
Indirect	.95	.90	.73	.70	.67	.68
Regulated	.76	.96	1.25	1.12	1.60	1.53
Unknown	1.45	1.82	1.60	1.94	1.72	1.55

to estimate age and schooling distributions by race among employees of firms whose product is produced for governments, in contrast to age-schooling employment distributions among firms whose product is produced for use in the private sector.

Table 17 summarizes our information of changes in industrial distributions. Employment shares by industrial group are given for blacks (panel I), whites (panel II) and for blacks relative to whites (panel III) as of 1960, and in 1970 for pre- and post-1960 entrants separately for those who had no more than twelve years of schooling and for the combined 13–15 and 16+ classes. The most notable change occurred for those who had some college education. The relative black share dropped sharply between 1960 and 1970 in direct federal employment (where 16 percent of all blacks who had attended college were employed in 1960, in comparison to 5 percent of whites). The most pronounced increase in employment shares of blacks who had attended college between 1960 and 1970 was in the private-private and the indirect federal sectors. The drop in direct federal employment shares for blacks accompanied a (somewhat less pronounced) drop for whites and suggests that at least for those who have attended college, the federal government is less of a "growth industry" than many would imagine. The increase in the private sector employment of blacks who have attended college would seem to be reason for optimism, although the more-than-proportionate increase in that part of the private sector whose product is purchased by the federal government suggests that this change may have been associated, in part, with some "arm twisting."

VIII. CONCLUSION

There are many ways of slicing up data, but whatever one's angle of vision, the improvement in the relative income of black males during the 1960s is impressive. Equally eye-catching is the universal sharing of these gains across experience and schooling classes. Those whose relative position improved most are more likely to be the most educated and the more recent entrants into the labor market.

We feel the data summarized offer a mildly optimistic picture for black relative wages. First, the most pronounced gains in earnings ratios are associated with increased schooling levels, and black school completion continues to rise relative to white levels. Second, younger cohorts fare better than their older peers. Whatever the cause of the inter-cohort differentials exhibited in 1970, if the experience of the sixties is a basis for prediction, wage ratios within cohorts will not decline as time passes, at least, not by very much.

Viewed from the historical perspective of relatively constant or deteriorating black/white wages, the experience of the sixties is encouraging. It is still important to note that although the patterns of gains found between 1960 and 1970 suggest that earnings will rise for blacks relative to whites, the rate of increase is likely to be slow. Among those who were in the work force in both years, 1960 and 1970, black relative earnings increased from 0.57 to 0.62. The aggregate ratio in 1970 is roughly 0.64 when the higher earnings of new entrants are taken into account.

If the most optimistic view is taken and the relative wage of new black entrants changes by the same amount (11.8 percent) in each new decade as it did between 1960 and 1970, and if the within-cohort growth continues at 0.04, we shall have to wait until the Census of 2000 before parity for new entrants is achieved. Full racial parity would take another 40 years, so that few of us will be alive to see it. Since the improvement in the 1960s was exaggerated by the business-cycle gains, racial income equality will probably take a good deal longer and could easily be partly nullified by a two or three percentage point increase in the unemployment rate.

Many have argued that the rise in black/white wage ratios over the sixties is the effect of enforced compliance to fair employment legislation of what is popularly known as affirmative action. While this issue is not addressed directly, we have compiled some indirect evidence that the economic impact of this legislation is probably overrated. Based on our work, the largest gains in black/white wage ratios have occurred in industries least vulnerable to federal or local government "arm twisting."

APPENDIX

TABLE A-1 Proportion with Zero Earnings

Years of Experience	White 1960: Education Group				Black 1960: Education Group			
	8	12	16	All	8	12	16	All
1–5	.179	.030	.021	.058	.273	.101	.046	.186
6–10	.083	.013	.007	.029	.120	.066	.009	.109
11–15	.022	.015	.005	.025	.099	.065	.039	.084
16–20	.033	.099	.008	.027	.109	.052	–	.088
21–30	.038	.018	.015	.032	.097	.069	.036	.087
31–40	.053	.051	.105	.059	.112	.087	.105	.111

TABLE A-2 Regression Results for Combined Samples of Black and White Males in 1960 and 1970, by Years of Work Experience[a]

Interaction	Experience Class: 1 to 5 Years — Full Interaction	1 to 5 Years — Constrained Estimates	6 to 10 Years — Full Interaction	6 to 10 Years — Constrained Estimates	11 to 15 Years — Full Interaction	11 to 15 Years — Constrained Estimates	16 to 20 Years — Full Interaction	16 to 20 Years — Constrained Estimates	21 to 30 Years — Full Interaction	21 to 30 Years — Constrained Estimates	31 to 40 Years — Full Interaction	31 to 40 Years — Constrained Estimates
I. Schooling												
A. Grade school	.1376	.1434	.1075	.1006	.0666	.0687	.0614	.0623	.0578	.0585	.0466	.0495
	(18.86)	(27.56)	(21.38)	(28.34)	(14.58)	(22.69)	(13.91)	(22.10)	(19.89)	(29.35)	(15.26)	(22.45)
Race	−.0457	−.0460	−.0148	−.0176	−.0134	−.0151	−.0164	−.0187	−.0279	−.0269	−.0188	−.0234
	(4.79)	(6.91)	(2.29)	(3.96)	(2.28)	(3.96)	(2.84)	(5.24)	(7.29)	(10.65)	(4.65)	(8.28)
Year	.0115	–	−.0119	–	.0044	–	.0021	–	.0013	–	.0066	–
	(1.10)	–	(1.65)	–	(.71)	–	(.36)	–	(.32)	–	(1.46)	–
Race-year	−.0045	–	−.0113	–	−.0045	–	−.0042	–	.0007	–	−.0115	–
	(.34)	–	(1.23)	–	(.56)	–	(.55)	–	(.13)	–	(1.95)	–
B. College	.1225	.1237	.0880	.0927	.0901	.0920	.0882	.0881	.0757	.0773	.0744	.0744
	(24.98)	(28.87)	(20.86)	(26.01)	(21.88)	(26.96)	(19.58)	(23.81)	(20.23)	(24.39)	(13.27)	(15.25)
Race	.0390	.0336	.0117	–	.0070	–	−.0007	–	.0089	–	.0006	–
	(3.84)	(4.25)	(1.42)	–	(.89)	–	(.09)	–	(1.17)	–	(.05)	–
Year	−.0241	−.0243	−.0078	−.0107	−.0108	−.0135	−.0200	−.0233	−.0038	−.0076	−.0254	−.0244
	(3.13)	(3.75)	(1.18)	(1.99)	(1.64)	(2.56)	(2.79)	(3.97)	(.64)	(1.51)	(2.59)	(2.94)
Race-year	−.0055	–	−.0079	–	−.0112	–	−.0126	–	−.0210	–	−.0018	–
	(.34)	–	(.62)	–	(.89)	–	(.91)	–	(1.69)	–	(.08)	–
II. Location												
A. North Central	−.0223	–	.0212	–	.0068	.0307	.0150	.0366	.0376	.0510	.0350	.0474
	(.82)	–	(.93)	–	(.31)	(2.56)	(.66)	(3.23)	(2.27)	(5.90)	(1.82)	(4.57)
Race	−.1064	.0744	.1299	.1410	.0360	–	.0056	–	.0060	–	.0127	–
	(2.50)	(2.44)	(3.69)	(5.56)	(1.05)	–	(.16)	–	(.23)	–	(.41)	–
Year	.0412	–	−.0018	–	.0370	–	.0174	–	.0343	–	−.0115	–
	(1.01)	–	(.05)	–	(1.18)	–	(.56)	–	(1.46)	–	(.41)	–

TABLE A-2 (continued)

Interaction	Experience Class: 1 to 5 Years — Full Interaction	1 to 5 Years — Constrained Estimates	6 to 10 Years — Full Interaction	6 to 10 Years — Constrained Estimates	11 to 15 Years — Full Interaction	11 to 15 Years — Constrained Estimates	16 to 20 Years — Full Interaction	16 to 20 Years — Constrained Estimates	21 to 30 Years — Full Interaction	21 to 30 Years — Constrained Estimates	31 to 40 Years — Full Interaction	31 to 40 Years — Constrained Estimates
II. Location (continued)												
Race-year	−.1308	−.0821	−.1281	−.1234	−.0530	–	.0446	–	−.0291	–	.0551	–
	(1.96)	(1.66)	(2.44)	(3.20)	(1.08)	–	(.92)	–	(.78)	–	(1.22)	–
B. South	−.1454	−.1323	−.1226	−.1290	−.0921	−.0837	−.1257	−.0826	−.0733	−.0915	−.1089	−.1026
	(5.31)	(7.71)	(5.27)	(8.88)	(4.08)	(5.48)	(5.33)	(5.59)	(4.29)	(8.24)	(5.42)	(7.63)
Race	−.0178	−.0169	−.0897	−.0970	−.1553	−.1580	−.1768	−.2008	−.2249	−.2110	−.1777	−.1985
	(.44)	(.54)	(2.65)	(3.70)	(4.77)	(6.86)	(5.20)	(10.16)	(8.94)	(14.04)	(5.89)	(11.00)
Year	.0170	–	.0063	–	.0121	–	.0685	–	−.0345	–	−.0020	–
	(.41)	–	(.18)	–	(.37)	–	(2.08)	–	(1.39)	–	(.07)	–
Race-year	−.1289	−.1521	−.0602	−.0453	−.0365	−.0440	−.0096	–	.0171	–	−.0226	–
	(2.02)	(3.62)	(1.17)	(1.37)	(.77)	(1.69)	(.20)	–	(.47)	–	(.51)	–
C. West	−.0693	−.0441	−.0677	−.0651	−.0568	−.0369	−.0186	–	.0117	–	−.0082	–
	(2.32)	(2.01)	(2.61)	(3.46)	(2.30)	(1.95)	(.72)	–	(.61)	–	(.36)	–
Race	.0454	–	.0406	–	.0369	–	.0066	–	−.0307	–	−.0374	–
	(.86)	–	(.92)	–	(.85)	–	(.15)	–	(.90)	–	(.89)	–
Year	.0802	.0423	.0896	.0780	.1359	−.0988	.0278	.0138	.0293	.0461	.0552	.0516
	(1.71)	(1.23)	(2.33)	(2.77)	(3.75)	(3.77)	(.77)	(.72)	(1.05)	(2.96)	(1.63)	(2.67)
Race-year	−.0619	–	−.0229	–	−.0875	–	.0444	–	.0521	–	.0500	–
	(.72)	–	(.34)	–	(1.35)	–	(.70)	–	(1.04)	–	(.81)	–
D. Metropolitan	.0357	.0192	.1092	.0966	.1698	.1387	.1728	.1467	.1850	.1693	.2185	.1905
	(1.60)	(.96)	(5.80)	(5.76)	(9.21)	(8.52)	(8.96)	(8.87)	(13.09)	(13.79)	(13.07)	(13.11)
Race	−.0211	.0013	−.0477	−.0161	−.1175	−.0449	−.0735	−.0313	−.0950	−.0702	−.0750	−.0385
	(.56)	(.04)	(1.44)	(.65)	(3.69)	(1.95)	(2.19)	(1.35)	(3.90)	(4.00)	(2.64)	(1.86)
Year	.1293	.1663	.0524	.0755	−.0060	.0566	.0263	.0823	.0367	.0669	.0410	.1048
	(3.71)	(6.79)	(1.83)	(3.72)	(.22)	(2.96)	(.96)	(4.44)	(1.76)	(4.81)	(1.62)	(6.43)

	Race-year	.0330	–	.0663	–	.1473	–	.0861	–	.0489	–	.0843	–
		(.54)	–	(1.33)	–	(3.19)	–	(1.85)	–	(1.39)	–	(2.02)	–
E.	Central city	−.0379	−.0555	−.0765	−.0686	−.0922	−.0942	−.0999	−.0946	−.0460	−.0576	−.0554	−.0478
		(1.65)	(3.14)	(3.79)	(4.59)	(4.57)	(6.50)	(4.81)	(6.58)	(3.07)	(5.31)	(3.20)	(3.70)
	Race	.0517	.1138	.0976	.0982	.1518	.1629	.1042	.1437	.1204	.1382	.1376	.1411
		(1.46)	(4.09)	(3.18)	(4.25)	(5.07)	(7.50)	(3.37)	(6.66)	(5.31)	(8.38)	(5.15)	(7.18)
	Year	−.0390	–	.0160	–	−.0012	–	.0160	–	−.0253	–	.0183	–
		(1.08)	–	(.53)	–	(.04)	–	(.55)	–	(1.16)	–	(.70)	–
	Race-year	.1705	–	.0094	–	.0191	–	.0731	–	.0411	–	.0102	–
		(2.96)	–	(.20)	–	(.44)	–	(1.69)	–	(1.24)	–	(.26)	–
F.	Years in current residence	−.0158	−.0112	−.0072	−.0083	−.0037	−.0039	−.0003	–	.0002	–	−.0006	–
		(9.48)	(12.54)	(4.40)	(9.99)	(2.35)	(5.03)	(.19)	–	(.20)	–	(.67)	–
	Race	.0064	–	−.0034	–	−.0005	–	−.0001	–	−.0010	–	.0027	–
		(2.72)	–	(1.52)	–	(.22)	–	(.08)	–	(.82)	–	(2.21)	–
	Year	.0041	–	.0000	–	−.0004	–	−.0006	–	.0005	–	.0036	–
		(1.61)	–	(.01)	–	(.20)	–	(.32)	–	(.37)	–	(2.91)	–
	Race-year	−.0010	–	.0034	–	.0011	–	.0018	–	.0033	–	−.0020	–
		(.28)	–	(1.01)	–	(.37)	–	(.64)	–	(1.85)	–	(1.09)	–
						III. Government Employment							
A.	Federal employee	.1037	.0522	.0865	.0756	.0737	.0829	.0528	.0612	.0838	.0666	.1596	.1584
		(1.59)	(1.09)	(1.77)	(2.14)	(1.65)	(2.64)	(1.20)	(2.11)	(3.04)	(3.24)	(4.53)	(5.76)
	Race	.0234	.0663	.0717	.1054	.0957	.0950	.1648	.1489	.1561	.1681	.1188	.1211
		(.28)	(.93)	(1.08)	(1.86)	(1.58)	(1.86)	(2.83)	(3.15)	(4.01)	(4.96)	(2.39)	(2.75)
	Year	−.1035	–	−.0124	–	.0235	–	.0180	–	−.0392	–	−.0115	–
		(1.07)	–	(.18)	–	(.37)	–	(.31)	–	(.94)	–	(.20)	–
	Race-year	.2034	.1120	.1020	.0559	.0795	.0920	.0433	.0818	.1192	.0929	.0676	.0581
		(1.63)	(1.43)	(1.08)	(.90)	(.94)	(1.68)	(.55)	(1.60)	(2.04)	(2.31)	(.85)	(1.07)
B.	Industry regulated by federal govt.[b]	.1534	.1694	.1218	.1394	.0949	.0870	.1364	.1191	.1211	.1148	.1631	.1447
		(3.34)	(6.09)	(3.46)	(6.63)	(2.82)	(4.66)	(3.95)	(6.54)	(4.93)	(8.45)	(5.37)	(9.06)
	Race	.0619	–	−.0238	–	−.0209	–	−.0790	–	−.0455	–	−.1329	–
		(.88)	–	(.42)	–	(.40)	–	(1.44)	–	(1.13)	–	(2.90)	–
	Year	−.0277	–	.0135	–	−.0162	–	.0202	–	.0044	–	−.0198	–
		(.38)	–	(.25)	–	(.34)	–	(.43)	–	(.12)	–	(.46)	–
	Race-year	.0350	–	.1476	–	.0460	–	.0166	–	.0441	–	.2157	–
		(.28)	–	(1.65)	–	(.59)	–	(.22)	–	(.79)	–	(3.35)	–

TABLE A-2 (concluded)

Interaction	Experience Class: 1 to 5 Years — Full Interaction	1 to 5 Years — Constrained Estimates	6 to 10 Years — Full Interaction	6 to 10 Years — Constrained Estimates	11 to 15 Years — Full Interaction	11 to 15 Years — Constrained Estimates	16 to 20 Years — Full Interaction	16 to 20 Years — Constrained Estimates	21 to 30 Years — Full Interaction	21 to 30 Years — Constrained Estimates	31 to 40 Years — Full Interaction	31 to 40 Years — Constrained Estimates
III. Government Employment (concluded)												
C. Federal share of industry product[c]	.3629	.4073	.2050	.2997	.2712	.3177	.1976	.2560	.2356	.2833	.2501	.3212
	(4.97)	(7.17)	(3.14)	(6.53)	(4.29)	(7.29)	(3.06)	(5.88)	(5.03)	(8.33)	(4.54)	(7.53)
Race	.2424	.1754	.0962	.0042	.1410	.0622	.2222	.1658	.2284	.1619	.5248	.4282
	(2.10)	(1.67)	(.94)	(.05)	(1.34)	(.67)	(2.11)	(1.79)	(2.68)	(2.10)	(5.05)	(4.48)
Year	.1029	–	.1836	–	.0829	–	.1111	–	.1014	–	.1862	–
	(.88)	–	(1.99)	–	(.95)	–	(1.27)	–	(1.49)	–	(2.13)	–
Race-year	.4814	.6549	.2343	.4012	.1863	.3202	.3757	.4916	.3866	.5269	.2446	.5261
	(2.18)	(3.63)	(1.36)	(2.85)	(1.22)	(2.64)	(2.48)	(4.08)	(3.06)	(5.12)	(1.53)	(4.10)
D. State and local govt. share of industry product[c]	.5973	.5188	.5938	.4210	.5440	.4423	.4030	.3760	.5004	.3938	.3874	.3583
	(4.52)	(6.87)	(5.52)	(7.08)	(5.52)	(8.22)	(3.99)	(7.19)	(6.38)	(9.80)	(4.22)	(7.54)
Race	−.2275	–	−.3636	–	−.3717	–	.0660	–	−.0867	–	.0351	–
	(1.09)	–	(2.18)	–	(2.42)	–	(.43)	–	(.76)	–	(.26)	–
Year	−.2227	–	−.1792	–	−.1039	–	−.0387	–	.2129	–	−.0856	–
	(1.14)	–	(1.13)	–	(.71)	–	(.27)	–	(1.90)	–	(.65)	–
Race-year	.6024	–	.3398	–	.4918	–	−.1323	–	.1675	–	.0004	–
	(1.94)	–	(1.41)	–	(2.26)	–	(.63)	–	(1.04)	–	(.00)	–
IV. Experience												
A. Years	.2361	.1871	.2111	.1020	.0522	.0593	−.0348	.1104	−.0713	−.0140	.0585	−.0344
	(6.69)	(9.43)	(2.66)	(2.40)	(.42)	(.91)	(.19)	(1.22)	(1.64)	(.62)	(.82)	(.92)
Race	−.0390	–	−.1465	–	−.2202	–	.1290	–	.0479	–	−.1553	–
	(.75)	–	(1.27)	–	(1.20)	–	(.49)	–	(.75)	–	(1.49)	–
Year	−.0366	–	−.1357	–	.0975	–	.0082	–	.0953	–	−.0817	–
	(.68)	–	(1.16)	–	(.54)	–	(.03)	–	(1.53)	–	(.82)	–

Race-year	−.0916	–	.1117	–	.2813	–	.3172	–	−.0484	–	.0911	–
	(1.13)	–	(.65)	–	(1.07)	–	(.87)	–	(.53)	–	(.61)	–
B. Years squared	−.0220	−.0156	−.0115	−.0040	−.0012	−.0015	.0013	−.0029	.0014	.0002	−.0009	.0004
	(3.80)	(4.86)	(2.32)	(1.52)	(.26)	(.61)	(.25)	(1.15)	(1.65)	(.56)	(.92)	(.77)
Race	.0048	–	.0100	–	.0084	–	−.0038	–	−.0010	–	.0022	–
	(.56)	–	(1.38)	–	(1.19)	–	(.53)	–	(.82)	–	(1.52)	–
Year	.0035	–	.0092	–	−.0038	–	−.0004	–	−.0018	–	.0012	–
	(.40)	–	(1.26)	–	(.56)	–	(.06)	–	(1.52)	–	(.81)	–
Race-year	.0152	–	−.0075	–	−.0105	–	−.0086	–	.0009	–	−.0014	–
	(1.16)	–	(.70)	–	(1.04)	–	(.85)	–	(.52)	–	(.66)	–
					V. Intercept							
Intercept	2.6091	2.5998	2.7609	3.2324	3.7615	3.7070	4.5404	3.2696	5.2380	4.5490	3.5146	5.0960
	(25.20)	(40.13)	(8.07)	(18.91)	(4.47)	(8.76)	(2.91)	(4.01)	(9.29)	(15.85)	(2.60)	(7.70)
Race	.2661	.2043	.4171	−.1072	1.3076	−.1571	−1.1697	−.1227	−.5516	−.0463	2.4904	−.1371
	(2.03)	(2.59)	(.91)	(1.97)	(1.11)	(3.40)	(.50)	(2.84)	(.68)	(1.54)	(1.36)	(4.23)
Year	−.3411	−.2818	.3474	−.2600	−.8809	−.2418	−.2770	−.2308	−1.4538	−.2535	1.0677	−.2574
	(2.41)	(12.08)	(.75)	(13.65)	(.76)	(13.45)	(.12)	(13.12)	(1.85)	(19.28)	(.58)	(16.66)
Race-year	−.0393	−.0962	−.4336	−.0620	−1.9944	−.0754	−3.0981	−.1078	.4737	−.0815	−1.5005	−.1015
	(.21)	(2.47)	(.64)	(2.02)	(1.18)	(3.16)	(.95)	(5.52)	(.41)	(5.44)	(.57)	(5.73)
R^2	.36	.36	.39	.39	.39	.39	.38	.38	.36	.35	.34	.33
Variance of estimate	.5096	.5103	.3423	.3428	.2964	.2965	.2955	.2957	.3232	.3234	.3641	.3649
Degrees of freedom	17,613	17,641	17,413	17,442	16,722	16,722	16,752	16,609	31,254	31,287	24,899	24,932

NOTE: Observations are of individuals. The dependent variable is log, base *e*, of weekly wages.

[a]These are estimates of equation 1 in the text.

[b]Industries regulated by the federal government include railroads and railway express service, trucking service, water transportation, air transportation, radio broadcasting and television, telephone (wire and radio), and telegraph and miscellaneous communication services.

[c]The government share of the industry product is the ratio of government purchases from the industry to value added originating in the industry. Data for these calculations were obtained from BLS Bulletin 1972; resultant shares are available on request from the authors.

TABLE A-3 Gini Coefficients—Male Earnings

Samples	Ages					
	All	18–25	26–35	36–45	46–55	56–65
1960 whites	.360	.445	.268	.296	.338	.437
1960 blacks	.435	.556	.370	.363	.392	.506
1960 combined	.423	.513	.346	.363	.399	.495
1970 whites	.376	.477	.276	.288	.325	.434
1970 blacks	.440	.570	.344	.357	.386	.493
1970 combined	.424	.528	.321	.347	.381	.477
	Zero Earners Excluded					
1960 whites	.324	.388	.251	.280	.315	.347
1960 blacks	.353	.434	.314	.312	.329	.365
1960 combined	.367	.422	.310	.333	.358	.388
1970 whites	.323	.419	.248	.270	.293	.327
1970 blacks	.346	.441	.285	.302	.313	.343
1970 combined	.359	.432	.283	.312	.332	.359

TABLE A-4 Explained Variance Summary (σ^2 = variance in annual earnings; σ_1^2 = explained variance in annual earnings; σ_2^2 = explained variance in weekly wages)

	Whites 1970				Whites 1960			
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
I. Experience Class, 1–5 Years								
	$\sigma^2 = .773; \sigma_1^2 = .273; \sigma_2^2 = .773$				$\sigma^2 = .857; \sigma_1^2 = .393; \sigma_2^2 = .110$			
Schooling (1)	.040	.004	.003	.035	.054	.010	.003	.064
Location (2)		.008	.000	.007		.016	.001	.016
Government employment (3)			.006	.002			.006	.004
Weeks worked (4)				.138				.187
II. Experience Class, 6–10 Years								
	$\sigma^2 = .481; \sigma_1^2 = .129; \sigma_2^2 = .048$				$\sigma^2 = .533; \sigma_1^2 = .193; \sigma_2^2 = .063$			
Schooling (1)	.030	.003	.001	.018	.036	.006	.002	.029
Location (2)		.007	.000	.002		.012	.001	.005
Government employment (3)			.004	.000			.004	.001
Weeks worked (4)				.058				.093
III. Experience Class, 11–15 Years								
	$\sigma^2 = .370; \sigma_1^2 = .070; \sigma_2^2 = .031$				$\sigma^2 = .397; \sigma_1^2 = .126; \sigma_2^2 = .044$			
Schooling (1)	.016	.002	.001	.005	.022	.005	.001	.013
Location (2)		.007	.000	.001		.012	.001	.002
Government employment (3)			.004	−.000			.004	−.001
Weeks worked (4)				.034				.067
IV. Experience Class, 16–20 Years								
	$\sigma^2 = .419; \sigma_1^2 = .077; \sigma_2^2 = .030$				$\sigma^2 = .389; \sigma_1^2 = .125; \sigma_2^2 = .044$			
Schooling (1)	.016	.003	.000	.007	.021	.006	.000	.011
Location (2)		.008	.000	.002		.013	.001	.003
Government employment (3)			.003	−.001			.003	−.000
Weeks worked (4)				.039				.066
V. Experience Class, 21–30 Years								
	$\sigma^2 = .413; \sigma_1^2 = .083; \sigma_2^2 = .034$				$\sigma^2 = .463; \sigma_1^2 = .149; \sigma_2^2 = .047$			
Schooling (1)	.017	.003	.000	.006	.020	.007	−.000	.013
Location (2)		.010	.000	.002		.016	.000	.004
Government employment (3)			.003	−.001			.003	−.001
Weeks worked (4)				.043				.085
VI. Experience Class, 31–40 Years								
	$\sigma^2 = .422; \sigma_1^2 = .110; \sigma_2^2 = .038$				$\sigma^2 = .535; \sigma_1^2 = .177; \sigma_2^2 = .053$			
Schooling (1)	.016	.004	.001	.005	.016	.007	−.000	.012
Location (2)		.012	.000	.003		.024	.001	.007
Government employment (3)			.010	.002			.018	−.001
Weeks worked (4)				.064				.105

TABLE A-4 (concluded)

	Blacks 1970				Blacks 1960			
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
I. Experience Class, 1–5 Years								
	$\sigma^2 = 1.130$; $\sigma_1^2 = .430$; $\sigma_2^2 = .090$				$\sigma^2 = 1.187$; $\sigma_1^2 = .591$; $\sigma_2^2 = .206$			
Schooling (1)	.030	.008	.003	.041	.056	.041	.009	.037
Location (2)		.020	.001	.012		.060	.009	.005
Government employment (3)			.008	.005			.015	.001
Weeks worked (4)				.268				.327
II. Experience Class, 6–10 Years								
	$\sigma^2 = .730$; $\sigma_1^2 = .256$; $\sigma_2^2 = .094$				$\sigma^2 = .819$; $\sigma_1^2 = .398$; $\sigma_2^2 = .150$			
Schooling (1)	.036	.014	.003	.021	.051	.036	.007	.023
Location (2)		.034	−.000	.003		.043	.005	.013
Government employment (3)			.004	.001			.008	.001
Weeks worked (4)				.135				.207
III. Experience Class, 11–15 Years								
	$\sigma^2 = .551$; $\sigma_1^2 = .148$; $\sigma_2^2 = .064$				$\sigma^2 = .695$; $\sigma_1^2 = .314$; $\sigma_2^2 = .117$			
Schooling (1)	.018	.010	.002	.006	.025	.023	.005	.011
Location (2)		.028	.000	.002		.048	.005	.002
Government employment (3)			.004	−.000			.010	.002
Weeks worked (4)				.077				.181
IV. Experience Class, 16–20 Years								
	$\sigma^2 = .536$; $\sigma_1^2 = .149$; $\sigma_2^2 = .069$				$\sigma^2 = .608$; $\sigma_1^2 = .273$; $\sigma_2^2 = .116$			
Schooling (1)	.013	.011	.002	.004	.019	.022	.004	.010
Location (2)		.036	.001	.003		.051	.007	.005
Government employment (3)			.006	−.000			.013	.002
Weeks worked (4)				.074				.140
V. Experience Class, 21–30 Years								
	$\sigma^2 = .555$; $\sigma_1^2 = .163$; $\sigma_2^2 = .073$				$\sigma^2 = .648$; $\sigma_1^2 = .286$; $\sigma_2^2 = .108$			
Schooling (1)	.009	.012	.002	.003	.011	.017	.003	.008
Location (2)		.043	.002	.003		.057	.007	.001
Government employment (3)			.006	.001			.014	.001
Weeks worked (4)				.083				.168
VI. Experience Class, 31–40 Years								
	$\sigma^2 = .632$; $\sigma_1^2 = .192$; $\sigma_2^2 = .088$				$\sigma^2 = .734$; $\sigma_1^2 = .322$; $\sigma_2^2 = .131$			
Schooling (1)	.007	.012	.002	.004	.007	.016	.002	.006
Location (2)		.053	.003	.005		.077	.011	.009
Government employment (3)			.010	.002			.018	−.001
Weeks worked (4)				.093				.176

NOTE: In the first experience class, experience accounts for 2.9 to 6.5 percent of explained variance, and the covariance between experience and weeks worked accounts for 2.5 to 3.8 percent. In other classes, experience within intervals accounted for little wage variation.

BLE A-5 Measures of Variation in Alternative Indicators of Well-Being

Measure	Schooling[a] Experience Group 1–5	6–10	11–15	16–20	21–30	31–40
riance 1960 blacks	7.056	10.86	11.7	12.50	13.62	12.7
riance 1960 whites	7.475	9.29	9.71	9.67	10.19	10.0
efficient of variation 1960 blacks	.2070	.2774	.3052	.3322	.3937	.440
efficient of variation 1960 whites	.1889	.2180	.2326	.2399	.2585	.285

Measure	Health Status[b] Blacks	Whites
/. Proportion in good health	.7895	.7106
/. Length of latest health limitation	.8231	.6098

Characteristic	Selected 12-Grade School Characteristics[c] Blacks Mean	Blacks S.D.	Whites Mean	Whites S.D.
eachers' experience	11.66	3.21	10.72	3.10
)uality of teachers' college	6.74	.103	.741	.046
eachers' verbal ability	21.2	2.56	23.1	1.48
'eachers' salary (dollars)	6464.8	1494	6745.6	1210
upil/teacher ratio	25.8	12.1	23.1	8.65
)ays in session	179.9	4.14	179.4	4.03
\ttendance (percent)	91.4	3.67	94.3	2.38
.ibrary volumes per student	4.65	3.99	5.65	4.01

J.S. Census.
1966 Survey of Economic Opportunity data. For derivation, see James P. Smith, "Life Cycle Allocation of Time in a Family Context," Ph.D. dissertation, University of Chicago, 1972.
James S. Coleman et al., *Equality of Educational Opportunity*, OE 38001, U.S. Office of Education, 1966.

NOTES

1. This paper is in part a compilation of two earlier papers: "Black/White Wage Ratios: 1960–1970" and "Inequality: Race Differences in the Distribution of Earnings." It contains a good deal of additional supporting evidence and a shorter version was issued as a final report to the Department of Labor by the Rand Corporation. (See R-1666, June 1975.)
2. See his *Economics of Discrimination*, page 140. Becker simply used income by occupation data in 1940 to weight the occupations. Therefore, a secular increase in his index would imply that blacks were moving more rapidly than whites into occupations that had high wages in 1940.
3. See James Gwartney [5].
4. Before 1965, the Current Population Survey (CPS) did not provide a black/white income ratio. Because other nonwhites have higher incomes than blacks do, the nonwhite to white income ratio exceeds the ratio of black to white incomes. Fortunately, for an analysis of secular trends the two ratios appear to move together. Therefore, the ratio of nonwhite to white income provides an accurate picture of the long-term trends in black/white income ratios.
5. As assumed from Table 3:

SCHOOL LEAVING AGE

Schooling level (years)	0–7	8	9–11	12	13–15	16	17 and above
Age	14	16	18	20	23	25	28

6. Weekly wages are earnings last year divided by weeks worked last year. The average weekly wage used here is total earnings of all persons divided by total weeks worked, i.e., individual earnings per week are weighted by weeks worked.
7. The sole exception is for weekly wages of elementary school graduates for the cohort with 31 to 40 years of work experience in 1970.
8. We have also excluded males with zero earnings from this study. Table A-1 of the Appendix describes the left-out group.
9. In particular, the recently available 1-in-100 Public Use Samples contain state of residence identification, so that these data on wages and weeks worked can be merged with other sources which indicate state-specific levels of economic activity.
10. Available evidence of the distribution of cyclic effects refers to employment rather than wages (see Kosters and Welch [8] and Kalachek [7]). Yet it is hard to conceive of a "theory" of wage flexibility that predicts negative correlation between employment and wage changes.
11. A number of "secondary labor market" hypotheses have been put forward to describe earnings and job progress over working careers. The presumption underlying these theories is that some jobs, those dubbed "secondary," are dead-end, with little prospect for career progress in wages and job status, while other jobs facilitate upward mobility. Persons who seem likely candidates for secondary careers are disproportionately black and less schooled. The observed relative wage performance of blacks during the sixties is not consistent with these theories.
12. A life-cycle argument has been suggested in Jacob Mincer's work [9]. The observed convergence in relative wages by skill level could be rationalized in Mincer's human capital model by a negative correlation between initial postschool earning capacity and the proportion of time spent in job-related investment activities.
13. One interesting possibility is that job markets are less discriminatory than schools, so that, relative to whites, blacks have a comparative advantage in acquiring skills on the job rather than in school.

14. Degrees of freedom in each of the regressions are large, so that the normal approximation can be used. In the 24 regressions (6 experience classes, 2 races, and 2 years) the absolute value of the computed t-statistic exceeds 1.96 in 19 of 24 cases, with the largest calculated value being 7.2 for blacks in 1970 with 21–30 years of experience. Exceptions include: (1) blacks 1970, 6–10 years of experience ($|t| = 0.6$); (2) whites 1960, 6–10 years ($|t| = 1.8$); (3) whites 1960, 16–20 years ($|t| = 1.5$); (4) whites 1960, 31–40 years ($|t| = 0.4$); and (5) blacks 1960, 31–40 years ($|t| = 1.4$).
15. In preliminary analysis a variable was also included to indicate whether an individual was an employee of state and local government, and this variable was permitted to interact with the one denoting Southern residence. No consistent pattern emerged, and the variable for employment by state and local governments was deleted in subsequent estimates.
16. If Q_i is the sum of squared residuals for the ith group and df_i is the associated degrees of freedom, then the estimate of residual variance within group is $S_i^2 = Q_i/df_i$ and for the pooled sample it is $S^2 = \Sigma Q_i/\Sigma df_i$.
17. The potential loss is the bias entailed by incorrect constraints.
18. Of the 186 coefficients deleted in constrained estimation, 12 have associated t-statistics exceeding 2.0 (in absolute value) computed from the fully interactive equations.
19. The computed F-statistics are:

Experience class =	1–5	6–10	11–15	16–20	21–30	31–40
F =	1.95	1.92	1.18	1.36	1.51	2.61

Degrees of freedom =	28; 17,613	29; 17,413	30; 16,722
	33; 16,576	33; 31,254	33; 24,899

The associated (0.01) critical value $F(30; \infty) = 1.69$.
20. See in particular references [10] and [11].
21. By statistical "significance" we use the arbitrary rule that a coefficient is significant if its associated t-statistic is 2.0 or more. Henceforth, the term significant is not placed in quotation marks, but comments about significance should be taken with a grain of salt.
22. For an attempt to disentangle these hypotheses, see Rosen [11].
23. The sample is the 1966 Survey of Economic Opportunity; see Welch [15] and [16].
24. The relative weight given to characteristic differences and coefficient differences is somewhat arbitrary. Characteristic differences could just as easily have been weighted by black coefficients if coefficient differences were weighted by white characteristics. This would have reduced the size of the first term relative to the second.
25. For example, if we simply entered years of schooling as our independent variable, the main effect in the 1–5 experience interval would remain essentially unchanged, but the race interaction would be cut by one-third, and the total schooling effect cut by one-half.
26. The following table gives the rise in education between 1960 and 1970 within experience classes:

CHANGE IN EDUCATION LEVEL BETWEEN 1960 AND 1970 WITHIN EXPERIENCE CLASS

	Experience Class					
Sample	1–5	6–10	11–15	16–20	21–30	31–40
Blacks	.72	1.1	1.51	1.60	1.87	1.52
Whites	.35	.35	.76	1.02	.98	1.22

27. See the papers by Becker [1], Oi [10], and Rosen [11].
28. The migration pattern is illustrated as:

MIGRATION PATTERNS OF BLACKS
(Change between 1960 and 1970 in the proportion of blacks living in these areas)

	Experience Groups					
Areas	1–5	6–10	11–15	16–20	21–30	31–40
Metropolitan region	.0541	.0665	.0454	.0405	.0521	.0406
Central city	.0493	.0650	.0426	.0354	.0477	.0446
South	−.0498	−.0719	−.0395	−.0204	−.0630	−.0459

29. Total earnings variance,

$$\sigma^2 = f\sigma_1^2 + (1-f)\sigma_2^2 + f(1-f)(\bar{y}_1 - \bar{y}_2)^2$$

where σ^2 is earnings variance among blacks, σ_2^2 is earnings variance among whites, f is the proportion of blacks in the population, and $\bar{y}_1$ and $\bar{y}_2$ refer to mean earnings for blacks and whites, respectively. Our statement about earnings inequality for blacks refers to the logarithm of earnings and is a statement that $\sigma_1^2 > \sigma^2$.
30. The Gini coefficients were computed for the 1960 Census with $100 intervals until $10,000 and $1,000 intervals between $10,000 and $25,000. The midpoints of these intervals were used and the open-ended interval was assigned a value of $40,000. For the 1970 Census, $100 intervals were used and the open-ended category of $50,000 and above was assigned $65,000.
31. In each case the base within groups is 0.5, i.e., approximately 50 percent of whites' earnings exceed the white geometric mean.
32. That is, we have imposed the constraint that annual earnings be proportionate to weeks worked.
33. Hourly wage rates are appropriate because of the absence of direct employment variation. Unfortunately, the Census does not provide direct measures of hourly rates. An hourly wage could be computed by dividing previous year's earnings by annual hours worked, but employment variation would be reintroduced through the back door. In some preliminary work on the SEO, which has better measures of hourly rates, variances in log hourly wages were upward sloping.
34. Note that the constraint of a unit coefficient for (log) weeks worked implies that the variance of weeks worked is that part of total earnings variance attributed to weeks worked when all other factors are held constant.
35. The surveying for the 1970 Census occurred during Good Friday week. Unfortunately, we do not know if people answered the weekly hours question with their normal work week or excluded the holiday. One hopeful sign that this may not be as serious a problem as many of us had feared is that in examining the variance among age groups, the patterns were about as smooth in 1970 as they were in 1960.
36. The effect was also larger in 1960 than 1970, presumably reflecting the more elastic labor supply functions in recession years.
37. Due no doubt to the aggregate variance being heavily weighted by the white sample.
38. Single-year age cells from ages 18–65 were used in Table 13. The total variance σ_T^2 may be expressed as

$$\sigma_T^2 = \sum_{i=1}^{N} P_i(\sigma_i^2 + d_i^2)$$

where P_i is the proportion of people in age cell i, σ_i^2 is the within-cell variance, and d_i is the difference between the within-cell mean and the overall mean. Table 9 results from varying the P_i and adjusting the between-cell variances to reflect the new overall mean. For Table 10, 7 education cells were used: 0–7, 8, 9–11, 12, 13–15, 16, and 17+ years of schooling completed.

39. For a thorough and illuminating investigation of these within-cell variances, see Jacob Mincer's *Schooling, Experience, and Earnings* [9].
40. The extent of the change declines as schooling level rises.
41. In the regression analysis, federal and state and local governments' shares of industry products are entered directly, as explanatory variables. This distinction between the two imputation techniques is important. It must be true that government shares of products of individual firms vary considerably within industrial classes. Consider the random assignment procedure used here under the assumption that by 1970 federal contractors responding to pressure for affirmative-action recruiting, within a given industry, are more likely to employ blacks than are other firms in the industry. Our procedure assumes that the government's share of the industry's product is the probability that a black working in a given industry is an indirect federal employee—a clear understatement. Further, the amount of the understatement depends upon the average governmental share and the bias should decline as the governmental share rises. Not only are these imputations biased, but estimates of change between 1960 and 1970 are also biased. If clustering of blacks in firms with government contracts is more common in 1970 than in 1960—and it should be as a consequence of the 1964 legislation and the executive orders that followed—then changes over the decade are understated.

    In the regression analyses, provisions for race interaction on coefficients for government employment have the potential to compensate for these biases. Assume, for simplicity, that firms specialize by selling either all or none of their product to the government. Assume further that wages in firms with governmental sales exceed those of other firms by a given fraction which may or may not depend on race. For whites, the excess of the mean wage in an industry relative to wages in firms with no governmental sales will be proportionate to the government's share of the industry's product—assuming that labor/output ratios are constant. If blacks are clustered in firms with sales to the government, then their average wage within the industry will exceed that of whites, and this clustering effect will be reflected in the race interaction coefficient.

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7 COMMENTS

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The Smith–Welch paper represents an enormous amount of data collection and analysis. The results are clearly and faithfully reported, even when they do not seem to support the (perhaps vested) interests (of at least one) of the authors. I cannot imagine a different organization of the data that would be likely to change the results appreciably. In consequence, those who are interested in the subject of racial differences in economic success owe a considerable debt to the authors of this paper. Nevertheless, there is an important sense in which I believe the paper is largely a failure.

Surely the most important part of the paper is the attempt in the second section to provide an accounting, or explanation, of why the ratio of black to white male earnings increased over the period 1959 to 1969. In principle, this could be done very successfully if we could first verify empirically that the effect

of a unit of a characteristic (such as schooling) on earnings was the same for both black and white groups in both 1960 and 1970. Changes in the average characteristics of the black and white populations could then provide an unambiguous accounting of the sources of relative earnings growth, with any residual decrease in discrimination affecting the constant terms in the regressions. As it turns out, the effects of the characteristics of workers on their earnings are neither the same by race group or over time. This introduces considerable ambiguity into the accounting process. As can be seen from Table 6, for example, the accounting process based on observed characteristics produces predictions of declines in the relative incomes of blacks in the three highest experience classes, but increases in the three lower experience classes. Since there were actually increases in the relative earnings of blacks in all experience classes, objective characteristics are supposed to have helped boost the relative earnings of younger blacks but to have kept relative earnings from going up even faster among older blacks. And this is true even though the single most important objective characteristic, the schooling gap, was narrowing in each experience class. The upshot is that the "residual," or component of growth in the relative earnings of blacks not accounted for by objective characteristics, is large and almost identical in every experience class. Thus, we have failed to "explain" the cause of the increase in the relative earnings of black males.

It is natural to attribute this large residual to a general decline in labor market discrimination during the 1960s. Before doing so, however, it would be useful to have at least some direct evidence that nondiscrimination was a factor of importance. One way to do this is to search for larger increases in the relative earnings of black workers in the sectors of the economy where it might plausibly be argued that antidiscrimination forces would be greater. The authors have tried to do just this, though, as they admit, the Census of Population provides only very crude data for this purpose. In particular, they have examined the change in the relative earnings of black male workers in sectors which they estimate to have been affected directly or indirectly by the government, on the presumption that government may have been an independent force in the reduction of labor market discrimination. There are now several studies using microeconomic data of a different kind that find, as do the authors, little impact that can be attributed directly to government action.[1]

Where does this leave us? In my view, it leaves us with a very considerable puzzle. To amplify this, Table 1 contains annual data on the relative wage and salary earnings of black men and women through the most recent year available. These data from the Current Population Survey reports are for year-round, full-time workers and thus provide some control, though not as much as would be desirable, on cyclical changes in annual working hours. These aggregate data are not entirely comparable to the aggregates that Smith and Welch use, but they do suggest to me an increase in the relative earnings of black males sometime during the 1960s comparable to the magnitude that Smith and Welch observe. These data also suggest to me that the relative earnings of black males were very stable until around the mid-1960s and that most of the increase that did take place may have been completed by the early 1970s, though it will take

TABLE 1 Ratios of Nonwhite to White Median Wage and Salary Earnings for Year-Round, Full-Time Workers,[a] 1955–73

	Men	Women
1955	.64	.57
1956	.62	.55
1957	.63	.60
1958	.65	.62
1959	.61	.66
1960	.67	.70
1961	.66	.67
1962	.63	.63
1963	.65	.64
1964	.66	.69
1965	.64	.71
1966	.63	.71
1967	.68	.77
1968	.69	.78
1969	.69	.82
1970	.70	.85
1971	.71	.90
1972	.70	.87
1973	.72	.88

SOURCE: Various reports from the *Current Population Surveys*. For details see Ashenfelter [1].

[a]A year-round, full-time worker is defined as a worker who worked 50-52 weeks per year and 35 or more hours per week.

considerably more experience before this can be confirmed. Perhaps more important, the relative earnings data for black women suggest that there will be no easy resolution of the puzzle. For these data show continuous upward progress in the relative earnings of black women until the early 1970s. Thus, attributing the increase in the relative earnings of black males to post-1964 Civil Rights activities requires an explanation for the considerable steady progress of the relative earnings of black women in the period before 1964. On the other hand, attributing the steady increase in the relative earnings of black women to the gradual relative increase in their skills (as measured, say, by schooling) requires an explanation of why the gradual relative increase in the skills (as measured again, say, by schooling) of black men had so little effect on their relative earnings before the mid-1960s.

In sum, this subject clearly will require considerably more effort before we have a clear empirical picture based on a convincing causal foundation. Smith and Welch have helped to provide a part of this foundation.

NOTE

1. See Ashenfelter and Heckman [2] and Goldstein and Smith [3].

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The paper by Finis Welch and James P. Smith represents an impressive effort in manipulating and analyzing data from the latest decennial Census. The study will surely be of great value in providing new angles of vision for analyzing the relative progress of blacks and will add fresh material to the growing controversy over the extent and permanence of the apparent improvement in the relative economic status of blacks by experience cohorts.

The Smith and Welch findings of black experience-cohort gains relative to whites' parallel Richard Freeman's results of black progress (Brookings Papers on Economic Activity, 1: 1973) analyzed from the age-cohort approach. Both find that there have been remarkable gains for black male and female workers, when measured by the more recent age/experience cohorts. Both the Freeman study and the Smith-Welch paper reach conclusions which challenge the conventional view that there has been little improvement in black economic status relative to whites in terms of relative incomes and life-cycle labor market activity, especially when cyclical factors are carefully accounted for. I do not so much want to carry a brief for the standard view as to cite some critical limitations to which, I believe, the Smith-Welch paper fails to give adequate consideration. These factors, in my view, mainly center around black interregional migration, southern black progress, and overall economic activity.

First, recent studies, including a paper by Wayne Vroman, have shown that the gains in relative income for black males, even in the prosperous decade of the 1960s, were pretty much confined to the South and were barely evident in the Northeast and North Central regions. Smith and Welch, too, note that the third most significant argument "explaining" a major part of the relative earnings gain is black migration out of the South and the improvement in earnings of resident southern blacks. Since the major strides in educational improvements occurred

mainly among resident southern blacks, I suspect that a certain amount of intercorrelation here captured some of the importance of the southern-resident and regional variables the authors employ. In fact, Smith and Welch do show that estimated gains by blacks were reinforced by interregional and metropolitan migration of the black population.

When Smith and Welch consider the black/white cohort earnings ratios shown in Tables 3A and 3B, they do not, of course, adequately account for the peculiar effects of the southern region. Nor do they properly caution that 1969 was an incomparably better year than 1959 for overall economic activity. Moreover, the prolonged expansion from 1961 to 1969 exceeded any experienced in the postwar period and contrasts dramatically to the stop-and-go, generally stagnant 1950s. Thus, 1960s labor market entrants could surely be expected to make spectacular gains relative to 1950s labor market entrants.

It has been repeatedly documented that (1) the status of black workers improves relative to whites during expansions, and declines relative to whites during contractions, and (2) recent evidence suggests that occupational mobility and earnings/educational differentials, however measured, are highly elastic with respect to cyclical activity. In this connection, one might also mention that the speed and duration of expansion also affect black employment opportunities.

In spite of the strong emphasis attributed to education and schooling quality as accounting for the narrowing of the black-white differentials for the 1960s labor market entrants, Smith and Welch were not able to isolate fully the pervasive effects of the prolonged labor market tightness experienced in that decade from the operation of other determinants purporting to measure separately cohort life-cycle effects, although their employment variables do adjust for some of the expansionist impact.

The specter that haunts these cross-sectional approaches, which are "snapshots" of cohort gains at points in time, and which are in sharp contrast to the minimal relative progress of blacks documented in time series, is a reconciliation problem perhaps similar to that of time series versus cross-section surveys in aggregate consumption studies.

Since the relative gains for the black earnings profiles in 1970 seemed to have been registered so widely for practically all the experience cohorts, one might seek out an argument more compelling than schooling quality or "vintage": and that is the very distinct possibility that the 1960s expansion, like the 1940–48 period, achieved a dramatic one-time gain in black-white earnings ratios, and overall probably had a more equalizing impact than previous expansions.

This contention also applies to the occupational-industrial analysis in the paper. While the 1960s black entrants to the labor force may be approaching greater occupational congruency with whites, available data from another angle of vision using an occupational dissimilarity index approach show that the concentration of black workers in just three occupations (operatives, laborers, and private households) still accounts for over 40 percent of the black labor force, with little overall change since 1957. Less than 21 percent of white workers are concentrated in these jobs.

I suggest, moreover, that the pattern of gains in earnings for various experience cohorts may not square uniformly with the Welch-Smith interpretation of major gains for the latest experience cohorts when we compare cohort gains within occupations.

For example, in professional groups for both sexes, the gains in relative incomes are shown to be at least as large for many of the 1950s entrants as they were for the 1960s entrants.

If our major argument is that education improvement, in isolation from cyclical factors, accounts for the gain in relative incomes for more recent black experience cohorts, we might look at black progress in occupations ranging from ones considered more sensitive to cyclical factors to those considered less sensitive. A category I regard as "less sensitive" is the professional-technical group. My own estimates indicate that the black proportion of total employment in this group increased more during 1957–63 than during 1963–69, and the same was nearly true for managers and proprietors.

Finally, I want to note some areas to which the cross-sectional approach employed by Smith and Welch gives inadequate attention. One is the much higher unemployment of black high school graduates relative to white high school dropouts. In every year for which data are available, some 12 to 18 black graduates are jobless for every 10 white school dropouts. No such pattern exists between white graduates and dropouts. Second, labor force participation rates for black males have been experiencing a dramatic decline, a trend that shows up even for men under 45. If anything, this trend accelerated in the latter 1960s (the reference point where the most recent experience cohort of blacks show dramatic relative gains). Also, if we look at those occupations in which the bulk of the black labor force is crowded—operatives, laborers, household workers, and sales-clerical—we find that real earnings have held constant since 1967.

How are we to reconcile the hopeful "light at the end of the tunnel" emerging from cross-sectional studies of this type with the persistent gloomy results revealed in the dark tunnel of time-series studies? Perhaps longitudinal approaches made possible from Continuous Work History Samples of the Social Security Administration—once this file overcomes problems of incomplete coverage and can account for utilization continuity—may offer the way for overcoming the dissonance of opposite signs portrayed in relative black economic progress emerging from time-series and cross-sectional data.

In the meantime, I feel that more promising avenues for future research in these areas point in the direction of analysis of labor market segmentation and barriers to mobility among submarkets.

By using an index of occupational congruency Welch and Smith manage to bias upward the estimated improvement in the distribution of blacks, since they compare unweighted flows of recent black job market entrants to "stocks" of the distribution of occupationally classified whites. Such an index could be expected to exhibit more "congruency" if the (most recent) distributional flows of blacks into occupations are considered better educated and trained than previous whites—or blacks—already classified in existing jobs in 1960.

If they had compared the flows (1960–70) of new black occupational entrants to flows of new white occupational entrants for the same period and then asked:

How long will it take for blacks in a given occupation to approach parity with whites? I surmise that the answer that would emerge would put the estimate far enough into the distant long run so that, as Keynes might say, we might all be dead!

A more appropriate index for gauging this kind of progress would be one of occupational dissimilarity. Ron Oaxaca's paper, using such an index, showed no improvements when occupational comparisons of black-white, male-female were made over the years 1958–71.

I trust that we do not have to wait for 1980 or 1984, to determine whether or not the gains that seem to impress the authors, are real.

I am convinced that if the 1970s repeat the 1950s pattern of "stagflation" and low overall economic growth, many of the touted gains registered for the 1970 cohorts will probably erode and the black-white earnings differential can be expected to remain relatively constant.