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Accounting for the Slowdown in Black-White Wage Convergence

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In 1963 the average black male worker earned about 63 percent as much per week as the average white male worker. By the late 1970s the weekly wage differential between black and white men had decreased by about one third, and black men earned about 75 percent as much as their white counterparts. Based on these numbers, wages for black men increased 1.1 percent faster per year than wages for whites from 1963 through 1979. This rapid convergence toward equality is well known and is actually a continuation of past trends of wage convergence dating back to at least 1940.[1]

The recent evidence on wage convergence is strikingly different. During the early 1980s relative wages for black men actually declined slightly and only recently have recovered to the levels of the late 1970s. The decade and a half of rapid wage convergence from 1963 through 1979 has been followed by a slight divergence in black-white wages. At best there has been no improvement in the relative earnings of black men over the past decade. The changes are equally dramatic for newly entering cohorts of blacks. Among workers with fewer than ten years of experience, blacks earned about 68 percent as much as whites in 1963. This fraction increased to about 80 percent by 1980 and has actually declined to about 78 percent in recent years. As in the calculation for workers of all experience levels, a period of rapid wage convergence has been followed by a period of wage divergence or at best no progress.

One popular explanation is that antidiscrimination and affirmative action policies have slowed in the 1980s. Another possible explanation points to the business cycle and the recession of 1982, which may have more adversely affected black workers. The business cycle explanation at least does not seem to be supported by the data. The

slowdown in black progress continued through the 1980s long after the recovery from the recession. An alternative explanation we consider in this chapter is that the slowdown in black-white convergence reflects a more general trend of growing wage inequality affecting all workers—black and white alike.

Recent growth in wage inequality has been dramatic. Since 1979, for example, the earnings differential between workers with a college degree and those with a high school degree has increased by about 30 percent, and the college–high school wage differential for younger workers has approximately doubled.[2] During this period the wage differential between high school graduates with twenty-six to thirty-five years of experience and young high school graduates has increased by about 50 percent.[3] Such dramatic swings in relative wages have not been limited to differentials between groups. Even within education and experience groups, workers at the 90th percentile of the earnings distribution have gained about 30 percent relative to workers at the 10th percentile.[4] Thus the recent period—particularly the 1980s—is characterized by growing wage inequality, both within and between education and experience groups. The evidence suggests a demand change in favor of better-educated and better-skilled workers as a partial explanation for the relative wage changes. Insofar as black workers are behind in education and the attainment of other market skills, these demand changes will slow their progress relative to whites.

Our goal in this chapter is to account for the slowdown in black-white wage convergence within the broader context of the wage structure changes described above. We would like in particular to distinguish the part of the slowdown caused by changes in skill prices (such as returns to education) from the component caused by factors that are black-specific (such as changes in the impact of discrimination, affirmative action, and black-white skill convergence).

The standard approach for this type of analysis has been to "correct" the black-white wage differential for observable differences between blacks and whites. This allows the analyst to identify the effects of changes in the observable differences between blacks and whites (skill convergence), as well as changes in the black-white differential caused by changes in the relative wages of observable groups (price effects). The residual is typically attributed to convergence in unmeasured dimensions of skill or to changes in discrimination (changes in the relative prices paid to whites and blacks for the same skills). This approach ignores completely the effect of changes in prices of unmeasured skills. Given the large changes in wage inequality for whites that we observe even when we control for education and

experience effects, such a neutrality assumption seems particularly inappropriate over the span of our data.

When relative wages among whites are not stable, measuring black-white wage convergence is somewhat problematic. One must select a particular group of whites as a yardstick for black economic progress. The standard regression approach assumes that whites with the same observable characteristics are the appropriate benchmark. When part of the gap between wages for whites and for blacks is caused by differences in unobserved skills, due to differences in schooling quality for example, whites with the same number of years of schooling are not the appropriate benchmark. More appropriately, whites and blacks with the same "effective" years of schooling could be compared. When relative wages across schooling levels are constant, this change in reference would make no difference for calculating black-white convergence. When the returns to education have increased significantly as they have in recent years, however, such a change can have an enormous effect on convergence calculations.

This chapter is organized as follows. First we describe the data used in our analysis. Next we describe black-white wage convergence over the past twenty-five years, identify the recent slowdown, and outline the changes in education, occupation, and inequality differentials observed over the sample period. We then describe basic techniques and our statistical framework and present several descriptions of the slowdown based on alternative empirical implementations of these techniques. The final section summarizes our results and suggests avenues for future research.

The Data

The data we use in this analysis come from twenty-five consecutive annual March current population surveys, from 1964 through 1988. Our wage data come from the annual demographic supplement and refer to earnings and weeks worked in the previous calendar year, thus covering 1963 through 1987. From the survey we included all white and black men who worked at least one week, usually worked full-time, participated in the labor force for at least thirty-nine weeks, and met several other sample inclusion criteria. The conclusions drawn in this chapter are relatively insensitive to these sample inclusion criteria.

For purposes of analysis we measure the average weekly wage as annual wage and salary earnings divided by the number of weeks worked by the individual. The earnings data are deflated by the personal consumption expenditure deflator from the national income

FIGURE 4-1
BLACK-WHITE WEEKLY WAGE DIFFERENTIAL, 1963–1987
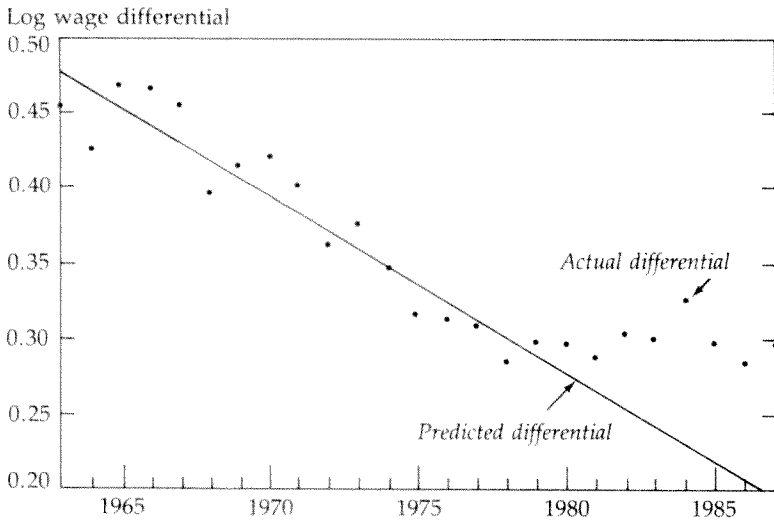
NOTE: The actual log wage differential is the average log wage for whites minus the average log wage for blacks. See the text for the construction of the wage measures. The predicted differential is a linear trend based on the 1963–1979 data; hence the 1980–1987 predicted differentials represent extrapolations of what the differential would have been, had the 1963–1979 wage convergence continued in the 1980s.
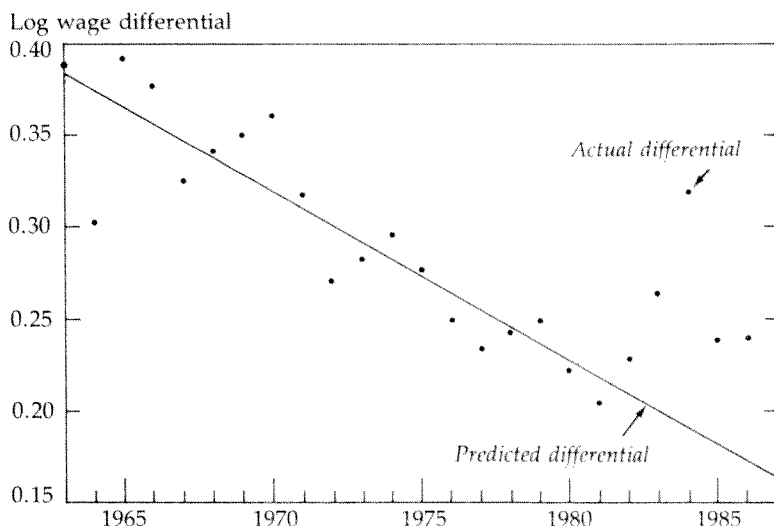SOURCE: Authors' calculations.

and product accounts. Throughout this chapter we refer to the natural logarithm of the deflated average weekly wage as the wage.[5] In describing black-white wage convergence we organize the data around years of potential work experience, where potential experience is defined as the minimum of age minus education minus seven and age minus seventeen.

The Slowdown in Black-White Wage Convergence

Figure 4-1 shows the unadjusted or raw difference between wages for whites and blacks, across all experience levels, from 1963 through 1987. The figure also shows a trend line, estimated from a regression of the wage differentials on a constant term and a linear time trend using data from 1963 through 1979. As the figure illustrates, the black-white differential declined from about .45 in the mid-1960s to about .30 by 1979. In contrast, the black-white differential in 1987 was about

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Log wage differential

the same as it had been in 1977. The present differential of about .30 is approximately 50 percent larger than the .20 differential one would predict based on the trend from 1963 through 1979. While year-to-year variation in the black-white differential makes it difficult to pinpoint the beginning of the slowdown within the 1975–1979 interval, it is clear that wage convergence in the past decade has been significantly smaller than it was in the preceding decade and a half.

Figure 4-2 plots the log-wage differential for white and black workers with fewer than ten years of potential experience. The story is similar. The black-white wage differential narrows from approximately .38 in the mid-1960s to about .23 by 1980. More recent observations show a differential of about .25, with the exception of 1984, when the differential was significantly higher. The recent differentials are once again about ten to twelve percentage points higher than the pre-1979 trend would have caused an analyst to project. The data in figure 4-2 are particularly informative, since much of the convergence documented in figure 4-1 reflects the retirement of older cohorts

whose black-white wage differential was significantly greater than that of more recent cohorts. This effect could have caused wages for blacks and whites to continue converging over the sample period, even though wage differentials were constant or expanding between successive entering cohorts. In addition, the rate of convergence might also be expected to slow as the cohorts of men who entered the labor force before World War II leave the sample, even if stable convergence continues among the relatively new entrants. Given the similar patterns in figures 4–1 and 4–2, it appears the slowdown in black-white wage convergence is not simply an artifact of the retirement of older cohorts from the data. Rather, it appears that it does not matter qualitatively whether we choose the wage differential among young workers or among all workers as the barometer of black-white wage convergence.

The pervasiveness of the slowdown can be seen most clearly from the data in table 4–1. Panel A gives average log-wage differentials by five-year-experience intervals based on a division of the sample into five calendar-year intervals. The data in the table are simple averages across years of the wage differential for the indicated experience group. The data in the 1965 column are the averages of the differentials from the years 1963 through 1967; the 1970 column refers to 1968–1972, and so forth. The labels 1965, 1970, etc., refer to the mid-years of the calculations. The layout of the table allows the reader to follow given experience levels through time by reading across the rows; reading down the diagonals allows us to follow cohorts through time.[6]

Comparisons of the first, second, and third columns of panel A show a consistent pattern of wage convergence from the 1963–1967 interval to the 1973–1977 interval. In contrast, comparisons of the third and fourth columns of the table show that wages converged at some levels of experience, particularly for those with six to ten years of experience and those with sixteen to twenty years of experience, but they remained stable at other levels. It appears that wage convergence was significantly smaller between the 1973–1977 period and the 1978–1982 period than it had been in earlier years. Comparisons of the data from the final two columns reveal a pattern of either stable differentials or a slight divergence. Most important, the pattern of rapid convergence illustrated in the first two columns is no longer present. Following cohorts down the diagonals we see a similar story. Only four out of the possible twenty-one comparisons for the earlier periods show relative wages diverging within a cohort, but five out of the seven possible comparisons show blacks losing ground when the final two columns are compared. The evidence for a significant slowdown in convergence seems quite clear from these numbers.

TABLE 4-1
BLACK-WHITE DIFFERENTIALS BY EXPERIENCE LEVEL, 1965-1985

	Panel A. Wage Differentials				
	1965	1970	1975	1980	1985
All experience					
levels	0.45	0.40	0.33	0.29	0.30
< 6	0.34	0.29	0.24	0.24	0.26
6-10	0.37	0.35	0.29	0.22	0.27
11-15	0.49	0.39	0.30	0.30	0.32
16-20	0.50	0.45	0.37	0.29	0.28
21-25	0.49	0.45	0.37	0.31	0.33
26-30	0.47	0.43	0.40	0.36	0.34
31-35	0.46	0.44	0.38	0.43	0.38
> 35	0.48	0.41	0.36	0.35	0.35
	Panel B. Residual Differentials				
	1965	1970	1975	1980	1985
All experience					
levels	0.30	0.25	0.21	0.21	0.23
< 6	0.21	0.15	0.14	0.18	0.21
6-10	0.26	0.24	0.18	0.16	0.22
11-15	0.34	0.27	0.21	0.21	0.26
16-20	0.34	0.30	0.27	0.21	0.21
21-25	0.32	0.28	0.23	0.22	0.26
26-30	0.30	0.29	0.25	0.25	0.25
31-35	0.29	0.27	0.23	0.28	0.26
> 35	0.29	0.24	0.19	0.22	0.23

NOTE: Standard errors for the "all experience levels" estimates are approximately 0.005 in each year. Standard errors for individual experience-level estimates range from 0.011 to 0.020.
SOURCE: Authors.

Panel B of table 4-1 makes analogous comparisons using differences in black and white residuals from a simple wage equation. The use of regression residuals allows us to control for differences between blacks and whites in education levels, experience levels, and regions of residence.[7] Since the regression used to calculate the residuals includes education effects, these calculations do not reflect changes in the black-white wage gap caused by schooling-completion changes and fluctuations in the return to schooling for whites. In spite of this difference the results are qualitatively similar to those shown in panel A. When the black-white differentials are compared at

FIGURE 4-3
TRENDS IN COLLEGE WAGE PREMIUMS,
1963–1986

a given level of experience through time, convergence occurs at all experience levels from 1965 to 1970 and again from 1970 to 1975. In contrast, comparisons of the third and fourth columns (1975 and 1980) show mixed results, and comparisons of the final two columns (1980 and 1985) show either no convergence or divergence for six of the seven comparisons. Whether we compare unadjusted differentials as in panel A or regression residuals as in panel B, clearly black-white wage convergence has slowed significantly since the mid- to late 1970s.

This slowdown, however, has not occurred in isolation. The slowdown in black-white convergence has been accompanied by other dramatic changes in relative wages. Perhaps the most dramatic change in relative wages in recent years has been the remarkable increase in the returns to a college degree. Figure 4–3 illustrates the change. In 1979 college graduates earned about 50 percent more on average than high school graduates. By 1987 this differential had

increased to over 65 percent. When the calculations are restricted to those with one to five years of experience the changes are even more dramatic. The differential between young college and high school graduates was about 33 percent in 1979. It more than doubled to 68 percent by 1986.
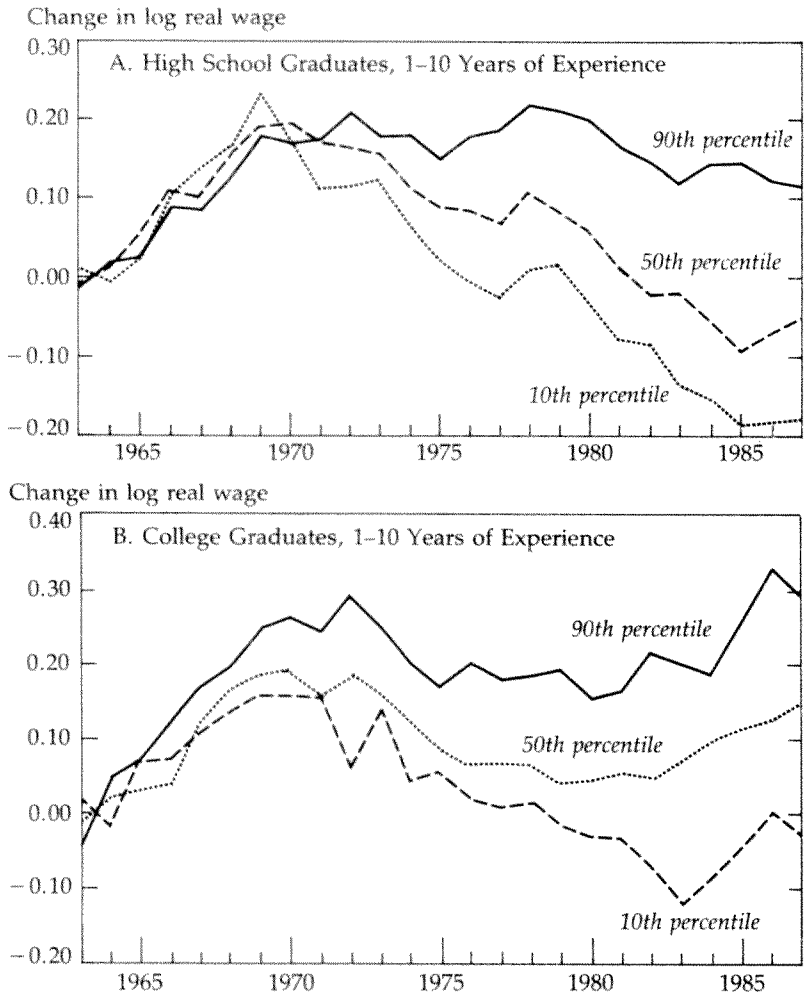
Education is not the only dimension in which wage differentials have increased. Figure 4–4 plots real wages for the 10th, 50th, and 90th percentiles of the college and high school wage distributions for recent entrants from 1963 through 1987. Wages for each percentile are indexed to start at zero between 1963 and 1964. There is almost no divergence among the different percentiles for high school graduates from 1963 through about 1970, and very little divergence for college graduates from 1965 through 1970. Since 1970, however, the wage differential between the 90th percentile and the 10th percentile has increased by about 30 percentage points for both education groups.

This general increase in wage inequality based on both the observables and unobservables has caused wage differentials to expand considerably over the sample period. More significant for the slowdown, the expansion has been more rapid in recent years than in earlier years. Figure 4–5 gives the average annual rate of increase in wages by percentiles of the wage distribution (where wage growth is measured relative to mean growth) for two periods: 1965 to 1980, the decade and a half when blacks gained significantly on whites, and 1980 to 1985, the period after the slowdown.[8] As the figure makes clear, inequality rose significantly in both periods. The increase is far larger in the later period, however, particularly at the percentile extremes. Based on these results it appears that the tendency for wage differentials to expand has increased in recent years.

Changes in inequality such as those documented in figure 4–5 and changes in the return to schooling of the magnitude documented in figure 4–3 are likely to have a significant impact on the black-white wage gap. The magnitude of these effects depends on the differences in educational attainment and quality of schooling between blacks and whites, and on the size of the wage gap between blacks and whites at a given educational level.

Table 4–2 addresses differences in educational attainment between blacks and whites as of 1965, 1975, 1985, and for the sample as a whole. The most striking differences between blacks and whites emerge in comparisons of the numbers of each who graduated from college or who attained less than a high school degree. Across all experience levels about 20 percent of whites were college graduates, whereas only 8.4 percent of blacks received a college degree. The gap is actually slightly larger in absolute terms for new entrants, among

FIGURE 4–4
CUMULATIVE WAGE GROWTH BY PERCENTILE
WITHIN GROUPS, 1963–1987

Change in log real wage

A. High School Graduates, 1–10 Years of Experience

90th percentile

50th percentile

10th percentile

Change in log real wage

B. College Graduates, 1–10 Years of Experience

90th percentile

50th percentile

10th percentile

NOTE: The series plot cumulative growth of wages at the median and the 10th and 90th percentiles of wage distributions for two demographic groups. Wage growth is measured relative to a 1963–1964 average.
SOURCE: Authors' calculations.

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FIGURE 4-5

GROWTH RATES OF RELATIVE WAGE BY PERCENTILE,
1965–1980 AND 1980–1985

Annual growth rate of relative wage
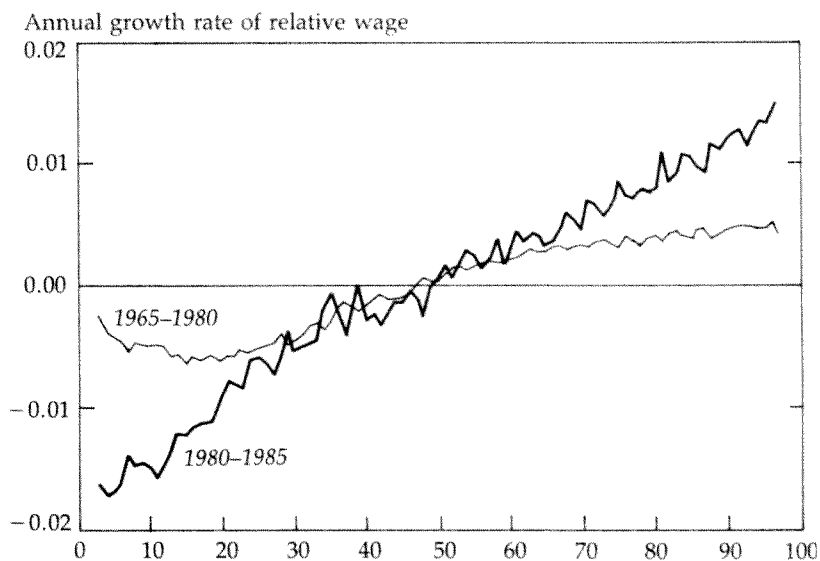
NOTE: The series represent growth rates of wages at different percentiles of the wage distribution for two subperiods of the data. Both series are indexed relative to the period's average wage growth; by construction, relative wage growth of a worker with the average wage is zero.
SOURCE: Authors' calculations.

whom 25.5 percent of white men have college degrees but only 12.2 percent of young blacks do. The percentage of blacks with less than a high school degree exceeds that of whites by about twenty percentage points in the whole sample (45.1 versus 26.2 percent), and by ten percentage points among those with one to ten years of experience (24.4 percent versus 14.5 percent).

Based on these numbers the increase in returns on a college degree since 1979 of about 0.15 should have increased the black-white wage differential by about $11.5 \times 0.15 = 1.75$, which would account for a slowdown of $1.75/8 = 0.22$ percent per year. Calculations for the younger cohorts give significantly larger effects, since the profits of higher education have increased most for younger workers. These calculations illustrate how changes in the returns to education can have a significant effect on the black-white wage differential and thus in the way the turnaround from a period of moderate decline in

TABLE 4-2
### EDUCATIONAL ATTAINMENT FOR WHITES AND BLACKS, 1963-1987

Panel A. Blacks: All Experience Levels

	1965	1975	1985	1963-1987
Less than high school	65.5	45.8	26.7	45.1
High school graduates	23.5	35.0	41.8	34.1
Some college	6.3	11.9	18.2	12.4
College graduates	4.6	7.4	13.4	8.4

Panel B. Whites: All Experience Levels

	1965	1975	1985	1963-1987
Less than high school	40.0	25.8	17.0	26.2
High school graduates	35.2	38.6	39.6	38.4
Some college	11.1	15.9	18.1	15.6
College graduates	13.9	19.7	25.2	19.9

Panel C. Blacks: 1-10 Years of Experience

	1965	1975	1985	1963-1987
Less than high school	40.5	23.6	13.4	24.4
High school graduates	41.3	47.8	48.3	45.4
Some college	10.4	17.4	22.2	18.0
College graduates	7.7	11.2	16.0	12.2

Panel D. Whites: 1-10 Years of Experience

	1965	1975	1985	1963-1987
Less than high school	21.4	13.8	11.9	14.5
High school graduates	42.6	38.6	40.4	40.6
Some college	15.3	21.2	19.4	19.4
College graduates	20.7	26.4	28.3	25.5

SOURCE: Authors.

education returns in the 1970s to rapidly increasing returns in the 1980s could contribute to the slowdown in black-white wage convergence. In addition, these numbers make no attempt to correct for differences in the quality of schooling received by blacks and whites, which may make the effective gap in schooling larger than the gap in educational attainment measured in table 4-2, and thus may increase the effect of higher schooling returns on the black-white wage gap.

In addition to the increase in wage differentials between education groups, the within-group comparisons shown in figure 4-4 and the inequality changes displayed in figure 4 point to a more general increase in wage inequality. Given the existing gap between blacks

FIGURE 4–6

LOCATION OF BLACKS IN THE WHITE WAGE DISTRIBUTION

Percent of whites
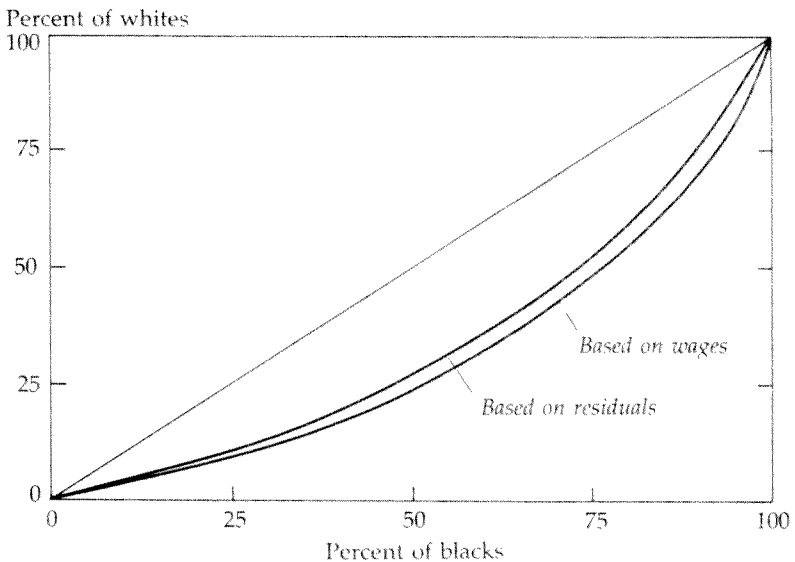
NOTE: The series relate the percentage of blacks with wages below the wage at any given point in the white wage distribution.
SOURCE: Authors' calculations.

and whites in weekly earnings, any increase in wage inequality is likely to expand the wage differential between blacks and whites. Figure 4–6 and the associated numbers given in table 4–3 illustrate the size of the black-white wage gap by finding the position of blacks in the white wage distribution over the full sample period. The figure and the calculations in the table compute the fraction of whites earning less than a given percentage of blacks. The number twenty-four in the "all years" column shows that on average over our sample, 24 percent of whites have wages lower than the median blacks', or alternatively that the median black is at the 24th percentile of the white wage distribution. Market forces that cause the lower quartile of whites to lose relative to the average white might well be expected to increase black-white wage inequality, because the same forces will cause the average black (with wages and perhaps marketable skills similar to someone at the 24th percentile of the white wage distribution) to lose relative to the average white.

TABLE 4-3

PERCENTAGE OF WHITES EARNING LESS THAN BLACKS
BY PERCENTILE, 1965, 1975, AND 1985

Panel A. Weekly Wages

Percentile of Black Distribution	1965	1975	1985	All Years
10	2	3	4	3
25	5	10	12	9
50	16	25	29	24
75	38	51	54	48
90	63	72	76	70

Panel B. Weekly Wage Residuals

Percentile of Black Distribution	1965	1975	1985	All Years
10	2	4	5	4
25	7	11	13	11
50	21	29	31	28
75	46	56	56	54
90	74	79	78	77

SOURCE: Authors.

The upper line in figure 4–6 and panel B of table 4–3 give the corresponding numbers based on weekly wage residuals from the white regression line. In terms of wage residuals, blacks do slightly better than for the wage level calculations. This does not follow simply from the fact that the observable differences between whites and blacks "explain" some of the wage gap. Rather, this reflects the fact that the gap in wages between blacks and whites is actually larger relative to the dispersion of wages than is the residual gap relative to the dispersion of the residuals. Hence the gap between blacks and whites based on the observables is larger relative to the dispersion of the observables than is the residual gap between blacks and whites relative to the dispersion of the residuals. Given the large increase in within-group inequality shown in figure 4–5, one would have expected blacks to lose ground relative to whites beginning around 1970. Whether changes in within-group inequality or changes in the returns to education can account for the recent slowdown are at this point open questions. It is clear that they both work in that direction. The next section attempts to give us an answer.
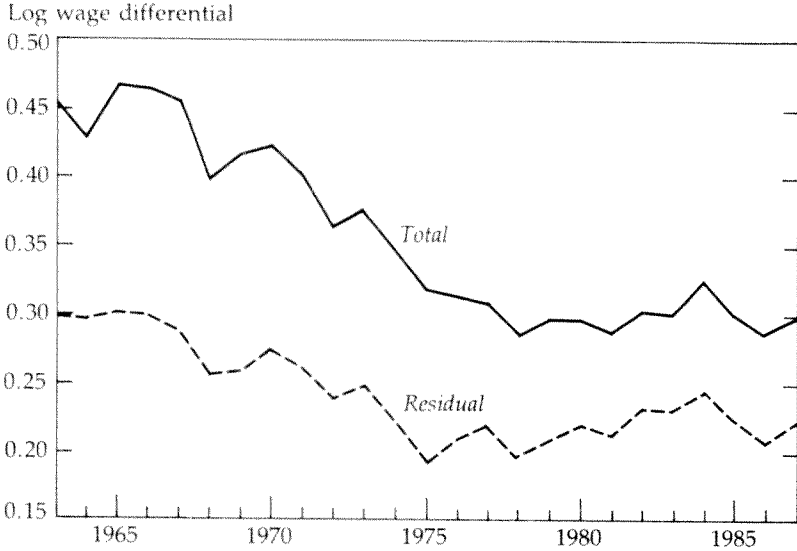
Accounting for the Slowdown

In order to talk sensibly about the slowdown we must first provide a useful definition of black-white wage convergence. In our opinion the most useful definition distinguishes between effects that are black-specific and effects that result from more pervasive relative wage changes in the economy. The black-specific category would include both observable and unobservable convergence in the skills of blacks and whites (such as convergence in either years of or the quality of schooling), as well as changes in relative wages generated by changes in black-specific prices (such as changes in market discrimination). The more pervasive changes would then consist of relative price changes in the labor market affecting the relative wages of whites and blacks, including those price effects affecting the "unexplained" or residual portion of the black-white wage differential.

In addition to distinguishing between black-specific and not black-specific, we would ideally distinguish the effects of skill convergence between blacks and whites from the effects of racial discrimination changes in the labor market. Our ability to do this is extremely limited, however, and we will only be able to attribute wage gap changes generated by relative schooling completion changes to the skill convergence category. Any residual convergence will be considered as simply reflecting some combination of skill convergence and changes in labor market discrimination.

We begin our analysis by performing a decomposition of the black-white wage differential into predicted and residual components, using yearly regressions of wages on measures of education, potential experience, and region of residence. Our approach along these lines is to divide the black-white differential in each year into two categories: the "predicted gap," the difference between the average wage of whites and the wage blacks would receive given their observable characteristics if they were paid like whites; and the "residual gap," the difference between the predicted and the actual wage for blacks. Figure 4–7 graphs the black-white differential as well as the residual gap calculated over all experience levels. Figure 4–8 replicates these calculations for workers with one to ten years of experience. As the figures make clear, the differences in observable characteristics account for a significant portion (about one-third) of the total black-white wage gap, and convergence in the predicted gap accounts for a significant amount of wage convergence, as evidenced by the decline in the vertical distance between the lines through time.

Analytically we can think of this exercise as follows. In each year we have a log weekly wage equation for whites so that

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FIGURE 4-7

BLACK-WHITE WAGE DIFFERENTIAL, 1963–1987

Log wage differential

$$Y_{it} = X_{it}\beta_t + u_{it} \qquad (4\text{--}1)$$

where X_{it} is a vector containing the observable characteristics of an individual white worker and β_t gives the coefficients on these characteristics in year t; as usual, we define $E(u_{it}|x_{it}) = 0$, so that this equation gives mean wages for whites with given characteristics. The actual wage differential between blacks and whites is then simply

$$
\begin{aligned}
D_t = Y_{wt} - Y_{bt} &= X_{wt}\beta_t + U_{wt} - (X_{bt}\beta_t + U_{bt}) \\
&= (X_{wt} - X_{bt})\beta_t - U_{bt} \\
&= \Delta X_t \beta_t - U_{bt} \qquad (4\text{--}2)
\end{aligned}
$$

Where $\Delta X_t = (X_{wt} - X_{bt})$, the term $\Delta X_t \beta_t$ is the predicted gap between blacks and whites, and $-U_{bt}$ is the residual gap. Using this formulation, wage convergence between blacks and whites between one year, such as year t, and another year, such as year t', can be written as

$$D_{t'} - D_t = (\Delta X_{t'} - \Delta X_t)\beta_t + \Delta X_t(\beta_{t'} - \beta_t) - (U_{bt'} - U_{bt}) \qquad (4\text{--}3)$$

which decomposes wage convergence into convergence based on observable quantity changes at fixed prices, $(\Delta X_{t'} - \Delta X_t)\beta_t$, price

FIGURE 4-8

BLACK-WHITE WAGE DIFFERENTIAL FOR NEW ENTRANTS, 1963–1987

Log wage differential
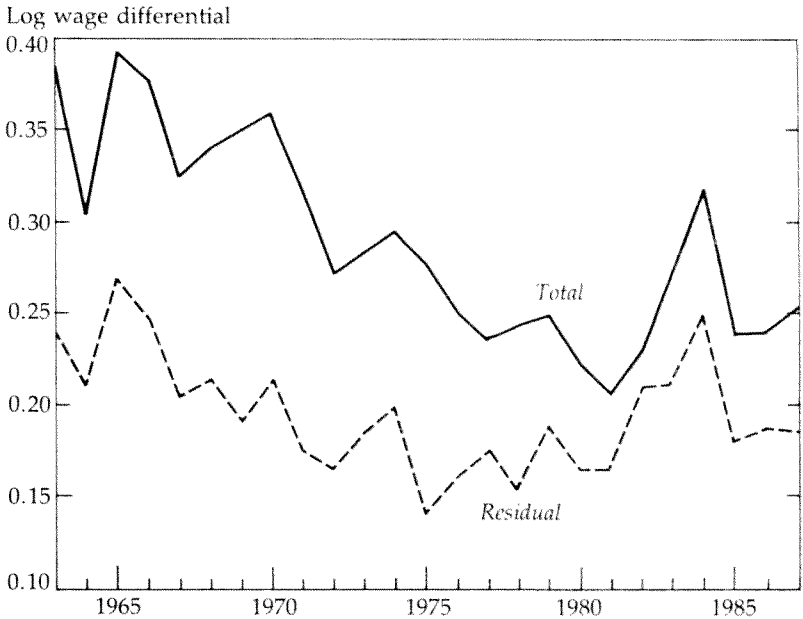
NOTE: See note to figure 4–7.
SOURCE: Authors' calculations.

effects, $\Delta X_t \cdot (\beta_{t'} - \beta_t)$, and changes in the residual gap, $-(U_{bt'} - U_{bt})$. Rather than pick some base year for measuring effects (year t in the example above), we pick the average over all years as the benchmark so that in our empirical implementation equation (4–3) becomes

$$D_{t'} - \bar{D} = (\Delta X_{t'} - \Delta\bar{X})\beta + \Delta X_{t'} \cdot (\beta_{t'} - \bar{\beta}) - (U_{bt'} - \bar{U}_b) \qquad (4\text{--}4)$$

where $\bar{D}$, $\bar{\beta}$, $\Delta\bar{X}$, and $\bar{U}_b$ are obtained using the data for all years together.

The results of such a decomposition are presented in table 4–4. Panel A presents the calculations for all experience levels and panel B presents calculations for workers with one to ten years of experience. For simplicity the results in the table divide the sample into three periods, 1963–1970, 1970–1979, and 1979–1987. These periods represent our attempt to distinguish the post-1979 slowdown period from the earlier periods of more rapid wage convergence. For each period we estimate the average annual rate of change in each component, such as the total gap or the predicted gap, by estimating a linear spline

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TABLE 4-4

RATE OF BLACK-WHITE CONVERGENCE AND COMPONENTS,
SELECTED PERIODS, 1963–1987

Panel A. All Experience Levels

	(1) 1963–70	(2) 1970–79	(3) 1979–87	Difference (2)–(3)
Total	.78	1.38	−.27	1.65
	(.22)	(.15)	(.19)	(.30)
Observables	.01	.81	.07	.74
	(.13)	(.09)	(.11)	(.18)
Prices	.07	.06	−.27	.33
	(.05)	(.03)	(.04)	(.07)
Quantities	−.06	.76	.34	.42
	(.12)	(.08)	(.10)	(.16)
Gap	.77	.57	−.34	.91
	(.20)	(.13)	(.17)	(.27)

Panel B. Experience Levels 1–10

	(1) 1963–70	(2) 1970–79	(3) 1979–87	Difference (2)–(3)
Total	.49	1.20	−.51	1.71
	(.36)	(.24)	(.30)	(.48)
Observables	−.41	.99	−.01	1.00
	(.24)	(.16)	(.20)	(.32)
Prices	.13	.14	−.37	.52
	(.06)	(.04)	(.05)	(.09)
Quantities	−.55	.85	.36	.48
	(.24)	(.16)	(.20)	(.32)
Gap	.91	.21	−.50	.71
	(.31)	(.20)	(.26)	(.42)

SOURCE: Authors.

with break points in 1970 and 1979. The numbers in the first row of panel A indicate that the total black-white wage gap narrowed at an average rate of 0.78 percent per year from 1963 to 1970. The gap then narrowed at a rate of 1.38 percent per year from 1970 through 1979, and the gap actually expanded at a rate of about .27 percent per year from 1979 to 1987. As we saw earlier, these numbers indicate that black-white convergence has been slower in the most recent years than it was during either of the previous periods. Here and for most of the remainder of the paper we define the slowdown as the difference between the rate of convergence during the 1970–79 period and the rate of convergence during the 1979–1987 period. As the last

column shows, we estimate the slowdown in total wage convergence as 1.65 percent per year.[9]

This slowdown can be decomposed into a component explained by the observables, or predicted gap, of 0.74 and a residual, or unexplained slowdown, of 0.91 percent per year. The observable component of the slowdown can then be decomposed further into the part due to changes in prices, 0.33 percent per year, and a slowdown in measured skill convergence, 0.42 percent per year. The residual gap shown in figure 4–7 indicates a moderate decline in wage convergence from the 1963–1970 period to the 1970–1979 period, from 0.77 percent per year residual convergence to 0.57 percent per year. Residual convergence declines significantly more, from 0.57 to −0.34, when we compare the second and third intervals. In fact the residual slowdown of 0.91 shown in the final column accounts for about 60 percent of the total slowdown. As these calculations show, the increase in returns to education have had a significant effect on black-white convergence, lowering the rate of convergence by 0.33 percentage points, but this together with the slowdown in education convergence still explains somewhat less than half of the total slowdown.

The calculations for workers with one to ten years of experience presented in panel B of table 4–4 give only slightly different results. For this group the total slowdown is quite similar to that measured over all workers, 1.71 versus 1.65, and the observed changes account for slightly more than half of the slowdown—1.00 out of 1.71. The slowdown in measured skill convergence accounts for 0.48 percentage points of the predicted slowdown and the price effect accounts for another 0.52 percentage points. The larger price effect for the younger workers simply reflects the much greater increase in education differentials among younger workers. As in panel A, the residual gap accounts for a significant component of the slowdown—about 40 percent.

The basic message of table 4–4 is that the rise in education differentials and a slowing of black-white education convergence in the 1980s explain somewhat less than half of the decline for all workers and slightly more than one-half of the decline for younger workers. As we illustrated in the previous section, however, the expansion in education differentials has not been the only or even the largest source of relative wage changes among whites. Much of the increase in total inequality has been due to changes in relative wages within narrowly defined education and experience categories. As we saw above, the median black worker is at the twenty-eighth percentile of the white residual distribution; hence the slowdown in wage growth for blacks relative to whites within group (what is captured by the

residual gap in table 4–4) may simply reflect the more pervasive losses suffered by other workers at the low end of the wage distribution, and not something black-specific.

A statistical framework useful in evaluating this hypothesis parallels that used above to decompose the effects of the observables. We simply write

$$Y_{it} = X_{it}\beta_t + \sigma_t\theta_{it} \qquad (4-5)$$

where θ_{it} is a "standardized" residual (with mean zero and variance 1) and σ_t is the within-group standard deviation of wages in year t. Changes in σ_t through time reflect changes in within-group inequality. Using this notation the wage differential between blacks and whites is

$$D_t = Y_{wt} - Y_{bt} = \Delta X_t\beta_t + \sigma_t\Delta\theta_t \qquad (4-6)$$

where $\Delta\theta_t$ is the difference in the average standardized residual for whites and blacks. The convergence in black-white wages from year t to year t' would then be

$$D_{t'} - D_t = (\Delta X_{t'} - \Delta X_t)\beta_t + \Delta X_{t'}(\beta_{t'} - \beta_t)$$
$$+ (\Delta\theta_{t'} - \Delta\theta_t)\sigma_t + \Delta\theta_{t'}(\sigma_{t'} - \sigma_t) \qquad (4-7)$$

where we have decomposed the change in the unobservables in a fashion identical to that used for the observables. The first two terms are identical to those in equation (4–3). The third term captures changes in the relative positions of blacks and whites—that is, whether blacks are moving up or down within the distribution of whites—while the fourth term captures the effect of changing inequality. Provided the $\Delta\theta_t$ term is negative, meaning that blacks earn on average less than the mean, the fourth term implies that a rise in inequality would increase the black-white wage differential even if blacks maintained the same positions in the white distribution— $\Delta\theta_t - \Delta\theta_{t'}' = 0$.

A decomposition such as that defined in equation (4–7) can easily be implemented empirically. The term $(\Delta\theta_{t'} - \Delta\theta_t)\sigma_t$ measures the change in the average black residual, evaluated using the year-t distribution of white earnings, due to blacks changing their position in the white wage distribution. Empirically this decomposition can be implemented by assigning to each black in each year a percentile number corresponding to his position in the white residual distribution for that year. For each individual in year t' we can then compute what his wage residual would have been in year t given his position in the wage distribution. The term $(\Delta\theta_{t'} - \Delta\theta_t)\sigma_t$ is then simply the difference between the average of these imputed residuals and the actual average residual for blacks in year t. Since both computations use the

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same year t residual distribution, this term only captures movements of blacks through the white residual distribution.

The final term can be calculated analogously. In this case we compare the same year t' individuals and allow only the white residual distribution to change. Once again we assign percentiles of the white distribution to each black in year t', compute what residual that black would have had in year t given that position in the white distribution, and subtract that from the actual year t' residual. Since the percentile locations of the blacks are held fixed in this calculation, the change in this index only reflects changes in residual inequality for whites.

While these terms are relatively straightforward to calculate, their interpretation can be more problematic. We have to decide whether these effects should be labeled black-specific or should be attributed to more general changes in relative prices. The term $(\Delta\theta_{t'} - \Delta\theta_t)\sigma_t$ reflects gains or losses for blacks relative to whites with the same level of earnings and hence would most likely be considered black-specific. Such a change could be due to either skill convergence of blacks and whites, causing blacks to move up in the white wage distribution, or a reduction in discrimination.

Whether the second term should be called a black-specific effect or a more general relative wage effect depends on the source of the difference in wage distribution locations for blacks and whites. To see this, it is instructive to look at one polar case where the wage gap between blacks and whites consists of a difference in marketable skills, due perhaps to market or pre-market discrimination in training or schooling. If we interpret the rise in wage inequality among whites as a rise in the market premium for skill, then the term $\Delta\theta_{t'}(\sigma_{t'} - \sigma_t)$ correctly represents a general relative price effect. It is simply the residual skill differential between whites and blacks times the change in the market prices for these skills, and it is completely analogous to the observable price change effects described in table 4–4. Including this term in the components of explained changes gives the convergence in the residual wage gap of

$$R_{t'} - R_t = -[(U_{bt'} - U_{bt}) - \Delta\theta_t(\sigma_{t'} - \sigma_t)] \qquad (4\text{--}8)$$

which simply says that the true black-specific effect is the change in the regression residual gap minus the change in the gap that would be expected given the position of blacks in the white residual distribution. This can have two interpretations. First, since this second term represents a pure price effect, we can think of equation (4–8) as netting out the price change so as to leave a pure quantity change, which is the convergence term of interest. Second, we can think of

this expression as a comparison between the wage change for a given black and the wage change for a white with the same observable characteristics and comparable initial earnings—a white at the same point in the residual distribution. Since the difference in earnings between whites and blacks reflects a difference in skills in this hypothetical case, the comparison between whites and blacks at the same earnings level allows us to compare black wage changes with wage changes for white workers with comparable skills.

This analysis would not be completely appropriate when the black-white wage gap reflects both skill differences and market discrimination. To see this, let $\theta_{it} = \delta_{it} + d_{it}$, where δ_{it} is the skill level of individual i relative to the average, and d_{it} reflects market discrimination, so that $d_{it} = -d_t$ if the individual is black and $d_{it} = 0$ if he is white. In this case the decomposition from equation (4–8) can be written as

$$D_{t'} - D_t = (\Delta X_{t'} - \Delta X_t)\beta_t + \Delta X_{t'}(\beta_{t'} - \beta_t) +$$
$$(\Delta\theta_{t'} - \Delta\theta_t)\sigma_t + [\Delta\delta_{t'}(\sigma_t - \sigma_t) + d_t(\sigma_{t'} - \sigma_t)] \qquad (4-9)$$

where $\Delta\delta_t$ is the skill gap between whites and blacks. The term in brackets is what would be calculated by the decomposition described above. In this case, however, only the first term in brackets represents something that is not black-specific. The first term here again gives the predicted change in the wage differential based on the skill difference between whites and blacks. The second term captures the fact that as the wage differentials increase among whites, the dollar cost to blacks rises for being moved down a given amount in the white distribution; in other words, the cost of a given value of d_t rises. Since this component of the differential is a consequence of market-specific treatment of blacks, it seems appropriate to include any increase in its cost in the black-specific category.

One can also think of the issue in terms of the choice of the proper white comparable. When some of the residual differential between whites and blacks reflects discrimination, blacks must be · more skilled than whites earning the same wage. When we compare the wage change for a black with the wage change for a white at the same initial wage level we are comparing a typical black to a less-skilled white. This then causes us to overstate the extent by which any increase in the returns to skill should have lowered the wages of these blacks, thus leading to an overcorrection for the effect of skill prices. Hence, when discrimination is a significant component of the wage gap between whites and blacks, "correcting" for the residual inequality effect as we have shown will overstate the desired price change effect.

The opposite is equally true. When a significant portion of the residual wage gap between whites and blacks is accounted for by skill

TABLE 4–5

BLACK-WHITE CONVERGENCE CONTROLLING FOR RESIDUAL INEQUALITY CHANGES, SELECTED PERIODS, 1963–1987

	(1) 1963–70	(2) 1970–79	(3) 1979–87	Difference (2)–(3)
Total	.78	1.38	−.27	1.65
	(.22)	(.15)	(.19)	(.30)
Observables	.01	.81	.07	.74
	(.13)	(.09)	(.11)	(.18)
Prices	.07	.06	−.27	.33
	(.05)	(.03)	(.04)	(.07)
Quantities	−.06	.76	.34	.42
	(.12)	(.08)	(.10)	(.16)
Unobservable	−.10	−.22	−.33	.11
prices	(.05)	(.04)	(.05)	(.07)
Gap	.87	.79	−.01	.80
	(.19)	(.13)	(.16)	(.26)

SOURCE: Authors.

differences, the failure to make any correction would cause an understatement of the effects of an increase in skill differentials on the black-white gap. Since the truth is likely to lie somewhere between the extreme of a pure skill gap and a pure discrimination effect, it seems clear that one can use the computations with and without such a correction to obtain a range of reasonable estimates.
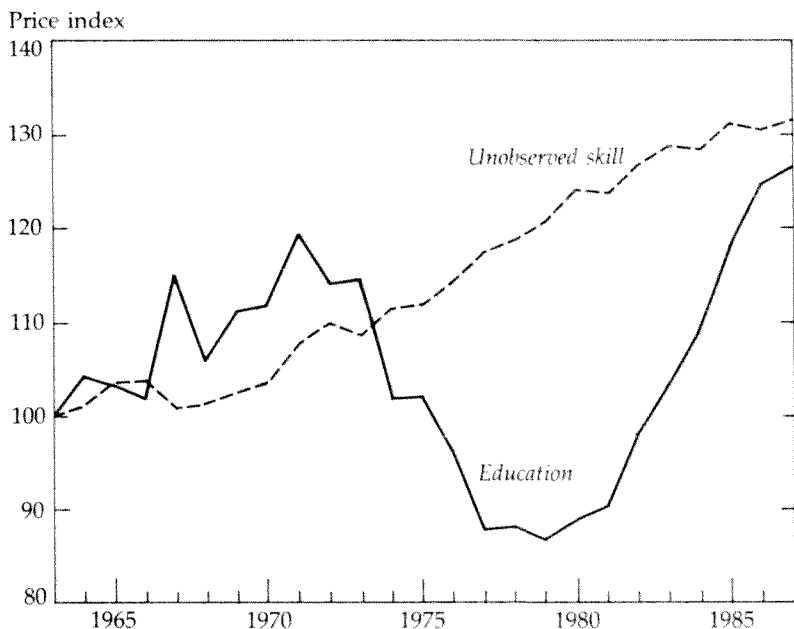
Table 4–5 supplements the observable decompositions from table 4–4 with an additional term, which we label an unobservable price effect.[10] The most noticeable effect of this addition is to increase the convergence of the residual gap in all three periods as compared with table 4–4. This increase results from the rise in residual wage inequality over most of the sample period and implies that actual black progress must be greater in order to overcome the negative effect of rising inequality. In addition, the accelerating rate of inequality growth over the sample implies that the slowdown in residual convergence from the first period to the second was cut in half and that the unexplained slowdown effect measured in the final column was reduced from .91 to .80. As these calculations make clear, however, correcting for the increase in white inequality does much more to the level of black-white convergence and to the difference between the first and final periods than to the comparison of the 1970s and 1980s. The basic reason for this is that growth in within-group inequality has been relatively steady since about 1970.

As this analysis shows, as long as a nontrivial portion of the black-white wage differential is accounted for by a difference in skills, such as differences in schooling quality, then it is necessary to make at least some adjustment beyond the usual regression adjustment based on observables to account for changes in skill prices. The approach we have outlined benchmarks the two extremes, of no skill gap and of a gap accounted for entirely by skill differentials, by using the wage differentials within whites at a given schooling level as a proxy for the price effect on the black-white skill gap. This is equivalent to tracking black-white convergence by comparing wages for blacks and for white comparables, defined as whites with the same observable characteristics and the same initial wage level. Such an analysis assumes that the part of the black-white gap accounted for by a difference in skills would move proportionately with wage differences among observationally equivalent whites. While it seems clear that such a skill price adjustment is necessary, it is by no means obvious that the wage differentials among whites at a given level of experience and education represent the best proxy.

If all skill differentials moved together then the choice of which observable skill price to use in such an analysis would be of no consequence. As we have documented elsewhere,[11] however, even though all skill differentials have increased by about the same amount since 1963 the timing of these increases within the interval shows significant differences. To illustrate, figure 4–9 gives the "price" of skill measured by the difference between the 90th and 10th percentiles within education and experience groups, and the price of skill as measured by the college–high school wage differential. Both series are indexed to equal 100 in 1963. As the figure shows, even though both prices rise by about the same amount over the sample period the time patterns are significantly different. The within-group inequality measure moves steadily upward after 1970, while the education premium actually goes down slightly during the 1970s before moving sharply upward after 1979. Given this difference in these two series it seems quite clear that the choice of which one to use as a proxy for the skill differential between whites and blacks might matter considerably.

In many ways the educational wage differential may be the most natural differential to use for looking at the black-white wage gap, given the emphasis on differences in schooling quality in much of the previous literature.[12] In order to evaluate this alternative we utilize the same framework as above and attempt to benchmark the two extremes. The case of little or no skill gap is the same as above, since with no gap the skill price is of no consequence. To pin down the

FIGURE 4–9
PRICES OF SKILLS, 1963–1987
$(1963 = 100)$

Price index

other end of the spectrum we assume that the skill gap is accounted for entirely by differences in the quality of schooling. We let the log-wage equation for whites be

$$Y_{it} = X_{it}\beta_t + U_{it}, E(U_{it}/X_{it}) = 0 \tag{4–10}$$

When the gap is accounted for by schooling quality the true wage equation for blacks would be

$$Y_{it} = X^*_{it}\beta_t + U_{it}, E(U_{it}/X^*_{it}) = 0 \tag{4–11}$$

where X^*_{it} gives the "quality adjusted" education level for blacks in equivalent average years of schooling for whites. The change in the wage differential between blacks and whites from year t to t' would then be

$$D_{t'} - D_t = [(X_{wt'} - X^*_{bt'}) - (X_{wt} - X^*_{bt})]$$
$$\beta_t + (X_{wt'} - X^*_{bt'})(\beta_t - \beta_t) \tag{4–12}$$

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The first term reflects skill convergence due both to convergence in actual schooling and to convergence in average schooling quality. To see this we can write $X^*_{bt} = X_{bt} - Q_t$, where X_{bt} is actual years of schooling for blacks and Q_t measures the difference between measured and effective schooling for blacks. Using this notation and rearranging terms yields

$$D_{t'} - D_t = [(X_{wt'} - X_{bt'}) - (X_{wt} - X_{bt})]\beta_t + (X_{wt'} - X_{bt'})(\beta_{t'} - \beta_t)$$
$$+ (Q_{t'} - Q_t)\beta_t + Q_{t'}(\beta_{t'} - B_t) \qquad (4\text{--}13)$$

The first two terms are simply the decompositions of the observables used in tables 4–4 and 4–5. The third and fourth terms are more novel and represent the effect of convergence in schooling quality at fixed prices and the effect of the change in education returns at a fixed quality of schooling gap. In this case the final term represents a general price effect on the black-white wage gap which we would like to net out when measuring black-white convergence.

Empirically we calculated this term as follows. We estimated the average relationship between earnings and education over all years of the sample for both blacks and whites. The functional form used for both equations was a piecewise linear function with independently estimated linear segments from zero to twelve years of schooling, twelve to sixteen years of schooling, and more than sixteen years of schooling. In addition we allow for graduation premiums at both twelve and sixteen years of schooling.[13] Armed with these estimates we found effective schooling for blacks by finding the level of white schooling that gave the same level of earnings at a given level of black schooling. The price effect, $Q_t(\beta_{t'} - \beta_t)$, is then calculated as the difference in the predicted change in wages for blacks evaluated at actual education levels and at the education levels implied by the quality correction. In addition, since the education gap is not the same at all levels of schooling we obtain another term, which is the predicted change in education quality as the education composition of the black labor force changes (This is labeled as a composition effect in table 4–6.

The results of these calculations are presented in table 4–6. The price effect, $Q_{t'}(\beta_{t'} - \beta_t)$, labeled as unobservable prices in the table, is quite large and explains an additional .78 percentage points of the slowdown. After correcting for observable changes and making this adjustment for education quality, the slowdown in residual wage convergence is basically eliminated, although a larger slowdown occurs between the 1960s and 1970s than in table 4–4. The educational composition effect is quite small, but it also helps to explain a portion of the convergence slowdown. According to the results in panel A, if the level of the black-white wage gap is largely accounted for by

TABLE 4–6
Black-White Convergence with Estimated Education Quality Effects, Selected Periods, 1963–1987

Panel A. All Experience Levels

	(1) 1963–70	(2) 1970–79	(3) 1979–87	Difference (2)–(3)
Total	.78	1.38	−.27	1.65
	(.22)	(.15)	(.19)	(.30)
Observables	.01	.81	.07	.74
	(.13)	(.09)	(.11)	(.18)
Prices	.07	.06	−.27	.33
	(.05)	(.03)	(.04)	(.07)
Quantities	−.06	.76	.34	.42
	(.12)	(.08)	(.10)	(.16)
Educational composition effect	−.03	.03	−.04	.07
	(.02)	(.01)	(.02)	(.03)
Unobservable prices	−.26	.02	−.76	.78
	(.14)	(.09)	(.12)	(.19)
Gap	1.06	.52	.46	.06
	(.20)	(.13)	(.17)	(.27)

Panel B. Experience Levels 1–10

|	(1) 1963–70	(2) 1970–79	(3) 1979–87	Difference (2)–(3)
Total	.49	1.20	−.51	1.71
	(.36)	(.24)	(.30)	(.48)
Observables	−.41	.99	−.01	1.00
	(.24)	(.16)	(.20)	(.32)
Prices	.13	.14	−.37	.52
	(.06)	(.04)	(.05)	(.09)
Quantities	−.55	.85	.36	.48
	(.24)	(.16)	(.20)	(.32)
Educational composition effect	.08	.13	−.04	.17
	(.06)	(.04)	(.05)	(.08)
Unobservable prices	−.13	.00	−.65	.65
	(.18)	(.12)	(.15)	(.24)
Gap	.96	.07	.19	−.11
	(.28)	(.19)	(.24)	(.38)

Source: Authors.

educational quality differences in the cross section, then it may be reasonable to attribute a large component of the slowdown in black-white wage convergence to the rise in returns to schooling in recent years. Under this interpretation, the existing gap in "effective" schooling has led to rising differentials between blacks and whites as the demand for a more educated work force has increased.

The results for younger workers, shown in panel B, are similar. In this case the total slowdown of 1.71 is slightly more than accounted for by these computations, leaving a residual slowdown of -0.11. The education quality adjustment for younger workers turns out to be about the same as for workers in general, reflecting the conflicting effects of a smaller gap in education quality and a larger change in educational prices for younger workers. As was the case in the calculations for all workers, however, the slowdown from the 1960s to the 1970s is now marginally larger than in table 4–4.

Figure 4–10 graphs the predicted black-white wage gap and the actual wage gap using the education quality model described above. The actual gap is the same as that shown in figure 4–1. The predicted gap is simply the predicted wage for whites in each year minus the predicted wage for blacks after the education quality adjustment and after adding a linear trend of $-.62$ percent per year, to make the total wage convergence the same for the actual and predicted series for the period as a whole; this simply proxies for a constant rate of black-white residual wage convergence. The similarity of the two lines is striking, given the fact that the scaling of the predicted differential is entirely determined by the cross-sectional wage differentials between whites and blacks and that the time series movements used are simply those for the education returns applied to our estimated quality gap. Figure 4–11 presents the same two series for new entrants. Once again the similarity of the two series is striking. These two figures demonstrate that the time series fluctuations in the black-white wage gap around trend are closely related to the observable differences between blacks and whites and the returns to schooling.

Figures 4–12 and 4–13 graph the residual gap from the regression decomposition and the predicted residual gap based on the education quality adjustment and trend only. Since the effects of observables are eliminated from both series, the comovement of these time series reflects only the strong association between the black-white wage gap within education and experience levels and the returns to schooling. Clearly the black-white wage differential appears to be well explained by a model in which the returns to education proxy for the price effects between races, overlaid on a smooth trend toward wage equal-

Log wage differential
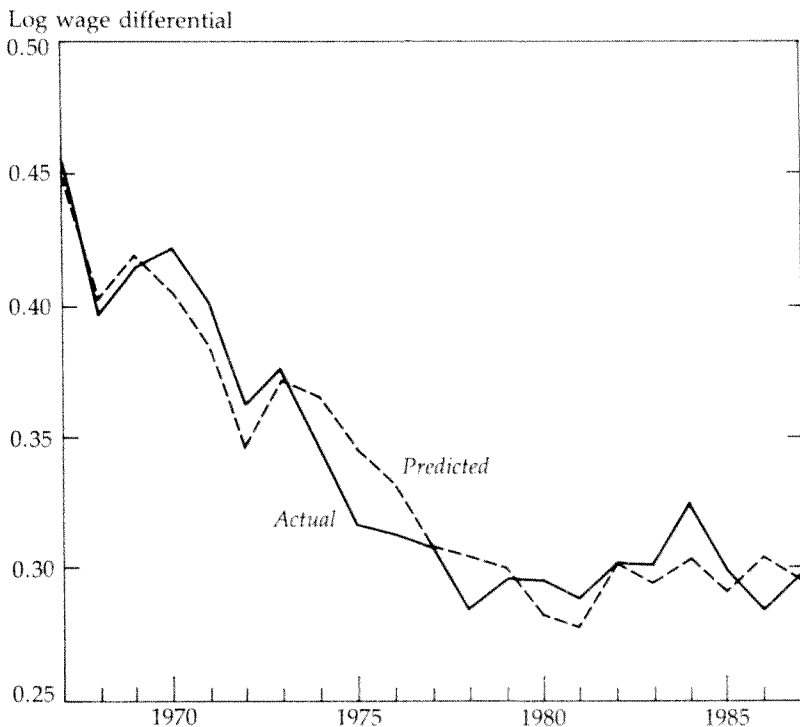
NOTE: The actual series is as in figure 4–1. The predicted series is the average predicted wage for whites minus the average predicted wage for blacks, after correcting for differences in educational quality. See the text for details.
SOURCE: Authors' calculations.

ity. The only significant variations appear for the earliest few years, for which data quality may in fact be suspect.

The basic idea underlying results such as those presented in table 4–5 and figures 4–10, 4–11, 4–12, and 4–13 is that relative price changes have led to significant fluctuations in the wage differentials within education levels. One way to test the validity of this hypothesis is to obtain additional observable measures of skills and skill prices to find proxies, such as occupational differentials, for such relative price effects. Table 4–7 presents relative wage changes by one-digit occupa-

FIGURE 4–11

BLACK-WHITE WAGE DIFFERENTIAL FOR NEW ENTRANTS, BASED
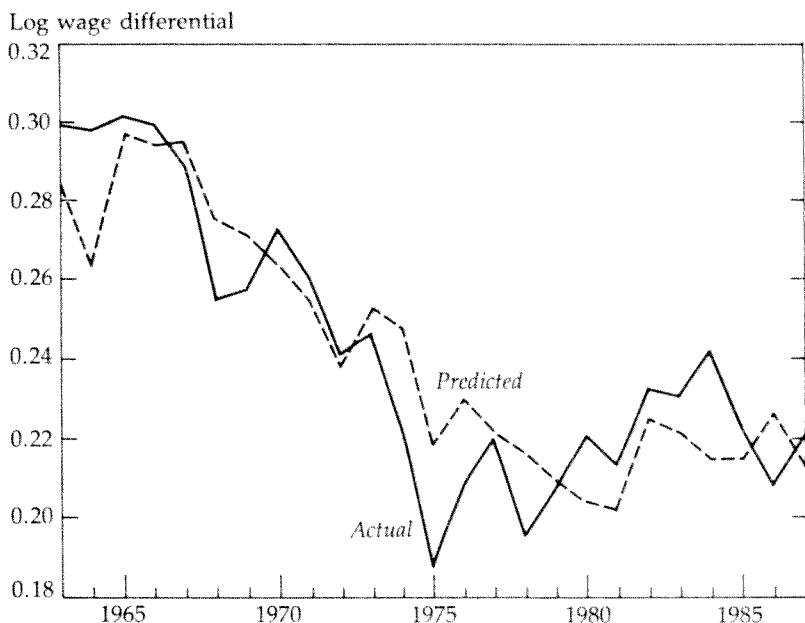ON THE EDUCATION QUALITY MODEL, 1963–1987

Log wage differential
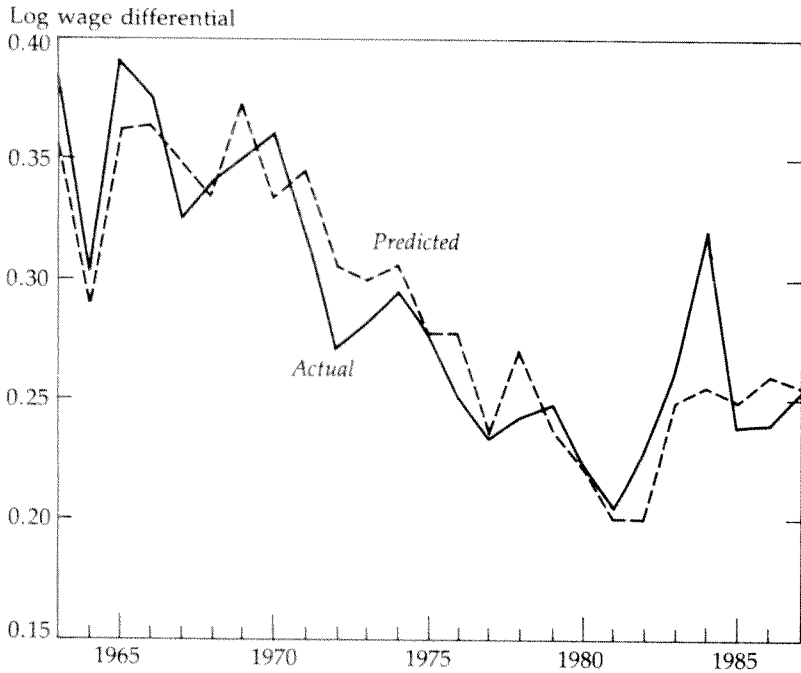
NOTE: See note to figure 4–10.
SOURCE: Authors' calculations.

tion categories for the 1970s and 1980s; data comparability limits our
ability to do these calculations for the 1960s. Clearly occupational
differentials have moved similarly to the returns to education, with
more highly skilled workers such as professionals, managers, and
salespeople losing ground during the 1970s and gaining significantly
during the 1980s. This is probably not surprising given the well-
known relationship between education and occupation. What inter-
ests us here is the additional information contained in occupation for
wage differentials within education levels.

Table 4–8 gives the average occupational distributions for whites
and blacks, as well as the difference in these distributions. This table
illustrates that expansions in occupational differentials such as those
shown in table 4–7 lead to a significant change in the black-white
wage differentials, given the large difference in occupation distribu-
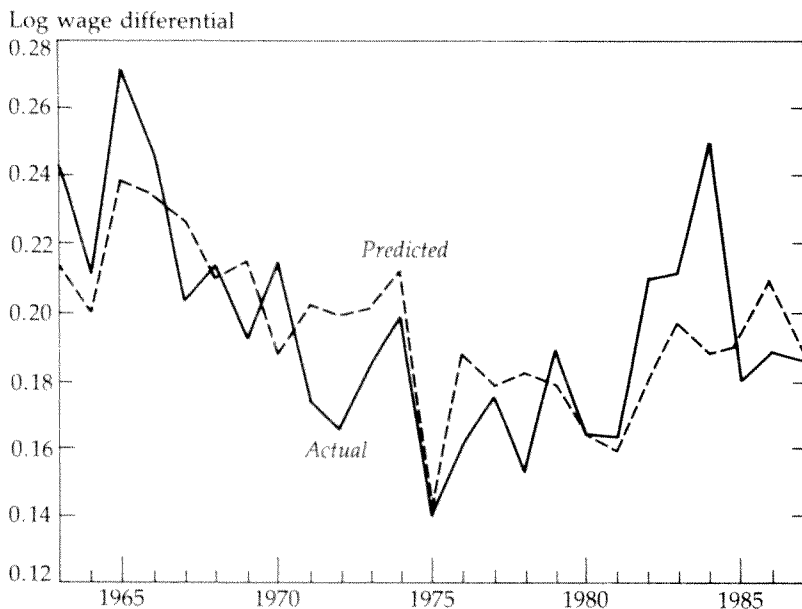
FIGURE 4–12

Log wage differential

NOTE: The series are constructed as in figures 4–10 and 4–11, except that wage residuals are utilized. See figure 4–7 and the text for details.
SOURCE: Authors' calculations.

tions. It remains to be seen whether these changes are already proxied by the education effects included in our previous decompositions. In order to see how much additional information is added by occupation we included three-digit occupation dummies along with the other observable variables included in the decomposition in table 4–4. We calculated the additional impact of occupation by taking the difference between the predicted values from regression equations using occupational effects and education controls, and the predicted values from regression equations containing only the education controls. Since this exercise can be performed for both the quantity change term (change in observables at fixed prices) and the price effect term (change in the wage gap given fixed education and occupation differences between whites and blacks), we decompose the occupation effect just as we did the education effects in table 4–4.

The results of this decomposition are summarized in table 4–9.[14]

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FIGURE 4–13
BLACK-WHITE WAGE RESIDUAL DIFFERENTIAL
FOR NEW ENTRANTS, 1963–1987

Log wage differential

Even after controlling for education, changes in occupational prices explain another 0.29 percentage points of the slowdown, and changes in occupation quantities explain another 0.32 percentage points. Based on these numbers it appears that a significant portion of the residual slowdown (0.29 out of 0.91) is attributable to shifts in relative wages across occupations within education levels. Our speculations that changes in skill prices within education levels have contributed significantly to the black-white slowdown seem to be confirmed. Table 4–9 also shows something else. Occupational progress within education levels, defined as the predicted change in the wage gap from the change in the black education and occupation distributions minus the predictions based on education changes alone, slowed significantly from the 1970s to the 1980s. This seems to suggest that at least some component of the slowdown in residual wage convergence reflects an actual slowdown in black economic progress and is not solely the result of relative price movements.

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TABLE 4-7

RELATIVE WAGE GROWTH BY OCCUPATIONS, 1970–1979 AND 1979–1987

Occupation	1970–79	1979–87	Difference
Professionals	−.53	.95	1.48
	(.06)	(.07)	
Managers	−.55	.66	1.21
	(.11)	(.13)	
Sales	−.52	.46	.98
	(.20)	(.24)	
Clerical	.21	−.80	−1.01
	(.18)	(.21)	
Craftsmen	.17	−.54	−.71
	(.06)	(.07)	
Operatives	.81	−.82	−1.63
	(.09)	(.11)	
Transport operatives	.68	−.80	−1.48
	(.12)	(.14)	
Laborers	.63	.72	−1.06
	(.16)	(.19)	
Services	−.65	−.44	.21
	(.13)	(.15)	
Private household	1.92	−.85	−2.77
	(.31)	(.37)	

SOURCE: Authors.

Panel B presents the analogous estimates for workers with one to ten years of experience. For this group, occupation related changes capture slightly less of the slowdown, but more was already captured by education for this group. In addition the slowdown in occupational quantity convergence, or occupational progress for blacks, seems somewhat smaller than in the calculation for all workers.

If we add the amount explained by the changes in occupation prices to the amount explained by the observable prices and quantities, what is left over is simply the occupational quantity changes, which represent convergence, and the residual or unexplained rate of black-white convergence. These convergence rates as well as the slowdown in convergence are listed in the final row of each panel. Since the initial slowdown in panel A is 1.65 and the slowdown shown in the last row is .64, changes in education and occupation returns and changes in educational convergence explain about $61 = 100 \times (1 − .64/1.65)$ percent of the slowdown. For younger work-

TABLE 4–8

DISTRIBUTION OF BLACK AND WHITE WORKERS ACROSS OCCUPATIONS

Occupation	Whites	Blacks	Total
Professionals	16.06	7.61	15.38
Managers	14.45	4.92	13.69
Sales	5.73	1.68	5.41
Clerical	6.59	8.41	6.74
Craftsmen	24.28	16.58	23.66
Operatives	12.72	18.57	13.18
Transport operatives	6.38	10.33	6.69
Laborers	5.43	14.24	6.13
Services	6.84	15.28	7.52
Private household	1.51	2.31	1.57

SOURCE: Authors.

ers the combination of observed changes in education along with education and occupation price changes explain about $70 = 100 \times (1 - .51/1.71)$ percent of the slowdown. As we have stressed, these calculations are likely to understate the importance of relative price changes since they make no correction for price effects within occupational classifications.

Table 4–10 presents similar results using one-digit occupation classifications. These calculations avoid many of the problems in matching three-digit occupations across the 1970-1980 census definitions. They have significantly less detail, however, and one would expect them to pick up less of the occupational wage structure change. While this seems to be somewhat true, the similarity of the results with the three-digit calculations is reassuring. We believe that the occupation results lend significant support to to our view that the recent increase in returns to skill have had significant effects on the black-white wage gap within education groups. This could not be revealed by the usual regression decomposition methods. These calculations imply that most of the slowdown in black-white convergence is attributable to changes in the rate of educational convergence, or observable quantities, and more importantly to the effects of a rising premium on education and other forms of skill. At the same time these results show that there has been a real slowdown in the occupational convergence between blacks and whites, suggesting that prices cannot be the whole story.

TABLE 4–9

BLACK-WHITE CONVERGENCE WITH THREE-DIGIT OCCUPATION
EFFECTS, 1970–1979 AND 1979–1987

Panel A. All Experience Levels

	(1) 1970–79	(2) 1979–87	Difference (1)–(2)
Total	1.38	−.27	1.65
	(.15)	(.19)	(.30)
Observables	1.11	−.25	1.36
	(.08)	(.09)	(.16)
Prices	.06	−.27	.33
	(.03)	(.04)	(.07)
Quantities	.76	.34	.42
	(.08)	(.10)	(.16)
Occupation prices	.11	−.18	.29
	(.04)	(.04)	(.07)
Occupation quantities	.18	−.14	.32
	(.05)	(.05)	(.09)
Gap	.29	−.03	.32
	(.15)	(.17)	(.28)
Gap + occupation quantities	.47	−.17	.64
	(.15)	(.17)	(.29)

Panel B. Experience Levels 1–10

	(1) 1970–79	(2) 1979–87	Difference (1)–(2)
Total	1.20	−.51	1.71
	(.24)	(.30)	(.48)
Observables	1.01	−.28	1.29
	(.21)	(.24)	(.39)
Prices	.14	−.37	.52
	(.04)	(.05)	(.09)
Quantities	.85	.36	.48
	(.16)	(.20)	(.32)
Occupation prices	.07	−.13	.20
	(.05)	(.06)	(.10)
Occupation quantities	−.05	−.14	.09
	(.08)	(.09)	(.16)
Gap	.19	−.23	.42
	(.23)	(.26)	(.43)
Gap + occupation quantities	.14	−.37	.51
	(.23)	(.27)	(.45)

SOURCE: Authors.

TABLE 4-10
BLACK-WHITE CONVERGENCE WITH ONE-DIGIT OCCUPATION
EFFECTS, 1970–1979 AND 1979–1987

Panel A. All Experience Levels

	(1) 1970–79	(2) 1979–87	Difference (1)–(2)
Total	1.38	−.27	1.65
	(.15)	(.19)	(.30)
Observables	1.12	−.10	1.22
	(.11)	(.12)	(.21)
Prices	.06	−.27	.33
	(.03)	(.04)	(.07)
Quantities	.76	.34	.42
	(.08)	(.10)	(.16)
Occupation prices	.13	−.10	.23
	(.03)	(.04)	(.05)
Occupation quantities	.17	−.07	.24
	(.04)	(.05)	(.08)
Gap	.25	−.17	.42
	(.16)	(.20)	(.32)
Gap + occupation	.42	−.24	.66
quantities	(.17)	(.19)	(.32)

Panel B. Experience Levels 1–10

	(1) 1970–79	(2) 1979–87	Difference (1)–(2)
Total	1.20	−.51	1.71
	(.24)	(.30)	(.48)
Observables	1.09	−.21	1.30
	(.21)	(.24)	(.41)
Prices	.14	−.37	.52
	(.04)	(.05)	(.09)
Quantities	.85	.36	.48
	(.16)	(.20)	(.32)
Occupation prices	.07	−.13	.20
	(.05)	(.06)	(.10)
Occupation quantities	−.05	−.14	.09
	(.08)	(.09)	(.16)
Gap	.19	−.23	.42
	(.23)	(.26)	(.43)
Gap + occupation	.14	−.37	.51
quantities	(.23)	(.27)	(.45)

SOURCE: Authors.

Conclusion

When relative wages are not constant among whites, the measurement of black economic progress is problematic. The selection of a particular segment of the white population to serve as the barometer of black progress has a direct bearing on results. Considering the large changes in the wage structure over the past decade and a half, this problem is particularly acute for the most recent period. Simply comparing raw averages for blacks and whites yields an enormous slowdown in black progress from the 1970s to the 1980s—1.65 percent per year. Controlling for observable changes in prices and quantities—that is, comparing blacks to whites with the same education and experience—lowers this slowdown by about 0.74 percentage points to 0.91 percent per year. If we compare wage growth for blacks with wage growth for whites with similar education and experience levels and similar initial wages, the slowdown falls further, to 0.80. Finally, if we compare the wages for blacks with the wages for less educated whites with the same earnings, thus controlling for differences in the quality of schooling, the slowdown is almost eliminated.

Which of these comparisons is valid depends crucially on the cause of the residual wage gap between whites and blacks. To the extent that it reflects only discrimination, the numbers after controlling for the observables provide the best estimate of the slowdown in true black progress. To the extent that it reflects a gap between whites and blacks in acquired skills such as education, one of the other estimates becomes more relevant. Even if the black-white wage gap has a large skill component, the type of skill differential and hence the relevant skill price must still be ascertained. To the extent that the skill gap reflects differences in the quality of schooling, as emphasized by research to date, a very large portion of the black-white slowdown can be attributed to the recent change in the market value of education. What is needed is further direct evidence concerning the size of the schooling quality gap and the way returns to schooling quality have changed within racial groups. Our analysis in this paper suggests that looking in that direction may be an excellent way to understand the slowdown in black-white convergence.

1963–1987: Supply and Demand Factors" (Harvard University, April 1990, mimeograph).

3. Juhn, Murphy, and Pierce, "Wage Inequality."

4. Katz and Murphy, "Changes in Relative Wages."

5. George J. Borjas, Richard B. Freeman, and Kevin Lang, "Undocumented Mexican-Born Workers in the United States: How Many and How Permanent" in J. Abowd and Richard B. Freeman, eds., *Immigration, Trade, and the Labor Market* (Chicago: University of Chicago Press and NBER, forthcoming).

6. George J. Borgas, Richard B. Freeman, and Lawrence F. Katz, "On the Labor Market Effects of Trade and Immigration" (Harvard University, January 1989, mimeograph).

7. Lawrence F. Katz and Ana L. Revenga, "Changes in the Structure of Wages: The United States vs. Japan," *Journal of the Japanese and International Economies*, vol. 3 (December 1989), pp. 522–53.

8. Mark Adams, Ruth Maybury, and William Smith, "Trends in the Distribution of Earnings, 1973 to 1986," *Employment Gazette*, vol. 96 (February 1988), pp. 75–82.

Chapter 4: Slowdown in Black-White Convergence,
Juhn, Murphy, and Pierce

1. See, for example, James P. Smith and Finis Welch, "Black-White Earnings and Employment: 1960–1970," *American Economic Review*, vol. 67 (June 1977), and Richard Freeman, "Black Economic Progress after 1964: Who Has Gained and Why?" in Sherwin Rosen, ed., *Studies in Labor Markets* (Chicago: University of Chicago Press, 1981), pp. 247–94.

2. Kevin M. Murphy and Finis Welch, "Wages Premiums for College Graduates: Recent Growth and Possible Explanations," *Educational Researcher* (May 1989), pp. 17–26.

3. Kevin M. Murphy and Finis Welch, "The Structure of Wages" (Paper presented at a meeting of the Population Association, Chicago, May 1987).

4. Chinhui Juhn, Kevin M. Murphy, and Brooks Pierce, "Wage Inequality and the Rise in Returns to Skill" (University of Chicago, Graduate School of Business, 1989).

5. For survey years 1964 through 1976, weeks worked are only available on a bracketed basis. We imputed means to these cells based on average weeks worked in each cell from the later sample years.

6. These cohorts are actually averages of five consecutive five-year cohorts. Since the weight on each cohort in the average stays fixed, however, the numbers can still be given a strict cohort interpretation.

7. The regressions include dummies for regions, as well as a quartic in experience fully interacted with education dummies for less than high school, high school graduates, some college and college graduates, and with linear education terms within the education categories.

8. As in the earlier table these calculations actually refer to five-year

averages so that 1965 is really the average of 1963–1967 and 1985 is really the average of 1983–1987.

9. The numbers for total convergence would seem to indicate that blacks gained more during the 1970s than during the 1960s. Such an interpretation, however, may not be correct. First, this difference is more than accounted for by the difference ($.82 = .76 - (-.06)$) in observable quantity convergence. Second, the majority of the quantity of skill convergence numbers is most likely a result of the change in sample composition from the first four years of data (1963 through 1967), which were generated at the University of Wisconsin, and the data from the public release tapes used in later years. Hence it is quite likely that the composition effects do not represent skill convergence for the U.S. population as a whole.

10. Here as in the observable decomposition presented in table 4–4, we actually chose a single base year (the average of all years). Hence year t in the formulas is actually a composite of all years in the sample.

11. Chinhui Juhn et al., "Wage Inequality."

12. See, for example, James P. Smith and Finis Welch, "Closing the Gap: Forty Years of Economic Progress for Blacks," Paper R-3330-DOL (RAND Corporation, Santa Monica, Calif., February 1986), and Finis Welch, "Black-White Earnings and Employment: 1960–1970," *American Economic Review*, vol. 67 (June 1977).

13. As we note below, the use of such a flexible functional form is actually critical in this case since the changes in education premiums have not been the same at all schooling levels. In particular the college–high school premium has risen much more than other education-based wage premiums.

14. The change in occupation codes from 1981 to 1982 in the Current Population Survey (CPS) prevented us from computing the fixed price or quantity change over this interval so that we had to interpolate this year. We chose to use the remaining years from 1979 through 1987 to estimate the average allocation between components over the period, and we assigned these to the 1981–1982 change using a regression. Provided the other years are representative of the 1981–1982 change, the interpolation should not yield misleading results. The similarity of these results with the one-digit results presented seems to suggest that the procedure worked well.

CHAPTER 5: ACHIEVEMENT, TEST SCORES, AND WAGES, *John Bishop*

1. Iowa Test of Educational Development composite scores of eleventh-grade students in Iowa declined from 18.9 in 1965 to 16.8 in 1977 and then rose to 19.2 in 1989. Composite scores for twelfth graders fell from 20.8 in 1966 to 18.4 in 1979 and then rose to 20.2 in 1989. During the 1970s and 1980s, twelfth-grade scores on the ITED composite averaged about 5.5 points higher than ninth-grade scores, implying that a grade-level equivalent was roughly equal to 1.835 points. Consequently in terms of grade-level equivalents the decline was 1.31 for seniors and 1.14 for juniors. Data on ITED trends were provided by Robert Forsyth of the Iowa Testing Program.