Chapter 9

WHY HAS BLACK–WHITE SKILL CONVERGENCE STOPPED?

DEREK NEAL
University of Chicago and NBER

Contents

Handbook of the Economics of Education, Volume 1
Edited by Eric A. Hanushek and Finis Welch

DOI: 10.1016/S1574-0692(06)01009-9

Abstract

All data sources indicate that black–white skill gaps diminished over most of the 20th century, but black–white skill gaps as measured by test scores among youth and educational attainment among young adults have remained constant or increased in absolute value since the late 1980s. I examine the potential importance of discrimination against skilled black workers, changes in black family structures, changes in black household incomes, black–white differences in parenting norms, and education policy as factors that may contribute to the recent stability of black–white skill gaps. Absent changes in public policy or the economy that facilitate investment in black children, best case scenarios suggest that even approximate black–white skill parity is not possible before 2050, and equally plausible scenarios imply that the black–white skill gap will remain quite significant throughout the 21st century.

Keywords

basic skills, black–white differences, convergence

JEL classification: I20, J15, J20

1. Introduction

Four decades after the adoption of civil rights laws that prohibit racial discrimination by employers in hiring, pay, and promotion practices, black–white differences in standards of living remain a fact of life in the United States. These differences fuel much public debate about the government's role in regulating the labor market, the effects of alternative means of financing and governing public schools, procedures that determine admission to institutions of higher education, and other policies that affect the distribution of income and opportunity. In this chapter, I do not explore all factors that contribute to observed black–white differences in employment rates or incomes. Instead, I focus on black–white differences in skill and how these differences have changed over time.

According to all available measures, blacks are less skilled than whites. Black adults of all ages report less completed schooling than their white counterparts. Black youth and adults also score lower than their white counterparts on numerous tests that measure cognitive function and academic achievement, and this is true even among students or adults with the same level of completed schooling. In modern economies, most wealth takes the form of human capital, which consists of the knowledge, skills, and abilities that determine the productive capacities of individual workers. Long before cohorts of young persons reach adulthood, significant black–white skill gaps emerge, and these gaps are an important determinant of black–white differences in lifetime earnings. Thus, as long as one assumes that large scale redistribution from white to black Americans is not politically feasible, one must conclude that closing the black–white skill gap is a necessary although possibly not sufficient condition for economic equality between blacks and whites in the United States.

Section two of this chapter documents the evolution of black–white gaps in completed schooling and measured skill over the past four decades and highlights several patterns in the data. To begin, all data sources indicate that overall black–white skill gaps have diminished over time. A large literature documents the progress made throughout most of the previous century in closing black–white gaps in schooling attainment, and more recent data show a dramatic closing of the black–white test score gap during the 1970s and 1980s. Existing trends in 1990 suggested that successive generations of black children were making steady progress toward approximate skill parity with white children. However, during the 1990s, black–white skill gaps as measured by test scores among youth and educational attainment among young adults remained constant or increased in absolute value. Further, there is evidence that black youth in large cities actually lost significant ground relative to white students during much of the 1980s and 1990s. Data on employment rates and incarceration rates also indicate that, since 1980, the number of young black men who spend more time interacting with corrections officials than employers has grown at an alarming rate.

To date, much of the literature on the black–white skill gap explores the determinants of past improvements in relative achievement and attainment among blacks, but recent developments challenge scholars to think carefully about why the black–white skill gap remains so large and why many black youth may have actually fallen farther behind

their white peers during the past fifteen years or more. In section three, I argue that low skill levels among black youth cannot be easily understood as a rational response to labor discrimination against skilled black adults. In recent decades, estimated gains from investments in education and skills have almost always been greater among blacks adults than among whites. This pattern is most striking in data on employment rates and total labor market earnings.

Having shown that black youth can expect significant returns from skill investments, I turn in section four to the determinants of investments in children and the intergenerational transmission of human capital. Standard models clearly indicate that current wealth differences between black and white parents do contribute directly to current black–white skill gaps among youth, and shocks to the wage structure in recent decades may have lowered wealth among black families. However, the effects of these shocks or other temporary negative shocks to black families and communities cannot cause black–white skill gaps to remain at current levels indefinitely. Given the stability of black–white skill gaps since 1990, I explore the possibility that more persistent barriers to skill development among black youth may exist. I deal explicitly with the ways that education policies may impede black progress, and I also examine the potential role of norms concerning academic achievement within black families and communities.

The concluding section looks forward. It is possible to form estimates of future black–white skill gaps by using existing data to calibrate rates of skill convergence between black and white youth. Results based on convergence rates that represent best case scenarios for black youth suggest that even approximate black–white skill parity is not possible before 2050, and equally plausible scenarios imply that the black–white skill gap will remain quite significant throughout the 21st century. Absent changes in public policy or shocks to the economy that facilitate investment in black children, there is little reason to be optimistic about the future pace of black–white skill convergence. I close by discussing the possibility that early childhood interventions among disadvantaged children may be an important policy tool for closing the black–white skill gap earlier rather than later in the 21st century.

2. Trends in measures of the black–white skill gap

At the dawn of the 20th century, the educational attainment of blacks lagged well behind that of whites for many reasons. In the antebellum period, the vast majority of blacks were slaves who had almost no access to formal schooling. Thus, blacks began the post-war period with low adult levels of education. Further, most blacks lived in the South, and the South lagged behind the rest of the nation in providing education. Even whites in the South attended schools that received fewer resources than schools in the rest of the country, and after reconstruction, the disenfranchisement of blacks and the resulting segregationist policies regarding the provision of public schooling guaranteed that blacks in the South only had access to schools that were worse yet than the substandard schools that their white neighbors attended. There is little evidence that blacks

born during the period from the end of reconstruction through the first decade of the twentieth century made any attainment gains relative to their white counterparts, and Collins and Margo (2003) report that, among those born in the South between 1905 and 1909, the average final attainment of six years among blacks fell three years below the average white attainment. The corresponding attainment gap for the nation as a whole was almost 3.5 years.[1]

For subsequent birth cohorts, the story is different. A large existing literature documents how successive cohorts of black young adults born after the first decade of the twentieth century obtained higher and higher schooling levels relative to whites. In another chapter in this Handbook, Collins and Margo document these trends and discuss their causes. Collins and Margo focus on the period before 1960. In their seminal work on black progress during the 20th century, Smith and Welch (1989) employ data from the period 1940–1980. Here, I present results based on data from the 1960–2000 census files. The rows of Table 1 give birth years, the columns give age groups, and each diagonal row running from lower left to upper right contains results from a particular census. The top diagonal row contains data from 1960. The bottom such row presents data from the 2000 census.

Table 1 shows that, during the 1980s, the black–white attainment gap continued to narrow at a pace that one might expect given the experience of previous decades. Among men ages 26–30, the black–white education gap fell from roughly one year to about two thirds of a year between 1980 and 1990, and this change is simply an extension of the 1960–1980 trends in relative attainment. Starting in 1990 and going back to 1960, the black–white education gap among men 26–30 is always two thirds of the corresponding gap in the previous decade. The rate of convergence among women is not quite as rapid over this period, but the initial gap in 1960 was not nearly as large. Black women made steady gains in attainment relative to white women over the entire period, and by 1990 the black–white attainment gap among young adult women was just under one half of a year of schooling. The results in Table 1 combined with those in Smith (1984) and Smith and Welch (1989) indicate that each decade from 1940 through 1990 brought a decline in the measured black–white attainment gap for both men and women at all ages, and in 1990, the overall black–white gap in years of attainment among young adults ages 26–30 represented less than 5 percent of the average schooling level among whites.[2]

However, this trend toward black–white parity in attainment stops in 1990. Among men and women ages 26–30 in 2000, the black–white educational attainment gap is slightly larger than the corresponding gap in 1990. Similar results hold for men and women ages 31–35.[3] In terms of school cohorts, the black–white gap in educational

[1] Smith and Welch (1989) report an even larger black–white attainment gap for this cohort. The Smith and Welch number of 3.9 is larger because they report results for males only.

[2] The gaps in 1960–1980 are larger in Smith and Welch. The differences result because the census changed the coding of education in 1990, and in order to make results comparable over the entire 1960–2000 period, I adopted a less disaggregate coding scheme for education.

[3] These changes are small, but given the large samples sizes in the census files, they are statistically significant among women.

Table 1
Black–white differences in average education

Men

Year of birth	Age				
	26–30	31–35	36–40	41–45	46–50
1910–1914					−3.13
1915–1920				−3.03	
1920–1924			−2.81		−2.60
1925–1929		−2.48		−2.30	
1930–1934	−2.26		−1.95		−1.81
1935–1939		−1.71		−1.53	
1940–1944	−1.50		−1.38		−1.29
1945–1949		−1.21		−1.29	
1950–1954	−0.99		−0.97		−1.10
1955–1959		−0.76		−0.84	
1960–1964	−0.66		−0.76		
1965–1969		−0.81			
1970–1974	−0.72				

Notes: Data are from the decennial census IPUMS. Mean education for whites 26–30 years old was 11.6 in the 1960 census, 12.5 in the 1970 census, 13.3 in the 1980 census, 13.1 in the 1990 census and 13.6 in the 2000 census. The IPUMS variables used for constructing years of schooling are "higraded" for 1960, 1970 and 1980 and "educ99" for 1990 and 2000. Individuals with allocated age, sex, race or education have been dropped from the sample. Sample weights "perwt" are used for year 2000.

Women

Year of birth	Age				
	26–30	31–35	36–40	41–45	46–50
1910–1914					−2.53
1915–1920				−2.25	
1920–1924			−2.04		−2.00
1925–1929		−1.68		−1.54	
1930–1934	−1.46		−1.21		−1.06
1935–1939		−1.07		−0.80	
1940–1944	−1.06		−0.72		−0.73
1945–1949		−0.68		−0.65	
1950–1954	−0.64		−0.64		−0.71
1955–1959		−0.47		−0.63	
1960–1964	−0.45		−0.59		
1965–1969		−0.64			
1970–1974	−0.62				

Notes: Data are from the decennial census IPUMS 1960–2000. Mean education for whites 26–30 years old was 11.3 in the 1960 census, 12.1 in the 1970 census, 13.0 in the 1980 census, 13.3 in the 1990 census and 13.9 in the 2000 census. The IPUMS variables used for constructing years of schooling are "higraded" for 1960, 1970 and 1980 and "educ99" for 1990 and 2000. Individuals with allocated age, sex, race or education have been dropped from the sample. Sample weights "perwt" are used for year 2000.

Appendix Table 1
Average years of schooling and black–white education gaps

Men

Year	Dataset	Age														
		26–30			31–35			36–40			41–45			46–50		
		black	white	gap	black	white	gap	black	white	gap	black	white	gap	black	white	gap
1990	CPS	12.58	13.03	−0.45	12.55	13.28	−0.73	12.85	13.58	−0.73	12.41	13.60	−1.19	11.80	13.10	−1.30
	Census	12.47	13.13	−0.66	12.56	13.33	−0.77	12.66	13.64	−0.98	12.40	13.68	−1.28	11.94	13.23	−1.29
2000	CPS	13.12	13.43	−0.31	13.14	13.52	−0.38	13.10	13.39	−0.29	12.93	13.55	−0.62	13.09	13.83	−0.74
	Census	12.88	13.59	−0.71	12.83	13.64	−0.81	12.83	13.59	−0.76	12.84	13.68	−0.84	12.84	13.95	−1.11
	ACS	12.88	13.47	−0.59	13.13	13.50	−0.37	12.89	13.53	−0.64	12.99	13.57	−0.58	12.94	13.90	−0.96
2001	CPS	13.09	13.44	−0.35	13.07	13.56	−0.49	13.03	13.41	−0.38	12.85	13.55	−0.70	13.09	13.76	−0.67
	ACS	13.03	13.45	−0.42	13.12	13.58	−0.46	12.89	13.53	−0.64	12.92	13.56	−0.64	12.93	13.84	−0.91

Women

Year	Dataset	Age														
		26–30			31–35			36–40			41–45			46–50		
		black	white	gap	black	white	gap	black	white	gap	black	white	gap	black	white	gap
1990	CPS	12.65	13.18	−0.53	12.92	13.26	−0.34	12.76	13.38	−0.62	12.28	13.14	−0.86	11.95	12.74	−0.79
	Census	12.82	13.27	−0.45	12.88	13.35	−0.47	12.85	13.50	−0.65	12.63	13.28	−0.65	12.12	12.85	−0.73
2000	CPS	13.35	13.72	−0.37	13.25	13.64	−0.39	13.32	13.50	−0.18	13.23	13.57	−0.34	13.10	13.70	−0.60
	Census	13.30	13.92	−0.62	13.20	13.84	−0.64	13.17	13.75	−0.58	13.16	13.79	−0.63	13.14	13.85	−0.71
	ACS	13.30	13.80	−0.50	13.15	13.74	−0.59	13.16	13.64	−0.48	12.95	13.70	−0.75	13.04	13.80	−0.76
2001	CPS	13.31	13.77	−0.46	13.45	13.72	−0.27	13.19	13.63	−0.44	13.10	13.55	−0.45	13.24	13.78	−0.54
	ACS	13.31	13.79	−0.48	13.19	13.82	−0.63	13.14	13.68	−0.54	13.14	13.68	−0.54	13.06	13.77	−0.71

Notes: This table compares average years of schooling and black–white gaps across three datasets: CPS, Census and ACS. The calculations use sample weights for ACS, CPS and Census 2000. Individuals with allocated age, sex, race or education have been dropped from the samples. Entries for the black–white gaps using Census data may differ from Table 1 because of rounding. Table 1 calculates black–white gaps rounding to the nearest hundredth while this appendix table rounds average years of schooling and then calculates the black–white gap.

attainment may have stopped closing and even begun to widen with the cohorts of children who began their schooling during the late 1960s and early 1970s. I have examined educational attainment by individual birth cohorts over the period 1960 to 1974. Regardless of gender, the black–white attainment gaps for those born after 1965 are almost always slightly greater than the attainment gaps associated with birth cohorts from the early 60s.

Because the black–white attainment gap also increases between 1990 and 2000 within several birth cohorts who reached adulthood before 1990, i.e., as one moves along rows in the table, there is some concern that the increase in black–white attainment gaps observed among the most recent cohort of young adults may, in part, reflect a change in sampling procedures between 1990 and 2000. To provide more information about trends in black–white attainment gaps during the 1990s, I have also examined education gaps in the March Current Population Surveys and the American Community Surveys. Appendix Table 1 describes the results. These surveys are not exactly comparable to census files because the CPS does not include persons in the military or in institutional quarters, and the ACS does not include persons in institutions. The ACS did not exist in 1990, but the 1990 March CPS and 1990 Census provide similar estimates of black–white attainment gaps. Thus it is somewhat surprising that, in contrast to the census results reported in Table 1, a comparison of results from the March 2000 and March 1990 CPS files indicates that three of four black–white education gaps among men and women in the 26–30 and 31–35 age groups grew smaller in absolute value over the 1990s. At the same time, the CPS files are much smaller than the census files, and none of these changes is statistically significant.

While the CPS results provide some suggestion that young black adults continued to close the black–white attainment gap during the 1990s, the balance of the evidence indicates that the attainment gap remained constant at best during the 1990s. The case for convergence during the 1990s is strongest among men ages 31–35. Here, the ACS 2000 and 2001 results are clearly more in line with the CPS results than the census numbers. However, the 2000 ACS results for men ages 26–30 are quite consistent with the 2000 census results.[4] Further, among young adult women, black–white education gaps in the 2000 census, the 2000 ACS, and the 2001 ACS are always larger in absolute value than corresponding gaps taken from either the 2000 or 2001 March CPS files. In fact, among women ages 26–35, black–white education gaps in the 2000 census, 2000 ACS and 2001 ACS are always larger than the corresponding gaps in the 1990 census, implying that young adult black women in 2000 were no closer to educational parity with white women than were their predecessors in 1990.

[4] In 2001, the implied black–white attainment gap among men ages 26–30 is larger in the ACS than the CPS but still smaller than the gap implied by the 2000 census data. To compare census and ACS results directly, one must adjust the census numbers by removing the institutionalized population. The prison population grew substantially over the 1990s, especially among black men. Black–white education gaps among men ages 26–35 in the 2000 census are almost 0.1 smaller in absolute value when men living in institutions are not included in the sample.

In sum, Table 1 provides significant but not definitive evidence that black–white convergence in educational attainment stopped during the 1990s. One can have more confidence that convergence in relative attainment actually stopped if other measures of attainment tell a similar story. Next, I present results concerning how black–white differences in rates of graduating from high school and college have evolved over recent decades.

Although cohorts born in the late seventies or the eighties have not completed their schooling, one can compare high school graduation rates for cohorts born in the early 1960s to those of cohorts born in the early 1980s by examining data from the National Longitudinal Surveys of Youth. Table 2a gives high school graduation rates by age and birth cohort for samples taken from the National Longitudinal Surveys of Youth, NLSY79 and NLSY97. The NLSY79 provides panel data on persons born between 1957 and 1964. The NLSY97 provides panel data on persons born between 1980 and 1984. Using recent data from the NLSY97, I compute the fraction of people born in 1980 or 1981 who graduated from high school by the date of their 19th, 20th, or 21st birthdays. I calculate the corresponding graduation rates for all the NLSY79 cohorts, and in addition, I calculate the number who graduate high school by age 30.

Each cell in Table 2a contains two graduation rates. The top number is a graduation rate based on the number of persons with regular high school diplomas. The bottom number includes as graduates those persons who receive a high school equivalency credential by passing the General Educational Development (GED) test. For the moment, focus on the results concerning regular diplomas. The numbers are averages for people born in adjacent birth cohorts who share the same race and gender. There is no evidence that black men born in the early 1980s were generally more likely to graduate high school than black men born in the late 1950s and early 1960s. Among black men born in 1980–1981, 62 percent graduate from high school by their 21st birthday. This graduation rate is lower than corresponding rates for three of the four pairs of adjacent birth cohorts taken from the NLSY79. In contrast, the 82 percent graduation rate among white males born in 1980–1981 is higher than three of the four graduation rates associated with the NLSY79 cohorts of white males. The rate among white males born in 1957–1958 is 0.83, but the graduation rates for cohorts born in 1959–1964 are all below 0.80. The overall comparison of the NLSY79 and NLSY97 results indicates that, among men, there may have been no net closing of the black–white gap in high school graduation rates over roughly two decades of cohorts born between 1960 and 1980, although black–white differences in graduation rates do diminish over the cohorts born in the late 1950s and early 1960s, in large part because white graduation rates decline over this period. The time pattern of black–white gaps in graduation rates is consistent with the results in Table 1 concerning final attainment gaps. The black–white attainment gap among men reached a historic low among those born in the early 1960s and appears to remain constant or widen slightly among later cohorts.

The results for women in Table 2a are quite similar. Although high school graduation rates for those born in 1980–1981 are higher than rates for birth cohorts from the late 50s and early 60s regardless of race, the improvement in graduation rates since the early

Table 2a
High school graduation rates by age, gender and race. Actual graduation rates (top line, bold), high school diplomas and GED (bottom line)

	Year of birth	Men				Women			
		19	20	21	30	19	20	21	30
Whites	1957–1958	**0.75**	**0.81**	**0.83**	**0.84**	**0.80**	**0.83**	**0.84**	**0.85**
		0.77	0.84	0.85	0.89	0.82	0.86	0.87	0.91
	1959–1960	**0.69**	**0.78**	**0.79**	**0.79**	**0.79**	**0.81**	**0.81**	**0.83**
		0.71	0.81	0.83	0.86	0.81	0.85	0.86	0.90
	1961–1962	**0.69**	**0.74**	**0.75**	**0.75**	**0.74**	**0.79**	**0.79**	**0.79**
		0.73	0.79	0.81	0.84	0.78	0.83	0.84	0.89
	1963–1964	**0.66**	**0.72**	**0.72**	**0.74**	**0.74**	**0.78**	**0.78**	**0.78**
		0.71	0.78	0.79	0.85	0.79	0.83	0.84	0.88
	1980–1981	**0.67**	**0.78**	**0.82**		**0.76**	**0.85**	**0.88**	
		0.71	0.84	0.86		0.78	0.87	0.91	
Blacks	1957–1958	**0.51**	**0.61**	**0.65**	**0.66**	**0.64**	**0.74**	**0.75**	**0.77**
		0.55	0.66	0.71	0.74	0.67	0.78	0.80	0.86
	1959–1960	**0.48**	**0.62**	**0.67**	**0.68**	**0.62**	**0.70**	**0.70**	**0.72**
		0.50	0.67	0.72	0.79	0.66	0.74	0.76	0.82
	1961–1962	**0.50**	**0.61**	**0.61**	**0.63**	**0.69**	**0.76**	**0.76**	**0.77**
		0.56	0.68	0.71	0.80	0.71	0.79	0.80	0.85
	1963–1964	**0.53**	**0.64**	**0.67**	**0.68**	**0.66**	**0.72**	**0.73**	**0.74**
		0.59	0.72	0.76	0.83	0.68	0.77	0.78	0.84
	1980–1981	**0.43**	**0.56**	**0.62**		**0.66**	**0.76**	**0.78**	
		0.47	0.62	0.70		0.69	0.79	0.81	

Notes: Data are from NLSY 1979 and NLSY 1997. Only individuals who were observed after the age of interest are included. Individuals with coding errors for the age variable have been dropped from the sample.

Table 2b
College graduation rates by gender and race – ages 26–35

	Women			Men		
	Black	White	Ratio	Black	White	Ratio
1960	4.45	7.74	1.74	4.05	16.08	3.97
1970	5.30	12.04	2.27	5.38	20.27	3.77
1980	11.73	21.30	1.82	12.23	29.08	2.38
1990	13.41	23.50	1.75	11.48	24.50	2.13
2000	17.90	32.75	1.83	13.91	30.22	2.17

Notes: Data are from the decennial census IPUMS 1960–2000. The variable used for constructing college graduation rates is "educrec". Individuals with allocated age, sex, race or education have been dropped from the sample. Sample weights "perwt" are used for year 2000.

1960s is slightly greater among white females, and thus the black–white gap in graduation rates is slightly greater among those born in 1980–1981 than among those born in the 1961–1964 period. Table 1 indicates that the black–white gap in attainment among women declined to roughly 0.45 of one year of schooling for women born between 1955 and 1964 and then widened slightly among later cohorts.

Table 2a also provides a cautionary tale concerning the measurement of educational attainment. Data from the NLSY79 cohorts show that a notable number of those who receive a high school diploma by age 30 are GED recipients who never graduated from a particular high school. Among both black and white men in NLSY79, the rate of GED receipt was higher among later birth cohorts, and over 15 percent of all black men born between 1961 and 1964 received a GED. The corresponding figure for white men is around 10 percent. Table 2a shows that, within the NLSY79 cohort, most high school credentials received after a respondent's 21st birthday are GEDs. Because census data do not distinguish between GEDs and regular diplomas, educational attainment data from census files do not capture the true magnitude of black–white differences in actual graduation rates.[5]

Table 1 presents overall attainment gaps, and Table 2a explores differences in high school graduation rates. Another important marker of education attainment is college graduation. Table 2b presents college graduation rates among men and women ages 26–35 in each census year from 1960 through 2000. The final column in each panel presents ratios of these race-specific graduation rates (white to black). In 1960, the white graduation rate for men was almost four times greater than the corresponding rate for blacks. This ratio falls to 2.13 by 1990, but increases slightly between 1990 and 2000 to 2.17. College graduation rates for white women were quite low in 1960. Thus, the time trend in the ratio of white to black graduation rates among women before 1990 is not nearly as dramatic. Nonetheless, in the 1990s, graduation rates did not increase as rapidly among young black women as among young white women.[6]

In sum, data on attainment gaps as well as trends in high school and college graduation rates suggest that, among both men and women, the dramatic black–white convergence in attainment that began with cohorts born around 1910 came to a halt just over 50 years later. The attainment outcomes among blacks born in the late 1960s and early 1970s as well as the high school graduation rates of those born in the early 1980s may reflect only a pause in the long-term process of black–white convergence in attainment, but this pause is noteworthy because it is a clear departure from the trend toward black–white parity in attainment that dominated most of the 20th century. It is ironic that the cohorts of black youth born immediately after the passage of the Civil Rights

[5] See Cameron and Heckman (1993) for differences in outcomes between GED and regular diploma recipients.

[6] The 2000 Census and 2000 March CPS provide fairly comparable estimates of race-specific college graduation rates for young adults. The same is true in 1990. Neither data series indicates that young black adults closed the black–white gap in college graduation rates during the 1990s.

Act of 1964 did not add to previous decades of progress toward racial equality in educational attainment. However, the next section demonstrates that the cohorts born in the late 1960s and the 1970s did participate in a dramatic narrowing of the black–white test score gap.

2.1. Achievement gaps

Years of schooling is an indirect measure of human capital. It provides an accounting of time devoted to acquiring skills through formal schooling. However, schools differ in curricula, and some schools facilitate learning more effectively than others. Further, even within the same school, some children learn faster than others, and these differences reflect more than simple differences in individual aptitudes. Children differ greatly in the extent to which adults direct their activities outside school toward learning. Thus, for many reasons, persons who reach the same level of educational attainment may have significantly different skill sets.

In this section, I review existing data on black–white differences in test scores, and I focus on tests that measure basic math and reading skills among children and teenagers. These basic skills provide the foundation for acquiring new skills as an adult both in the work place and in institutions of higher education. Table 3 presents statistics based on the data found in the National Assessment of Education Progress – Long Term Trend study (NAEP-LTT). The NAEP-LTT is a series of nationwide assessments in reading, math, and science. The tests have been given periodically since 1971 to students who are in school and age 9, 13, or 17. These assessments maintain a consistent testing framework and are designed to measure trends in achievement over time. Here, I do not employ data from the tests for the age 17 sample. The assessments of 17 year old students provide a select sample of scores because the NAEP-LTT first samples schools and then samples enrolled students within schools. All 17 year old dropouts are therefore not eligible for testing. Because drop out rates are not the same for blacks and whites, these data are not ideal for inferences concerning black–white achievement differences among 17 year old students. In addition, compared to the age 9 and 13 assessments, response rates are significantly lower in the 17 year old samples.

Table 3 presents test score gaps for students who share a common age and birth cohort. To determine the year that a particular test was given simply sum the appropriate row and column labels. Each entry is the black–white test score gap for a particular birth cohort in a given subject at a given age. The score gaps are normalized by the population standard deviation on the particular assessment in question. The sample standard deviations on these tests vary from year to year, and although standard deviations tend to be higher in the early assessments, there is no trend in the standard deviation of scores over most of the period.[7] The NAEP-LTT reveal significant test score gaps at both ages,

[7] The score gaps from the 1973 math assessments are normalized by the standard deviations from the 1978 assessments because I cannot find a report containing the 1973 standard deviations.

Table 3
Black–white math and reading score gaps in NAEP. Entries are black–white gaps in mean scores expressed in standard deviation units

	Reading		Math	
Cohort/age	9	13	9	13
1958		−1.08		
1960				−1.18
1962	−1.04	−1.02		
1964			−0.97	
1965				−1.08
1966	−0.92			
1967		−0.91		
1969			−0.88	−1.02
1971	−0.84	−0.74		
1973			−0.84	−0.79
1975	−0.79	−0.53		
1977		−0.58	−0.74	−0.87
1979	−0.71	−0.73		−0.93
1981	−0.79	−0.77	−0.81	−0.90
1983	−0.83	−0.82	−0.82	−0.92
1985	−0.80		−0.74	
1986		−0.74		−0.98
1987	−0.74		−0.75	
1990	−0.91		−0.82	

Notes: Data are from 1999 NAEP Long-Term Trend Summary Data Tables. Entries are calculated as the score gap divided by the overall standard deviation for the corresponding test year. The standard deviations for the 1973 age 9 and age 13 math tests are not available, and therefore the standard deviations of the 1978 math tests are used instead.

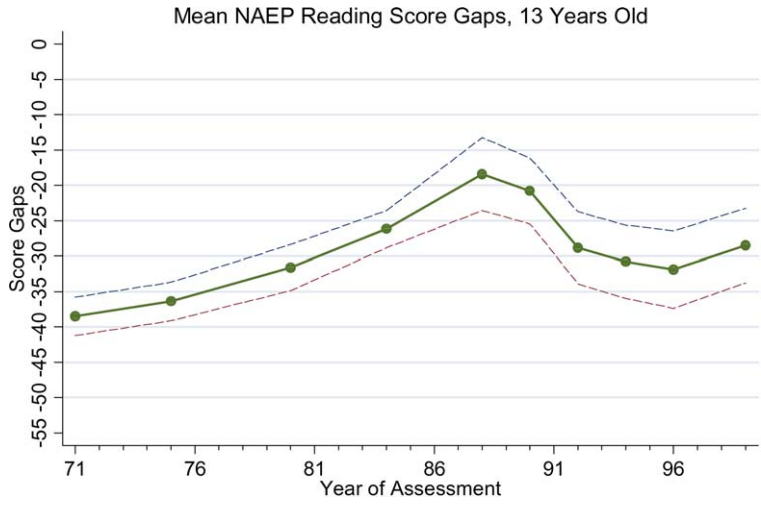
for both subjects, and among all birth cohorts. Black–white test score gaps are always greater than 0.5 standard deviations and several are roughly a full standard deviation or more.

The previous section shows that the black–white gap in final educational attainment did not continue to close among cohorts born after 1965. However, black children born in the 1970s did perform better relative to white children on both math and reading tests than black children born in previous cohorts. In terms of birth cohorts, black–white test score convergence proceeds at a steady rate until the mid to late 1970s. In terms of assessment dates, the relative test scores of black children improve among both nine and thirteen years old students from the early 1970s until the late 1980s. Appendix Table 2 provides more details concerning time trends in achievement by race. From the late 1970s through the late 1980s, black children made striking gains in achievement while scores for white children remained relatively flat. The most dramatic changes occurred in the 13 year old sample. Figures 1(a) and (b) plot black–white test score gaps in the

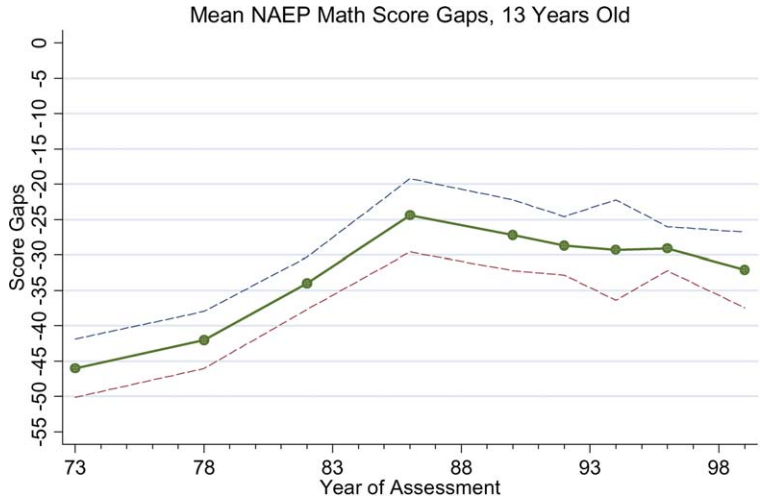
Appendix Table 2
NAEP test scores (standard errors in parenthesis, standard deviations in brackets)

Year	Math scores				Year	Reading scores			
	9 year-olds		13 year-olds			9 year-olds		13 year-olds	
	White	Black	White	Black		White	Black	White	Black
73	225 (1.0)	190 (1.8)	274 (0.9)	228 (1.9)	71	214 (0.9)	170 (1.7)	261 (0.7)	222 (1.2)
	–	–	–	–		[39.4]	[38.3]	[32.9]	[33.5]
78	224 (0.9)	192 (1.1)	272 (0.8)	230 (1.9)	75	217 (0.7)	181 (1.2)	262 (0.7)	226 (1.2)
	[34]	[34.5]	[35.7]	[36]		[36.1]	[35.8]	[32.9]	[34.9]
82	224 (1.1)	195 (1.6)	274 (1.0)	240 (1.6)	80	221 (0.8)	189 (1.8)	264 (0.7)	233 (1.5)
	[32.8]	[33.7]	[31]	[31]		[35.2]	[37.6]	[32.7]	[32.7]
86	227 (1.1)	202 (1.6)	274 (1.3)	249 (2.3)	84	218 (0.9)	186 (1.4)	263 (0.6)	236 (1.2)
	[32.6]	[31.7]	[29.4]	[28.3]		[38.8]	[38.9]	[33.8]	[34.1]
90	235 (0.8)	208 (2.2)	276 (1.1)	249 (2.3)	88	218 (1.4)	189 (2.4)	261 (1.1)	243 (2.4)
	[31.2]	[31.5]	[29]	[28.7]		[39.3]	[39.4]	[33.9]	[32.1]
92	235 (0.8)	208 (2.0)	279 (0.9)	250 (1.9)	90	217 (1.3)	182 (2.9)	262 (0.9)	242 (2.2)
	[31]	[31.8]	[28.5]	[30.1]		[42.9]	[41.7]	[34.5]	[35.3]
94	237 (1.0)	212 (1.6)	281 (0.9)	252 (3.5)	92	218 (1.0)	185 (2.2)	266 (1.2)	238 (2.3)
	[31.4]	[30.8]	[29.8]	[31.5]		[37.5]	[39.8]	[36.6]	[39.8]
96	237 (1.0)	212 (1.4)	281 (0.9)	252 (1.3)	94	218 (1.3)	185 (2.3)	265 (1.1)	234 (2.4)
	[32.4]	[31.1]	[28.7]	[29.5]		[37.4]	[40.6]	[37.5]	[38]
99	239 (0.9)	211 (1.6)	283 (0.8)	251 (2.6)	96	220 (1.2)	191 (2.6)	266 (1.0)	234 (2.6)
	[31.8]	[33]	[30.3]	[28.8]		[36.5]	[38.6]	[36.5]	[36.4]
					99	221 (1.6)	186 (2.3)	267 (1.2)	238 (2.4)
						[35.6]	[37.9]	[36.6]	[37.6]

Notes: The table displays average NAEP scores and standard deviations for math and reading tests, ages nine and thirteen. Data are taken from the 1999 NAEP Long-Term Trend Summary Data Tables.



(a)



(b)

Figure 1. Data are from the 1999 NAEP Long-Term Trend. Dashed lines are 95% confidence intervals.

age 13 NAEP-LTT by assessment date. The relative gains in math and reading between the early 1970s and the late 1980s are large by any metric.

However, Table 3 and Figures 1(a) and (b) show that black–white test score gaps among 9 and 13 year old students stopped closing in the late 1980s. Since then, black test scores have shown little improvement in levels, and black–white test score gaps have either remained constant or increased modestly. Some may be tempted to draw

significance from the fact that, as shown in Table 1, the 1990s are also the first decade in which census data record no further closing and possibly an increase in the black–white attainment gap among young adults. However, it is not clear exactly how the trends in Tables 1, 2b and 3 are related. Most adults between 26 and 35 in the 2000 census were born more than a decade before the cohorts of children who took NAEP-LTT tests during the late 1980s and throughout the 1990s. On the other hand, given the constraints of mandatory schooling laws, the majority of adults ages 26–35 in the 2000 census made decisions that determined their final educational attainments during the late 1980s or the 1990s. It is possible that a shock common to many black communities occurred during this period that both restrained educational attainment among young adults and harmed the development of math and reading skills among youth during the coming decade. In Section 4, I discuss changes in family income and family structure that may in part reflect changes in the wage structure that hurt less skilled workers during the 1980s. I also discuss recent work by Fryer et al. (2004) that documents how the crack epidemic ravaged urban black communities during the late 1980s and early 1990s. However, before turning to possible explanations for the time series of black–white attainment and test score gaps documented in the census files and the NAEP-LTT, I present results from other data sets concerning changes in black–white test score gaps over time.

2.2. *Evidence from other test data*

The NAEP-LTT is one of the few data sources that provides test scores for a nationally representative sample of persons sharing the same age.[8] Most data sets containing test scores provide samples of students, often high school students, who are enrolled in a particular grade at a point in time. However, the NLSY79 and NLSY97 do provide test scores for samples of students defined by birth cohort who took comparable tests almost twenty years apart. These data provide an excellent opportunity to determine whether or not the patterns observed in the NAEP-LTT data concerning black–white progress over the birth cohorts of the 1960s and 1970s hold given different tests of reading and math skills.

In 1980, the Department of Defense used the NLSY79 sample to construct a national distribution of scores for the Armed Services Vocational Aptitude Battery (ASVAB). The ASVAB contains 10 tests. Many are designed to measure aptitude for special military vocations. The Armed Forces Qualifying Test (AFQT) is a composite of four ASVAB tests that cover basic reading and math skills. The military uses AFQT scores as proxies for general aptitude in learning military jobs. Extensive evaluations of the AFQT show that it does help predict future measured performance on military jobs and

[8] The improvement of test scores among black children during the 1970s and 1980s is well documented. See Hedges and Nowell (1998) for analyses of relative gains in black achievement during this period that also include results from samples drawn based on grade of attendance.

Table 4
Black–white test score gaps

Year and age	Boys			Girls			Full sample		
	Reading	Math	Composite	Reading	Math	Composite	Reading	Math	Composite
1979									
13–14									
15–17	−1.15	−0.94	−1.11	−1.17	−0.96	−1.14	−1.16	−0.95	−1.13
1997									
13–14	−0.87	−0.90	−0.93	−0.69	−0.79	−0.78	−0.78	−0.84	−0.85
15–17	−0.87	−0.82	−0.89	−0.96	−0.92	−0.99	−0.91	−0.87	−0.94

Notes: Data are from NLSY 1979 and NLSY 1997. Test scores have been transformed into deviations from the average score among persons born in the same two-month interval and standardized so that one unit equals one standard deviation in the distribution of scores for persons of the same birth cohort and gender.

that it is not racially biased. Relationships between AFQT and post-training assessments are quite similar for black and white recruits.[9] The Defense Department gave a computer assisted version of the ASVAB to NLSY97 respondents during the fall of 1997 and early 1998. The NLSY79 follows respondents born between 1957 and 1964. The NLSY97 includes respondents born between 1980 and 1984.

Table 4 presents test scores for three different groups of birth cohorts drawn from the NLSY panels. These students took the AFQT at ages 13–17. To facilitate comparisons among the NLSY panels and the NAEP-LTT, I transformed all test score data from the NLSY panels into deviations from the average score among persons born in the same two month interval.[10] The scores are also standardized so that one unit equals one standard deviation in the distribution of scores for persons of the same birth cohort and gender.

The NAEP-LTT reports do not provide separate scores for boys and girls within racial groups. However, the NLSY data allow me to report separate black–white score gaps by gender. The results for 15–17 year old respondents allow direct comparisons over time under the assumption that the 1997–1998 and 1980 administrations of the ASVAB are comparable assessments. This comparison indicates clear improvement for black

[9] See Wigdor and Green (1991).

[10] The NAEP-LTT is a random sample of students who were a particular age at a point in time. The NLSY samples are drawn according to birth dates. Therefore, over the two calendar intervals that the AFQT was given to the NLSY panels, the shares of persons with the youngest and oldest ages in each panel were less than their corresponding shares in the population. In NLSY79, the share of 15 year olds is too small. In the NLSY97, the share of 17 year olds is to small.

The NLSY97 provides the date that each respondent took the ASVAB. Thus, in the NLS97, I standardized scores for birth date and whether or not the student took the test during the summer of 1997, the fall of 1997, or the winter of 1998. Test dates are not available in the NLSY79, but the NLSY79 exams were given over a shorter time interval.

teenagers relative to their white counterparts among boys and girls. Note that this improvement mirrors secular trends in the NAEP-LTT data for age 13 assessments.

The NAEP reading scores for those born in 1962 and the NAEP math scores for those born in 1965 are the best points of comparison for the NLSY79 scores. The estimated size of the black–white reading gap among those age 13 in 1975 was just over one standard deviation. The absolute value of the estimated black–white gap in math scores among those age 13 in 1978 was about 1.1 standard deviations. The NLSY79 sample of those tested at ages 15–17 includes persons born in 1962–1964. The black–white test score gaps in this sample are similar in magnitude to those in the 1975 and 1978 NAEP-LTT for age 13, but the relative sizes of the reading and math gaps are reversed. The AFQT scores imply that reading gaps are larger than the math gaps.

The AFQT scores from the 1997–1998 administration of the ASVAB yield black–white test score gaps in reading of −0.78 and −0.91 standard deviations among those ages 13–14 and 15–17, respectively. In math, the corresponding gaps are −0.84 and −0.87. Compared to the NLSY79 scores for those ages 15–17, these gaps represent relative improvements for black youth of 0.38 to 0.25 standard deviations in reading and 0.11 to 0.08 standard deviations in math. Because the NLSY97 respondents were born in 1980–1984, the NAEP-LTT scores that provide the best points of comparison are the age 13 scores for students born in 1981 and 1983 and tested in 1994 and 1996. Relative to the black–white score gaps in the 1975 reading assessment and the 1978 math assessment, Table 3 shows that the 1994–1996 assessments imply relative score gains for black youth of 0.2–0.25 standard deviations in reading and 0.16–0.18 standard deviations in math. Taking the differences between the NLSY79 and NLSY97 results as baselines, the implied achievement gains in the NAEP-LTT over roughly the same period are slightly larger in math and somewhat smaller in reading. Nonetheless, the shrinking of black–white gaps in scores on the math and reading sections of the AFQT between 1979 and 1997 lends credit to the hypothesis that the NAEP-LTT data reported in Table 3 capture a real and noteworthy closing of the black–white skill gap among teenagers.[11]

The narrowing of the black–white test score gap is an important development in the post-civil rights era. Because there are no reliable measures of individual achievement prior to the NAEP-LTT data, we do not know the extent to which the narrowing of black–white test score gaps among cohorts born during the 1960s and 1970s was part of a long term trend toward skill convergence, but the amount of convergence documented in Tables 3 and 4 is noteworthy. Both Neal and Johnson (1996) and Hansen, Heckman and Mullen (2004) estimate that one year of high school raises average AFQT scores by roughly 0.2 standard deviations. Thus, the final column of Table 4 indicates that,

[11] The AFQT data are consistent with the relative improvement of blacks scores in the NAEP-LTT over the 1978–1999 period, but no data from random samples based on age allow an independent check on the conclusion, often drawn from the NAEP-LTT, that the post-1978 improvements in black achievement took place before 1990. Hedges and Nowell (1998) do document noteworthy improvement during the 1980s in the relative scores of black students included in grade-based samples.

between 1980 and 1997–1998, the overall improvement in AFQT scores among those ages 15–17 represents the addition of roughly one year's worth of achievement for black students relative to white students. While this gain is impressive, it also highlights the enormous magnitude of the black–white skill gap that remains. Work by Neal and Johnson (1996) and Johnson and Neal (1998) suggests that the black–white skill gap among teenagers in the NLSY97 will likely translate into at least a 15 percent difference in lifetime earning capacity.[12]

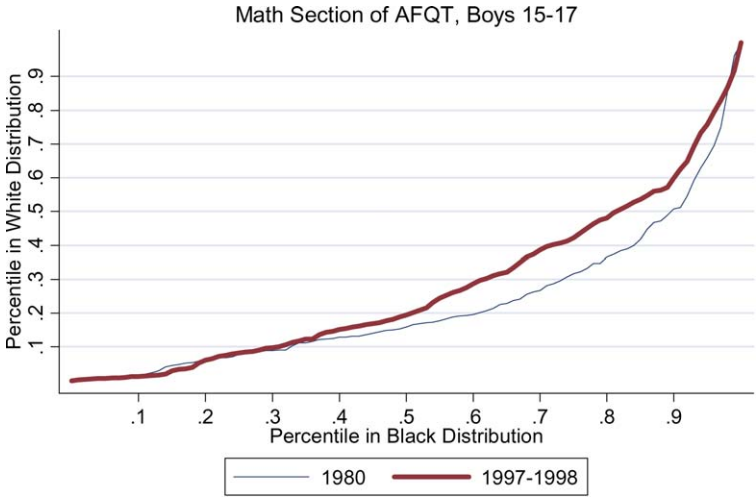
I have followed accepted practice by discussing these gaps in terms of units created by transforming all sets of scores so that the sample average is zero and the sample standard deviation is one. Because some test score distributions are approximately normal by design, standard deviation units often serve as a cardinal metric for test score gaps, and given this metric, the NAEP-LTT data and the NLSY panels provide fairly consistent information about the magnitude of the black–white test score gap at different points in time among different birth cohorts. However, ability has no natural units.[13] In most cases, test scores provide only a ranking of individuals. Whatever the scoring system, one assumes that if person A has a higher score than person B, then A performed better on the exam than B, but statements about the distance between A's performance and B's performance usually rely on arbitrary scales that have no inherent cardinal significance.

Figures 2(a) and (b) present results for respondents in the NLSY79 and NLSY97 who were ages 15–17 when they took the ASVAB. The figures give matches between percentile rankings in white and black math score distributions by gender.[14] For example, in the 1980 administration of the test, the tenth percentile in the distribution of math scores for black males equaled the second percentile in the distribution of math scores for white males. Several aspects of these figures are noteworthy. To begin, these figures provide a useful perspective on the size of black–white differences in the distributions of scores that remain in 1997. Roughly 80 percent of black males and females scored below the corresponding median score among whites, and just over five percent of black males and females scored in the top 25% of the corresponding score distributions for whites. Further, the pattern of changes in relative rankings over time is what one would expect given the results in Table 4. Compared to blacks born in the early 1960s, those born in the early 1980s were more likely to be in at least the middle of the white distribution of scores. Among boys, the fraction of blacks who scored above the median

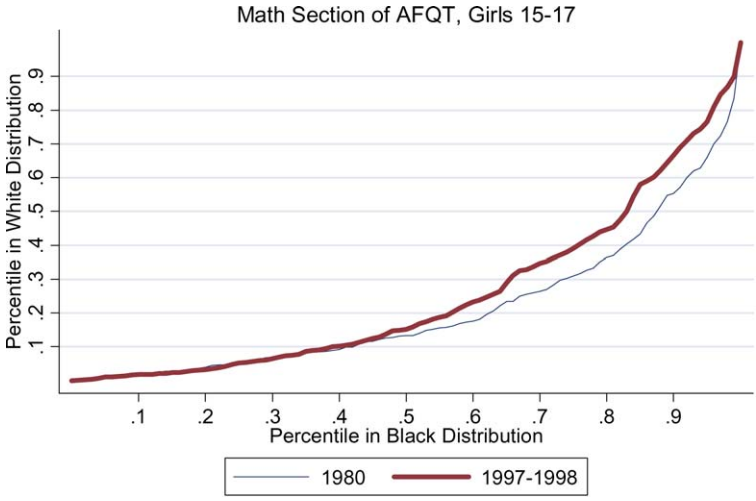
[12] Neal and Johnson (1996) employ wage data from the 1990–1991 wave of the NLSY79. The next section includes results from the 2000 wave of the NLSY79, and the results suggest an even stronger relationship between AFQT and future earnings capacity.

[13] If the distributions of black scores and white scores were both normal with the same variance, then knowledge of the black–white gap in mean scores expressed in standard deviation units would fully reveal the mapping between percentile ranks in the black distribution and percentile ranks in the white distribution. However, it is obvious that these conditions do not hold in many data sets. In fact, distributions of AFQT composites from the NLSY panels are not always normal and are skewed as well.

[14] I do not include reading scores because I was not able to get the required individual NAEP-LTT data as points of comparison in enough relevant years.



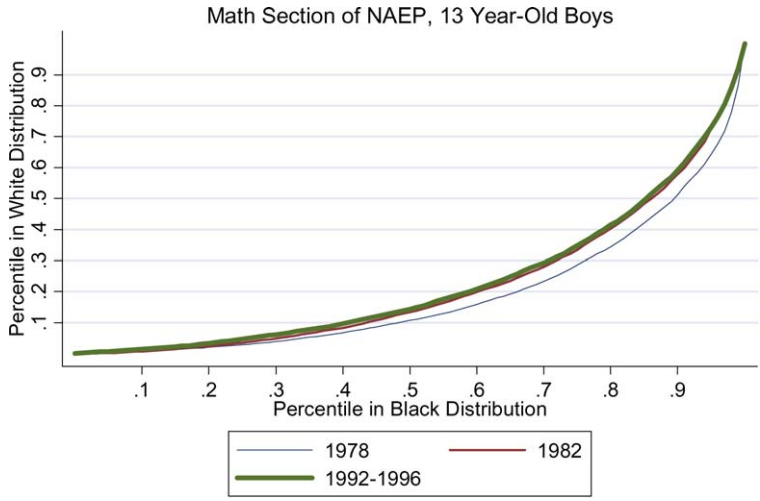
(a)



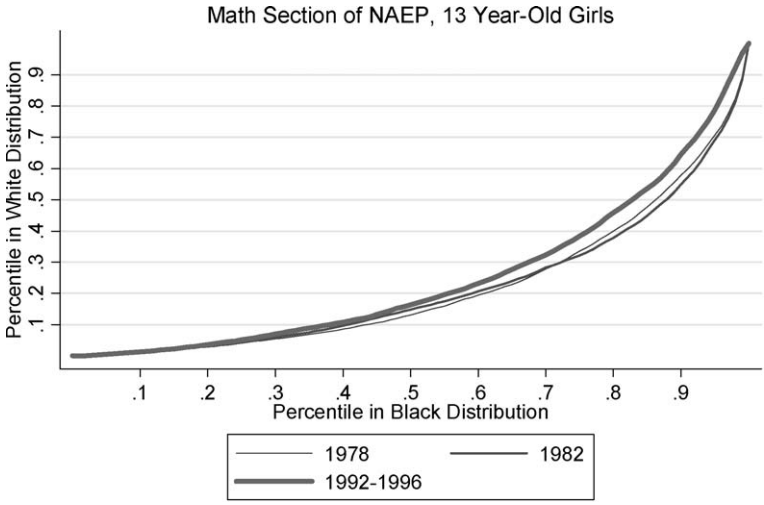
(b)

Figure 2. (a), (b) The figures use standardized AFQT scores from the 1979 and 1997 NLSY. (c), (d) The figures use math scores from the 1978, 1982 and 1992–1996 NAEP.

white score increased from roughly 10 percent to about 20 percent. Still, progress toward racial equality in scores was not the same at all percentiles in the black score distributions. While the right tails of the black score distributions moved farther into the upper half of the white score distribution, the left tails of the black score distributions remained below all but a handful of white scores.



(c)



(d)

Figure 2. (*Continued.*)

Figures 2(c) and (d) present similar results based on individual data from the NAEP-LTT math assessments. The figures present relative ranks for three samples of 13 year old students. The first two samples are the 1978 and 1982 NAEP-LTT math assessments.

The third sample combines data from the 1992, 1994, and 1996 assessments.[15] Once again, the NLSY and NAEP-LTT paint similar pictures. Black teenagers improved their relative ranks over this period, but they remain far behind white teenagers in terms of math achievement. Further, blacks in the lower percentiles of test score distributions are making the least progress relative to whites. However, the timing of black relative progress differs by gender. Almost all of the improvements in relative scores for black males came between 1978 and 1982, but the significant improvements for black girls come after 1982. In addition, among boys, the overall improvement of black NAEP scores relative to white scores is not as dramatic as the relative improvement in the math components of AFQT scores observed between the two NLSY cohorts. This is somewhat surprising given that results from Tables 3 and 4, where black–white score gaps are expressed in standard deviation units, suggest that blacks made larger relative gains in math on the NAEP-LTT assessments than on the AFQT.[16]

Because the NAEP-LTT is designed to test the same math skills in every assessment year and because all scores from all years are on a common scale, one can also determine whether or not there was improvement over time within the black sample. The scale scores of those in the lower percentiles of the black score distributions did improve between the 1978 and mid 1990s assessments, but this improvement did not result in noticeable improvements in the rank of lower scoring black students in the white score distribution for two reasons. To begin, the black and white math score distributions for those age 13 in 1978 did not effectively share a common support. The lower percentile scores for blacks born in 1965 were so low that these scores could have improved without generating notable changes in the relative ranks of black and white test scores, even if the white score distribution remained completely constant over time. In addition, scores at the lower percentiles of the white distribution also improved over time.

The NLSY79 respondents took a paper and pencil version of the ASVAB. Those born in 1961 through 1964 took the test as teenagers, and the distribution of raw scores among black teenagers in this sample provides some context for just how poorly less skilled blacks from cohorts born before 1965 performed on cognitive tests. The version of the AFQT administered to NLSY79 respondents contains 105 questions. Each question is a multiple choice question with four possible answers and one correct answer. Thus, if a given respondent simply guessed randomly, he or she would have expected a raw score between 26 and 27. Further, among a group of respondents who guessed randomly, we expect over 20 percent to have answered 30 or more questions correctly. Thus, a score

[15] I was not able to obtain individual NAEP data for many years. I combined results from the 1992–1996 wave because the data sets from the 1990s are much smaller than those from previous years. I present math results because I was not able to verify the quality of the 1996 data on individual reading scores by reproducing the published tables that summarize the assessment.

[16] I do not present graphs for reading scores because I was not able to obtain a reliable version of the 1996 reading test results from the NAEP. For the analyses involving math scores, I was able to recreate the published tables that document percentiles in score distributions for various years and subpopulations.

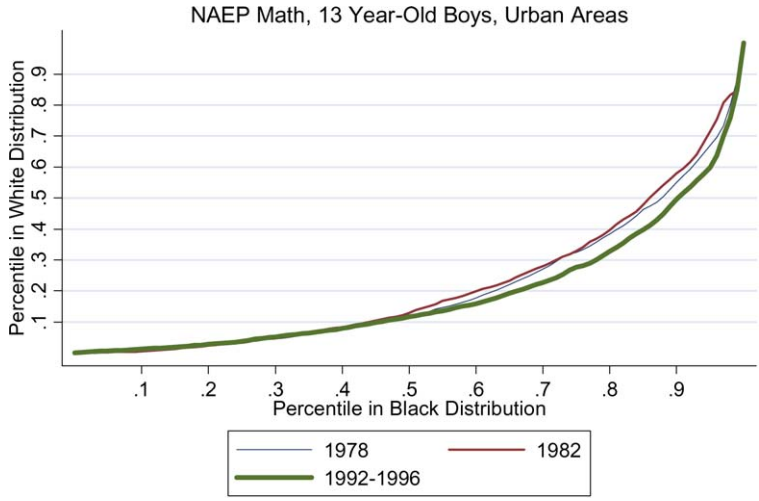
of 30 constitutes far less than decisive evidence against the null hypothesis that a given respondent knew the correct answer to none of the questions and simply chose answers randomly. Still, 19 percent of black male respondents and 11 percent of black female respondents answered 27 or less questions correctly, and almost 27 percent of black males and roughly 18 percent of black females posted a raw score of 30 or less. In contrast, more than 94 percent of whites scored above 30 regardless of gender.

Given these results, it seems fair to conclude that a substantial fraction of the NLSY79 sample of black males who took the ASVAB test lacked the basic math and reading skills covered by the exam, lacked any motivation to put forth effort during the exam, or both. The results for black females are not quite as bleak, but they still indicate very low levels of performance in the left-tail of the black score distribution. The NLSY97 and the NAEP-LTT tests do not permit the type of "number correct" counts that I have done for the NLSY79, but taken as a whole, the results presented here suggest that cohorts of black youth and young adults born in the 1980s and 1990s may still contain a significant number of individuals who do not possess the basic math and reading skills that young teenagers are expected to acquire in school. Although scaled NAEP-LTT scores for black youth at the fifth and tenth percentiles of the distributions did improve between 1978 and the mid 1990s, these achievement gains were not sufficient to create notable changes in the score ranks of lower performing black youth relative to white students, and Figures 2(a) and (b) also show little, if any, improvement between 1980 and 1997 in relative AFQT score ranks for youth scoring in the lower percentiles of the black score distributions.

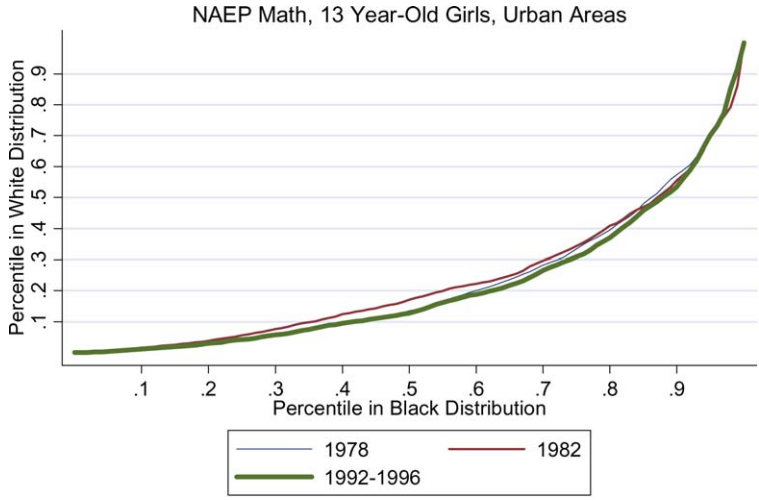
Finally, Figures 3(a)–(b) present the relative ranks of black youth from large cities in the nationwide distribution of white math scores. As in Figures 2(c) and (d), the data come from the NAEP-LTT math assessments, and I define large cities as central cities with a total metropolitan area population of at least two million in 1990. Note that the relative ranks of blacks in these large cities who are age 13 actually tended to fall, especially among boys, between 1978 and the mid 1990s. Compare Figures 2(c) and 3(a). The falling achievement of black boys in large cities over the 1980s and early 1990s is comparable in magnitude to the significant overall improvements made by black boys during the 1978–1982 period. By the mid 1990s, black youth in large cities performed notably worse than black youth in small towns or rural areas. This development is noteworthy because prior to 1980, rural blacks performed worse than other blacks on tests of academic achievement.

Flanagan and Grissmer (2002) provide evidence that reinforces the results in Figures 3(a)–(b). Table 5 is taken directly from their paper. In order to create samples that provide significant numbers of observations for various subgroups defined by race and geography, Flanagan and Grissmer combined data from nine different grade level NAEP assessments conducted during the 1990s. These include three 4th grade reading tests, three 8th grade math tests, two 4th grade math tests and one 8th grade reading test.

The population percentage figures refer to shares in the national sample of public school students. Among both blacks and whites, students in central cities perform be-



(a)



(b)

Figure 3. The figures use math scores from the 1978, 1982 and 1992–1996 NAEP for MSAs with population greater than 2 million.

low average.[17] However, less than one in four white students attend public schools in cities while over half of all black students in the Flanagan and Grissmer sample are

[17] These samples of central city students contain scores from many cities that are not included in the results for Figures 3(a)–(b) because Grissmer and Flanagan do not restrict their attention to the largest central cities.

Table 5
Average test scores and population percentages by race, region and locality

Race	Locality	Region	Student population percentage	Avg score (standard deviation)
White	Suburban	Northeast	9.4	0.47
White	Suburban	Midwest	11	0.37
White	Rural	Northeast	3.3	0.37
White	Rural	Midwest	5.1	0.31
White	Suburban	Southeast	10.1	0.23
White	Suburban	West	8.5	0.18
White	Central city	Southeast	5.1	0.17
White	Rural	West	2.9	0.16
White	Central city	West	4.6	0.15
White	Central city	Midwest	4.1	0.14
White	Central city	Northeast	2.2	0.03
White	Rural	Southeast	5.6	0
Black	Suburban	Northeast	1.4	−0.38
Black	Suburban	Midwest	0.8	−0.49
Black	Rural	Southeast	1.2	−0.65
Black	Rural	Northeast	0.2	−0.68
Black	Rural	Midwest	0.1	−0.71
Black	Suburban	Southeast	3.1	−0.76
Black	Central city	Southeast	3.7	−0.79
Black	Central city	Midwest	1.9	−0.79
Black	Central city	West	0.6	−0.81
Black	Central city	Northeast	2.2	−0.84
Black	Suburban	West	0.7	−0.93
Black	Rural	West	0.1	−0.99

Notes: This table is taken from Flanagan and Grissmer (2002), Table 4. Column 4 reports the students living in each location as a percentage of the national student population.

in central cities. Further, with the exception of a small number of black students in suburbs and rural areas in the West, blacks in central cities score lower than all other black students. For the vast majority of the 20th century, any result suggesting that black children in the rural South were better educated than black children in northern cities would have been completely incredible, but note that by the 1990s, black students in the rural southeast score more than 0.2 standard deviations higher than black students in northeastern cities.

Several existing studies of the relative performance of public versus private schools document particularly poor educational outcomes for black students who attend public schools in large cities.[18] These results as well as the results in Figures 3(a)–(b) and Table 5 stand in stark contrast to a literature that documents the experiences of blacks

[18] See Neal (1997) and Grogger and Neal (2000).

Appendix Table 3
NAEP national test scores (standard errors in parenthesis)

Year	Math scores							
	4th grade				8th grade			
	White		Black		White		Black	
90	220	(1.00)	188	(1.80)	270	(1.30)	237	(2.70)
92	227	(0.80)	193	(1.40)	277	(1.00)	237	(1.30)
96	232	(1.00)	198	(1.60)	281	(1.10)	240	(1.90)
00	234	(0.80)	203	(1.20)	284	(0.80)	244	(1.20)
03	243	(0.20)	216	(0.40)	288	(0.30)	252	(0.50)
Year	Reading scores							
	4th grade				8th grade			
	White		Black		White		Black	
92	224	(1.20)	192	(1.70)	267	(1.10)	237	(1.70)
94	224	(1.30)	185	(1.80)	267	(1.00)	236	(1.80)
98	225	(1.00)	193	(1.90)	270	(0.90)	244	(1.20)
00	224	(1.10)	190	(1.80)	–	–	–	–
02	229	(0.30)	199	(0.50)	272	(0.40)	245	(0.70)
03	229	(0.20)	198	(0.40)	272	(0.20)	244	(0.50)

Notes: The table displays average NAEP National scores and standard errors for math and reading tests, grades 4 and 8. Data are taken from the NAEP sponsored The Nation's Report Card. In 2000, reading tests for 8th graders were not administered.

during the pre-Civil Rights era. In the decades prior to the Civil Rights Act of 1964, large numbers of blacks migrated from the rural South to seek a better life for themselves and their children in cities, especially northern cities, but by the end of the 20th century, black children in cities possessed lower levels of skill than black children in the rural South.

In summary, there is considerable evidence that during the 1970s and 1980s black youth made significant achievement gains relative to white youth. The gains are present in math and reading using different data sets and different measures of progress. On the other hand, both the NAEP-LTT and AFQT data suggest that youth in the lower deciles of black test score distributions did not improve their relative ranks in distributions of test scores for whites over this period, and black youth in large cities, especially boys, likely lost ground relative to white youth.

In terms of overall trends, it is most important to note that Table 3 provides no evidence that black–white test score gaps continued to close during the 1990s. This development is puzzling in light of the sizeable gains made by black youth during the 1970s and 1980s. The AFQT data in the NLSY panels provide two snapshots that are almost two decades apart, and although these snapshots allow comparisons between two specific sets of birth cohorts, the NLSY panels provide no information about achieve-

ment trends during the 1990s. It would be useful to examine other measures of trends in black–white achievement gaps during the 1990s, but the NAEP-LTT assessments are the only nationally representative data on achievement intended to measure trends over time. The best available points of comparison may come from the national NAEP math and reading assessments for 4th and 8th graders. These assessments are not designed to be comparable over time, but the National Center for Educational Statistics (NCES) suggests that they may in some instances provide useful information about short term achievement trends in samples defined by grade attending rather than age.[19] Appendix Table 3 presents results from these assessments. During the 1990s, the NAEP national assessments suggest that black elementary and junior high school students gained no ground on their white peers in terms of overall achievement. Reading scores for black eighth graders rose relative to scores for their white peers, but the opposite was true for math scores, and black–white test score gaps among fourth graders were roughly the same at the end of the 1990s as they were at the beginning. Results from these assessments are not directly comparable to those from the NAEP-LTT assessments, and the two sets of assessments do not always paint exactly the same picture. However, neither set of assessments indicate that the overall black–white skill gap narrowed during the 1990s.

It is worth noting that the 2002 reading assessments and the 2003 math assessments show significant gains in achievement for black fourth graders both in levels and relative to whites. These results may signal the beginning of another period of test score convergence between black and white youth. However, it is important not to draw too much from these two data points. The national NAEP scores are reported on a common scale across years, but the national NAEP program does not maintain a fixed assessment framework over time. In addition, even if one is willing to use these data to measure trends from the early 1900s through 2003, there is no clear evidence of overall progress for black youth relative to white youth. The black–white gap in fourth grade math scores is significantly smaller in 2003 than in the early 1990s, but this is not true for the other three assessments. Finally, the reading assessments in 2002 and the math assessments in 2003 involved dramatic changes in the administration of the tests. In these years, the state NAEP assessments were folded into the national NAEP assessments creating a set of national assessments that involved more than 10 times as many students as in previous years. The NAEP-LTT assessments for 2003 will be released in 2005. These data should tell us much more about trends in black–white achievement after 1999.[20]

[19] See http://www.nces.ed.gov/nationsreportcard/about/national.asp. The difference between the national and LTT assessment is described as follows: "As the content and nature of the NAEP instrument evolve to match instructional practice, the ability of the assessment to measure change over time is reduced. While short-term trends can be measured in many of the NAEP subjects (e.g., mathematics, reading), the most reliable instrument of change over time are the NAEP long-term trend assessments".

[20] These assessments were released while this volume was in press. While these most recent NAEP-LTT results do suggest some closing of back–white test score gaps after 1999, the most recent gaps remain at least as large, on average, as the gaps observed between 1986 and 1990.

3. Skills and adult outcomes

The future will reveal whether the 1990s were only a pause in a secular process of skill convergence between black and white Americans, or whether the late 1980s and early 1990s marked the beginning of an important period of constant or falling relative skill levels for blacks. In either case, the results presented in the previous section raise important questions. Why have relative skill levels for black youth apparently remained constant at best for the past fifteen years or more given the large black–white skill gap that remains? Why do so many black youth apparently fail to master the basic math and reading skills covered by their schools' curricula? Can a large black–white skill gap persist for the indefinite future?

I begin my discussion of these issues by reviewing modern models of statistical discrimination. A large theoretical literature explores the idea that black youth may fail to acquire skills because they believe that employers are not likely to view them as skilled regardless of their true skill level. In these models, the response of black youth to the anticipated prejudice of employers confirms the prejudice, and the black community finds itself in an equilibrium characterized by low levels of skill investment and low gross returns to the skill investments that are made. In this section, I flesh out the logic of statistical discrimination models, and I assess whether or not these models can explain recent data on skill levels and racial wage gaps.

I illustrate the key features of statistical discrimination models by describing a particular model that has been quite influential. In Coate and Loury (1993), firms must assign workers to one of two tasks. Task one yields higher output if and only if the worker assigned to task one is a skilled worker. Workers are skilled if they make particular investments in their own human capital. These skill investments are costly to workers but not verifiable. Firms have prior beliefs, π_b and π_w, concerning the fraction of black workers and white workers respectively who invest in skills, and for each worker i, firms see only a noisy signal of worker i's productivity, θ_i, and worker i's race. Based on these two pieces of information, firms form posterior beliefs about worker i's productivity and assign the worker to the task that maximizes his expected output. Firms use a cutoff rule such that every worker with a signal greater than some standard, s, is assigned to task one. Because firms' prior beliefs may differ by race, firms may establish $s_w \neq s_b$ as race-specific standards for assignment. Individual workers face heterogeneous costs of investing in skill, but these costs are independent draws from the same distribution $G(c)$ for both black and white workers. An individual worker invests in skills if the expected return is positive given the standard he faces. An equilibrium in the model consists of pairs of beliefs and standards (π_w, s_w) and (π_b, s_b) such that worker investment behavior is an optimal response to the standards set by employers, and given these optimal responses, employer beliefs are self-confirming. The equilibrium is defined by the following condition:

$$\pi_i = G\big(B\big(s^*(\pi_i)\big)\big), \quad \text{where } s_i = s^*(\pi_i),\ i = b, w.$$

The key term is $B(s^*(\pi_i))$. This is the expected wage increase associated with investing in skill for a member of group i. Although all workers assigned to the same task earn the same wage regardless of race, $B(s_i)$ declines with the assignment standard s_i because higher cutoffs imply lower chances of assignment to task one.

There are many variations on this theme in the literature on statistical discrimination. However, throughout the literature, the structure of models implies that blacks invest less in skills than whites as a rational response to employer discrimination. In equilibrium, $\pi_b < \pi_w$, is not only a statement about beliefs but also a statement about racial differences in actual levels of investment, and here, $\pi_b < \pi_w$ holds precisely because $s_b > s_w$, which implies directly that $B(s^*(\pi_b)) < B(s^*(\pi_w))$. The irony is that there is little or no evidence from recent decades that blacks do earn lower returns from skill investments and much evidence suggesting that blacks earn equal or higher returns to investments in skill. It is plausible that, before the 1960s, statistical or other types of discrimination against highly skilled black workers may have dampened incentives for skill acquisition among black youth, but I demonstrate in the next section that apparent returns to investments in skills have been as great or greater among black adults than white adults for many decades. I begin by discussing returns to skills that are not directly observed by most firms. These results speak most clearly to the empirical content of statistical discrimination models. I then turn to race-specific relationships between education and labor market outcomes. In both cases, the evidence indicates that, in recent decades, the correlation between skill levels and labor market outcomes has been at least as strong and likely stronger among blacks than whites.

The analyses presented below are restricted to samples of adult men. A significant literature demonstrates that sample selection bias contaminates standard measures of black–white wage gaps because patterns of selection into work differ by race. Since relationships between participation rates and measured skills also differ by race, selection bias contaminates estimates of black–white gaps in standard measures of the return to skills. In analyses of men, it is possible to make some progress by assuming that men who have not worked for significant periods of time face relatively low potential wages. However, this is not a fruitful approach in analyses of women. For significant numbers of white women, the choice to work at home appears to be driven not by low potential wages but the high earnings potential of their spouse.[21]

3.1. Returns to cognitive skills

In previous work, Neal and Johnson (1996) and Johnson and Neal (1998), William Johnson and I have examined race-specific returns to skills measured by the ASVAB tests taken by respondents in the NLSY79. Using labor market data from the early 1990s, we found that the correlation between AFQT scores at ages 15–18 and subsequent log wages observed at ages 26–30 was at least as strong among black males as among

[21] See Neal (2004) for more on racial differences in selection patterns among women.

white males. We also found that the AFQT-log earnings gradient was clearly steeper among black males than among white males. Here, I repeat our previous analyses using wage and earnings data from the 2000 wave of the NLSY79.[22] The specifications I adopt here differ from those in the earlier analyses because I use data from all birth cohorts in the NLSY79 sample. In the previous work, we excluded cohorts that were old enough to have engaged in a significant period of full-time work before taking the AFQT. We adopted this approach because we were trying to assess the importance of black–white differences in pre-market skill acquisition. If employers discriminate against black workers by denying them access to jobs with significant opportunities for learning, AFQT scores posted after labor market entry could be contaminated by discrimination in the labor market.[23] However, between the early 1990s and 2000, the NLSY suffered noteworthy attrition bias, and to increase sample sizes, I performed the analyses presented in Figures 4(a)–(c) on the full NLSY sample.

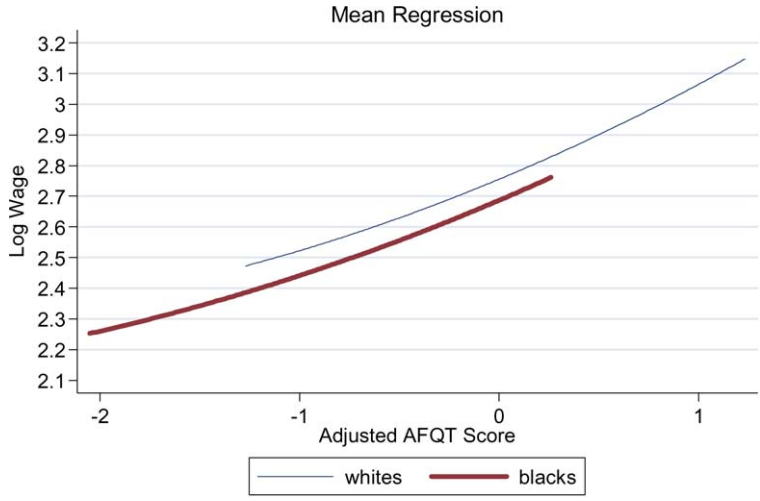
Similar figures based on data from only the 1962–1964 birth cohorts are available upon request. These figures illustrate the same patterns that I highlight below. Wage and earnings profiles with respect to AFQT are as steep or steeper among blacks than the corresponding profiles among whites. However, the absolute value of AFQT-constant wage and earnings gaps is somewhat larger among respondents from these later birth cohorts.

Figures 4(a)–(c) present three sets of results on relationships between AFQT and wages for blacks and whites separately. Figure 4(a) presents results from regressions of log wages on a quadratic in AFQT. These regressions are weighted to account for non-random attrition, and the wage observation used is the hourly rate of pay associated with the job identified in the 2000 wave of the NLSY79 as the CPS job. The figure graphs these predicted wages between the 10th and 90th percentiles of the race-specific AFQT distributions. Figures 4(b) and (c) present results from median regressions. The median regressions corresponding to the lines in Figure 4(b) employ the same samples used in the mean regressions. However, the median regressions associated with Figure 4(c) include imputed wages of one dollar per hour for all men who report not working any job since their last interview. Since the previous wave of the NLSY was administered in 1998, the imputations are restricted to men who have not worked at all for at least two years.[24]

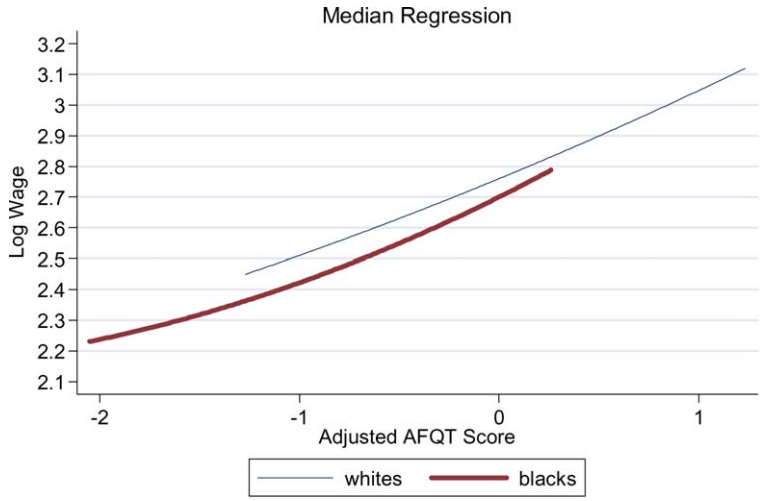
[22] The sample includes males from all birth years. It does not include respondents from the oversamples of Hispanics, economically disadvantaged whites or military personnel. However, the sample does include respondents from the oversample of black males. The white sample here differs from the white sample used in the Neal and Johnson (1996). Here, I construct a white category that matches, as closely as possible, the census definition of white. In the earlier paper, we used the non-black, non-Hispanic category that forms the basis for the NLSY sampling frame.

[23] In this scenario, the age-adjusted score for black respondents from earlier birth cohorts may measure not only cognitive function but also a separate ability to overcome discrimination.

[24] Johnson, Kitamura and Neal (2000) use panel data from earlier waves of the NLSY79 to show that workers, who report past or future wages rates but are currently in the middle of a multiple year spell of non-employment, almost always earn less than the median wage observed among workers with similar demographic characteristics.



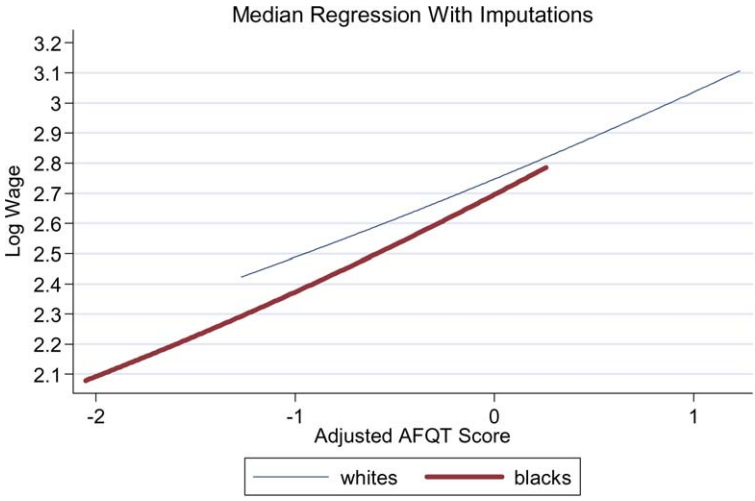
(a)



(b)

Figure 4. The figures show predicted values from a regression of log wages on a quadratic in adjusted AFQT score for black and white males separately. Data are from the 2000 wave of the NLSY79. In the median regressions (c) for individuals who did not work since their 1998 interview are imputed a wage equal to one dollar.

Several patterns in these figures are noteworthy. First, the black and white AFQT distributions do overlap but the right tail of the white score distribution and the left tail of the black score distribution represent regions with little if any overlap. A sig-

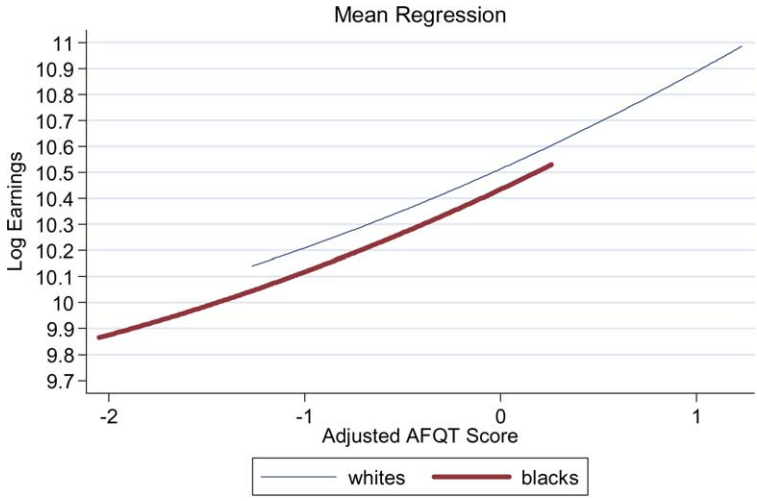


(c)

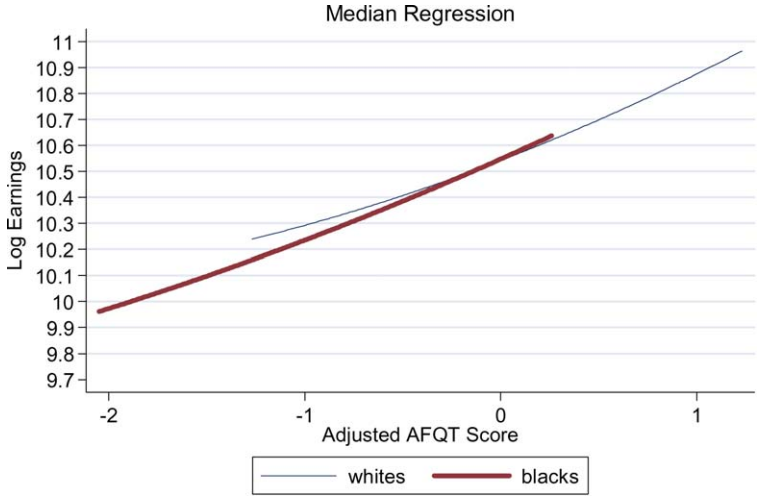
Figure 4. (*Continued.*)

nificant fraction of males in the black sample score more than 1.5 standard deviations below the mean, and these males have few white peers.[25] There is also a clear absence of black scores in the upper tail of the distribution. Thus, meaningful comparisons of race-specific returns to AFQT must focus on respondents who score from just below -1 to just above 0. Second, in all three figures, the wage-AFQT gradient is as steep or steeper among black men than white men. The difference in slopes for the mean regressions is small and not statistically significant. The racial difference in slopes for the median regressions is much more significant economically but still falls short of conventional standards of statistical significance. Third, the low levels of employment among black men with low AFQT scores drive the important differences between Figures 4(b) and (c). Within the upper half of the black skill distribution, the wage-AFQT profiles for black men in Figures 4(b) and (c) are similar, but the two profiles diverge dramatically as one moves down through the bottom half of the black skill distribution. This result foreshadows a theme that will be repeated several times in this section. In recent decades, employment levels among less skilled and less educated black men have been quite low by any historical standard for adult men. One possible explanation is that changes in the relative demands for workers of different skill levels have adversely affected less-skilled black workers in a manner that has no counterpart among white workers because there are so few white workers who struggle with basic math and reading skills.

[25] This result is not surprising given the results reported above concerning the fraction of black teens in NLSY79 who did not do better on the AFQT than one would expect from guessing.



(a)



(b)

Figure 5. The figures show predicted values from a regression of log earnings on a quadratic in adjusted AFQT score for black and white males separately. Data are from the 2000 wave of the NLSY79.

Figures 5(a)–(b) present two sets of results based on earnings levels in the previous calendar year. Figure 5(a) presents results from a regression of log earnings on a quadratic in AFQT. Figure 5(b) presents results from a corresponding median regression. I do not present results that incorporate earnings imputations for workers with

missing earnings.[26] The patterns are similar to those observed in Figures 4(a)–(b). However, the difference in slopes is more pronounced for the median regression. The median regression results are quite robust to the use of various cutoff rules for trimming earnings levels that imply either coding error or short spells of employment, and these results indicate that median earnings rise quite a bit faster with skill among black men.

Such results present a challenge for models that explain low black skill levels as a rational response to the presence of statistical discrimination by employers. The Coate and Loury model is a one period model, but it seems natural to interpret it in the following way. Firms acquire signals about workers' talents through interviews, observing their performance in entry level jobs, and checking their work records with other employers. Based on these signals, employers make assignment decisions. Because employers statistically discriminate against black workers, blacks who invest in skills will see a smaller increase in their probability of promotion to good jobs than whites who invest.[27] This implies that the gradient between wages and productive skills, that are not directly observed by the employer, should be greater among whites than blacks. Figures 4(a)–5(b) provide no evidence that this prediction is true, and they provide considerable suggestive evidence that this prediction is false.

Some may argue that what matters is not realized returns to investments but rather the fact that many blacks believe that the labor market will not reward them or their children for investing in human capital. The literature on statistical discrimination began with Arrow (1973) and Phelps (1972). When Arrow and Phelps first developed these ideas, existing cohorts of adult workers had lived most of their lives in labor markets where blacks may well have earned lower returns to education and skills than whites workers.[28] However, it is hard to find data that would support this belief today. Blacks who reached adulthood after the Civil Rights Act of 1964 have not earned systematically lower returns to attainment or achievement than their white peers. During the past decade or more, black adult respondents in the NLSY79 have earned relatively high

[26] There is no 1999 wave of the NLSY79. Wage data are collected with reference to the time since the last interview. Earnings data are collected with reference to the past calendar year. Thus, if someone worked in 1998 but not in 1997 or 1999, his most recent wage is likely recorded but his most recent calendar earnings are not recorded. Thus, I cannot identify earnings levels for all persons who worked since their 1998 interview.

[27] Because employers hold all blacks to a higher promotion standard whether they have invested or not, it may seem possible that discrimination of this type could raise returns from skill investment for blacks. However, this cannot occur in equilibrium because higher returns for blacks would generate higher investment levels for blacks and the original discriminatory beliefs that led to the racial difference in promotion standards would not be self-confirming.

[28] No data provide gradients of labor market outcomes with respect to cognitive test scores during the 1970s and early 1980s. However, Cutright (1973) matched social security earnings data from 1964 with AFQT scores for persons drafted in the Korean war. His results suggest that prior to the Civil Rights Act, blacks may well have earned lower gross returns to basic skills. Nonetheless, Welch (1973) notes that shortly after the passage of the Civil Rights Acts, blacks began enjoying comparable or better implied returns to investments in education than whites.

returns to skills measured by the AFQT.[29] Further, as I demonstrate below, apparent returns to formal schooling among black young adults have typically been as large or larger than the corresponding returns among whites since at least 1970.

In the balance of this section, I present details concerning the relationship between education and labor market outcomes among black and white adult men. Existing panel data sets do not provide information concerning racial differences in the relationship between cognitive skills and adult outcomes for birth cohorts other than those included in the NLSY79.[30] However, census data document the relationship between educational attainment and labor market outcomes for a broad range of cohorts. Education differs from reading and math scores in that it is an indirect measure of skill that is easily observed by employers, but the patterns documented below are similar to those in Figures 4(a)–5(b). Correlations between schooling and positive labor market outcomes among blacks are as strong or stronger than the corresponding correlations among whites, especially in recent decades.

3.2. Education and labor market outcomes

The Integrated Public Use Micro Samples (IPUMS) drawn from decennial census records provide individual data on education, earnings and labor force activity in the various census years. Most of the results below come from 1980 through 2000 census files, but in some cases, I also include results from 1960 and 1970. I begin by describing data on rates of employment and incarceration. Table 6 describes outcomes for groups of men who fall in the same (race $*$ education $*$ age) cell in a given census year. The diagonal rows in the table provide results from the same census file, which in this case is either 1980, 1990, or 2000. Moving across a row, one can follow a birth cohort over time. Moving down columns, one can track the evolution over birth cohorts of outcomes at specific ages. The three education groups are: (1) completed some high school but no credential (2) finished high school or obtained a GED but completed no post-secondary schooling and (3) college degree but no post-graduate degrees. These education groups provide the opportunity to measure cell means with respectable sample sizes. Each cell contains three numbers. The top number is the fraction working or enrolled in school at the time of the census. The second number is the fraction who worked in the previous calendar year. The final number is the fraction institutionalized. For men ages 26–45, correctional institutions are by far the most common form of institutional housing.

[29] Both Altonji and Pierret (2001) and Lange (2004) present evidence consistent with the view that employers learn a great deal over time about aspects of worker productivity that are correlated with AFQT scores. These findings raises concerns about all models in which the reason that blacks cannot earn a market return to skill investments is that they cannot reveal their true skill levels to employers.

[30] The National Educational Longitudinal Surveys provide panel data on high school experiences and adult labor market outcomes. However, these samples are drawn from students who are enrolled in specific grades at a point in time, and thus they provide select samples from persons born in a set of birth years. In addition, the follow-up data on earnings and employment are of relatively poor quality in the NELS surveys when compared to NLSY79 on work outcomes.

Table 6
(1) Fraction working or at school in reference week
(2) Fraction worked last calendar year
(3) Fraction institutionalized

Year of birth and education	White				Black			
	26–30	31–35	36–40	41–45	26–30	31–35	36–40	41–45
9–11 years								
1935–1939				0.86				0.77
				0.91				0.79
				0.01				0.03
1940–1944			0.86				0.75	
			0.92				0.80	
			0.01				0.03	
1945–1949		0.84		0.81		0.71		0.64
		0.91		0.85		0.75		0.68
		0.02		0.01		0.06		0.05
1950–1954	0.81		0.80		0.62		0.62	
	0.90		0.85		0.69		0.65	
	0.02		0.02		0.09		0.09	
1955–1959		0.80		0.71		0.56		0.47
		0.86		0.77		0.63		0.51
		0.03		0.03		0.14		0.13
1960–1964	0.79		0.73		0.51		0.49	
	0.86		0.78		0.58		0.53	
	0.04		0.04		0.19		0.19	
1965–1969		0.74				0.44		
		0.79				0.47		
		0.05				0.28		
1970–1974	0.73				0.43			
	0.79				0.47			
	0.05				0.26			

(*Continued on next page*)

Two gradients in Table 6 deserve particular attention. First, black–white differences in employment rates decline dramatically with worker education levels. Among black men ages 26–45 without a high school diploma or GED, less than half were employed at their 2000 Census interview date and less than half worked at all during the calendar year 1999. In contrast, the corresponding employment rates among less educated white men, whether measured in terms of current status or employment last year, are all more than 20 percentage points higher and in four cases are as much as 30 percentage points higher. But, the third panel shows that employment rates for college graduates do not differ greatly by race. In 2000, no black–white difference in employment rates for college educated workers is greater than eight percentage points. The racial differences in employment rates among high school graduates fall between these extremes. It is clear that the relationship between employment and education is much stronger among black

Table 6
(*Continued*)

Year of birth and education	White				Black			
	26–30	31–35	36–40	41–45	26–30	31–35	36–40	41–45
12 years								
1935–1939				0.93				0.84
				0.95				0.84
				0.00				0.01
1940–1944			0.93				0.81	
			0.95				0.85	
			0.01				0.03	
1945–1949		0.91		0.89		0.80		0.76
		0.95		0.92		0.84		0.79
		0.01		0.01		0.03		0.04
1950–1954	0.89		0.89		0.77		0.75	
	0.95		0.92		0.82		0.77	
	0.01		0.01		0.04		0.06	
1955–1959		0.89		0.85		0.73		0.65
		0.93		0.87		0.76		0.70
		0.01		0.02		0.07		0.07
1960–1964	0.89		0.85		0.74		0.67	
	0.93		0.87		0.78		0.71	
	0.02		0.02		0.08		0.09	
1965–1969		0.85				0.67		
		0.87				0.71		
		0.03				0.11		
1970–1974	0.84				0.65			
	0.87				0.68			
	0.03				0.11			

(*Continued on next page*)

workers than white workers. This was also true in 1980 and 1990, but the strength of the relationship between education and employments rates among black men has grown dramatically over time.

In Table 6, I define working last year based on the presence of information provided by the respondent that either directly indicates actual work last year or at least suggests that an allocated positive value of weeks worked last year is credible. If I were to simply calculate employment rates for the previous calendar year based on published census data, employment rates for less educated men would be notably higher among both black and white men in 2000. However, the 2000 data contain many allocated values of positive weeks worked that are not credible. For example, roughly 1 in 6 black men ages 26–45 who have nine to eleven years of schooling receive positive allocated weeks worked even though they did not provide answers to any of the questions about work or earned income sources during the previous calendar year. Further, more than half of

Table 6
(*Continued*)

Year of birth and education	White				Black			
	26–30	31–35	36–40	41–45	26–30	31–35	36–40	41–45
16 years								
1935–1939				0.97				0.91
				0.97				0.91
				0.00				0.01
1940–1944			0.97				0.94	
			0.97				0.93	
			0.00				0.01	
1945–1949		0.97		0.96		0.93		0.92
		0.97		0.97		0.93		0.91
		0.00		0.00		0.01		0.02
1950–1954	0.96		0.96		0.91		0.90	
	0.97		0.97		0.92		0.89	
	0.00		0.00		0.01		0.03	
1955–1959		0.97		0.95		0.93		0.90
		0.97		0.94		0.89		0.90
		0.00		0.00		0.02		0.01
1960–1964	0.97		0.96		0.95		0.89	
	0.96		0.95		0.91		0.88	
	0.00		0.00		0.01		0.02	
1965–1969		0.96				0.90		
		0.96				0.90		
		0.00				0.02		
1970–1974	0.96				0.91			
	0.95				0.89			
	0.00				0.01			

Notes: Data for this table are from the decennial census IPUMS 1960–2000. The table displays the fraction of males working or in school in the census reference week, fraction who worked last year and fraction of people institutionalized. In order to be counted as working in the previous calendar year, a respondent must have (a) an affirmative, non-allocated response to the question "Did this person work . . . (during the previous calendar year)?" or (b) positive, non-allocated weeks worked or (c) positive non-allocated earned income or (d) positive, allocated weeks worked and a non-allocated indication of working since January 1st of the census year in question. Sample weights "perwt" are used for year 2000.

these men were institutionalized at the time of the census. I have also calculated rates of working last year based only on samples of persons who answered at least one question concerning work last year or earned income in the previous year. This method yields results that are quite similar to those in Table 6.

When considering the strikingly low employment rates among less educated black men reported in Table 6, one must also remember that not all black men are counted in the census. Robinson, Adlakha and West (2002) use vital statistics data to estimate how many persons should have been counted in the 2000 census in various demographic

groups defined by age, race, and gender. They report that black men are the only adult group in 2000 for which a significant undercount is present, and their estimates imply that at least 9 percent of black males ages 25–44 were not counted in the 2000 census. If less educated black men are over-represented in the undercount of black men, the true gradient between education and employment among black men could be even steeper than the relationship implied by Table 6.

The second noteworthy gradient in Table 6 involves the sizes of institutionalized populations. Among black men, the fraction institutionalized declines dramatically with education, and this is particularly true among men ages 26–35. Note that over one in four black high school dropouts in this age group were institutionalized at the time of the 2000 census. This is roughly 5 times the rate of institutionalization among white men in the same age and education cells, and at least three times greater than the corresponding rate among black men in 1980. If one assumes that rates of institutionalization correspond closely to rates of imprisonment, it is clear that incarceration rates have risen among black men of all ages and education levels since 1980, but the increase among black college graduates is trivial compared to increases among black men who have no high school credential or a high school credential with no post-secondary schooling.[31]

Next, I turn to wages and earnings and their relationships with education. Table 7 presents black–white differences in mean log wages within cells defined by education and levels of potential experience.[32] Because the census gathers information on income from the past calendar year, the data describe wage gaps in 1979, 1989, and 1999. In a recent paper, Baum-Snow and Neal (2004), Nathaniel Baum-Snow and I document serious problems with hours worked information in census data.[33] Thus, I construct predicted log hours per week for each employed individual using data from the March CPS of the corresponding year and form log wages for each individual in the census by subtracting reported log weeks worked and predicted log hours per week from reported log annual earnings. I present mean black–white gaps in log wages for workers who fall in 45 cells defined by three education groups, three census years, and five experience levels. The education groups are the same ones used in Table 6.

The results in Table 7 demonstrate that in the vast majority of cases black–white log wage gaps decline with education level among men who have similar levels of potential

[31] The results presented in Table 6 also underscore why results that follow concerning wages and earnings draw on census data and not data from the Current Population Surveys (CPS). The CPS do not sample incarcerated individuals and thus, in recent years, are not useful for constructing representative samples of less educated black men.

[32] Here, I define potential experience as the $\max\{\min(\text{age} - 18,\ \text{age} - \text{years of schooling} - 6), 0\}$. The education variable used here is a measure of school completed not school attended. Data on highest grade attended is not available in 1990 and 2000. By marking age 18 as the beginning of adult work experience, I minimize the number of high school dropouts that are falsely given credit for a year of potential work experience simply because they started school after age 6, repeated a grade, or did not graduate from the last grade they attended.

[33] We show that many persons respond to the question on usual hours worked per week as if it were a question about usual hours worked per day. The frequency of these apparent errors is correlated with race and gender and varies across census years.

Table 7
Black–white differences in average log hourly wages (predicted hours from CPS). No imputations. Standard deviations in parentheses

Year and education	Experience				
	1–5	6–10	11–15	16–20	21–25
9–11 years					
1980	−0.21	−0.24	−0.25	−0.27	−0.24
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
1990	−0.18	−0.24	−0.22	−0.21	−0.17
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
2000	−0.15	−0.14	−0.22	−0.23	−0.25
	(0.02)	(0.03)	(0.03)	(0.02)	(0.02)
12 years					
1980	−0.14	−0.16	−0.16	−0.18	−0.19
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
1990	−0.12	−0.21	−0.22	−0.16	−0.19
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
2000	−0.07	−0.14	−0.16	−0.18	−0.21
	(0.02)	(0.02)	(0.01)	(0.01)	(0.01)
16 years					
1980	−0.01	−0.06	−0.12	−0.15	−0.25
	(0.02)	(0.02)	(0.03)	(0.03)	(0.04)
1990	−0.02	−0.14	−0.17	−0.18	−0.17
	(0.02)	(0.02)	(0.02)	(0.02)	(0.03)
2000	−0.03	−0.12	−0.16	−0.27	−0.27
	(0.03)	(0.02)	(0.02)	(0.02)	(0.02)

Notes: This table displays black–white average log wage gaps. Data are from the decennial census IPUMS 1960–2000. Log hourly wages are created using the IPUMS variables "incwage" and "wkswork1" and predicted hours using CPS data. The sample includes non self-employed males with positive wage income who worked last year. Working last year is defined using the rules described in the notes to Table 6. Sample weights "perwt" are used for year 2000. Wages are trimmed at the 1st and 99th percentile. Values are expressed in 1999 USD. Current monetary values have been adjusted using the CPI-U. Potential experience is defined as $\max\{0, \min(\text{age} - 18, \text{age} - \text{years of schooling} - 6)\}$.

labor market experience, and these declines tend to be larger at lower levels of experience. The results in Table 7 permit the calculation of 45 racial differences in the log wage gain associated with a given increase in completed schooling. These include differences in the wage gains associated with finishing high school, finishing high school and going on to finish college, and completing college given a high school credential. In 43 of 45 cases, the implied gain for black men is either greater than or not statistically different than the implied gain for white men. The exceptions involve wage gains associated with obtaining a college education among workers with more than 16 years

of experience. Table 8 presents black–white log earnings gaps in the same format as Table 7. Table 8 also includes data from the 1960 and 1970 census files. The results from the 1980–2000 data follow the same patterns found in Table 7, and in the earlier census years, implied log earnings gains associated with education tend also to be as large or larger for blacks. However, the pattern of racial differences in returns in 1960 is more mixed than in other years.

Table 6 demonstrates that, across a broad age range, black–white employment ratios rise with education levels. Similar patterns emerge if one calculates employment rates by race for groups defined by education and potential experience. Even among workers with decades of potential experience, employment rates among black men with no post-secondary schooling have fallen dramatically in recent decades, both in absolute terms and relative to those of comparably educated white men.[34] Economists often assume that, among men who share a common set of demographic characteristics, the mean observed wage is greater than the mean of potential wages among those who do not work. Thus, the mean wage among workers in a given group may be a poor approximation of the mean potential wage in that group when a significant percentage of persons in the group do not work. The results in Table 6 suggest that selection bias may attenuate the measured racial wage and earnings gaps in Tables 7 and 8, and this bias may be most severe among less educated workers. The entries in Tables 7 and 8 for high school dropouts in 2000 are calculated based on samples of black men who report employment rates of roughly 50 percent or less at all experience levels.

Tables 9 and 10 represent versions of Tables 7 and 8 that are corrected for selection in the following manner. For each cell defined by race, experience level, and education, I calculate the average log wage and average log earnings. I subtract 0.4 from these log averages to form imputed average log wages and earnings for men in these same cells who did not work in the previous calendar year. I then calculate the implied averages for overall log potential wages and log potential earnings in each cell and calculate black–white differences in these averages.[35] These tables suggest that selection bias does tend to dampen black–white differences in gradients between education and either wages or earnings. In the 2000 census data, the largest black–white differences in log potential

[34] The participation rates in Table 6 do not provide precise information about racial differences in selection rates for the entries in Tables 7 and 8 because Table 6 presents results for age groups rather than experience groups and because Table 6 includes self-employed persons in the sample of workers even if they have no wage and salary income.

[35] After examining wage levels of workers in the NLSY79 who were not employed for entire interview years, I have concluded that 0.4 is a conservative adjustment factor. I also performed analyses in which I calculated the average log wage and average log earnings among workers between the 40th and 60th percentiles of the wage and earnings distributions associated with each of the cells in Tables 7 and 8. I then calculated selection adjustments for these averages under the assumption that all non-workers who report multiple years of non-employment or institutional living quarters face potential wages and earnings below the 40th percentile of the relevant potential wage and earnings distributions for each cell. This approach generated even greater black–white differences in the slopes of the gradients between education and log potential wages or log potential earnings.

Table 8
Black–white differences in average log earnings. No imputations. Standard deviations in parentheses

Year and education	Experience				
	1–5	6–10	11–15	16–20	21–25
9–11 years					
1960	−0.36	−0.47	−0.49	−0.41	−0.44
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
1970	−0.26	−0.35	−0.39	−0.37	−0.39
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
1980	−0.40	−0.35	−0.34	−0.34	−0.30
	(0.02)	(0.02)	(0.03)	(0.03)	(0.03)
1990	−0.41	−0.41	−0.42	−0.37	−0.29
	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
2000	−0.35	−0.35	−0.35	−0.30	−0.37
	(0.03)	(0.04)	(0.04)	(0.03)	(0.03)
12 years					
1960	−0.34	−0.43	−0.49	−0.47	−0.42
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
1970	−0.16	−0.30	−0.30	−0.34	−0.36
	(0.02)	(0.01)	(0.01)	(0.02)	(0.02)
1980	−0.32	−0.34	−0.29	−0.32	−0.31
	(0.01)	(0.01)	(0.01)	(0.02)	(0.02)
1990	−0.22	−0.36	−0.40	−0.31	−0.33
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
2000	−0.23	−0.30	−0.27	−0.29	−0.34
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
16 years					
1960	−0.27	−0.37	−0.47	−0.42	−0.54
	(0.06)	(0.04)	(0.04)	(0.04)	(0.08)
1970	0.00	−0.23	−0.28	−0.42	−0.48
	(0.05)	(0.04)	(0.04)	(0.05)	(0.06)
1980	−0.15	−0.19	−0.21	−0.28	−0.37
	(0.03)	(0.03)	(0.03)	(0.04)	(0.05)
1990	−0.04	−0.21	−0.29	−0.29	−0.23
	(0.03)	(0.02)	(0.02)	(0.03)	(0.03)
2000	−0.09	−0.19	−0.25	−0.32	−0.33
	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)

Notes: This table displays black–white average log earnings gaps. Data are from the decennial census IPUMS 1960–2000. The IPUMS variable used is "incwage". The sample includes non self-employed males with positive wage income who worked last year. Working last year is defined using the rules described in the notes to Table 6. Earnings are trimmed at the 1st and 99th percentile. Values are expressed in 1999 USD. Current monetary values have been adjusted using the CPI-U. Potential experience is defined as $\max\{0, \min(\text{age} - 18, \text{age} - \text{years of schooling} - 6)\}$. Sample weights "perwt" are used for year 2000.

Table 9
Black–white differences in average log hourly wages (predicted hours from CPS). With imputations for non-workers. Standard deviations in parentheses

Year and education	Experience				
	1–5	6–10	11–15	16–20	21–25
9–11 years					
1980	−0.32	−0.33	−0.32	−0.32	−0.28
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
1990	−0.30	−0.35	−0.33	−0.29	−0.24
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
2000	−0.27	−0.26	−0.35	−0.34	−0.35
	(0.02)	(0.03)	(0.03)	(0.02)	(0.02)
12 years					
1980	−0.21	−0.22	−0.21	−0.22	−0.23
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
1990	−0.19	−0.28	−0.28	−0.23	−0.24
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
2000	−0.15	−0.23	−0.23	−0.24	−0.28
	(0.02)	(0.02)	(0.01)	(0.01)	(0.01)
16 years					
1980	−0.04	−0.09	−0.13	−0.17	−0.28
	(0.02)	(0.02)	(0.03)	(0.03)	(0.04)
1990	−0.05	−0.16	−0.20	−0.21	−0.19
	(0.02)	(0.02)	(0.02)	(0.02)	(0.03)
2000	−0.06	−0.15	−0.19	−0.30	−0.30
	(0.03)	(0.02)	(0.02)	(0.02)	(0.02)

Notes: This table displays black–white average log wage gaps, with imputations for non-workers. See notes to Table 7 for sample and variable definitions, and notes to Table 6 for the definition of working status. Each entry is equal to $[p_b x_b + (1 - p_b)(x_b - 0.4)] - [p_w x_w + (1 - p_w)(x_w - 0.4)]$, where x_w (x_b) is the mean log wage in the white (black) year–experience–education cell among working men, and p_w (p_b) is the fraction working in the white (black) year–experience–education cell.

wages and earnings are always found among workers who have not obtained any high school credential, and in recent decades, new cohorts of college educated blacks have fared much better relative to whites than less educated blacks.

Here, I am using the cross-section relationships between education and earnings or education and wages as indicators of the gains from education that individual young persons might expect at a given point in time. Heckman, Lochner and Todd (2004) adopt a life-cycle investment framework and calculate rates of return on investments in education by following the earnings histories of synthetic cohorts over recent census years. They find consistent evidence that blacks earn higher rates of return to education than whites.

Table 10
Black–white differences in average log earnings. With imputations for non-workers. Standard deviations in parentheses.

Year and education	Experience				
	1–5	6–10	11–15	16–20	21–25
9–11 years					
1960	−0.40	−0.49	−0.50	−0.43	−0.47
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
1970	−0.32	−0.38	−0.42	−0.39	−0.41
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
1980	−0.51	−0.44	−0.42	−0.39	−0.34
	(0.02)	(0.02)	(0.03)	(0.03)	(0.03)
1990	−0.53	−0.52	−0.53	−0.45	−0.36
	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
2000	−0.47	−0.48	−0.48	−0.41	−0.47
	(0.03)	(0.04)	(0.04)	(0.03)	(0.03)
12 years					
1960	−0.37	−0.45	−0.51	−0.49	−0.44
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
1970	−0.20	−0.32	−0.32	−0.35	−0.38
	(0.02)	(0.01)	(0.01)	(0.02)	(0.02)
1980	−0.39	−0.40	−0.33	−0.36	−0.35
	(0.01)	(0.01)	(0.01)	(0.02)	(0.02)
1990	−0.29	−0.43	−0.47	−0.37	−0.38
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
2000	−0.31	−0.39	−0.34	−0.35	−0.40
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
16 years					
1960	−0.28	−0.38	−0.47	−0.42	−0.53
	(0.06)	(0.04)	(0.04)	(0.04)	(0.08)
1970	−0.01	−0.24	−0.28	−0.42	−0.50
	(0.05)	(0.04)	(0.04)	(0.05)	(0.06)
1980	−0.17	−0.21	−0.22	−0.31	−0.39
	(0.03)	(0.03)	(0.03)	(0.04)	(0.05)
1990	−0.07	−0.23	−0.32	−0.32	−0.25
	(0.03)	(0.02)	(0.02)	(0.03)	(0.03)
2000	−0.12	−0.22	−0.28	−0.34	−0.36
	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)

Notes: This table displays black–white average log earnings gaps, with imputations for non-workers. See notes to Table 7 for sample and variable definitions and notes to Table 6 for the definition of working status. Each entry is equal to $[p_b x_b + (1 - p_b)(x_b - 0.4)] - [p_w x_w + (1 - p_w)(x_w - 0.4)]$, where x_w (x_b) is the mean log earnings in the white (black) year–experience–education cell among working men, and p_w (p_b) is the fraction working in the white (black) year–experience–education cell.

4. Investments in children

Section 2 of this chapter demonstrates that recent cohorts of black young adults have not continued to close the black–white attainment gap and that cohorts of black youth born after the late 1970s appear to have either fallen farther behind their white counterparts or simply made no progress toward closing the black–white achievement gap. The preceding section demonstrates that these measures of the black–white skill gap stopped closing during a time when the correlations between adult labor market outcomes and measured skills were at least as strong and likely stronger among black adults than among white adults. It is possible that race-specific correlations between measured skills and labor market outcomes paint a misleading picture concerning racial differences in the distributions of potential gains from skill investments, but no existing studies provide clear evidence that this is the case.[36] Regardless of the degree to which blacks still suffer from labor market discrimination, recent labor market data do not support the view that discrimination harms skilled blacks more than unskilled blacks, and there is no evidence that some recent surge in discrimination against skilled black workers could serve as a plausible explanation for the recent lack of progress toward closing black–white skill and attainment gaps among youth.[37]

Because black youth can apparently expect relatively high returns from investments in skills, the observed low and stagnant relative skill levels among black youth suggest that there exist barriers to skill acquisition in black families and communities. In this section, I discuss black–white skill convergence in terms of a simple model of the intergenerational transmission of human capital that illustrates how various factors affect investments in children and the evolution of group differences in human capital over time.

Assume that each person lives two periods, and each family has one parent and one child. Children make no decisions. Parents divide their time between market work and investment activities with their children. They divide their income between current household consumption and investment in their child's human capital. Each parent has a utility function

$$U(c, h'),$$

where c = family consumption, and h' = the human capital that her child enjoys in adulthood. In this framework, h' enters the utility function directly. Parents may care about the future well-being of their children, but parents also derive utility directly from

[36] See Card (1999), Carneiro and Heckman (2002) and Carneiro, Hansen and Heckman (2003) for work on individual heterogeneity and measured returns to schooling.

[37] The empirical work in the previous section did not address heterogeneity in returns to skill investments among blacks. While it is possible that the returns to skill and attainment implied by the results in the previous section are not available to some black children, it is important to remember that the NAEP data from the 1990s indicate that a significant fraction of black youth still perform at levels that are approximately below the support of the white skill distribution. For the parents of these black students, what information could sustain the belief that their children have little to gain from improving their reading and math skills, especially given the well documented increase in the apparent labor market returns to education and cognitive skills during the past two decades or more?

having a well educated child.[38] Each parent has one unit of time and devotes a fraction s to investments in her child and a fraction $(1-s)$ to market work. Three factors determine human capital accumulation for a child. These are purchased inputs, d, effective parental time, sh, and the child's ability, θ. Thus, each parent faces the following constraints:

$$h' = g(\theta, sh, d),$$
$$(1-s)h = pc + td,$$

where h is the human capital of the parent, p is the price of the consumption good, t is the price of the purchased investments in children, and wages are normalized to one. A key finding in the literature on black–white skill gaps is that black children often find themselves well behind their white peers at young ages. I use this model, in large measure, to analyze parents' decisions to invest in young children, and thus I assume that a parent does not know her child's ability to learn, θ, when making these decisions. The abilities of individual children are i.i.d. draws from an ability distribution $F(\theta)$.[39] I impose the standard restriction that parents cannot borrow on behalf of their children. I also ignore bequests, but the results that I highlight remain in a slightly modified version of the model that permits financial transfers to children.

Consider the following special case of the model:

$$U(c, h') = \ln(c) + \alpha \ln(h'),$$
$$h' = \theta(sh)^{\gamma}(d)^{\delta}, \quad \gamma > 0, \quad \delta > 0, \quad (\gamma + \delta) < 1.$$

Given this specification, it is straightforward to derive the following equation describing the evolution of human capital over generations.

$$\ln h' = \ln\theta + (\gamma + \delta)\ln h + k(\alpha, \gamma, \delta) - \delta \ln t,$$

where k is a constant determined by preference and production parameters. I maintain the assumption that the distribution of θ does not vary by race. Existing psychometric studies offer many results that are inconsistent with the view that the black–white skill gap is genetic in origin.[40] Here, I also assume that blacks and whites have the same utility functions and home production functions. Thus, $k(\alpha, \gamma, \delta)$ is the same for black and white families and does not affect the black–white skill gap. Given these assumptions, three factors determine the evolution of black–white skill gaps across generations.[41]

[38] This assumption simplifies the presentation of the model. However, it is not central to the analysis. Below, I solve a specific version of the model to illustrate several basic points. It is straightforward to reformulate this version of the model as a recursive problem in which parents care only about their consumption and the indirect utility of their children.

[39] In the special case of the model that I solve below, investment decisions are not a function of $F(\theta)$, and the analysis of group differences would not change if I allowed correlations within families among realizations of θ.

[40] See Ceci (1991) and Nisbett (1995).

[41] The form of the utility function in this example is such that preference parameters do not enter this equation. Here, the income elasticity of demand for h' would equal one if parents acquired h' at a constant price. If h' is a luxury good, there will be less regression to the mean in human capital across generations.

To begin, the current black–white skill gap affects the skill gap in the next generation. All wealth in this model is held in the form of human capital, and wealth matters here because all investments in children are financed through forgone consumption. Second, the size of this wealth effect varies inversely with the degree of diminishing returns to investments in a given child. Finally, racial differences in the cost of investment goods, $\Delta \ln t$, influence future human capital gaps through their effect on the racial gap in current investments in children.

A little algebra gives the following equation for the steady-state black–white skill gap,

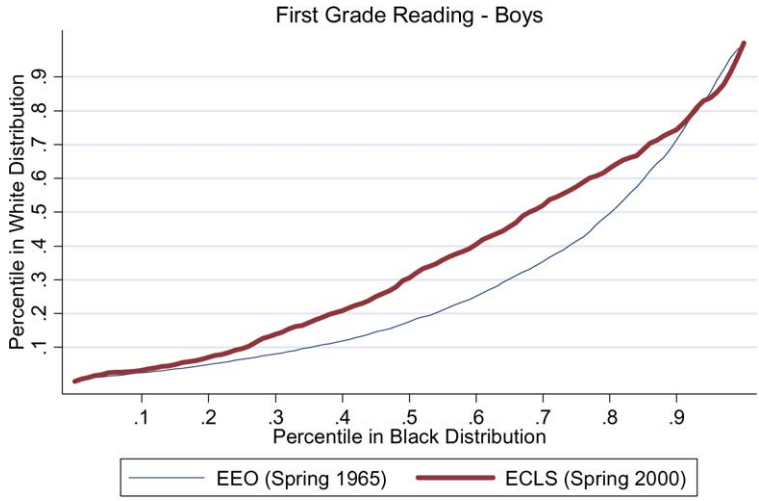
$$\Delta \ln h = \frac{-\delta}{1-\gamma-\delta} \Delta \ln t,$$

where Δx denotes the mean value of x among blacks minus the corresponding mean among whites. Two steady-state scenarios present themselves. First, if blacks and whites face the same investment cost, $\Delta \ln t = 0$, the black–white skill gap will equal zero in steady state regardless of the size of the initial black–white skill gap. This outcome is not peculiar to this model. In models with perfect capital markets, full convergence may take place in one generation, but even in models with borrowing constraints, diminishing returns to child-specific investments tend to eliminate group differences in human capital as long as both groups enjoy the same opportunities to invest in children.[42] Diminishing returns is a natural assumption in this context because each child's own time and energy are fixed factors in the production of h'.

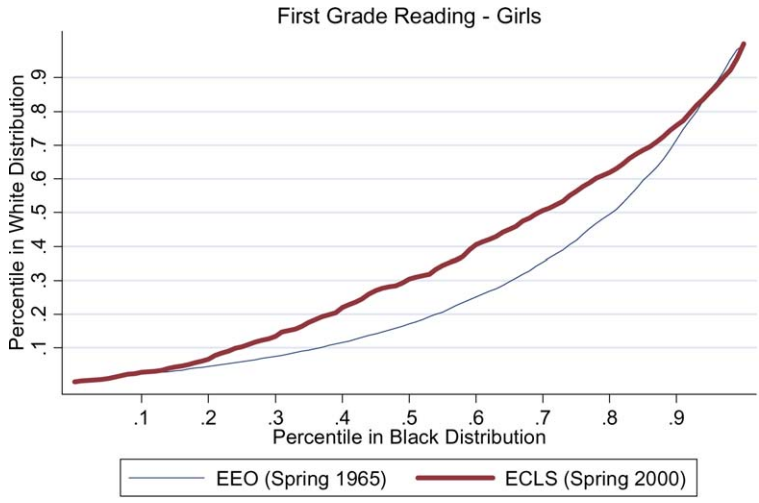
On the other hand, if blacks face higher costs than whites, $\Delta \ln t > 0$, then $\Delta \ln h < 0$ will be the steady state outcome. A large literature documents significant relative improvements in school quality for blacks during the 20th century. Further, compared to the pre-Civil Rights era, blacks enjoy much greater freedom to choose communities, schools, and colleges. The extent to which black and white families now face the same costs of investing in their children will influence the degree to which the skills of black youth converge to those of white youth in future generations.

Below, I examine three possible explanations for the halt in black–white skill convergence during the 1990s. I begin by discussing shocks that black families and communities suffered during the 1980s and 1990s. I then turn to the roles of schools and culture. These potential explanations have very different implications for black–white skill convergence in the future. One time shocks to black families or communities can only slow the process of black–white skill convergence for a limited period of time, but persistent racial differences in access to quality schooling or racial differences in social norms concerning investments in children or the organization of families can create more permanent barriers to black–white skill convergence.

[42] See Becker and Tomes (1986) and Loury (1981) for examples. Mulligan (1997) provides a useful exposition of these models and provides analyses of intergenerational correlations for consumption as well as potential income.



(a)



(b)

Figure 6. The figures use verbal and reading EEO and ECLS test scores.

4.1. Shocks to families and communities

The importance of family resources comes into sharper focus when one realizes that black–white achievement gaps are large even among children in their first few years of school. Figures 6(a)–(b) present results based on first grade reading scores from the

Equality of Education Opportunity Study of 1965 (EEO) and the Educational Childhood Longitudinal Study – Kindergarten Class of 1998–1999 (ECLS-K). The figures give matches between percentiles in the black and white score distributions separately by gender. While black first graders did make significant gains relative to their white counterparts over the last three and one half decades of the 20th century, roughly 70 percent of black first-graders in 2000 still performed below the median score among white first-graders of the same gender.[43]

The fact that test scores among black children lag well behind scores among white children at early ages is consistent with the idea that the black–white skill gap among young adults can be traced, in large measure, to black–white differences in the types of investments made in children at early ages. These investments are, for the most part, made by families, and Tables 11 and 12 show that, among young children, the black–white gap in family resources remains large today. Table 11 describes trends in family structure for children ages five and under. The data come from the 1960–2000 census files. The numbers in each cell give the fraction of children of a given race in a given census year who live with either one parent, two parents, or neither of their parents. In 2000, only 1/3 of black pre-school children lived with two parents, and just over one in ten lived with neither of their parents. Black family structures differed from white family structures even in 1960, and in the decades that followed, the rate of decline in two-parent households was much more dramatic in the black community. However, rising black incomes more than made up for the adverse effects of changes in family structure on black household incomes during the period from 1960 to 1980. Table 12 presents weighted averages of household incomes by race, census year, and family structure for families with children ages five and under. The weights are the number of pre-school children in each household. The table shows that between 1960 and 1980, black incomes increased dramatically regardless of family structure, and despite adverse changes in family structures, overall average black household incomes rose considerably relative to white household incomes.

Yet, beginning around 1980, many factors worked together to diminish the resources available to black children. Two-parent families became even more rare in the black community, and for the first time, never-married motherhood became quite common.[44] Further, real wages for less skilled workers fell, and the real value of transfers offered by various welfare programs declined. Thus, Table 12 shows that mean black household income fell during the 1980s and that the ratio of mean black income to mean white income remained lower in 2000 than it was in 1980. Further, within any family structure category, the incomes of black families in that structure did not keep pace

[43] Measured in standard deviation gaps, the black–white gaps for boys are 0.65 and 0.57 for the EEO and ECLS-K respectively. The corresponding gaps for girls are 0.66 and 0.53. Brooks-Gunn, Duncan and Klebanov (1996) document IQ gaps of roughly one full standard deviation in a sample of five year olds.

[44] Neal (2004b) shows that, between 1980 and 1990, the prevalence of never-married motherhood among black women with no postsecondary schooling increased quite dramatically. Never-married mothers may receive much less financial support than divorced mothers.

Table 11
Fraction of children with zero, one, and two parents

	Black			White		
	Zero	One	Two	Zero	One	Two
1960	0.08	0.24	0.68	0.01	0.06	0.93
1970	0.06	0.36	0.58	0.01	0.09	0.90
1980	0.06	0.49	0.46	0.01	0.13	0.86
1990	0.07	0.59	0.34	0.02	0.18	0.80
2000	0.11	0.56	0.33	0.03	0.19	0.79

Notes: The table displays fractions of children aged 0–5 who live in a household with zero, one or two parents. Data are from the decennial census IPUMS, 1960–2000. The IPUMS variables used for defining the number of parents are "momloc" and "poploc". Individuals with allocated sex, age or race have been dropped from the sample. Sample weights "perwt" are used for year 2000.

Table 12
Average household income of children with zero, one, and two parents

Year	Parents							
	Black				White			
	Average	Zero	One	Two	Average	Zero	One	Two
1960	18,280	15,730	13,282	20,323	34,769	24,386	21,076	35,725
1970	28,065	23,376	19,264	33,934	45,779	34,477	27,427	47,664
1980	31,017	29,674	22,150	40,670	45,480	41,464	27,671	48,136
1990	30,933	29,299	22,590	45,634	52,828	42,965	31,773	57,740
2000	35,756	35,591	25,197	53,894	64,065	46,149	37,495	71,016

Notes: The table displays average total household income for children aged 0–5. Data are from the decennial census IPUMS, 1960–2000. The IPUMS variable used for constructing total household income is "inctot". Total household income is the sum of "inctot" across individuals who live in the same household. Negative values of "inctot" have been recoded to zeros. Values are expressed in 1999 USD. Current monetary values have been adjusted using the CPI-U. The variables used for defining the number of parents are "momloc" and "poploc". Individuals with allocated sex, age or race have been dropped from the sample. Sample weights "perwt" are used for year 2000.

with the incomes of their white counterparts from 1980 to 2000. Still, it is clear that the magnitude of the overall relative decline in black family income since 1980 is related to changes in black family structure and the weak growth of household income among black single parents. Mean household incomes for black children in two-parent families did increase by one third during the 1980s and 1990s, but two-parent black families declined in numbers over this period, and mean household income for black children in single parent homes barely increased in real terms during the 1980s and grew at an anemic pace during the 1990s.

A large literature documents dramatic changes in the wage structure during the 1980s and 1990s.[45] These changes involved falling real wages for less skilled workers throughout the 1980s, and because black adults entered the 1980s with less human capital than white adults, these changes in the wage structure lowered the earnings of black adults relative to white adults, especially in the early 1980s.[46] This earnings shock lowered wealth among black adults, and may have also lowered gains from marriage in the black community, helping foster changes in family structures that further widened the effective family resource gap between black and white children. The 1980s were preschool years for most of the nine and thirteen year old respondents tested in the NAEP-LTT assessments of the late 1980s and early 1990s, and these assessments were the first NAEP assessments that showed no closing of the black–white test score gap. The timing of these episodes may be purely coincidental, but the model outlined above suggests that a negative shock to parental wealth should lower human capital accumulation among children, and several recent empirical studies, Mayer (1997) and Blau (1999), find that increases in family wealth are associated with increases in cognitive test scores among children.

Although the magnitudes of existing estimates of the effects of long-term family income on achievement are not large, the sharp declines in family income among black families during the early 1980s were likely accompanied by many episodes of job displacement and family disruption that harm development in children.[47] If negative shocks to black families in the 1980s did reduce investments in black preschoolers, these shocks likely played a role in creating the large and stagnant black–white test score gaps observed during the 1990s. Further, the rising relative incomes of black families during the late 1990s may provide a reason to expect smaller black–white test score gaps in the near future.[48]

Fryer et al. (2004) point to another shock to black families and communities that occurred in the late 1980s and early 1990s. The crack epidemic began around 1985, and it may be no coincidence that this increase in drug market activity began as real wages for unskilled workers were declining. Although the crack epidemic was generally confined to cities, crack distribution did create significant disruptions in urban black communities during the late 1980s and early 1990s. I noted above how Figures 3(a) and (b) show that between 1982 and the period 1992–1996, black youth in large cities actually lost ground in math, relative to the overall distribution of scores for whites. This is quite striking given that overall results for black youth show a narrowing of black–white test

[45] See Katz and Autor (1999).

[46] See Bound and Freeman (1992) and Juhn, Murphy and Pierce (1991). Further, CPS data on yearly averages of household income indicate that the significant declines in black family income prior to 1985 contributed greatly to the overall decline in black family incomes during the 1980s.

[47] McLanahan and Sandefur (1994) and Sandefur and Wells (1999) present much suggestive evidence that children benefit in many ways from growing up in stable homes with two parents.

[48] CPS data indicate that the rising black incomes during the late 1990s generated much of the overall increase in black family incomes during the 1990–2000 period.

score gaps during most of the 1980s and relatively constant gaps during the 1990s. I have not been able to acquire individual NAEP-LTT data for years between 1982 and 1992, and thus I cannot determine the extent to which black achievement in large cities moves with the spread of crack among large cities. However, Figures 3(a)–(b) suggest that this may be an important task for future research.

4.2. Schools

The discussion above focuses on the possibility that changes in the wage structure may have harmed black families and communities in ways that have temporarily stalled the process of black–white skill convergence.[49] However, the model of investment in children presented earlier demonstrates that, if black families face persistently higher costs of investing in their children, black–white skill convergence is not inevitable, and the experience of the past 15 years or more could mark the beginning of a long period of large and stable black–white skill gaps. In this section, I discuss schools as potential sources of fixed racial differences in the levels of investments made in children.

Governments greatly influence the cost of investing in children by selecting policies that regulate the funding and operation of public schools serving different groups in society, and there is no doubt that, during much of the 20th century, blacks were only allowed to attend schools that were funded poorly relative to schools that served predominately white populations. In contrast, black and white students today attend schools that receive comparable resources in terms of standard measures of school inputs.[50] Still, there is some evidence that blacks attend less effective schools than white students, and although this racial gap in school quality cannot be linked to racial differences in school funding levels, it may indicate that blacks pay higher implicit, if not explicit, costs to attend quality schools. Here, I review some of the evidence on the contribution of schools to the black–white achievement gap.

In a recent paper, Fryer and Levitt (2004) analyze data from a panel of students who entered kindergarten in 1998. Fryer and Levitt report that black–white gaps in reading and math are large when students begin kindergarten, and they also report that these gaps grow as children progress through kindergarten and first grade. When they control for school fixed effects, they find little evidence that black–white test score gaps grow over time among students attending the same school, and they interpret this result as suggestive evidence that blacks, on average, attend schools that are less effective than the schools that whites attend.

De los Santos, Heckman and Larenas (2004) use a different methodology to address black–white differences in school quality. Using data from the NLSY79, they estimate how AFQT scores change with years of schooling prior to the date of the test. They con-

[49] Note that even if the drop in real wages for unskilled workers is permanent, this change amounts to a one time negative shock to the relative wealth of black families. This shock would slow but not stop the process of black–white skill convergence.

[50] See Neal (2004b), Grogger (1996), and Boozer, Krueger and Wolkon (1992) for details.

trol for endogeneity in attainment at the time of the test using two methods developed in Hansen, Heckman and Mullen (2004) and conclude that, on average, AQFT scores do increase with schooling faster among white students than black students. However, their results also suggest that these racial differences in how scores change with additional schooling may only be important among children with low latent ability, which they interpret as poor pre-school preparation.

These studies suggest that either racial differences in available school quality or black–white differences in how families and children interact with schools cause the black–white skill gap to grow as children age, but several other data sets offer little evidence that the black–white achievement gap grows at all with time in school. Table 13a summarizes results from three different panel studies of achievement. Each study follows a nationally representative cohort of students who are in the same grade in the first year of the panel. The table describes how the black–white test score gap evolves as students in these cohorts progress through school. The High School and Beyond Study of 1980 (HSB80) follows 10th graders through high school. Follow-up testing took place in 1982 when most respondents were high school seniors. The National Educational Longitudinal Study of 1988 (NELS88) began with a cohort of eighth graders and included follow up testing in 1990 and 1992. In the ECLS-K, black–white test score gaps are clearly wider at the end of first grade than the beginning of kindergarten, and this widening appears to be slightly more dramatic among boys. The NELS88 data show small increases in the absolute value of test score gaps between 8th and 10th grade. However, neither the HSB80 or NELS88 data show that blacks fall farther behind whites after 10th grade. In some cases, black–white gaps in raw test scores widen as students progress through school even though the corresponding gaps measured in standard deviation units shrink over the same time interval. This reflects the fact that, with the exception of the ECLS-K data, the changes in black–white test score gaps reported here are quite small and in some cases they are significantly smaller than the increase in the overall standard deviation of scores between two grades.

Table 13b compares how the relative ranks of black students in distributions of white test scores change between assessments. I assign each black student a percentile score based on where his or her score falls in the corresponding distribution of scores for white students and then calculate the average for these percentile scores. The change in the average percentile rank of black students within the white test score distribution is an attractive index of the change in the achievement of blacks relative to whites because it is invariant to all monotonic transformations of the distributions of test scores. Using this metric, there is no clear evidence that black students lose ground relative to their white peers after 8th grade, and some suggestion of improvement between grades 10 and 12 in the relative ranks of black students in the HSB. The ECLS-K results follow the same pattern found in Table 13a, but the average changes in relative rank among young black girls are quite small.

Table 14 addresses the issue of black–white test score divergence during school ages using synthetic cohort data from the NAEP-LTT studies. I calculate the change in the black–white score gap between ages 9 and 13 for various birth cohorts by subject using

Table 13a
Changes in black–white score gaps. Gap in followup year – gap in base year

Data set	Boys				Girls			
	Reading		Math		Reading		Math	
	Score gain (se)	Stand dev. gain	Score gain (se)	Stand dev. gain	Score gain (se)	Stand dev. gain	Score gain (se)	Stand dev. gain
High School & Beyond Sophomore 1980 Cohort (10th–12th grade)	−0.123 0.371	0.005	0.188 0.744	0.078	−0.302 0.323	−0.021	−0.206 0.627	0.047
NELS 1988–1990 (8th–10th grade)	−1.154 0.844	−0.013	−1.176 1.066	0.037	−0.527 0.737	0.024	−1.894 0.954	−0.047
NELS 1990–1992 (10th–12th grade)	−0.316 0.905	−0.017	−0.750 1.166	−0.012	−0.214 0.725	−0.013	0.529 0.999	0.071
ECLS 1998–1999 (Fall K–Spring 1st grade)	−4.386 1.171	−0.122	−2.417 0.846	−0.130	−3.429 1.217	−0.096	−1.876 0.837	−0.071

This table displays the changes in the black–white score gaps (referred to as score gains) in score terms and in standard deviation terms for the HSB, NELS and ECLS data. The ECLS base period is fall kindergarten and followup period is spring first grade for 1998–1999. The HSB base period is 10th grade and the followup period is 12th grade for the 1980 cohort. The NELS data covers two time periods. In the first the base period is 8th grade and followup is 10th grade for 1988–1990. The second has a base period of 10th grade and a followup of 12th grade for 1990–1992.

Table 13b
Average percentile ranking in white test scores among black children

Year	HSB			
	Reading		Math	
	Male	Female	Male	Female
1980	0.34	0.33	0.27	0.28
1982	0.35	0.32	0.30	0.30
	NELS			
	Reading		Math	
	Male	Female	Male	Female
1988	0.31	0.31	0.26	0.28
1990	0.31	0.32	0.27	0.29
1992	0.31	0.31	0.27	0.31
	ECLS			
	Reading		Math	
	Male	Female	Male	Female
1998	0.36	0.36	0.32	0.30
1999	0.34	0.35	0.28	0.29

Notes: Each entry represents the average white percentile for black scores. The ECLS data corresponds to fall kindergarten in 1998 and to spring first grade in 1999. The HSB data are for 10th grade in 1980 and 12th in 1982. The NELS data are for 8th grade in 1988, 10th grade in 1990 and 12th grade in 1992.

published reports from the NAEP-LTT. For nine different birth cohorts from 1962 to 1983, there is not one instance of a statistically significant increase in the absolute value of the black–white test score gap in either math or reading. Further, the most notable entries in Table 14 involve instances where black students gained ground on white students, especially in reading. Other studies have found that black–white test score gaps widen as children age,[51] but the ECLS-K is the only nationally representative sample involving multiple waves of testing which provides consistent evidence that blacks fall farther behind whites as they progress through school.

Black–white achievement gaps are quite large before students enter school, and before children leave elementary school, black–white test score gaps are comparable to the gaps that will be observed later when these children are young adults. It seems unlikely that one can understand the black–white skill gap and its recent stability without a

[51] See Carneiro and Heckman (2002) and Phillips, Crouse and Ralph (1998). These studies examine the Children of the National Longitudinal Survey (CNLSY) samples and the Prospects sample. Both studies provide evidence that achievement gaps widen during elementary school years.

Table 14
Relative test score gains of black students. Ages 9–13 NAEP-LTT

Cohort	Reading		Math	
	Score gain (se)	Stand dev. gain	Score gain (se)	Stand dev. gain
1962	7.50 (2.37)	0.03	–	–
1969	–	–	−2.30 (2.36)	−0.14
1971	5.80 (2.38)	0.11	–	–
1973	–	–	4.70 (3.28)	0.04
1975	14.10 (3.12)	0.26	–	–
1977	–	–	−1.90 (3.20)	−0.13
1979	0.40 (3.80)	−0.02	–	–
1981	4.40 (4.13)	0.01	−2.50 (4.31)	−0.09
1983	1.50 (3.69)	0.01	−2.00 (2.67)	−0.10

Notes: The table displays the changes in the black–white reading and math score gap between ages 9 and 13 for various birth cohorts. The data are taken from the 1999 NAEP Long-Term Trend Assessment Summary Data Tables.

better understanding of black–white differences in experiences during early childhood. Because parents play such a large role in preparing children for school and then aiding their children's transition into school, it is worthwhile to consider the potential obstacles that black families may face as they attempt to build their children's human capital. I take up this task in the next section.

Before turning to the role of families, I must add one clarifying comment about schools and education policy. It is well known that black students now, on average, attend public schools that receive resource levels equal to or slightly greater than national averages.[52] Given this fact, and the result that black students do not fall farther behind their white peers after elementary school, some may conjecture that schools per

[52] See Boozer, Krueger and Wolkon (1992), Grogger (1996) and Neal (2004c) for recent statistics on black–white differences in public school resources.

Ferguson (2004) adds a cautionary note concerning teacher quality. He reviews several studies that report a negative correlation between the average level of academic quality among teachers and the percentage of minority students in their classrooms. The measures of teacher quality in these studies include teacher test scores and college major.

se contribute little to the black–white skill gap among today's youth, but even if this conjecture is correct, it does not imply that changes in education policy cannot help close the black–white achievement gap. A recent book edited by Chubb and Loveless (2002) reviews evidence from several experiments involving class size changes, vouchers for disadvantaged students, changes in school management and curriculum, and the introduction of test-based accountability systems. Many of the papers conclude that specific policy changes could contribute to a narrowing of the black–white achievement gap. Krueger and Whitmore (2002) argue that, even though no racial difference in class size currently exists, further across the board reductions in class size would shrink the black–white test score gap because black students benefit more than white students from class size reductions, and they argue that black students were hurt by the fact that average class sizes shrank at a slower rate during the 1990s than in previous decades. Howell and Peterson (2002) argue that vouchers targeted to economically disadvantaged students in cities should reduce the black–white skill gap because black students make up a large portion of disadvantaged urban students and because voucher experiments in cities have shown particularly impressive gains from vouchers for black students.[53]

These results and others reported in the Chubb and Loveless (2002) volume are important for stimulating informed debate about potential changes in public policy that may be particularly beneficial for black children, but I know of no change in public policy during the last 20 years that systematically took resources away from black children. Changes in education policy may be needed to restart the process of convergence, but it is difficult to identify a specific policy change that could have caused black–white convergence in achievement and attainment to suddenly halt after decades of steady progress.

4.3. The role of norms

Black–white differences in family wealth play some role in determining black–white skill gaps among children by shaping investments in children at early ages, and the extremely slow growth of black household income during the 1980s may have contributed to the lack of progress toward closing the black–white skill gap among children born at the end of the 1970s and during the 1980s. However, as I noted earlier, negative wealth shocks should only slow the process of black–white skill convergence for a period of time, and black household income per child began to grow again at a respectable rate at some point during the 1990s. If the below-trend academic performance of black-children born during the 1980s and early 1990s is attributable to the relatively weak

[53] The Krueger and Whitmore paper follows up Krueger's earlier 1999 paper that evaluates the Tennessee STAR experiment. The Howell and Peterson paper summarizes selected results from a larger study of voucher experiments in Dayton, New York City, and Washington, DC, Howell and Peterson (2002b).

Slavin and Madden (2002) contribute another interesting chapter on the use of the "Success for All" school management model in schools with significant populations of minority students.

growth of black family incomes during this period, the process of black–white skill convergence may resume in the near future.

Nonetheless, there is a more ominous potential explanation for the recent stability of the black–white skill gap. Black families may pay consistently higher costs to invest in their children and these cost differences may support persistent and significant black–white gaps in test scores and attainment. This scenario is not compelling unless one can be specific about the form that these cost differences might take, and I have already noted that black and white children now attend schools that receive comparable resources. Further, in stark contrast to the state of affairs a century ago, no legal structures today explicitly place black families at a legal disadvantage relative to whites when investing in their children. Civil Rights laws now guarantee that black families have the right to live in any neighborhood in any house they can afford and also apply to any school they choose without fear of being denied admission solely because of their race. On the other hand, race appears to matter per se in determining how persons organize their social interactions. Rates of inter-marriage are far too low to be explained by economic differences between blacks and whites. Further, neighborhoods and schools are much more segregated by race than one would expect if purely economic considerations determined patterns of sorting. Because social interactions are so segregated by race, one must ask whether or not black–white differences in norms or culture affect patterns of investment in children.

This issue is salient because some evidence suggests that black–white differences in parenting styles contribute to black–white skill gaps among children. Brooks-Gunn, Duncan and Klebanov (1996) follow a sample of low-birth weight infants through age 5. At age 5, these children took IQ tests that revealed a full standard deviation gap in IQ between black and white children. The authors found that measures of family wealth and neighborhood quality did account for roughly half of the black–white gap in IQ scores, but the analyses also included measures of maternal parenting behavior that were constructed from data gathered at ages 12 and 36 months by trained observers who made visits to each child's home. These measures of parenting behavior accounted for over half of the black–white IQ gap among children from families who enjoyed comparable wealth and neighborhood quality even in regression specifications that included additional controls for maternal education and verbal ability. It is possible that parenting behaviors serve as proxies for unmeasured dimensions of maternal human capital. Even among mothers with similar measured skills, those with greater intellectual sophistication likely make better parenting choices. Nonetheless, the fact that parenting behaviors differ greatly by race among families that are similar with respect to wealth, neighborhood quality, family structure, and measured maternal human capital raises the possibility that norms concerning child rearing differ among blacks and whites in important ways.[54]

[54] See also Brooks-Gunn et al. (1998) and Ferguson (2004). Lightfoot (1978) provides a more qualitative analysis of how black families and schools interact and discusses the role on culture in these interactions.

In the economics and sociology literature, there are at least two different lines of argument that deal with social norms and human capital accumulation among children. I begin with the literature on "acting white". A substantial literature examines the possibility that blacks may invest less in human capital than whites because they fear social sanctions from other blacks. If academic achievement is viewed as a "white" accomplishment, higher achieving blacks may be ostracized by other blacks. Austen-Smith and Fryer (2005) develop an explicit model of human capital investment in a setting where this type of social sanction is possible. In their model, residents of a particular neighborhood or social group who invest in academic achievement risk being excluded from social interactions in their neighborhood or group. Contributing to group functions is more costly for skilled people because they have a higher shadow price of time. Thus, the group expects that persons who invest in market skills are more likely to default on future obligations to the group. This social dynamic reduces aggregate investment in human capital because the expected loss of cooperation within the group acts as an extra cost of investing in market skills. Anecdotal evidence in media reports and ethnographic work often suggests that something like this pattern of social interactions hinders human capital accumulation among black youth,[55] but at this point, the existing empirical literature does not provide conclusive evidence that high-achieving black children experience different social benefits or sanctions than high-achieving white children. Further, there is no evidence that black parents suffer social sanctions when they encourage their children to excel in school.[56]

Another important argument about group norms involves attitudes towards marriage and single motherhood. The most striking demographic difference between black and white children is the greater likelihood that a black child will live in a home with one or no parents. Further, many single parent homes in the black community do not arise because of divorce or the death of a parent. Neal (2004b) demonstrates that never-married motherhood became common among black women by 1990, and never-married mothers are even less likely to receive support from the fathers of their children or the families of these fathers than women who are widowed or divorced.

Nechyba (2001) describes a model of unwed motherhood in which the fraction of women who are unwed mothers in one generation determines the stigma associated with unwed motherhood in the next generation. Nechyba argues that, because behavior today affects group norms tomorrow, changes in economic returns to marriage versus single motherhood can create changes in behavior that endogenously generate new norms that persist much longer than the original change in the economic returns to marriage. The possibility that black–white differences in marriage rates reflect not only black–white differences in the economic gains from marriage but also black–white differences in

[55] Ogbu (1990) presents the hypothesis that historical discrimination against blacks has created a belief among blacks that investment in individual skills is a "white" strategy for success and not an attractive strategy for them.

[56] Austen-Smith and Fryer survey this literature. Cook and Ludwig (1998) is one well-known study that finds no support for the claim that highly skilled black students suffer social penalties for "acting white".

norms concerning the desirability of marriage may have implications for how we understand black–white differences in youth outcomes. Weiss and Willis (1985) present a model that shows how investments in children are likely to be below efficient levels when parents do not live in the same household because parents who live together can better coordinate investments in children. When parents live apart, an agency problem arises. The non-custodial parent cannot be sure that transfers intended for expenditures on their child are spent entirely on the child. This monitoring problem acts as a tax on investments in children.

We do not fully understand the causes of existing black–white differences in family structure, but if important black–white differences in norms concerning the desirability of marriage do exist, these differences could be a source of racial differences in investment in children, even among sets of parents with similar wealth and education levels. Further, to the extent that black–white differences in norms concerning marriage affect the expected stability of existing marriages or the likelihood that single mothers will marry the father of their children in the future, black–white differences in parenting behaviors may arise even among families that currently share the same structures and enjoy the same wealth levels. In sum, black–white differences in norms concerning marriage may create differences in the mapping between parental human capital and investments in children that could support persistent black–white skill differences among adults across generations.

Here, I have discussed these potential differences in norms as black–white differences in the cost of investing in children. This seems natural when discussing the Willis and Weiss model because the moral hazard problem they discuss raises the cost of purchasing investment goods for children. However, some may prefer to think of acting white theories or other theories concerning black culture as hypotheses concerning racial differences in preferences or home production technologies. This distinction has no effect on the analysis presented here because such black–white differences in preferences or technology that retard investment in children, $\Delta k(\alpha, \gamma, \delta) < 0$, will yield a non-zero steady-state skill gap, $\Delta \ln h = \Delta k(\alpha, \gamma, \delta)$, even if one assumes that $\Delta \ln t = 0$.

5. Conclusion

It is not clear why the process of black–white skill convergence appeared to stop around 1990. In the previous section, I highlight several possible explanations, but the task of gathering definitive evidence concerning the relative merit of these competing hypotheses remains for future research. I have stressed how some potential explanations imply that the 1990s will one day be seen as an aberration, while other scenarios highlight the possibility that black–white skill gaps may be constant and large indefinitely. However, no plausible scenario implies that one should expect anything approaching black–white skill parity over the next several generations.

After some experimentation, I conclude that even the most optimistic projections imply that the black–white skill gap will be large throughout much of this century. To

construct a best-case scenario, I draw on NAEP-LTT data from the late 1970s and the 1980s. Between 1978 and 1986, the black–white test score gap in math for 13 year old students shrank from 1.08 standard deviations to 0.79 standard deviations. Further, between 1980 and 1988, the reading gap for those age 13 shrank from 0.91 to 0.53. These gaps of 0.53 and 0.79 are the smallest gaps ever recorded in the NAEP-LTT for reading and math respectively, and the rates of convergence between black and white test scores during these eight year periods are more rapid than rates observed during any other periods of equal or greater length. What would happen if test scores for black and white youth converged at these rates throughout the 21st century using 1999 gaps as baselines?[57] The black–white test score gap among teenagers in 1999 was roughly 0.75 standard deviations in reading and 0.9 standard deviations in math in 1999.[58] Given the rates of convergence observed during the 1978–1988 period and the 1999 baselines, one would expect the black–white reading gap to remain above 0.1 standard deviations until roughly 2030 and above 0.05 standard deviations until after 2040. For math, one would expect the gap to remain above these thresholds until after 2055 and 2070, respectively.

These dates represent best-case scenarios.[59] It is easy to construct plausible scenarios in which black–white test score gaps remain large throughout the next century. Further, Figures 2(a)–(d) demonstrate that the relative achievement gains among black students observed during the 1980s were concentrated in the middle and upper percentiles of the black skill distribution. In terms of relative ranks in white test score distributions, black students in the lower percentiles of the black skill distribution appear to have made little progress since the late 1970s, and black students in large cities have actually lost ground.

Now is an appropriate time to consider what policy makers can do to enhance the skill levels of black youth in this generation and those to come. In a recent book, James Heckman and Alan Krueger (2003) engage in a detailed debate concerning the desirability of various human capital policies. The two disagree on much, but both agree

[57] I use NAEP-LTT data and the formula $\text{gap}(t) = \text{gap}(0)\exp(-rt)$ evaluated at $t = 8$ to pin down r. Assume that a generation equals 20 years. The rates of convergence that I recover imply that the ratio of the math test score gaps at $t + 20$ and t is 0.46. The corresponding figure for reading gaps is 0.26.

Solon (2002) surveys the literature on intergenerational earnings mobility. He concludes that the expected value of the ratio of a son's log earnings to his father's log earnings, given the father's earnings, is "about 0.4 or a bit higher". In more recent work, Haider and Solon (2004) present results suggesting that the expected value of this ratio may well be between 0.5 and 0.6.

Thus, my best case projections assume that measured cognitive achievement is even less persistent across generations than log earnings.

[58] I use these figures as approximations based on the results in Table 4 from the NLSY97 and the results for 13 years old in the 1999 wave of NAEP-LTT. The black–white test score gaps in these NAEP-LTT samples are roughly one standard deviation in math and 0.75 standard deviations in reading.

[59] Sampling error affects each of the NAEP-LTT estimates of race-specific achievement means for a given year. Since I chose convergence rates by selecting the most rapid documented period of convergence and since the end points of these periods represent record lows for the absolute value of these black–white score gaps, it is reasonable to suspect that the NAEP-LTT data overstate the actual convergence that occurred during these two periods. True rates of convergence may have never been this rapid.

that high quality pre-school programs may yield large returns for disadvantaged youth. Further, this debate and the related literature provide considerable support for the view that many of the important consequences of black–white differences in parental wealth arise during the pre-school years.

I argue above that the black–white differences in early childhood experiences contribute significantly to measured black–white skill gaps later in life. In another chapter in this Handbook, Blau and Currie (2004) review the literature on the effectiveness of early childhood intervention programs. Many early interventions have yielded positive results, but I will not review that literature again here. Rather, I focus on one particular experiment that is rather distinctive because it involved intense interventions that began while children were still infants. The Carolina Abecederian Project (CAP) began in the early 1970s in North Carolina. 98% of the children in the study were black and all were economically disadvantaged. The study randomly assigned infants to four different treatment and control groups. One group received high-quality day care services with special emphasis on skill and social development during pre-school years. Another group received these services as well as mentoring services during school years. A third group received no pre-school treatment but mentoring services while in school. The final group received no treatment. Treatments for school aged children were associated with few benefits. However, the day care services provided during pre-school years had long lasting impacts on adult employment, attainment, and test scores. Campbell et al. (2001) report that the achievement gains associated with pre-school treatment at age 15 are 0.45 standard deviations in reading and 0.37 standard deviations in math. Figures 4(a)–5(b) suggest that such large increases in basic reading and math skills may translate into significant increases in lifetime earnings.

Prudence requires that one refrain from drawing too many conclusions from a single study which involved only slightly over 100 children. The pre-school treatment services were quite expensive, and no existing studies provide a full cost–benefit analysis for the project. Nonetheless, the results of the CAP show that direct interventions at an early age can generate significant increases in basic skills even among black children who are quite disadvantaged. This is an important finding because the results presented in Section 2 show that a significant portion of black youth still possess basic reading and math skills that place them in the far left tails of the white skill distribution. Further, Figures 2(a)–(d) show that, relative to their white peers, youth in the lower percentiles of the black skill distribution have made the least progress in recent decades.

Among the mothers of children in the CAP, the average IQ is 85 and the average education level is 10.6 years of schooling.[60] Women with such low skill levels may find it difficult to provide early childhood experiences for their children that stimulate cognitive growth and prepare them for school. Although a large literature explores the effect of credit market imperfections on investments in post-secondary education,[61] the large

[60] See Campbell and Ramey (1994).

[61] See Cameron and Heckman (2001), Carneiro and Heckman (2002) and Card (1999).

and lasting benefits of the CAP treatments suggest that, for women in these circumstances, the inability to finance the type of high quality pre-school instruction provided by CAP may be the single most important credit constraint they face as parents. Further, seen in the light of the Brooks-Gunn, Duncan and Klebanov (1996) results concerning racial differences in parenting behaviors, the CAP results also suggest that the mothers in the CAP control group may have benefited greatly from mentoring, instruction and education in effective parenting practices.[62]

There is much evidence that changes in government policies concerning the funding and governance of schools contributed in important ways to the relative academic progress of blacks during the 20th century, but at the dawn of the 21st century, black–white differences in family environments are by far the most important source of black–white differences in levels of resources devoted to children. Important future work is required to more fully understand black–white differences in how parents invest in young children because the black–white skill gap among today's young children is considerably larger than existing estimates of the potential achievement gains associated various education reform proposals.[63] The first generation of black children who enter kindergarten with the same basic language and arithmetic skills as white children may well be the first generation of black adults to enter the labor market on equal footing with their white peers.

Acknowledgements

I thank Nathaniel Baum-Snow, Mario Macis, and Marie Tomarelli for research assistance. I thank Greg Duncan, Steven Durlauf, Eric French, Roland Fryer, James Heckman, Larry Hedges, Steven Levitt, Casey Mulligan, Ananth Sheshadri, Eric Hanushek, and Finis Welch for their comments. I thank the D&D Foundation for research support. I thank summer workshop participants at IRP and IZA.

References

Altonji, J.G., Pierret, C.R. (2001). "Employer learning and statistical discrimination". Quarterly Journal of Economics 116 (1), 313–350.

Arrow, K. (1973). "The theory of discrimination". In: Ashenfelter, O., Rees, A. (Eds.), Discrimination in Labor Markets. Princeton University Press.

Austen-Smith, D., Fryer Jr., R.G. (2005). "An economic analysis 'Acting White' ". Quarterly Journal of Economics. In press.

[62] However, a recent literature survey by Magnuson and Duncan (2005) concludes that interventions targeted directly at young children are more effective means of improving child outcomes than interventions that aim to improve parenting skills.

[63] There are also reasons to worry that gains from class size reductions, voucher programs and other experiments may be difficult to replicate on a large scale.

Baum-Snow N., Neal D. (2004). "Data problems and the measurement of racial and gender wage gaps over time". Mimeo, University of Chicago.

Becker, G.S., Tomes, N. (1986). "Human capital and the rise and fall of families". Journal of Labor Economics 4 (3), S1–S39.

Blau, D., Currie, J. (2004). "Pre-school, day care, and after school care: Who's minding the kids". In: Handbook of Economics of Education. Elsevier, New York.

Blau, D.M. (1999). "The effect of income on child development". Review of Economics and Statistics 81 (2), 261–276.

Boozer, M.A., Krueger, A.B., Wolkon, S. (1992). "Race and school quality since brown versus the board of education". Brookings Papers on Economic Activity: Microeconomics, 269–338.

Bound, J., Freeman, R.B. (1992). "What went wrong? The erosion of relative earnings and employment among young black men in the 1980s". Quarterly Journal of Economics 107 (1), 201–232.

Brooks-Gunn, J., Duncan, G.J., Klebanov, P. (1996). "Ethnic differences in children's intelligence test scores: Role of economics deprivation, home environment and maternal characteristics". Child Development 67 (2), 396–408.

Brooks-Gunn, J., Phillips, M., Duncan, G.J., Klebanov, P., Crane, J. (1998). "Family background, parenting practices, and the black–white test score gap". In: Jencks, C., Philips, M. (Eds.), The Black–White Test Score Gap. Brookings Institution, Washington, DC.

Cameron, S.V., Heckman, J.J. (1993). "The nonequivalence of high school equivalents". Journal of Labor Economics 11 (1), 1–47.

Cameron, S.V., Heckman, J.J. (2001). "The dynamics of educational attainment for black, Hispanic, and white males". Journal of Political Economy 109 (3), 455–499.

Campbell, F.A., Ramey, C.T. (1994). "Effects of early intervention on intellectual and academic achievement: A follow-up study of children from low-income families". Child Development 65, 684–698.

Campbell, F.A., Pungello, E.E., Miller-Johnson, S., Burchinal, M., Ramey, C.T. (2001). "The development of cognitive and academic abilities: Growth curves from an early childhood educational experiment". Developmental Psychology 37 (2), 231–242.

Card, D. (1999). "The causal effect of education on earnings". In: Handbook of Labor Economics, vol. 3A. Elsevier, New York.

Carneiro, P., Heckman, J.J. (2002). "The evidence on credit constraints in post-secondary schooling". Economic Journal 112 (482), 705–734.

Carneiro, P., Hansen, K., Heckman, J.J. (2003). "Estimating distributions of treatment effects with an application to the returns to schooling and measurement of the effects of uncertainty on college choice". International Economic Review 44 (2), 361–422.

Ceci, S. (1991). "How much does schooling influences general intelligence and its cognitive components? A reassessment of the evidence". Development Psychology 27 (5), 703–722.

Chubb, J.E., Loveless, T. (Eds.) (2002). Bridging the Achievement Gap. Brookings Institution, Washington, DC.

Coate, S., Loury, G.C. (1993). "Will affirmative-action policies eliminate negative stereotypes?" American Economic Review 83 (5), 1220–1240.

Collins W.J., Margo R.A. (2003). "Historical perspectives on racial differences in schooling in the United States", NBER Working Paper #9770.

Cook, P.J., Ludwig, J. (1998). "The burden of "Acting White": Do black adolescents disparage academic achievement?" In: Jencks, C., Philips, M. (Eds.), The Black–White Test Score Gap. Brookings Institution, Washington, DC.

Cutright P. (1973). "Achievement, mobility, and the draft: Their impact on the earnings of men", Social Security Administration.

De los Santos B., Heckman J., Larenas M. (2004). "Explaining the gap in achievement test scores for blacks, Hispanics and whites". Mimeo, University of Chicago.

Ferguson, R.F. (2004). "Why America's black–white school achievement gap persists". In: Loury, G.C., Teles, S., Modood, T. (Eds.), Ethnicity, Social Mobility and Public Policy. Cambridge University Press. In press.

Flanagan, A., Grissmer, D. (2002). "The role of federal resources in closing the achievement gap". In: Chubb, J.E., Loveless, T. (Eds.), Bridging the Achievement Gap. Brookings Institution, Washington, DC.

Fryer Jr., R.G., Heaton P., Levitt S., Murphy K. (2004). "The impact of crack cocaine". Mimeo, University of Chicago.

Fryer Jr., R.G., Levitt, S. (2004). "Understanding the black–white test score gap in the first two years of school". Review of Economics and Statistics 86 (2), 447–464.

Grogger, J., Neal, D. (2000). "Further evidence on the effects of catholic secondary schooling". Brookings–Wharton Papers on Urban Affairs 1 (1). Brookings Institution, Washington, DC.

Grogger, J. (1996). "Does school quality explain the recent black–white wage trend". Journal of Labor Economics 14 (2), 231–253.

Haider S., Solon G. (2004). "Life-cycle variation in the association between current and lifetime earnings". Mimeo, University of Michigan.

Hansen, K.T., Heckman, J.J., Mullen, K.J. (2004). "The effect of schooling and ability of achievement test scores". Journal of Econometrics 121 (1).

Heckman J.J., Lochner L., Todd P. (2004). "Fifty years of mincer earnings equations". Mimeo, University of Chicago.

Heckman, J.J., Krueger, A. (2003). Inequality in America: What Role For Human Capital Policy? MIT Press, Cambridge.

Hedges, L., Nowell, A. (1998). "Black–white test score convergence since 1965". In: Jencks, C., Philips, M. (Eds.), The Black–White Test Score Gap. Brookings Institution, Washington, DC.

Howell, W.G., Peterson, P. (2002). The Education Gap: Vouchers and Urban Schools. Brookings Institution, Washington, DC.

Howell, W.G., Peterson, P. (2002b). "Voucher programs and the effect of ethnicity on test scores". In: Chubb, J.E., Loveless, T. (Eds.), Bridging the Achievement Gap. Brookings Institution, Washington, DC.

Johnson, W., Kitamura, Y., Neal, D. (2000). "Evaluating a simple method for estimating black–white gaps in median wages". American Economic Review 90.

Johnson, W., Neal, D. (1998). "Basic skills and the black–white earnings gap". In: Jencks, C., Philips, M. (Eds.), The Black–White Test Score Gap. Brookings Institution, Washington, DC.

Juhn, C., Murphy, K., Pierce, B. (1991). "Accounting for the slowdown in black–white wage convergence". In: Workers and Their Wages: Changing Patterns in the U.S. American Enterprise Institute.

Katz, L., Autor, D. (1999). "Changes in the wage structure and earnings inequality". In: Ashenfelter, O., Card, D. (Eds.), Handbook of Labor Economics, vol. 3A. Elsevier, Amsterdam.

Krueger, A.B. (1999). "Experimental estimates of education production functions". Quarterly Journal of Economics 114 (2), 497–532.

Krueger, A.B., Whitmore, D. (2002). "Would smaller classes help close the black–white achievement gap?" In: Chubb, J.E., Loveless, T. (Eds.), Bridging the Achievement Gap. Brookings Institution, Washington, DC.

Lange F. (2004). "The returns to schooling and ability during the early career: Evidence on job market signaling, employer learning, and post school investments". Mimeo, Yale University.

Lightfoot, S.L. (1978). Worlds Apart. Basic Books, New York.

Loury, G.C. (1981). "Intergenerational transfers and the distribution of earnings". Econometrica 49 (4), 843–867.

Mayer, S. (1997). What Money Can't Buy: Family Income and Children's Life Chances. Harvard University Press.

Magnuson K., Duncan G. (2005). "Parent-vs.-child based intervention strategies for promoting children's well-being". Mimeo, Columbia University.

McLanahan, S., Sandefur, G. (1994). Growing Up With a Single Parent, What Hurts, What Helps. Harvard University Press.

Mulligan, C.B. (1997). Parental Priorities and Economic Inequality. University of Chicago Press.

Neal, D. (1997). "The effects of catholic secondary schooling on educational achievement". Journal of Labor Economics 15 (1).

Neal, D. (2004). "The measured black–white wage gap among women is too small". Journal of Political Economy 112, S1–S28.
Neal, D. (2004b). "The relationship between marriage market prospects and never-married motherhood". The Journal of Human Resources 39 (4), 938–957.
Neal, D. (2004c). "Resources and educational outcomes among black children". In: Peterson, P. (Ed.), In One Generation: The Elimination of Race Differences in Educational Achievement. Rowman & Littlefield.
Neal, D., Johnson, W. (1996). "The role of pre-market factors in black–white wage differences". Journal of Political Economy 104, 869–895.
Nechyba, T. (2001). "Social approval, values, and AFDC: A reexamination of the illegitimacy debate". Journal of Political Economy 109, 637–672.
Nisbett, R.E. (1995). "Race, IQ, and scientism". In: The Bell Curve Wars. Basic Books, New York, NY.
Ogbu, J. (1990). "Minority education in comparative perspective". Journal of Negro Education 59, 45–57.
Phillips, M., Crouse, J., Ralph, J. (1998). "Does the black–white test score gap widen after children enter school?" In: Jencks, C., Philips, M. (Eds.), The Black–White Test Score Gap. Brookings Institution, Washington, DC.
Phelps, E.S. (1972). "The statistical theory of racism and sexism". American Economic Review 62 (4), 659–661.
Robinson J.G., Adlakha A., West K. (2002). "Coverage of population in census 2000: Results from demographic analysis", U.S. Census Bureau, Washington, DC.
Sandefur, G.D., Wells, T. (1999). "Does family structure really influence educational attainment?" Social Science Research 28 (4), 331–357.
Slavin, R.E., Madden, N. (2002). " 'Success for all' and African American and Latino student achievement". In: Chubb, J.E., Loveless, T. (Eds.), Bridging the Achievement Gap. Brookings Institution, Washington, DC.
Smith, J.P., Welch, F.R. (1989). "Black economic progress after Myrdal". Journal of Economic Literature 27 (2), 519–564.
Smith, J.P. (1984). "Race and human capital". American Economic Review 74 (4), 685–698.
Solon, G. (2002). "Cross-country differences in intergenerational earnings mobility". Journal of Economic Perspectives 16 (3), 59–66.
Weiss, Y., Willis, R.J. (1985). "Children as collective goods and divorce settlements". Journal of Labor Economics 3 (3), 268–292.
Welch, F. (1973). "Black–white differences in returns to schooling". American Economic Review 63 (5), 893–907.
Wigdor, A.K., Green Jr., B.F. (Eds.) (1991). Performance Assessment For the Workplace. National Academy Press, Washington, DC.