Black-White Inequality

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Big Picture

- Black-White Progress Largely Stalled About 1990
- Measured Skill Gaps, Education Gaps, and Labor Market Progress All Beginning Stalling in the 1980s
- Hard to blame bad labor market outcomes or trends (primarily) on market discrimination
- Hard to blame skill gap trends on some broad trend in public education policy
- Great Recession made things worse, what will Pandemic Recession do?
- Criminal Justice outcomes make overall story worse.
- Researchers are not sure how criminal justice policy impacts other trends
- My recent work: differences in recidivism are appear to be a huge driver of differences in criminal justice outcomes by race. 60 percent boost associated with being black. Part appears to be a different response to treatment, but large component is orthogonal to sentencing decisions.

Puzzle

- Much of 20th century B-W convergence in education and earnings was noteworthy. See Smith and Welch (1989)
- Skill convergence stops around 1990
- Wage / Earnings convergence stopped earlier
- Remaining gaps are large

Important Facts

Table 11. Ratio of Median Black and Median White Weekly Wages, Males Only

Mixing Over Only Non-Institutionalized Nonworkers

Years of Potential Experience	Year	10/25	15/15	25/10	Raw	Percent Workers		Percent Inst. Nonworkers		Percent Other Nonworkers	
						Black	White	Black	White	Black	White
6-10	1960	0.553	0.567	0.567	0.606	90.1%	96.7%	3.6%	0.9%	6.3%	2.4%
	1970	0.643	0.650	0.666	0.689	89.6%	96.4%	3.8%	0.7%	6.6%	2.8%
	1980	0.645 [0.659]	0.661 [0.676]	0.686 [0.692]	0.716 [0.717]	82.1%	95.2%	4.2%	0.7%	13.7%	4.1%
	1990	0.644 [0.648]	0.673 [0.650]	0.677 [0.680]	0.738 [0.750]	79.0%	94.1%	6.7%	1.0%	14.3%	5.0%
	2000	0.679 [0.673]	0.704 [0.686]	0.730 [0.703]	0.828 [0.764]	74.2%	92.1%	10.7%	1.7%	15.1%	6.2%
	2007	0.696 [0.667]	0.722 [0.673]	0.733 [0.705]	0.812 [0.781]	77.8%	92.5%	8.1%	1.5%	14.1%	6.0%
	2010	0.567 [0.604]	0.593 [0.623]	0.652 [0.684]	0.801 [0.750]	68.6%	88.3%	8.6%	1.6%	22.8%	10.1%
	2014	0.637 [0.603]	0.667 [0.650]	0.667 [0.656]	0.758 [0.706]	73.2%	88.6%	7.3%	1.5%	19.5%	9.9%
11-15	1960	0.578	0.578	0.581	0.601	91.1%	97.2%	3.3%	0.9%	5.6%	1.9%
	1970	0.666	0.672	0.684	0.669	91.1%	97.0%	2.9%	0.7%	6.0%	2.2%
	1980	0.635 [0.659]	0.657 [0.675]	0.688 [0.692]	0.712 [0.742]	83.8%	95.2%	3.7%	0.7%	12.5%	4.1%
	1990	0.606 [0.601]	0.635 [0.619]	0.650 [0.636]	0.713 [0.701]	79.7%	94.2%	6.2%	0.9%	14.1%	4.9%
	2000	0.667 [0.662]	0.700 [0.667]	0.717 [0.700]	0.785 [0.787]	76.3%	92.4%	10.5%	1.7%	13.2%	5.8%
	2007	0.673 [0.668]	0.684 [0.681]	0.711 [0.697]	0.750 [0.769]	79.6%	93.2%	8.3%	1.5%	12.1%	5.3%
	2010	0.591 [0.573]	0.617 [0.583]	0.667 [0.618]	0.750 [0.695]	71.1%	89.2%	8.9%	1.7%	20.0%	9.1%
	2014	0.610 [0.593]	0.640 [0.615]	0.676 [0.649]	0.750 [0.700]	75.1%	89.4%	7.3%	1.7%	17.6%	8.9%
16-20	1960	0.593	0.593	0.593	0.622	90.9%	96.8%	3.5%	1.0%	5.6%	2.2%
	1970	0.654	0.657	0.669	0.654	91.3%	96.9%	2.5%	0.7%	6.2%	2.4%
	1980	0.645 [0.686]	0.658 [0.687]	0.684 [0.714]	0.718 [0.722]	84.6%	94.9%	2.7%	0.7%	12.7%	4.4%
	1990	0.600 [0.615]	0.622 [0.615]	0.651 [0.631]	0.709 [0.685]	80.0%	93.8%	4.9%	0.8%	15.1%	5.4%
	2000	0.658 [0.647]	0.692 [0.657]	0.694 [0.685]	0.788 [0.757]	76.6%	91.7%	9.1%	1.7%	14.3%	6.6%
	2007	0.698 [0.642]	0.706 [0.648]	0.743 [0.676]	0.791 [0.697]	80.8%	92.6%	7.5%	1.3%	11.7%	6.1%
	2010	0.632 [0.648]	0.667 [0.688]	0.731 [0.705]	0.782 [0.746]	74.2%	89.0%	7.1%	1.5%	18.7%	9.5%
	2014	0.622 [0.607]	0.654 [0.645]	0.713 [0.679]	0.745 [0.719]	75.3%	89.4%	7.1%	1.6%	17.7%	9.0%
21-25	1960	0.571	0.575	0.578	0.619	90.4%	96.3%	3.0%	1.0%	6.6%	2.7%
	1970	0.640	0.647	0.661	0.641	89.8%	96.1%	2.5%	0.8%	7.8%	3.1%
	1980	0.651 [0.682]	0.665 [0.686]	0.667 [0.711]	0.707 [0.722]	84.1%	93.9%	1.8%	0.6%	14.1%	5.5%
	1990	0.641 [0.636]	0.645 [0.642]	0.677 [0.667]	0.750 [0.705]	80.1%	92.6%	3.8%	0.8%	16.2%	6.6%
	2000	0.615 [0.620]	0.630 [0.643]	0.658 [0.660]	0.750 [0.693]	75.4%	90.8%	7.5%	1.4%	17.2%	7.8%
	2007	0.652 [0.655]	0.667 [0.676]	0.693 [0.702]	0.735 [0.728]	79.8%	90.9%	6.4%	1.3%	13.9%	7.8%
	2010	0.622 [0.590]	0.653 [0.626]	0.673 [0.670]	0.760 [0.722]	71.8%	87.5%	7.0%	1.3%	21.2%	11.2%
	2014	0.609 [0.607]	0.625 [0.636]	0.651 [0.667]	0.775 [0.726]	74.8%	88.7%	5.8%	1.4%	19.4%	9.9%

Data come from IPUMS. See note to Table 10 for information about the sample. Columns one through four of this table apply a different mixing rule

Figure I: Racial Earnings Level and Earning Rank Gaps.

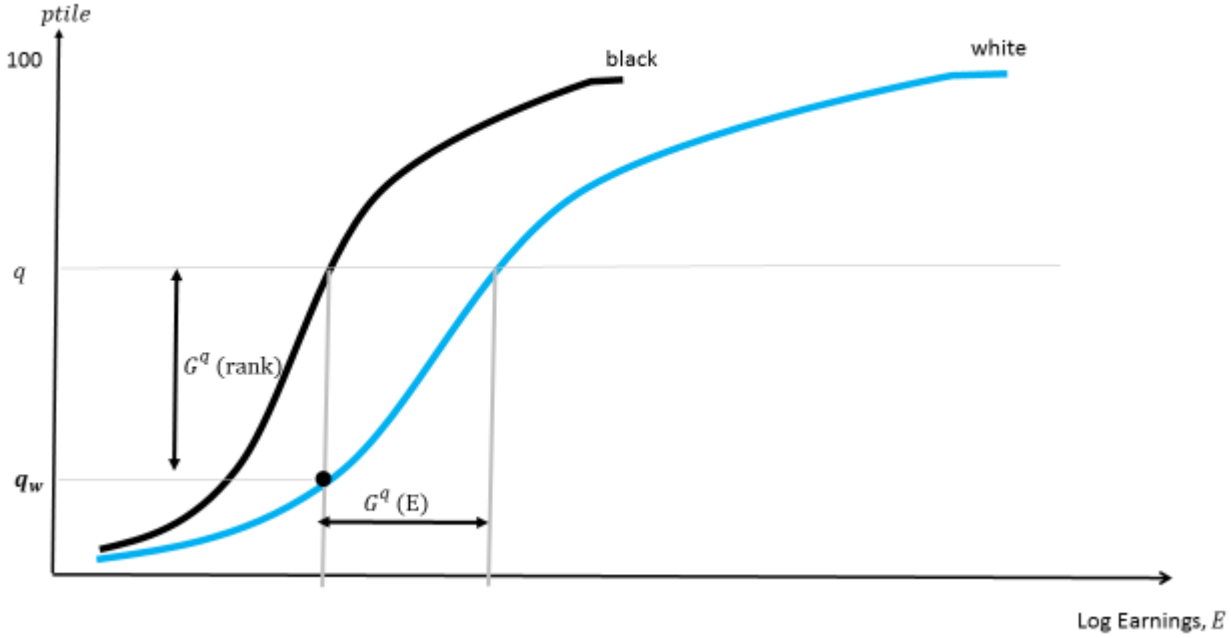
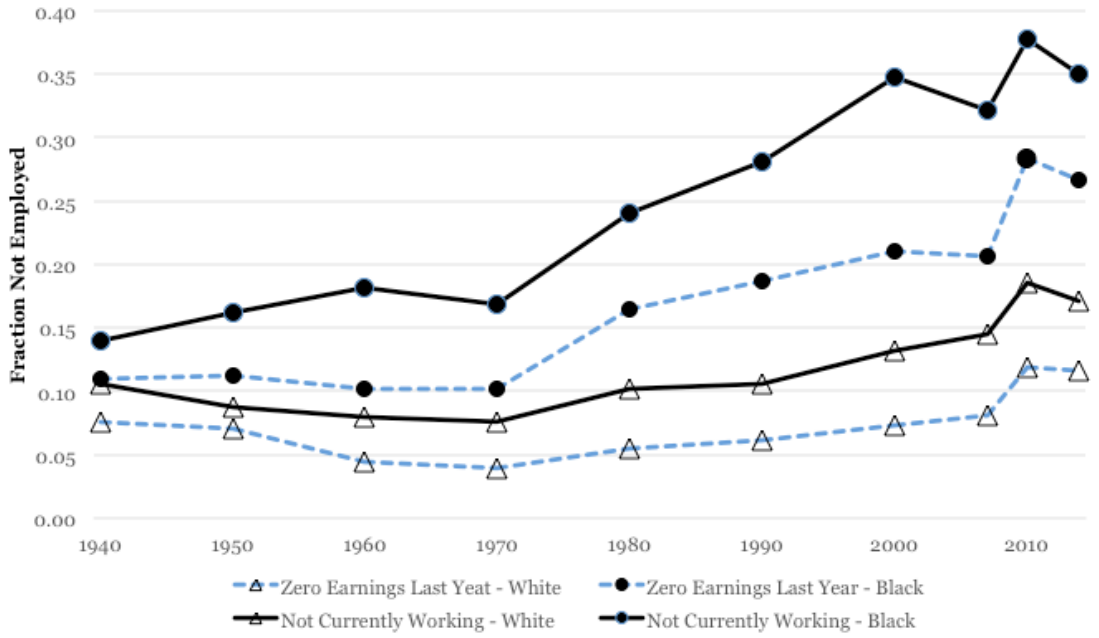
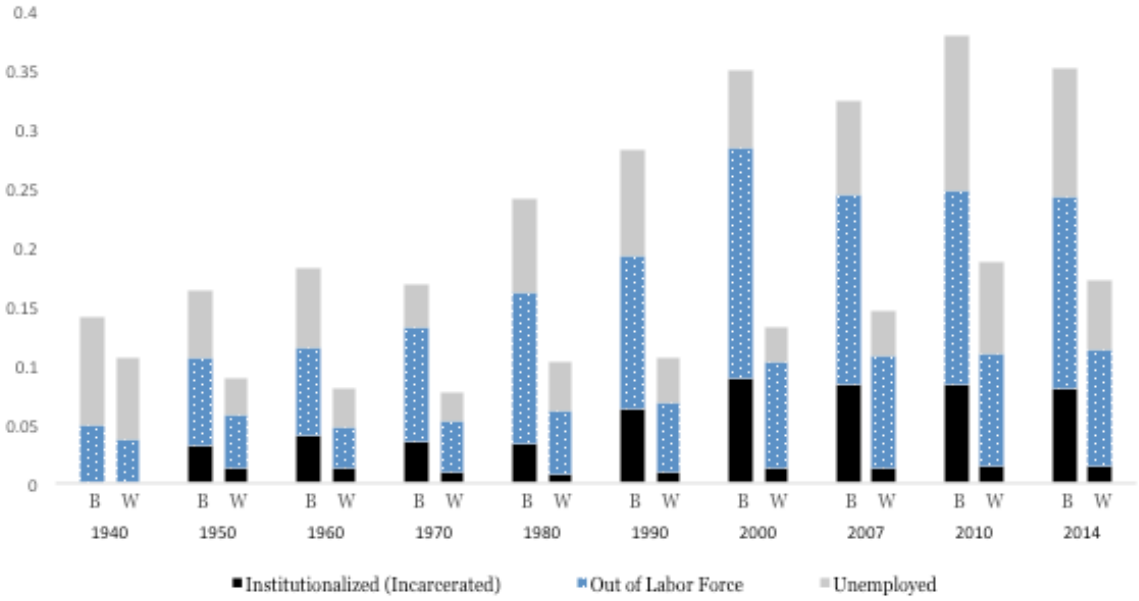


Figure II.A: Fraction of Men Not Employed, by Alternative Measure and Race

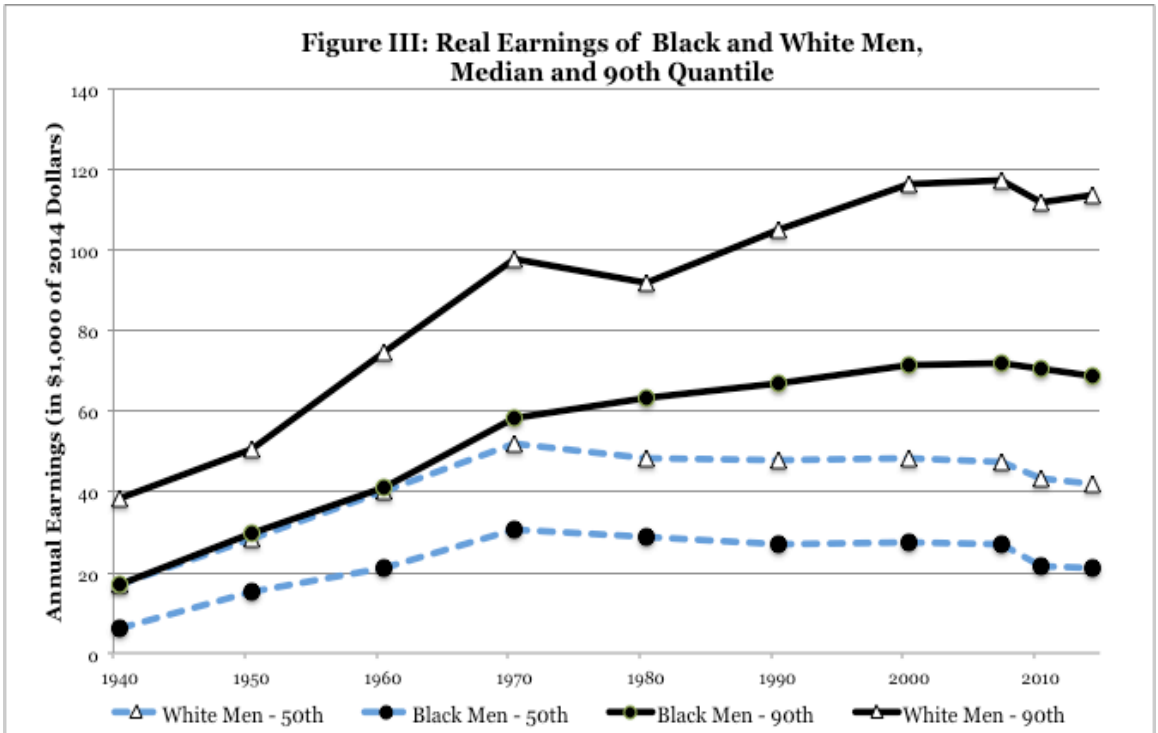


Note: Figure displays fraction of non-Hispanic black and white men aged 25-54 not working according to two measures: not currently working and zero annual earnings in the previous year. The measure of earnings is labor market earnings plus business and farm income. *Sources:* Census, 1940-2000; American Community Survey, 2005-2014. The sample year labeled '2007' combines ACS samples from 2005-07 and '2014' combines those from 2013-14.

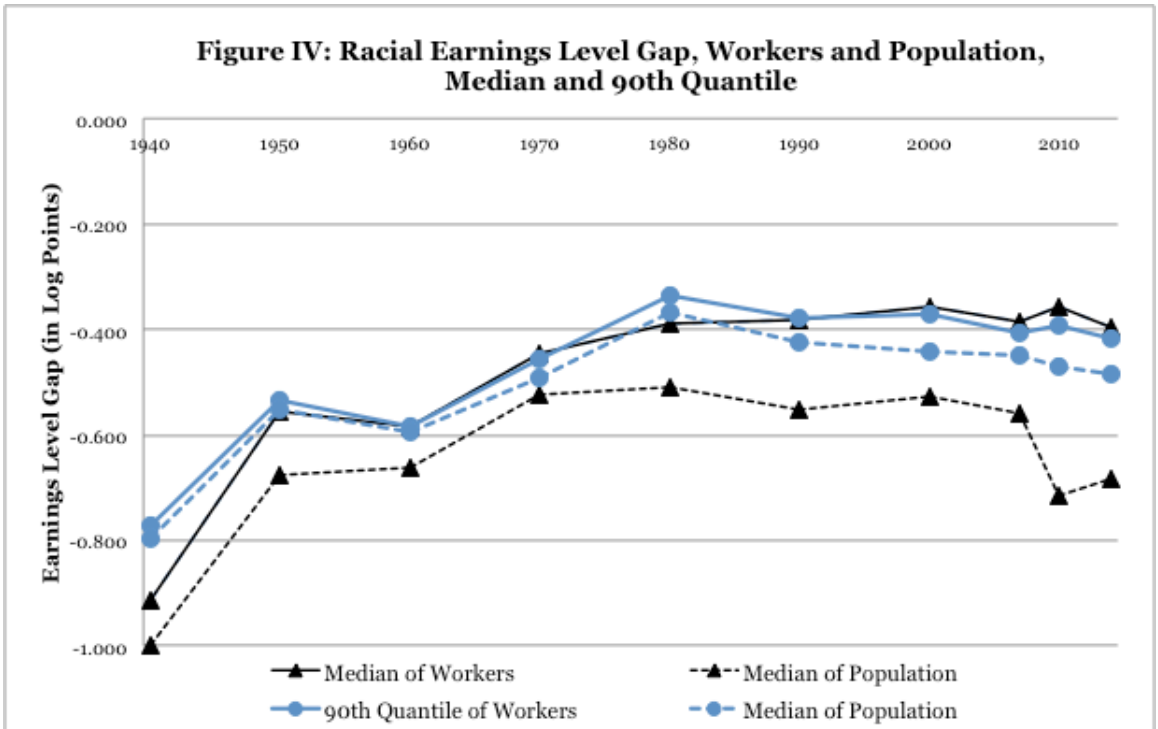
Figure II.B: Fraction of Men Not Currently Working, by Explanation and Race



Note: Figure displays fraction of non-Hispanic black and white men aged 25-54 not currently working for three mutually exclusive reasons: institutionalized, not institutionalized but out of the labor force, in the labor force but unemployed. *Sources:* Census, 1940-2000; American Community Survey, 2005-2014. The sample year labeled '2007' combines ACS samples from 2005-07 and '2014' combines those from 2013-14.

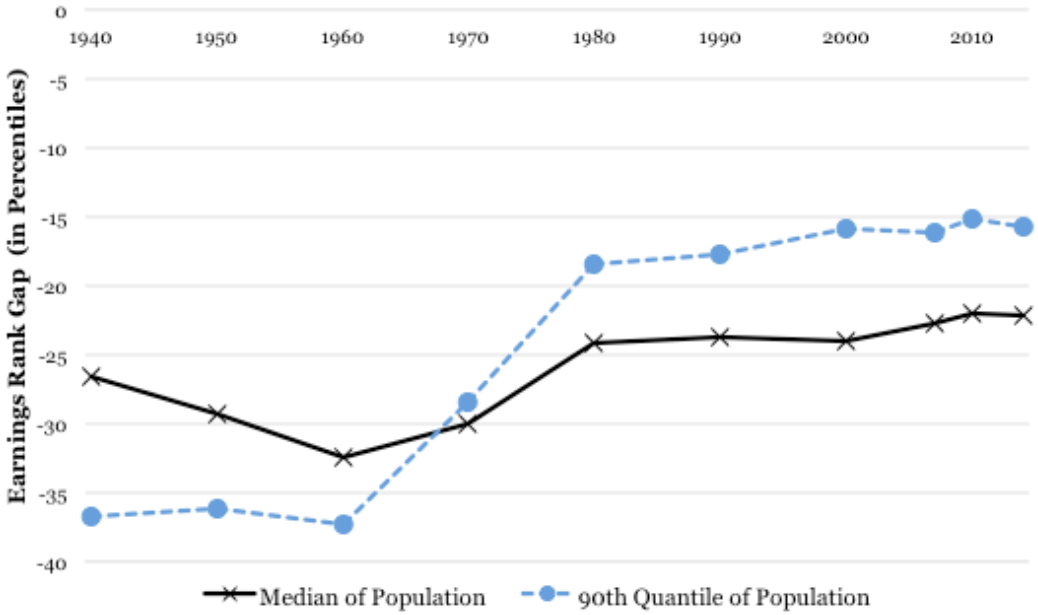


Note: Figure displays earnings of the median and 90th quantile non-Hispanic black and white men measured in the population of all men aged 25-54. Earnings are converted to constant 2014 dollars using the CPI-U price deflator and are measured in thousands of dollars. *Sources:* Census, 1940-2000; American Community Survey, 2005-2014. The sample year labeled '2007' combines ACS samples from 2005-07, '2014' combines those from 2013-14.



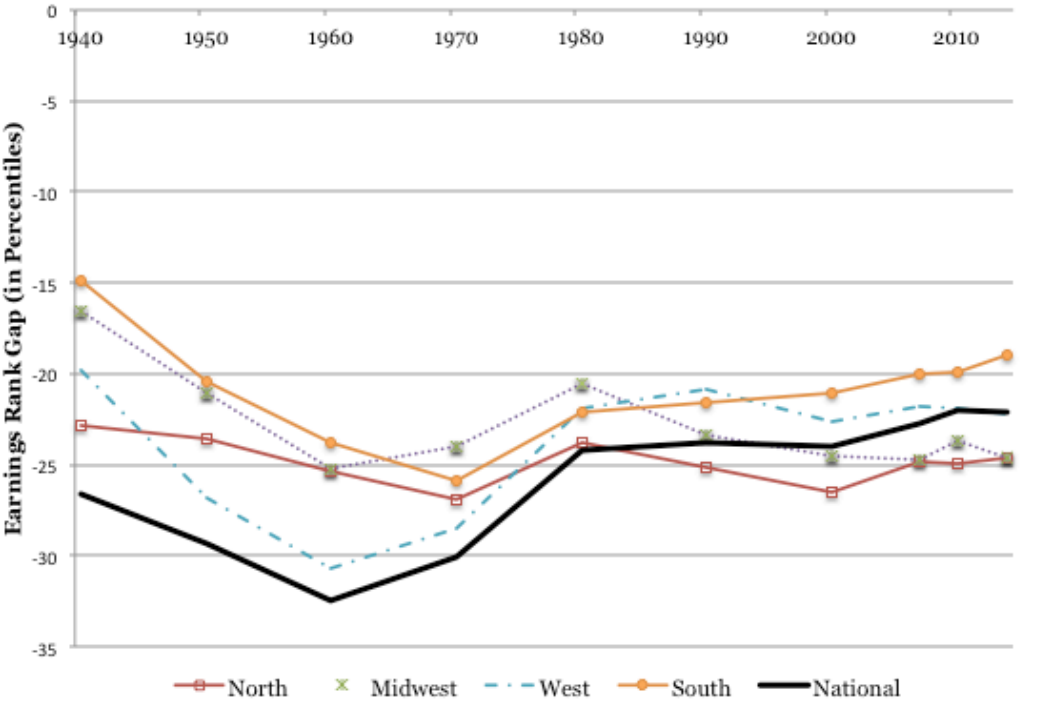
Note: Figure displays earnings level gap, measured in log points, for the median and 90th quantile for non-Hispanic black and white men aged 25-54. Gaps are reported for the sample of workers and the population of all men, including non-workers. *Sources:* Census, 1940-2000; American Community Survey, 2005-2014 .The sample year labeled '2007' combines ACS samples from 2005-07 and '2014' combines those from 2013-14.

Figure V: Racial Earnings Rank Gaps, Median and 90th Quantiles



Note: Figure displays earnings rank gap, measured in percentiles, for the median and 90th quantile in the population of all non-Hispanic black and white men aged 25-54, including non-workers. *Sources:* Census, 1940-2000; American Community Survey, 2005-2014 .The sample year labeled '2007' combines ACS samples from 2005-07 and '2014' combines those from 2013-14.

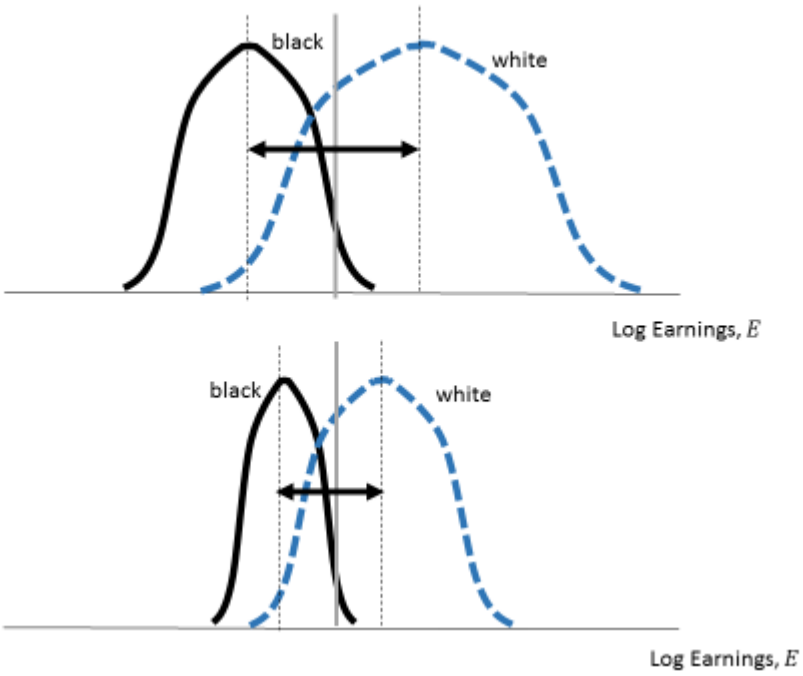
Figure VI: Median Earnings Rank Gaps, by Region



Note: Figure displays median earnings rank gap, measured in percentiles, for the population of all non-Hispanic black and white men aged 25-54, including non-workers. Gaps are shown for the four major Census regions as well as the U.S. as a whole. *Sources:* Census, 1940-2000; American Community Survey, 2005-2014. The sample year labeled '2007' combines ACS samples from 2005-07 and '2014' those from 2013-14.

Figure VII: Two Sources of Changes in Racial Earnings Gaps

A. Distributional Convergence



B. Positional Convergence

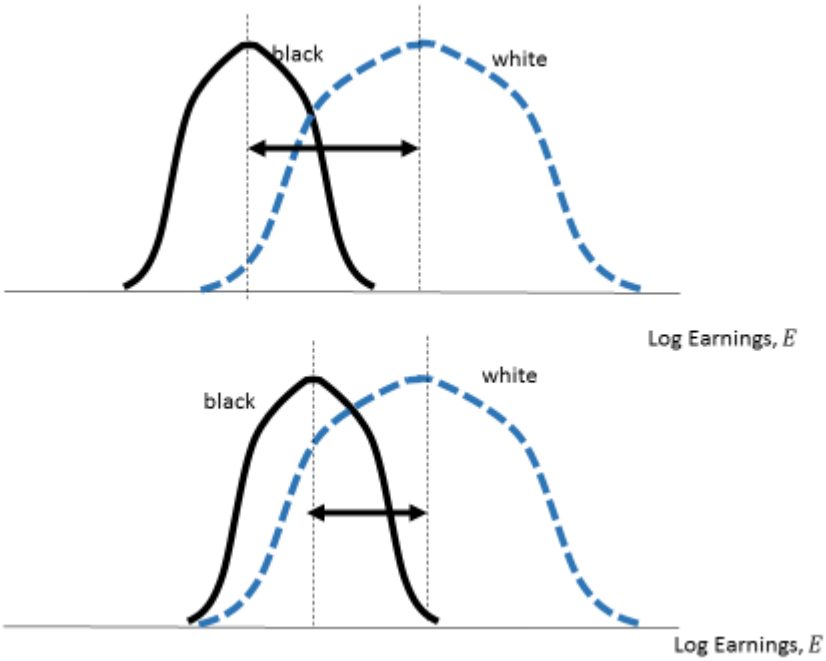
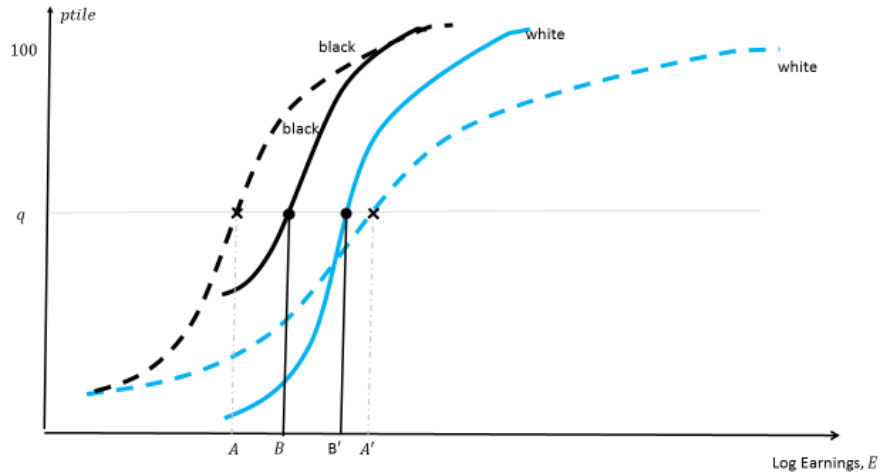
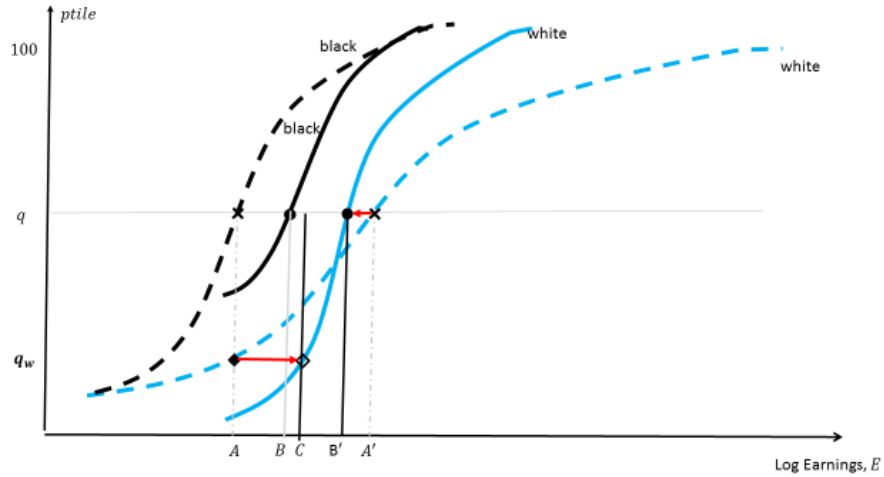


Figure VIII: Illustrating Decomposition Method

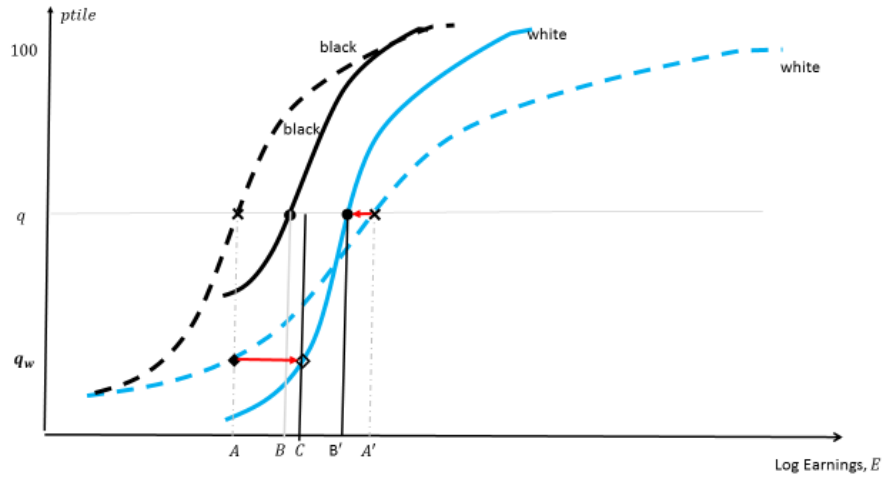
A.

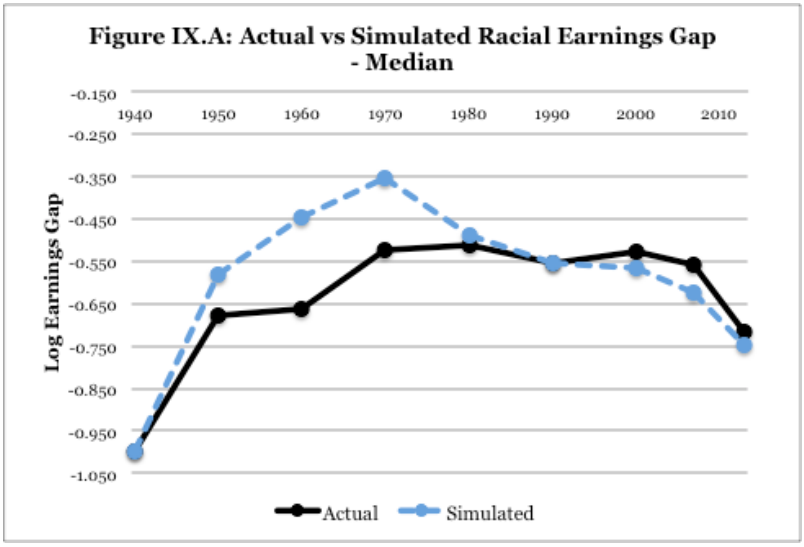


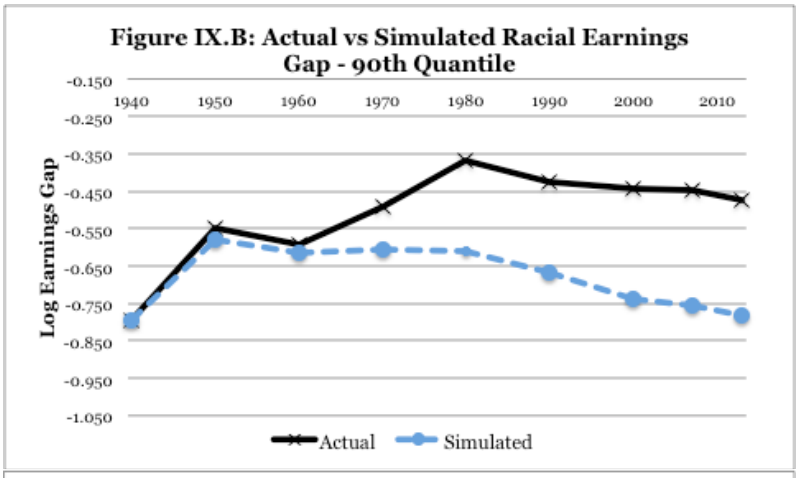
B.

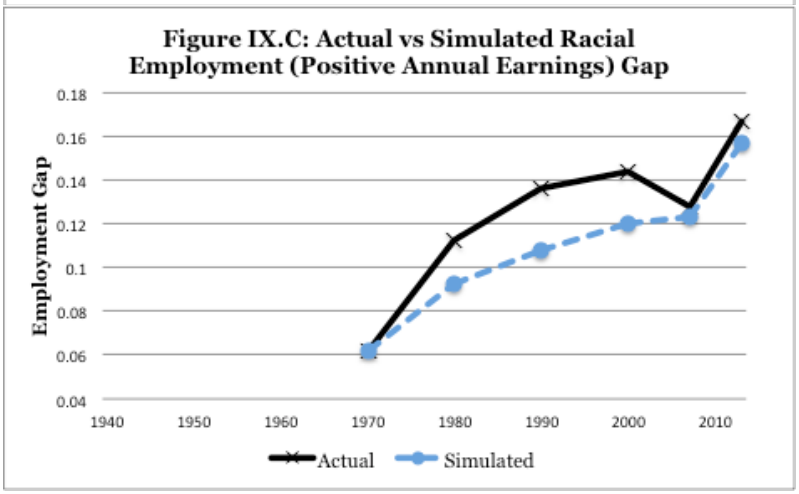


C.









Note: Figures 9a-c display actual and simulated racial employment gaps and median and 90th quantile earnings level gaps. *Sources:* Simulated - Author's calculations. Actual - Census, 1940-2000; American Community Survey, 2005-2014 .The sample year labeled '2007' combines ACS samples from 2005-07 and '2014' combines those from 2013-14.

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.

Table 2a
High School Graduation Rates By Age, Gender and Race

Top Number Excludes GED, Bottom Number Includes GED

		Men				Women			
	Year of Birth	**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	0.79		0.76	0.85	0.86	
		0.71	0.84	0.86		0.78	0.87	0.89	
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	0.58		0.66	0.76	0.78	
		0.47	0.62	0.65		0.68	0.79	0.82	

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 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.

Coate and Loury - 1993

- Firms must assign workers to one of two tasks.
  - Task one yields higher output if and only if the worker is skilled.
- Skill results from investments in their own human capital.
- Skill investments are costly to workers but not verifiable.
- Firms have prior beliefs, π_b and π_w, concerning the fraction who invest.
- Firms see only signal θ_i and worker i's race

Coate and Loury, cont.

- 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: signal greater than some standard, s, $\Rightarrow$ assignment 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.

Coate and Loury, cont.

- 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
  - given these optimal responses, employer beliefs are self-confirming.

Coate and Loury, cont.

- The equilibrium is defined by the following condition:

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

- $B(s^*(\pi_i))$ is the expected wage increase associated with investing in skill for a member of group i.
- 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.

Coate and Loury, cont.

- Equilibria exist with different standards and different investment levels by group
- Many variations on this theme in the literature on statistical discrimination
- 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
  - here, $\pi_b < \pi_w$ holds precisely because
  - $s_b > s_w$, which implies directly that
  - $B(s^*(\pi_b)) < B(s^*(\pi_w))$.
  - However, there is little or no recent evidence that blacks do earn lower gross returns from skill investments.

Coates and Loury: More details

- $\theta \in [0,1]$ is noisy signal of quality
- $F_q(\theta)$ ($F_u(\theta)$): distribution for qualified (unqualified) workers
- $\phi(\theta) = \frac{f_u(\theta)}{f_q(\theta)}$ non-increasing in θ
- $\rightarrow F_q(\theta) \leq F_u(\theta)$
- Employees use a cutoff policy

Workers

- They become qualified if they invest
- $G(c)$: distribution of investment costs

Production

- Task one
  - X_q: if qualified
  - $-X_u$: if unqualified
- Task zero
  - Output normalized to zero
  - Wage normalized to zero
- $\Gamma = \frac{X_q}{X_u}$
- $w =$ wage given assignment to task one

Equilibria

- π: prior belief that $q = 1$ (worker is qualified)
- $\epsilon(\pi, \theta) = \frac{\pi f_q(\theta)}{\pi f_q(\theta) + (1-\pi) f_u(\theta)}$
- if $\epsilon(\pi, \theta) X_q > [1 - \epsilon(\pi, \theta)] X_u$ assign or
- $\Gamma > \frac{1-\epsilon}{\epsilon} = \frac{1-\pi}{\pi\phi(\theta)}$
- Then, $s^*(\pi) = \min_\theta$ s.t. $\Gamma > \frac{1-\epsilon}{\epsilon} = \frac{1-\pi}{\pi\phi(\theta)}$

Investment

- $\beta(s) = w\left[F_u(s) - F_q(s)\right]$
- Invest if
  - $c \leq \beta(s)$
  - $\rightarrow G\left(\beta\left(s\right)\right)$ invest
  - π is an equilibrium if $\pi = G\left(\beta\left(s^*\right)\right)$

Figure 4a

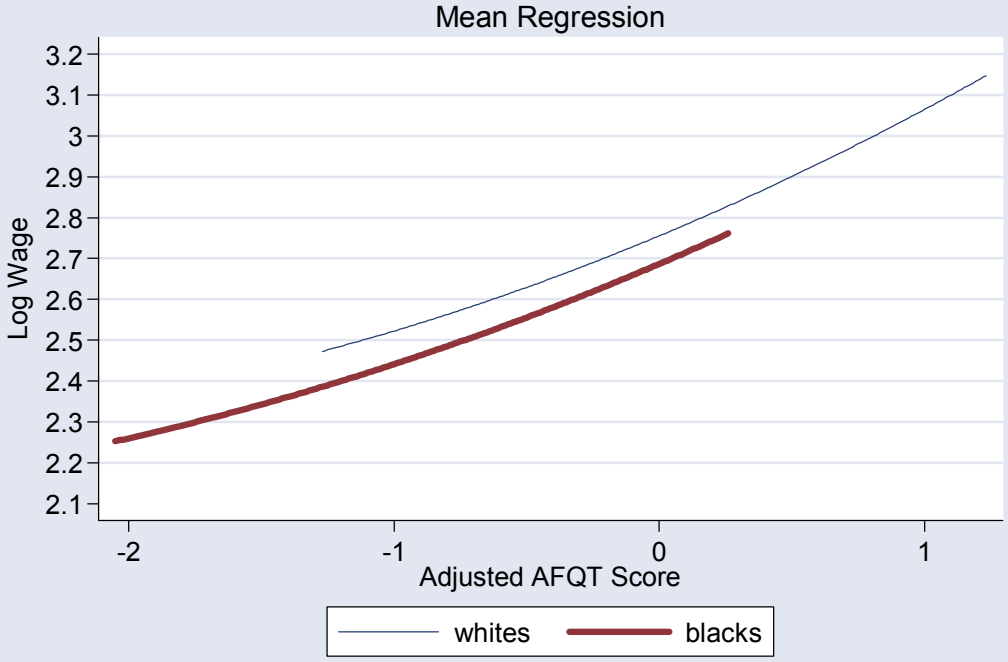
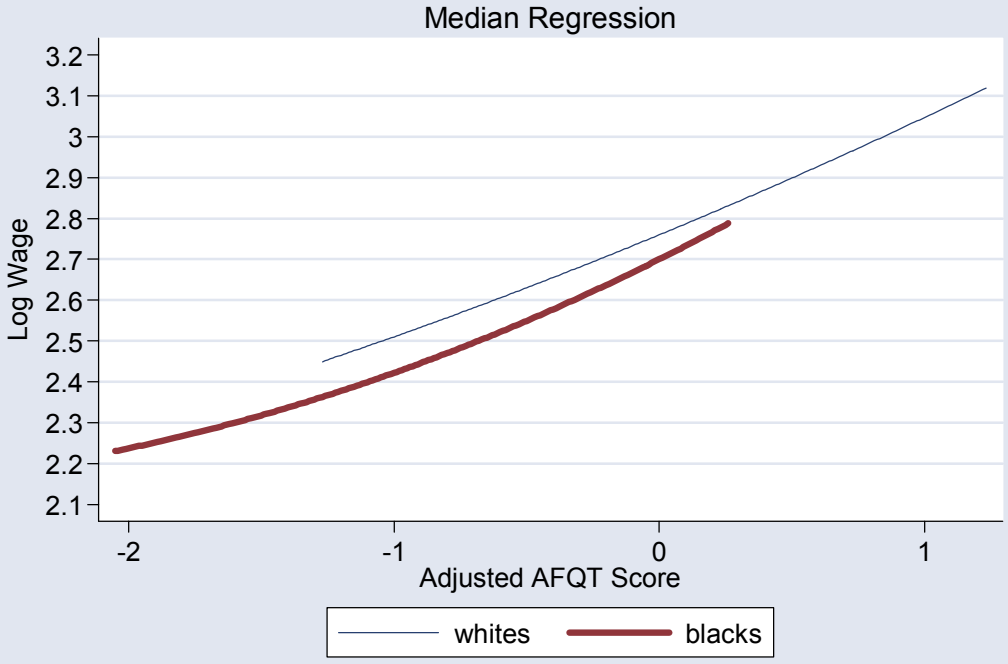
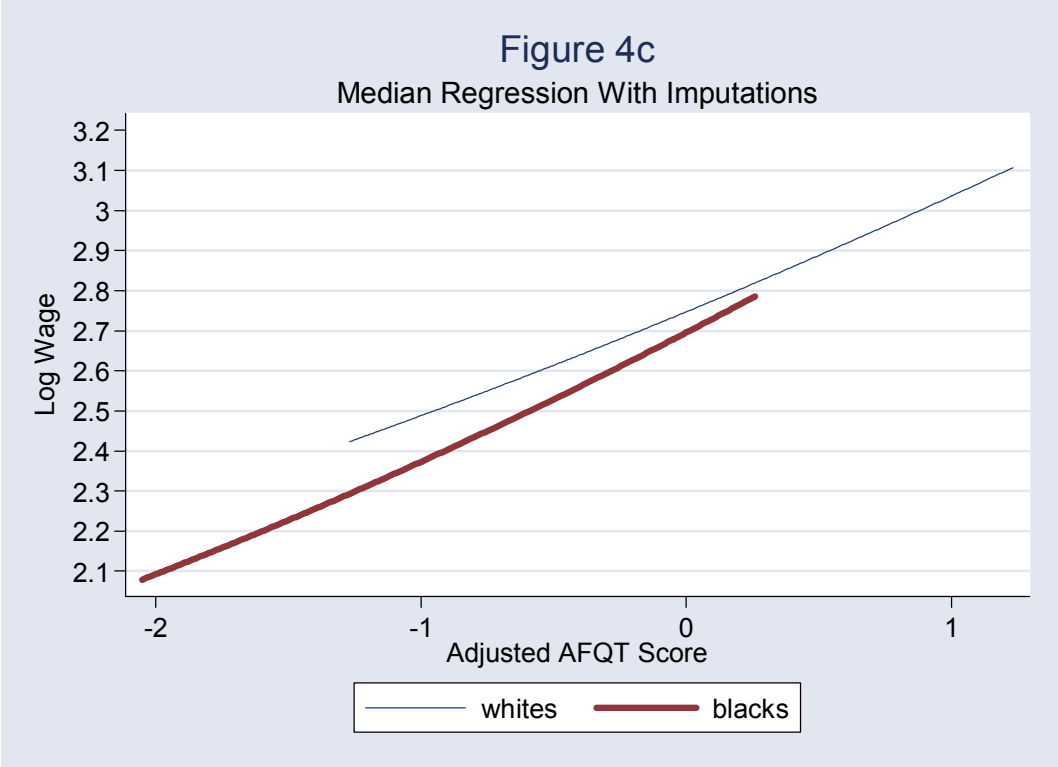
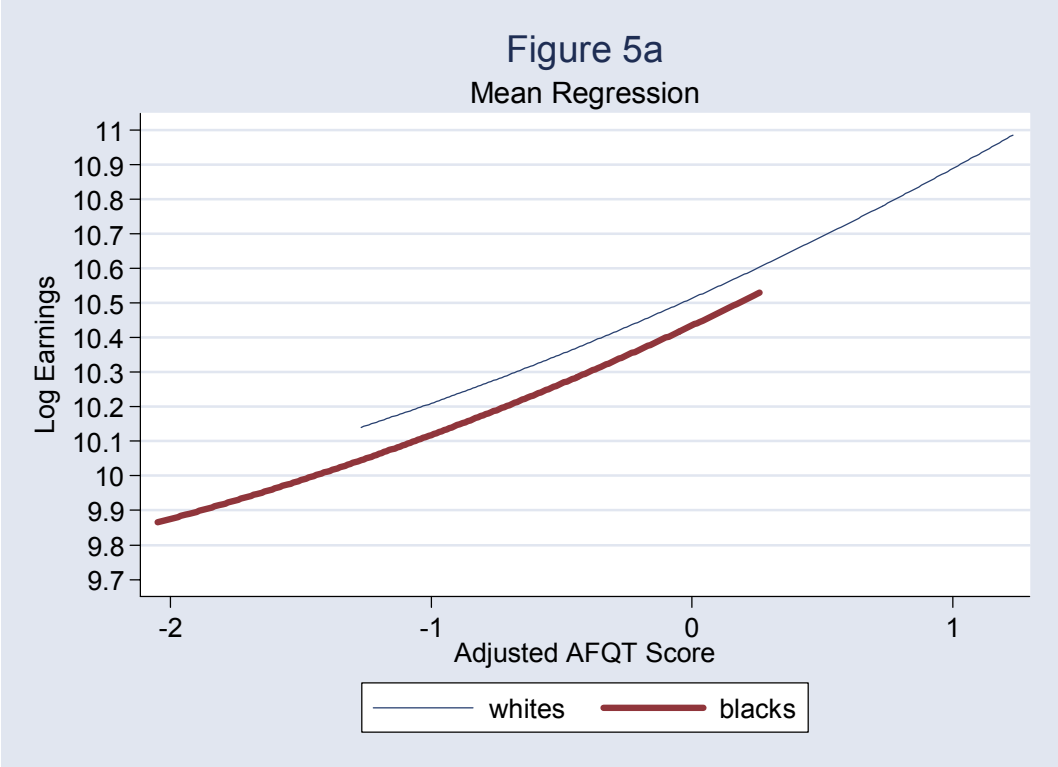


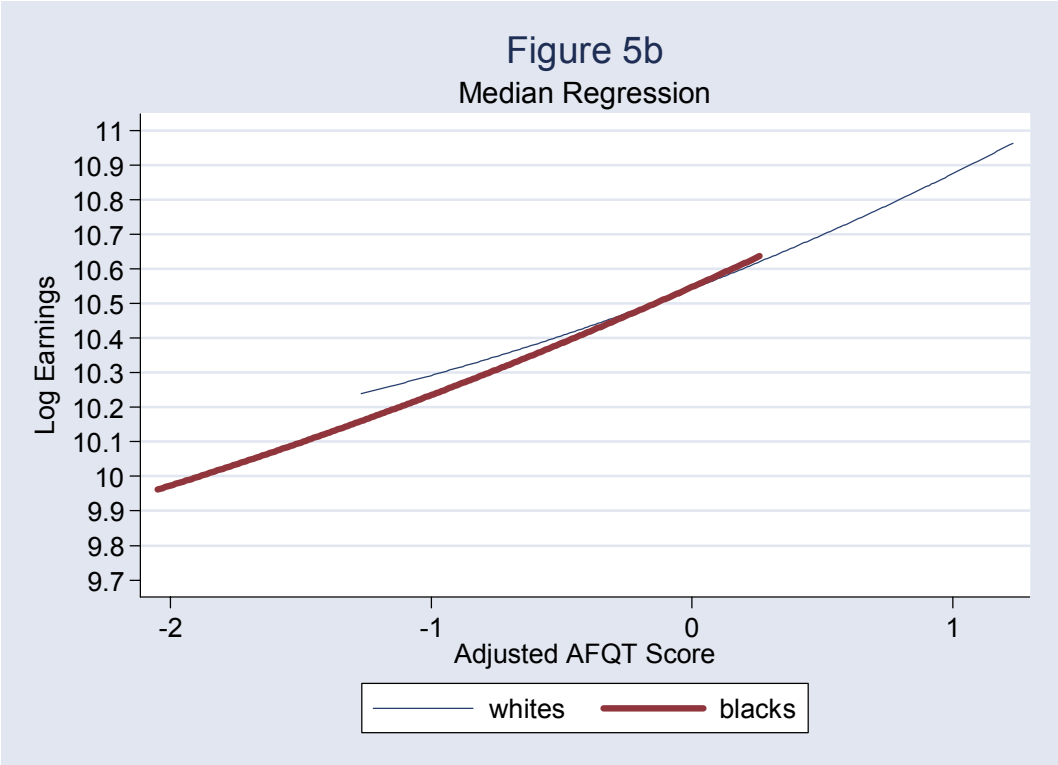
Figure 4b





Notes: 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 for Figure 4c individuals who did not work since their 1998 interview are imputed a wage equal to one dollar.





Notes: 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.

Becker and Tomes, redux

- Assume that each person lives two periods
- Each family has one parent and one child.
- Children make no decisions.
- Parents allocate time between different activities and divide their income between current household consumption and investment in their child's human capital

Becker and Tomes, redux

- Each parent has a utility function

$$U(c, h')$$

- where c = family consumption
- h' = the human capital that her child enjoys in adulthood.
- 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.
  - purchased inputs, d
  - effective parental time, sh
  - and the child's ability, θ.

Becker and Tomes, redux

- Thus, each parent faces the following constraints.

$$h' = g(\theta, sh, d)$$

$$(1 - s)h = pc + td$$

- wages are normalized to one.

Becker and Tomes, redux

- A parent does not know her child's ability, θ, when making investment decisions.
- Abilities of individual children are i.i.d draws from an ability distribution $F(\theta)$.
- Parents cannot borrow on behalf of their children.
- I also ignore bequests, but this is not essential

Becker and Tomes, redux

Consider the following special case of the model.

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

Given this specification, the evolution of human capital over generations follows

$$\ln h' = \ln \theta + (\gamma + \delta) \ln h + k_1(\alpha, \gamma, \delta) + k_2(\alpha, \gamma, \delta) - \ln t$$

Here, k_1 and k_2 are constants determined by preference and production

Becker and Tomes, redux

LOM for black-white skill gap across generations,

$$\Delta \ln h' - \Delta \ln h = [(\gamma + \delta) - 1]\Delta \ln h - \Delta \ln t$$

- Δx = the mean value of x among blacks - white mean of x
- Three factors that determine evolution of black-white skill gaps
  - Current black-white skill gap affects the skill gap in the next generation.
    - wealth matters since investments in children are financed through forgone consumption.
  - Wealth effect varies inversely with $(1 - (\gamma + \delta))$
  - Racial differences in the cost of investment goods, $\Delta \ln t$

Becker and Tomes, redux

- The black-white skill gap, $\Delta \ln h$, reaches a steady-state level when the left hand side of this equation equals zero
- Two steady-state scenarios present themselves.
- $\Delta \ln t = 0 \Rightarrow$ steady state $\Delta \ln h = 0$
  - In models with perfect capital markets, full convergence may take place in one generation
  - with borrowing constraints, diminishing returns to child-specific investments does the trick.
- $\Delta \ln t > 0$, then $\Delta \ln h < 0$ will be the steady state outcome.

Cost Differences

- Convergence was robust when "measurable" cost differences were greater
- Changes in family structure (exogenous?)
- Wage Structure
- Crack Epidemic
- Parenting Norms (exogenous?)

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

	Black				White			
year/parents	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.

Table 13a
Changes in Black-White Score Gaps
Gap in Followup Year - Gap in Base Year

	Boys				Girls			
	Reading		Math		Reading		Math	
Data Set	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)	-1.151 0.844	-0.013	-1.169 1.066	0.037	-0.517 0.738	0.025	-1.872 0.954	-0.046
NELS 1990-1992 (10th - 12th Grade)	-0.326 0.904	-0.018	-0.757 1.165	-0.012	-0.217 0.723	-0.012	0.515 0.996	0.069
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 1998-99. 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 1988-90. The second has a base period of 10th grade and a followup of 12th grade for 1990-92.

Table 13b

Average Percentile Ranking in White Test Scores Among Black Children

HSB

Year	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	0.32	0.27	0.28
1990	0.32	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.

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 change 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 Assesment Summary Data Tables.

Table 1
The Move to Determinate Sentencing

	Abolish / Restrict Discretionary Parole	Sentencing Commission	Truth In Sentencing[e]
AL		1998 **2000**[d, f]	
AK	1980 (partial)[a]	1980[c]	Other
AZ	1994[b]		85%
AR	1994 (partial)[a]	1994[c]	Other
CA	1976[b]		85%
CO	1979-85[b]		Other
CT	1981-90[b]	2010[f]	85%
DE	1990[a, b]	1987[c]	85%
FL	1983[a, b]	1983 - 98[c]	85%
GA			85%
HI			
ID			100%
IL	1978[b]	2010[f]	85%
IN	1977[b]		50%
IA			85%
KS	1993[a, b]	1993[c]	85%
KY			85%
LA		2010[f]	85%
ME	1976[b]		85%
MD		1983[c] **1996**[d]	50%
MA		1994[f]	75%
MI		1984[c] **1995 - 2002**[d]	85%
MN	1980[a, b]	1980[c]	85%
MS	1995[b]		85%
MO		1997[c]	85%
MT			
NE			50%
NV			100%
NH			100%
NJ			85%
NM	1977[b]	1978[f]	
NY		2010[f]	85%
NC	1994[a]	1994[c]	85%
ND			85%
	Abolish / Restrict Discretionary Parole	**Sentencing Commission**	**Truth In Sentencing[e]**
OH	1996[a, b]	1996[c]	85%

OK			85%
OR	1989[a, b]	1989[c]	85%
PA		1982[c]	85%
RI			
SC			85%
SD			
TN	1989 (partial)[a]	1989-95[c]	85%
TX			50%
UT		1979[c] **1983**[d]	85%
VT			
VA	1995 (partial)[a, b]	1991 **1995**[c, d]	85%
WA	1984[a, b]	1984[c]	85%
WV			
WI	1999[b]	1985 - 95[c] 2002 - 7[f]	Other
WY			

Notes:
[a]: Listed in Table 1 of Frase (2005) as abolishing parole release in the given year.
[b]: Listed in tables 1-3 of Stemen et al. (2006) as having enacted determinate sentencing in the given year. Date ranges are used when indeterminate sentencing was reinstated in a later year. Mississippi reinstated indeterminate sentencing for first-time non-violent offenses in 2000.
[c]: Listed in Table 1 of Frase (2005) as establishing a state sentencing commission in the given year. Date ranges are used when a sentencing commission was abolished.
[d]: First year is date when commission was first established. Bolded date is the year when the commission was made permanent. In all other cases, the commission was permanent when established.
[e]: Listed in Table 1 of Ditton (1999) as requiring prisoners to serve the listed percentage of their minimum sentence.
[f]: Sources gathered from state sentencing commission and legislative websites. For more information, see Section D of the online appendix.

Table 2
Number of Persons per 1000 Arrests Who Serve Prison Terms of length = s

		0-1 years	1-2 years	2-3 years	3-4 years	4-5 years	5+ years	TOTAL
Violent Crime								
Murder & Homicide	1985	37.84	55.55	45.56	35.58	23.02	239.74	437
	2000	31.26	36.96	29.36	25.35	23.87	478.39	625
	Ratio	**0.83**	**0.67**	**0.64**	**0.71**	**1.04**	**2.00**	**1.43**
Forcible Rape	1985	9.01	21.72	22.77	20.68	10.34	38.80	123
	2000	11.00	13.36	20.04	13.36	14.93	80.04	153
	Ratio	**1.22**	**0.62**	**0.88**	**0.65**	**1.44**	**2.06**	**1.24**
Robbery	1985	26.76	37.75	22.85	14.90	8.61	20.37	131
	2000	34.62	37.67	24.78	17.49	13.73	69.76	198
	Ratio	**1.29**	**1.00**	**1.08**	**1.17**	**1.60**	**3.43**	**1.51**
Aggravated Assault	1985	9.76	11.24	5.59	2.48	1.14	2.75	33
	2000	11.74	9.90	4.48	3.26	2.02	6.72	38
	Ratio	**1.20**	**0.88**	**0.80**	**1.32**	**1.77**	**2.44**	**1.16**
Other Assault	1985	1.22	1.06	0.30	0.13	0.08	0.13	2.9
	2000	3.39	3.01	0.90	0.48	0.32	0.66	8.8
	Ratio	**2.77**	**2.85**	**2.95**	**3.74**	**3.94**	**5.11**	**3.00**
Property Crime								
Burglary	1985	27.14	16.74	7.33	3.24	1.50	3.17	59
	2000	40.34	23.49	13.54	6.06	3.89	9.67	97
	Ratio	**1.49**	**1.40**	**1.85**	**1.87**	**2.59**	**3.05**	**1.64**
Motor Vehicle Theft	1985	13.37	5.18	1.46	0.45	0.16	0.59	21
	2000	41.74	18.32	5.59	1.81	0.97	1.78	70
	Ratio	**3.12**	**3.54**	**3.82**	**4.01**	**6.17**	**3.04**	**3.31**
Larceny/Theft	1985	6.52	2.73	0.82	0.40	0.14	0.38	11
	2000	12.74	5.55	2.07	0.80	0.45	0.71	22
	Ratio	**1.95**	**2.03**	**2.53**	**1.99**	**3.21**	**1.88**	**2.03**
Other Property Crime	1985	2.56	1.69	0.97	0.55	0.22	0.32	6.3
	2000	3.29	2.33	1.00	0.55	0.35	0.89	8.4
	Ratio	**1.28**	**1.38**	**1.02**	**1.01**	**1.58**	**2.84**	**1.33**
Drug Crime								
Drug Trafficking	1985	29.81	29.96	7.29	2.05	1.21	3.50	74
	2000	62.36	59.44	26.84	11.91	6.42	9.45	176
	Ratio	**2.09**	**1.98**	**3.68**	**5.82**	**5.31**	**2.70**	**2.39**
Drug Possession/Use	1985	7.23	2.04	0.42	0.18	0.07	0.46	10
	2000	21.47	6.92	2.33	0.86	0.51	0.85	33
	Ratio	**2.97**	**3.39**	**5.60**	**4.80**	**7.76**	**1.84**	**3.17**
Other								
Other Sex Crime	1985	9.71	17.29	13.98	11.00	6.00	19.57	78
	2000	21.75	23.70	24.53	12.55	17.28	62.73	163
	Ratio	**2.24**	**1.37**	**1.75**	**1.14**	**2.88**	**3.21**	**2.10**
White Collar Crime	1985	14.95	5.95	1.74	0.70	0.23	0.41	24
	2000	23.07	8.19	3.12	1.17	0.57	0.68	37
	Ratio	**1.54**	**1.38**	**1.79**	**1.67**	**2.49**	**1.66**	**1.54**
Other Crime	1985	1.70	0.54	0.16	0.07	0.04	0.14	2.7
	2000	3.12	1.63	0.63	0.31	0.17	0.40	6.3
	Ratio	**1.84**	**3.00**	**3.96**	**4.13**	**4.89**	**2.78**	**2.36**
ALL OFFENSES	1985	5.45	3.49	1.52	0.83	0.43	1.53	13
	2000	10.13	6.00	2.74	1.36	0.92	3.19	24
	Ratio	**1.86**	**1.72**	**1.81**	**1.63**	**2.16**	**2.09**	**1.84**

Table 3
Jail, State, and Federal Incarceration Rates per 100,000 Persons

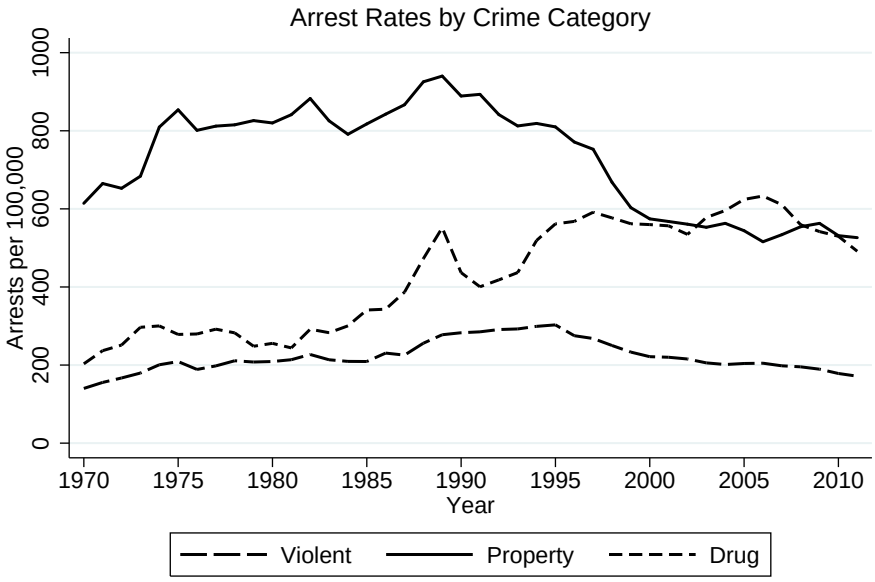
Year	Jail	State	Federal	Federal Violent	Federal Property	Federal Drug	Federal Weapon	Federal Immigration	Federal Other
1970		90	10						
1971		89	11						
1972	67	87	11						
1973		89	11						
1974		96	11						
1975		105	12						
1976		113	13						
1977		117	14						
1978	71	125	13						
1979		128	12						
1980		134	11						
1981		149	12						
1982		166	13						
1983	97	173	14						
1984	98	181	15						
1985	111	194	17						
1986	111	208	18						
1987	120	222	20						
1988	137	236	20						
1989	157	265	24	4.29	1.20	11.54	1.14	0.90	4.91
1990	164	284	26	4.05	1.01	14.04	1.42	0.80	4.94
1991	168	299	28						
1992	173	315	31	4.17	0.88	21.00	2.45	0.94	0.80
1993	181	341	35	4.18	0.65	20.59	2.74	0.91	5.68
1994	184	369	37	4.35	0.53	21.89	2.93	1.08	5.72
1995	194	390	38	4.39	0.48	22.71	3.20	1.47	5.89
1996	194	406	40	4.37	0.46	23.70	3.30	1.92	6.03
1997	208	421	42	4.38	0.47	24.99	3.45	2.33	6.59
1998	220	438	46	4.63	0.51	26.34	3.65	3.11	7.29
1999	223	450	50	5.25	0.51	28.45	3.95	4.23	7.22
2000	219	443	52	4.87	0.57	29.24	4.24	5.45	7.15
2001	220	437	55	5.10	0.58	31.17	4.91	6.06	7.25
2002	227	444	57	5.08	0.54	32.20	5.45	6.19	7.37
2003	234	446	60	5.00	0.54	33.54	6.26	6.61	7.66
2004	241	449	62	4.87	0.42	34.11	7.55	7.16	7.43
2005	248	453	63	4.80	0.39	34.48	8.45	7.66	7.66
2006	253	461	65	4.67	0.35	35.15	9.13	7.44	7.91
2007	257	463	66	4.42	0.33	35.99	9.62	7.49	8.34
2008	255	462	66	4.29	0.32	35.19	9.98	7.39	8.95
2009	250	458	68	4.12	0.34	35.58	10.26	8.10	9.39
2010	242	454	68	4.04	0.34	35.31	10.42	7.82	9.88

Data on jail populations come from several BJS reports, including the Census of Local Jails and Jail Inmates (at Midyear). Data on state prison populations and aggregate federal prison populations come from National Prisoner Statistics (NPS) and Historical Statistics on Prisoners in State and Federal Institutions, Year-end 1925-86. Data on federal prison populations by offense come from the Compendium of Federal Justice Statistics, adjusted to align with the aggregate NPS data. Population data for generating incarceration rates come from Census historical population estimates.

Figure 1

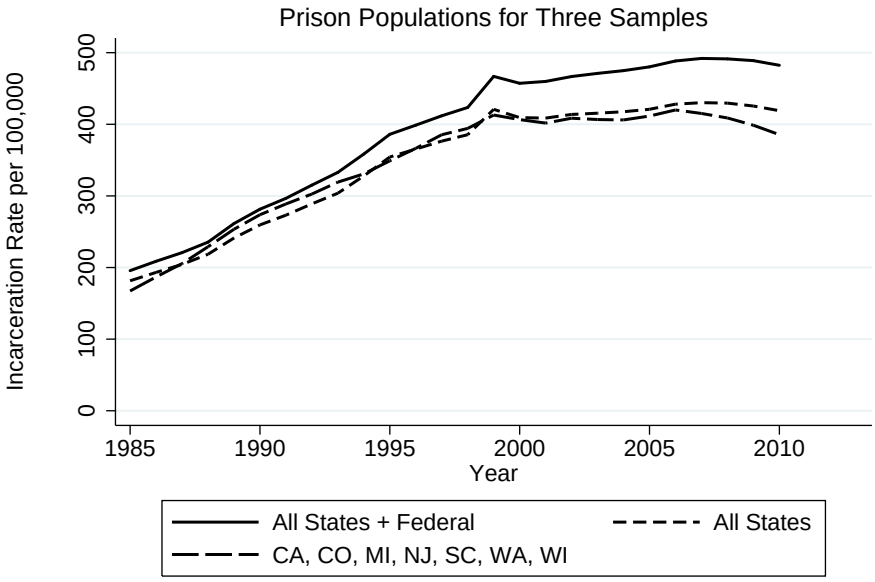
This figure uses data from National Prisoner Statistics, Historical Statistics on Prisoners in State and Federal Institutions, Year-end 1925-86 on prison populations. Population data for generating incarceration rates come from Census historical population estimates.

Figure 2



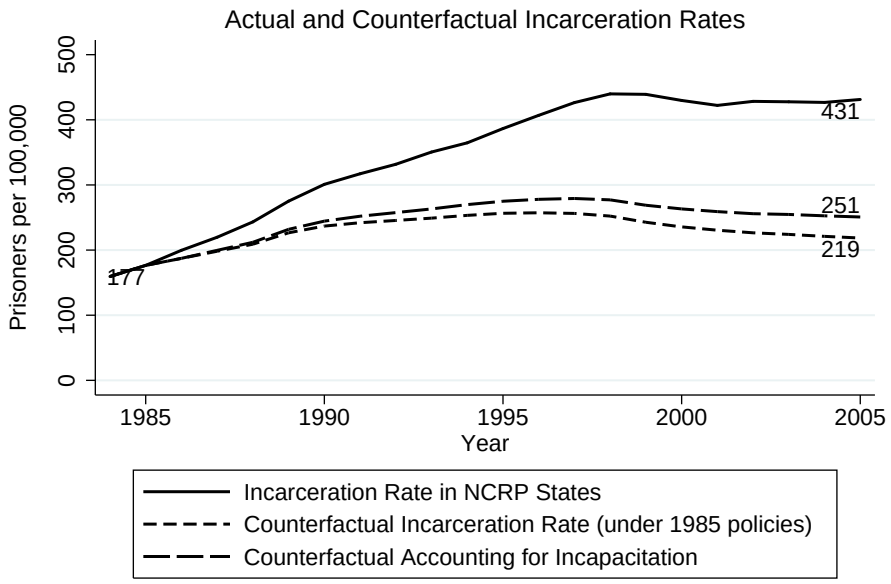
This figure uses data from the FBI's Uniform Crime Reporting program, which contain national estimates from crimes and arrests based on voluntary reporting from law enforcement agencies. Population data for generating incarceration rates come from Census historical population estimates.

Figure 3



This figure uses annual data from the National Prisoner Statistics. Population data for generating incarceration rates come from Census historical population estimates.

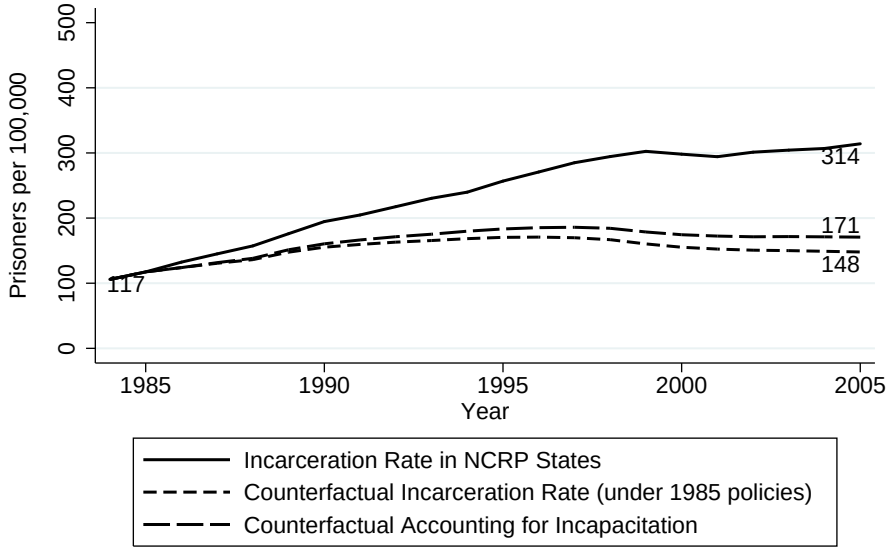
Figure 4



This figure uses data from the National Corrections Reporting Program, the FBI's Uniform Crime Reporting program, and the National Prisoner Statistics. See Appendices A, B & C for details regarding data cleaning and the simulation methodology.

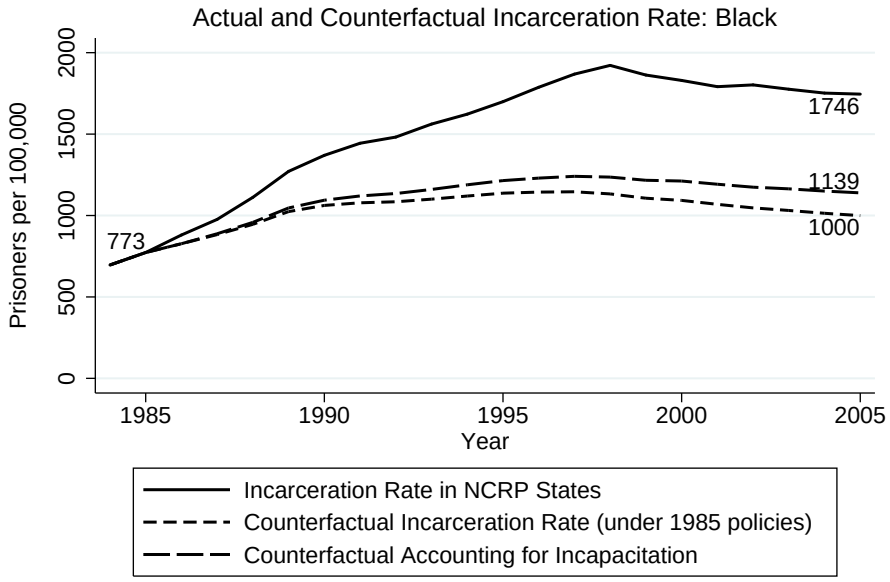
Figure 5

Actual and Counterfactual Incarceration Rate: White



See notes to Figure 4.

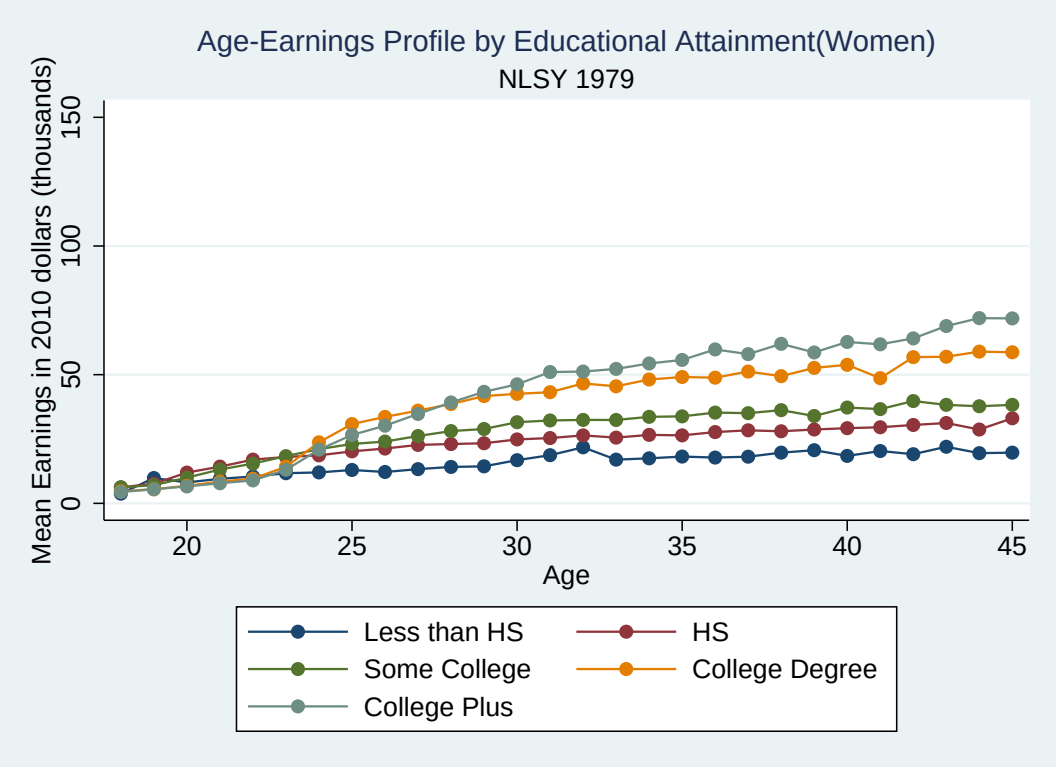
Figure 6



See notes to Figure 4.

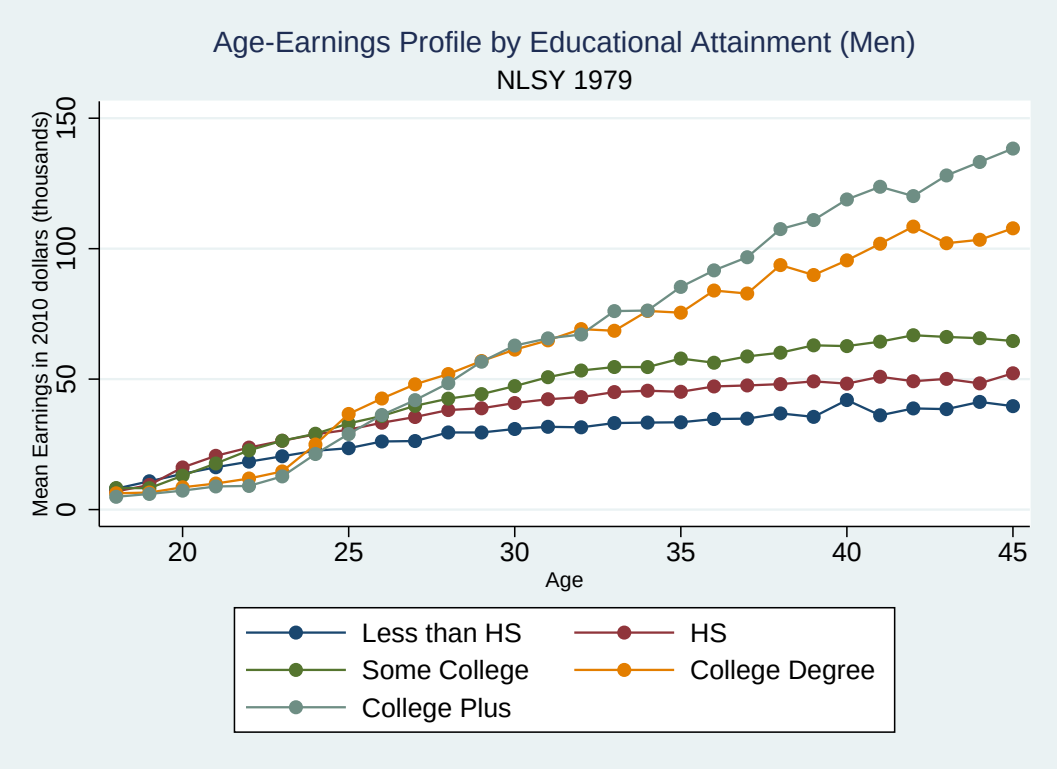
1.6 Figures

Figure 1.1: Age-Earnings Profile by Educational Attainment (Women)



Notes: This figure shows the mean of total wages and salary for women, across ages and education categories. We use the NLSY79 data. The graph covers periods from 1979-1995 (yearly basis) and 1996-2012 (biennial basis). We express earnings in 2012 thousands of dollars using an inflation index based on hourly wages of private nonagricultural industries (Source: 2013 Economic Report of the President). We dropped earnings flagged as "valid skips" or equal to 0. The sample considers individuals between ages 20-47 years old. Self-employed are excluded from the sample. We define the education categories using the maximum number of years of schooling attained up to age 39 (for cohorts born in 1957, 1959, 1961 and 1963) or 40 (for cohorts born in 1958, 1960, 1962 and 1964). Less than High School: ≤ 11; High School: $= 12$ years of schooling. years of schooling; Some College: $[13, 15]$ years of schooling; College: $= 16$ years of schooling; College+: ≥ 17 years of schooling.

Figure 1.2: Age-Earnings Profile by Educational Attainment (Men)



Notes: This figure shows the mean of total wages and salary for men, across ages and education categories. We use the NLSY79 data. The graph covers periods from 1979-1995 (yearly basis) and 1996-2012 (biennial basis). We express earnings in 2012 thousands of dollars using an inflation index based on hourly wages of private nonagricultural industries (Source: 2013 Economic Report of the President). We dropped earnings flagged as "valid skips" or equal to 0. The sample considers individuals between ages 20-47 years old. Self-employed are excluded from the sample. We define the education categories using the maximum number of years of schooling attained up to age 39 (for cohorts born in 1957, 1959, 1961 and 1963) or 40 (for cohorts born in 1958, 1960, 1962 and 1964). Less than High School: ≤ 11; High School: $= 12$ years of schooling. years of schooling; Some College: $[13, 15]$ years of schooling; College: $= 16$ years of schooling; College+: ≥ 17 years of schooling.

Table 5.2
Effects of Charter School Attendance on Achievement
Lottery Studies

Study	Sample	Grades	Type	Results
Hoxby et al (2009)	NYC Charter Schools	3-8	TOT / yr	.09σ Math*
			TOT / yr	.06σ ELA*
		9-12	TOT / yr	.19σ Math*
			TOT / yr	.18σ ELA*
Gleason et al (2010)	National - 28 schools	5-8	TOT	-.08σ Math
			TOT	-.08σ ELA
	Free or Reduce Lunch	5-8	ITT	.17$\boldsymbol{\sigma}$ Math*
			ITT	.05$\boldsymbol{\sigma}$ ELA
Dobbie and Fryer (2011)	Harlem Children's Zone	5-8	TOT / yr	.23$\boldsymbol{\sigma}$ Math*
			TOT / yr	.05$\boldsymbol{\sigma}$ ELA
Abdulkadiroglu et al (2011)	Boston	5-8	TOT / yr	.36$\boldsymbol{\sigma}$ Math*
			TOT / yr	.20$\boldsymbol{\sigma}$ ELA*
		9-12	TOT / yr	.36$\boldsymbol{\sigma}$ Math*
			TOT / yr	.27$\boldsymbol{\sigma}$ ELA*
Angrist et al (2012)	Lynn, MA	5-8	TOT / yr	.36$\boldsymbol{\sigma}$ Math*
			TOT / yr	.12$\boldsymbol{\sigma}$ ELA*
Angrist et al (2013)	Urban - MA	5-8	TOT / yr	.32$\boldsymbol{\sigma}$ Math*
			TOT / yr	.15$\boldsymbol{\sigma}$ ELA*
		9-12	TOT / yr	.34$\boldsymbol{\sigma}$ Math*
			TOT / yr	.27$\boldsymbol{\sigma}$ ELA*
	NonUrban - MA	5-8	TOT / yr	-.12$\boldsymbol{\sigma}$ Math*
			TOT / yr	-.14$\boldsymbol{\sigma}$ ELA*
		9-12	TOT / yr	-.02$\boldsymbol{\sigma}$ Math
			TOT / yr	-.05$\boldsymbol{\sigma}$ ELA
Dobbie and Fryer (2013)	NYC Charter Schools	3-5	TOT / yr	.11$\boldsymbol{\sigma}$ Math*
		3-5	TOT / yr	.06$\boldsymbol{\sigma}$ ELA*
		5-8	TOT / yr	.13$\boldsymbol{\sigma}$ Math*
		5-8	TOT / yr	.05$\boldsymbol{\sigma}$ ELA
Curto and Fryer (2014)	SEED (Boarding) Washington, DC	6-12	TOT / yr	.23$\boldsymbol{\sigma}$ Math*
		6-12	TOT / yr	.21$\boldsymbol{\sigma}$ Reading*
Hasserick et al (2017)	University of Chicago Charter Schools	3	TOT	.40$\boldsymbol{\sigma}$ M&R*
		4	TOT	.58$\boldsymbol{\sigma}$ M&R*
		5	TOT	.51$\boldsymbol{\sigma}$ M&R*
		6-8	TOT	.96$\boldsymbol{\sigma}$ M&R*

ITT - Intent to Treat, TOT - Treatment on the Treated. M - Math. ELA - English Language Arts. M&R - Composite Score for Math and Reading. * indicates statistically significant.

Racial/ethnic score gaps narrow at all three ages

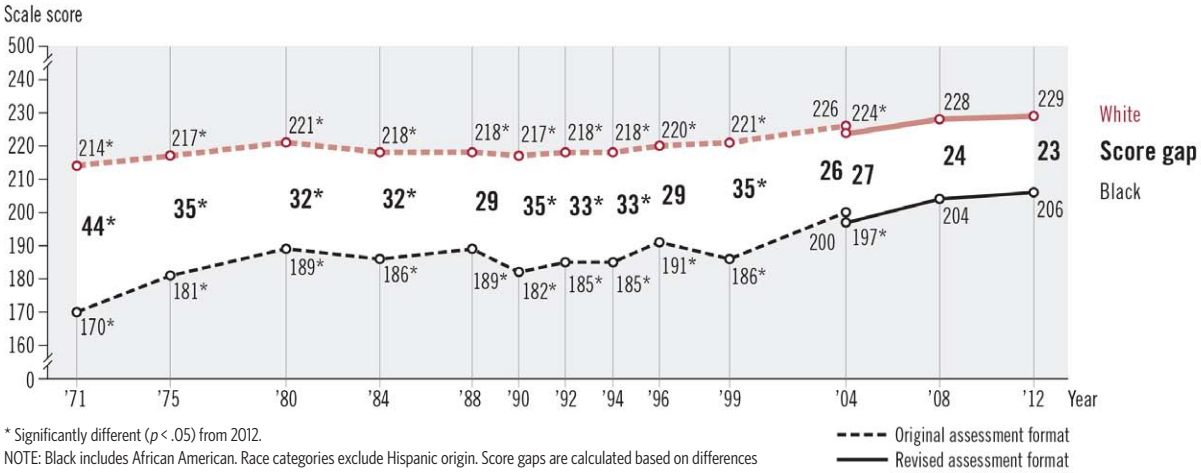
Even though White students continued to score 21 or more points higher on average than Black and Hispanic students in 2012, the White – Black and White – Hispanic gaps narrowed in comparison to the gaps in the 1970s at all three ages. The White – Black score gaps for 9- and 17-year-olds in 2012 were nearly half the size of the gaps in 1971.

Black and Hispanic 9-year-olds make larger gains than White students

The score gaps between White and Black students and between White and Hispanic students at age 9 narrowed from the 1970s because Black and Hispanic students made larger gains than did White students (**figures 7** and **8**). The average score for Black students was 36 points higher in 2012 than in 1971 (206 – 170) and the score for White students was 15 points higher (229 – 214). The average score for Hispanic students increased 25 points from 1975, and the score for White students increased 12 points.

Figure 7. Trend in NAEP reading average scores and score gaps for White and Black 9-year-old students

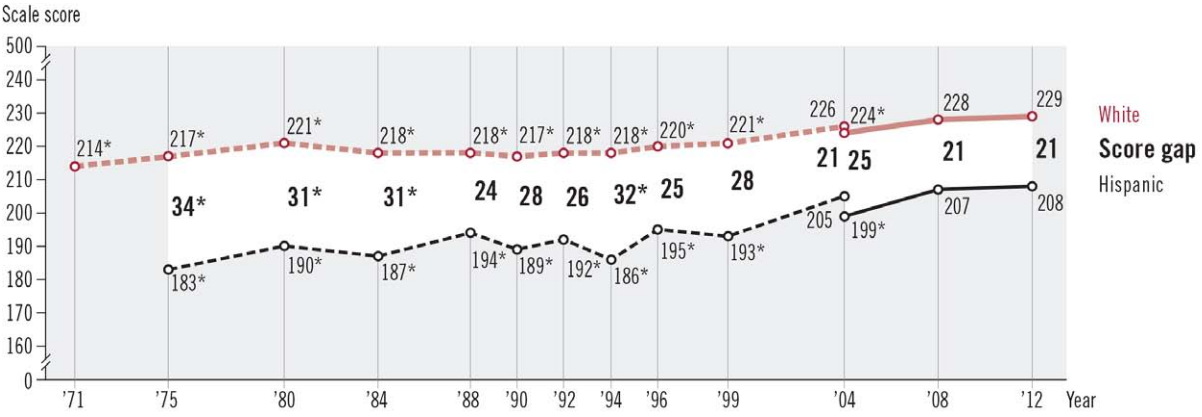
The White – Black score gap narrowed **21** points since 1971.



* Significantly different ($p < .05$) from 2012.
NOTE: Black includes African American. Race categories exclude Hispanic origin. Score gaps are calculated based on differences between unrounded average scores.

Figure 8. Trend in NAEP reading average scores and score gaps for White and Hispanic 9-year-old students

The White – Hispanic score gap narrowed about **13** points since 1975.



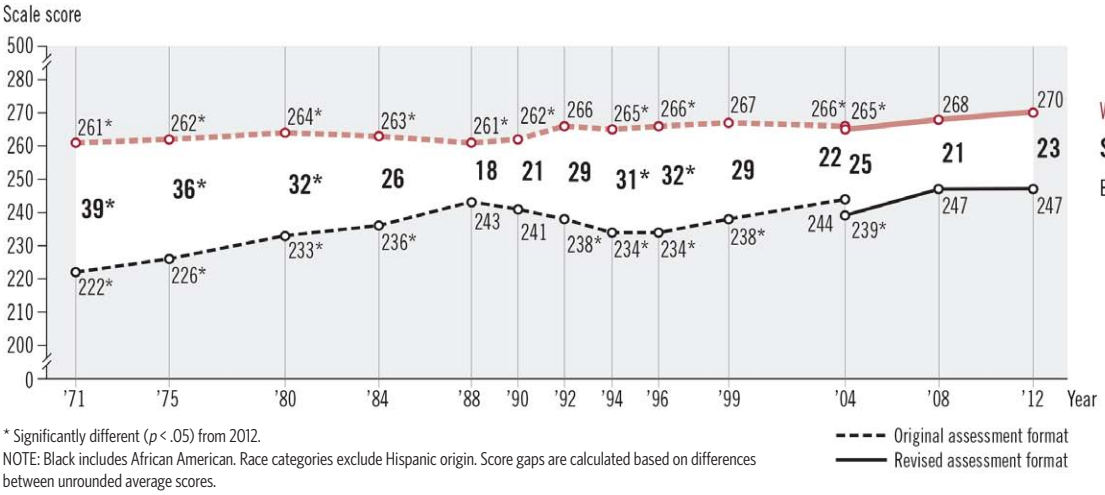
* Significantly different ($p < .05$) from 2012.
NOTE: White excludes students of Hispanic origin. Hispanic includes Latino. Results are not available for Hispanic students in 1971 because Hispanic was not reported as a separate category at that time. Score gaps are calculated based on differences between unrounded average scores.

SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, National Assessment of Educational Progress (NAEP), various years, 1971–2012 Long-Term Trend Reading Assessments.

Thirteen-year-old Hispanic students make long- and short-term gains

The racial/ethnic score gap trends at age 13 are similar to those at age 9. Black and Hispanic students both made larger gains from the 1970s than White students, leading to a narrowing of the score gaps in 2012 (**figures 9** and **10**). Hispanic 13-year-olds are the only racial/ethnic group to make short-term reading score gains. The White – Hispanic gap narrowed 5 points since 2008.

Figure 9. Trend in NAEP reading average scores and score gaps for White and Black 13-year-old students



* Significantly different ($p < .05$) from 2012.
NOTE: Black includes African American. Race categories exclude Hispanic origin. Score gaps are calculated based on differences between unrounded average scores.

The White – Black score gap narrowed **16** points since 1971.

Figure 10. Trend in NAEP reading average scores and score gaps for White and Hispanic 13-year-old students

* Significantly different ($p < .05$) from 2012.
NOTE: White excludes students of Hispanic origin. Hispanic includes Latino. Results are not available for Hispanic students in 1971 because Hispanic was not reported as a separate category at that time. Score gaps are calculated based on differences between unrounded average scores.

The White – Hispanic score gap narrowed **9** points since 1975.

SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, National Assessment of Educational Progress (NAEP), various years, 1971–2012 Long-Term Trend Reading Assessments.

White, Black, and Hispanic 17-year-olds show improvement since the 1970s

Average reading scores for 17-year-olds increased 4 points from the first assessment year for White students, 30 points for Black students, and 21 points for Hispanic students (**figures 11** and **12**). Larger gains for Black and Hispanic students than for White students narrowed the White – Black and White – Hispanic gaps to about half of what they were in the 1970s.

The changing makeup of the student population is one reason why the overall average score for 17-year-olds has not changed significantly, even though student groups within the overall population are making gains. When an increase in the proportion of typically lower performing students is accompanied by a decrease in the proportion of higher performing students, the overall average score can remain unchanged even though the average scores for both higher and lower performing groups increase. This phenomenon is known as Simpson's paradox.

Figure 11. Trend in NAEP reading average scores and score gaps for White and Black 17-year-old students

The White – Black score gap narrowed **27** points since 1971.

* Significantly different ($p < .05$) from 2012.
NOTE: Black includes African American. Race categories exclude Hispanic origin. Score gaps are calculated based on differences between unrounded average scores.

Figure 12. Trend in NAEP reading average scores and score gaps for White and Hispanic 17-year-old students

The White – Hispanic score gap narrowed about **20** points since 1975.

* Significantly different ($p < .05$) from 2012.
NOTE: White excludes students of Hispanic origin. Hispanic includes Latino. Results are not available for Hispanic students in 1971 because Hispanic was not reported as a separate category at that time. Score gaps are calculated based on differences between unrounded average scores.

SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, National Assessment of Educational Progress (NAEP), various years, 1971–2012 Long-Term Trend Reading Assessments.

White – Black score gap narrows at all three ages

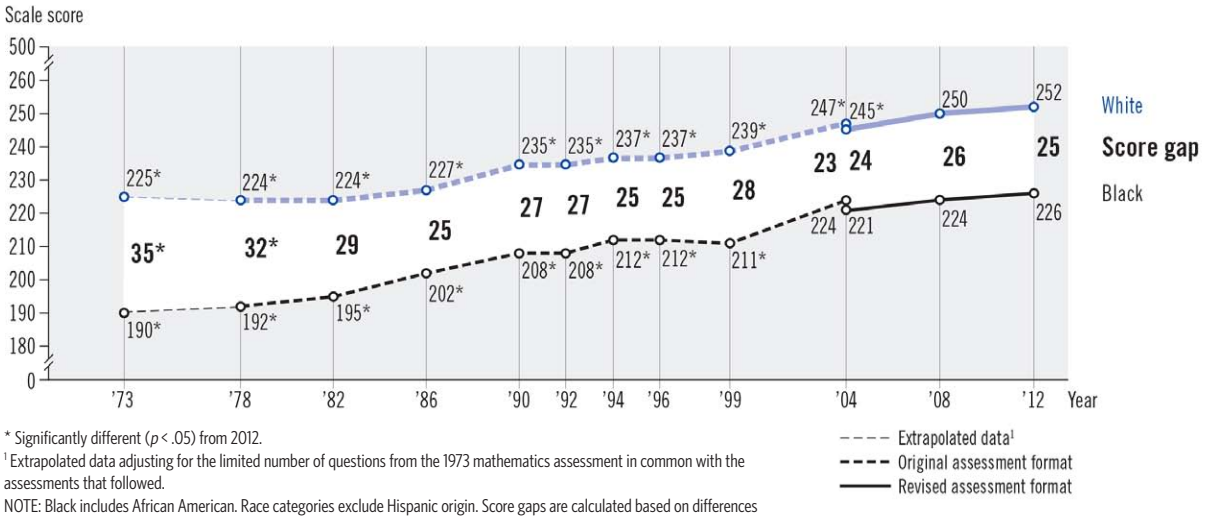
Even though White students continued to score 25 or more points higher on average than Black students in 2012, the White – Black gap narrowed in comparison to the 1970s at all three ages. The White – Hispanic gap also narrowed from 1973 at ages 13 and 17, but did not change significantly at age 9.

Black 9-year-olds make larger gains than White students

The 36-point gain made by Black 9-year-olds from 1973 was larger than the gain made by White students, leading to a narrowing of the White – Black score gap in 2012 (**figure 23**). Hispanic students made a 32-point gain, but this was not significantly different from the gain for White students (**figure 24**). Consequently, the White – Hispanic gap did not narrow significantly even though it was numerically smaller.

The White – Black score gap narrowed **10** points since 1973.

Figure 23. Trend in NAEP mathematics average scores and score gaps for White and Black 9-year-old students



* Significantly different ($p < .05$) from 2012.
[1] Extrapolated data adjusting for the limited number of questions from the 1973 mathematics assessment in common with the assessments that followed.
NOTE: Black includes African American. Race categories exclude Hispanic origin. Score gaps are calculated based on differences between unrounded average scores.

Figure 24. Trend in NAEP mathematics average scores and score gaps for White and Hispanic 9-year-old students

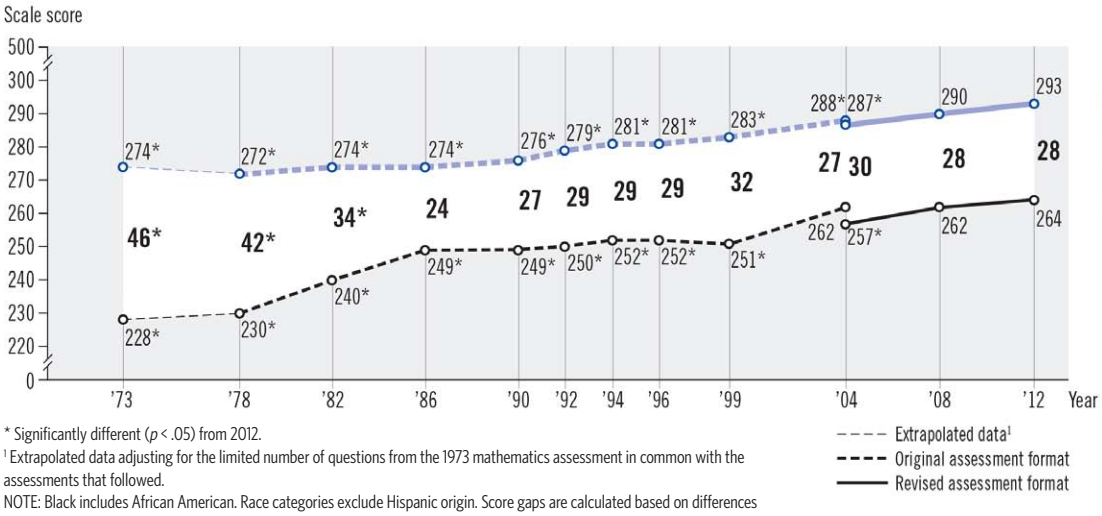
* Significantly different ($p < .05$) from 2012.
[1] Extrapolated data adjusting for the limited number of questions from the 1973 mathematics assessment in common with the assessments that followed.
NOTE: White excludes students of Hispanic origin. Hispanic includes Latino. Score gaps are calculated based on differences between unrounded average scores.

SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, National Assessment of Educational Progress (NAEP), various years, 1973–2012 Long-Term Trend Mathematics Assessments.

Racial/ethnic score gaps narrow at age 13

Both the White – Black and White – Hispanic gaps narrowed from 1973 at age 13 (**figures 25** and **26**). Black and Hispanic students both made larger gains from the 1970s than White students, leading to a narrowing of the score gaps in 2012.

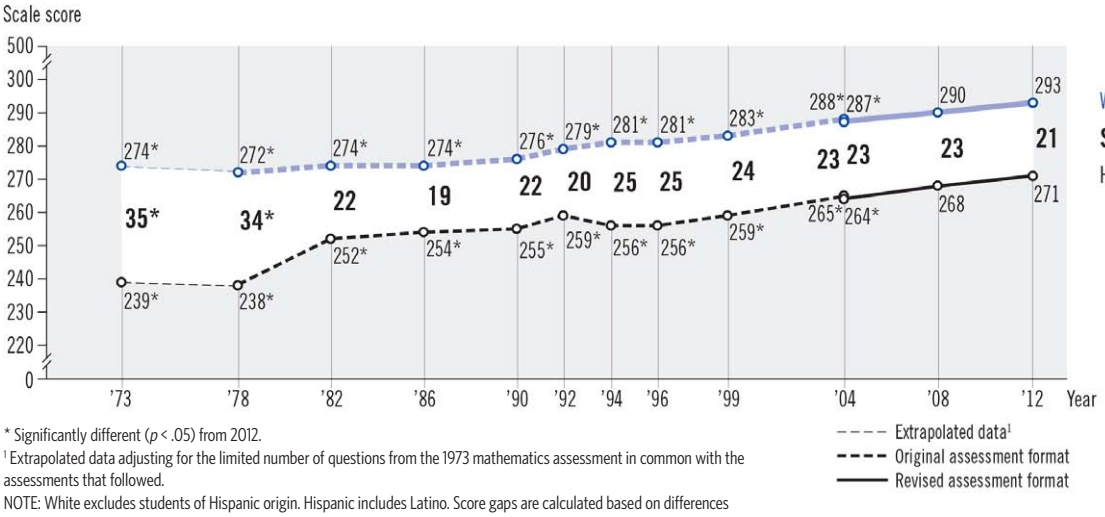
Figure 25. Trend in NAEP mathematics average scores and score gaps for White and Black 13-year-old students



* Significantly different ($p < .05$) from 2012.
[1] Extrapolated data adjusting for the limited number of questions from the 1973 mathematics assessment in common with the assessments that followed.
NOTE: Black includes African American. Race categories exclude Hispanic origin. Score gaps are calculated based on differences between unrounded average scores.

The White – Black score gap narrowed **18** points since 1973.

Figure 26. Trend in NAEP mathematics average scores and score gaps for White and Hispanic 13-year-old students



* Significantly different ($p < .05$) from 2012.
[1] Extrapolated data adjusting for the limited number of questions from the 1973 mathematics assessment in common with the assessments that followed.
NOTE: White excludes students of Hispanic origin. Hispanic includes Latino. Score gaps are calculated based on differences between unrounded average scores.

The White – Hispanic score gap narrowed **14** points since 1973.

SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, National Assessment of Educational Progress (NAEP), various years, 1973–2012 Long-Term Trend Mathematics Assessments.

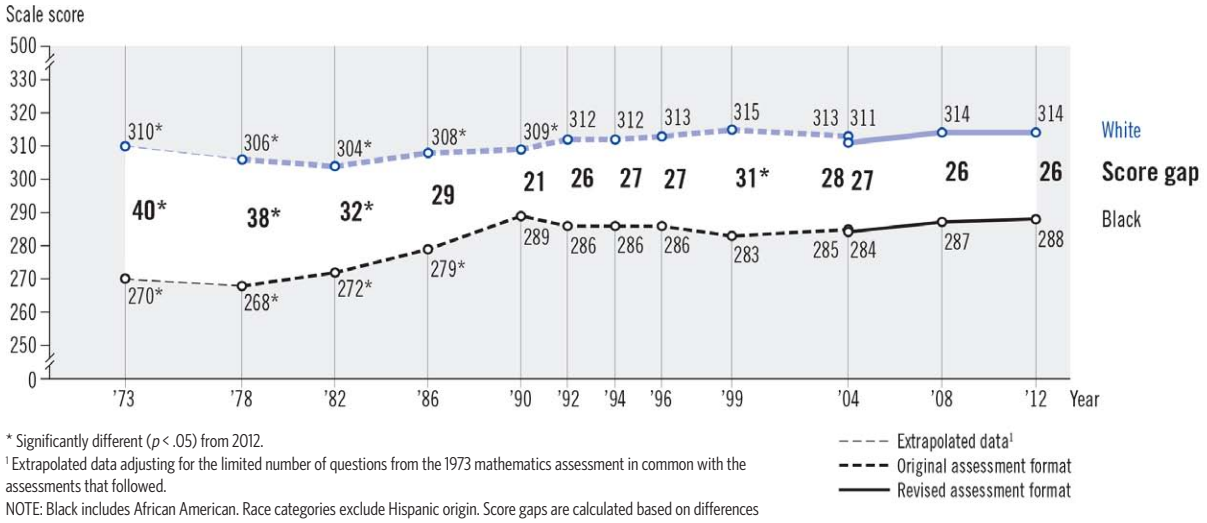
White, Black, and Hispanic 17-year-olds show improvement since the 1970s

White – Black and White – Hispanic gaps narrowed at age 17 because Black and Hispanic students made larger gains from 1973 than White students (figures 27 and 28). Average mathematics scores for 17-year-olds increased 4 points from the first assessment year for White students, 18 points for Black students, and 17 points for Hispanic students.

The changing makeup of the student population is one reason why the overall average score for 17-year-olds has not changed significantly even though student groups within the overall population are making gains. When an increase in the proportion of typically lower performing students is accompanied by a decrease in the proportion of higher performing students, the overall average score can remain unchanged even though the average scores for both higher and lower performing groups increase. This phenomenon is known as Simpson's paradox.

The White – Black score gap narrowed **14** points since 1973.

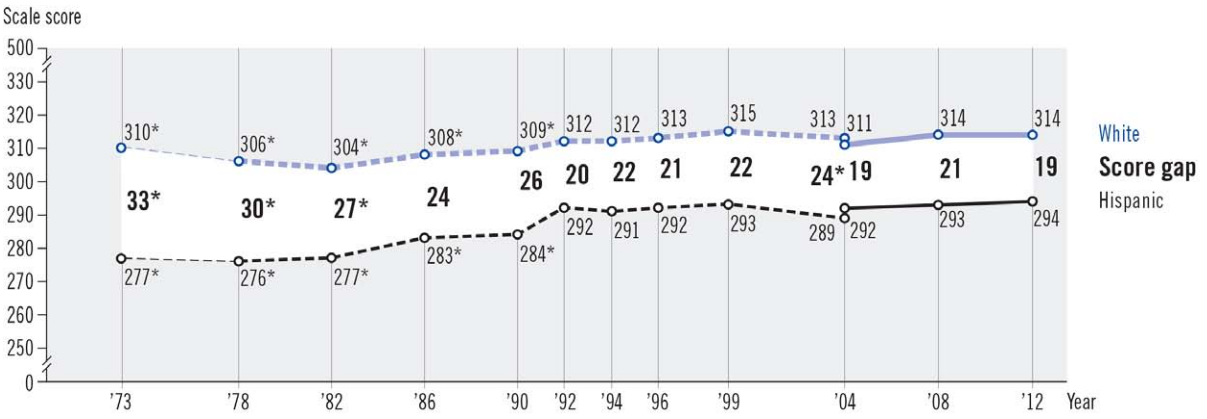
Figure 27. Trend in NAEP mathematics average scores and score gaps for White and Black 17-year-old students



* Significantly different ($p < .05$) from 2012.
[1] Extrapolated data adjusting for the limited number of questions from the 1973 mathematics assessment in common with the assessments that followed.
NOTE: Black includes African American. Race categories exclude Hispanic origin. Score gaps are calculated based on differences between unrounded average scores.

The White – Hispanic score gap narrowed **14** points since 1973.

Figure 28. Trend in NAEP mathematics average scores and score gaps for White and Hispanic 17-year-old students



* Significantly different ($p < .05$) from 2012.
[1] Extrapolated data adjusting for the limited number of questions from the 1973 mathematics assessment in common with the assessments that followed.
NOTE: White excludes students of Hispanic origin. Hispanic includes Latino. Score gaps are calculated based on differences between unrounded average scores.

SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, National Assessment of Educational Progress (NAEP), various years, 1973–2012 Long-Term Trend Mathematics Assessments.