Discrimination and Learning

14.662 Spring 2011

David Autor

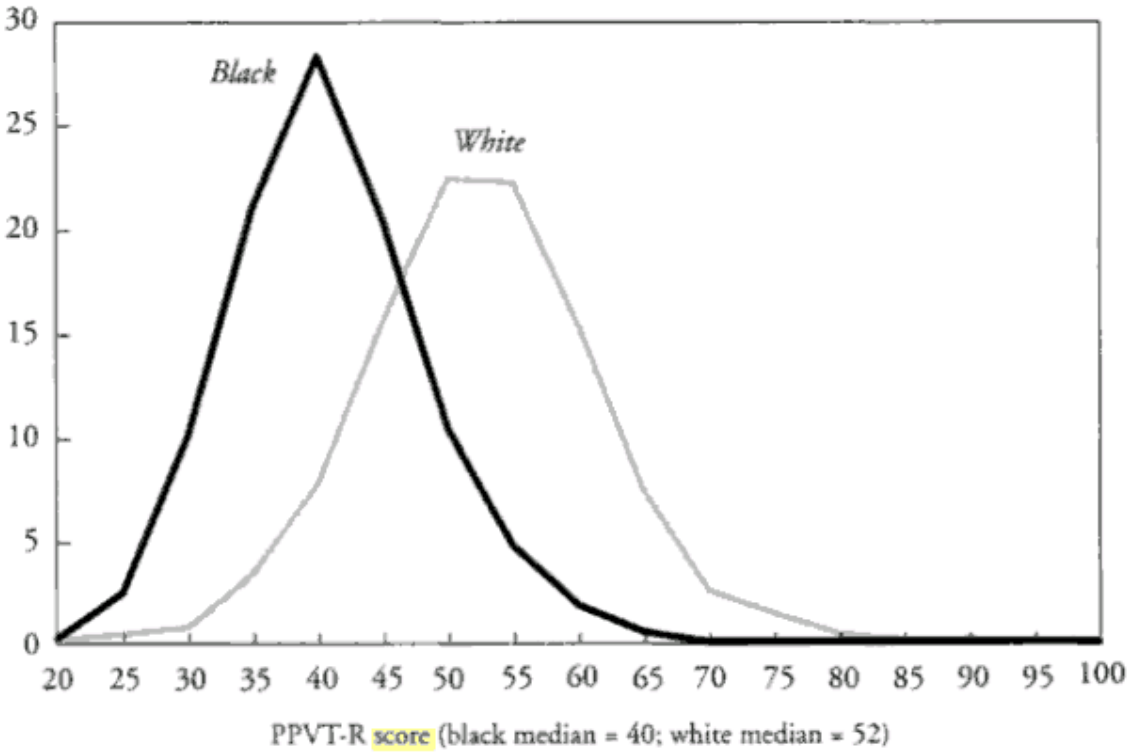
Autor and Scarborough 2008

The Tradeoff

- “What is the appropriate balance between anticipated productivity gains from better employee selection and the well-being of individual job seekers? Can equal employment opportunity be said to exist if screening methods systematically filter out very large proportions of minority candidates?”

  - Hartigan and Widgor, *Fairness in Employment Testing,*1989.

Figure 1-1. *Vocabulary Scores for Black and White Three- and Four-Year-Olds, 1986–94*



Source: National Longitudinal Survey of Youth Child Data, 1986–94. Black N = 1,134; white N = 2,071. Figure is based on black and white three- and four-year-olds in the Children of the National Longitudinal Survey of Youth (CNLSY) data set who took the Peabody Picture Vocabulary Test-Revised (PPVT-R). The test is the standardized residual, coded to a mean of 50 and a standard deviation of 10, from a weighted regression of children's raw scores on their age in months, age in months squared, and year-of-testing dummies. See chapter 4 for details on the CNLSY and the PPVT-R.

Jencks and Phillips, 1998

Sample Test Questions

1. Conscientiousness: “If you think a bit about a problem, you can always find a solution.”
2. Extroversion: “You hold back from talking a lot in a group.”
3. Agreeableness (self-control): “You can be rude when you need to be.”
4. Openness to experience (novelty versus structure; intellect): “It is easy for you to change your plans.”
5. Emotional Stability (mood, temper): “Sometimes you have negative feelings all day."

TABLE I

RACE AND GENDER CHARACTERISTICS OF TESTED AND NONTESTED HIRES

A. Frequencies

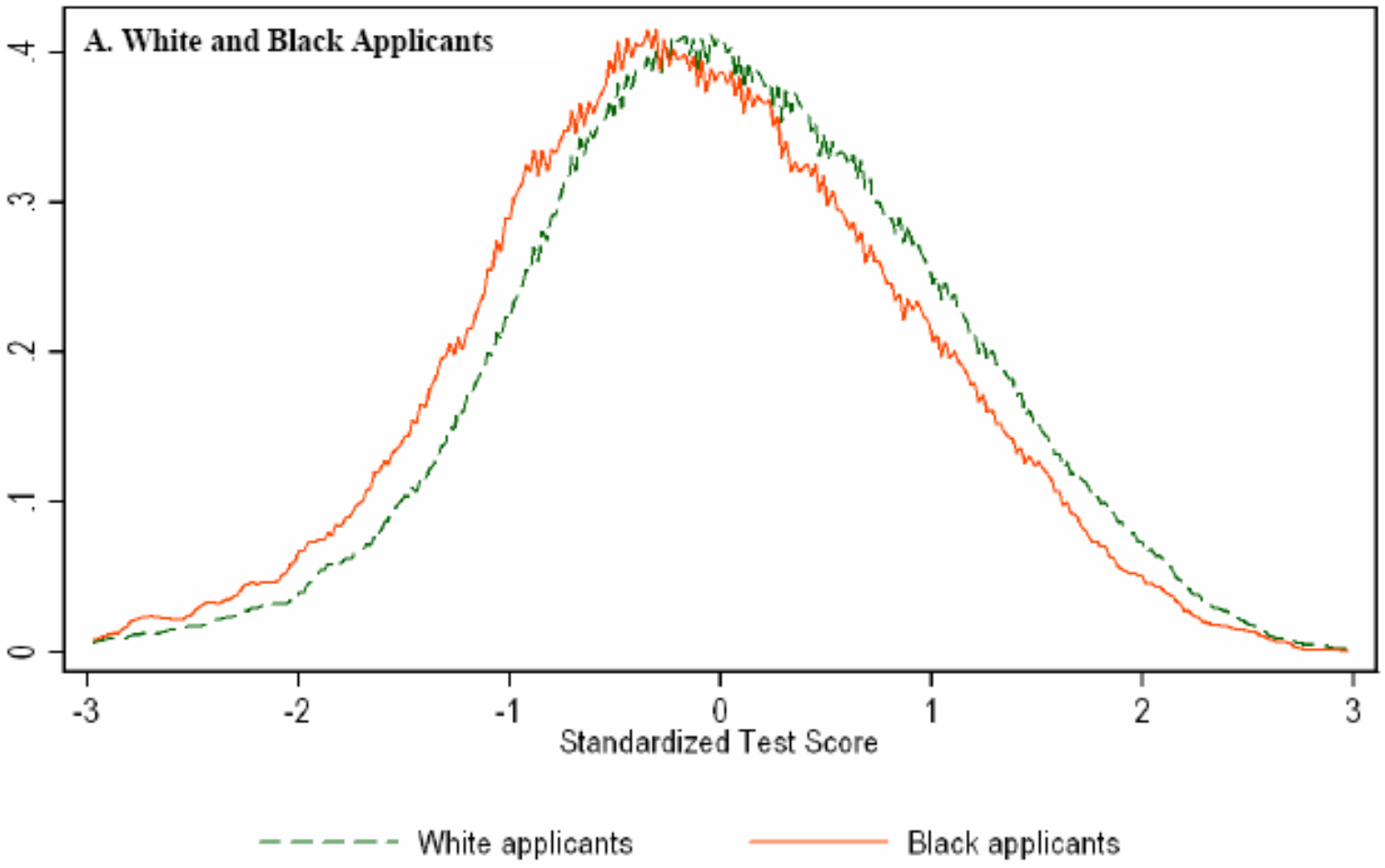
	Full sample		Nontested hires		Tested hires	
	Frequency	% of total	Frequency	% of total	Frequency	% of total
All	33,924	100	25,561	75	8,363	25
White	23,560	69.5	18,057	70.6	5,503	65.8
Black	6,262	18.5	4,591	18.0	1,671	20.0
Hispanic	4,102	12.1	2,913	11.4	1,189	14.2
Male	17,444	51.4	13,008	50.9	4,436	53.0
Female	16,480	48.6	12,553	49.1	3,927	47.0

B. Employment spell duration (days)

	Full sample		Nontested hires		Tested hires	
	Median	Mean	Median	Mean	Median	Mean
All	99	173.7	96	173.3	107	174.8
	[97, 100]	(1.9)	[94, 98]	(2.1)	[104, 111]	(2.9)
White	106	184.0	102	183.0	115	187.1
	[103, 108]	(2.1)	[100, 105]	(2.3)	[112, 119]	(3.6)
Black	77	140.1	74	138.1	87	145.7
	[75, 80]	(3.0)	[71, 77.4]	(3.5)	[81.9, 92]	(4.8)
Hispanic	98	166.4	98	169.3	99	159.5
	[93, 103]	(4.6)	[92, 104]	(5.4)	[90, 106]	(6.4)

Sample includes workers hired between January 1999 and May 2000. Mean tenures include only completed spells (98% spells completed). Median tenures include complete and incomplete spells. Standard errors in parentheses account for correlation between observations from the same site (1,363 sites total). 95 percent confidence intervals for medians are given in brackets.

Autor and Scarborough, 2008



Autor and Scarborough, 2008

TABLE II

TEST SCORES AND HIRE RATES BY RACE AND SEX FOR TESTED APPLICANT SUBSAMPLE

A. Test scores of applicants (n = 189,067)

			Percentage in each category		
	Mean	SD	Quartile 1: "red"	Quartile 2: "yellow"	Quartiles 3 and 4: "green"
All	0.000	1.000	23.2	24.8	52.0
White	0.064	0.996	20.9	24.5	54.6
Black	−0.125	1.009	27.8	25.2	47.1
Hispanic	−0.056	0.982	24.9	25.6	49.6
Male	0.019	0.955	24.4	24.3	51.3
Female	−0.014	1.033	21.6	25.5	52.9

B. Test scores of hires (n = 16,925)

Autor and Scarborough, 2008

TABLE III

THE RELATIONSHIP BETWEEN APPLICANT CHARACTERISTICS AND TEST SCORES
(DEPENDENT VARIABLE: STANDARDIZED TEST SCORE)

	(1)	(2)	(3)	(4)	(5)
Black	−0.192	−0.183	−0.125	−0.113	−0.113
	(0.008)	(0.007)	(0.008)	(0.008)	(0.008)
Hispanic	−0.121	−0.148	−0.100	−0.093	−0.093
	(0.009)	(0.008)	(0.008)	(0.008)	(0.008)
Male	−0.044	−0.045	−0.052	−0.053	−0.053
	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
Median income in applicant's ZIP code				0.066	0.062
				(0.015)	(0.016)
Percent nonwhite in applicant's ZIP code				−0.071	−0.071
				(0.023)	(0.023)
State effects	No	Yes	No	No	No
1,363 site effects	No	No	Yes	Yes	Yes
State trends	No	No	No	No	Yes
R^2	0.0070	0.0113	0.0265	0.0269	0.0277
Obs			189,067		

Robust standard errors in parentheses account for correlation between observations from the same site (1,363 sites). Sample includes all applications from August 2000 through May 2001 at sites in treatment sample. All models include controls for the year-month of application and an "other" race dummy variable to account for 25,621 applicants with other or unidentified race. Income and fraction nonwhite for stores and applicants are calculated using store ZIP codes merged to 2000 Census SF1 and SF3 files.

Autor and Scarborough, 2008

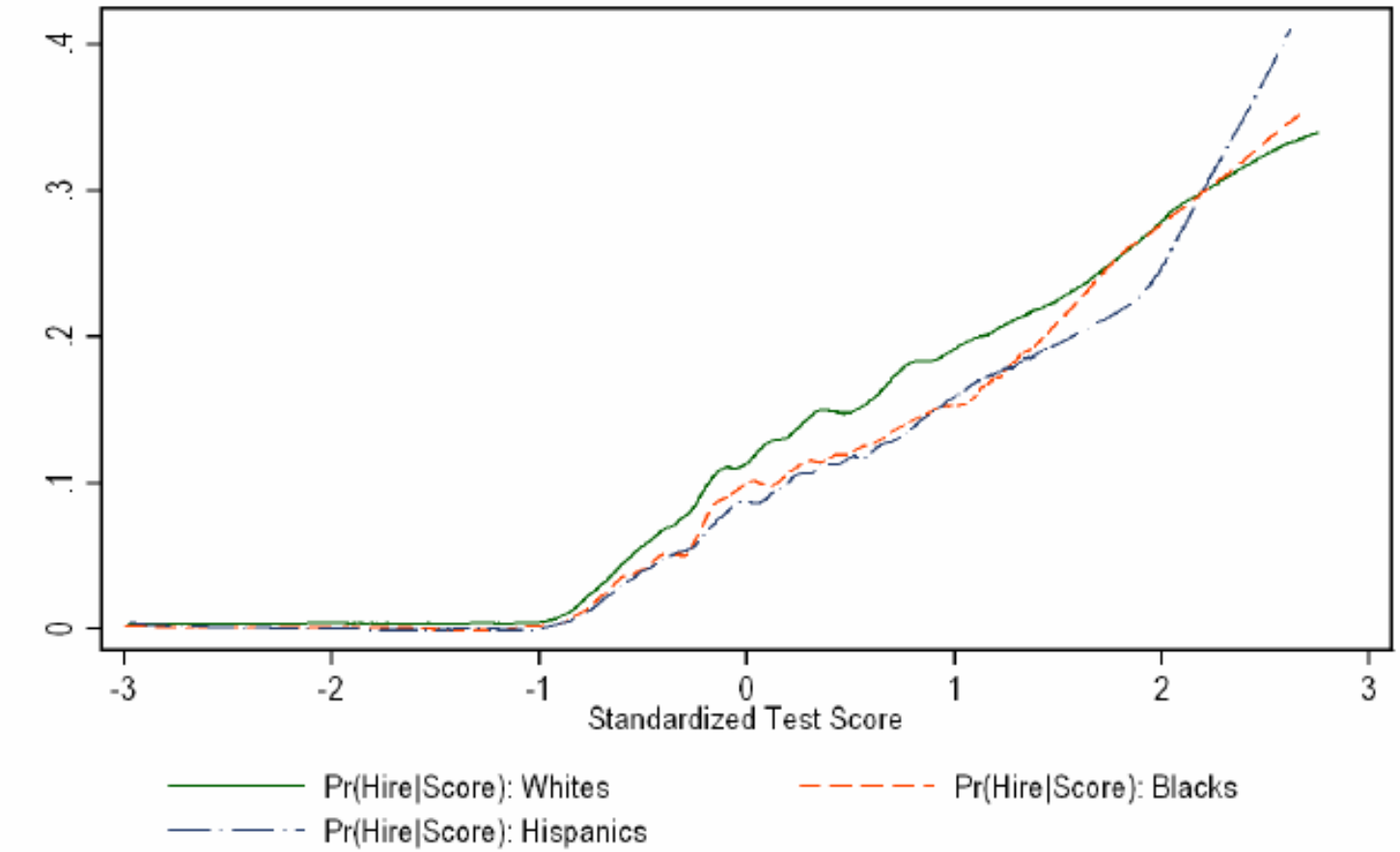


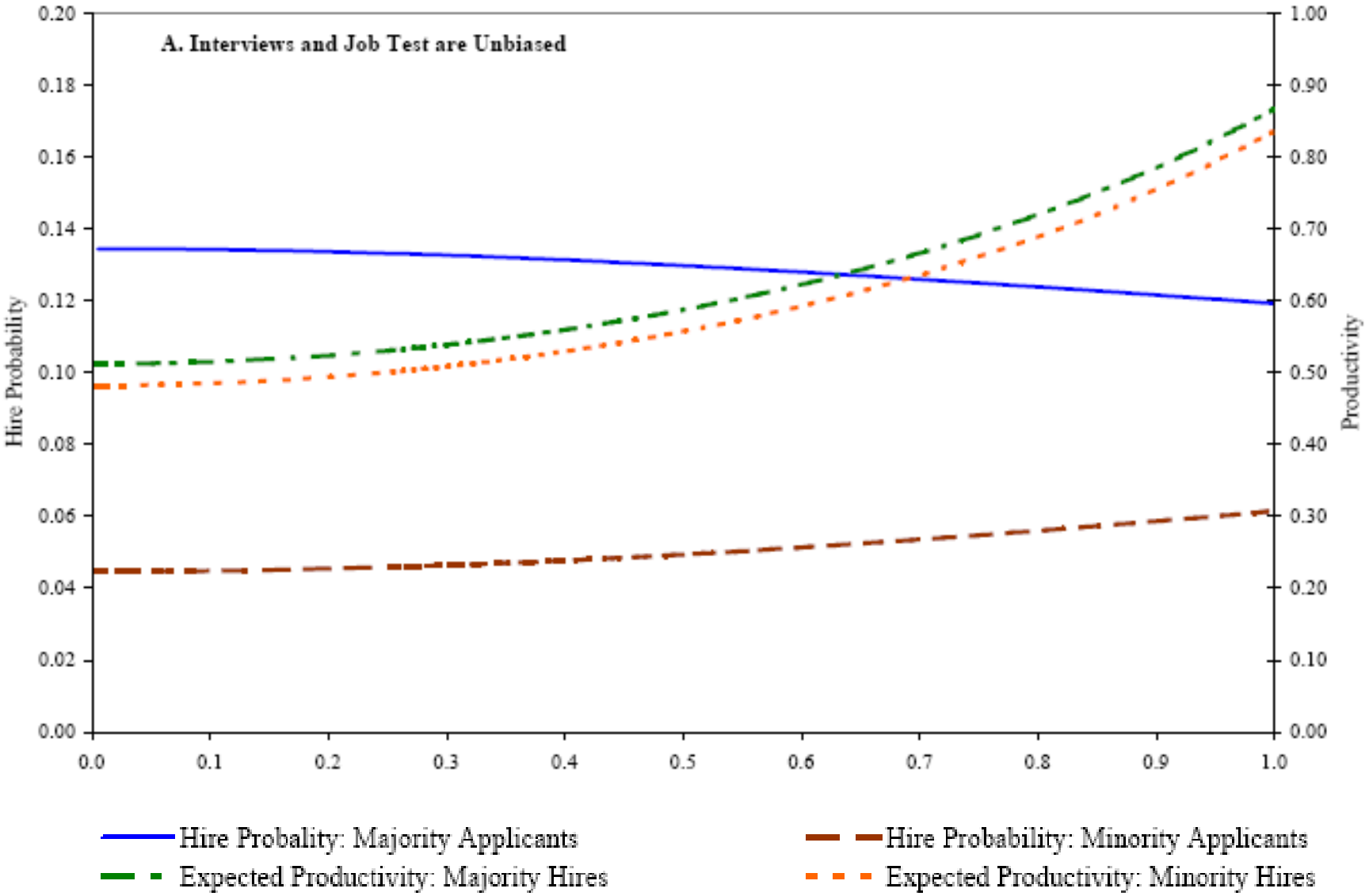
Figure I. Conditional Probability of Hire as a Function of Test Score by Race: Locally Weighted Regressions. Sample: All White, Black and Hispanic applicants, June 2000 - May 2001 (n=189,067).

Autor and Scarborough, 2008

C. Hire rates by applicant group

By Race and Sex			By Test Score Decile		
Race/Sex	% Hired	Obs	Decile	% Hired	Obs
			1	0.07	19,473
All	8.95	189,067	2	0.06	20,038
			3	3.96	18,803
White	10.16	113,354	4	5.65	18,774
Black	7.17	43,314	5	7.97	19,126
Hispanic	7.12	32,399	6	10.99	18,264
			7	11.71	18,814
			8	13.76	18,029
Male	8.59	106,948	9	16.14	19,491
Female	9.42	82,119	10	20.43	18,255

Autor and Scarborough, 2008



Autor and Scarborough, 2008

Autor and Scarborough, 2008

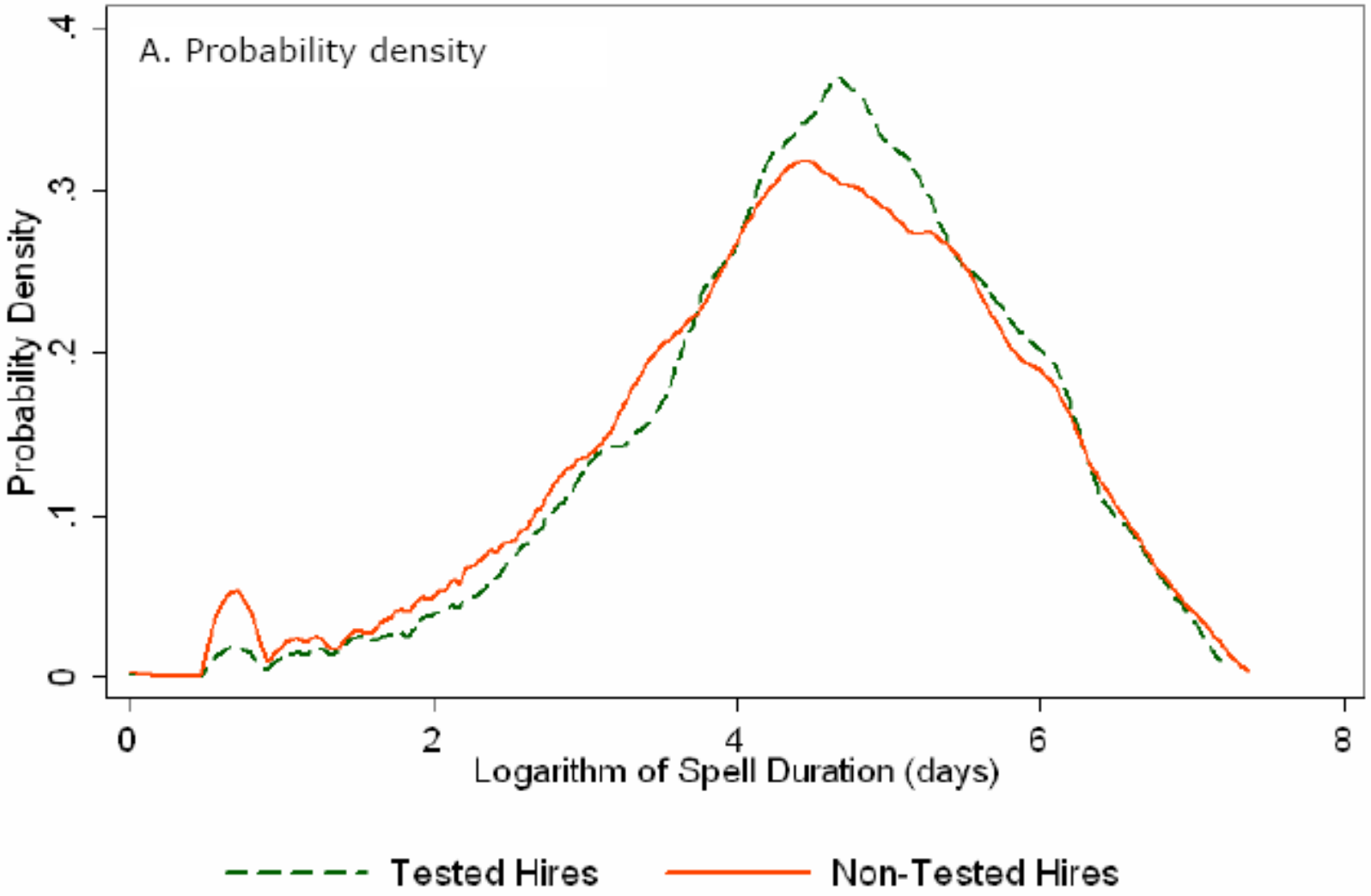


Figure IV. Completed Job Spell Durations of Tested and Non-Tested Hires.
Sample: Hires June 2000 - May 2001 with Valid Outcome Data (n =33,266)

Autor and Scarborough, 2008

TABLE IV

OLS AND IV ESTIMATES OF THE EFFECT OF JOB TESTING ON THE JOB SPELL DURATION OF HIRES

(DEPENDENT VARIABLE: LENGTH OF COMPLETED EMPLOYMENT SPELL IN DAYS)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
			OLS estimates				2SLS estimates			
Employment test			8.9	18.4	18.4	21.8	6.3	14.9	14.8	18.1
			(4.5)	(4.0)	(4.0)	(4.3)	(5.1)	(4.6)	(4.6)	(5.0)
Black	−43.5	−25.9			−25.9	−25.8			−25.9	−25.8
	(3.2)	(3.5)			(3.5)	(3.5)			(3.5)	(3.5)
Hispanic	−17.5	−11.8			−11.8	−11.7			−11.8	−11.7
	(4.4)	(4.1)			(4.1)	(4.1)			(4.1)	(4.1)
Male	−4.2	−2.0			−2.0	−1.9			−2.0	−1.9
	(2.4)	(2.4)			(2.4)	(2.4)			(2.4)	(2.4)
Site effects	No	Yes	No	Yes	Yes	Yes	No	Yes	Yes	Yes
State trends	No	No	No	No	No	Yes	No	No	No	Yes
R^2	0.0112	0.1089	0.0049	0.1079	0.1094	0.1116				

$N = 33{,}266$. Robust standard errors in parentheses account for correlation between observations from the same site hired under each screening method (testing or no testing). All models include controls for month-year of hire. Sample includes workers hired January 1999 through May 2000 at 1,363 sites. Instrument for worker receiving employment test in columns (7)–(10) is an indicator variable equal to one if site has begun testing.

Autor and Scarborough, 2008

TABLE VI

OLS AND IV ESTIMATES OF THE EFFECT OF JOB TESTING ON THE JOB SPELL DURATION OF HIRES: TESTING FOR DIFFERENTIAL IMPACTS BY RACE (DEPENDENT VARIABLE: LENGTH OF COMPLETED EMPLOYMENT SPELL IN DAYS)

	(1)	(2)	(3)	(4)	(5)	(6)
	OLS estimates			2SLS estimates		
White × tested	13.8	19.7	23.2	12.3	17.0	20.4
	(5.0)	(4.6)	(4.8)	(5.7)	(5.2)	(5.6)
Black × tested	15.4	22.2	23.2	12.4	18.1	18.8
	(6.4)	(5.9)	(6.0)	(7.0)	(6.7)	(6.9)
Hispanic × tested	−1.2	7.0	12.8	−5.6	0.5	6.4
	(8.8)	(7.3)	(7.6)	(9.2)	(7.7)	(8.1)
Black	−44.5	−26.5	−25.8	−44.0	−26.2	−25.4
	(3.8)	(3.9)	(3.9)	(3.9)	(3.9)	(3.9)
Hispanic	−14.0	−8.2	−8.8	−13.1	−7.2	−7.8
	(5.5)	(4.8)	(4.9)	(5.6)	(4.9)	(4.9)
Male	−4.2	−2.0	−1.9	−4.2	−2.0	−1.9
	(2.4)	(2.4)	(2.4)	(2.4)	(2.4)	(2.4)
Site effects	No	Yes	Yes	No	Yes	Yes
State trends	No	No	Yes	No	No	Yes
H_0: Race interactions jointly equal	0.19	0.15	0.36	0.14	0.08	0.21
R^2	0.012	0.109	0.112			

$N = 33{,}266$. Robust standard errors in parentheses account for correlation between observations from the same site hired under each screening method (testing or no testing). All models include controls for month-year of hire. Sample includes workers hired January 1999 through May 2000 at 1,363 sites. Instrument for worker receiving employment test in columns (7)–(10) is an indicator variable equal to one if site has begun testing.

Autor and Scarborough, 2008

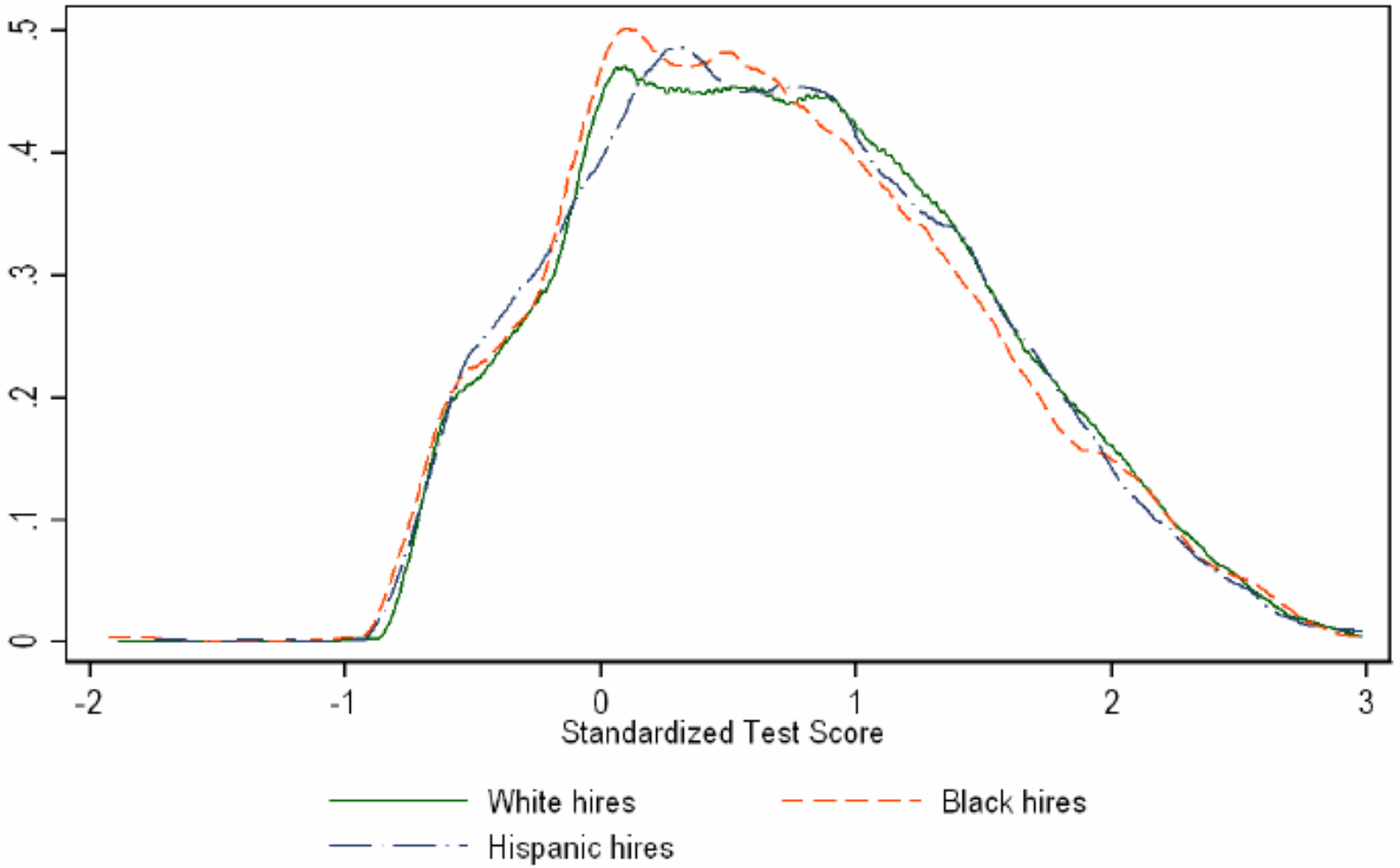


Figure V. Test Score Densities of Hired Workers by Race

Autor and Scarborough, 2008

TABLE VII

ESTIMATES OF THE EFFECT OF JOB TESTING ON HIRING ODDS BY RACE (PANEL A) AND THE SHARE OF HIRES BY RACE (PANELS B AND C) (DEPENDENT VARIABLE: EQUAL TO ONE (ZERO) IF HIRED WORKER IS (NOT) OF SPECIFIED RACE)

	(1)	(2)	(3)	(4)	(5)	(6)
	White		Black		Hispanic	
Panel A. Hiring odds: 100 × fixed effects logit estimates						
Employment test	2.90	2.06	−2.35	−0.13	−2.48	−5.78
(logit coefficient)	(5.63)	(5.89)	(6.77)	(7.14)	(7.33)	(7.62)
State trends	No	Yes	No	Yes	No	Yes
N	30,921	23,957	26,982	26,982	22,453	22,453
Panel B. Hiring shares: 100 × OLS estimates						
Employment test	0.41	0.24	−0.27	−0.04	−0.14	−0.21
(OLS coefficient)	(0.84)	(0.89)	(0.69)	(0.72)	(0.62)	(0.67)
State trends	No	Yes	No	Yes	No	Yes
N	33,924	33,924	33,924	33,924	33,924	33,924
Panel C. Hiring shares: 100 × 2SLS estimates						
Employment test	0.78	0.69	−0.15	0.09	−0.63	−0.78
(2SLS coefficient)	(0.95)	(1.02)	(0.78)	(0.81)	(0.70)	(0.77)
State trends	No	Yes	No	Yes	No	Yes
N	33,924	33,924	33,924	33,924	33,924	33,924

Standard errors in parentheses. For OLS and IV models, robust standard errors in parentheses account for correlations between observations from the same site. Sample includes workers hired January 1999 through May 2000. All models include controls for month-year of hire and site fixed effects. Fixed effects logit models discard sites where all hires are of one race or where relevant race is not present.

Autor and Scarborough, 2008

TABLE IX

THE IMPACT OF JOB TESTING ON HIRING AND JOB SPELL DURATIONS OF WHITE AND BLACK APPLICANTS UNDER SIX BIAS SCENARIOS: COMPARING SIMULATION RESULTS WITH OBSERVED OUTCOMES

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Simulation Results						
Avg. ability	$W > B$	$W > B$	$W > B$	$W = B$	$W = B$	$W = B$	
Interview bias	Neutral	Favors W	Favors B	Neutral	Favors W	Favors B	
Test bias	Neutral	Neutral	Neutral	Favors W	Favors W	Favors W	Observed
	A. Productivity: job spell durations in days						
Initial tenure	52.0	30.1	80.7	−13.2	−41.9	15.6	44.9
gap: $W - B$	(5.1)	(5.9)	(5.0)	(4.9)	(5.1)	(4.5)	(3.9)
ΔW tenure	18.6	20.4	16.8	16.8	18.6	16.0	23.2
	(1.2)	(1.1)	(1.3)	(1.3)	(1.2)	(1.3)	(4.8)
ΔB tenure	19.9	19.7	23.1	23.2	20.0	27.3	23.2
	(2.7)	(3.2)	(2.3)	(2.3)	(2.7)	(2.1)	(6.0)
$\Delta W - \Delta B$	−1.4	0.7	−6.3	−6.4	−1.4	−11.3	0.0
tenure	(3.0)	(3.4)	(2.7)	(2.7)	(3.0)	(2.6)	(6.2)
$\chi^2(3)$ rows 1, 2, 3	2.4	5.1	34.0	88.1	185.5	26.6	
P-value	.50	.17	.00	.00	.00	.00	
	B. Employment shares and log odds of hiring						
ΔW emp	−0.97	−2.38	0.86	0.86	−0.98	2.69	0.24
share × 100	(0.18)	(0.18)	(0.18)	(0.18)	(0.19)	(0.19)	(0.89)
ΔB emp	0.82	1.72	−0.53	−0.53	0.82	−1.88	−0.04
share × 100	(0.15)	(0.15)	(0.16)	(0.15)	(0.15)	(0.16)	(0.72)
$\Delta W - \Delta B$ emp	−1.79	−4.10	1.39	1.39	−1.79	4.57	0.28
share × 100	(0.31)	(0.30)	(0.31)	(0.30)	(0.31)	(0.32)	(1.42)
$\chi^2(2)$ rows 6, 7	3.4	14.9	1.0	1.0	3.4	15.0	
P-value	.33	.00	.79	.79	.33	.00	
	C. Omnibus goodness of fit statistics for productivity and employment						
$\chi^2(5)$ rows 5, 9	5.8	20.0	35.0	89.2	188.9	41.6	
P-value	.33	.00	.00	.00	.00	.00	

Autor and Scarborough, 2008

Coate and Loury, 1993

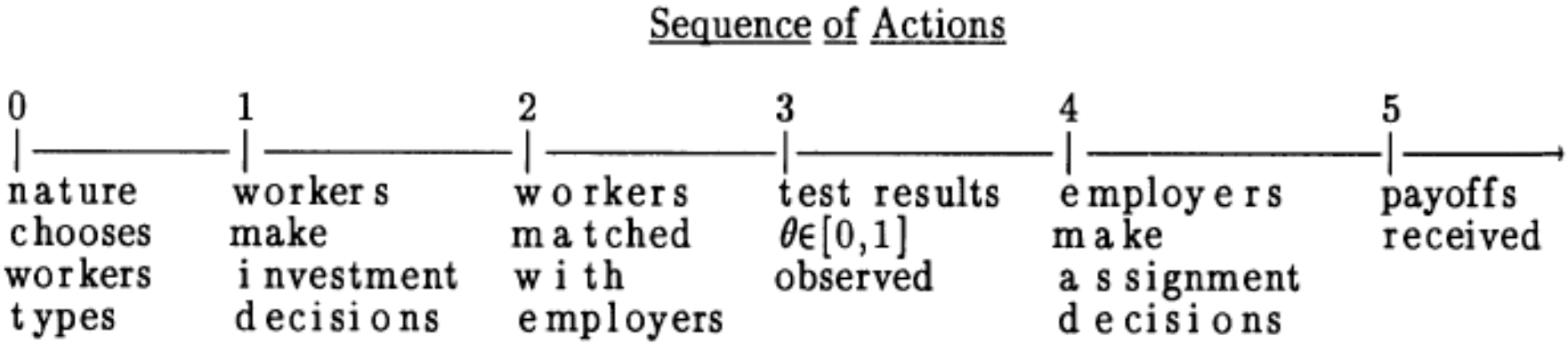


FIGURE 1. SEQUENCE OF ACTIONS

Coate and Loury 1993

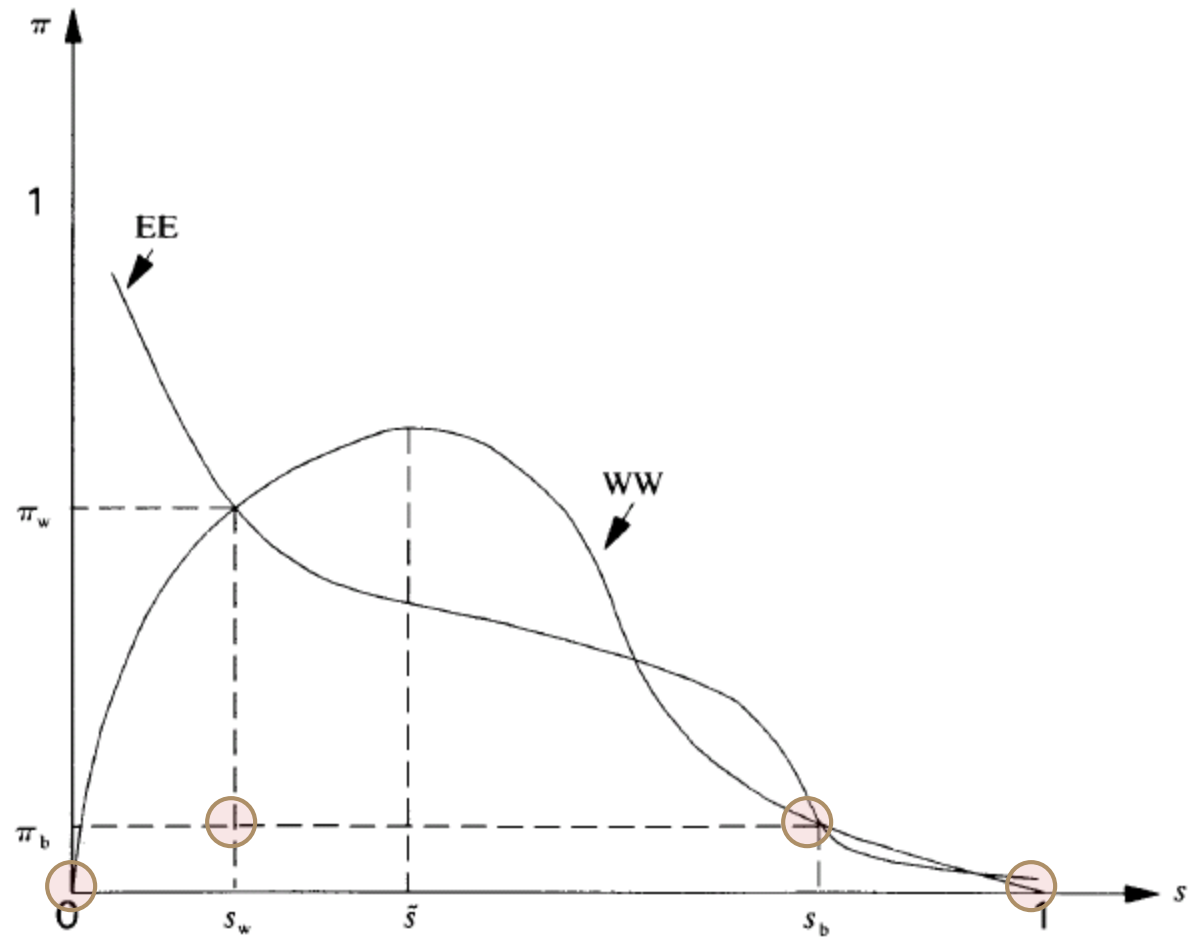


FIGURE 2. AN EQUILIBRIUM WITH NEGATIVE STEREOTYPES AGAINST B'S

Coate and Loury 1993

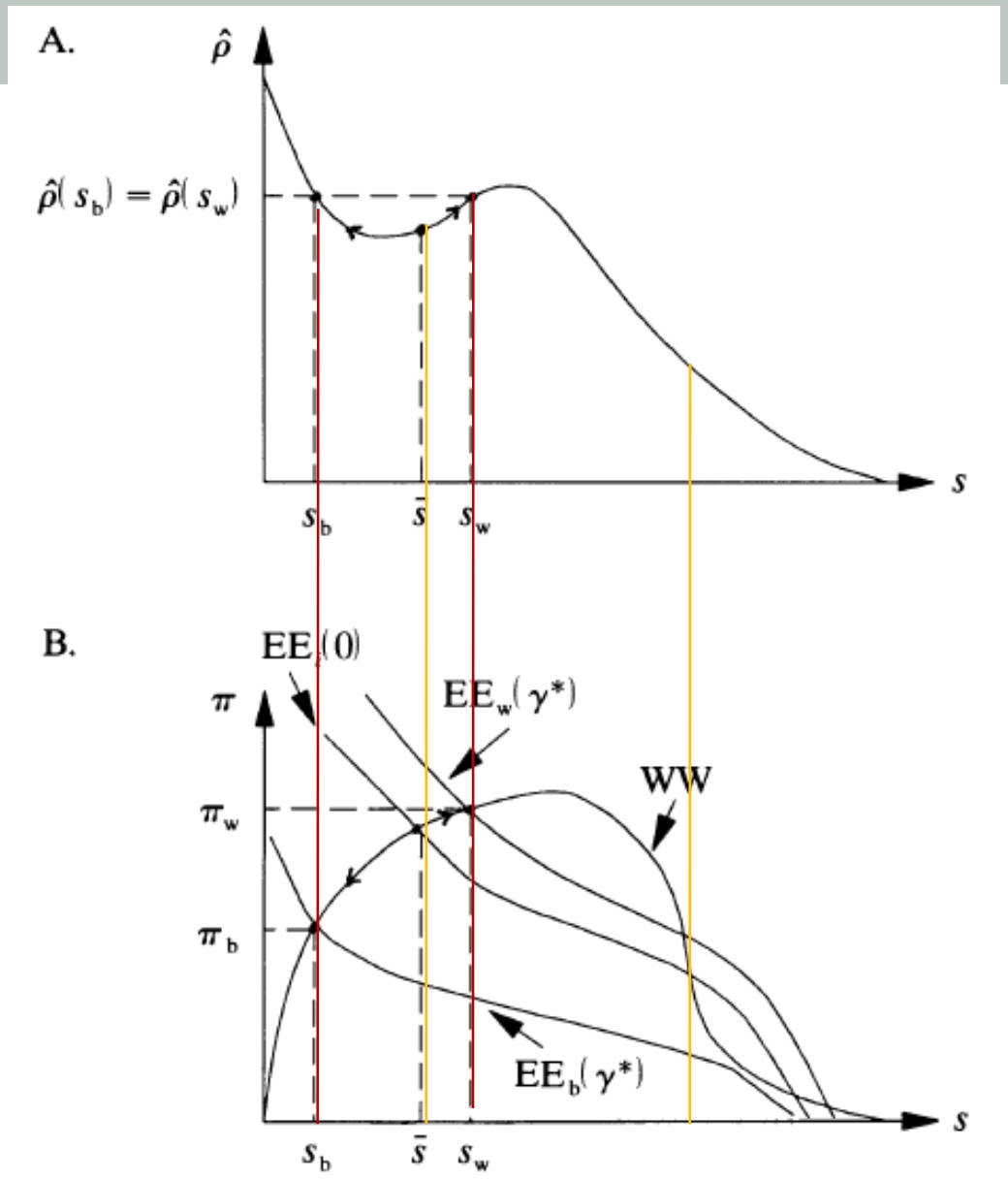


FIGURE 4. AN EQUILIBRIUM UNDER AFFIRMATIVE ACTION WITH NEGATIVE STEREOTYPE ABOUT B'S

Coate and Loury 1993

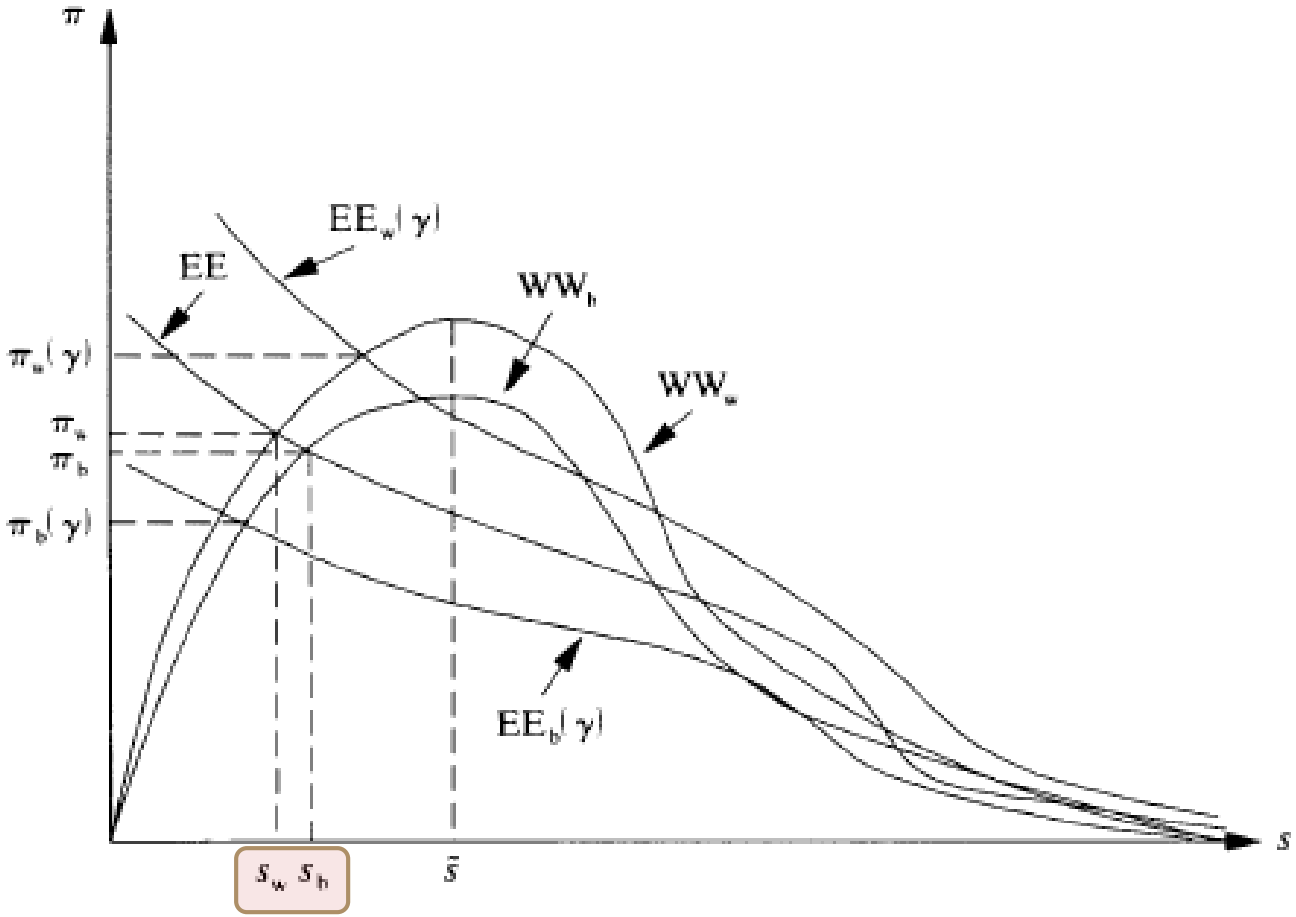


FIGURE 5. AFFIRMATIVE ACTION INCREASES SKILL DISPARITY IN THE ABSENCE OF STEREOTYPES

Coate and Loury 1993

Farber and Gibbons 1998

SUMMARY STATISTICS
NLSY
(MEANS AND STANDARD DEVIATIONS)
ALL YEARS OF EMPLOYMENT (1979–1991) BY EXPERIENCE

Experience	*N*	Wage	Age	Education	Part-Time	Coll. barg	Nonwhite	Female	Married	Marr. & female
0	1169	4.96	22.2	12.5	0.0	.170	.441	.483	.198	.119
		(2.02)	(2.56)	(2.33)						
1	4589	5.33	22.7	12.9	.132	.165	.415	.506	.202	.124
		(2.33)	(2.68)	(2.35)						
2	4622	5.90	23.6	13.0	.087	.180	.418	.504	.270	.152
		(2.62)	(2.67)	(2.37)						
3	4623	6.30	24.6	13.0	.071	.186	.421	.504	.332	.188
		(2.86)	(2.67)	(2.39)						
4	4182	6.70	25.5	13.1	.090	.186	.413	.505	.387	.213
		(3.13)	(2.51)	(2.37)						
5	3749	7.01	26.2	13.1	.096	.190	.416	.497	.441	.233
		(3.24)	(2.38)	(2.40)						
6	3269	7.27	27.0	13.1	.094	.185	.407	.501	.479	.252
		(3.48)	(2.25)	(2.36)						
7	2740	7.53	27.6	13.1	.093	.191	.397	.490	.510	.262
		(3.62)	(2.10)	(2.31)						
8	2170	7.77	28.3	13.0	.102	.191	.393	.486	.541	.270
		(3.61)	(1.97)	(2.29)						
9	1640	7.89	29.0	13.0	.098	.189	.387	.493	.573	.285
		(3.74)	(1.90)	(2.29)						
10	1230	7.77	29.8	12.9	.104	.196	.412	.496	.566	.281
		(3.54)	(1.79)	(2.21)						
11	759	7.88	30.6	12.9	.083	.202	.406	.511	.570	.283
		(3.68)	(1.66)	(2.17)						
Total:	34,742	6.64	25.6	13.0	.092	.184	.412	.500	.386	.207
		(3.21)	(3.27)	(2.35)						

The numbers in parentheses are standard deviations. The Part-time, Collective bargaining, Nonwhite, Female, Married, and Married & female variables are dummy variables. Wage data are in real 1982–1984 dollars (deflated by CPI). Observations at the time of entry (experience = 0) which are part-time are not included in this analysis. See text for details.

Farber and Gibbons, 1998

TABLE II

REGRESSION ANALYSIS OF EARNINGS FUNCTION

Independent variable	(1) Mean [sd]	(2) Wage (level)	(3) Wage (level)	(4) Wage (level)	(5) Wage (Level)	(6) Wage (log)
Constant	1.0	−3.5579	−3.8086	−6.0321	−2.7034	0.0873
		(0.785)	(0.788)	(0.928)	(0.388)	(0.124)
Experience	5.1804	0.4428	0.5054	0.5366	0.2697	0.1012
	[2.502]	(0.102)	(0.103)	(0.100)	(0.069)	(0.013)
Experience squared	33.0953	−0.0178	−0.0185	−0.0178	−0.0198	−0.0027
	[29.947]	(0.003)	(0.003)	(0.003)	(0.003)	(0.000)
Education	13.0450	0.6745	0.6938	0.6719	0.4602	0.0989
	[2.349]	(0.061)	(0.061)	(0.059)	(0.024)	(0.007)
Education × experience	67.5424	−0.0004	−0.0049	−0.0041	0.0172	−0.0026
	[35.014]	(0.008)	(0.008)	(0.007)	(0.005)	(0.001)
AFQT residual/100	0.0024	—	0.6494	0.8734	0.7841	0.1880
	[0.148]		(0.307)	(0.291)	(0.292)	(0.044)
AFQT resid/100 × experience	0.0189	—	0.1938	0.1848	0.1922	0.0187
	[0.856]		(0.064)	(0.060)	(0.060)	(0.008)
Lib card residual/10	−0.0002	—	0.2583	0.2130	−0.0579	0.1440
	[0.043]		(1.035)	(0.988)	(0.989)	(0.146)
Lib card resid × experience/10	−0.00011	—	0.6035	0.6169	0.6448	0.0588
	[0.248]		(0.205)	(0.192)	(0.192)	(0.026)
Year		yes	yes	yes	no	yes
Education × year		yes	yes	yes	no	yes
Other demographic		no	no	yes	yes	yes
R^2		0.215	0.224	0.294	0.289	0.296

The dependent variable is real hourly earnings on the current job (in levels in columns (2)–(5) and in logs in column (6). The mean of the level of earnings is 6.91 (s.d. = 3.30). The mean of the log of earnings is 1.83 (s.d. = 0.448). The numbers in parentheses are White/Huber standard errors computed accounting for the fact that there are multiple observations for each worker. There are 28,984 wage observations on 4970 individuals. Where included, there are ten year dummies for 1981–1990 and interactions of education with each of the ten year dummies. The base year is 1991. The other demographic characteristics, where included, consist of age at entry, a dummy variable for part-time, the interaction of part-time with education, and dummy variables for collective bargaining coverage, race, sex, marital status, and the interaction of sex and marital status.

Farber and Gibbons, 1998

TABLE III

EMPIRICAL COVARIANCE MATRIX OF WITHIN WORKER WAGE RESIDUALS (LEVELS)

(STANDARD ERROR)

[CELL SIZE]

	0	1	2	3	4	5	6	7	8	9	10	11
0	2.58											
	(.389)											
	[1169]											
1	1.82	3.85										
	(.379)	(.395)										
	[1081]	[4589]										
2	1.72	2.45	4.81									
	(.391)	(.335)	(.419)									
	[1080]	[4292]	[4622]									
3	1.66	2.45	3.40	5.67								
	(.397)	(.346)	(.372)	(.443)								
	[1092]	[4282]	[4333]	[4623]								
4	1.57	2.32	3.27	4.11	6.83							
	(.400)	(.354)	(.376)	(.399)	(.487)							
	[956]	[3875]	[3936]	[3945]	[4182]							
5	1.45	2.08	2.95	3.82	4.74	7.12						
	(.412)	(.353)	(.382)	(.429)	(.437)	(.519)						
	[834]	[3476]	[3514]	[3540]	[3479]	[3749]						
6	1.67	2.17	3.03	3.75	4.73	5.16	8.42					
	(.444)	(.373)	(.411)	(.426)	(.481)	(.477)	(.562)					
	[705]	[3023]	[3077]	[3078]	[3016]	[3028]	[3269]					
7	1.58	2.01	2.89	3.53	4.36	4.91	6.49	9.14				
	(.527)	(.396)	(.435)	(.450)	(.488)	(.498)	(.563)	(.600)				
	[567]	[2529]	[2589]	[2588]	[2529]	[2520]	[2557]	[2740]				
8	1.40	1.84	2.67	3.11	3.84	4.35	5.88	6.59	9.30			
	(.515)	(.405)	(.449)	(.451)	(.481)	(.504)	(.566)	(.580)	(.628)			
	[419]	[2006]	[2047]	[2051]	[2016]	[1991]	[2017]	[2029]	[2170]			
9	1.04	1.73	2.54	2.75	3.70	3.94	5.38	6.16	7.32	9.97		
	(.522)	(.434)	(.455)	(.464)	(.510)	(.532)	(.586)	(.589)	(.634)	(.699)		
	[316]	[1513]	[1543]	[1548]	[1521]	[1530]	[1519]	[1511]	[1495]	[1640]		
10	0.825	1.35	2.33	2.52	3.22	3.50	4.64	5.29	5.89	6.92	8.97	
	(.518)	(.403)	(.495)	(.480)	(.549)	(.543)	(.599)	(.630)	(.632)	(.640)	(.714)	
	[240]	[1125]	[1154]	[1156]	[1125]	[1133]	[1151]	[1132]	[1105]	[1112]	[1230]	
11	0.566	1.24	2.22	2.17	3.12	2.93	4.41	4.68	5.53	6.33	6.72	10.0
	(.467)	(.466)	(.579)	(.558)	(.619)	(.592)	(.664)	(.656)	(.763)	(.757)	(.766)	(.853)
	[148]	[683]	[704]	[711]	[696]	[695]	[706]	[718]	[676]	[669]	[704]	[759]

Farber and Gibbons, 1998

TABLE IV

OPTIMAL MINIMUM DISTANCE ESTIMATION OF COVARIANCE STRUCTURE MARTINGALE OVERLAID WITH CLASSICAL MEASUREMENT ERROR NLSY UNBALANCED PANELS

(STANDARD ERRORS IN PARENTHESES)

Name	Parameter	Estimate
Variance of initial unmeasured expected ability	σ_1^2	2.0404
		(0.089)
Variance of measurement error	σ_ϕ^2	1.5704
		(0.058)
Variance of wage innovations each period:	$\sigma_{\mu 1}^2$	0.8634
		(0.080)
	$\sigma_{\mu 2}^2$	0.5986
		(0.082)
	$\sigma_{\mu 3}^2$	0.8748
		(0.096)
	$\sigma_{\mu 4}^2$	0.5522
		(0.094)
	$\sigma_{\mu 5}^2$	1.3158
		(0.141)
	$\sigma_{\mu 6}^2$	0.8263
		(0.146)
	$\sigma_{\mu 7}^2$	0.7643
		(0.161)
	$\sigma_{\mu 8}^2$	0.6568
		(0.200)
	$\sigma_{\mu 9}^2$	0.2891
		(0.265)
	$\sigma_{\mu 10}^2$	0.8894
		(0.476)
χ^2 statistic, structural test:		157
Degrees of freedom		54
p-value of test statistic		1×10^{-11}
Number of workers		4998

Farber and Gibbons, 1998

Altonji and Pierret 2001

TABLE I

THE EFFECTS OF STANDARDIZED AFQT AND SCHOOLING ON WAGES

Dependent Variable: Log Wage; OLS estimates (standard errors).

Panel 1—Experience measure: potential experience

Model:	(1)	(2)	(3)	(4)
(a) Education	0.0586	0.0829	0.0638	0.0785
	(0.0118)	(0.0150)	(0.0120)	(0.0153)
(b) Black	−0.1565	−0.1553	0.0001	−0.0565
	(0.0256)	(0.0256)	(0.0621)	(0.0723)
(c) Standardized AFQT	0.0834	−0.0060	0.0831	0.0221
	(0.0144)	(0.0360)	(0.0144)	(0.0421)
(d) Education * experience/10	−0.0032	−0.0234	−0.0068	−0.0193
	(0.0094)	(0.0123)	(0.0095)	(0.0127)
(e) Standardized AFQT * experience/10		0.0752		0.0515
		(0.0286)		(0.0343)
(f) Black * experience/10			−0.1315	−0.0834
			(0.0482)	(0.0581)
R^2	0.2861	0.2870	0.2870	0.2873

Altonji and Pierret, 2001

TABLE I

THE EFFECTS OF STANDARDIZED AFQT AND SCHOOLING ON WAGES

Dependent Variable: Log Wage; OLS estimates (standard errors).

Panel 1—Experience measure: potential experience

Model:	(1)	(2)	(3)	(4)
(a) Education	0.0586	0.0829	0.0638	0.0785
	(0.0118)	(0.0150)	(0.0120)	(0.0153)
(b) Black	−0.1565	−0.1553	0.0001	−0.0565
	(0.0256)	(0.0256)	(0.0621)	(0.0723)
(c) Standardized AFQT	0.0834	−0.0060	0.0831	0.0221
	(0.0144)	(0.0360)	(0.0144)	(0.0421)
(d) Education * experience/10	−0.0032	−0.0234	−0.0068	−0.0193
	(0.0094)	(0.0123)	(0.0095)	(0.0127)
(e) Standardized AFQT * experience/10		0.0752		0.0515
		(0.0286)		(0.0343)
(f) Black * experience/10			−0.1315	−0.0834
			(0.0482)	(0.0581)
R^2	0.2861	0.2870	0.2870	0.2873

Altonji and Pierret, 2001

Panel 2—Experience measure: actual experience instrumented by potential experience

Model:	(1)	(2)	(3)	(4)
(a) Education	0.0836	0.1218	0.0969	0.1170
	(0.0208)	(0.0243)	(0.0206)	(0.0248)
(b) Black	−0.1310	−0.1306	0.0972	0.0178
	(0.0261)	(0.0260)	(0.0851)	(0.1029)
(c) Standardized AFQT	0.0925	−0.0361	0.0881	0.0062
	(0.0143)	(0.0482)	(0.0143)	(0.0572)
(d) Education * experience/10	−0.0539	−0.0952	−0.0665	−0.0889
	(0.0235)	(0.0276)	(0.0234)	(0.0283)
(e) Standardized AFQT * experience/10		0.1407		0.0913
		(0.0514)		(0.0627)
(f) Black * experience/10			−0.2670	−0.1739
			(0.0968)	(0.1184)
R^2	0.3056	0.3063	0.3061	0.3064

Altonji and Pierret, 2001

TABLE II

THE EFFECTS OF FATHER'S EDUCATION, SIBLING WAGES, AND SCHOOLING ON WAGES

Dependent Variable: Log Wage; Experience Measure: Potential Experience.

OLS estimates (standard errors)

Model:	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
(a) Education	0.0511	0.0630	0.0568	0.0659	0.0666	0.0730	0.0704	0.0734
	(0.0160)	(0.0166)	(0.0163)	(0.0167)	(0.0129)	(0.0140)	(0.0130)	(0.0140)
(b) Black	−0.2074	−0.2076	−0.0509	−0.0878	−0.2212	−0.2209	−0.0705	−0.0793
	(0.0276)	(0.0276)	(0.0846)	(0.0871)	(0.0250)	(0.0250)	(0.0668)	(0.0692)
(c) Log of sibling's wage	0.1802	−0.0260	0.1817	0.0010				
	(0.0328)	(0.0913)	(0.0329)	(0.0940)				
(d) Father's education/10					0.0826	−0.0187	0.0829	0.0314
					(0.0366)	(0.1000)	(0.0364)	(0.1030)
(e) Education * experience/10	0.0107	0.0012	0.0065	−0.0008	0.0023	−0.0029	−0.0002	−0.0027
	(0.0131)	(0.0136)	(0.0133)	(0.0136)	(0.0104)	(0.0113)	(0.0105)	(0.0113)
(f) Log of sibling's wage * experience/10		0.1796		0.1571				
		(0.0749)		(0.0770)				
(g) Father's education * experience/100						0.0867		0.0441
						(0.0813)		(0.0841)
(h) Black * experience/10			−0.1311	−0.1004			−0.1270	−0.1194
			(0.0686)	(0.0704)			(0.0541)	(0.0563)
R^2	0.3183	0.3196	0.3191	0.3200	0.2748	0.2750	0.2755	0.2756
Observations	10746	10746	10746	10746	18523	18523	18523	18523
Individuals	1441	1441	1441	1441	2594	2594	2594	2594

Experience is modeled with a cubic polynomial. All equations control for year effects, education interacted with a cubic time trend, Black interacted with a cubic time trend, two-digit occupation at first job, and urban residence. Columns (1)–(4) control for sibling's gender and the log of sibling's wage interacted with a cubic time trend. Columns (5)–(8) control for father's education interacted with a cubic time trend. For these time trends, the base year is 1992. For the models in columns (1) and (5), the coefficients on log of sibling wage and father's education are .1680 and .0357, respectively, when evaluated for 1983. Standard errors are White/Huber standard errors computed accounting for the fact that there are multiple observations for each worker.

Altonji and Pierret, 2001

TABLE III

THE EFFECTS OF STANDARDIZED AFQT, FATHER'S EDUCATION, SIBLING WAGE, AND SCHOOLING ON WAGES

Dependent Variable: Log Wage; Experience Measure: Potential Experience.
OLS estimates (standard errors)

Model:	(1)	(2)	(3)	(4)
(a) Education	0.0505	0.0832	0.0563	0.0780
	(0.0118)	(0.0151)	(0.0120)	(0.0155)
(b) Black	−0.1333	−0.1296	0.0454	−0.0284
	(0.0255)	(0.0257)	(0.0609)	(0.0704)
(c) Standardized AFQT	0.0792	−0.0206	0.0789	0.0065
	(0.0145)	(0.0361)	(0.0144)	(0.0413)
(d) Log of sibling's wage	0.1602	0.0560	0.1617	0.0604
	(0.0208)	(0.0352)	(0.0207)	(0.0351)
(e) Father's education/10	0.0362	0.0154	0.0385	0.0295
	(0.0356)	(0.0963)	(0.0354)	(0.0968)
(f) Education * experience/10	0.0005	−0.0269	−0.0035	−0.0220
	(0.0093)	(0.0123)	(0.0094)	(0.0128)
(g) Standardized AFQT * experience/10		0.0843		0.0614
		(0.0285)		(0.0333)
(h) Log of sibling wage * experience/10		0.1194		0.1151
		(0.0393)		(0.0393)
(i) Father's education * experience/100		0.0176		0.0055
		(0.0789)		(0.0794)
(j) Black * experience/10			−0.1500	−0.0861
			(0.0474)	(0.0570)
R^2	0.2991	0.3014	0.3002	0.3016

Altonji and Pierret, 2001