Discrimination in the Labor Market Part II: Learning Models

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14.663 Spring 2009

List 2004

- Setting: Sportscard market
- Four groups of subjects
  1. White males, age 20-30
  2. White females, age 20-30
  3. Nonwhite males, age 20-30
  4. White males, age 60+
- All recruited at the show when approached List's table to potentially buy the KG card.
- Market price: ~$100 if participant buying, ~$30 if selling
- About 25% of dealers in any show would have KG card.

- Part I: `Buy' = "B"
  - Ea. participant randomly sent to two unwitting dealers.
  - Told to buy the KG card.
    a. Reservation value $50
    b. Reservation value $80
- Part II: `Sell' = "S"
  - Participants recruited who are selling graded baseball cards
  - Given the KG card and randomly sent to 5 dealers to sell
  - Reservation price $80
- 41 and 75 dealers respectively in B and S
- 90% of dealers white males
- Dealers surveyed *after* having been subject to experiment

TABLE II

PARTICIPANT CHARACTERISTICS AND BARGAINING OUTCOMES—EXPERIMENT I

	White males age 20–30 mean (std. dev.)		White females age 20–30 mean (std. dev.)		Nonwhite males age 20–30 mean (std. dev.)		White males age 60+ mean (std. dev.)	
Treatment	**B**	**S**	**B**	**S**	**B**	**S**	**B**	**S**

Panel B. Bargaining summary

	Mean (s.e.)		Mean (s.e.)		Mean (s.e.)		Mean (s.e.)	
Initial offer	$108.75 (2.5)	$38.06 (2.8)	$119.41 (3.3)	$26.64 (2.2)	$113.50 (3.6)	$26.47 (2.3)	$120.58 (4.7)	$29.34 (2.5)
Final offer	$100.38 (2.1)	$42.05 (3.2)	$106.98 (2.7)	$33.99 (2.8)	$104.25 (2.6)	$33.52 (2.6)	$107.33 (3.3)	$35.16 (2.6)
"Trimmed" initial (final) offer	$107.31 ($100.05)	$38.12 ($41.73)	$117.31 ($105.62)	$25.45 ($33.15)	$110.65 (102.96)	$25.36 ($32.91)	$116.20 ($104.44)	$28.45 ($34.73)
Bargaining time (minutes)	1.97 (0.4)	1.69 (0.3)	4.08 (0.7)	3.13 (0.6)	3.49 (0.6)	2.26 (0.4)	3.02 (0.6)	2.06 (0.4)
Transactions	3	5	1	1	2	0	1	1
N	60	61	60	61	60	61	60	61

List, *QJE* 2004

TABLE IV

REGRESSION RESULTS: EXPERIMENT I

	Treatment B				Treatment S			
	Initial offer		Final offer		Initial offer		Final offer	
Variable	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
Female	10.8**	10.9**	6.6**	6.2**	−11.8**	−12.3**	−8.2**	−8.5**
(age 20–30)	(2.8)	(3.4)	(2.7)	(3.0)	(2.1)	(1.7)	(1.8)	(1.7)
Nonwhite	4.9*	4.9	3.7	3.3	−11.9**	−10.8**	−8.7**	−6.8**
(age 20–30)	(2.8)	(3.3)	(2.7)	(2.8)	(2.1)	(1.8)	(1.8)	(1.7)
Male	11.9**	13.6**	6.8**	8.6**	−8.8**	−11.3**	−7.0**	−7.1**
(age 60+)	(2.8)	(3.4)	(2.7)	(2.9)	(2.1)	(1.9)	(1.8)	(1.8)
Transaction	—	0.12	—	−0.13	—	−0.09	—	−0.04
intensity		(0.18)		(0.15)		(0.15)		(0.2)
Years of market	—	−0.17	—	−0.28**	—	0.38**	—	0.25**
experience		(0.14)		(0.12)		(0.12)		(0.12)
Bargaining	—	—	—	−0.36	—	—	—	0.35*
time				(0.24)				(0.20)
Dealer	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
fixed effects								
Buyer	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
random effects								
N	240	240	240	240	244	244	244	244

List, *QJE* 2004

TABLE III

SUMMARY STATISTICS FOR EXPERIMENT I: NUMBER OF DISCRIMINATING DEALERS

	Initial offer			Final offer		
	Females	Nonwhite	Older males	Females	Nonwhite	Older males
Panel A: Treatment B	`Baseline' = Offer to White males age 20-30					
Offer > Baseline offer	25	14	21	19	15	14
Offer = Baseline offer	14	22	18	18	20	18
Offer < Baseline offer	2	5	2	4	6	4
Panel B: Treatment S						
Offer > Baseline offer	8	9	7	8	7	4
Offer = Baseline offer	16	16	24	25	24	33
Offer < Baseline offer	37	36	30	28	30	24

List, *QJE* 2004

TABLE V

EXPERIENCE LEVELS AND BARGAINING OUTCOMES: EXPERIMENT I

	White males age 20–30 mean (std. error)		White females age 20–30 mean (std. error)		Nonwhite males age 20–30 mean (std. error)		White males age 60+ mean (std. error)	
Exp. level	High	Low	High	Low	High	Low	High	Low
Panel A. Treatment B								
Initial offer	$109.2	$108.3	$116.7	$121.5	$113.3	$113.7	$119.1	$123.5
	(3.8)	(3.1)	(4.0)	(5.0)	(4.6)	(5.9)	(4.9)	(10.2)
Final offer	$ 98.8	$102.0	$ 99.9	$112.4	$103.6	$105.2	$103.4	$115.3
	(2.8)	(3.1)	(4.0)	(3.9)	(3.1)	(4.5)	(2.8)	(8.2)
Bargaining time (minutes)	2.1	1.8	6.5	2.2	3.6	3.3	3.6	1.8
	(0.5)	(0.5)	(1.2)	(0.6)	(0.8)	(1.1)	(0.8)	(0.7)
N	30	30	26	34	36	24	40	20
Panel B. Treatment S								
Initial offer	$ 31.9	$ 29.5	$ 21.5	$ 21.8	$ 23.8	$ 18.2	$ 24.0	$ 23.1
	(3.9)	(4.1)	(2.8)	(3.5)	(3.0)	(3.3)	(2.7)	(5.6)
Final offer	$ 35.1	$ 32.8	$ 28.5	$ 26.4	$ 28.8	$ 25.0	$ 28.4	$ 29.3
	(4.4)	(4.6)	(3.8)	(3.9)	(3.4)	(4.1)	(3.0)	(5.9)
Bargaining time (minutes)	1.7	1.7	3.6	2.4	2.4	2.0	1.8	3.7
	(0.4)	(0.4)	(0.9)	(0.7)	(0.5)	(0.6)	(0.4)	(1.7)
N	45	30	45	30	45	30	60	15

An individual is assumed to have a "high" level of experience if she has either i) a greater number of transactions per month *or* ii) a greater number of years of market experience than the average subject in her treatment type (i.e., more than 6.6 (7.8) transactions per month or 9.4 (9.1) years of market experience in Treatment B (S)).

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$Disc_j$ = Dealer's average offer to Minorities minus average offer to Whites

$$Disc_j = V_j\beta + \varepsilon_j,$$

TABLE VI
REGRESSION ESTIMATES—EXPERIMENT I DEALER DATA

	Treatment B		Treatment S	
	Initial offer	Final offer	Initial offer	Final offer
Years of market experience	−0.47**	−0.44**	0.45**	0.42**
	(0.12)	(0.11)	(0.12)	(0.12)
Trading intensity	−0.21	−0.12	0.17	0.16
	(0.17)	(0.15)	(0.13)	(0.12)
Age	0.06	0.21	0.03	−0.09
	(0.16)	(0.15)	(0.13)	(0.12)
Constant	−3.60	−6.17	−0.45	2.48
	(6.6)	(5.9)	(5.3)	(5.2)
R^2	0.30	0.34	0.30	0.24
Adjusted R^2	0.24	0.28	0.27	0.20
n	41	41	61	61

a. Dependent variable is the average level of dealer discrimination as measured by dealer i's average offer to baseline members minus dealer i's average offer to minority group members.
b. Standard errors are in parentheses beneath coefficient estimates.
c. ** denotes coefficient estimate is significant at the $p < .05$ level.

Experiment II: Dictator Game

- Dealers asked to divide $5 between themselves and an anonymous participant
- Dealers are told if recipient is:
  1. White males, age 20-30
  2. White females, age 20-30
  3. Nonwhite males, age 20-30
  4. White males, age 60+
- Extensive measures to assure that experimenters cannot observe dealer's choice – no stigma

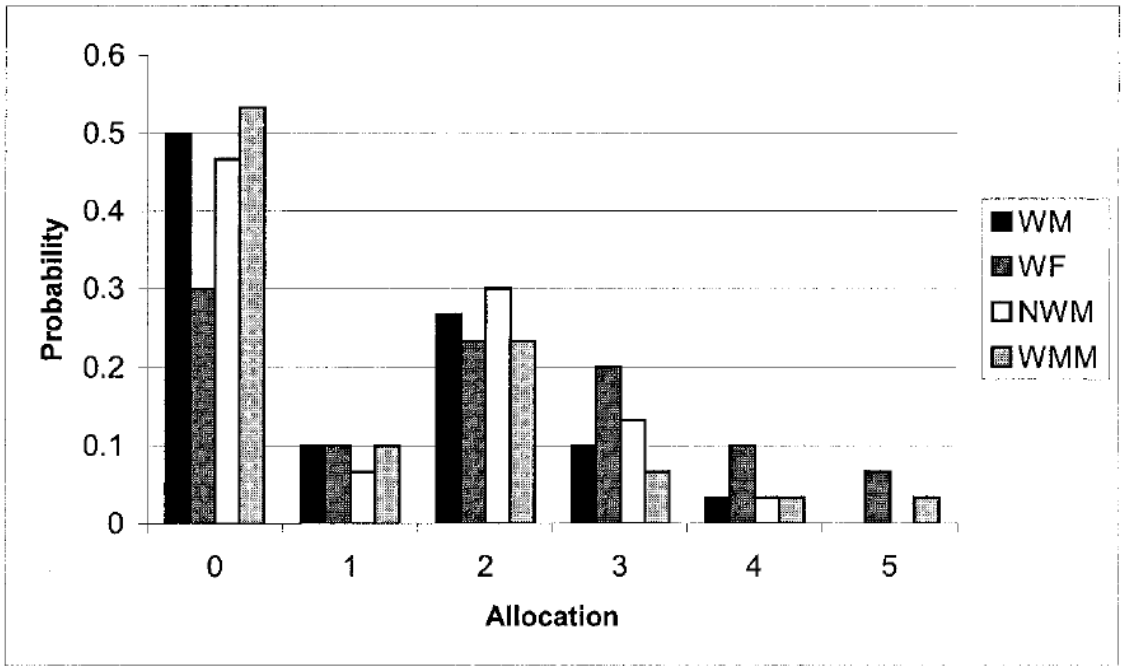

FIGURE I
Dictator Experiment Results Summary

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A Lab Experiment with Market Participants

- Again, bargaining over cards.
- Face to face bargaining
- Dealers know they are part of an experiment now
- Treatment 'Random'
  - Dealers told that participants are assigned a reservation value at random for the card.
  - Card is defaced so has no market value
- Treatment 'Unclear'
  - Dealers not told anything about buyers' reservation values
  - Card has market value
- In all cases, non-dealer participant is randomly assigned a reservation value for buying selling
- 'Predicted surplus' is $13.50 per round (not entirely clear why).

TABLE IX
CHAMBERLAIN EXPERIMENTAL DATA SUMMARY

	Treatment random			Treatment unclear		
	Pooled lost surplus (s.e.)	Inexp. lost surplus (s.e.)	Exp. lost surplus (s.e.)	Pooled lost surplus (s.e.)	Inexp. lost surplus (s.e.)	Exp. lost surplus (s.e.)
Sellers	0.24	0.33	0.17	0.35	0.38	0.32
	(0.05)	(0.08)	(0.07)	(0.07)	(0.08)	(0.09)
	n = 72	n = 34	n = 38	n = 72	n = 37	n = 35
White males, age 20–30	0.21	0.29	0.01	0.07	0.23	−0.17
	(0.11)	(0.12)	(0.24)	(0.02)	(0.12)	(0.08)
	n = 24	n = 17	n = 7	n = 25	n = 15	n = 10
White females, age 20–30	0.31	0.39	0.03	0.45	0.70	0.13
	(0.11)	(0.14)	(0.26)	(0.10)	(0.11)	(0.10)
	n = 18	n = 14	n = 4	n = 18	n = 10	n = 8
Nonwhite males, age 20–30	0.10	0.21	−0.03	0.67	0.74	0.51
	(0.08)	(0.11)	(0.09)	(0.07)	(0.09)	(0.12)
	n = 15	n = 8	n = 7	n = 14	n = 10	n = 4
White males, age 60+	0.23	0.22	0.23	0.42	0.43	0.41
	(0.15)	(0.20)	(0.21)	(0.10)	(0.20)	(0.11)
	n = 15	n = 5	n = 10	n = 15	n = 6	n = 9

a. Summary statistics in each cell are the average lost surplus, its standard error, and the number of observations. To derive the average lost surplus (lost surplus = predicted surplus − actual surplus), I first computed the average for each market participant over the five rounds within each session. I then computed the average and standard error of the individual averages. Predicted surplus is what would have happened if competitive predictions had prevailed throughout the market session—I use a price of $13.50 when computing predicted surplus.

b. "Inexp." and "Exp." denote inexperienced and experienced sellers (dealers) and buyers (nondealers), respectively. A dealer (nondealer) is labeled "experienced" if he or she has fifteen (nine) or more years of market experience.

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Reservation Value Experiments

1. Participants at market examine the KG card

2. WTP treatment: Second price auction for buying card
   - Each participant submits a sealed bid
   - Card sold to the participant with the highest bid at the price offered by the second highest bidder

3. WTA treatment: Second price auction for selling the card
   - One participant chosen at random to be winner
   - If that person is lowest bidder, receives cash equal to price offered by second lowest bidder
   - If that person is not lowest bidder, receives the card

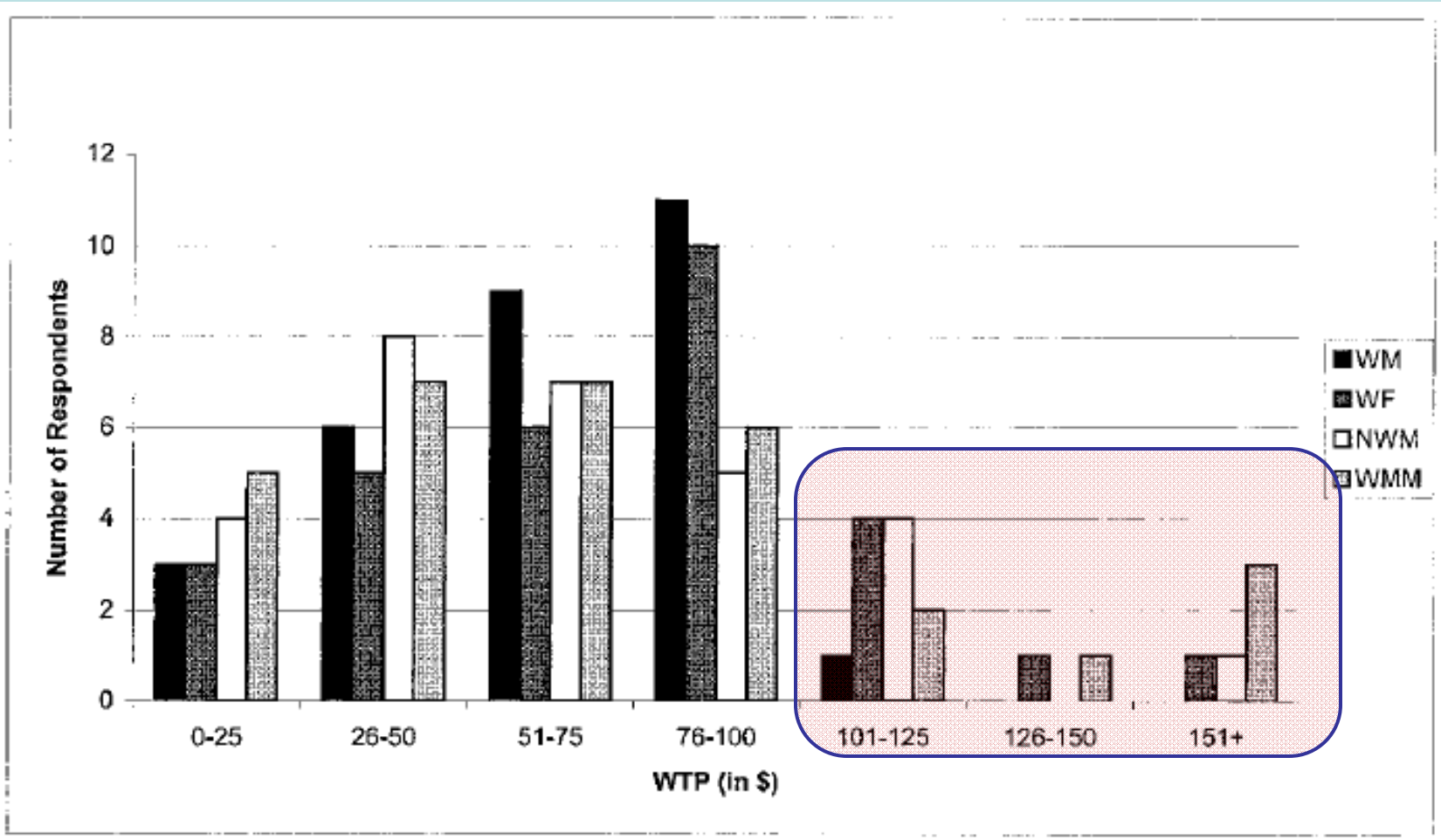

FIGURE II
Reservation Value Distributions: WTP

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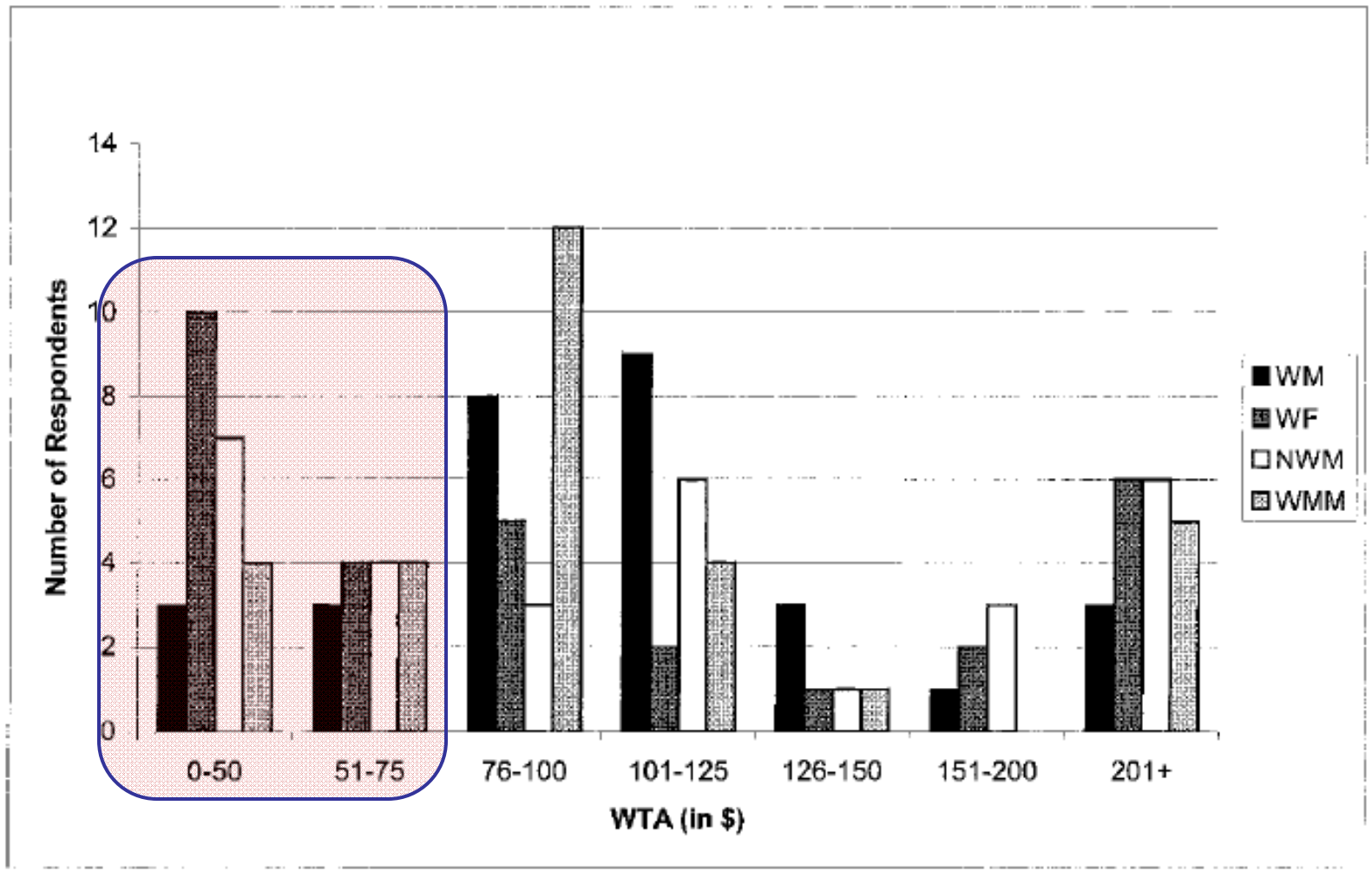

FIGURE III
Reservation Value Distributions: WTA

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Dealer: Guess which dist'n is white males 20-30 vs. white males 60+

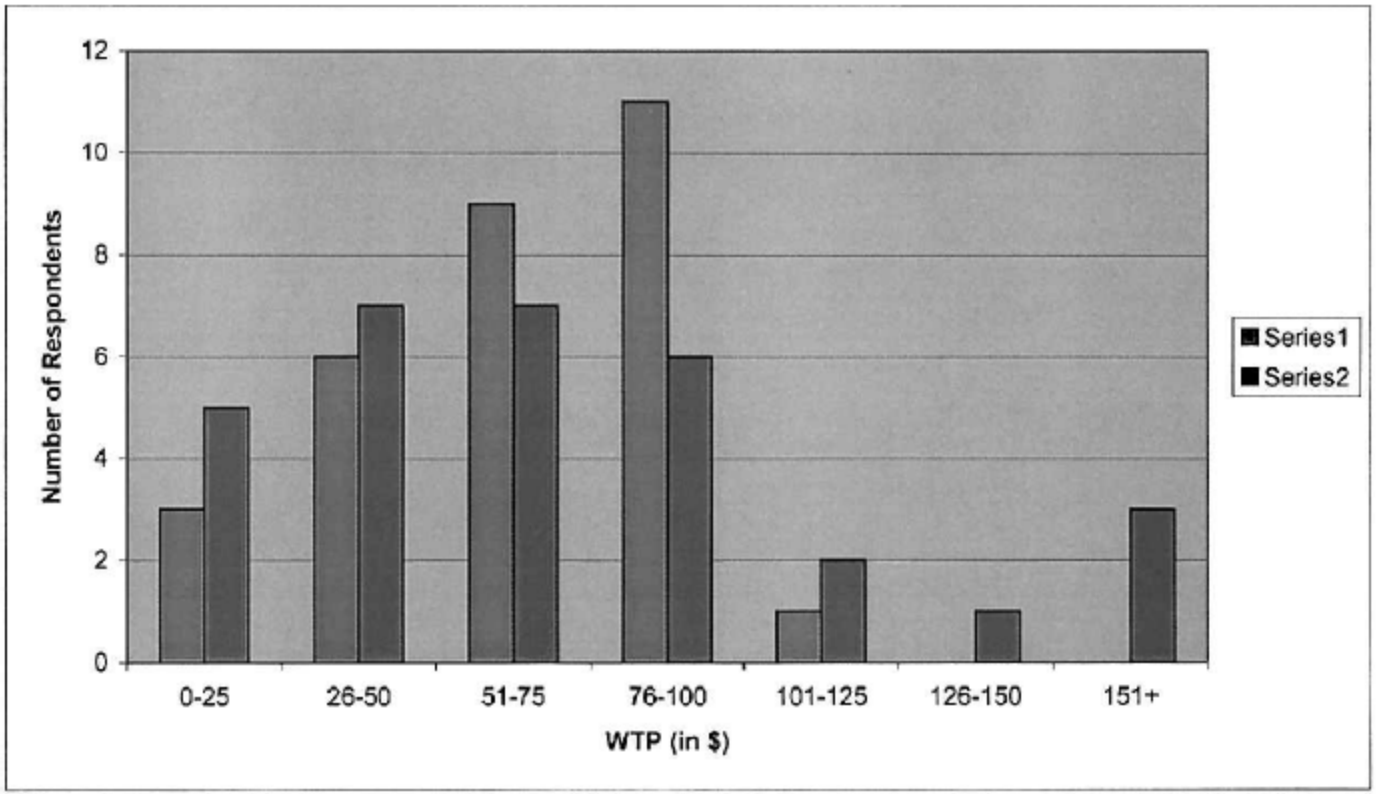

FIGURE IV
Dealer Perception Experimental Example: WTP

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Dealer: Guess which dist'n is white males 20-30 vs. white females 20-30

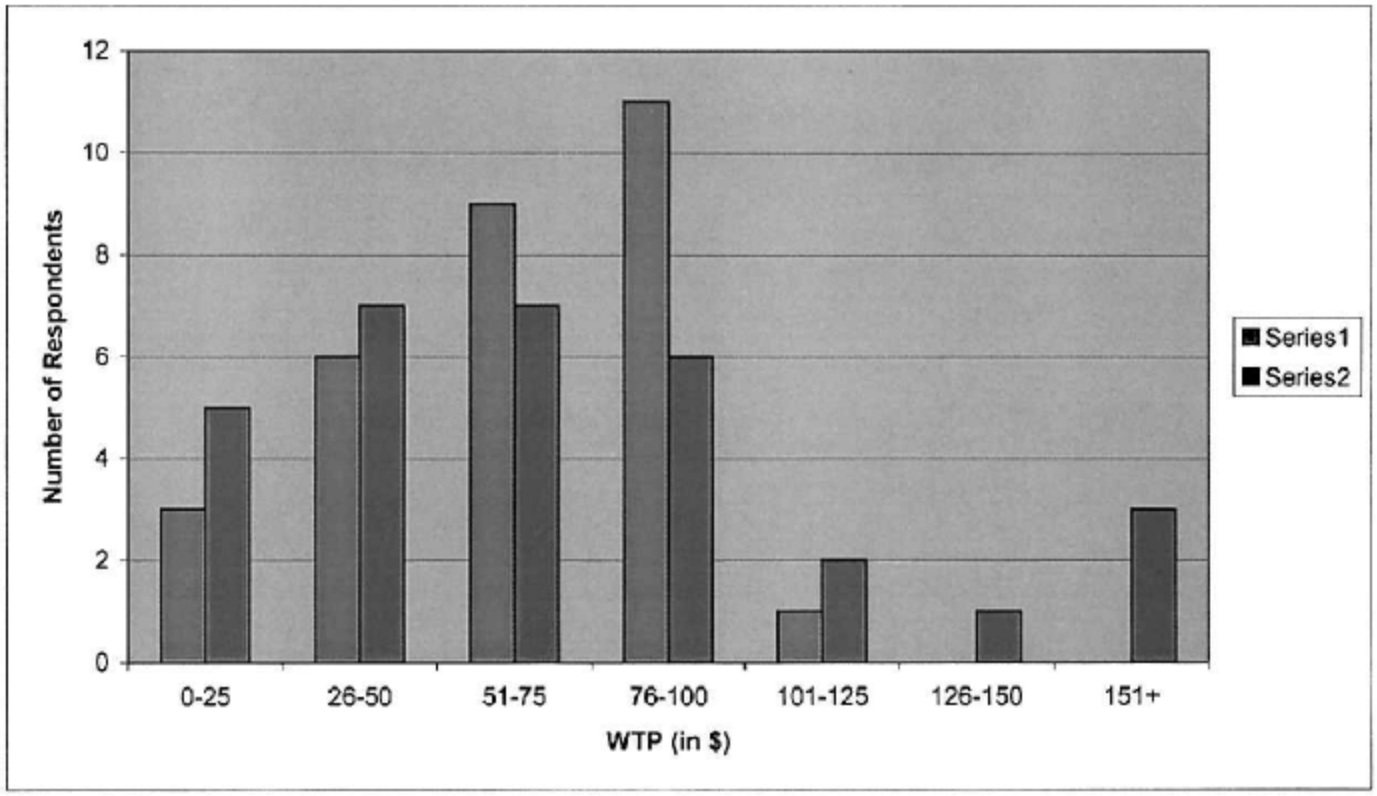


FIGURE IV
Dealer Perception Experimental Example: WTP

List, *QJE* 2004

Panel B. Dealer Perception

Summary

Comparison		Percentage correct: Overall	Inexperienced dealer	Experienced dealer
WTP				
White males and:				
White females		15/20 (75%)	8/12 (67%)	7/8 (88%)
Nonwhite males		11/20 (55%)	5/11 (45%)	6/9 (67%)
Older males		13/20 (65%)	5/9 (55%)	8/11 (72%)
	Aggregate:	39/60 (65%)	18/32 (56%)	21/28 (75%)
WTA				
White males and:				
White females		17/20 (85%)	7/10 (70%)	10/10 (100%)
Nonwhite males		15/20 (75%)	8/12 (67%)	7/8 (88%)
Older males		10/20 (50%)	4/10 (40%)	6/10 (60%)
	Aggregate:	42/60 (70%)	19/32 (59%)	23/28 (82%)

a. Panel A summarizes data from the auctions for the Griffey Jr. sportscard. Panel B summarizes data gathered from the dealer perception experiment in which dealers chose which distribution was from the majority group and which was from the minority group.

b. Figures can be read as follows: in the WTP white males and white females comparison, 15 of 20 dealers correctly matched the reservation value distributions. More specifically, 8 of 12 (7 of 8) inexperienced (experienced) dealers correctly matched the reservation value distributions. A dealer is labeled "experienced" if he has fifteen or more years of market experience.

List, *QJE* 2004

Summarizing

1. Minorities receive worse offers in the sportscard market
2. There is not strong evidence of dealer animus against minorities
3. When told that reservation values of participants are set randomly, dealers treat minorities/majorities similarly
4. When not told that reservation values are set randomly, dealers make worse offers to minorities
5. Minorities have a more dispersed distribution of willingness to pay and willingness to accept
6. Dealers appear to recognize this

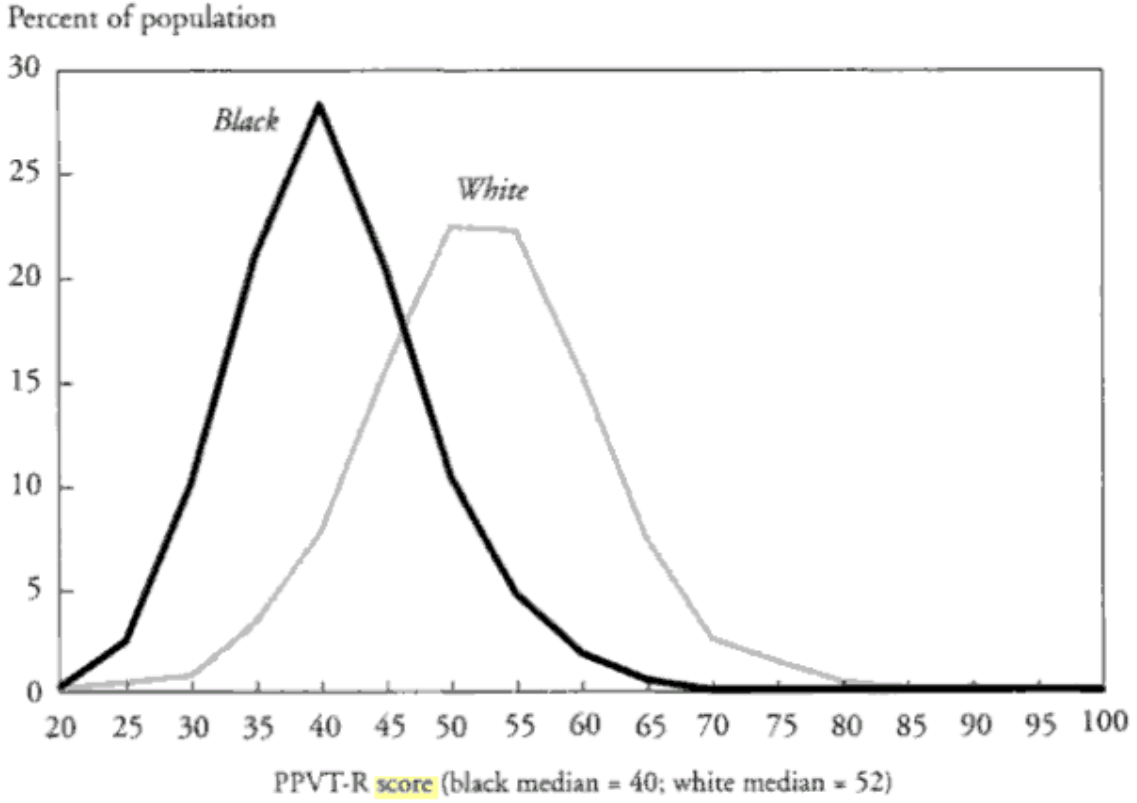
Autor and Scarborough 2008

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.

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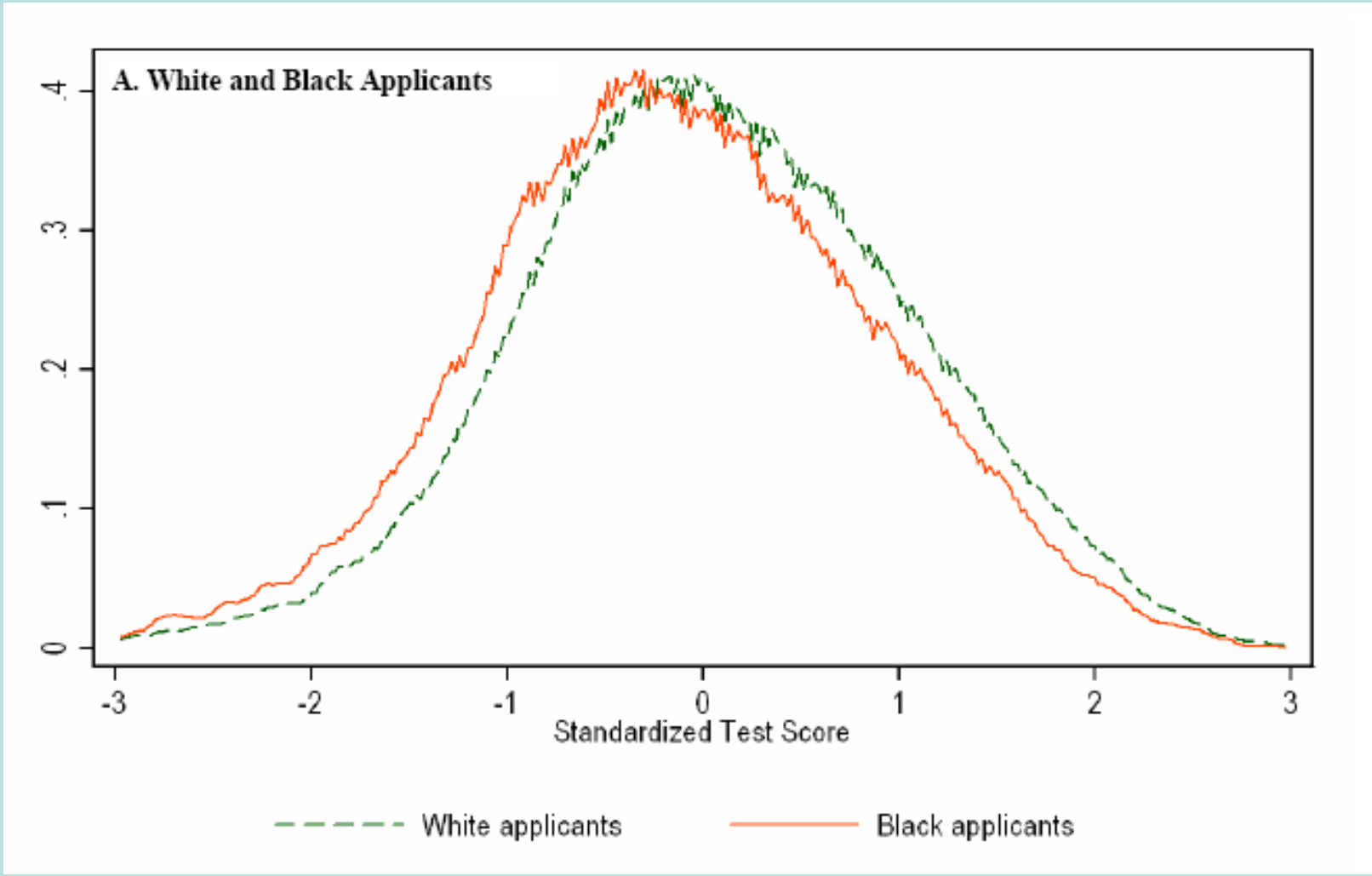

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TABLE II

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)

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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.

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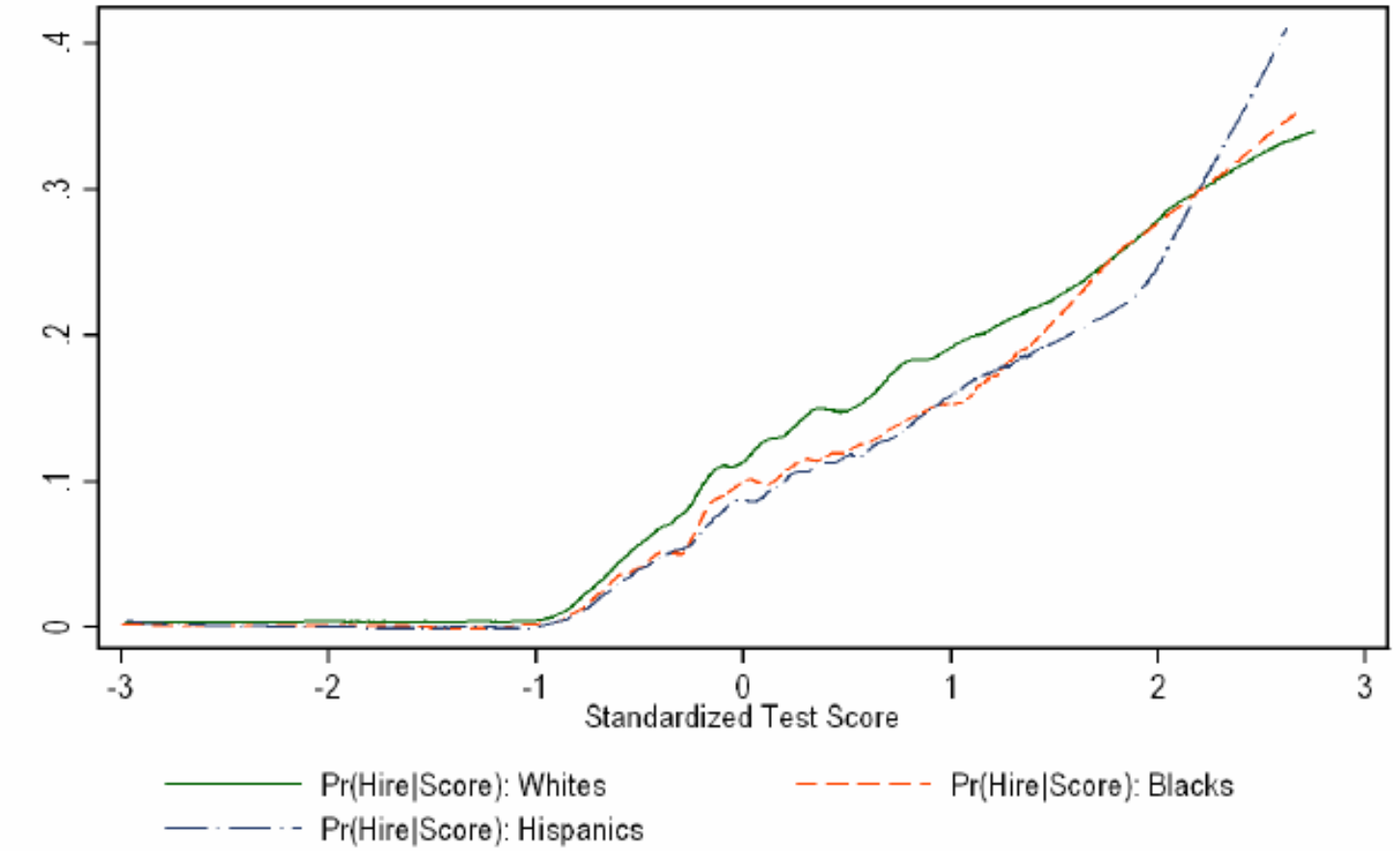

Figure I. Conditional Probability of Hire as a Function of Test Score by Race: Locally Weighted Regressions. Sample: All White, Black and Hispanic applicants, June 2000 - May 2001 (n=189,067).

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

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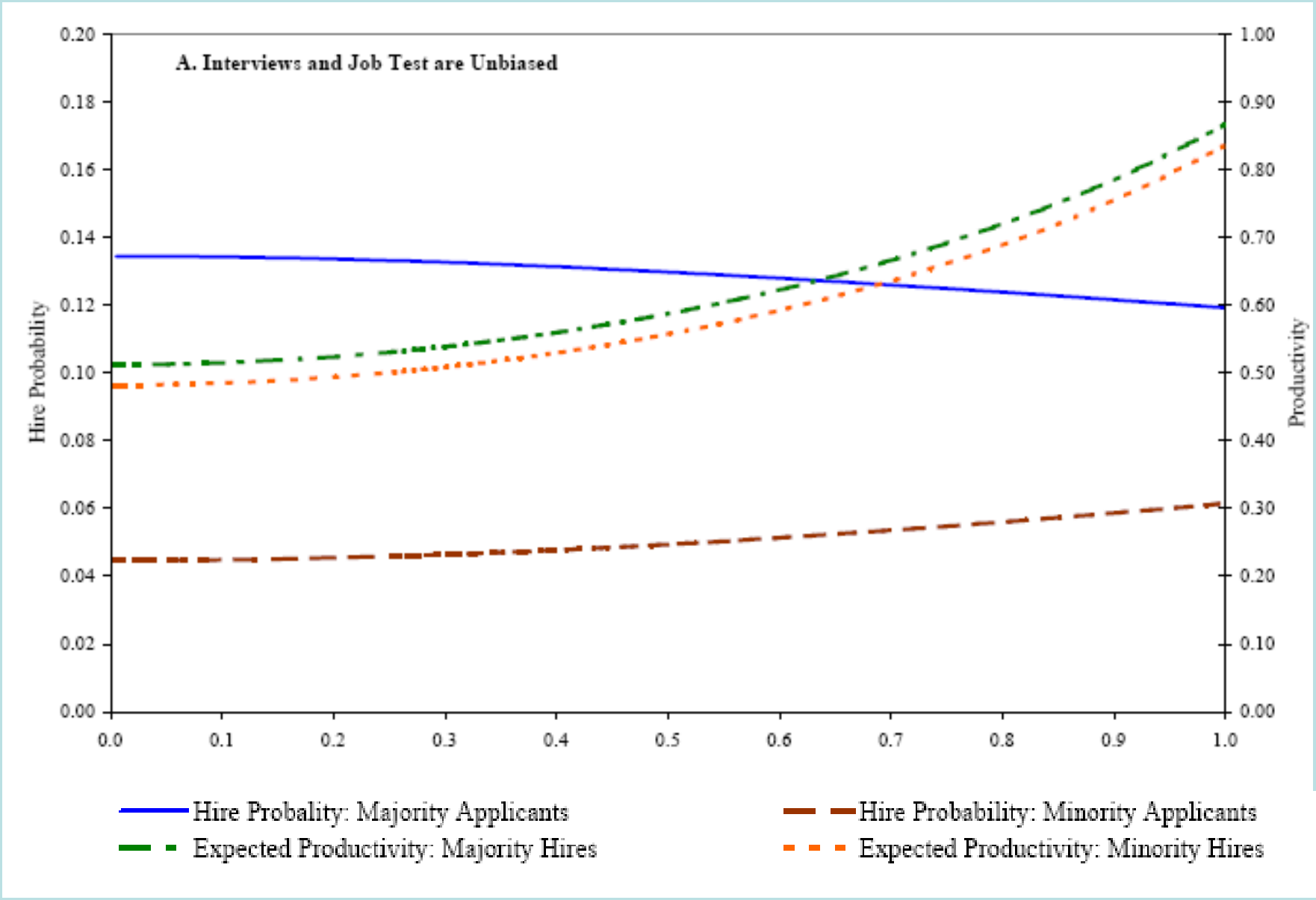

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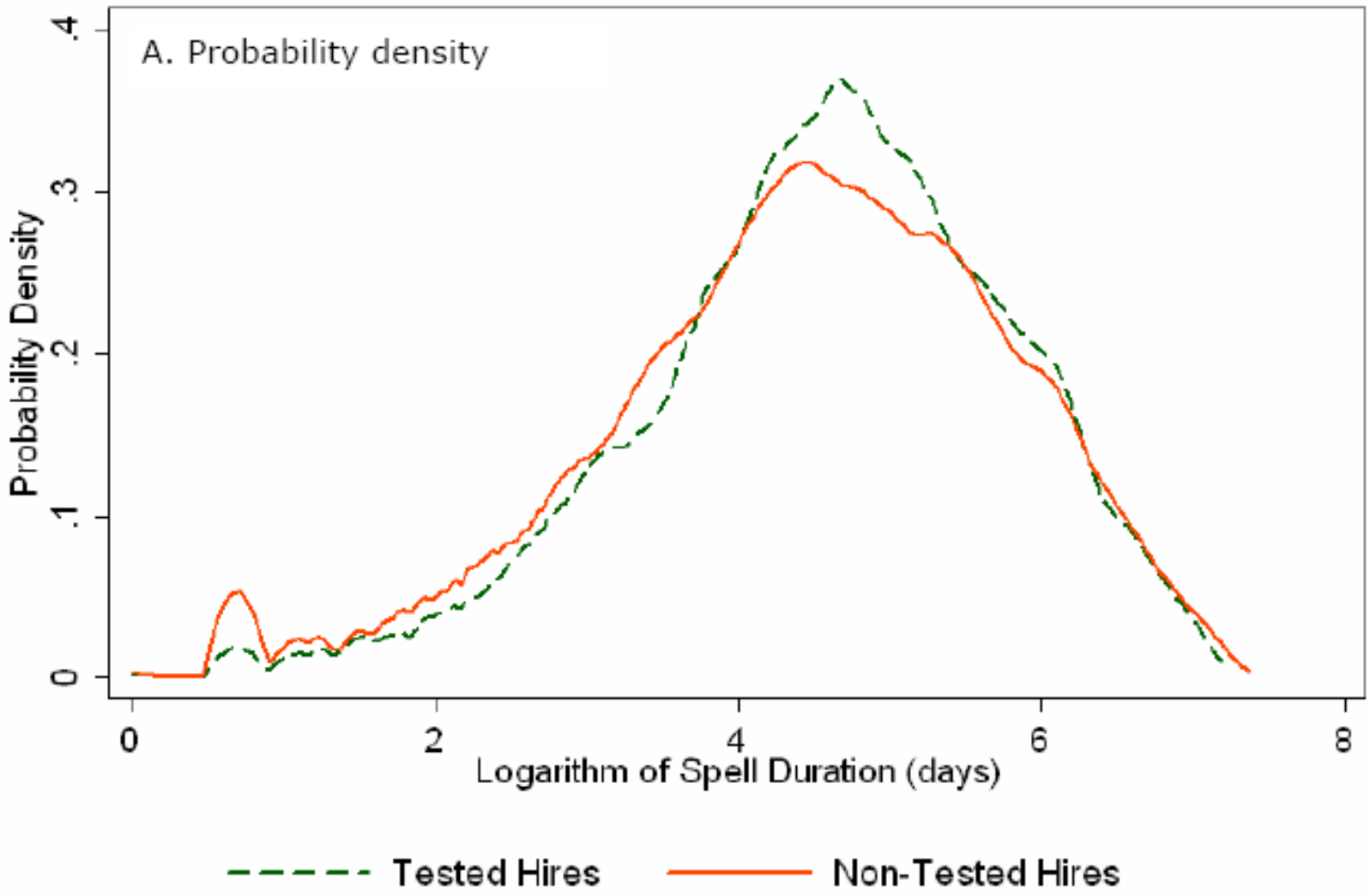

Figure IV. Completed Job Spell Durations of Tested and Non-Tested Hires.
Sample: Hires June 2000 - May 2001 with Valid Outcome Data (n =33,266)

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

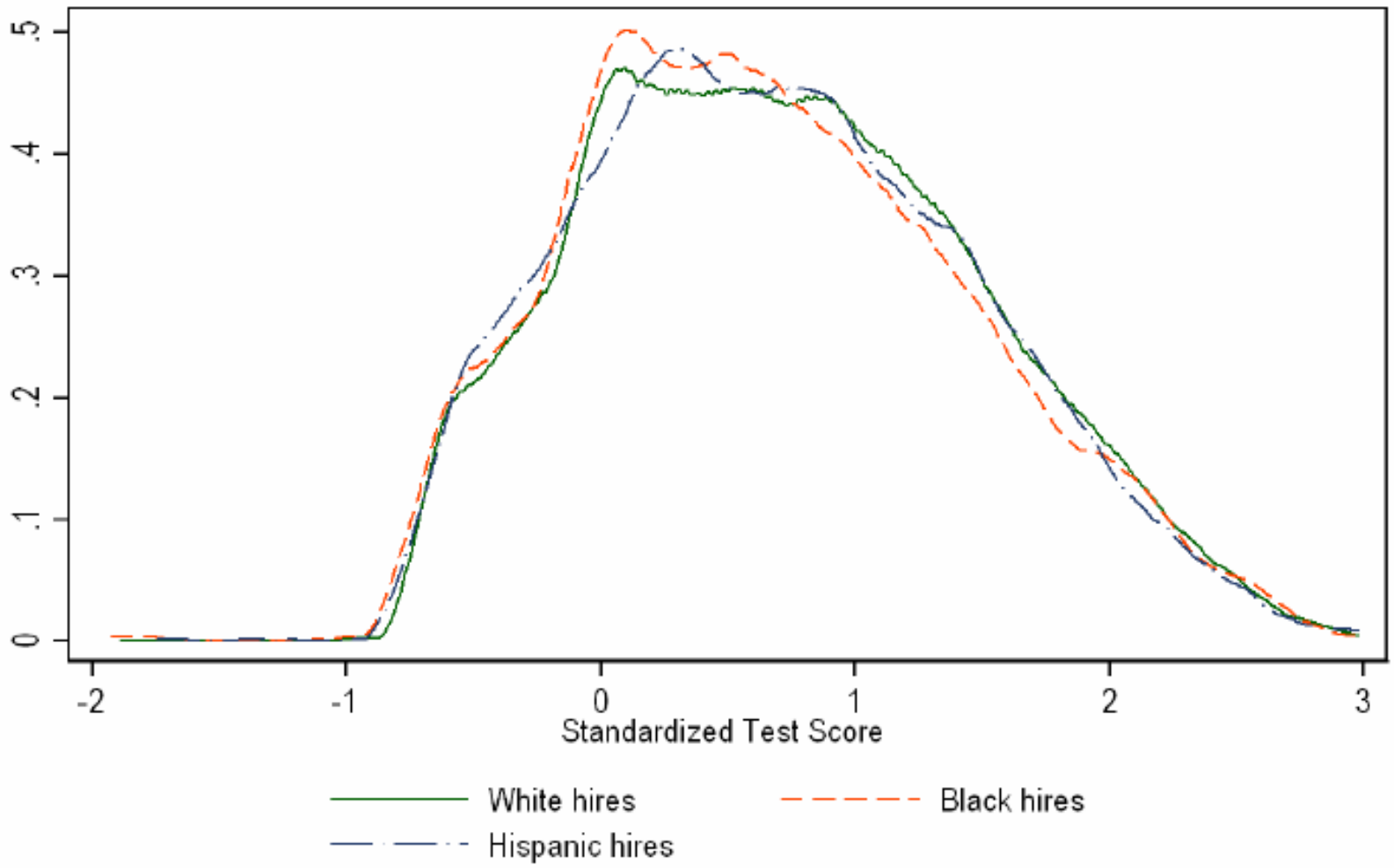

Figure V. Test Score Densities of Hired Workers by Race

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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

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

Coate and Loury, 1993

Sequence of Actions

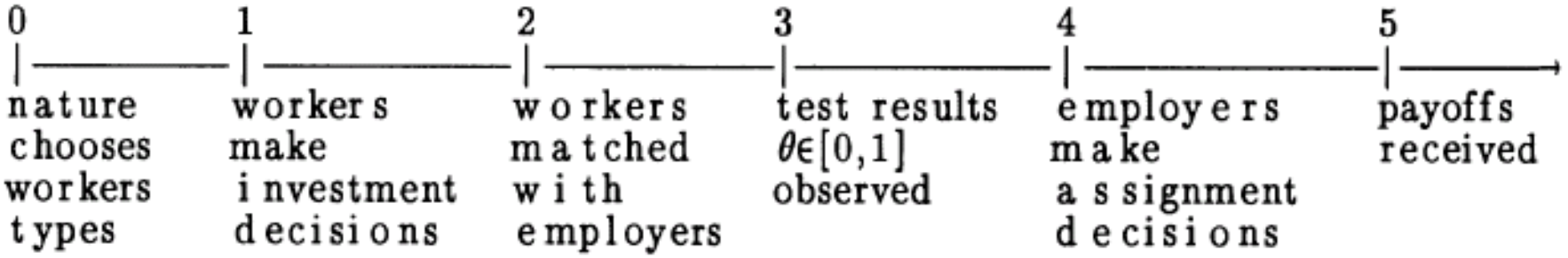

FIGURE 1. SEQUENCE OF ACTIONS

Coate and Loury 1993

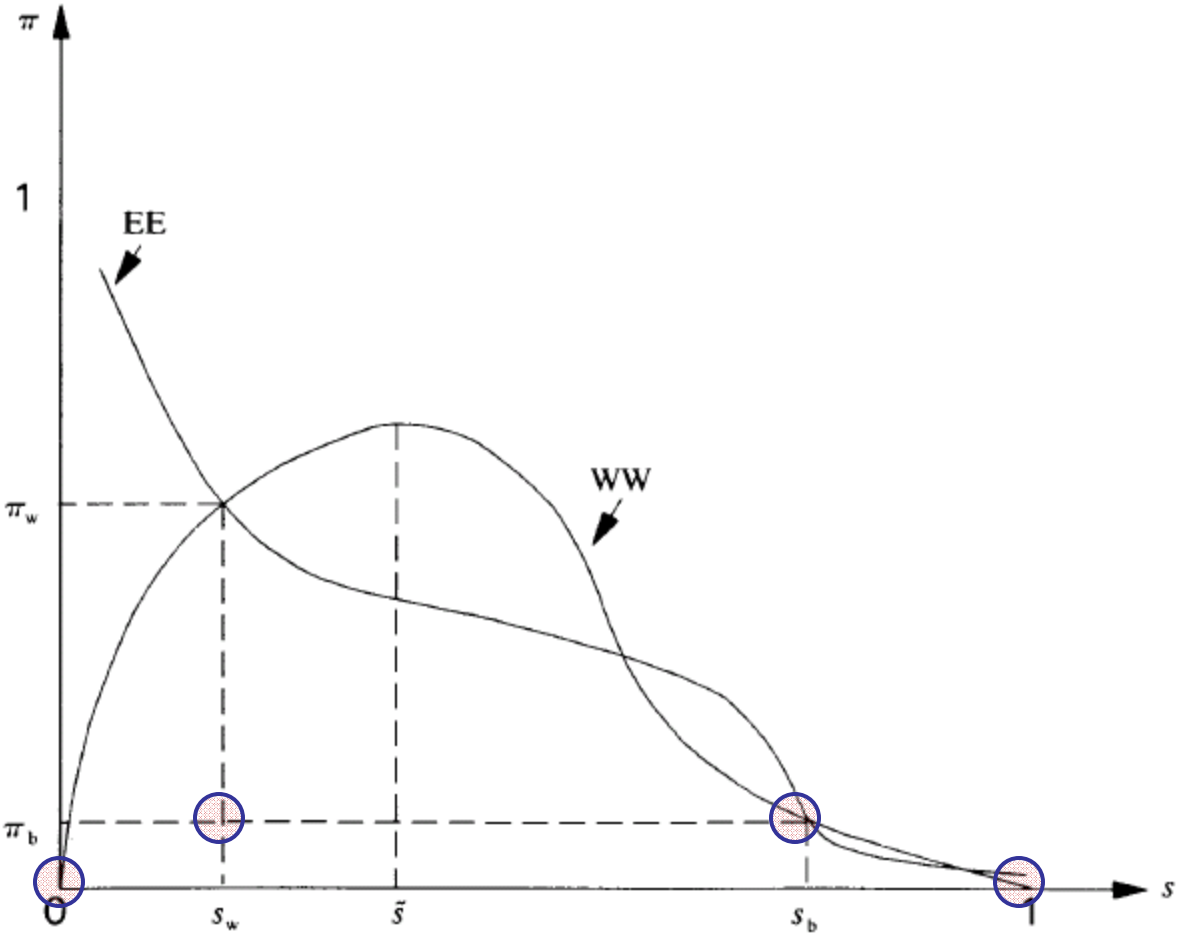

FIGURE 2. AN EQUILIBRIUM WITH NEGATIVE STEREOTYPES AGAINST B'S

Coate and Loury 1993

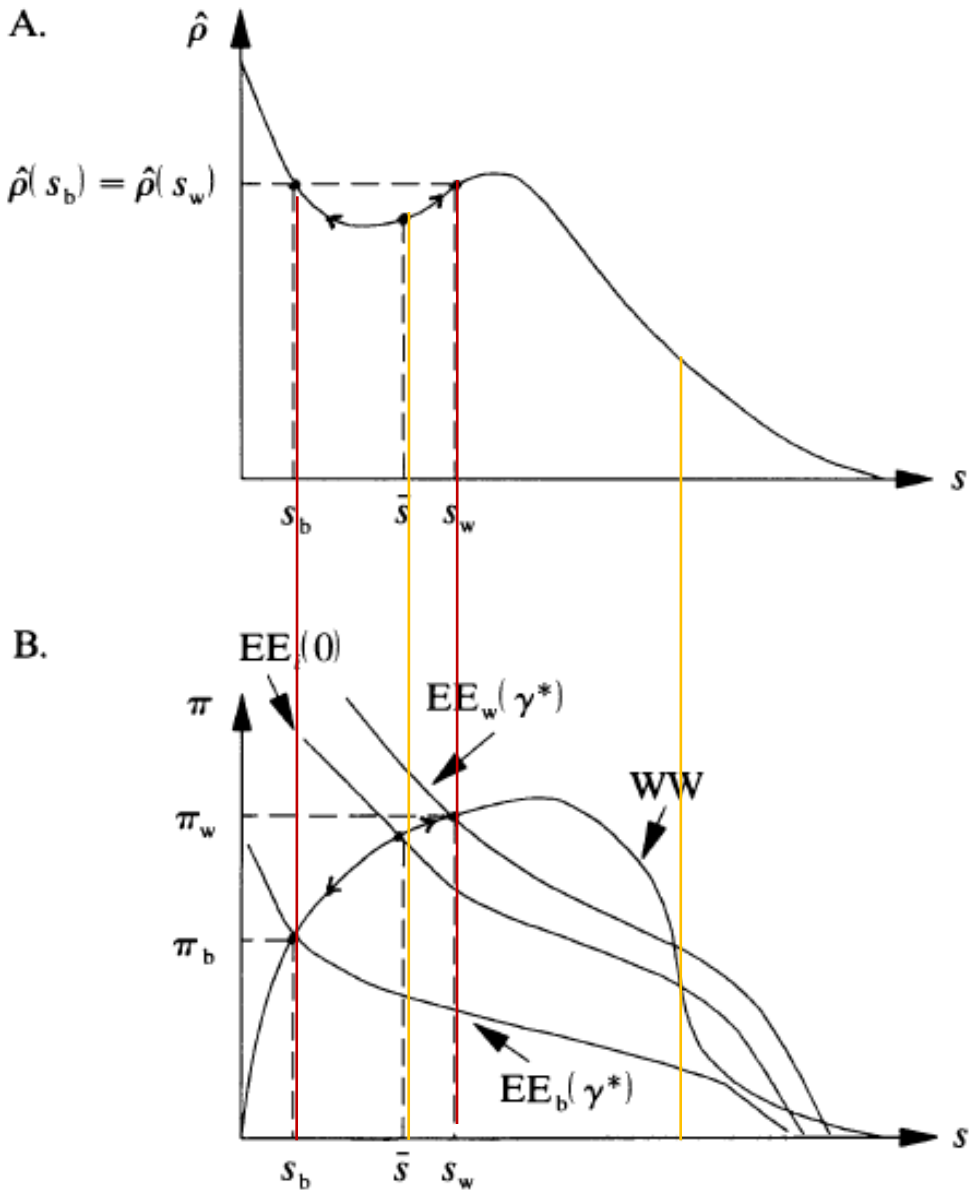

FIGURE 4. AN EQUILIBRIUM UNDER AFFIRMATIVE ACTION WITH NEGATIVE STEREOTYPE ABOUT B'S

Coate and Loury 1993

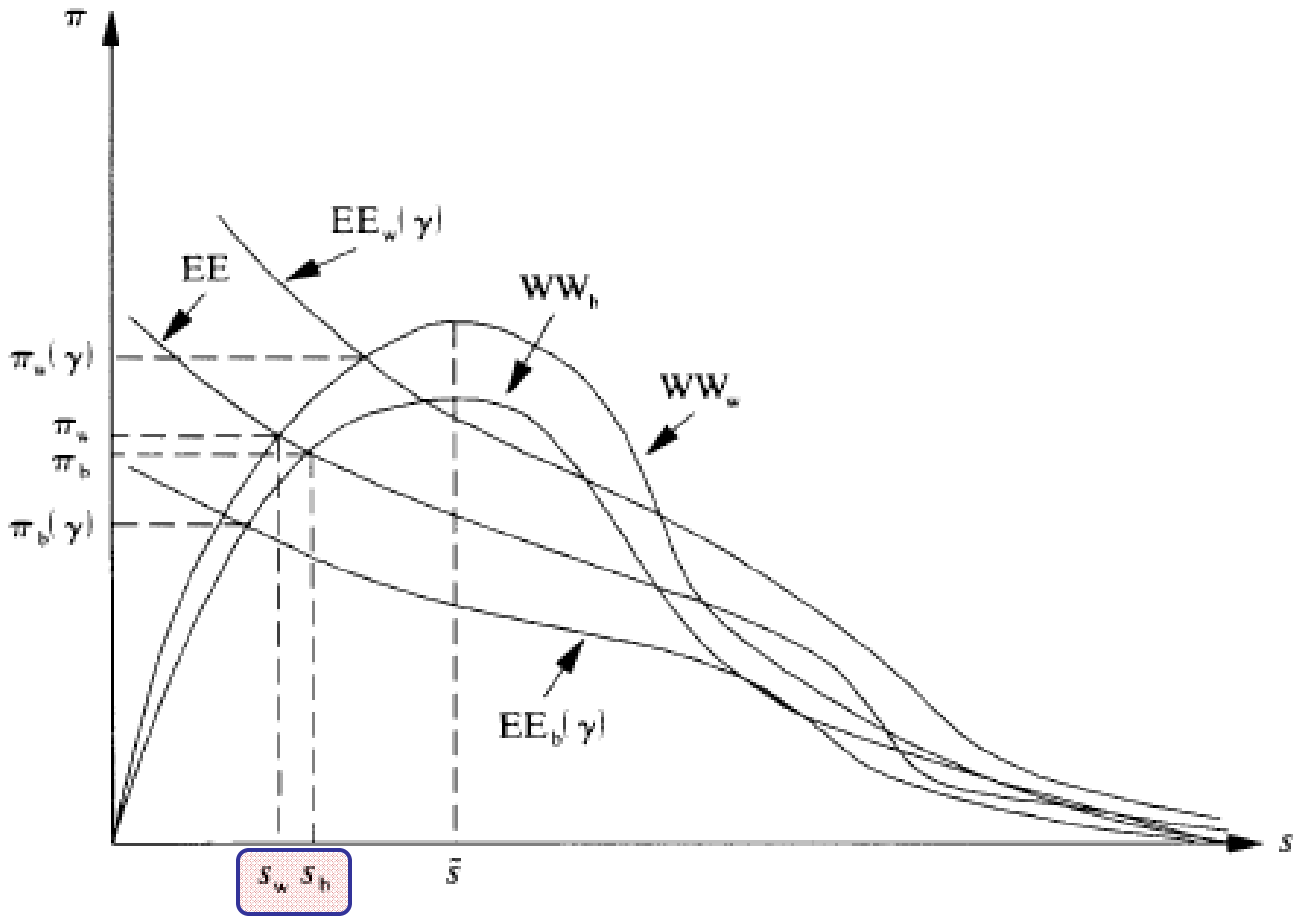

FIGURE 5. AFFIRMATIVE ACTION INCREASES SKILL DISPARITY IN THE ABSENCE OF STEREOTYPES

Coate and Loury 1993