

Firm Heterogeneity and Racial Labor Market Disparities

Caitlin Hegarty

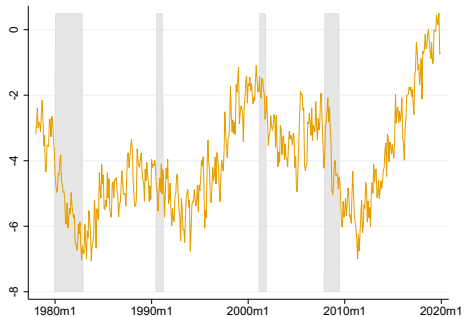
Michigan

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Motivation

Employment-to-population ratio (B-W)



Employment share (B-W)

Motivation

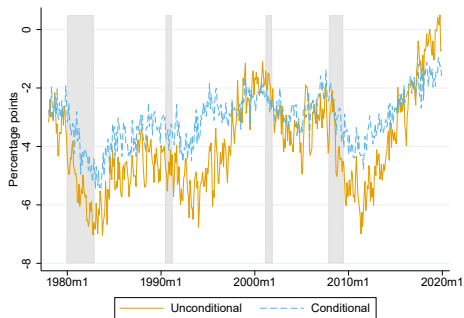
Employment-to-population ratio (B-W)



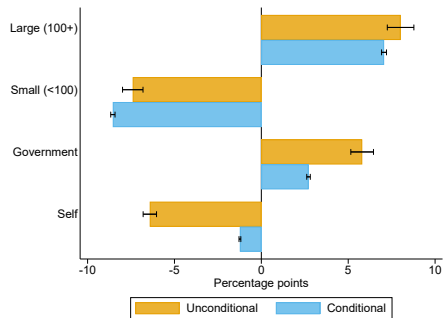
Employment share (B-W)

Motivation

Employment-to-population ratio (B-W)

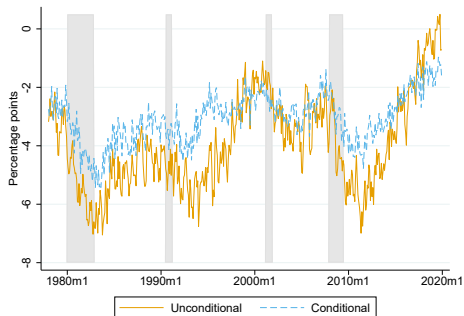


Employment share (B-W)

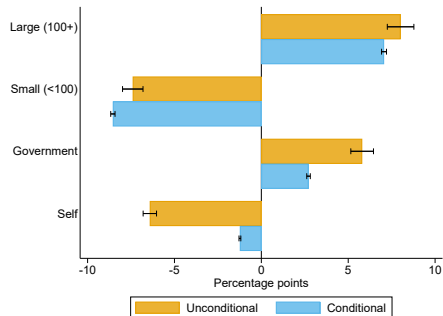


Motivation

Employment-to-population ratio (B-W)



Employment share (B-W)



Research question

- How does employer composition contribute to the excess volatility of the Black employment rate and through what channels?

This paper

1. Empirical: Employment transitions vary by race, firm size, and macro conditions

- Monthly household survey data
- Black workers have lower job-finding rates and higher separation rates at small firms
- [Job-finding at large firms](#) more cyclically sensitive for Black workers

This paper

1. Empirical: Employment transitions vary by race, firm size, and macro conditions

2. Model: Information frictions in labor market can generate both patterns

- Firms imperfectly observe worker productivity, varies by race and firm size
 - Information gap narrower at large firms → hire more Black workers
 - Consistent with micro evidence (Miller & Schmutte, 2021)
- Slack labor market → hiring lower → affects Black workers *more*
- Information frictions can explain
 - Job-finding and separation gaps, bigger for **small** firms
 - Worse job-finding gap with slack labor market, stronger for **large** firms

Related literature

- Empirical patterns in the labor market

1. Black employment is more sensitive to business cycle fluctuations

Couch & Fairlie (2010), Hoynes *et al.* (2012), Cajner *et al.* (2017), Aaronson *et al.* (2019), Forsythe & Wu (2021)

2. Black workers are more likely to work for large firms

Holzer (1998), Miller (2017), Miller & Schmutte (2021)

3. Employment growth at large firms is more cyclically sensitive

Moscarini & Postel-Vinay (2012), Haltiwanger *et al.* (2018), Moscarini & Postel-Vinay (2018)

- ★ First to study interactions in (1)-(3) both empirically and theoretically

- Labor market models with information frictions

1. Firm heterogeneity

Baydur (2017)

2. Worker heterogeneity

Morgan & Várdy (2009), Jarosch & Pilossoph (2019)

- ★ Link worker disparities to firm heterogeneity and information frictions

Outline

Introduction

Empirical Evidence

Model

Quantitative Analysis

Survey of Income and Program Participation (SIPP)

Overview

- Rotating panel, HHs interviewed every 4 months for 3-4 years
- Four panels covering 1996-2011 with gaps
- Individuals self-identified as (non-Hispanic) white or Black
- 286k individuals across 4 panels
- Average 22 months per person
- Details on two jobs per interview period

Monthly labor force states

- Nonemployed
- Employed- match to job dates
 - Large firm (100+ emp. across establishments)
 - Small firm
 - Government
 - Self-employed

Job-finding gap

$$f_{ijt} = \alpha_j + \alpha_j^B \text{Black}_i + \beta_j \text{High UR}_t + \beta_j^B \text{Black}_i \times \text{High UR}_t + \Gamma_j X_{it} + u_{ijt}$$

f_{ijt} job-finding indicator at firm type j

X_{it} age, age², marital status, gender, education, geographic region, metro area size, length of spell (years), new entrant, calendar month

β_j^B job-finding gap in high UR months relative to other months

Cluster standard errors by time

Unemployment rate higher → Black job-finding decreases by more

	(1) All	(2) Large	(3) Small
Black	-0.76*** (0.06)		
High UR	-0.62*** (0.09)		
Black × High UR	-0.23** (0.09)		
N	2,226,789		
R ²	0.04		
Black mean	2.65		
White mean	2.39		

SE in parentheses clustered by time. * $p < .1$, ** $p < .05$, *** $p < .01$
Units: percentage points. Sample aged 20 and older.

Cyclical job-finding response driven by large firms

	(1) All	(2) Large	(3) Small
Black	-0.76*** (0.06)	-0.07* (0.04)	
High UR	-0.62*** (0.09)	-0.26*** (0.04)	
Black \times High UR	-0.23** (0.09)	-0.24*** (0.06)	
N	2,226,789	2,226,789	
R^2	0.04	0.02	
Black mean	2.65	1.42	
White mean	2.39	1.03	

SE in parentheses clustered by time. * $p < .1$, ** $p < .05$, *** $p < .01$
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Cyclical job-finding response driven by large firms

	(1) All	(2) Large	(3) Small
Black	-0.76*** (0.06)	-0.07* (0.04)	-0.59*** (0.03)
High UR	-0.62*** (0.09)	-0.26*** (0.04)	-0.22*** (0.03)
Black \times High UR	-0.23** (0.09)	-0.24*** (0.06)	0.04 (0.04)
N	2,226,789	2,226,789	2,226,789
R^2	0.04	0.02	0.02
Black mean	2.65	1.42	0.74
White mean	2.39	1.03	0.87

SE in parentheses clustered by time. * $p < .1$, ** $p < .05$, *** $p < .01$
 Units: percentage points. Sample aged 20 and older.

Separation gap

$$s_{it} = \alpha_j + \alpha_j^B \text{Black}_i + \beta_j \text{High UR}_t + \beta_j^B \text{Black}_i \times \text{High UR}_t + \Gamma X_{it} + u_{ijt}$$

	(1) All	(2) Large	(3) Small
Black	0.09*** (0.03)	0.18*** (0.05)	0.27*** (0.07)
High UR	0.05 (0.04)	0.07 (0.05)	0.10* (0.06)
Black × High UR	-0.08 (0.05)	-0.11 (0.08)	-0.21 (0.14)
N	3,701,235	3,701,235	
R2	0.01	0.01	
Black mean	1.60	1.69	2.20
White mean	1.30	1.27	1.79

SE in parentheses clustered by time. * $p < .1$, ** $p < .05$, *** $p < .01$

Units: percentage points. Sample aged 20 and older.

Summary and roadmap

Key empirical patterns

- Black workers face especially lower job-finding rates and higher separation rates at small firms
- Job-finding at large firms decreases more for Black workers in slack labor market

Model

- Endogenous sorting through information frictions in hiring (e.g. Miller & Schmutte, 2021)
- Compare job-finding gaps across tight/slack labor market states
- Abstract from
 - Other sorting mechanisms (e.g. Miller, 2017)
 - Separations comparisons

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Environment

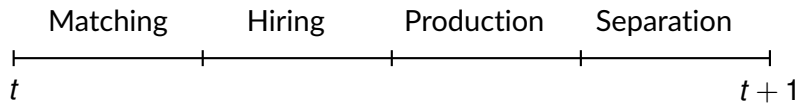
Agents

- High and low productivity firms (i.e. large and small)
- Black and white workers

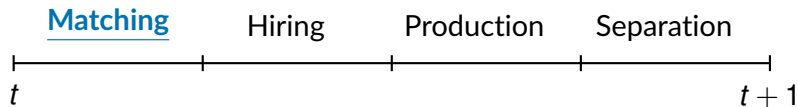
Technology

- Decreasing returns to scale
- Random search with uncertain worker productivity
- Wages via bargaining

Environment: Search timing



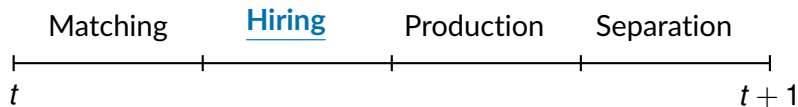
Environment: Search timing



Matching

- Firm posts v vacancies at cost $c_v(z)$
- Matches with $vq(\theta)$ workers
- Random sample of nonemployed population
- Potential hire draws unobservable match quality

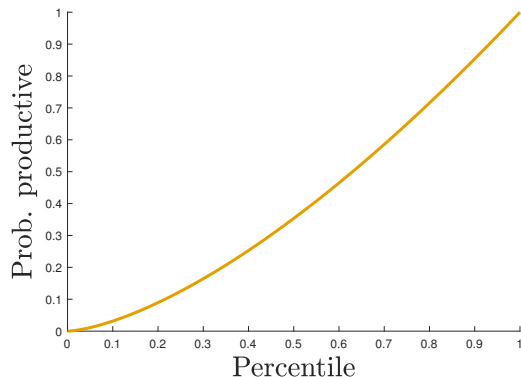
Environment: Search timing



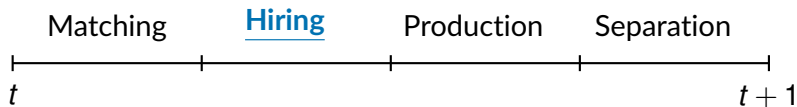
Hiring

- Match quality = probability worker is productive
- Exogenous distribution F
- Observed with **noisy** signal
- Noise varies with **race and firm size**

$$x \equiv p_{gz}s + (1 - p_{gz})\mathbb{E}[s]$$



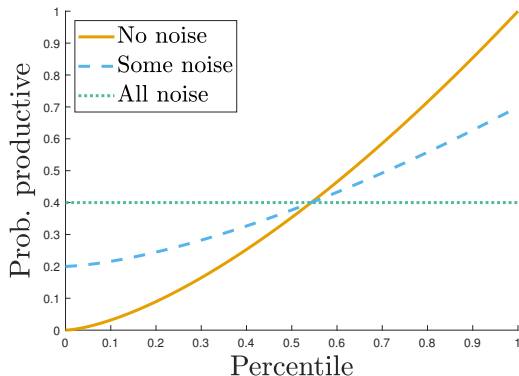
Environment: Search timing



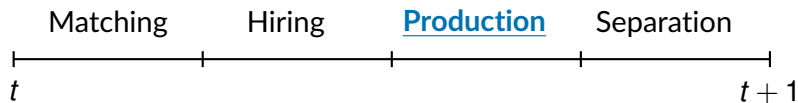
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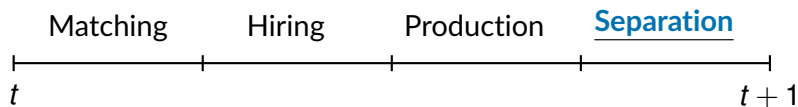
Environment: Search timing



Production

- Wages are paid to all workers
- New hire productivity is revealed at production
- Only productive workers contribute to output
- Nonemployed worker receives b

Environment: Search timing



Separation

- Unproductive hires separate
- Exogenous share δ productive workers separate
- Separated workers cannot apply to jobs next period

Firm problem

Firm chooses vacancies v , hiring standards x_B^* , x_W^* , and **productive** employment n'_B , n'_W

Firm problem

Firm chooses vacancies v , hiring standards x_B^*, x_W^* , and **productive** employment n'_B, n'_W

$$J_t(n_B, n_W, z) = \max_{v \geq 0, n'_g, x_g^*} -c_v(z)v + a_t z (n'_B + n'_W)^\alpha - \underbrace{\sum_g (1 - \delta) n_g w^n(n'_B + n'_W, g, z)}_{\text{incumbent wages}} \\ - \underbrace{\sum_g \frac{u_{gt}}{u_t} q(\theta_t) v (1 - F(x_g^* | p_{gz})) w^h(x_g^*, n'_B + n'_W, g, z)}_{\text{new hire wages}} + \beta \mathbb{E}_t J_{t+1}(n'_B, n'_W, z)$$

s.t.

$$n'_g = (1 - \delta) n_g + \underbrace{\frac{u_{gt}}{u_t} q(\theta_t) v}_{\text{matches}} \underbrace{(1 - F(x_g^* | p_{gz}))}_{\text{hire share}} \underbrace{\mathbb{E}[x | x > x_g^*, p_{gz}]}_{\text{probability productive}}$$

$$\underline{x}(p_{gz}) \leq x_g^* \leq \bar{x}(p_{gz})$$

x is **probability worker is productive**, conditional on signal

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$$\underline{x}(p_{gz}) \leq x_g^* \leq \bar{x}(p_{gz})$$

x is **probability worker is productive**, conditional on signal

Firm problem solution

1. How many workers to hire?

$$\underbrace{\text{current + future wages + MC hiring}}_{\text{MC}} = \underbrace{\text{MPL + future savings on hiring}}_{\text{MB}}$$

2. Hiring strategy

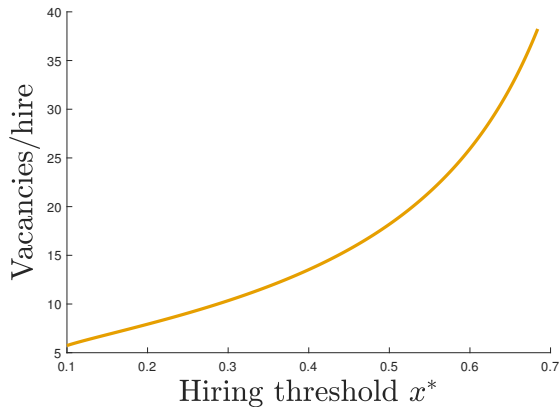
- Vacancies vs selectivity
- Minimize cost of hiring

Tradeoff between vacancies and selectivity

$$\underbrace{\Delta n}_{\text{productive hires}} = \underbrace{vq(\theta)}_{\text{matches}} \underbrace{(1 - F(x^*|p))}_{\text{hired share}} \underbrace{\mathbb{E}[x|x > x^*, p]}_{\text{probability productive}}$$

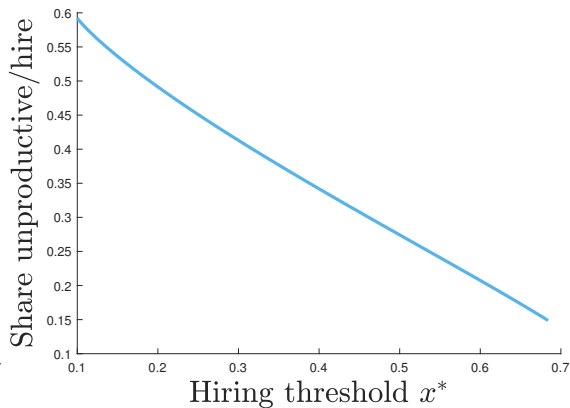
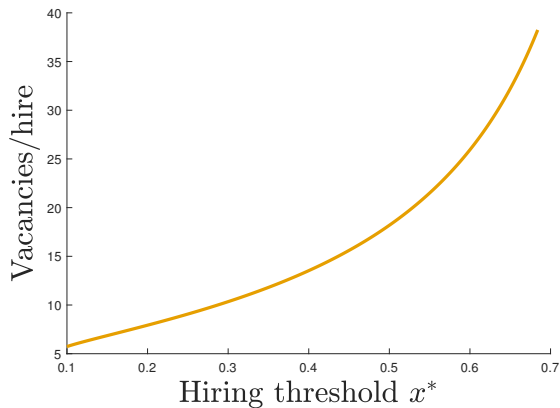
More selective \implies more vacancies

$$\underbrace{\Delta n}_{\text{productive hires}} = \underbrace{vq(\theta)}_{\text{matches}} \underbrace{(1 - F(x^*|p))}_{\text{hired share}} \underbrace{\mathbb{E}[x|x > x^*, p]}_{\text{probability productive}}$$



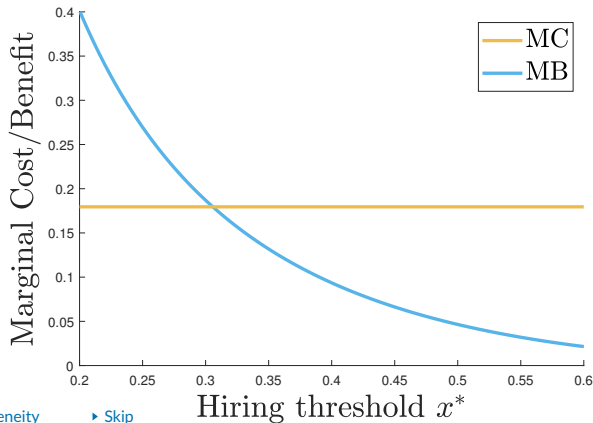
More selective \implies fewer unproductive hires

$$\underbrace{\Delta n}_{\text{productive hires}} = \underbrace{vq(\theta)}_{\text{matches}} \underbrace{(1 - F(x^*|p))}_{\text{hired share}} \underbrace{\mathbb{E}[x|x > x^*, p]}_{\text{probability productive}}$$



Optimal hiring threshold where MC = MB

$$\underbrace{\frac{c_v}{q(\theta)}}_{\text{MC}} = \underbrace{(1 - F(x^*|p)) \left(\mu_t \mathbb{E}[x | x > x^*, p] - w^h(x^*, n') \right)}_{\text{MB}}$$



► Equilibrium MB

► Firm heterogeneity

► Skip

Worker problem

Productive worker

New hire

Nonemployed

Worker problem

Productive worker

$$V_t^n(g, z) = w_t^n(n', z, g) + \beta \mathbb{E}_t \left[V_{t+1}^u(g) + \underbrace{(1 - \delta)}_{\text{prob. employed}} \underbrace{(V_{t+1}^n(g, z) - V_{t+1}^u(g))}_{\text{employment surplus}} \right]$$

New hire

Nonemployed

Worker problem

Productive worker

$$V_t^n(g, z) = w_t^n(n', z, g) + \beta \mathbb{E}_t \left[V_{t+1}^u(g) + \underbrace{(1 - \delta)}_{\text{prob. employed}} \underbrace{(V_{t+1}^n(g, z) - V_{t+1}^u(g))}_{\text{employment surplus}} \right]$$

New hire

$$V_t^h(g, z) = w_t^h(x_g^*, n', z, g) + \beta \mathbb{E}_t \left[V_{t+1}^u(g) + \underbrace{(1 - \delta) \mathbb{E}[x | x > x_g^*, p_{gz}]}_{\text{prob. employed}} \underbrace{(V_{t+1}^n(g, z) - V_{t+1}^u(g))}_{\text{employment surplus}} \right]$$

Nonemployed

Worker problem

Productive worker

$$V_t^n(g, z) = w_t^n(n', z, g) + \beta \mathbb{E}_t \left[\underbrace{V_{t+1}^u(g)}_{\text{prob. employed}} + \underbrace{(1 - \delta) (V_{t+1}^n(g, z) - V_{t+1}^u(g))}_{\text{employment surplus}} \right]$$

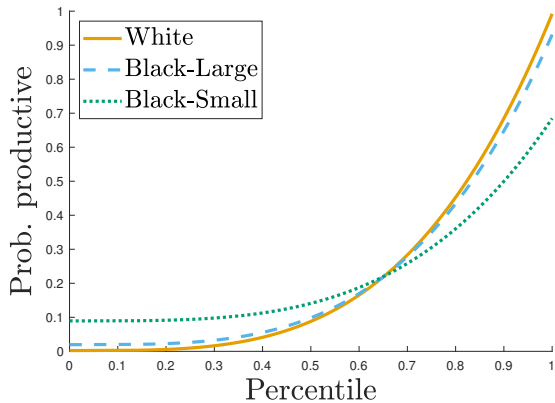
New hire

$$V_t^h(g, z) = w_t^h(x_g^*, n', z, g) + \beta \mathbb{E}_t \left[\underbrace{V_{t+1}^u(g) + (1 - \delta) \mathbb{E}[x | x > x_g^*, p_{gz}]}_{\text{prob. employed}} + \underbrace{(V_{t+1}^n(g, z) - V_{t+1}^u(g))}_{\text{employment surplus}} \right]$$

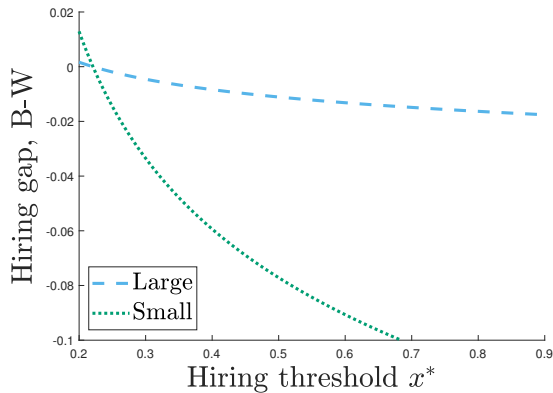
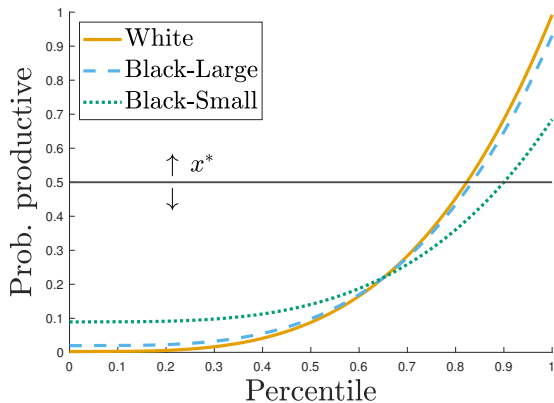
Nonemployed

$$V_t^u(g) = b + \beta \mathbb{E}_t V_{t+1}^u(g) + \underbrace{\beta \mathbb{E}_t \left[\underbrace{\sum_z \theta_{t+1} q(\theta_{t+1}) \frac{v^*(z)}{V}}_{\text{prob match at } z} \underbrace{(1 - F(x_g^* | p_{gz}))}_{\text{prob hired}} \underbrace{(V_{t+1}^h(g, z) - V_{t+1}^u(g))}_{\text{new hire surplus}} \right]}_{\text{value of search} := \Omega_t(g)}$$

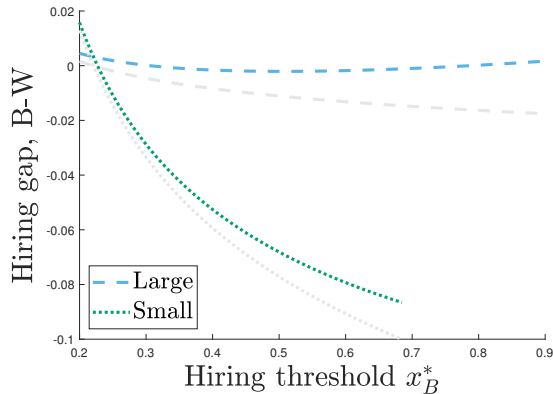
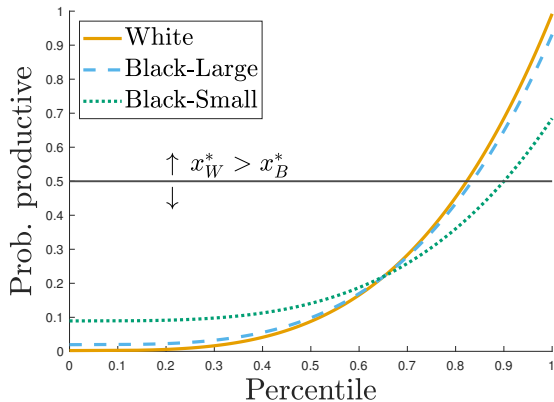
Racial differences in signal precision



Selectivity determines hiring gap



Endogenous wages attenuate hiring gap



► Low productivity

► Threshold rule

Outline

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Calibration

Parameter	Meaning	Value	Moment
<i>Scale parameters</i>			
μ	Number firms/worker	0.007	Market tightness
b	Flow value unemp	0.998	Normalize outside option
ϕ	Bargaining power	0.259	Ratio w to avg. prod
γ	Match quality shape	3.28	Large firm share hired
<i>Estimated parameters</i>			
δ	Exog. separation	0.012	Avg. separation
$c_v(L)$	Vacancy cost	0.001	Job-finding rate, large
$c_v(S)$	Vacancy cost	0.060	Job-finding rate, small
$\frac{z(L)}{z(S)}$	Relative productivity	4.158	Large empl. share
$\Delta_p(L)$	Signal gap, large	0.121	Black share empl, large
$\Delta_p(S)$	Signal gap, small	0.598	Black share empl, small

► Fixed parameters

Model fit

(a) Targeted		(b) Untargeted		
Moment	Data/Model	Moment	Data	Model
Separation rate	1.47	Separation rate		
Employment share		Large	1.43	1.28
Large	64.10	Small	1.56	1.82
Job-finding rate		Job-finding gap (B-W)		
Large	1.34	Large	-0.21	-0.07
Small	1.06	Small	-0.70	-0.26
Black share		Separation gap (B-W)		
Large	13.68	Large	0.18	0.11
Small	8.97	Small	0.28	0.70
Hired share matches*		Hired share matches*		
Large	5.02	Small	10.04	31.63

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Counterfactual exercise

- Calibrate model in high-productivity steady state
- Permanent, negative productivity shock (e.g. Great Recession)
- Compare steady states
- Magnitude of shock to match white job-finding difference in data
- Untargeted moments
 - Job-finding difference at large vs. small firms
 - Black job-finding difference

Change in job finding for white workers matches by construction

Steady state comparison of job-finding rates

	Data	Model
White job finding rate	-0.87	-0.87
Large	-0.49	-0.46
Small	-0.39	-0.41
Job finding gap	-0.28	-0.30
Large	-0.28	-0.25
Small	0.01	-0.05

Units: percentage points

Composition of change fits well

Steady state comparison of job-finding rates

	Data	Model
White job finding rate	-0.87	-0.87
Large	-0.49	-0.46
Small	-0.39	-0.41
Job finding gap	-0.28	-0.30
Large	-0.28	-0.25
Small	0.01	-0.05

Units: percentage points

Model overshoots change in job-finding gap

Steady state comparison of job-finding rates

	Data	Model
White job finding rate	-0.87	-0.87
Large	-0.49	-0.46
Small	-0.39	-0.41
Job finding gap	-0.28	-0.30
Large	-0.28	-0.25
Small	0.01	-0.05

Units: percentage points

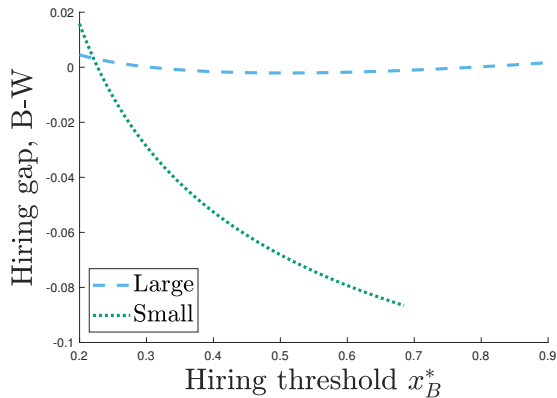
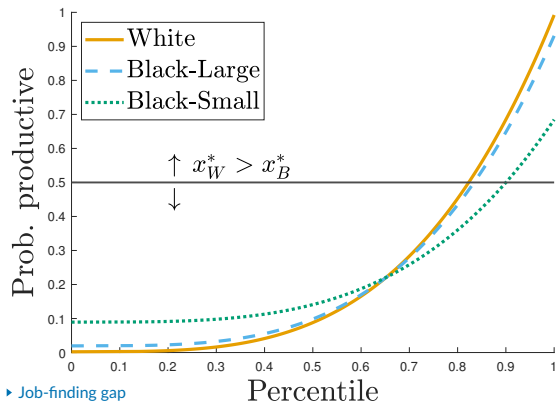
Gap is coming from large firms

Steady state comparison of job-finding rates

	Data	Model
White job finding rate	-0.87	-0.87
Large	-0.49	-0.46
Small	-0.39	-0.41
Job finding gap	-0.28	-0.30
Large	-0.28	-0.25
Small	0.01	-0.05

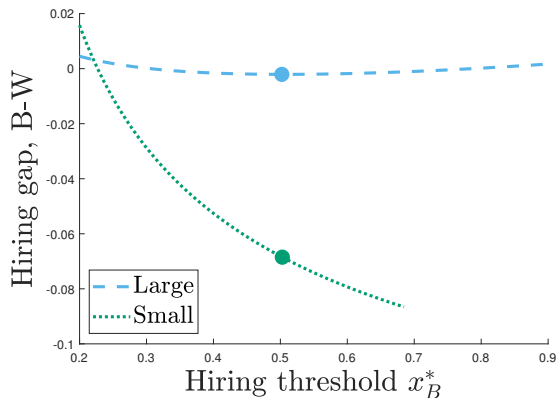
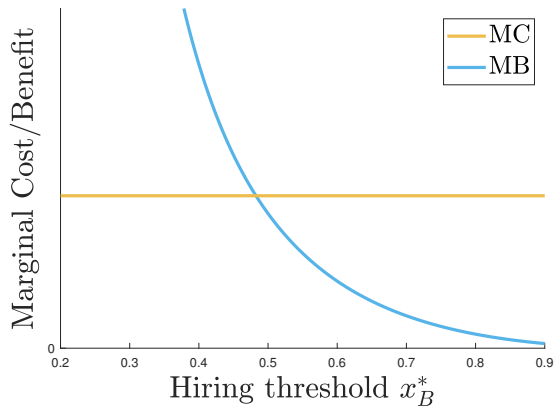
Units: percentage points

Selectivity determines hiring gap



Firm optimization determines selectivity

$$\frac{c_v}{q(\theta)} = \sum_g \frac{u_{gt}}{u_t} (1 - F(x_g^* | p_{gz})) \left(\mu_{gt} \mathbb{E} [x | x > x_g^*, p_{gz}] - w^h(x_g^*, n', g, z) \right)$$



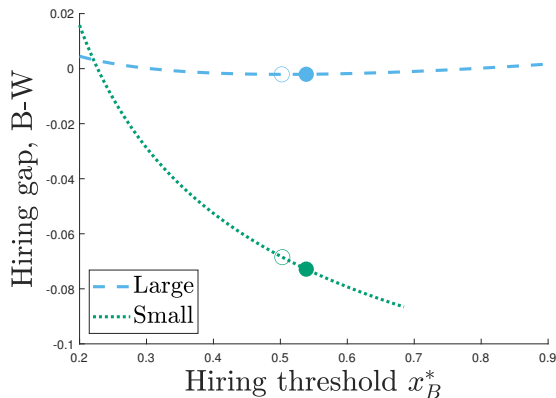
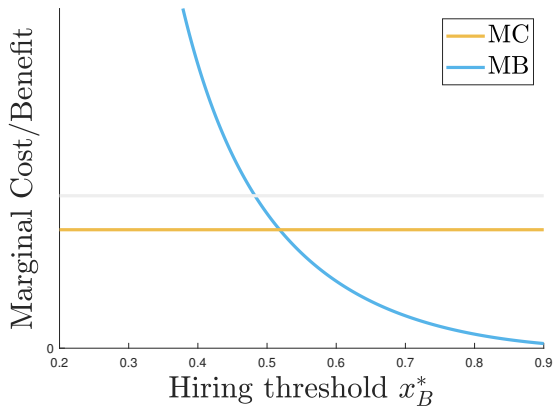
► Job-finding gap

► Quant version

► Quant version

Direct effect: Market tightness ↓, firms more selective

$$\frac{c_v}{q(\theta)} = \sum_g \frac{u_{gt}}{u_t} (1 - F(x_g^* | p_{gz})) \left(\mu_{gt} \mathbb{E} [x | x > x_g^*, p_{gz}] - w^h(x_g^*, n', g, z) \right)$$

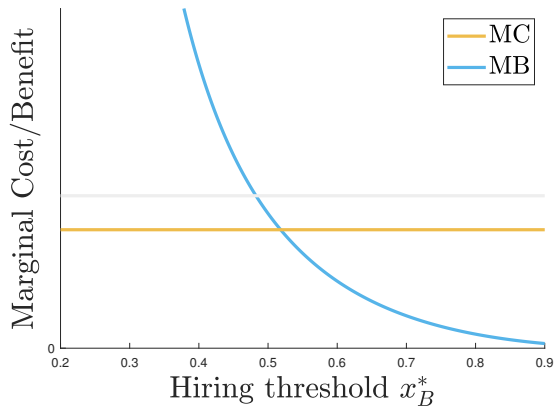


► Job-finding gap

► Quant version

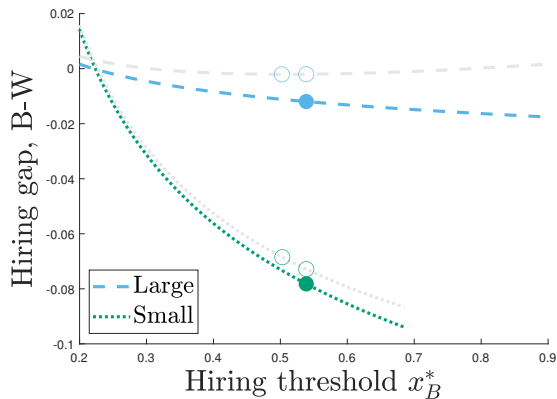
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Indirect effect: Wage gap narrows



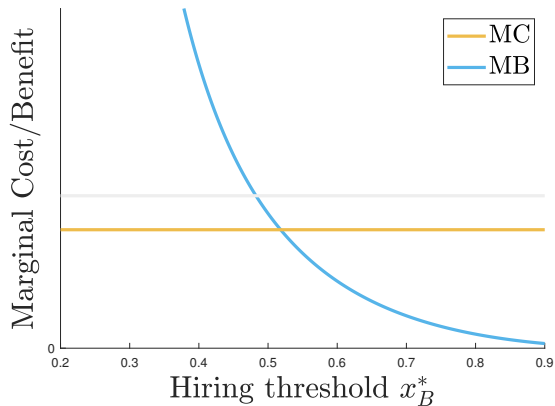
► Job-finding gap

► Quant version



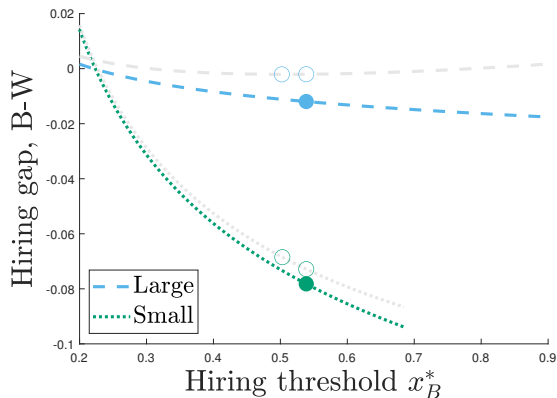
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Large respond more if wage effect > selectivity effect



► Job-finding gap

► Quant version



► Quant version

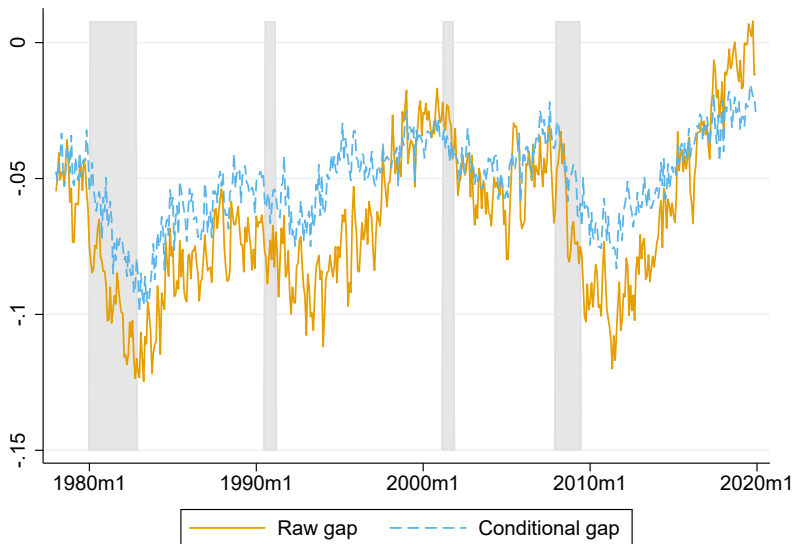
Conclusion

- Firm differences important for racial employment dynamics
- Vary over business cycle
- Differences in information exacerbate disparities
- Future research
 - Stabilization policies
 - How to address structural frictions?

Thank you!

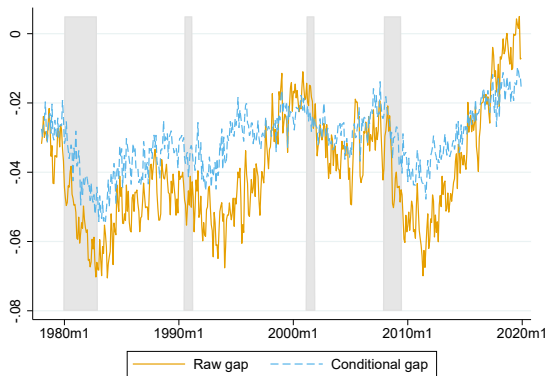
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Employment-to-population ratio relative to white, logs

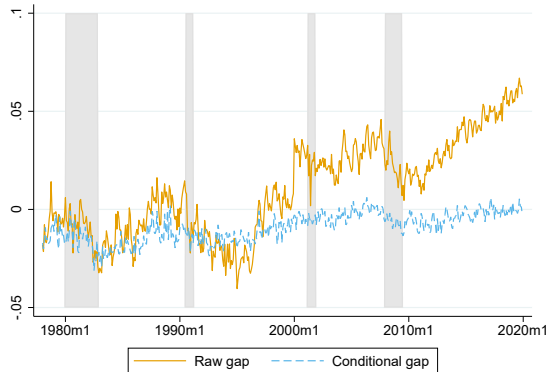


Employment-to-population ratio relative to white

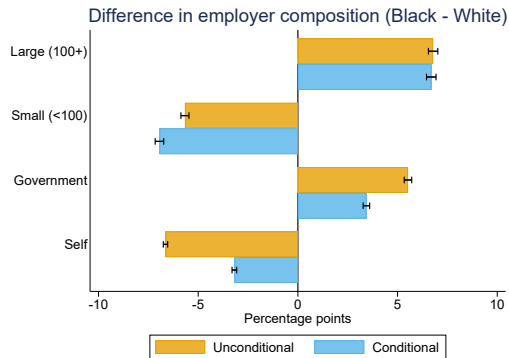
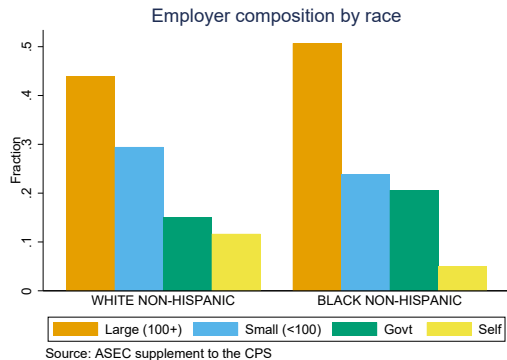
Black



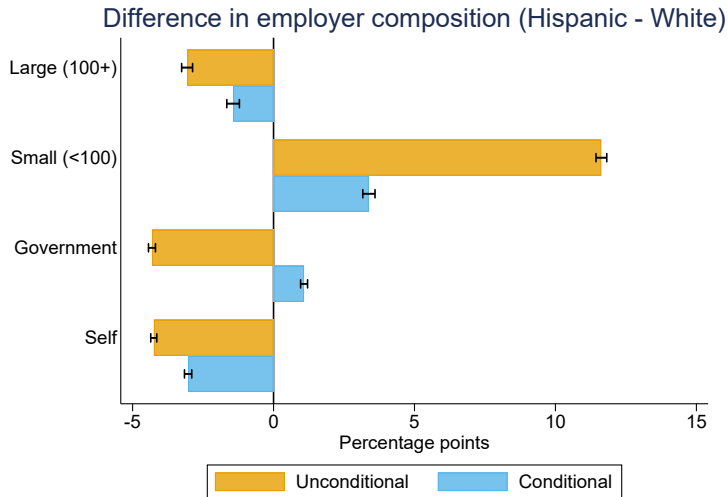
Hispanic



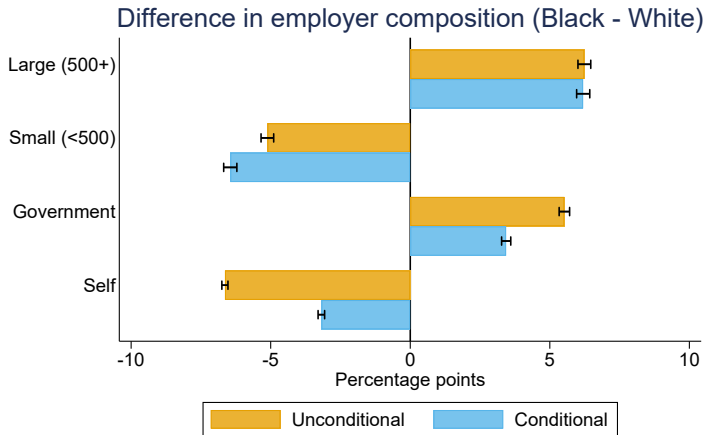
Black workers are more likely to be employed by large firms



Gap for Hispanic workers explained by characteristics



Black workers are more likely to be employed by large firms



Source: ASEC supplement to the CPS
Conditional estimates control for age and education by gender, industry, occupation, state, metro area size

Why do Black workers sort to larger firms?

Empirical evidence

1. Affirmative action policies (Miller (2017))

- Firms with at least 100 employees must report composition of workforce by occupation to EEOC each year
- Also federal contractors with at least 50 employees
- Anecdotal, large firms more likely to be audited

2. Referral hiring (Miller & Schmutte (2021))

- Referral hires are more important for small businesses
- Workers tend to refer candidates of their own race
- More white-owned small businesses leads to more white employees at small businesses

3. Other explanations?

Cyclical job-finding (logit)

	(1) All	(2) Large	(3) Small	(4) Government	(5) Self
Black	-0.27*** (0.02)	-0.10*** (0.03)	-0.62*** (0.03)	0.06 (0.06)	-0.62*** (0.10)
High UR	-0.28*** (0.05)	-0.27*** (0.05)	-0.28*** (0.05)	-0.13** (0.06)	-0.34*** (0.07)
Black × High UR	-0.08** (0.04)	-0.12** (0.05)	0.01 (0.05)	-0.17 (0.11)	0.13 (0.17)
N	2,226,789	2,226,789			
Pseudo R2	0.21	0.17			
Black mean	2.65	1.42	0.74	0.28	0.09
White mean	2.39	1.03	0.87	0.26	0.13

SE in parentheses clustered by time. * $p < .1$, ** $p < .05$, *** $p < .01$

Transitions into large firm employment

	(1) Nonemp _{t-1}	(2) Large _{t-1}	(3) Small _{t-1}	(4) Government _{t-1}	(5) Self _{t-1}
Large_t					
Black	-0.0419* (0.0247)	0.0000 (.)	0.1819** (0.0796)	0.1329 (0.1590)	0.1636 (0.1518)
UR	-0.1301*** (0.0121)	0.0000 (.)	-0.1933*** (0.0347)	-0.1872** (0.0804)	-0.1104** (0.0541)
Black × UR	-0.0639** (0.0288)	0.0000 (.)	0.1430 (0.1040)	0.0824 (0.1481)	-0.4476* (0.2504)
N	2,542,427	1,857,269	1,046,868	687,843	482,692

Standard errors in parentheses

* $p < .1$, ** $p < .05$, *** $p < .01$

Transitions into small firm employment

	(1)	(2)	(3)	(4)	(5)
	Nonemp_{t-1}	Large_{t-1}	Small_{t-1}	Government_{t-1}	Self_{t-1}
Small_t					
Black	-0.5722*** (0.0306)	-0.4759*** (0.0815)	0.0000 (.)	-0.5501** (0.2244)	-0.3377* (0.1728)
UR	-0.1055*** (0.0130)	-0.2193*** (0.0384)	0.0000 (.)	-0.1805** (0.0825)	-0.0781 (0.0483)
Black × UR	0.0095 (0.0362)	0.0386 (0.1104)	0.0000 (.)	-0.5627* (0.3234)	0.4871*** (0.1585)
N	2,542,427	1,857,269	1,046,868	687,843	482,692

Standard errors in parentheses

* $p < .1$, ** $p < .05$, *** $p < .01$

Cyclical job-finding, all employers

	(1) All	(2) Large	(3) Small	(4) Government	(5) Self
Black	-0.76*** (0.06)	-0.07* (0.04)	-0.59*** (0.03)	0.01 (0.02)	-0.08*** (0.01)
High UR	-0.62*** (0.09)	-0.26*** (0.04)	-0.22*** (0.03)	-0.04*** (0.01)	-0.04*** (0.01)
Black \times High UR	-0.23** (0.09)	-0.24*** (0.06)	0.04 (0.04)	-0.03 (0.03)	0.02 (0.02)
N	2,226,789	2,226,789	2,226,789	2,226,789	2,226,789
R2	0.04	0.02	0.02	0.01	0.00
Black mean	2.65	1.42	0.74	0.28	0.09
White mean	2.39	1.03	0.87	0.26	0.13

Standard errors in parentheses

* $p < .1$, ** $p < .05$, *** $p < .01$

Cyclical job-finding, 25-65

	(1) All	(2) Large	(3) Small	(4) Government	(5) Self
Black	-0.88*** (0.08)	-0.17*** (0.05)	-0.64*** (0.04)	0.08*** (0.02)	-0.11*** (0.02)
High UR	-0.85*** (0.13)	-0.35*** (0.06)	-0.30*** (0.05)	-0.05** (0.02)	-0.07*** (0.02)
Black \times High UR	-0.11 (0.13)	-0.14* (0.08)	0.06 (0.06)	-0.06 (0.05)	0.03 (0.02)
N	1,088,709	1,088,709	1,088,709	1,088,709	1,088,709
R2	0.03	0.02	0.01	0.01	0.00
Black mean					
White mean					

Standard errors in parentheses

* $p < .1$, ** $p < .05$, *** $p < .01$

Cyclical job-finding, 25-65 men

	(1) All	(2) Large	(3) Small	(4) Government	(5) Self
Black	-1.48*** (0.14)	-0.46*** (0.09)	-0.89*** (0.08)	0.05 (0.03)	-0.16*** (0.03)
High UR	-1.15*** (0.17)	-0.51*** (0.08)	-0.41*** (0.08)	-0.03 (0.03)	-0.11*** (0.03)
Black \times High UR	0.07 (0.20)	0.09 (0.13)	0.03 (0.11)	-0.09* (0.05)	0.05 (0.05)
N	381,568	381,568	381,568	381,568	381,568
R2	0.04	0.02	0.02	0.00	0.00
Black mean					
White mean					

Standard errors in parentheses

* $p < .1$, ** $p < .05$, *** $p < .01$

Cyclical job-finding, 25-65 women

	(1) All	(2) Large	(3) Small	(4) Government	(5) Self
Black	-0.42*** (0.09)	0.07 (0.07)	-0.45*** (0.04)	0.09*** (0.03)	-0.07*** (0.02)
High UR	-0.69*** (0.11)	-0.25*** (0.05)	-0.25*** (0.04)	-0.06** (0.03)	-0.05*** (0.01)
Black \times High UR	-0.17 (0.15)	-0.26*** (0.09)	0.11 (0.07)	-0.05 (0.06)	0.02 (0.03)
N	707,141	707,141	707,141	707,141	707,141
R2	0.03	0.01	0.01	0.01	0.00
Black mean					
White mean					

Standard errors in parentheses

* $p < .1$, ** $p < .05$, *** $p < .01$

Cyclical job-finding, men

	(1) All	(2) Large	(3) Small	(4) Government	(5) Self
Black	-1.30*** (0.09)	-0.33*** (0.06)	-0.84*** (0.05)	-0.00 (0.02)	-0.11*** (0.02)
High UR	-0.77*** (0.11)	-0.33*** (0.05)	-0.28*** (0.05)	-0.02 (0.02)	-0.06*** (0.01)
Black \times High UR	-0.10 (0.14)	-0.11 (0.10)	0.04 (0.07)	-0.04 (0.04)	0.03 (0.03)
N	837,928	837,928	837,928	837,928	837,928
R2	0.05	0.02	0.02	0.00	0.00
Black mean	2.81	1.45	0.85	0.23	0.12
White mean	3.01	1.31	1.17	0.23	0.17

Standard errors in parentheses

* $p < .1$, ** $p < .05$, *** $p < .01$

Cyclical job-finding, women

	(1) All	(2) Large	(3) Small	(4) Government	(5) Self
Black	-0.36*** (0.07)	0.12** (0.05)	-0.41*** (0.03)	0.01 (0.02)	-0.06*** (0.01)
High UR	-0.53*** (0.07)	-0.21*** (0.03)	-0.18*** (0.03)	-0.05*** (0.02)	-0.03*** (0.01)
Black \times High UR	-0.29*** (0.10)	-0.31*** (0.07)	0.05 (0.04)	-0.03 (0.03)	0.02 (0.02)
N	1,388,861	1,388,861	1,388,861	1,388,861	1,388,861
R2	0.04	0.02	0.01	0.01	0.00
Black mean	2.53	1.40	0.66	0.31	0.07
White mean	2.01	0.85	0.68	0.27	0.10

Standard errors in parentheses

* $p < .1$, ** $p < .05$, *** $p < .01$

Cyclical job-finding, continuous gap

	(1) All	(2) Large	(3) Small	(4) Government	(5) Self
Black	-0.82*** (0.05)	-0.14*** (0.03)	-0.58*** (0.03)	-0.00 (0.01)	-0.07*** (0.01)
UR gap	-0.17*** (0.02)	-0.07*** (0.01)	-0.06*** (0.01)	-0.01*** (0.00)	-0.01*** (0.00)
Black \times UR gap	-0.05*** (0.02)	-0.06*** (0.01)	0.01 (0.01)	-0.01 (0.01)	0.01* (0.00)
N	2,226,789	2,226,789	2,226,789	2,226,789	2,226,789
R2	0.04	0.02	0.02	0.01	0.00
Black mean	2.65	1.42	0.74	0.28	0.09
White mean	2.39	1.03	0.87	0.26	0.13

Standard errors in parentheses

* $p < .1$, ** $p < .05$, *** $p < .01$

Cyclical job-finding, state UR

	(1) All	(2) Large	(3) Small	(4) Government	(5) Self
Black	-0.79*** (0.05)	-0.13*** (0.03)	-0.57*** (0.03)	0.00 (0.01)	-0.07*** (0.01)
State UR	-0.15*** (0.01)	-0.07*** (0.01)	-0.05*** (0.01)	-0.01*** (0.00)	-0.01*** (0.00)
Black \times State UR	-0.05*** (0.02)	-0.05*** (0.01)	0.00 (0.01)	-0.01 (0.01)	0.01** (0.00)
N	2,226,789	2,226,789	2,226,789	2,226,789	2,226,789
R2	0.04	0.02	0.02	0.01	0.00
Black mean	2.65	1.42	0.74	0.28	0.09
White mean	2.39	1.03	0.87	0.26	0.13

Standard errors in parentheses

* $p < .1$, ** $p < .05$, *** $p < .01$

Cyclical job-finding, UR below trend

	(1) All	(2) Large	(3) Small	(4) Government	(5) Self
Black	-0.85*** (0.06)	-0.19*** (0.04)	-0.56*** (0.03)	-0.01 (0.02)	-0.06*** (0.01)
Hot	0.36*** (0.09)	0.14*** (0.04)	0.13*** (0.03)	0.03*** (0.01)	0.02** (0.01)
Black \times Hot	0.01 (0.09)	0.08 (0.06)	-0.05 (0.04)	0.02 (0.03)	-0.03* (0.02)
N	2,226,789	2,226,789	2,226,789	2,226,789	2,226,789
R2	0.04	0.02	0.02	0.01	0.00
Black mean	2.65	1.42	0.74	0.28	0.09
White mean	2.39	1.03	0.87	0.26	0.13

Standard errors in parentheses

* $p < .1$, ** $p < .05$, *** $p < .01$

Cyclical large-firm job-finding, interactions

	(1)	(2)	(3)	(4)
Black	-0.07* (0.04)	-0.07* (0.04)	-0.13*** (0.04)	-0.14*** (0.04)
Black \times High UR	-0.24*** (0.06)	-0.24*** (0.07)	-0.09 (0.06)	-0.06 (0.06)
N	2,226,789	2,226,789	2,226,789	2,226,789
R2	0.02	0.02	0.02	0.02
Black mean	1.42	1.42	1.42	1.42
White mean	1.03	1.03	1.03	1.03
Interactions		Education	Highest sig	All

Standard errors in parentheses

* $p < .1$, ** $p < .05$, *** $p < .01$

Cyclical small-firm job-finding, interactions

	(1)	(2)	(3)	(4)
Black	-0.59*** (0.03)	-0.59*** (0.03)	-0.63*** (0.03)	-0.65*** (0.04)
Black \times High UR	0.04 (0.04)	0.03 (0.04)	0.15*** (0.04)	0.20*** (0.05)
N	2,226,789	2,226,789	2,226,789	2,226,789
R2	0.02	0.02	0.02	0.02
Black mean	0.74	0.74	0.74	0.74
White mean	0.87	0.87	0.87	0.87
Interactions		Education	Highest sig	All

Standard errors in parentheses

* $p < .1$, ** $p < .05$, *** $p < .01$

Simple counterfactual

	All	Large	Small	Government	Self
High UR	-0.62 (0.086)	-0.26 (0.038)	-0.22 (0.032)	-0.039 (0.014)	-0.041 (0.0084)
Black × High UR	-0.23 (0.092)	-0.24 (0.064)	0.035 (0.039)	-0.034 (0.028)	0.022 (0.016)
Redistribute High UR	-0.03	-0.07	0.05	-0.03	0.02
Outcome mean					
Black	2.65	1.42	0.74	0.28	0.09
White	2.39	1.03	0.87	0.26	0.13

Simple counterfactual

	All	Large	Small	Government	Self
High UR	-0.62 (0.086)	-0.26 (0.038)	-0.22 (0.032)	-0.039 (0.014)	-0.041 (0.0084)
Black \times High UR	-0.23 (0.092)	-0.24 (0.064)	0.035 (0.039)	-0.034 (0.028)	0.022 (0.016)
Redistribute High UR	-0.03	-0.07	0.05	-0.03	0.02
Redistribute High UR +Black \times High UR	-0.23	-0.18	-0.01	-0.05	0.01
Outcome mean					
Black	2.65	1.42	0.74	0.28	0.09
White	2.39	1.03	0.87	0.26	0.13

Cyclical large-firm separations, interactions

	(1)	(2)	(3)	(4)
Black	0.18*** (0.05)	0.18*** (0.05)	0.18*** (0.05)	0.17*** (0.05)
Black \times High UR	-0.11 (0.08)	-0.14* (0.08)	-0.12 (0.07)	-0.10 (0.08)
N	3,701,235	3,701,235	3,701,235	3,701,235
R2	0.01	0.01	0.01	0.01
Black mean	1.69	1.69	1.69	1.69
White mean	1.27	1.27	1.27	1.27
Interactions		Education	Highest sig	All

Standard errors in parentheses

* $p < .1$, ** $p < .05$, *** $p < .01$

Cyclical small-firm separations, interactions

	(1)	(2)	(3)	(4)
Black	0.27*** (0.07)	0.28*** (0.07)	0.28*** (0.07)	0.27*** (0.07)
Black \times High UR	-0.21 (0.14)	-0.22 (0.14)	-0.30** (0.14)	-0.25* (0.14)
N	3,701,235	3,701,235	3,701,235	3,701,235
R2	0.01	0.01	0.01	0.01
Black mean	2.20	2.20	2.20	2.20
White mean	1.79	1.79	1.79	1.79
Interactions		Education	Highest sig	All

Standard errors in parentheses

* $p < .1$, ** $p < .05$, *** $p < .01$

Cyclical separations

	(1) All	(2) Large	(3) Small	(4) Government	(5) Self
Black	0.09*** (0.03)	0.18*** (0.05)	0.27*** (0.07)	-0.30*** (0.04)	0.01 (0.07)
High UR	0.05 (0.04)	0.07 (0.05)	0.10* (0.06)	0.07 (0.08)	-0.01 (0.04)
Black × High UR	-0.08 (0.05)	-0.11 (0.08)	-0.21 (0.14)	0.05 (0.09)	0.29** (0.15)
N	3,701,235	3,701,235	3,701,235	3,701,235	3,701,235
R2	0.01	0.01	0.01	0.01	0.01
Black mean	1.60	1.69	2.20	0.82	0.82
White mean	1.30	1.27	1.79	0.96	0.47

SE in parentheses clustered by time. * $p < .1$, ** $p < .05$, *** $p < .01$

Units: percentage points. Sample aged 20 and older.

Cyclical separations (logit)

	(1) All	(2) Large	(3) Small	(4) Government	(5) Self
Black	0.07*** (0.02)	0.12*** (0.03)	0.12*** (0.03)	-0.31*** (0.05)	0.23** (0.09)
High UR	0.05 (0.03)	0.06 (0.04)	0.07* (0.04)	0.08 (0.09)	-0.06 (0.06)
Black \times High UR	-0.05 (0.03)	-0.07 (0.05)	-0.11 (0.07)	0.10 (0.10)	0.37** (0.17)
N	3,701,235	3,701,235	3,701,235	3,701,235	3,701,235
Pseudo R2	0.07	0.07	0.07	0.07	0.07
Black mean	1.60	1.69	2.20	0.82	0.82
White mean	1.30	1.27	1.79	0.96	0.47

SE in parentheses clustered by time. * $p < .1$, ** $p < .05$, *** $p < .01$

Cyclical separations, 25-65

	(1) All	(2) Large	(3) Small	(4) Government	(5) Self
Black	0.05* (0.03)	0.12*** (0.04)	0.25*** (0.07)	-0.26*** (0.04)	0.00 (0.07)
High UR	0.05 (0.04)	0.07 (0.04)	0.12* (0.06)	0.02 (0.07)	-0.01 (0.04)
Black \times High UR	-0.05 (0.05)	-0.07 (0.07)	-0.18 (0.13)	0.06 (0.08)	0.29* (0.15)
N	3,246,761	3,246,761	3,246,761	3,246,761	3,246,761
R2	0.01	0.01	0.01	0.01	0.01
Black mean					
White mean					

Standard errors in parentheses

* $p < .1$, ** $p < .05$, *** $p < .01$

Cyclical separations, 25-65 men

	(1) All	(2) Large	(3) Small	(4) Government	(5) Self
Black	0.05 (0.04)	0.04 (0.06)	0.29*** (0.11)	-0.19*** (0.06)	-0.01 (0.08)
High UR	0.13*** (0.04)	0.11** (0.05)	0.30*** (0.09)	0.09 (0.06)	0.02 (0.03)
Black \times High UR	0.01 (0.08)	0.09 (0.10)	-0.24 (0.21)	0.09 (0.13)	0.28 (0.17)
N	1,664,569	1,664,569	1,664,569	1,664,569	1,664,569
R2	0.01	0.01	0.01	0.01	0.01
Black mean					
White mean					

Standard errors in parentheses

* $p < .1$, ** $p < .05$, *** $p < .01$

Cyclical separations, 25-65 women

	(1) All	(2) Large	(3) Small	(4) Government	(5) Self
Black	0.02 (0.03)	0.16*** (0.05)	0.18** (0.09)	-0.32*** (0.06)	0.06 (0.12)
High UR	-0.04 (0.03)	0.02 (0.05)	-0.07 (0.06)	-0.04 (0.09)	-0.06 (0.07)
Black \times High UR	-0.07 (0.06)	-0.18* (0.10)	-0.08 (0.17)	0.07 (0.12)	0.29 (0.27)
N	1,582,192	1,582,192	1,582,192	1,582,192	1,582,192
R2	0.01	0.01	0.01	0.01	0.01
Black mean					
White mean					

Standard errors in parentheses

* $p < .1$, ** $p < .05$, *** $p < .01$

Cyclical separations, men

	(1) All	(2) Large	(3) Small	(4) Government	(5) Self
Black	0.08* (0.04)	0.06 (0.06)	0.31*** (0.10)	-0.28*** (0.06)	-0.02 (0.08)
High UR	0.14*** (0.05)	0.12** (0.06)	0.28*** (0.09)	0.17*** (0.07)	0.03 (0.04)
Black \times High UR	0.01 (0.07)	0.12 (0.10)	-0.25 (0.22)	0.07 (0.13)	0.28* (0.16)
N	1,900,483	1,900,483	1,900,483	1,900,483	1,900,483
R2	0.01	0.01	0.01	0.01	0.01
Black mean	1.52	1.55	2.19	0.71	0.65
White mean	1.17	1.14	1.75	0.79	0.35

Standard errors in parentheses

* $p < .1$, ** $p < .05$, *** $p < .01$

Cyclical separations, women

	(1) All	(2) Large	(3) Small	(4) Government	(5) Self
Black	0.08** (0.04)	0.25*** (0.06)	0.21** (0.09)	-0.33*** (0.06)	0.07 (0.13)
High UR	-0.04 (0.04)	0.02 (0.05)	-0.08 (0.06)	-0.02 (0.10)	-0.09 (0.06)
Black \times High UR	-0.13* (0.07)	-0.28*** (0.11)	-0.13 (0.16)	0.07 (0.12)	0.31 (0.26)
N	1,800,752	1,800,752	1,800,752	1,800,752	1,800,752
R2	0.01	0.01	0.01	0.01	0.01
Black mean	1.66	1.81	2.20	0.88	1.09
White mean	1.44	1.42	1.83	1.09	0.70

Standard errors in parentheses

* $p < .1$, ** $p < .05$, *** $p < .01$

Cyclical separations, continuous gap

	(1) All	(2) Large	(3) Small	(4) Government	(5) Self
Black	0.07*** (0.02)	0.14*** (0.04)	0.21*** (0.06)	-0.29*** (0.04)	0.10 (0.06)
UR gap	0.02** (0.01)	0.02* (0.01)	0.03** (0.01)	0.03 (0.02)	0.00 (0.01)
Black \times UR gap	-0.02 (0.01)	-0.03* (0.02)	-0.04 (0.03)	0.01 (0.02)	0.08** (0.03)
N	3,701,235	3,701,235	3,701,235	3,701,235	3,701,235
R2	0.01	0.01	0.01	0.01	0.01
Black mean	1.60	1.69	2.20	0.82	0.82
White mean	1.30	1.27	1.79	0.96	0.47

Standard errors in parentheses

* $p < .1$, ** $p < .05$, *** $p < .01$

Cyclical separations, state UR

	(1) All	(2) Large	(3) Small	(4) Government	(5) Self
Black	0.07*** (0.02)	0.14*** (0.04)	0.21*** (0.06)	-0.29*** (0.04)	0.09 (0.06)
State UR	0.03*** (0.01)	0.02*** (0.01)	0.05*** (0.01)	0.03* (0.02)	-0.01 (0.01)
Black \times State UR	-0.01 (0.01)	-0.02 (0.02)	-0.04 (0.03)	0.00 (0.02)	0.06** (0.03)
N	3,701,235	3,701,235	3,701,235	3,701,235	3,701,235
R2	0.01	0.01	0.01	0.01	0.01
Black mean	1.60	1.69	2.20	0.82	0.82
White mean	1.30	1.27	1.79	0.96	0.47

Standard errors in parentheses

* $p < .1$, ** $p < .05$, *** $p < .01$

Cyclical separations, UR below trend

	(1) All	(2) Large	(3) Small	(4) Government	(5) Self
Black	0.07** (0.04)	0.15*** (0.05)	0.14* (0.08)	-0.25*** (0.06)	0.26*** (0.09)
Hot	-0.10*** (0.03)	-0.11*** (0.04)	-0.12** (0.05)	-0.07 (0.07)	-0.06 (0.04)
Black \times Hot	-0.01 (0.05)	-0.01 (0.07)	0.16 (0.12)	-0.09 (0.08)	-0.37*** (0.12)
N	3,701,235	3,701,235	3,701,235	3,701,235	3,701,235
R2	0.01	0.01	0.01	0.01	0.01
Black mean	1.60	1.69	2.20	0.82	0.82
White mean	1.30	1.27	1.79	0.96	0.47

Standard errors in parentheses

* $p < .1$, ** $p < .05$, *** $p < .01$

Cyclical separations by type

	(1)		(2)	
	Voluntary		Involuntary	
	Large ×	Small ×	Large ×	Small ×
Intercept	-0.07 (0.08)		-0.04 (0.06)	
Black	-0.48*** (0.12)	-0.71*** (0.18)	0.37*** (0.09)	0.56*** (0.16)
HighUR	-0.82*** (0.07)	-0.99*** (0.10)	0.63*** (0.06)	0.92*** (0.09)
Black × HighUR	-0.26 (0.17)	-0.08 (0.28)	-0.06 (0.16)	-0.06 (0.30)
N	1,556,118		1,556,118	
R2	0.02		0.01	
Black mean	2.31		1.93	
White mean	2.41		1.48	

SE in parentheses clustered by time. * $p < .1$, ** $p < .05$, *** $p < .01$

Units: percentage points. Sample aged 20 and older.

Largest decrease coming from large firms

$$\Delta_{B-W} \frac{\partial \mathbf{e}_t}{\partial \varepsilon_t} = \sum_j \Delta_{B-W} \left((1 - \mathbf{e}_{t-1}) \frac{\partial \lambda_t^{Nj}}{\partial \varepsilon_t} - s_{jt-1} \mathbf{e}_{t-1} \frac{\partial \lambda_t^{jN}}{\partial \varepsilon_t} \right)$$

Contributions to aggregate elasticity gap

	Total	Inflows (N→E)		Outflows (E→N)	
		Weight	Response	Weight	Response
Large	-1.57	-0.40	-2.44	-0.04	1.31
Small	0.87	-0.34	0.35	0.10	0.77
Govt	-0.69	-0.07	-0.44	-0.02	-0.15
Self	0.09	-0.06	0.33	-0.01	-0.17
Total	-1.29	-0.93	-2.23	-0.04	1.91

Units: basis points in response to a 1ppt increase in unemployment rate above mean

Decomposition

$$\begin{aligned}\Delta_{B-W} \frac{\partial \mathbf{e}_t}{\partial \varepsilon_t} &= \sum_j \Delta_{B-W} \left((1 - \mathbf{e}_{gt-1}) \frac{\partial \lambda_{gt}^{Nj}}{\partial \varepsilon_t} - \mathbf{s}_{gt-1}^j \mathbf{e}_{gt-1} \frac{\partial \lambda_{gt}^{jN}}{\partial \varepsilon_t} \right) \\ &= \sum_j \Delta_{B-W} (1 - \mathbf{e}_{gt-1}) \times \frac{\partial \lambda_{gt}^{Nj}}{\partial \varepsilon_t} + (1 - \mathbf{e}_{gt-1}) \times \Delta_{B-W} \frac{\partial \lambda_{gt}^{Nj}}{\partial \varepsilon_t} \\ &\quad + \Delta_{B-W} \mathbf{s}_{gt-1}^j \mathbf{e}_{gt-1} \times \frac{\partial \lambda_{gt}^{jN}}{\partial \varepsilon_t} + \mathbf{s}_{gt-1}^j \mathbf{e}_{gt-1} \times \Delta_{B-W} \frac{\partial \lambda_{gt}^{jN}}{\partial \varepsilon_t}\end{aligned}$$

Equilibrium

1. Firms maximize profits

- Choose vacancies and hiring standards \implies employment/output
- Pay wages

► Value function

2. Workers accept jobs

- Black workers face lower probability of entering employment \implies lower utility from being non-employed

► Value function

3. Wages

- Bargained
- Differences in utility of nonemployment \implies racial wage gap

► Bargaining rule

► Firm solution

Details

Let $F(x)$ be exogenous distribution of match quality (productivity)

x^* posterior belief about productivity conditional on signal and signal quality (p)

$$(1 - p)\mathbb{E}[x] \leq x^* \leq p + (1 - p)\mathbb{E}[x]$$

Posterior distribution

$$F(x^*|p) = F\left(\frac{x^* - (1 - p)\mathbb{E}[x]}{p}\right)$$

Conditional expectation

$$\mathbb{E}[x|x > x^*, p] = \frac{\int_{x^*}^1 x dF(x|p)}{1 - F(x^*|p)}$$

Wage bargaining

- Bargain over firm surplus *after* vacancy costs
- 4 types of workers: productive $\{n_B, n_W\}$, new hires $\{h_B, h_W\}$

Bargaining rule:

$$\phi D_{t,n_g} = (1 - \phi)(V_t^e(g, z) - V_t^u(g))$$

$$\phi D_{t,h_g} = (1 - \phi)(V_t^h(g, z) - V_t^u(g))$$

ϕ : worker bargaining power

D_t : firm value function excluding vacancy costs

Wage solution

$$w^n(n', z, g) = \underbrace{\frac{\alpha\phi}{1-\phi+\alpha\phi} a_t z n'^{\alpha-1}}_{\text{share of marginal product}} + \underbrace{(1-\phi)(b + \Omega_t(g))}_{\text{compensation outside option}}$$

$$w^h(x_g, n', z, g) = \underbrace{\mathbb{E}[x|x > x_g, p_{gz}]}_{\text{productivity}} \underbrace{\left(\frac{\alpha\phi}{1-\phi+\alpha\phi} a_t z n'^{\alpha-1} \right)}_{\text{share of marginal product}} + \underbrace{(1-\phi)(b + \Omega_t(g))}_{\text{compensation outside option}}$$

- $\Omega_t(g)$: nonemployed worker's value of search
- Lower prob of being hired $\rightarrow \Omega_t(B) < \Omega_t(W)$
- Extensive research on Black-white earnings gap, Lang & Lehmann (2012)

Wages without discrimination

Assume firm cannot observe group of worker when bargaining

$$w^n(n', z) = \underbrace{\frac{\alpha\phi}{1-\phi+\alpha\phi} a_t z n'^{\alpha-1}}_{\text{share of marginal product}} + (1-\phi) \underbrace{\left(b + \sum_g \frac{n_g}{n} \Omega_t(g) \right)}_{\text{compensation outside option}}$$

$$w^h(x_g, n', z) = \underbrace{\mathbb{E}[x | x > x_g, p_{gz}]}_{\text{productivity}} \underbrace{\left(\frac{\alpha\phi}{1-\phi+\alpha\phi} a_t z n'^{\alpha-1} \right)}_{\text{share of marginal product}} + (1-\phi) \underbrace{\left(b + \sum_g \frac{h_g}{h} \Omega_t(g) \right)}_{\text{compensation outside option}}$$

- $\Omega_t(g)$: nonemployed worker's value of search
- Firm's problem is the same as case where they observe worker group
- But GE effects are smaller $\rightarrow \Omega_t(B) - \Omega_t(W)$ smaller in absolute value

Relative hiring selectivity

Marginal cost = marginal benefit

$$\underbrace{\frac{(1 - \phi)(b + \Omega_t(g))}{x_g^*}}_{\text{marg. hire compensation}} + \underbrace{\beta(1 - \delta)\mathbb{E}_t[(1 - \phi)(b + \Omega_{t+1}(g))]}_{\text{marg. incumbent compensation } t+1}$$

$$= \underbrace{\frac{\alpha(1 - \phi)}{1 - \phi + \alpha\phi} a_t z(n')^{\alpha-1}}_{\text{MPL net wages}} + \underbrace{\beta(1 - \delta)\mathbb{E}_t \left[\frac{(1 - \phi)(b + \Omega_{t+1}(g))}{x_g^{*'}} \right]}_{\text{marg. hire compensation } t+1}$$

Relationship between hiring thresholds, x_B^* and x_W^* , is a function of relative outside options, $\Omega_t(B)$ and $\Omega_t(W)$, and parameters

Relative hiring selectivity

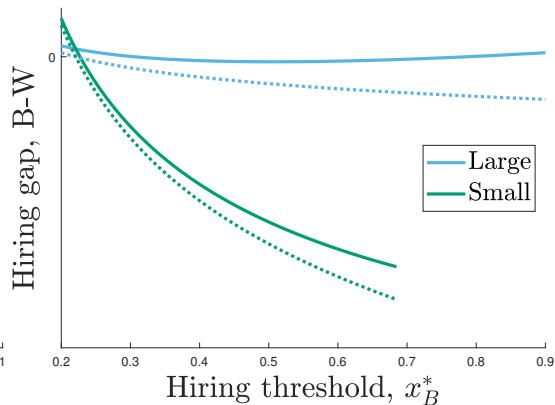
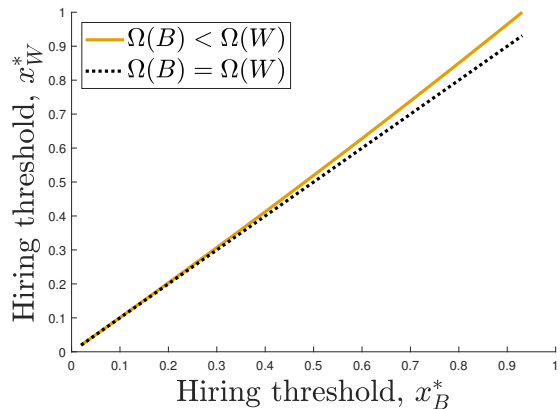
Marginal cost = marginal benefit

$$\underbrace{\frac{(1-\phi)(b + \Omega_t(g))}{x_g^*}}_{\text{marg. hire compensation}} + \underbrace{\beta(1-\delta)\mathbb{E}_t[(1-\phi)(b + \Omega_{t+1}(g))]}_{\text{marg. incumbent compensation } t+1}$$

$$= \underbrace{\frac{\alpha(1-\phi)}{1-\phi+\alpha\phi} a_t z (n')^{\alpha-1}}_{\text{MPL net wages}} + \underbrace{\beta(1-\delta)\mathbb{E}_t \left[\frac{(1-\phi)(b + \Omega_{t+1}(g))}{x_g^{*'}} \right]}_{\text{marg. hire compensation } t+1}$$

Relationship between hiring thresholds, x_B^* and x_W^* , is a function of relative outside options, $\Omega_t(B)$ and $\Omega_t(W)$, and parameters

Endogenous wages attenuate hiring gap



Equilibrium definition

A recursive competitive equilibrium for this economy is a list of functions:

- value function for firms, $J(n_B, n_W, z)$
- decision rules for vacancies and hiring standards, $v(z)$, $x(z, g)$
- value functions for workers, $V^e(z, g)$, $V^h(z, g)$, and $V^u(g)$
- wage functions, $w^n(n', z, g)$ and $w^h(x_g, n', z, g)$
- worker outside option functions $\Omega(g)$

and

- market tightness θ
- a stationary distribution of employment across firms $\Gamma(z)$
- a stationary distribution of minority workers in unemployment and each employer type $\lambda(u)$, $\lambda(z)$

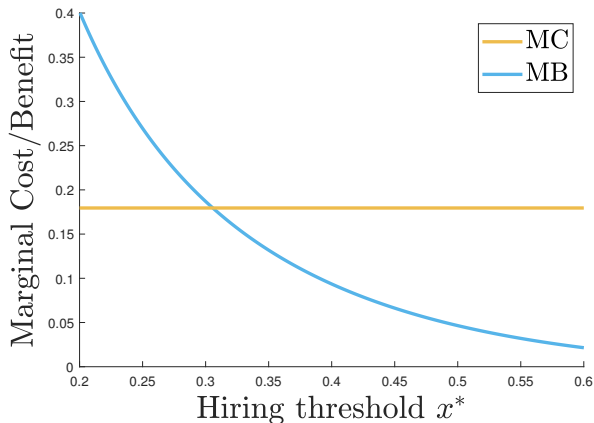
such that...

Equilibrium definition (continued)

1. *Firm optimization*: Given θ , $\lambda(u)$, $\Omega(g)$, $w^n(n', z, g)$, $w^h(x_g, n', z, g)$, the set of decision rules $v(z)$, $x(z, g)$ solve the firm problem
2. *Worker optimization*: Given θ , $\Gamma(z)$, $w^n(n', z, g)$, $w^h(x_g, n', z, g)$, and $v(z)$, $x(z, g)$, worker value functions $V^e(z, g)$, $V^h(z, g)$, and $V^u(g)$ solve the worker problem and $\Omega(g)$ is consistent with value functions
3. *Wage bargaining*: $w^n(n', z, g)$, $w^h(x_g, n', z, g)$ solve the bargaining problem
4. *Consistency*: The stationary distribution of employment $\Gamma(z)$ is consistent with firm optimization
5. *Market clearing*: The labor market clears and the distribution of minority workers across unemployment and employer types, $\lambda(u)$, $\lambda(z)$ is consistent with firm optimization

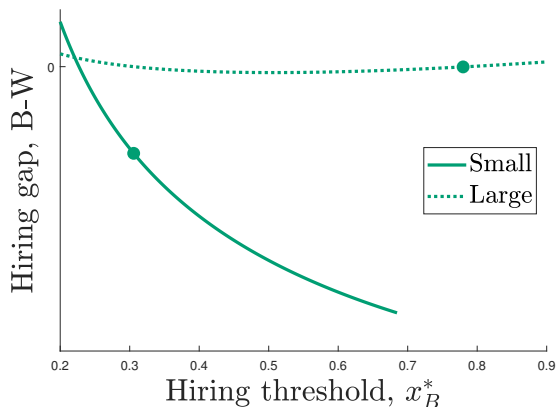
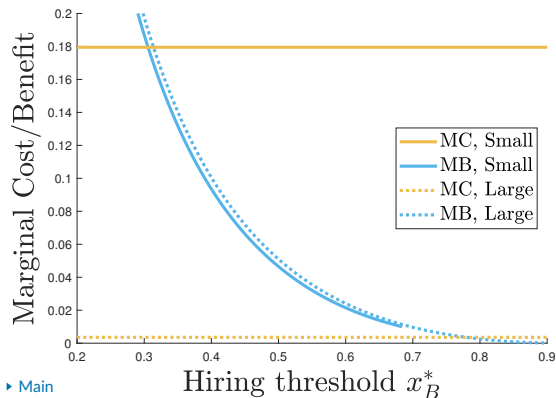
Optimal hiring threshold where MC = MB

$$\underbrace{\frac{c_v}{q(\theta)}}_{\text{MC}} = \underbrace{(1 - \phi)(b + \Omega_t)(1 - F(x^*|p))\mathbb{E}\left[\frac{x - x^*}{x^*} \mid x > x^*, p\right]}_{\text{MB}}$$

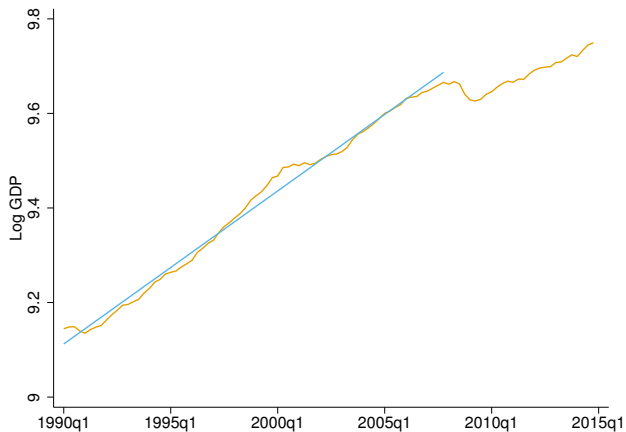


Firm heterogeneity in hiring strategy

$$\underbrace{\frac{c_v(z)}{q(\theta)}}_{MC} = \underbrace{\sum_g \frac{u_{gt}}{u_t} (1 - F(x_g^* | p_{gz})) \left(\mu_{gt} \mathbb{E} \left[\frac{x - x_g}{x_g} \middle| x > x_g^*, p_{gz} \right] - w^h(x_g^*, n', g, z) \right)}_{MB}$$



Great Recession



Fixed parameters

Parameter	Meaning	Value	Source
β	Discount factor	0.996	Quarterly interest rate 0.012
α	Production curvature	0.677	Baydur (2017)
ψ	Matching elasticity	0.6	Petrongolo & Pissarides (2001)
v	Share of large firms	0.02	Axtell (2001)
a	Aggregate productivity	4.2	Relative sizes
π	Minority share population	0.133	SIPP
ζ	Matching scale	.342	Avg. hired share 0.08
p_W	Majority signal quality	0.99	Normalization

Functional form assumptions

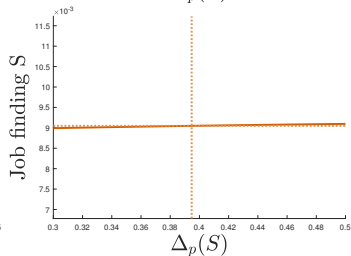
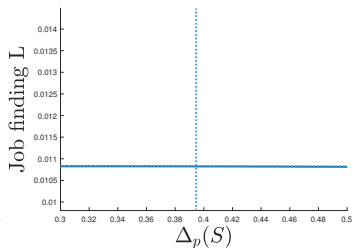
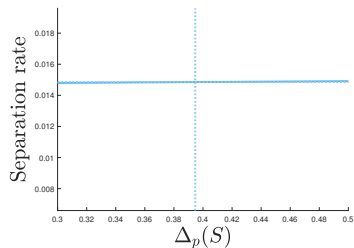
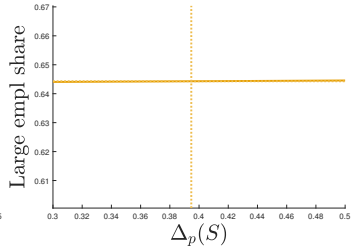
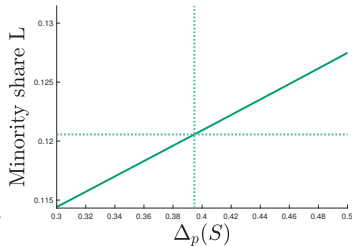
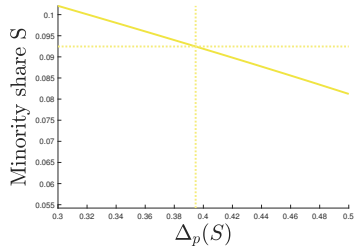
Match quality distribution

$$F(x) = x^{1/(\gamma-1)}$$

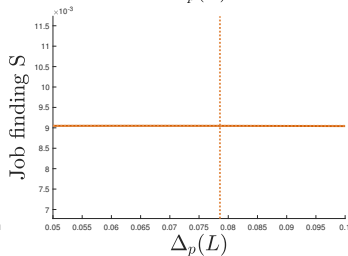
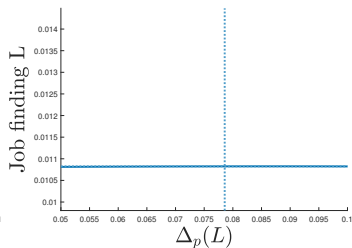
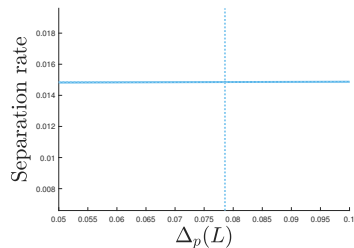
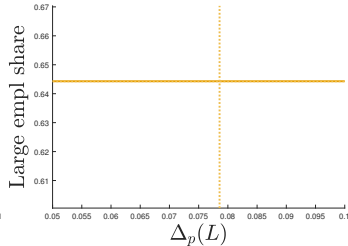
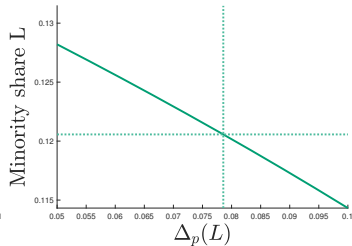
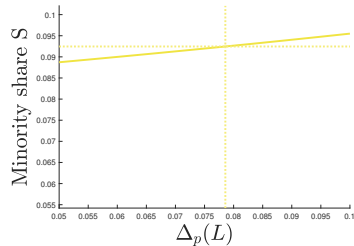
Matching function

$$q(\theta) = \zeta \theta^{-\psi}$$

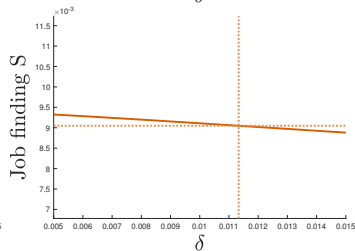
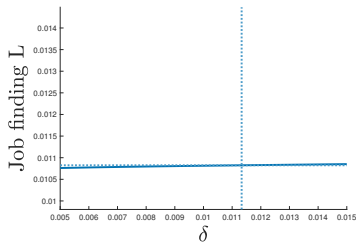
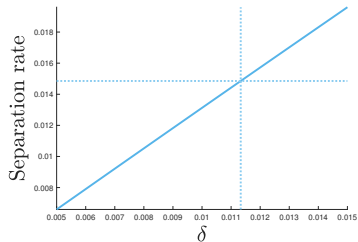
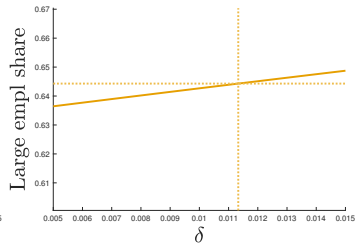
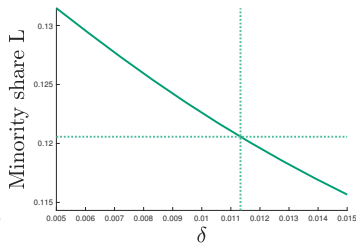
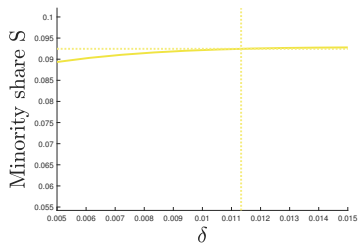
Identification: Signal gap, small



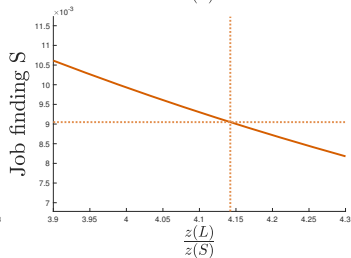
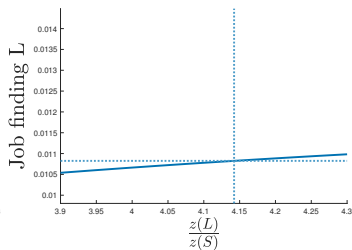
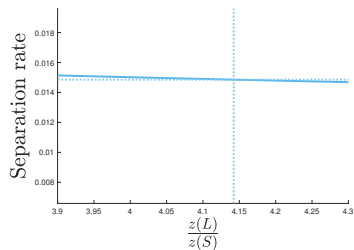
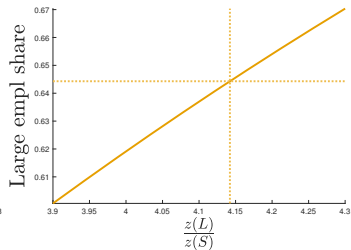
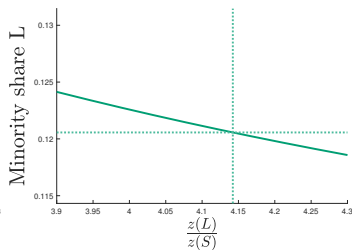
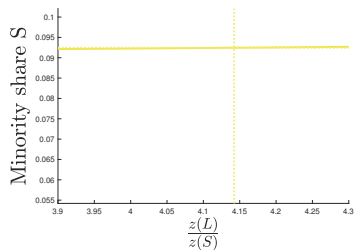
Identification: Signal gap, large



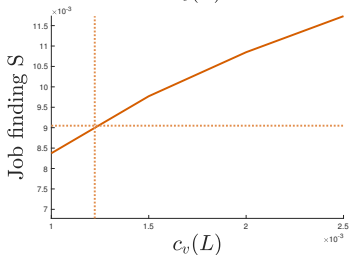
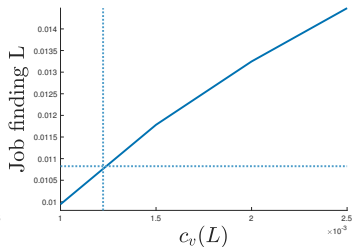
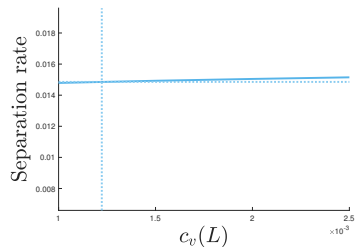
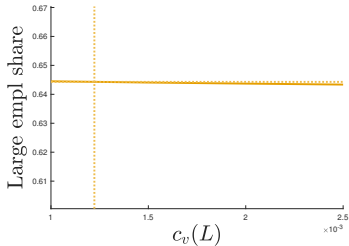
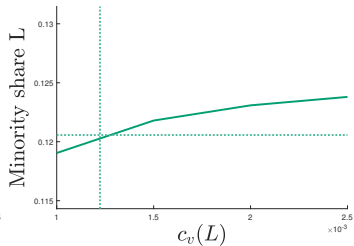
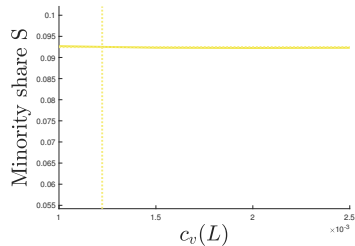
Identification: Exogenous separation rate



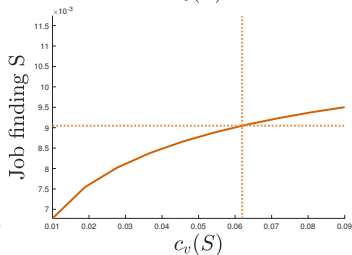
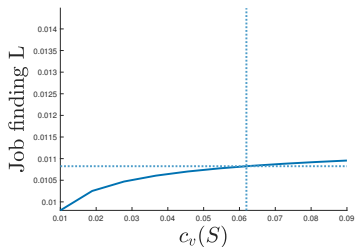
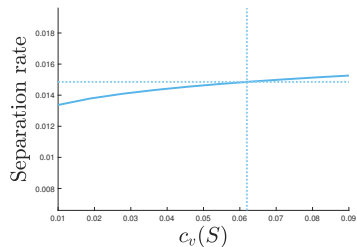
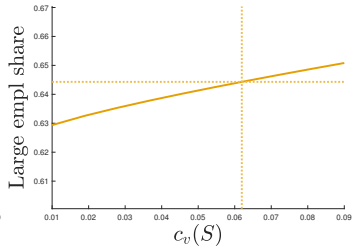
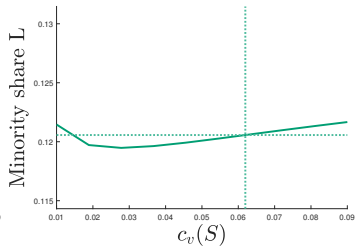
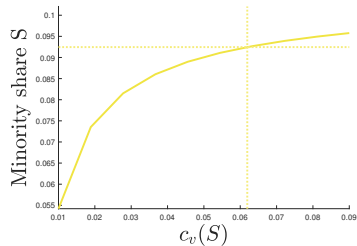
Identification: Relative productivity, large



Identification: Marginal vacancy cost, large

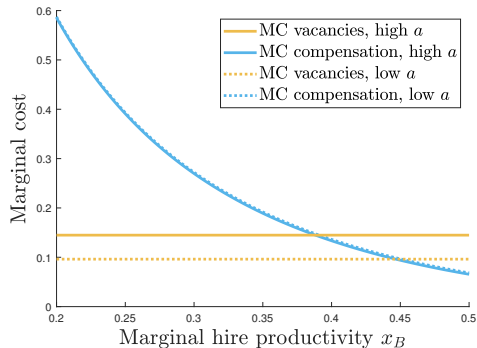


Identification: Marginal vacancy cost, small

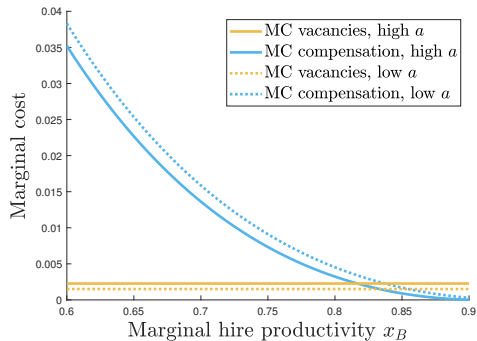


Change in selectivity with aggregate productivity

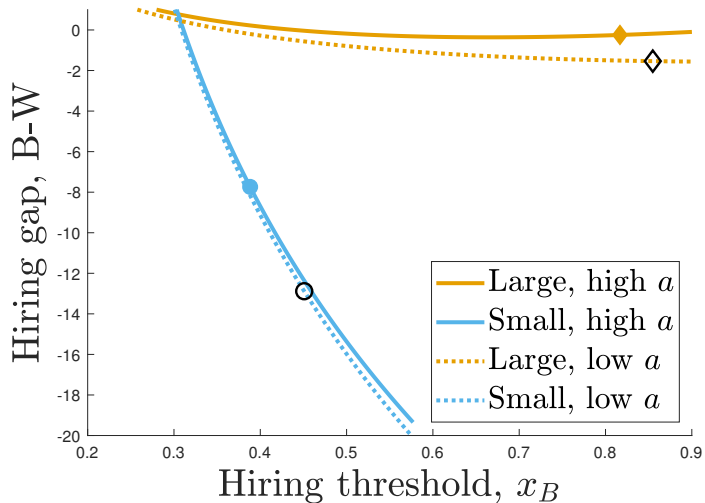
Small firm



Large firm



Hiring gap across firms



Empirical counterpart

	(1) Large Job-finding	(2) Small Job-finding	(3) Large Sep	(4) Small Sep	(5) Large share of empl	(6) Empl
Conditional gaps:						
Black	-0.21 (0.04)	-0.70 (0.03)	0.18 (0.04)	0.28 (0.08)	10.26 (0.44)	-6.22 (0.35)
High UR	-0.49 (0.02)	-0.39 (0.02)	0.07 (0.02)	0.11 (0.04)	0.92 (0.27)	-2.77 (0.17)
Black \times High UR	-0.28 (0.06)	0.01 (0.04)	-0.11 (0.07)	-0.20 (0.14)	-0.29 (0.69)	-0.99 (0.53)
Reference group mean						
White, Low UR	1.37 (0.02)	1.17 (0.01)	1.40 (0.01)	1.53 (0.02)	62.86 (0.15)	57.35 (0.15)

Empirical counterpart

	(1) Large Job-finding	(2) Small Job-finding	(3) Large Sep	(4) Small Sep	(5) Large share of empl	(6) Empl
Conditional gaps:						
Black	-0.21 (0.04)	-0.70 (0.03)	0.18 (0.04)	0.28 (0.08)	10.26 (0.44)	-6.22 (0.35)
High UR	-0.49 (0.02)	-0.39 (0.02)	0.07 (0.02)	0.11 (0.04)	0.92 (0.27)	-2.77 (0.17)
Black \times High UR	-0.28 (0.06)	0.01 (0.04)	-0.11 (0.07)	-0.20 (0.14)	-0.29 (0.69)	-0.99 (0.53)
Reference group mean						
White, Low UR	1.37 (0.02)	1.17 (0.01)	1.40 (0.01)	1.53 (0.02)	62.86 (0.15)	57.35 (0.15)

Job-finding gap components

	Total gap	Matching rate	Vacancy share	Hiring gap
Large firm				
High a	-0.07	0.30	0.888	-0.25
Low a	-0.31	0.23	0.894	-1.54
Small firm				
High a	-0.26	0.30	0.132	-7.74
Low a	-0.31	0.23	0.127	-12.88