

The Dynamics of Referral Hiring and Racial Inequality: Evidence from Brazil

Conrad Miller¹ Ian Schmutte²

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¹University of California, Berkeley and NBER

²University of Georgia

Referral Networks and Racial Inequality

(How) does referral-based hiring contribute to racial inequality in the labor market?

- ▶ Referrals are widely used in hiring

Ioannides and Loury (2004); Burks et al. (2015); Topa (2019)

- ▶ Alleviate information frictions for firms and workers

Montgomery (1991); Simon and Warner (1992); Dustmann et al. (2016)

- ▶ *Homophily* affects access to referral opportunities

Calvo-Armengol and Jackson (2004); Bolte et al. (2020); Okafor (2020)

- ▶ Racial segregation / homophily in particular

McPherson et al. (2001)

⇒ *Referral hiring can drive racial disparities in labor demand*

This Paper: Dynamic Effects of Referral Hiring

- ▶ Prior work: referral hires share characteristics of incumbent workers

(e.g., Petersen et al., 2000; Fernandez and Fernandez-Mateo, 2006; Dustmann et al., 2016)

- ▶ We emphasize dynamic effects over firm's life-cycle

- ▶ **Framework:** Job search model

1. Firms hire through referrals and formal methods
2. Referral networks are racially segregated
3. Firms are more informed about match quality of referred job seekers
4. At least some referrals are made by non-referred employees

Test model predictions using employer-employee data from Brazil (RAIS)

1. Firms with white founders are more likely to hire white employees than comparable firms with nonwhite founders
2. Racial composition of hires converges with cumulative hires
3. Firms are less likely to dismiss recent hires of the same race as the firm's founder
4. Racial differences in dismissal rates dissipate as cumulative hires increase

Preview of Results

- ▶ Few firms make enough hires to reach convergence
- ▶ Large racial disparities in entrepreneurship
- ▶ $\Rightarrow$ referral hiring helps explain why nonwhite workers:
 - ▶ are dismissed by employer at higher rates
 - ▶ have lower seniority
 - ▶ sort to larger employers

- 1 Model
- 2 Context and data
- 3 Evidence
 - Referral effects
 - Hiring dynamics
 - Turnover dynamics
 - Alternative interpretations
- 4 Implications for racial inequality

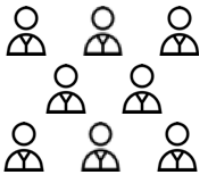
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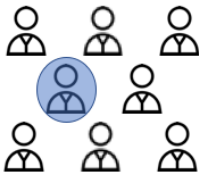
Morgan and Várdy (2009), Dustmann et al. (2016)

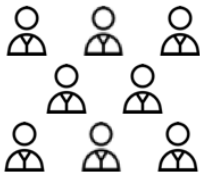
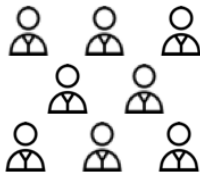
- ▶ Firm fills n vacancies sequentially;
- ▶ Matching:
 - ▶ with prob. ω , match with referred candidate;
 - ▶ Match-specific productivity, $\theta \in \{0, 1\}$;
 - ▶ $\theta = 1$ indicates candidate can perform job;
 - ▶ $Pr(\theta = 1)$ independent of pool and race
 - ▶ Incumbents refer same-race candidates

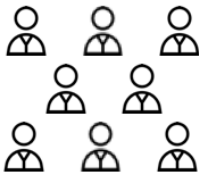
Stages

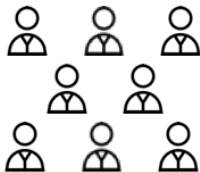
- ▶ Before hire: observe a signal of match productivity; more precise signal for referrals
 - ▶ Firm can improve non-referred signal at fixed cost (Holzer, 1987; Marsden, 1994; Rebien et al., 2020)
- ▶ If hired, they learn θ in probationary period; firm decides whether to retain
 - ▶ Morgan and Várdy (2009):
 - ▶ referral hires less likely to be dismissed;
 - ▶ if firm sufficiently selective, referral share decreasing in n
- ▶ If firm retains hire, it moves on to next vacancy; otherwise, repeat process











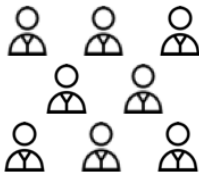
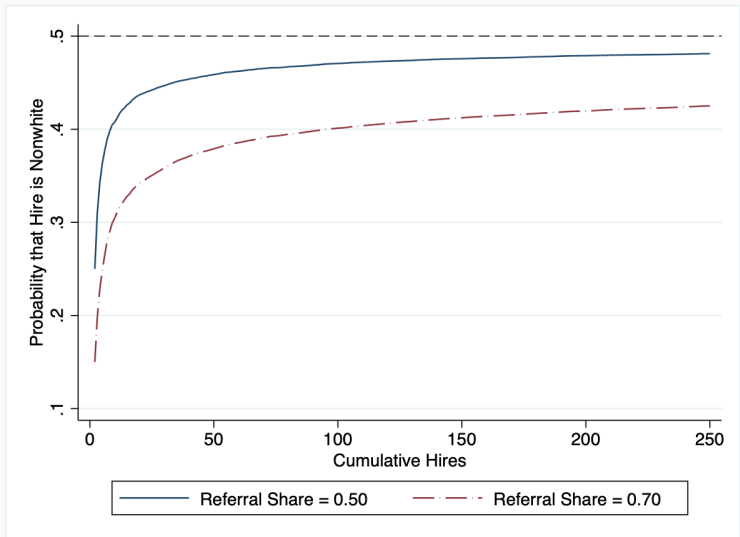


Figure 1: Simulated Nonwhite Share of Hires, White Founder



Empirical Predictions

1. Racial composition of hires at firms with white and nonwhite founders converge as cumulative hires increase.
2. Referral hires have lower dismissal rates than external market hires.
3. The referral dismissal advantage is decreasing in job spell tenure.
4. Racial differences in dismissal rates dissipate with cumulative hires.
5. Conditional on cumulative hires, racial differences in dismissal rates are decreasing in job spell tenure.

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Context: Race in Brazil

- ▶ Racial identity tied to skin color (Telles, 2004)
- ▶ Census categories:

Portuguese	English	Share
Branca	"White"	55.71
Pardo	"Brown"	36.05
Preto	"Black"	7.54
Amarelo	"Yellow"	0.50
Indigeno	"Indigenous"	0.21

Source: PNAD, 2009

- ▶ we group *pardo* and *preto* workers as 'nonwhite'
- ▶ Wage and unemployment rate gaps are about 30%
- ▶ Limited anti-discrimination laws; viewed as weak
 - ▶ No legislation mandating racial diversity in the private sector

Relação Anual de Informações Sociais (RAIS) 2003-2017

- ▶ Employer-employee data on formal sector jobs,
- ▶ Includes:
 - ▶ **Job characteristics:** wage, hours, occupation, start/end date
 - ▶ **Plant characteristics:** industry, size, location
 - ▶ **Worker characteristics:** education, race, gender
- ▶ Excludes large informal sector
 - ▶ Similar selection by race (Gerard et al. 2020)
- ▶ Sample restrictions for new hires:
 - ▶ Workers contracted for at least 30 hours per week
 - ▶ Ages 18 to 65
 - ▶ Exclude public and temporary contracts

	All Employees			Recent Hires		
	Pooled (1)	White (2)	Nonwhite (3)	Pooled (4)	White (5)	Nonwhite (6)
Nonwhite (%)	36.5	0.0	100.0	39.0	0.0	100.0
Log Wage	2.006 (0.674)	2.079 (0.713)	1.878 (0.581)	1.851 (0.553)	1.900 (0.582)	1.775 (0.493)
Male (%)	66.3	64.3	69.9	67.4	64.8	71.4
Age	33.7	34.0	33.1	30.9	31.1	30.7
< HS	30.4	28.7	33.5	28.4	25.9	32.3
HS Grad	57.2	56.3	58.8	61.7	61.8	61.4
College Grad	12.4	15.0	7.7	9.9	12.2	6.3
N Worker-Year Obs.	688m	437m	251m	254m	155m	99m

Relação Anual de Informações Sociais (RAIS) 2003–2017. We limit the sample to the jobs of men and women between the ages of 18 and 65 on private sector, indeterminate length contracts for at least 30 hours per week.

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Support for Assumptions about Referral Behavior

- ▶ We make three key assumptions about referral behavior:
 - ▶ Referrals are an important factor in hiring outcomes
 - ▶ Incumbents (tend to) refer same-race referral candidates
 - ▶ Referral share of hires is declining in employer size
- ▶ We provide empirical support for both assumptions

Evidence on Referral Behavior

- ▶ We proxy for social connections using information on past co-working relationships

Cingano and Rosolia (2012); Kramarz and Thesmar (2013); Hensvik and Skans (2016); Eliason et al. (2020)

- ▶ Identification strategy 1 (Eliason et al., 2020)
 - ▶ Compare workers that separate from the same plant, j , in the same year
 - ▶ Measure change in probability of being hired in any other plant k ...
 - ▶ ... when a social connection (past co-worker) is present

Evidence on Referral Behavior

- ▶ Identification strategy 2 (Hensvik and Skans, 2016, sort of)
 - ▶ 'placebo' social connections: pairs that worked in the same plant, but not at the same time.
 - ▶ Compare probability of being hired in plant k ...
 - ▶ for workers with true versus placebo connections
- ▶ Define *coworker overlap*
 - ▶ positive: number of months two workers were previously employed in the same job (plant-occupation)
 - ▶ negative: number of months between job spells for two workers that both held the same job in the past

Figure 2: True Coworker Connections Relative to Placebo Connections

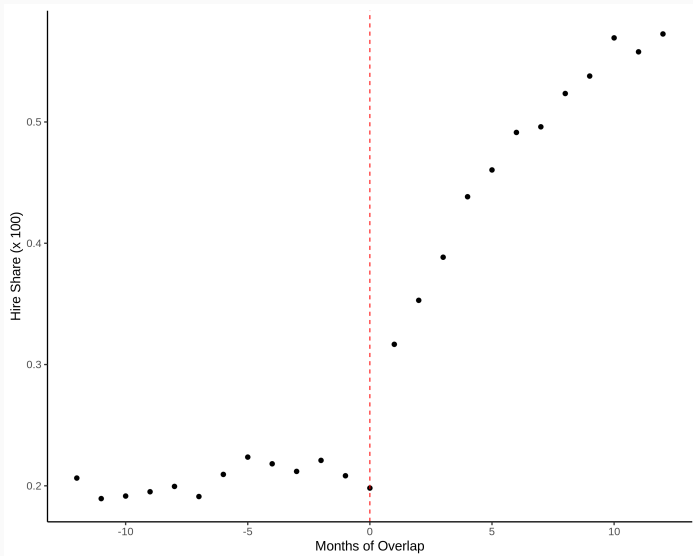
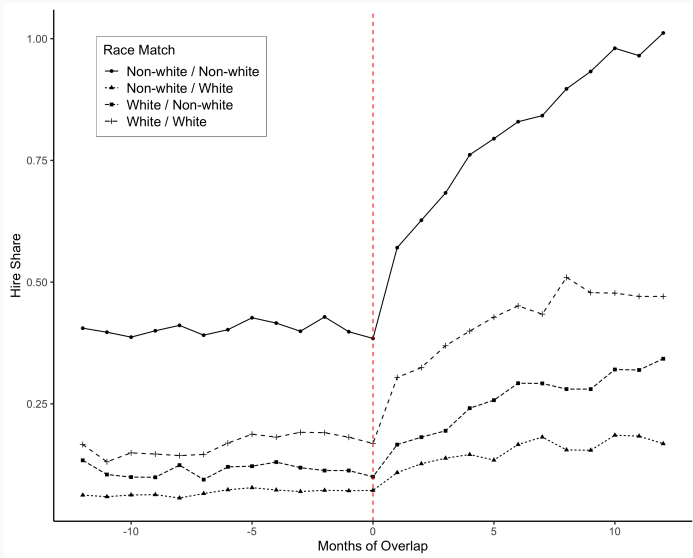


Figure 3: Hiring Share by Coworker Overlap by Incumbent and Job Seeker Race



Measuring Referral Effects

- ▶ we estimate the dyadic model Eliason et al. (2020)

$$P_{ijk} = \alpha_{jk} + X_{ij}\beta + \lambda C_{ijk} + \lambda^* A_{ijk} + \varepsilon_{ijk}.$$

- ▶ i denotes a worker who separates from plant j
- ▶ $P_{ijk} = 1$ if i moves from origin j to destination k
- ▶ $C_{ijk} = 1$ if i has a true social connection to some incumbent employee at destination k
- ▶ $A_{ijk} = 1$ if i has any connection at k (true or placebo)
- ▶ α_{jk} origin-destination pair fixed effects

Table 1: Referral Effects Overall and by Race Match Displaced

	Overall			Race Match
	(1)	(2)	(3)	(4)
True Link	0.182 (0.003)	0.222 (0.004)	0.117 (0.003)	
Any Link		0.097 (0.004)	0.066 (0.002)	
Race Match × True Link				
Nonwhite / Nonwhite				0.192 (0.007)
Nonwhite / White				0.025 (0.004)
White / Nonwhite				0.020 (0.007)
White / White				0.136 (0.006)
Dep. Var. Mean.	0.084	0.084	0.084	0.084
Estab. Pair FE	✓		✓	✓
Placebo Link Control		✓	✓	✓
Num. Estab. Pairs		23,026,153		
Number of Obs.		303,338,866		

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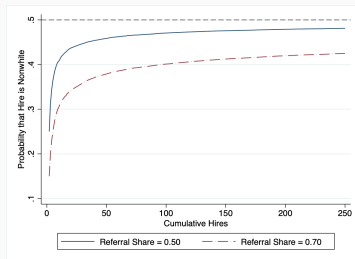
Racial Composition Converges with Cumulative Hires

Prediction: as cumulative hires increase, composition of hires less correlated with race of founder

- ▶ Sample: HQ estabs of entrant firms; < 50 employees in first year

Descriptive Stats

- ▶ Founder race: (1) race of top-paid manager at entry; (2) race of owners



Racial Composition Converges with Cumulative Hires

$$\log(E(\text{NONWHITE}_{it}|\cdot)) = \sum_n \sum_r \eta^{n,r} \times \mathbf{1}_{\{N(J,t)=n\}} \times \mathbf{1}_{\{R(J)=r\}} \\ + \tau_t + \mu_m(J(i,t)) + \omega_o(i,t) + \epsilon_{it}$$

- ▶ i indexes worker, t indexes year, $J(i, t)$ indexes firm
- ▶ $R(J) \in \{\text{white}, \text{nonwhite}\}$
- ▶ $N(J, t)$ indexes cumulative hires to date
- ▶ τ_t are year fixed effects
- ▶ $\mu_m(J)$ are micro region fixed effects
- ▶ $\omega_o(i,t)$ are 2-digit occupation fixed effects
- ▶ Poisson quasi maximum likelihood (Wooldridge, 1999; Correia et al., 2020)

Figure 4: Nonwhite Share of Hires Converges with Cumulative Hires

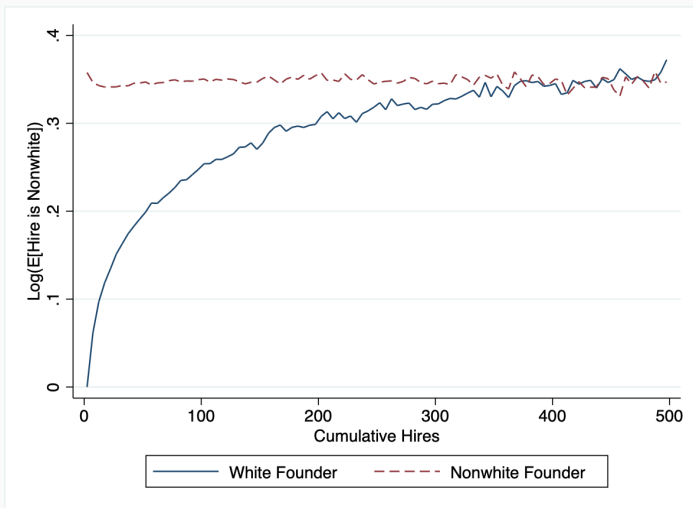
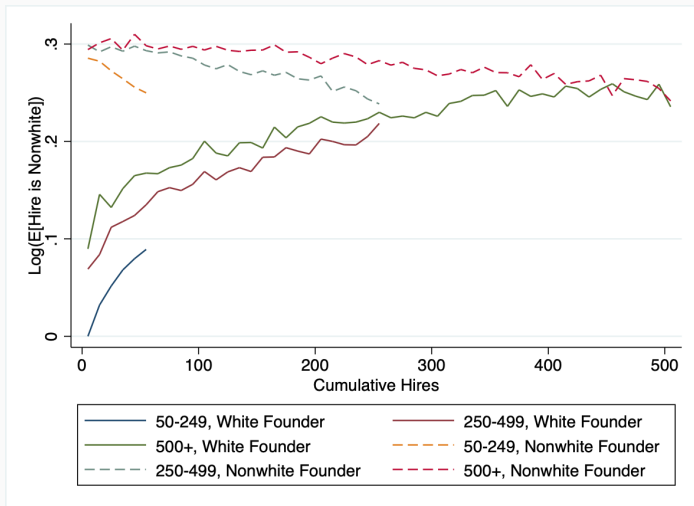


Figure 5: Nonwhite Share of Hires Converges with Cumulative Hires by Total Hires



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Evaluating Turnover Predictions

Predictions:

- ▶ Referral hires have lower dismissal rates
- ▶ Referral advantage is decreasing in job tenure
- ▶ Racial gap in dismissal dissipates with cumulative hires
- ▶ Racial gap in dismissal is decreasing in job tenure (given hires)

Empirical Strategy

- ▶ Problem: Dismissal correlated with unobserved determinants of referral-based hiring
- ▶ Idea: Use discontinuity arising from Brazilian EPL

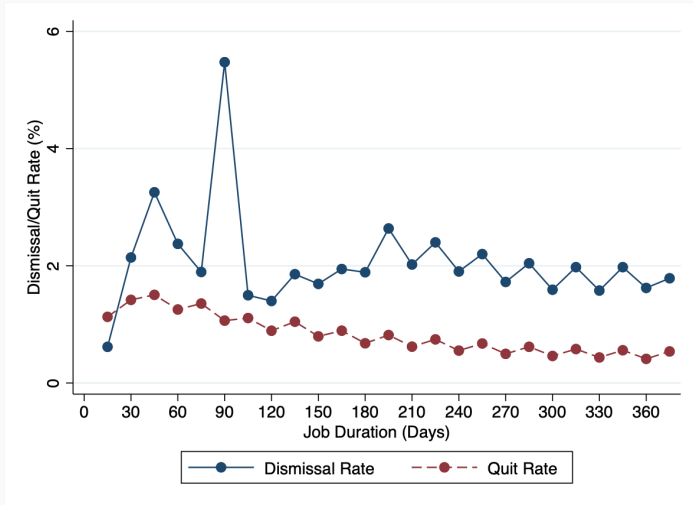
Employment Protections in Brazil

Employees entitled to:

- ▶ Yearly bonuses equivalent to one month's salary
- ▶ Vacation pay
- ▶ At least 30 days' prior notice of any separation
- ▶ Severance pay (guaranteed for those dismissed without cause)
- ▶ Employers pays firing penalty ($\approx 8\%$ of accumulated compensation)

But: only after 90 day probationary period (see Arnold and Bernstein, 2021)

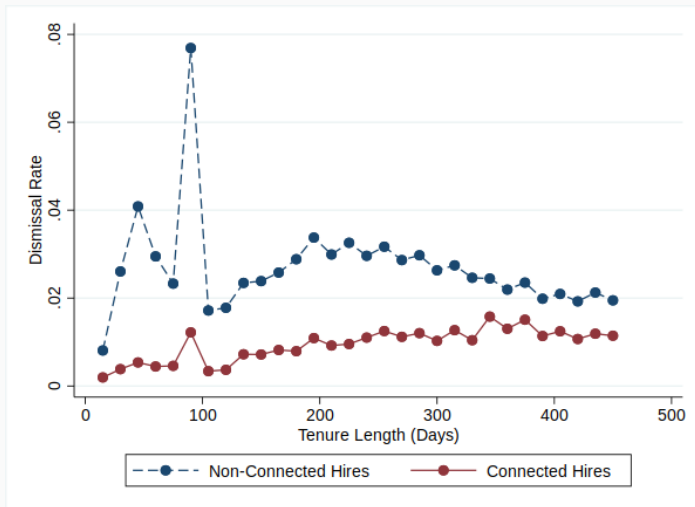
Figure 6: Dismissal and Quit Rates by Job Tenure



Do Connected Hires Have Lower Turnover?

- ▶ If employers have better information about referred workers, then referrals should have lower turnover, but difference dissipates with tenure Brown et al. (2016)
- ▶ Referrals should also be less likely to separate during the end of the probationary period.

Figure 7: Dismissal Rates by Job Tenure



Prob. of dismissal during probationary period net of plant, occupation, and time effects by overlap

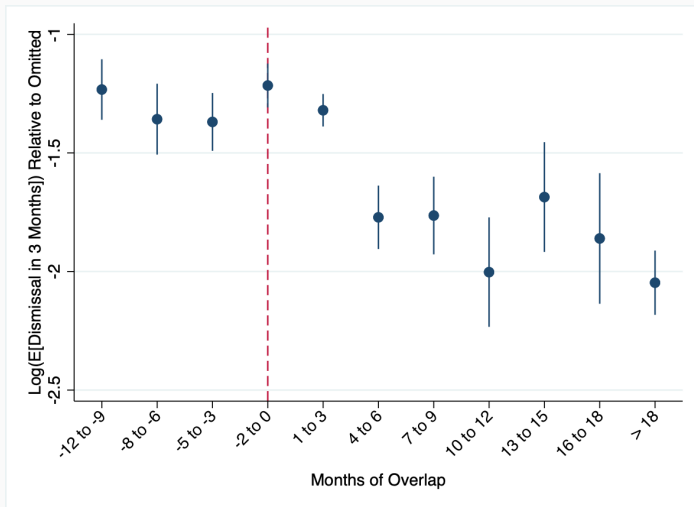
Identifying the Referral Effect on Dismissal

- ▶ The presence of a connection could be associated with other productive traits not related to referral
- ▶ Compare workers with true connections to those with placebo connections:

$$\begin{aligned} \log [E(\text{DISMISSED-3M}_{it}|\cdot)] = & \sum_{k \in \mathcal{K}} \theta_k \mathbb{1}_k (\text{OVERLAP}_{iJ(i,t)}) \\ & + \tau_t + \omega_{o(i,t)} + \psi_{J(i,t)} + \epsilon_{it}, \end{aligned}$$

- ▶ DISMISSED-3M_{it} indicates dismissal during probation
- ▶ $\mathcal{K}$ categorizes overlap into 3-month ranges, indexed by k

Figure 8: 3-Month Dismissal Rate



Dismissal during probationary period by overlap

Racial Gap in Dismissal Rates by Cumulative Hires

- ▶ **Prediction:** racial gap in dismissal rates decreasing in cumulative hires
- ▶ We estimate within-firm racial differences in dismissal rates:

$$\log [E(\text{DISMISSED-3M}_{it}|\cdot)] = \tau_t + \omega_{o(i,t)} + \psi_{J(i,t)} + \psi_{J(i,t)}^{NW} + \epsilon_{it}$$

- ▶ DISMISSED_{it} is indicator for dismissal within 3 months of hire
 - ▶ $\psi_{J(i,t)}$ are firm effects
 - ▶ $\psi_{J(i,t)}^{NW}$ is firm effect for nonwhite workers
-
- ▶ (Limit analysis to firms with at least 20 hires after year of entry)

Figure 9: Racial Disparity in Dismissal Rates by Founder Race

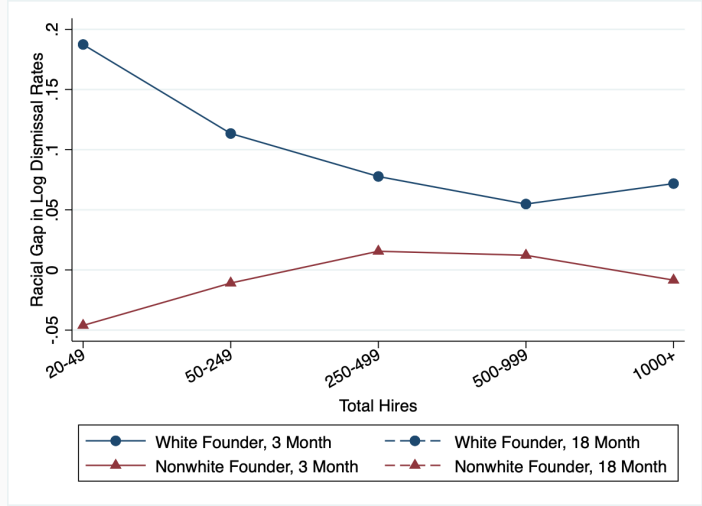
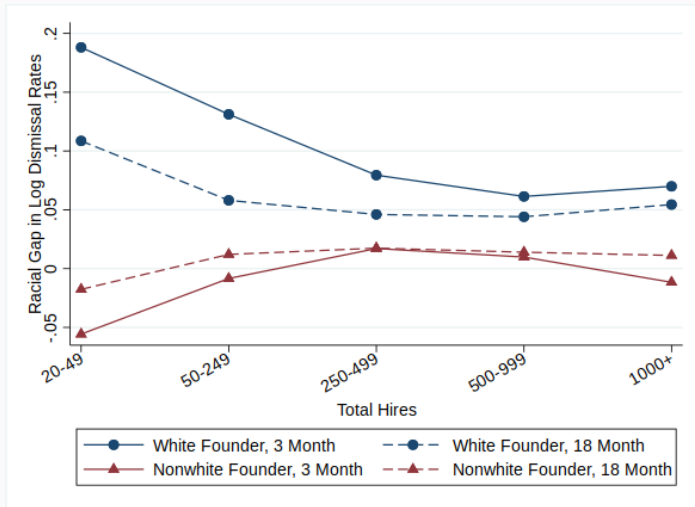


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Alternative Interpretations

- ▶ Human capital [details](#)
- ▶ Worker preferences [details](#)
- ▶ Taste-based discrimination [details](#)
- ▶ Complementarities in production [details](#)
- ▶ Screening ability [details](#)

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Racial Disparities in Entrepreneurship

- ▶ Our findings highlight connection between racial differences in *entrepreneurship* (and social connections to founders) and *labor demand*
- ▶ In household survey data, entrepreneurship rates at least twice as high for white men and women PNAD
- ▶ Small or young firms will disproportionately favor white job seekers in hiring
- ▶ Suggests nonwhite job seekers are connected to fewer firms, connected to larger firms that are less dependent on referral hiring

Implications for Racial Differences in Outcomes

Dynamics of referral hiring can help explain why, relative to white workers, nonwhite workers

- ▶ Face *higher dismissal rates* [details](#)
- ▶ have *lower seniority* [details](#)
- ▶ sort to *larger employers* [details](#)
- ▶ All three patterns driven by firms with white founders
- ▶ Similar black-white differences in United States

(Cavounidis et al., 2021; Holzer, 1998; Miller, 2017)

Conclusion

- ▶ Many posit that the widespread reliance on referral hiring contributes to racial inequality
- ▶ We show that hiring and turnover dynamics match predictions of a simple job search model with referrals
- ▶ Racial disparities in entrepreneurship lead to racial differences in labor demand and match quality
- ▶ Affirmative action policies may speed up convergence
- ▶ Frictions that affect the size distribution of firms will have implications for racial inequality in the labor market (Restuccia and Rogerson, 2017)

Thank you!

Ian Schmutte
schmutte@uga.edu

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Context: Discrimination Law

- ▶ Anti-discrimination introduced only relatively recently; racial discrimination in employment illegal under 1988 Constitution and laws passed in 1989 and 1995
- ▶ Lax enforcement; few successful discrimination claims (Equal Rights Trust 2009)
- ▶ No legislation mandating racial diversity in the workplace

Table 2: Entrepreneurship Rates and Characteristics of Private Sector Employees by Race

	All (1)	White (2)	Mixed (3)	Black (4)
A: Men				
Share of sample in column race group	1.00	0.48	0.43	0.08
Share in private employment	0.42	0.44	0.40	0.47
Share entrepreneurs	0.033	0.044	0.022	0.019
Characteristics of private sector employees				
Mean log hourly wage	2.13	2.36	1.86	2.00
Share in formal sector employment	0.78	0.82	0.75	0.78
A: Women				
Share of sample in column race group	1.00	0.50	0.41	0.08
Share in private employment	0.22	0.26	0.18	0.21
Share entrepreneurs	0.017	0.024	0.011	0.008
Characteristics of private sector employees				
Mean log hourly wage	2.05	2.23	1.74	1.86
Share in formal sector employment	0.80	0.82	0.76	0.80

Source: PNAD 2002-2014

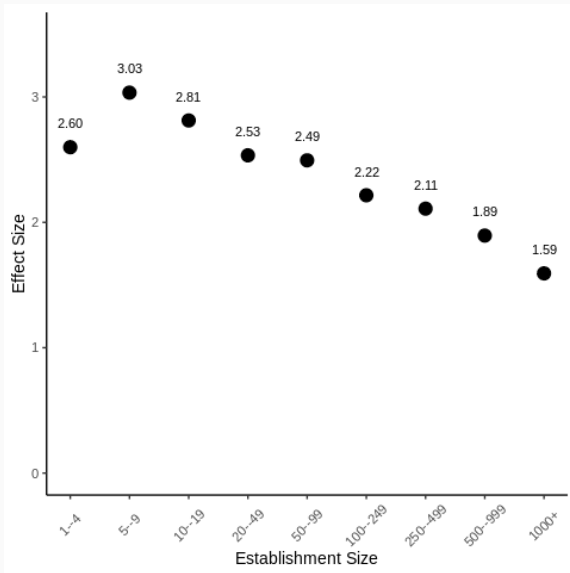
Are Referral Effects Declining in Establishment Size?

- To assess differences in referral use by employer size, we allow referral effect to vary with destination plant size:

$$\log(E(P_{ijk}|\cdot)) = \alpha_{jk} + X_{ij}\beta + \left[\gamma + \sum_s \delta_s \mathbb{1}(S_k = s) \right] C_{ijk}. \quad (1)$$

where S_k indicates the size class of destination plant k

Figure 10: Referral Effects Decreasing in Establishment Size



Racial Segregation in Co-Worker Referral Networks

- ▶ Whether pair of co-workers form social connections that generate referrals may depend on their racial concordance
- ▶ To assess differences in referral use by race, we allow referral effects to vary with race of the job seeker and the incumbent

$$\log(E(P_{ijk}|\cdot)) = \alpha_{jk} + X_{ij}\beta + [\gamma + \kappa_{W,N}M_{ijk}^{W,N} + \kappa_{N,W}M_{ijk}^{N,W} + \kappa_{W,W}M_{ijk}^{W,W}]C_{ijk} + \eta_{ijk} \quad (2)$$

- ▶ $M_{ijk}^{W,N} = 1$ if the hired worker is white and the incumbent worker to whom they are connected in firm k is nonwhite, and so on

Table 3: Referral Effects: Displacement Sample[Back](#)

	Overall			Race Match
	(1)	(2)	(3)	(4)
True Link	0.167 (0.012)	0.278 (0.020)	0.116 (0.014)	
Any Link		0.086 (0.013)	0.052 (0.007)	
Race Match × True Link				
Nonwhite / Nonwhite				0.181 (0.028)
Nonwhite / White				0.016 (0.018)
White / Nonwhite				0.017 (0.025)
White / White				0.130 (0.018)
Dep. Var. Mean.	0.074	0.074	0.074	0.074
Estab. Pair FE	✓		✓	✓
Placebo Link Control		✓	✓	✓
Number of Obs.	11,323,615			

Figure 11: Firm Size Distribution 5 Years Post-Entry

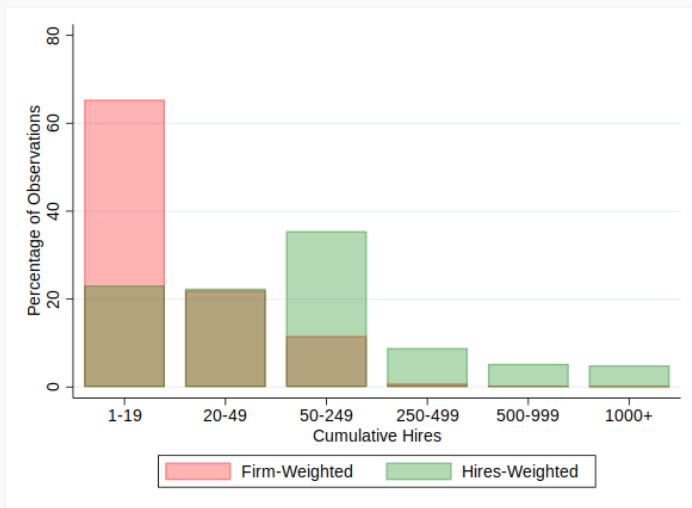
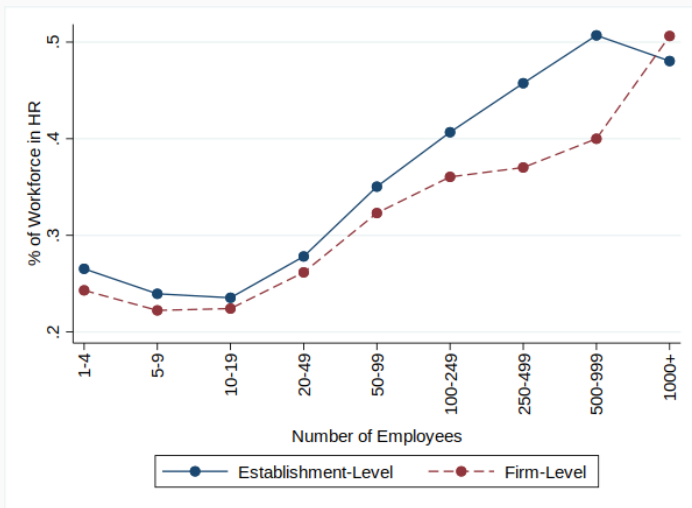


Figure 12: Share in Workforce in Human Resources by Size



	Dyads (1)	Job Changer (2)	Incumbents (3)
Any Link	8.4%		
Linked	4.1%		
Hired	0.082%		
White	30.2%	32.0%	50.1%
Male	43.2%	55.9%	62.4%
Age	32.2	31.7	34.2
Dest. Size			
1-99	62.6%	59.0%	60.5%
100-499	21.0%	22.7%	20.2%
500+	16.5%	18.3%	19.3%
Num. Obs.	303,338,866	1,353,787	9,216,640

Table 4: Characteristics of Entrant Establishments

	By Top-Paid Manager			By Ownership		
	Pooled Founders (1)	White Founders (2)	Nonwhite Founders (3)	Pooled Founders (4)	White Founders (5)	Nonwhite Founders (6)
Nonwhite Founder (%)	33.0	0.0	100.0	16.6	0.0	100.0
<i>Persistence</i>						
After 3 Years	65.5	66.4	63.8	63.1	63.6	60.3
After 5 Years	42.3	43.3	40.2	39.4	40.1	35.9
<i>Total Hires</i>						
After 3 Years						
1-19	79.2	79.4	79.0	72.8	73.2	70.6
20-49	14.3	14.3	14.4	17.9	17.8	18.3
50-249	6.1	6.0	6.2	8.6	8.4	10.1
250-499	0.3	0.3	0.4	0.5	0.5	0.8
500-999	0.1	0.1	0.1	0.2	0.1	0.2
1000+	0.0	0.0	0.0	0.0	0.0	0.0
After 5 Years						
1-19	65.4	65.6	64.8	56.8	57.3	54.0
20-49	22.0	21.8	22.4	25.5	25.4	26.3
50-249	11.6	11.6	11.6	15.8	15.5	17.1
250-499	0.8	0.8	0.9	1.3	1.2	1.8
500-999	0.2	0.2	0.3	0.4	0.4	0.6
1000+	0.1	0.1	0.1	0.2	0.2	0.2
Number of Firms	2.27m	1.52m	0.75m	591k	493k	98k

Figure 13: Nonwhite Share of Hires Converges with Cumulative Hires, by Ownership

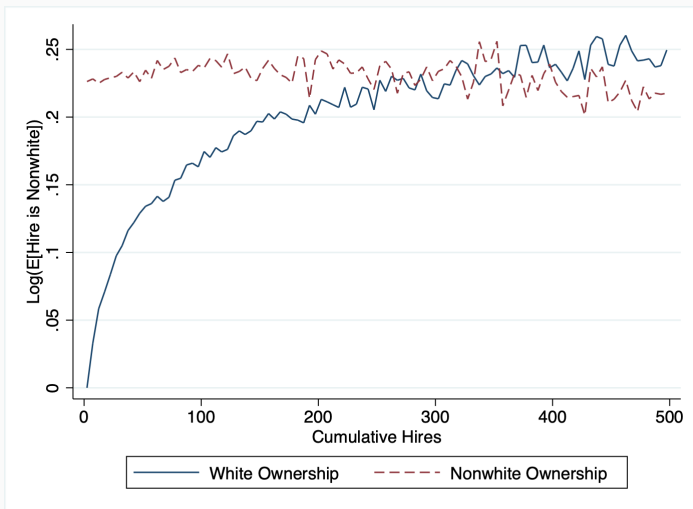


Figure 14: Nonwhite Share of Hires Converges with Cumulative Hires by Total Hires, by Ownership

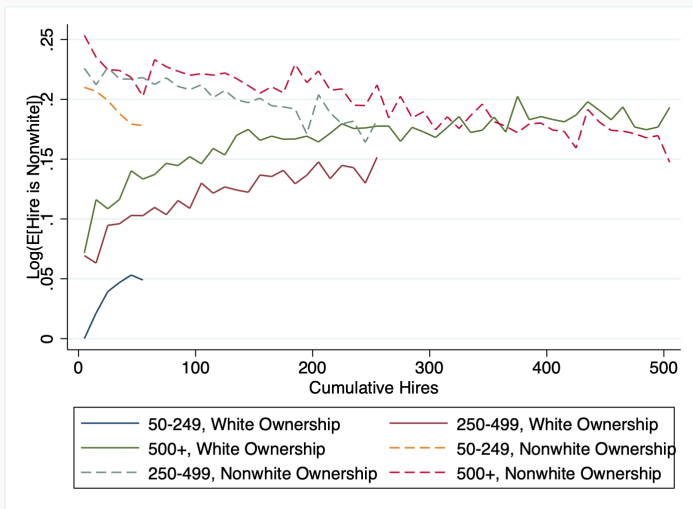
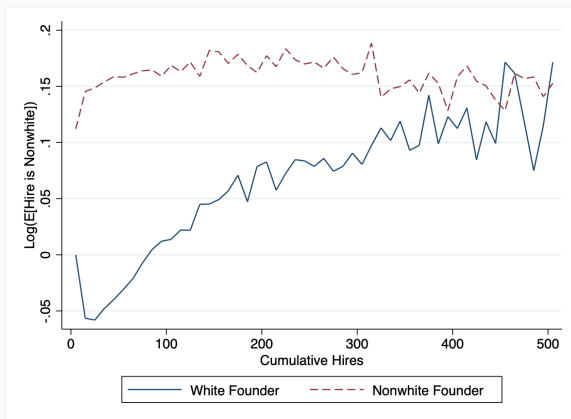


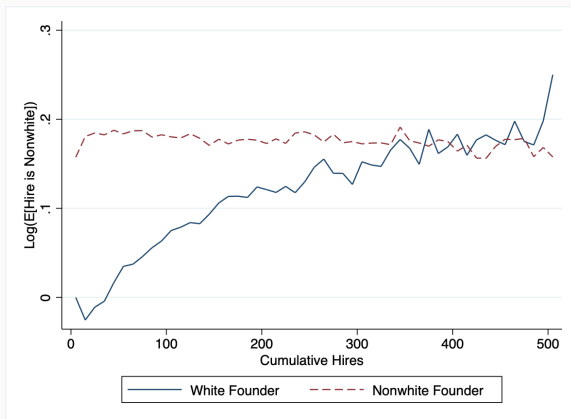
Figure 15: Nonwhite Share of Hires by Cumulative Hires for Varying Firm Pay Premiums



(a) Bottom Quintile

Note: This figure plots the $\eta^{n,r}$ coefficient estimates from equation (??), summarizing the relationship between an establishment's racial composition of hires, its cumulative hires to date (n) and the race of its founder (r). The model is estimated via Poisson quasi maximum likelihood (PQML). In each panel the omitted category is the first hire of establishments with white founders.

Figure 16: Nonwhite Share of Hires by Cumulative Hires for Varying Firm Pay Premiums



(a) Top Quintile

Note: This figure plots the $\eta^{n,r}$ coefficient estimates from equation (??), summarizing the relationship between an establishment's racial composition of hires, its cumulative hires to date (n) and the race of its founder (r). The model is estimated via Poisson quasi maximum likelihood (PQML). In each panel the omitted category is the first hire of establishments with white founders.

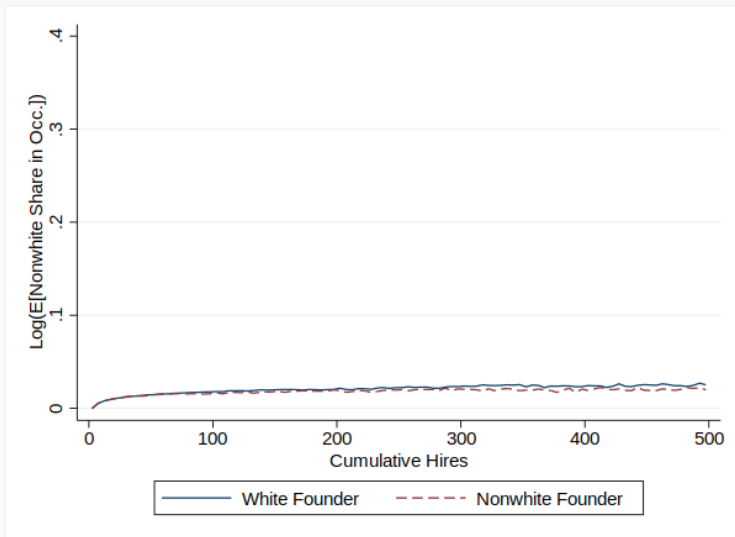
Alternative Interpretation: Human Capital

- ▶ Occupational composition and skill requirements change as firms grow
- ▶ Correlation with race could partially explain hiring dynamics
- ▶ Define $\bar{\omega}_o$: regional share nonwhite in occupation o (6-digit CBO)

$$\log(\mathbb{E} [\bar{\omega}_{o(i,t)} | \cdot]) = \sum_n \sum_r \eta^{n,r} \times \mathbb{1}_{\{N(J,t)=n\}} \times \mathbb{1}_{\{R(J)=r\}} \\ + \tau_t + \psi_{J(i,t)} + \epsilon_{it}.$$

- ▶ $\eta^{n,white}$ measures predicted share non-white in white-founded firms after n hires.

Figure 17: Occupation-Based Predicted Nonwhite Share



Do Nonwhite Workers Prefer Larger Establishments?

- ▶ Potential explanation: nonwhite workers have stronger preference for larger employers
- ▶ Can infer preferences from worker mobility between employers Sorkin (2018)
- ▶ *Poaching index*: share of new hires poached from other employers Bagger and Lentz (2018)

$$p_J = \frac{n(., J)}{n(0, J) + n(., J)}$$

- ▶ $n(., J)$ is number of hires poached from other establishments; $n(0, J)$ hires from unemployment
- ▶ We measure race-specific poaching indices, relate to establishment size

Figure 18: Poaching Index by Founder Race and Total Hires: White Hires

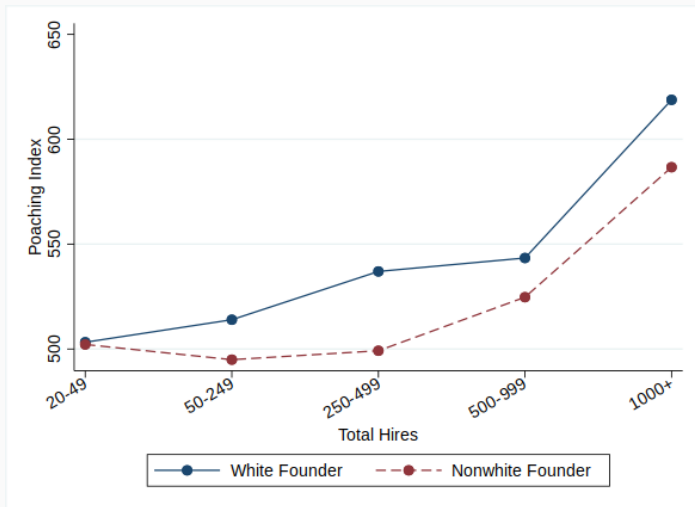
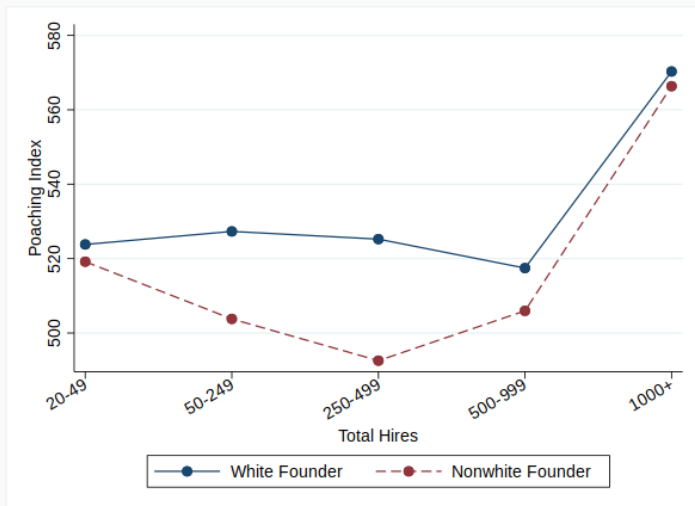


Figure 19: Poaching Index by Founder Race and Total Hires:
Non-white Hires



Alternative Explanation: Employer Preference

- ▶ Employer taste-based discrimination could contribute
- ▶ Not clear why hiring preference should decline with cumulative hire
- ▶ Not easily reconciled with dismissal rate findings

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Alternative Explanation: Production Complements

- ▶ Workers may be more productive when grouped with their own race Lang (1986)
- ▶ Perhaps these complementarities dissipate with size / hires
- ▶ Again, hard to rationalize dismissal evidence without *ad hoc* assumptions

Alternative Explanation: Screening Ability

- ▶ Founders might be better at screening same-race workers (in absence of referrals)

Giuliano et al. (2011); Åslund et al. (2014); Benson et al. (2019)

- ▶ If firms invest in screening technology with size, the relative advantage could dissipate over time
- ▶ Hard to rule out; referral may just be one of the ways this effect manifests
- ▶ We can at least provide evidence consistent with the referral channel

$$\log(E(\text{DISMISSED-3M}_{it}|\cdot)) = \tau_t + \omega_{o(i,t)} + \beta \text{NONWHITE}_i + \epsilon_{it}$$

Table 5: Racial Differences in Dismissal Rates by Founder Race

	All Entrants			White Founders			Nonwhite Founders		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Panel A									
Outcome: Dismissal									
Nonwhite	0.083 (0.001)	0.042 (0.001)	0.075 (0.001)	0.121 (0.001)	0.081 (0.001)	0.114 (0.001)	0.042 (0.001)	0.011 (0.001)	0.036 (0.001)
Year FEs	✓	✓	✓	✓	✓	✓	✓	✓	✓
Occupation FEs		✓			✓			✓	
Education FEs			✓			✓			✓
Number of Obs.	52,376,661			35,138,895			17,237,766		

Defining Seniority

Following Buhai et al. (2014), we define a worker's *seniority index* as follows:

- ▶ Define q_{ijt} as number of workers in establishment j with tenure greater than or equal to tenure of worker i at time t
- ▶ Define n_{jt} as total number of workers in establishment j at time t
- ▶ The seniority index is defined as

$$\log r_{ijt} \equiv \log n_{jt} - \log q_{ijt}.$$

$$\log r_{ijt} = \tau_t + \omega_{o(i,t)} + \beta \text{NONWHITE}_i + \gamma \log n_{jt} + \epsilon_{it}$$

Table 6: Racial Differences in Seniority by Founder Race

	All Entrants			White Founders			Nonwhite Founders		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Panel B									
Outcome: Seniority Index									
Nonwhite	-0.049 (0.000)	-0.040 (0.000)	-0.050 (0.000)	-0.097 (0.000)	-0.086 (0.000)	-0.099 (0.000)	0.002 (0.000)	0.005 (0.000)	0.000 (0.000)
Year FEs	✓	✓	✓	✓	✓	✓	✓	✓	✓
Occupation FEs		✓			✓			✓	
Education FEs			✓			✓			✓
Number of Obs.	39,203,654			26,171,760			13,031,894		

Figure 20: Nonwhite Share of New Hires by Establishment Size

