The Urban Density Premium Across Establishments

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Introduction

- Large literature on density premium afforded to workers' earnings and firms' productivity
  - Workers: Examines roles of sorting, skills, learning/spillovers
    - Glaeser (1999), Glaeser and Mare (2010), Bacolod et al. (2009), Baum-Snow & Pavan (2010a, 2010b), de la Roca & Puga (2010), and others
  - Firms: Examines productivity benefits of urban density
    - Ciccone and Hall (1996), Henderson (2003), Combes et al. (2008), Combes at al. (2010), and others
- Research finds
  - For both workers and firms, density premium that exists after controlling for variety of factors
    - Evidence of positive returns to urban agglomeration
  - For workers, evidence shows:
    - Premium that is increasing in worker skill
    - Steeper wage profiles w.r.t. city tenure (learning in cities)
    - Strong role for migration, sorting based on skills

Research Question

- Are the same returns, dynamics related to urban density observed for workers also present for firms?
  - Examine role of:
    - Establishment characteristics
    - Differential returns to density across earnings distribution
- Does firm learning, sorting, or selection (through exit) play a role?
  - Density premium may rise with age (firm learning)
  - Density Premium may be due to selection of low-productivity firms out of market in dense cities
  - Density premium may also be due to sorting of productive firms into dense cities

Findings

- Controlling for establishment characteristics & local education, density premium for establishments is ~7.4%
  - Robust to endogeneity concerns; varies little across characteristics
  - Higher for high-earnings (more productive) establishments
- Premium independent of establishment age
  - Rejects role for firm "learning"
- Premium not driven by selection through exit
  - Exit rates similar in high, low density cities across earnings distribution
- Evidence suggests firm sorting works in opposite direction
  - Entrant earnings similar in high, low density cities (relative to incumbents)
  - Relocating establishments more productive, move to less dense cities
  - Relocation results suggest "nursery city" story (Duranton-Puga, 2001) may best describe relation between firm dynamics, urban agglomeration

Data

- Longitudinal Business Database (LBD), U.S. Census Bureau
  - Micro data is virtual census of establishments in U.S.
  - Has annual payroll and employment data for each, as well as basic characteristics (location, industry, etc.)
  - Allows for reliable measure of establishment age
- Sample: All entering, exiting, continuing establishments in 1992 and 1997 within 363 CBSAs (~ older MSA definition)
  - 4.9m observations in 1992, 5.3m in 1997
- Main measure of interest: average establishment earnings
  - Generally payroll per employee, with adjustments made for timing, mismeasurement, entry, exit
  - Throughout consider avg. earnings ≈ labor productivity (evidence consistent with interpretation)
  - Relate to population density (1990 pop. per square mile)
  - Also control for share of pop. w/ college degree

Density Premium, Micro-Level Estimates

Establishment-Level Relations between Earnings and Density
(dependent = ln avg. earnings; instruments = geology, climate variables)

	Full-Sample (OLS)		IV Sample	
	(1)	(2)	OLS	IV
ln *Density*	**0.102** (0.007)	**0.074** (0.010)	**0.098** (0.007)	**0.100** (0.020)
College Share		0.883 (0.093)	0.898 (0.099)	1.588 (0.279)
Year effects?	Yes	Yes	Yes	Yes
Controls for establishment characteristics?	No	Yes	Yes	Yes
R^2	0.014	0.313	0.317	0.315
Number of Observations	10,256,604		7,761,264	

Density Premium, Various Subgroups

	Entrants and Exits		***Multi- & Single-Unit Firms***	
	Entrants	Exits	Single-Unit	Multi-Unit
ln *Density*	**0.076**	**0.079**	**0.080**	**0.058**
	(0.011)	(0.013)	(0.010)	(0.009)
R^2	0.257	0.271	0.279	0.460
	By Establishment Size (Employees)				
	1 to 9	10 to 99	100 to 249	250 to 999	1,000+
ln *Density*	**0.079**	**0.064**	**0.067**	**0.075**	**0.071**
	(0.010)	(0.010)	(0.009)	(0.012)	(0.013)
R^2	0.270	0.521	0.539	0.517	0.521
	By Major Industry Group				
	Construction	Mfg.	Retail	Prof. Serv.	Local Serv.
ln *Density*	**0.084**	**0.072**	**0.064**	**0.101**	**0.056**
	(0.019)	(0.016)	(0.016)	(0.012)	(0.005)
R^2	0.154	0.279	0.254	0.219	0.280

- Estimates from replication of previous specification (4) (all controls & college share)
- Some variation in estimates for single vs. multi unit firms and industries, but not size classes, entrants and exits

Differential Returns to Density: across the Earnings Distribution

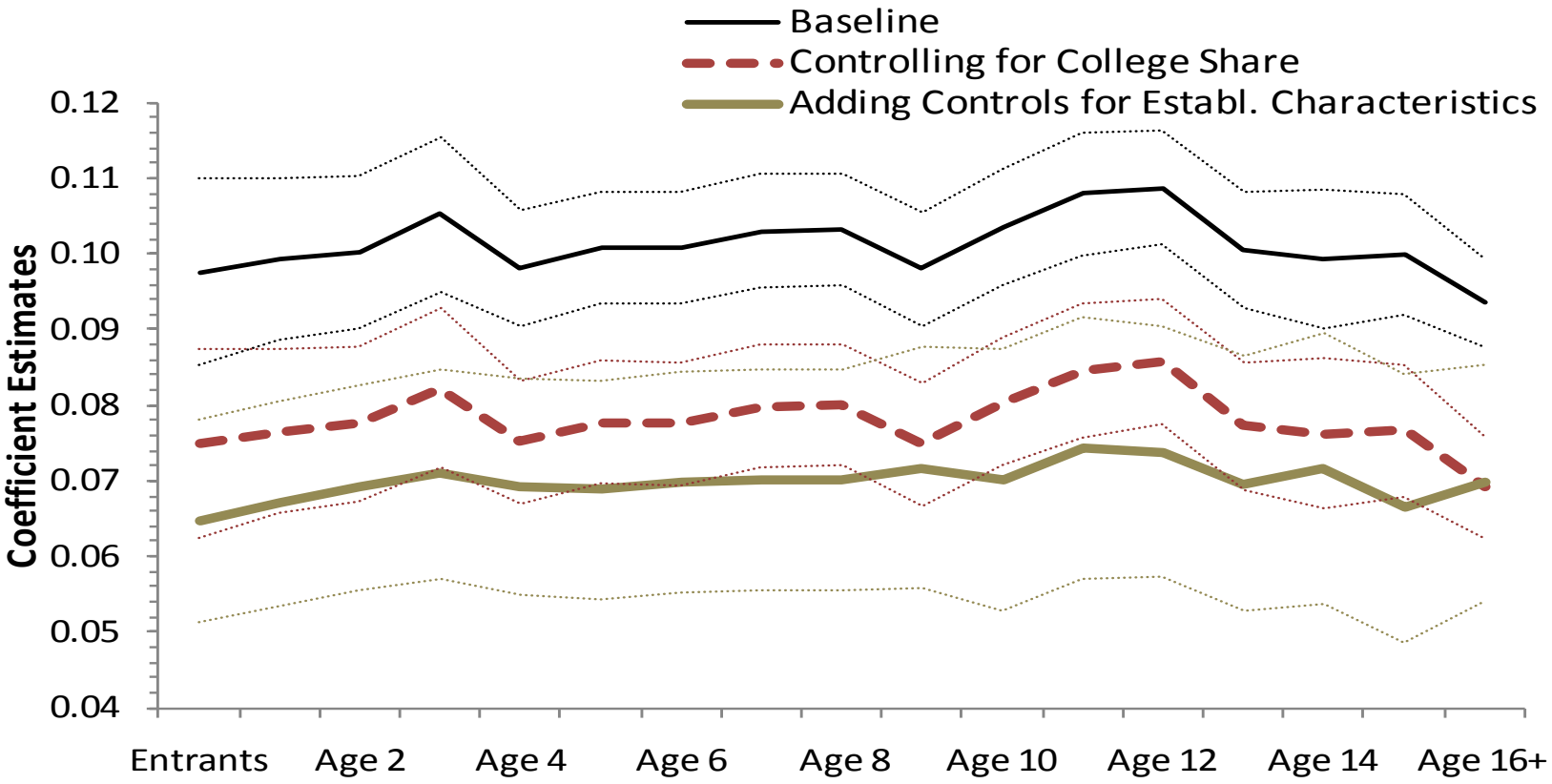
	Lowest Quintile	Second Quintile	Middle Quintile	Fourth Quintile	Highest Quintile
I. Within-Quintile Regression of Earnings on Density, Unconditional					
ln *Density*	**0.080**	**0.083**	**0.096**	**0.110**	**0.144**
	(0.011)	(0.009)	(0.008)	(0.007)	(0.008)
R^2	0.02	0.21	0.29	0.33	0.09
III. Within-Quintile Regression of Earnings on Density, Controls for CBSA College Share and Establishment Characteristics					
ln *Density*	**0.067**	**0.063**	**0.071**	**0.083**	**0.102**
	(0.012)	(0.008)	(0.007)	(0.007)	(0.007)
College Share	0.640	0.913	1.089	1.188	1.116
	(0.107)	(0.099)	(0.104)	(0.116)	(0.133)
R^2	0.10	0.30	0.41	0.45	0.28

- Exercise comparable to examining whether density premium rises w/ worker skill
- Density premium rises with avg. earnings, even after controls are added (consistent with Combes et al. (2008)

Earnings, Density and Establishment Age – Firm "Learning"

- Research on worker earnings finds evidence of "learning" in cities
  - Worker earnings-tenure profiles steeper in larger cities
- Can test for similar evidence of learning by establishments
  - Question: Do establishments have steeper earnings (productivity) profiles w.r.t. age?
  - Establishment age ~ city tenure since relocation is order of magnitude less frequent than entry
    - Mean entry rate: 10.3%
    - Mean relocation rate: 1.0%
- Estimate density premium with age, age interactions
- Estimates likely an upper bound since it includes both establishment return in (increasing) worker return

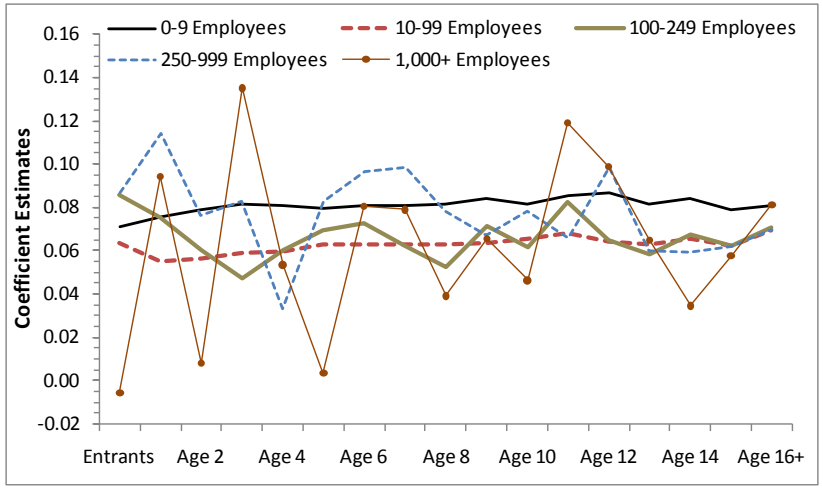
The Density Premium and Establishment Age



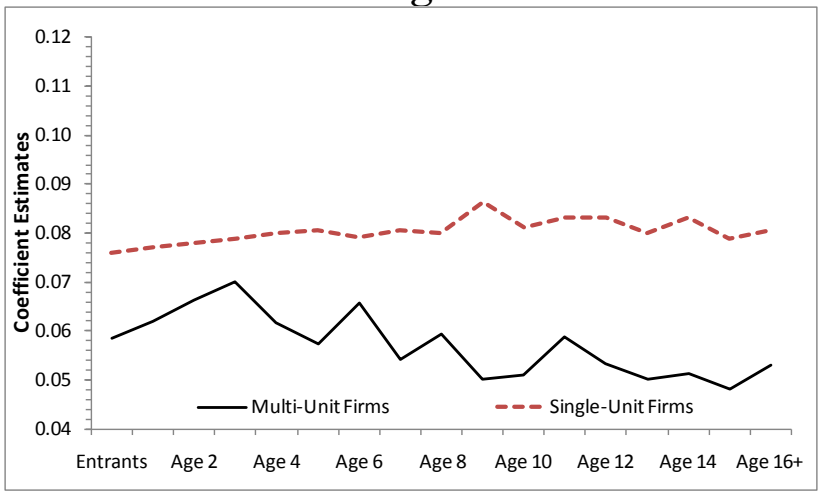
- Results show that density premium is constant w.r.t. establishment age
  - Returns to agglomeration accrue at entry

Earnings Density and Age, Various Subgroups

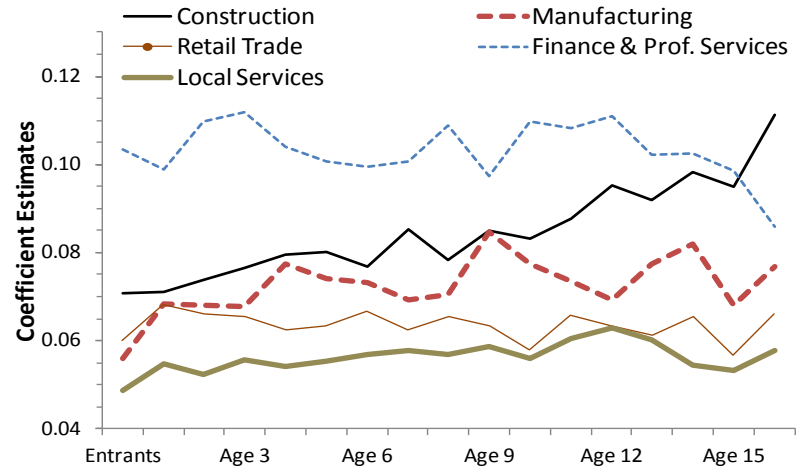
Establishment Size



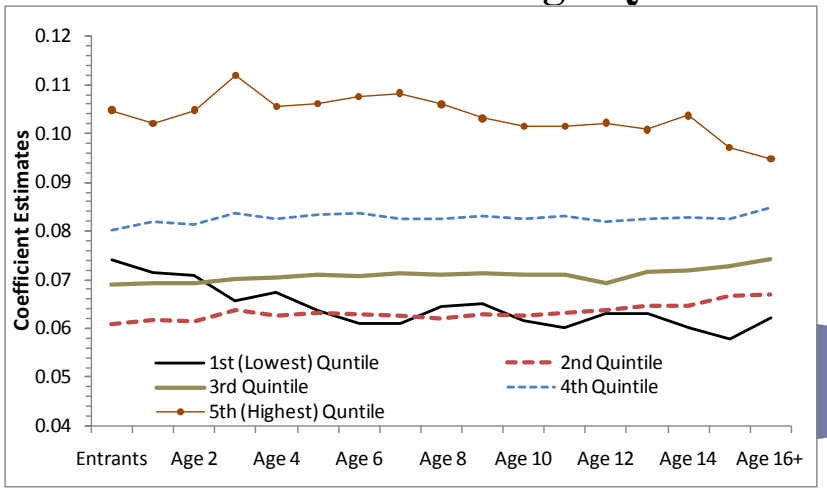
Multi- vs. Single-Unit Firms



Industry



Within-CBSA Earnings Quintile

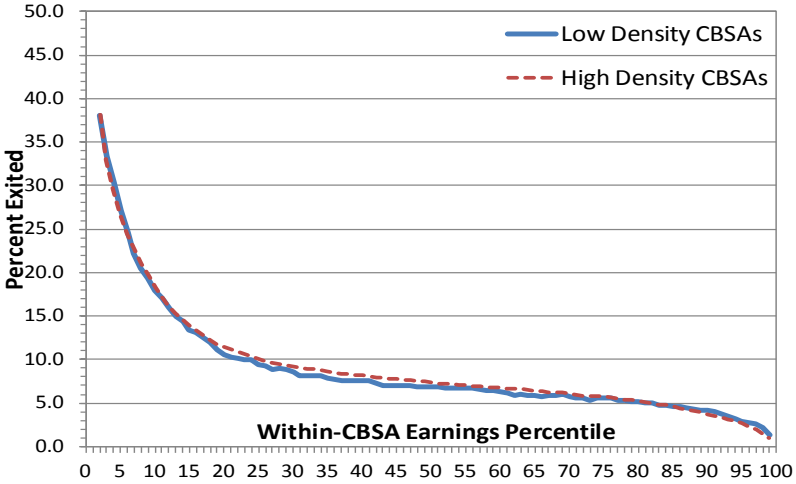


Identifying Firm Sorting and Selection

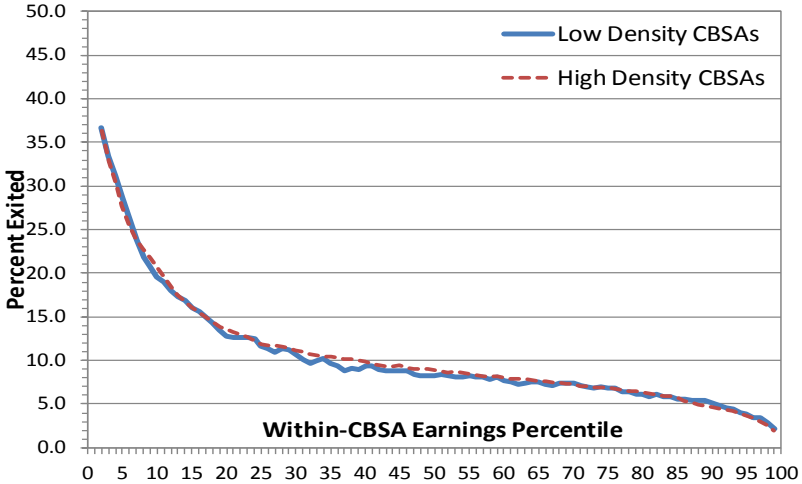
- Density premium may stem from **firm selection**
  - Selection causes exit of less productive firms, lower-truncation of productivity distribution
  - Dense locations may be more competitive; implies exit threshold is higher and relatively more productive firms exit
- Premium may also stem from **firm sorting**
  - High-productivity firms may self-select into more dense locations
  - For firms, sorting can occur along two margins:
    - Sorting at entry – hard to identify, but potentially large channel
    - Sorting through relocation – can identify, though selected & small group
- Present evidence based on exit, entry, and relocation across establishment earnings distribution

Selection Through Exit

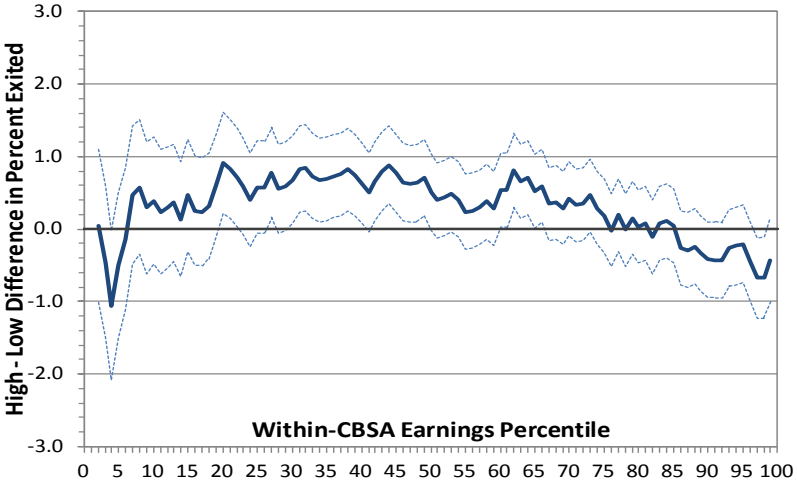
Exit Rates, All Exits



Exit Rates, Exits < 5 Yrs. Old



High-Low Density Difference



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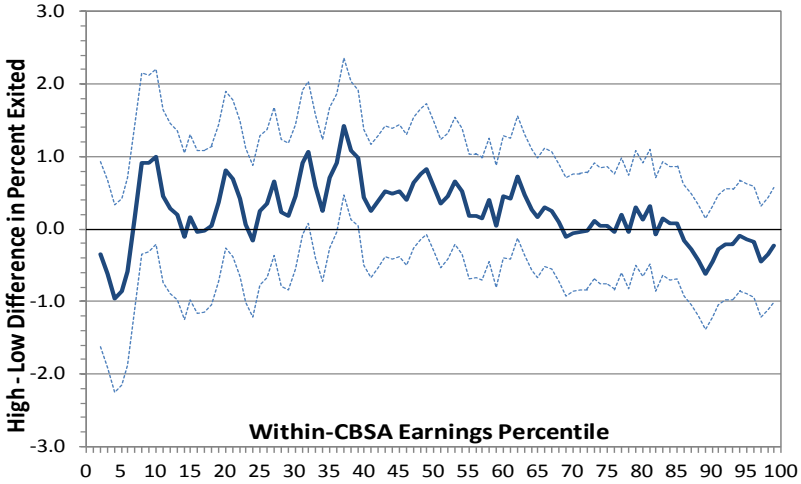
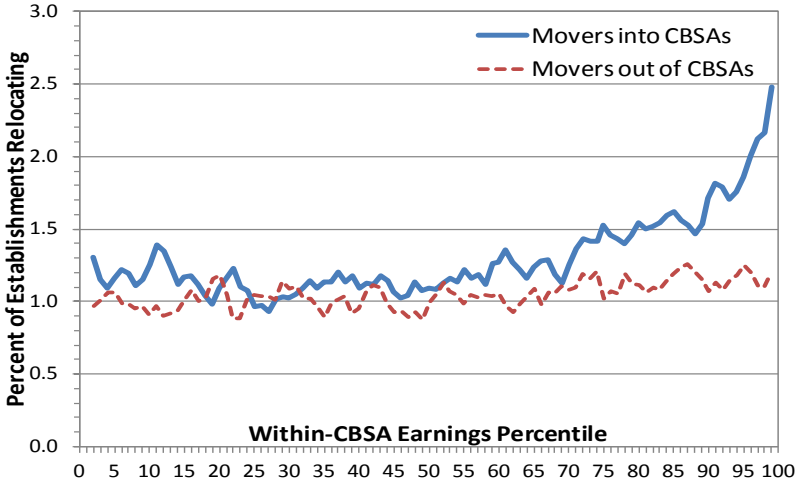
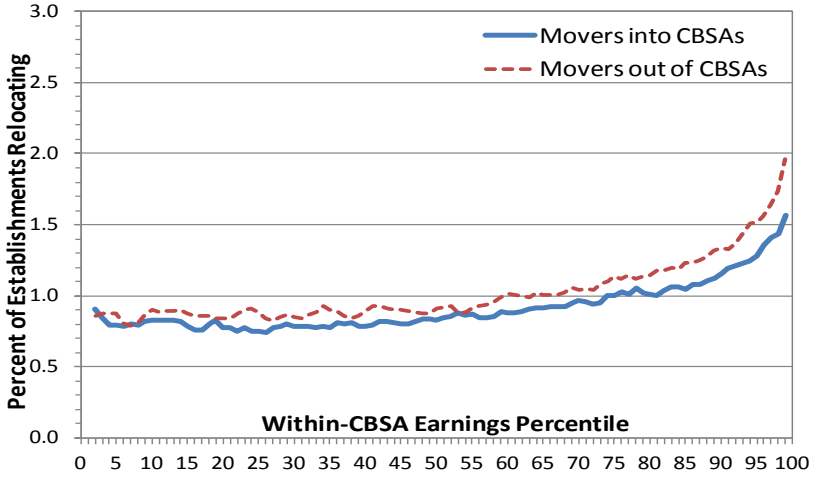


Sorting Through Relocations across CBSAs

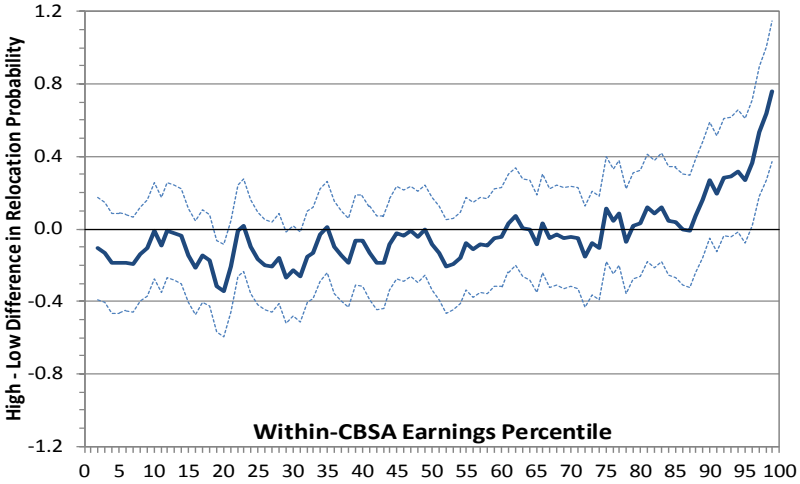
Relocation Rate, Low-Density CBSAs



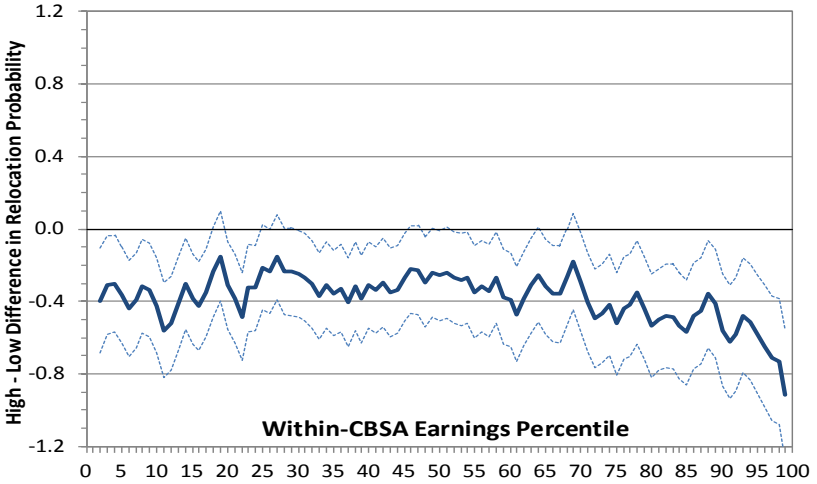
Relocation Rate, High-Density CBSAs



High-Low Difference: Out-Migration



High-Low Difference: In-Migration



Earnings Distribution Differences Among Entrants (Conditional on Establishment Characteristics & College Share)

Statistic	*Entrants*		*Difference, High – Low All Entrants*	*Difference, High – Low MU Entrants*	*Diff.-in-Diff.: Entrants – Incumbents*	*Diff.-in-Diff.: MU – All Entrants*
	Low-Density CBSAs	**High-Density CBSAs**				
Mean (log) Earnings	**9.640**	**9.852**	**0.212**	**0.163**	**0.013**	**-0.049**
IQR	**0.976**	**0.997**	**0.022**	**0.062**	**0.002**	**0.040**
90th Percentile	10.582	10.856	0.274	0.261	0.007	-0.013
50th Percentile	9.756	9.936	0.180	0.139	0.000	-0.041
10th Percentile	8.478	8.677	0.199	0.115	0.035	-0.084
90-10 Ratio	**2.104**	**2.179**	**0.075**	**0.146**	**-0.028**	**0.071**

- Examine differences among all entrants, and entrants of multi-unit firms only
- H_0: Multi-unit firms more likely to make location choice across several cities, where single-unit firms may choose location based on where entrepreneur lives

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Summary

- Like workers, establishments exhibit a large, significant premium for being in a dense area
  - Robust to variety of controls, similar across groups
  - Rises with establishment earnings ("productivity-biased" returns to density)
  - Unlike workers, establishments exhibit a density premium independent of age (no evidence of greater "learning")
- Sorting and selection do not appear to account for density premium
  - No differences in exit rates across CBSA earnings distribution
  - Relocations tend to move to *lower*-density cities and involve most productive establishments
  - No difference in relative earnings of entrants
- If anything, evidence on relocations points to "nursery city" effect of denser locations

Additional Slides

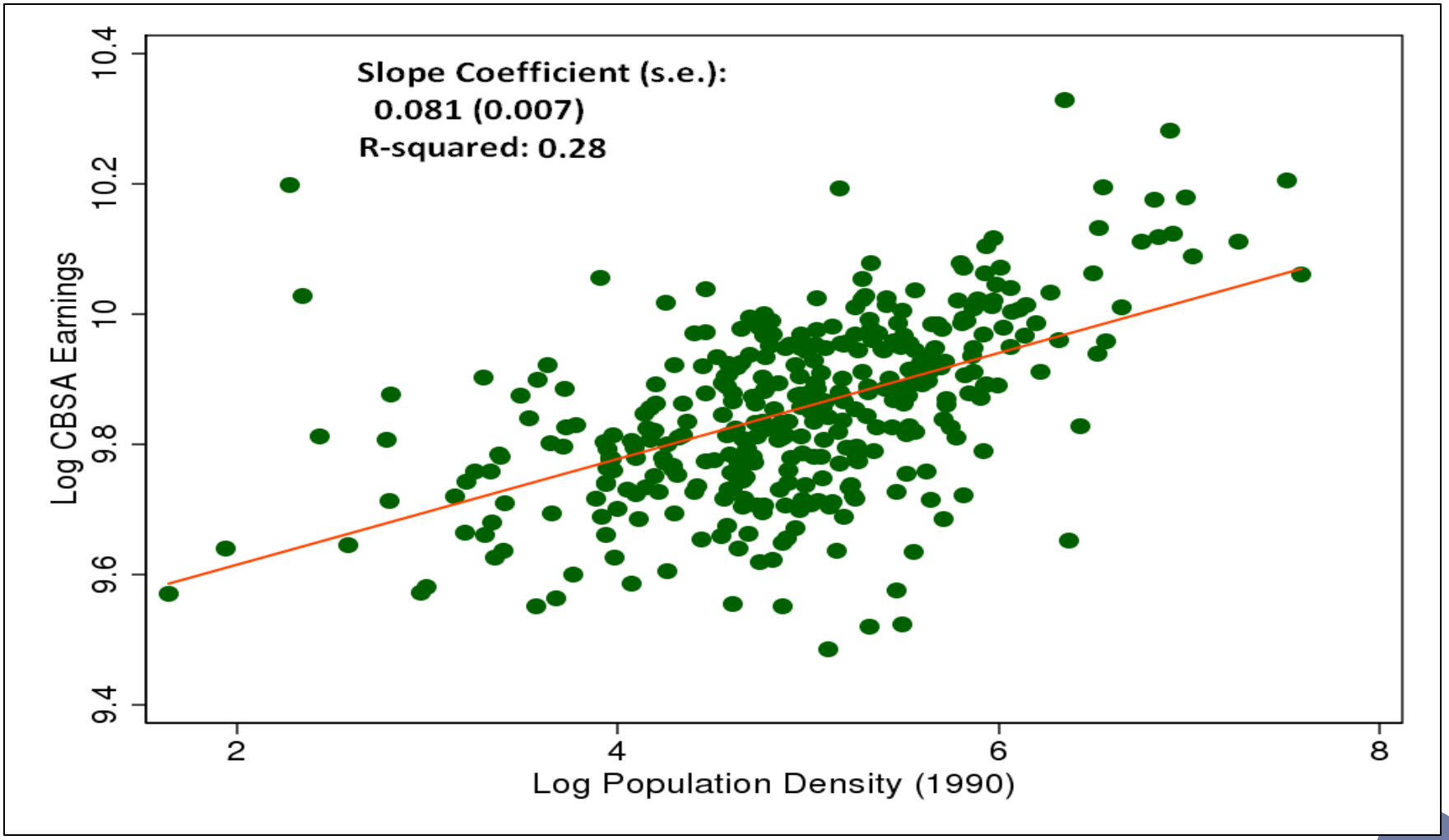
Some Basic Facts

- Average establishment earnings behaves a lot like productivity
  - Check: replicate findings of Syverson (2004) using average earnings in lieu of TFP (for concrete industry)
  - Result: Earnings variation behaves very similar to TFP variation
- Age and entry vary with density; size and exit do not
  - Age positively related, entry rates negatively related

OLS regression on ln(Density)
(controlling for college share, N = 10.26 million)

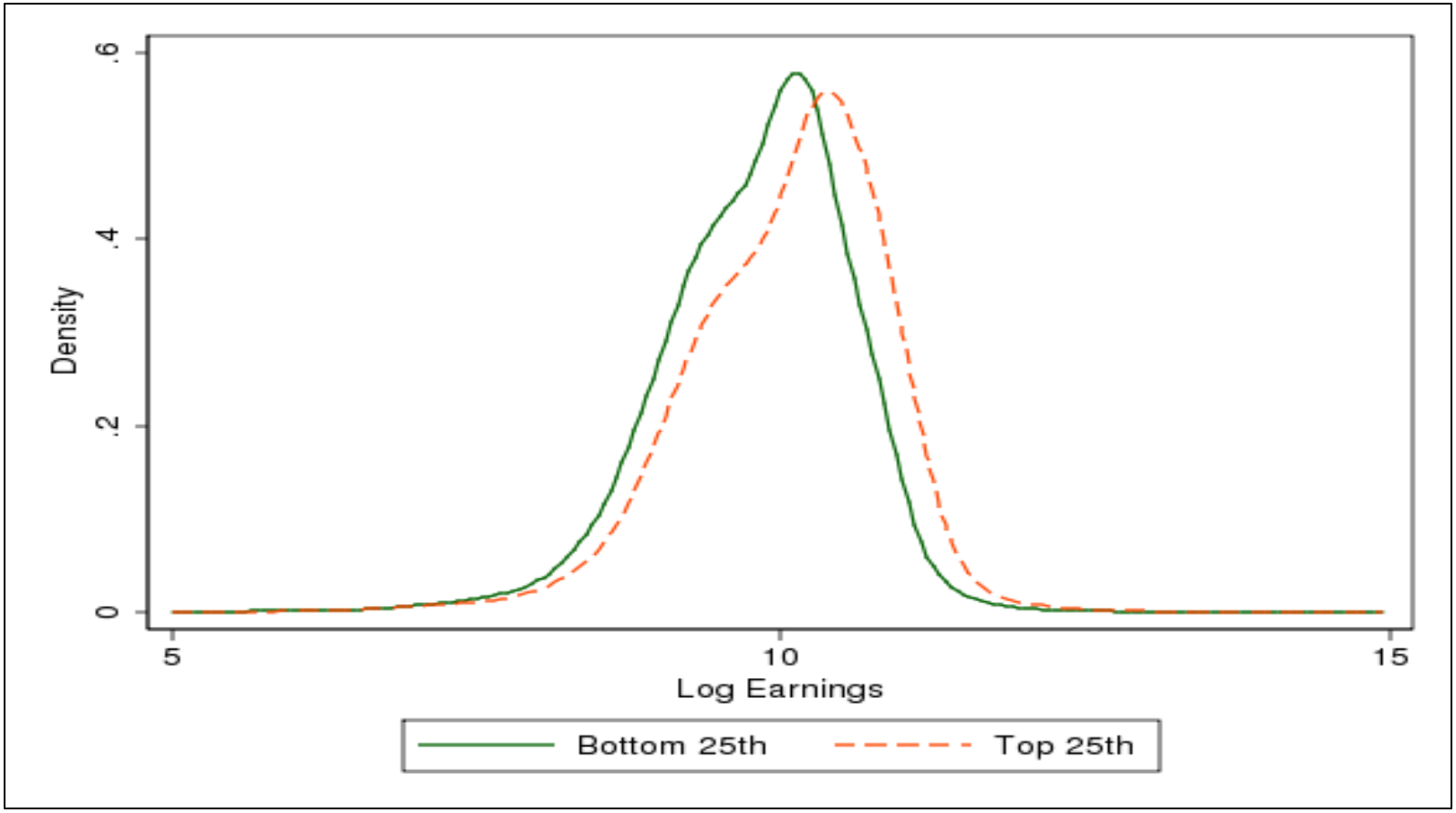
	ln *Size* (employees)	**Age (years)**	**Exit Rate (share of estabs.)**	**Entry Rate (share of estabs.)**
ln *Density* (alone)	-0.023 (0.021)	0.101* (0.044)	0.002 (0.001)	-0.003* (0.001)
ln *Density* (w/ controls)	-0.007 (0.012)	0.189* (0.052)	0.000 (0.002)	-0.004* (0.001)

Density Premium, Aggregate Relation



- Controlling for college share only reduces coefficient to 0.078

Density Premium across the Earnings Distribution

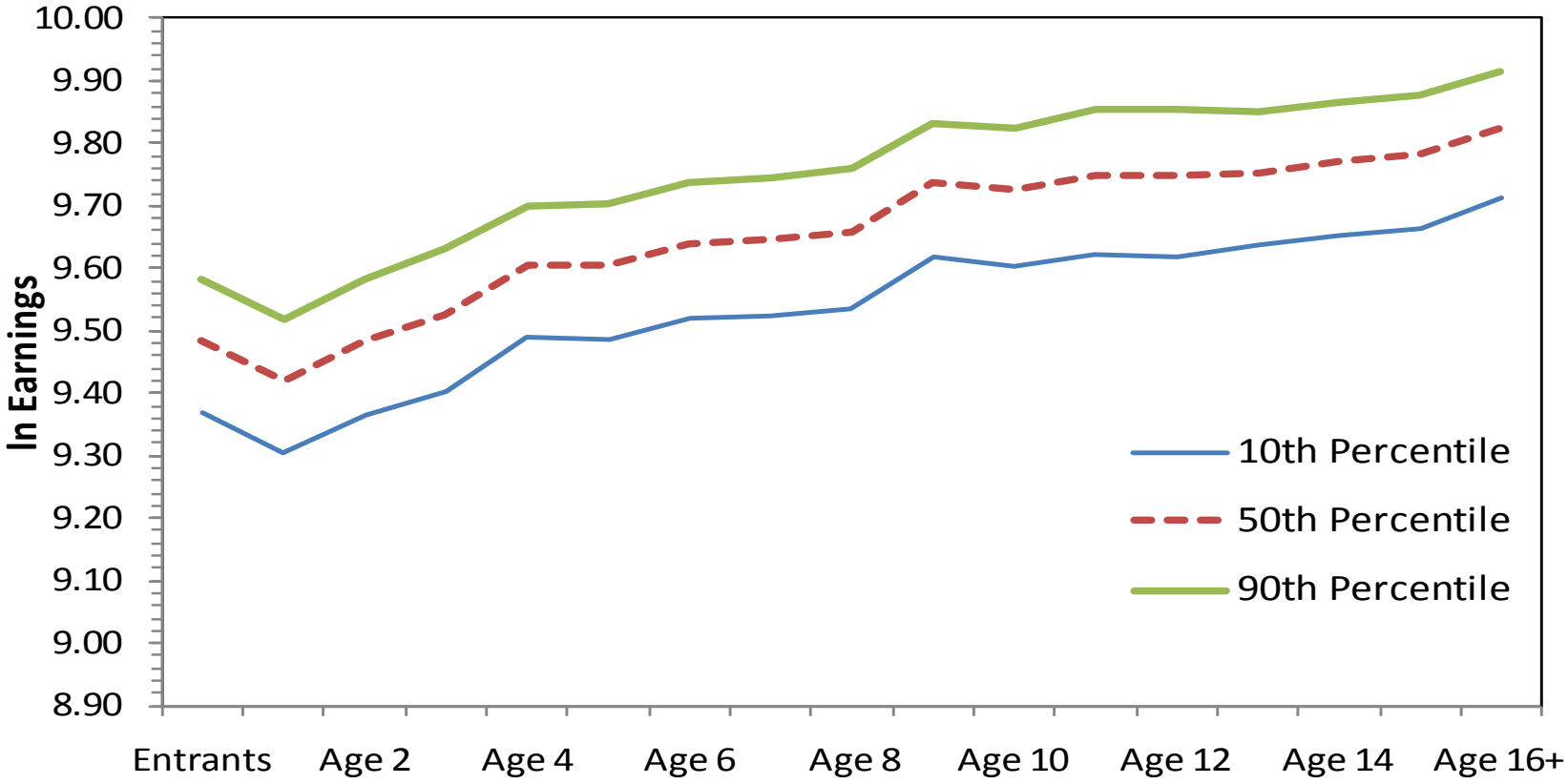


- Figure graphs earnings distribution in top, bottom quartile of CBSAs ranked by pop. density
- Density premium at micro level reflected in higher mean, greater dispersion of earnings distribution

Replication of Syverson (2004)

Moment (dependent variable)	*Estimate of Demand Density Elasticity* Estimate from Syverson (2004), using TFP for	Estimate from the LBD, using avg. earnings for
Interquartile range of distribution of ln y_{et}	-0.015	-0.028
	(0.004)	(0.013)
Median value of ln y_{et}	0.018	0.095
	(0.003)	(0.015)
Size-weighted mean of y_{et}	0.024	0.081
	(0.004)	(0.015)
Tenth percentile of distribution of ln y_{et}	0.056	0.080
	(0.010)	(0.027)
Mean plant size	0.211	0.065
	(0.012)	(0.016)
Producer-demand ratio	-0.363	-0.680
	(0.015)	(0.033)
Number of Observations	665	410

Earnings, Density and Establishment Age



- Earnings rise with establishment age; density premium only appears to have an effect on levels

Density Premium, Estimates from Relocations

Establishment-Level Relations between Earnings and Density
(dependent = d ln avg. earnings)

	Level Regressions		First-Difference Regressions	
	(1)	(2)	OLS	IV
(*d*) ln *Density*	0.101 (0.007)	0.072 (0.008)	0.008 (0.004)	0.007 (0.003)
(*d*) *College Share*		0.915 (0.091)		0.008 (0.030)
Year effects?	Yes	Yes	Yes	Yes
Controls for (changes in) establishment characteristics?	No	Yes	Yes	Yes
R^2	0.017	0.354	0.001	0.167
Number of Observations	7,881,354			