

Bridging the Miles: City Size and Job Search

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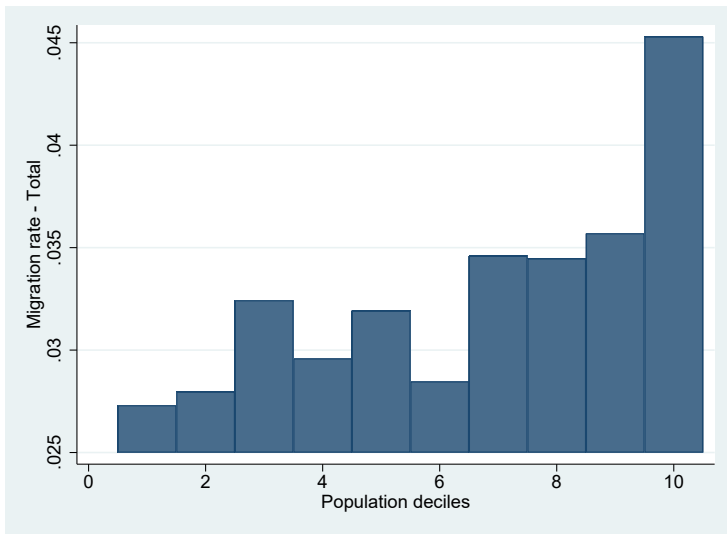
- **Motivation**

- Countries have wide spatial dispersion in wages and income (e.g., Delhi \approx 4x Patna)
- Metros overcrowded; non-metros underutilized (Desmet et al., 2015; Chauvin et al., 2017)

- **Key Issues**

- Despite technological and transport advances, smaller cities grow slower
- Which place-based policies can help?

Migration: Urban to Urban



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- What explains this distaste for non-metro?
 - Connectivity between cities
 - Job role concentration (future job mobility)
 - Employer distaste (equilibrium outcome)

Research Questions

Study spatial application behavior of job-seekers in India

- Is there a distaste for jobs located in distant locations?
 - Does it vary by large (metro) vs. small city (non-metro) - **Yes**
- What explains this distaste for non-metro? Can place-based policies work?
 - Connectivity between cities - **No**
 - Job role concentration (future job mobility) - **Yes**
 - Employer distaste (equilibrium outcome) - **No**

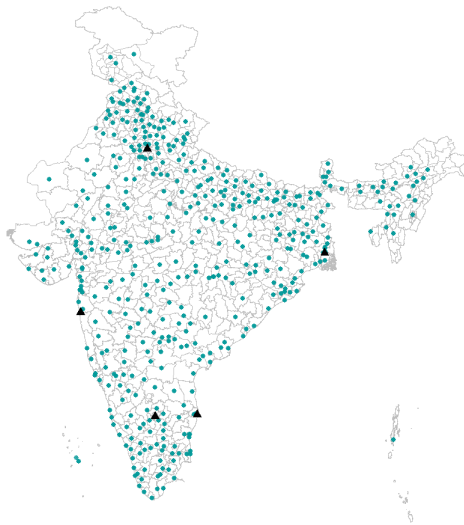
Data

- Major online job platform catering to young job-seekers

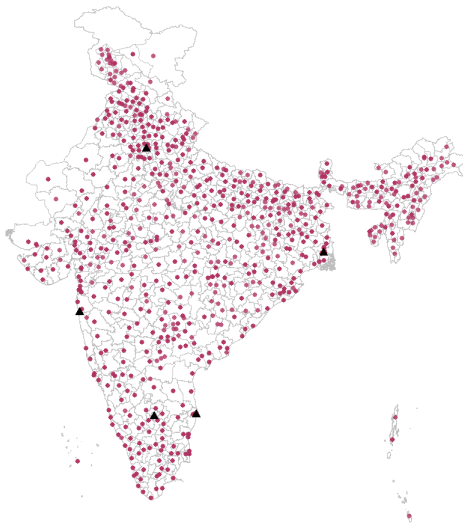
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 - Posted jobs - city, occupation, wages, ...
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 - Applications

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- Around 37k jobs posted between July-December 2020 (other samples)
 - 0.68 million applications made by 225k applicants

Spatial Distribution Jobs



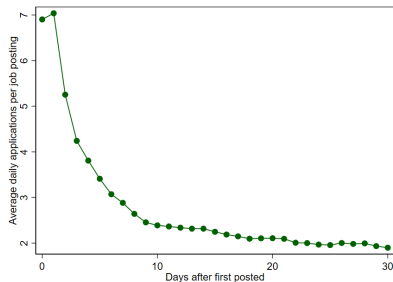
Spatial Distribution Candidates



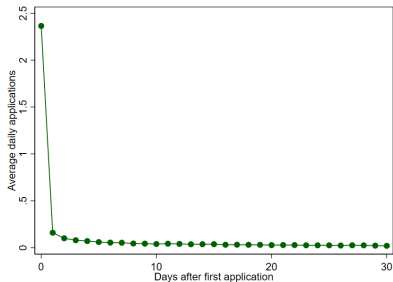
Choice Set Construction

- For a given candidate i applying to job role r on date d , we include all jobs postings on the platform in job role r between $d - 10$ and $d + 1$ days in her choice set.

(a) Average Applications from Date of Job Posting



(b) Average Daily Applications by Candidates after First Application



Evidence: Distaste for Distance and Non-metro Locations

$$\begin{aligned} Applied_{ijkt} = & \beta_0 + \sum_{k=1}^g \beta_k DistGroup_k + \sum_{k=1}^g \beta'_k (DistGroup_k \times NMI) \\ & + \alpha_i \mathbb{X}'_i + \alpha_j \mathbb{X}'_j + \delta_i + \delta_j + \delta_t + \epsilon_{ijkt} \end{aligned}$$

- Candidate i
- Job j
- Distance groups k : 1-50, 50-100, 100-500, >500 miles

Application Probability: By Distance

	(1)	(2)
1-50	-0.015*** (0.001)	-0.013*** (0.001)
50-100	-0.051*** (0.000)	-0.032*** (0.000)
100-500	-0.059*** (0.000)	-0.041*** (0.000)
> 500	-0.062*** (0.000)	-0.046*** (0.000)
1-50 × 1(Non-metro)		-0.045*** (0.003)
50-100 × 1(Non-metro)		-0.073*** (0.001)
100-500 × 1(Non-metro)		-0.073*** (0.001)
> 500 × 1(Non-metro)		-0.074*** (0.001)
N	166555050	166555050
Job FE	✓	✓
Candidate FE	✓	✓
Month-year FE	✓	✓

Application Probability: Metro vs. Non-metro || Wage

Sample:	All jobs	Jobs with posted wages		
	(1)	(2)	(3)	(4)
1-50	-0.013*** (0.001)	-0.022*** (0.002)	-0.036*** (0.003)	-0.023*** (0.003)
50-100	-0.032*** (0.000)	-0.053*** (0.001)	-0.063*** (0.001)	-0.056*** (0.001)
100-500	-0.041*** (0.000)	-0.066*** (0.000)	-0.076*** (0.001)	-0.069*** (0.001)
> 500	-0.046*** (0.000)	-0.075*** (0.000)	-0.085*** (0.001)	-0.078*** (0.001)
1-50 x 1(Non-metro)	-0.045*** (0.003)	-0.111*** (0.004)	-0.109*** (0.004)	-0.155*** (0.006)
50-100 x 1(Non-metro)	-0.073*** (0.001)	-0.147*** (0.002)	-0.146*** (0.002)	-0.181*** (0.003)
100-500 x 1(Non-metro)	-0.073*** (0.001)	-0.152*** (0.002)	-0.152*** (0.002)	-0.186*** (0.002)
> 500 x 1(Non-metro)	-0.074*** (0.001)	-0.150*** (0.002)	-0.150*** (0.002)	-0.184*** (0.002)
1-50 x 1(wage > med)			0.026*** (0.004)	0.002 (0.004)
50-100 x 1(wage > med)			0.020*** (0.001)	0.006*** (0.001)
100-500 x 1(wage > med)			0.020*** (0.001)	0.006*** (0.001)
> 500 x 1(wage > med)			0.019*** (0.001)	0.006*** (0.001)
N	166555050	62575521	62575521	62575521
<i>Controls</i>				
Job FE	✓	✓	✓	✓
Candidate FE	✓	✓	✓	✓
Month-year FE	✓	✓	✓	✓

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Month-year FE	✓	✓	✓	✓

- Candidate ability
- Candidate Controls
- Other job characteristics vary across metro and non-metro: interactions of education, experience, role, job title, job title by company with distance
- Alternative period: July–December 2019

[More Details](#)

What Explains Distaste for Non-metro Locations?

I - Impact of Connectivity

- Use a quasi-natural experiment that led to improvement in connectivity between cities
- UDAN Scheme: opening of new air routes to under-served cities - subsidized and half the cost of road travel - launched in April 2017
 - Application data: June 2018 – December 2019
 - Use applicant cities that got a new route (exclude large cities with existing airports): 54 got at least one air route
 - Compare applications between routes that got UDAN vs. others

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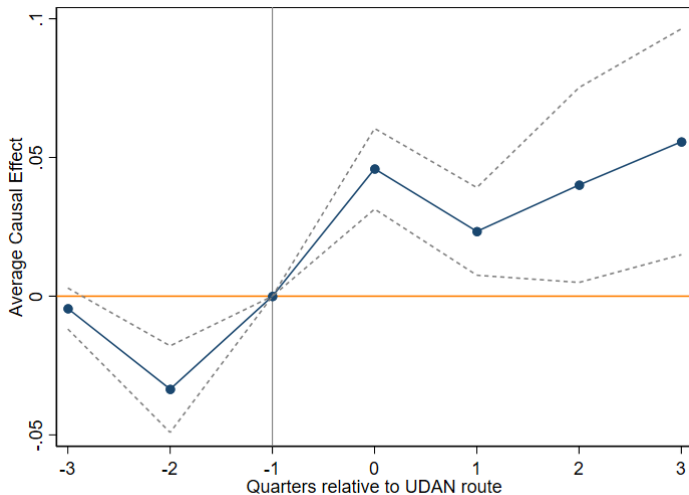
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 - Use applicant cities that got a new route (exclude large cities with existing airports): 54 got at least one air route
 - Compare applications between routes that got UDAN vs. others
- Job Cities: At least one application from the 54 cities and at least one route under UDAN
- Cities that are 200 miles apart

I - Impact of Connectivity

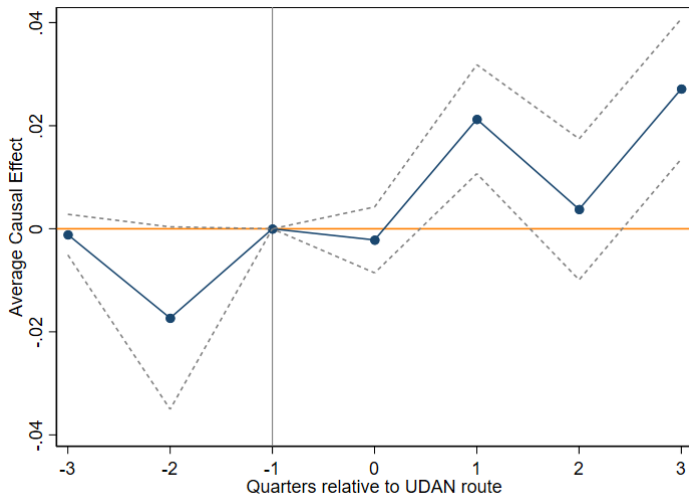
$$Y_{jkmt} = \delta_{km} + \delta_t + \delta_j + \sum_{\tau=-3, \tau \neq -1}^{\tau=3} \beta_{\tau} \text{Route}_{km}^{\tau} + \epsilon_{jkmt} \quad (1)$$

- Y : Number of applications received by Job ad j having posting date t , in job City k , from candidates in City m
- $\text{Route}_{km}^{\tau}=1$ for a city pair (k, m) , τ periods (quarters) after the route starts
- $\tau \in \{-3, 3\}$, normalize the coefficients relative to $\tau = -1$, i.e., the quarter before the treatment quarter.
- β_{τ} : Effect of treatment on the number of applications in τ
- Cluster the standard errors at job and candidate city level (k, m)
- Staggered: extensive controls, the staggered DID method proposed by Sun and Abraham that allows for adding covariates

Non-metro Candidates → Metro Jobs



Non-metro Candidates → Non-metro Jobs

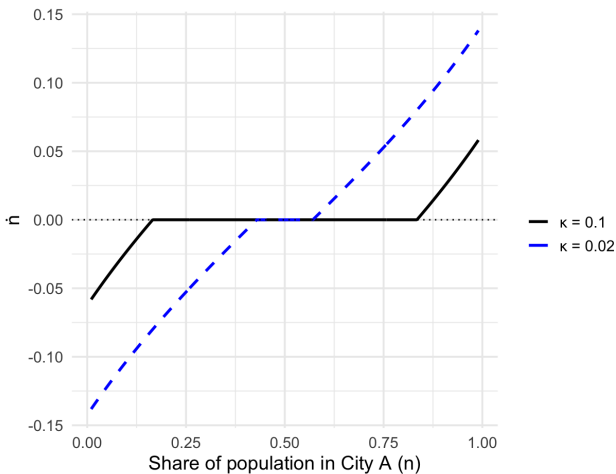


Summary: Impact of Connectivity

- Effect Metro Jobs: Approx 0.02 applications per job from a city, 25% increase
- Robustness and other tests:
 - Control for trends in applications across cities over time based on distance
 - Metro candidates → non-metro jobs: no impact
 - No spillover (cities within 50 miles of UDAN)

↓ Migration Costs → Agglomeration

Migration Dynamics in a Core-Periphery Model



II - Job Role Concentration

- Candidates may prefer a city due to long-run career prospects
- Baseline Concentration Measure: proportion of jobs in a specific job role posted in a city during July–December 2020
 - Static proportion for a specific job role-city pair may correlate with other city characteristics
- Dynamic Concentration Measure: proportion of jobs posted in a city for a given job role at the candidate-level
 - Based on the proportion of job advertisements visible to a specific candidate on the portal between $d - 10$ and $d + 1$

Job Role Concentration → Applications

	All (1)	Metro (2)	Non-metro (3)
1-50	-0.042*** (0.002)	-0.022*** (0.002)	-0.176*** (0.008)
50-100	-0.081*** (0.001)	-0.055*** (0.001)	-0.201*** (0.002)
100-500	-0.089*** (0.001)	-0.057*** (0.001)	-0.213*** (0.002)
> 500	-0.092*** (0.001)	-0.060*** (0.001)	-0.217*** (0.002)
Proportion	-0.151*** (0.003)	-0.067*** (0.003)	-0.786*** (0.019)
1-50 x Proportion	0.127*** (0.007)	0.048*** (0.007)	1.528*** (0.353)
50-100 x Proportion	0.169*** (0.005)	0.101*** (0.004)	0.824*** (0.022)
100-500 x Proportion	0.175*** (0.003)	0.085*** (0.002)	0.861*** (0.019)
>500 x Proportion	0.161*** (0.003)	0.072*** (0.003)	0.801*** (0.019)
N	166555050	102007876	64546823
Job FE	✓	✓	✓
Candidate FE	✓	✓	✓
Month-year FE	✓	✓	✓

Job Role Concentration → Applications

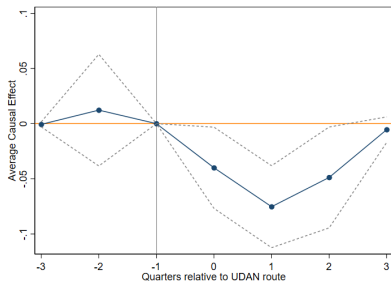
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Other factors

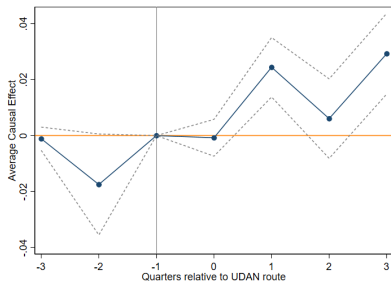
- Job's location within the candidate's home state or bordering state
- Direct language proximity
- Social connectivity: significant

Connecting Cities with High Job Role Concentration?

Non-Metro: Below Median

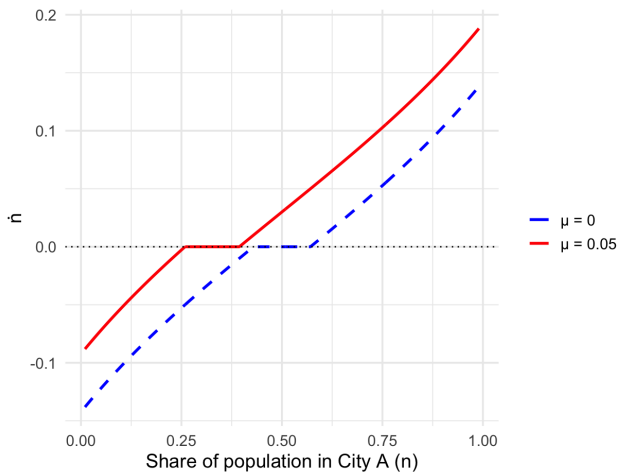


Non-Metro: Above Median



↓ Migration Costs and Specialization ↗ Agglomeration

Migration Dynamics When City A Specializes



III - Employer Distaste

- Distaste could be an equilibrium outcome where employers also prefer local candidates
- Test it using shortlisting data
 - Available for a subset of jobs posted during July–December 2020

$$Shortlist_{ijkt} = \gamma_0 + \sum_{k=1}^g \gamma_k DistGroup_k + \lambda_i \mathbb{X}_i + \lambda_j \mathbb{X}_j + \mu_i + \mu_j + \mu_t + \varepsilon_{ijkt}$$

Minimal Distaste on Employer Side (None for Non-metro)

	(1)	(2)	(3)	(4)
1-50	0.010 (0.067)	0.080 (0.048)	0.149 (0.116)	0.147 (0.119)
50-100	-0.035 (0.066)	0.022 (0.034)	-0.011 (0.083)	0.015 (0.082)
100-500	-0.001 (0.022)	-0.020 (0.016)	-0.059** (0.028)	-0.049 (0.032)
> 500	-0.049** (0.020)	-0.066*** (0.015)	-0.099*** (0.025)	-0.081*** (0.029)
1-50 × 1(Non-metro)		-0.128** (0.063)	-0.225 (0.157)	-0.230 (0.155)
50-100 × 1(Non-metro)		0.007 (0.046)	-0.024 (0.161)	0.023 (0.148)
100-500 × 1(Non-metro)		0.070*** (0.025)	0.147*** (0.047)	0.139*** (0.047)
> 500 × 1(Non-metro)		0.112*** (0.026)	0.166*** (0.045)	0.168*** (0.045)
N	28158	55738	28158	28158
Mean Y	0.295	0.295	0.295	0.295
Mean Y (Same city, base)	0.357	0.393	0.393	0.417
<i>Controls</i>				
Candidate controls		✓		
Job Edu, Exp × Distance				✓
Job FE	✓	✓	✓	✓
Candidate FE	✓		✓	✓
Month-year FE	✓	✓	✓	✓

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<i>Controls</i>				
Candidate controls		✓		
Job Edu, Exp × Distance				✓
Job FE	✓	✓	✓	✓
Candidate FE	✓		✓	✓
Month-year FE	✓	✓	✓	✓

Low Application Rate for Non-metro Jobs

- Applications per Vacancy: Metro vs Non-Metro

	(1)	(2)	(3)	(4)	(5)
Non-metro	-54.473*** (20.259)	-55.470** (21.869)	-39.870* (22.928)	-8.774*** (3.228)	-9.845*** (3.574)
log wage		-3.992 (14.964)			7.799** (3.299)
Constant	33.968*** (4.518)	82.494 (185.876)	20.421*** (2.990)	29.332*** (1.525)	-63.148 (40.087)
N	881	879	1034	19138	16670
Mean Y	27.2	26.2	15.5	26.6	29.6
<i>Controls</i>					
Job Controls	✓	✓	✓	✓	✓
Job Role FE	✓	✓	✓	✓	✓
Job Title FE			✓	✓	✓
Month-year FE	✓	✓	✓	✓	✓

Summary and Policy Implications

Question: How to attract candidates to non-metro locations?

- Air Connectivity - No
 - Metro Cities gain applicants from newly connected cities
- Job Role Concentration - Yes
 - Air Connectivity further helps non-metros with job specialization
- Is there Employer's distaste? - No
 - Employers are indifferent or those in non-metro more willing to hire distant candidates

- Distaste for Distant Locations
 - Marinescu & Rathelot (2018) and Banfi et al. (2019)
 - Distaste varies by city size

How to attract workers to non-metro locations?

- Air Connectivity → Job search
 - Impact on economic growth and population: Blonigen & Cristea (2015), McGraw (2020), Gibbons & Wu (2020), Sheard (2014) Breidenbach (2020)
- Role of Job Concentration
 - Industrial Cluster Policies: Neumark & Simpson (2015), Huber (2012), Martin et al. (2011), McDonald et al. (2007)

Conclusion

- Study spatial application behavior using major online job platform data
- Applicants show large distaste for distance
 - More so for jobs located in non-metro cities
- What attracts candidates to non-metro locations?
 - Air connectivity - no, job role concentration - yes, employer distaste - immaterial

Application: Metro vs. Non-metro (Other candidate controls)

	(1)	(2)
1-50	-0.013*** (0.001)	-0.022*** (0.004)
50-100	-0.036*** (0.000)	-0.058*** (0.001)
100-500	-0.041*** (0.000)	-0.069*** (0.001)
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1-50 × 1(Non-metro)	-0.059*** (0.003)	-0.156*** (0.006)
50-100 × 1(Non-metro)	-0.077*** (0.001)	-0.174*** (0.002)
100-500 × 1(Non-metro)	-0.082*** (0.001)	-0.180*** (0.002)
> 500 × 1(Non-metro)	-0.084*** (0.001)	-0.178*** (0.002)
N	166554699	62565076
Candidate FE	✓	✓
Job FE	✓	✓
Month-year FE	✓	✓
Candidate FE × Non-metro	✓	✓
Candidate FE × 1(wage > med)		✓
Candidate FE × 1(wage > med) × 1(Non-metro)		✓

Application: Metro vs. Non-metro (Other job controls)

	(1)	(2)	(3)	(4)
1-50	-0.394*** (0.042)			
50-100	-0.320*** (0.015)			
100-500	-0.286*** (0.009)			
> 500	-0.283*** (0.009)			
1-50 x 1(Non-metro)	-0.115*** (0.004)	-0.100*** (0.003)	-0.087*** (0.004)	-0.102*** (0.008)
50-100 x 1(Non-metro)	-0.145*** (0.002)	-0.122*** (0.002)	-0.120*** (0.002)	-0.135*** (0.004)
100-500 x 1(Non-metro)	-0.153*** (0.002)	-0.126*** (0.001)	-0.128*** (0.001)	-0.143*** (0.003)
> 500 x 1(Non-metro)	-0.152*** (0.002)	-0.128*** (0.001)	-0.129*** (0.001)	-0.145*** (0.003)
Constant	0.148*** (0.001)	0.026 (34657.890)	0.029 (16531.265)	-0.203 (14635.43)
N	62514607	62514607	62513819	62208200
Candidate FE	✓	✓	✓	✓
Job FE	✓	✓	✓	✓
Month-year FE	✓	✓	✓	✓
Candidate FE × Non-metro	✓	✓	✓	✓
Job edu, exp × distance	✓	✓	✓	✓
Job role × distance		✓		
Job title × distance			✓	
Job title, CompanyID × distance				✓

Application: Metro vs. Non-metro (2019)

<i>Sample:</i>	All jobs	Jobs with posted wages		
	(1)	(2)	(3)	(4)
1-50	-0.010*** (0.001)	-0.015*** (0.002)	-0.016*** (0.003)	-0.016*** (0.003)
50-100	-0.022*** (0.000)	-0.033*** (0.001)	-0.035*** (0.001)	-0.032*** (0.001)
100-500	-0.024*** (0.000)	-0.039*** (0.000)	-0.041*** (0.001)	-0.039*** (0.001)
> 500	-0.029*** (0.000)	-0.044*** (0.000)	-0.045*** (0.001)	-0.043*** (0.001)
1-50 x 1(Non-metro)	-0.019*** (0.002)	-0.037*** (0.004)	-0.037*** (0.004)	-0.042*** (0.006)
50-100 x 1(Non-metro)	-0.040*** (0.001)	-0.067*** (0.001)	-0.067*** (0.001)	-0.077*** (0.002)
100-500 x 1(Non-metro)	-0.041*** (0.001)	-0.067*** (0.001)	-0.067*** (0.001)	-0.076*** (0.002)
> 500 x 1(Non-metro)	-0.040*** (0.001)	-0.066*** (0.001)	-0.067*** (0.001)	-0.076*** (0.002)
1-50 x 1(wage> med)			0.002 (0.003)	0.002 (0.004)
50-100 x 1(wage> med)			0.003*** (0.001)	-0.001 (0.001)
100-500 x 1(wage> med)			0.002*** (0.001)	-0.001* (0.001)
> 500 x 1(wage> med)			0.001 (0.001)	-0.002*** (0.001)
N	162505938	78596823	78596823	78596823
Mean Y	0.006	0.009	0.009	0.009
Mean Y (Same city)	0.0356	0.0578	0.0578	0.0578
<i>Controls</i>				
Job FE	✓	✓	✓	✓
Candidate FE	✓	✓	✓	✓
Month-year FE	✓	✓	✓	✓

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Application: City size on Candidate Ability

Sample:	Graduates & above		Candidate ability	
	(1)	(2)	(3)	
1-50	-0.013*** (0.002)	-0.012*** (0.002)	-0.013*** (0.002)	
50-100	-0.030*** (0.000)	-0.036*** (0.001)	-0.033*** (0.001)	
100-500	-0.038*** (0.000)	-0.046*** (0.000)	-0.044*** (0.000)	
Above 500	-0.043*** (0.000)	-0.050*** (0.000)	-0.048*** (0.000)	
1-50 × 1(Non-metro)	-0.037*** (0.003)	-0.047*** (0.003)	-0.049*** (0.004)	
50-100 × 1(Non-metro)	-0.063*** (0.001)	-0.076*** (0.001)	-0.085*** (0.002)	
100-500 × 1(Non-metro)	-0.063*** (0.001)	-0.076*** (0.001)	-0.084*** (0.002)	
Above 500 × 1(Non-metro)	-0.064*** (0.001)	-0.076*** (0.001)	-0.085*** (0.002)	
1-50 × 1(Marks>75th ptile)		-0.002 (0.003)	0.002 (0.003)	
50-100 × 1(Marks>75th ptile)		0.010*** (0.001)	0.005*** (0.001)	
100-500 × 1(Marks>75th ptile)		0.011*** (0.001)	0.008*** (0.001)	
Above 500 × 1(Marks>75th ptile)		0.010*** (0.001)	0.006*** (0.001)	
1-50 × 1(Marks>75th ptile) × 1(Non-metro)			0.003 (0.006)	
50-100 × 1(Marks>75th ptile) × 1(Non-metro)			0.019*** (0.002)	
100-500 × 1(Marks>75th ptile) × 1(Non-metro)			0.016*** (0.002)	
Above 500 × 1(Marks>75th ptile) × 1(Non-metro)			0.017*** (0.002)	
N	151665025	151061161	151061161	
<i>Controls</i>				
Candidate FE	✓	✓	✓	
Job FE	✓	✓	✓	
Month-year FE	✓	✓	✓	

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Application: Metro vs. Non-metro (2019)

	(1)	(2)	(3)
1-50	-0.009*** (0.001)	-0.010*** (0.001)	-0.010*** (0.001)
50-100	-0.021*** (0.000)	-0.022*** (0.000)	-0.022*** (0.000)
100-500	-0.024*** (0.000)	-0.025*** (0.000)	-0.024*** (0.000)
> 500	-0.028*** (0.000)	-0.030*** (0.000)	-0.029*** (0.000)
1-50 × 1(Non-metro)	-0.018*** (0.002)	-0.019*** (0.003)	-0.019*** (0.002)
50-100 × 1(Non-metro)	-0.040*** (0.001)	-0.041*** (0.001)	-0.040*** (0.001)
100-500 × 1(Non-metro)	-0.041*** (0.001)	-0.041*** (0.001)	-0.041*** (0.001)
500 × 1(Non-metro)	-0.040*** (0.001)	-0.040*** (0.001)	-0.040*** (0.001)
N	161293860	162497861	162505938
Mean Y	0.006	0.006	0.006
Mean Y (Same city)	0.036	0.036	0.036
<i>Controls</i>			
Job controls		✓	
Candidate controls	✓		
Job FE	✓		✓
Candidate FE		✓	✓
Month-year FE	✓	✓	✓

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Application: City Size on Job Application, Alternative City Size Definition

	(1)	(2)	(3)
1-50	-0.012*** (0.001)	-0.024*** (0.002)	-0.013*** (0.002)
50-100	-0.039*** (0.000)	-0.053*** (0.000)	-0.044*** (0.000)
100-500	-0.045*** (0.000)	-0.060*** (0.000)	-0.051*** (0.000)
> 500	-0.049*** (0.000)	-0.064*** (0.000)	-0.054*** (0.000)
1-50 × 1 (Below 95th)	-0.377*** (0.006)	0.018*** (0.004)	-0.383*** (0.006)
50-100 × 1 (Below 95th)	-0.390*** (0.005)	0.004*** (0.001)	-0.394*** (0.005)
100-500 × 1 (Below 95th)	-0.400*** (0.005)	-0.005*** (0.000)	-0.404*** (0.004)
>500 × 1 (Below 95th)	-0.400*** (0.005)	-0.005*** (0.000)	-0.404*** (0.004)
N	164251691	165964571	166030192
<i>Controls</i>			
Job controls		✓	
Candidate controls	✓		
Job FE	✓		✓
Candidate FE		✓	✓
Month-year FE	✓	✓	✓

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Application: City Size on Job Application, Static Job Role Concentration

<i>Static Proportion</i>	(1)	Metro (2)	Non-metro (3)
1-50	-0.050*** (0.002)	-0.024*** (0.002)	-0.263*** (0.004)
50-100	-0.090*** (0.001)	-0.058*** (0.001)	-0.295*** (0.003)
100-500	-0.101*** (0.001)	-0.060*** (0.001)	-0.312*** (0.003)
> 500	-0.104*** (0.001)	-0.064*** (0.001)	-0.316*** (0.003)
1-50 × Proportion	0.188*** (0.007)	0.069*** (0.008)	2.908*** (0.167)
50-100 × Proportion	0.249*** (0.006)	0.135*** (0.006)	2.028*** (0.028)
100-500 × Proportion	0.275*** (0.004)	0.114*** (0.002)	2.160*** (0.026)
>500 × Proportion	0.258*** (0.004)	0.107*** (0.002)	2.125*** (0.026)
N	166555050	102007876	64546823
<i>Controls</i>			
Job FE	✓	✓	✓
Candidate FE	✓	✓	✓
Month-year FE	✓	✓	✓

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