

# Labor Market Integration and Entrepreneurship

---

Hanming Fang (Penn), Ming Li (CUHK-SZ), Wei Lin (CUHK-SZ)

May 2024

# Motivation

- Despite the well-known Hukou policies, China has seen a large increase in internal migration in the last 30 years.
  - ▶ The overall cross-city migrant population grew from 21 million in 1990 to 253 million in 2015.
  - ▶ Cross-city migration of urban residents start to overtake rural-urban migration as the more dominant form of migration
  - ▶ Job seekers (existing literature)
- Entrepreneurial activity exhibits great regional variation.
  - ▶ More than 50% of entrepreneurs establish their firms outside their hometown cities, and more than 30% are outside their hometown provinces.
  - ▶ Job creators (new)
- The two groups' migration decisions are closely related, and they jointly shape the economic distribution within the country.

- **How do labor market mobility restrictions affect entrepreneurial mobility?**
  - ▶ Use heterogeneous changes in Hukou restrictions to examine the effect
- **What is the equilibrium welfare effect?**
  - ▶ Build a quantitative spatial equilibrium model with labor and firm location choice simultaneously

# Heterogeneous Hukou Policies



《上海市居住证》积分指标体系表

指标分类及名称	最高分值	指标描述/具体积分标准	积分值	备注
基础指标	30分	56-60周岁, 积5分; 年龄每减少1岁, 积分增加0.2分	少1岁积2分	/
	110分	大专(高职)学历	50分	两项指标选择一项进行积分
		大学本科学历	60分	
		大学本科科学历和学士学位	90分	
		硕士研究生学历学位	100分	
		博士研究生学历学位	110分	
	140分	技能类国家职业资格五级	15分	两项指标选择一项进行积分
		技能类国家职业资格四级	30分	
		技能类国家职业资格三级	60分	
		技能类国家职业资格二级 或中级职称	100分	
技能类国家职业资格一级 或高级职称		140分		
/	/	缴纳职工社会保险费, 每满1年	3分	/

## Internal Migration

- Morten and Oliveira (2018); Allen et al. (2018); Bryan and Morten (2018)
- Beerli et al. (2021)
- We consider firm and labor market effects of internal migration jointly, and estimate the welfare effect in *equilibrium*

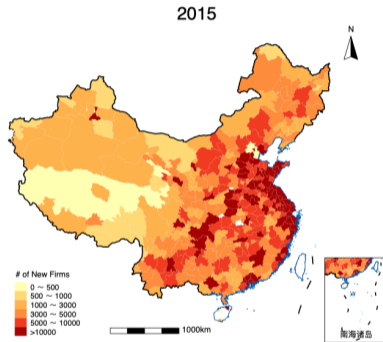
## Firm Location Choice

- Behrens et al. (2014); Gaubert (2018); Fajgelbaum et al. (2019); Kleinman (2022), etc.
- We account for the role of inter-regional labor mobility restrictions and their changes in shaping the firms' location choice.
- Identification of policy-induced sorting: We leverage the sample of *mover* entrepreneurs

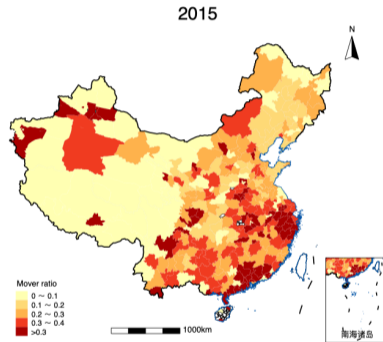
## Hukou system

- Imbert et al. (2022); Tombe and Zhu (2019); An et al. (2020);
- We are the first to distinguish heterogeneities in Hukou policy and study its distributional effect on entrepreneurial activities

# Distribution of Entrepreneurial Activities

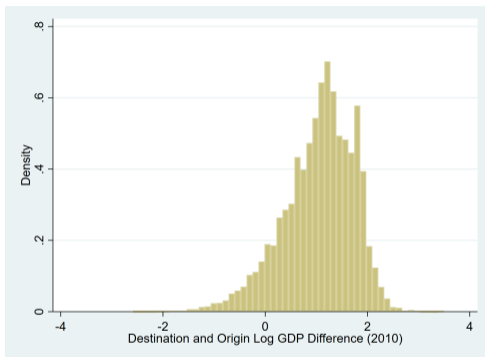


(a) # of New Firms (2015)

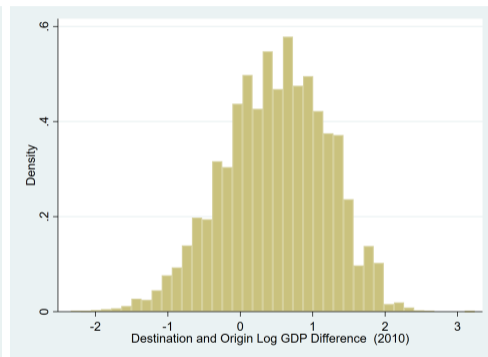


(b) % established by movers (2015)

# Labor are Migrating to Larger Cities

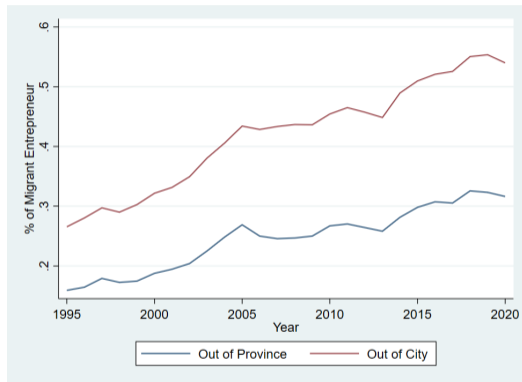


(a) Below College Education

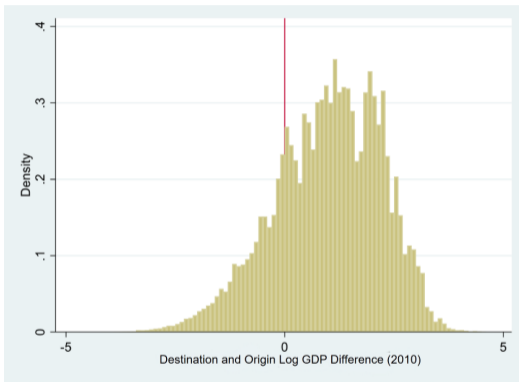


(b) College Education and Above

# Entrepreneurs are Moving to Larger Cities



(a) Share of Migrant Entrepreneurs



(b) Migrant Entrepreneurs Favor Larger Cities



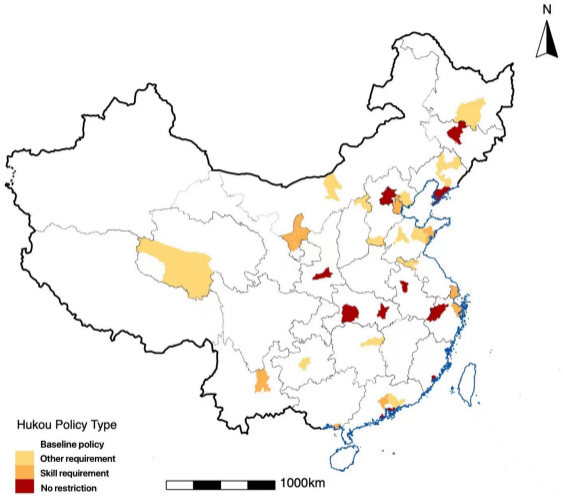
## Hukou Policy over the Past Decades

- **First wave (1984-1997):** 'Blue Stamp Hukou,' allowed entrepreneurs who made significant investments, white collar workers, and farmers who had been displaced by government purchases of their land to acquire urban Hukou.
- **Second wave (1997 to 2001):** enabled migrants who were permanently residing in certain (mostly smaller) cities to apply for local Hukou.
- **Third wave (2002 to 2013):** extended these regulations to 123 larger cities.
- **Last wave (2014 to Now):** "Guiding Opinions on Further Deepening the Reform of the Household Registration System," by the State Council, but cities may carry out their own policies.

# Reforming the Hukou

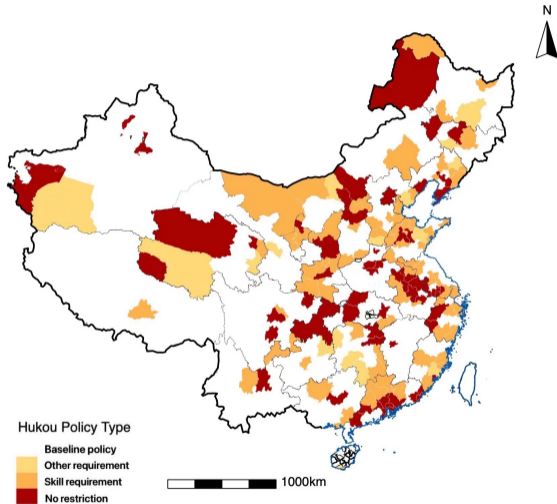
- The policy details are highly heterogeneous across cities, and **distinguish by group** of migrants example
- We collect data on **all** migration-related policy reforms from policy platforms, gazettes, websites and news portals for **each city**.
  - ▶ A Hukou reform is a deviation from the **0) baseline Hukou policies**.
  - ▶ For each document, we summarize the requirements into six categories: education degree, skill, investment, employment, purchase of housing units, and others.
  - ▶ We further classify all Hukou reforms into three broad categories based on their requirements for Hukou eligibility: **1) skill-biased requirement; 2) other requirements; 3) no restriction or only minimum requirement on employment**.

# Hukou Policies Over Years



Hukou Policies in 2000

# Hukou Policies Over Years



Hukou Policies in 2015

# Entrepreneur and Firm Registration Data

A comprehensive data set covering 30 million firms registered from 1995-2019.

- Firm registration: Detailed firms' registration information, including the establishment date, exit date (if any), industry, registration place, registered capital, shareholders, and legal person.
- Firm inspection data: Detailed firms' yearly reports
- **Entrepreneur (with unique identifier)**: the firm's shareholder and legal person's identity, birth place, birth year, and investment history.

# Administrative Tax Record Data

A comprehensive administrative data set from 2008 to 2016.

- Collected by the Chinese State Administration of Tax (SAT)
- Stratified sampling of more than 500 thousand firms each year.
- We use this data set to measure firms' performance: revenue, profit, value-added, TFP, employment, and wage.

# Migration Flow Data

**Migration flows 1996-2015:** Constructed from China Population Census 2000, 2005 (mini), 2010, 2015 (mini)

- We identify an individual to be a migrant if he/she reported a move and the time of move within five years of each census year
  - ▶ City of origin defined as the city of Hukou registration
  - ▶ City of destination defined as the city of living and working
- We validate the measure using additional questions in the 2010 and 2015 census
  - ▶ The city of residence 1 and 5 years ago
  - ▶ The date and origin city of the last migration in the last 5 years
- For example, our migrant flows in 1996 are based on people who migrated in 1996 and resided at their destination for at least 4 years where we observe them in the 2000 census.

# Hukou Reform and Entrepreneurship

We employ a diff-in-diff strategy at city level, with various policy measures as the treatment, relative to the control (baseline Hukou policy).

$$Y_{ct} = \beta_0 + \beta_1 Policy_{ct} + \gamma_c + \delta_t + \epsilon_{ct}$$

where

- $Y_{ct}$ : Number of *new* firms (in log) in city  $c$  at year  $t$
- $Policy_{ct}$ : indicators of different types of Hukou policy
  - ▶  $Hukou\_skill_{ct}$ : education/skill/business investment
  - ▶  $Hukou\_other_{ct}$ : other requirements such as long-term employment, housing purchase, etc.
  - ▶  $Hukou\_nonrestrictive_{ct}$ : no requirement or minimum requirement on employment
  - ▶  $Hukou_{ct}$ : indicator for any one of the above three reform



# Hukou Reform and Entrepreneurship

Y: log(# of New Firms)

	Total	Total	Migrant	Local
Hukou	0.0154 (0.0160)			
Hukou_skill		0.00950 (0.0272)	0.0626*** (0.0195)	-0.0600*** (0.0190)
Hukou_other		-0.0175 (0.0290)	0.0275 (0.0205)	-0.0337* (0.0181)
Hukou_nonrestrictive		0.0741*** (0.0244)	0.0917*** (0.0311)	0.0691** (0.0290)
Controls	Yes	Yes	Yes	Yes
City, Year FE, City Time Trend	Yes	Yes	Yes	Yes
Observations	6,816	6,816	6,816	6,816
R-squared	0.981	0.981	0.977	0.983

- Skill-biased Hukou reform changes the composition, but not the total number of entrepreneurs.
- Nonrestrictive Hukou reform spurs overall entrepreneurship (both local and migrant).

# Why do entrepreneurs respond to different policies differently?

- Local labor market skill composition
  - ▶ Skill-biased Hukou policy may attract more high-skilled workers, non-restrictive Hukou policies also attract low-skilled workers
  - ▶ This is particularly important for entrepreneurs in the low-skill-intensity industries
- Firms in different industries may respond differently
  - ▶ Low skill intensity firms may be hurt by skill-biased Hukou policy facing more fierce competition from migrant entrepreneurs
  - ▶ High skill intensity firms benefit from the skill-biased policy with cheaper high-skill labor
  - ▶ Low skill intensity firms may benefit from non-restrictive policy which also attracts abundant low-skill worker
  - ▶ High skill intensity firms may benefit even more from non-restrictive policy

# Hukou Reform and Labor Migration

For city  $c$ , year  $t$ , and number of migrant workers of skill type  $i$ :

$$Y_{ict} = \beta_0 + \beta_1 Policy_{ct} + \gamma_c + \delta_t + \epsilon_{ct}$$

- $Y_{ict}$ : # of Migrant Inflow of type  $i$  (in log), in city  $c$  in year  $t$
- We again consider skill-biased policy vs. policy with other requirement vs. non-restrictive policy

# Hukou Reform and Labor Migration

Y: log(# of Migrant Inflow)

	Total	Below College	College & Above
Hukou_skill	0.127*** (0.0397)	0.0309 (0.0318)	0.214*** (0.0421)
Hukou_other	0.122*** (0.0392)	0.0637** (0.0314)	0.152*** (0.0416)
Hukou_nonrestrictive	0.159*** (0.0585)	0.213*** (0.0469)	0.113* (0.0531)
Constant	2.974*** (0.0110)	2.743*** (0.00882)	1.417*** (0.0117)
City, Year FE, City Trend	Yes	Yes	Yes
Observations	6,292	6,292	6,292
R-squared	0.811	0.863	0.767

- Policies with skill requirements or other requirements mainly attract high-skill labor
- Nonrestrictive policies attract both high-skill and low-skill labor

## Hukou Reform and Firm Performance (By Firm Skill Intensity)

	log(Revenue)	log(Employment)	log(Wage)
Hukou_skill	-0.078*** (0.0240)	-0.0227*** (0.00378)	0.0400*** (0.00494)
Hukou_skill*Skill	0.194*** (0.0390)	0.0961*** (0.00607)	-0.0347*** (0.00796)
Hukou_other	-0.168*** (0.0253)	-0.0211*** (0.00399)	0.0177*** (0.00526)
Hukou_other*Skill	0.210*** (0.0406)	0.107*** (0.00629)	-0.0117 (0.00833)
Hukou_nonrestrictive	0.701*** (0.0300)	0.00364 (0.00447)	-0.00118 (0.00582)
Hukou_nonrestrictive*Skill	0.273*** (0.0470)	0.0661*** (0.00707)	0.00422 (0.00923)
Firm, Year FE	Yes	Yes	Yes
Observations	3,611,719	3,003,272	2,821,212
R-squared	0.911	0.922	0.638

## Hukou Reform and Firm Performance (By Firm Skill Intensity)

	log(Revenue)	log(Employment)	log(Wage)
Hukou_skill	-0.078*** (0.0240)	-0.0227*** (0.00378)	0.0400*** (0.00494)
Hukou_skill*Skill	0.194*** (0.0390)	0.0961*** (0.00607)	-0.0347*** (0.00796)
Hukou_other	-0.168*** (0.0253)	-0.0211*** (0.00399)	0.0177*** (0.00526)
Hukou_other*Skill	0.210*** (0.0406)	0.107*** (0.00629)	-0.0117 (0.00833)
Hukou_nonrestrictive	0.701*** (0.0300)	0.00364 (0.00447)	-0.00118 (0.00582)
Hukou_nonrestrictive*Skill	0.273*** (0.0470)	0.0661*** (0.00707)	0.00422 (0.00923)
Firm, Year FE	Yes	Yes	Yes
Observations	3,611,719	3,003,272	2,821,212
R-squared	0.911	0.922	0.638

## Hukou Reform and Firm Performance (By Firm Skill Intensity)

	log(Revenue)	log(Employment)	log(Wage)
Hukou_skill	-0.078*** (0.0240)	-0.0227*** (0.00378)	0.0400*** (0.00494)
Hukou_skill*Skill	0.194*** (0.0390)	0.0961*** (0.00607)	-0.0347*** (0.00796)
Hukou_other	-0.168*** (0.0253)	-0.0211*** (0.00399)	0.0177*** (0.00526)
Hukou_other*Skill	0.210*** (0.0406)	0.107*** (0.00629)	-0.0117 (0.00833)
Hukou_nonrestrictive	0.701*** (0.0300)	0.00364 (0.00447)	-0.00118 (0.00582)
Hukou_nonrestrictive*Skill	0.273*** (0.0470)	0.0661*** (0.00707)	0.00422 (0.00923)
Firm, Year FE	Yes	Yes	Yes
Observations	3,611,719	3,003,272	2,821,212
R-squared	0.911	0.922	0.638

## Hukou Reform and Firm Performance (By Firm Skill Intensity)

	log(Revenue)	log(Employment)	log(Wage)
Hukou_skill	-0.078*** (0.0240)	-0.0227*** (0.00378)	0.0400*** (0.00494)
Hukou_skill*Skill	0.194*** (0.0390)	0.0961*** (0.00607)	-0.0347*** (0.00796)
Hukou_other	-0.168*** (0.0253)	-0.0211*** (0.00399)	0.0177*** (0.00526)
Hukou_other*Skill	0.210*** (0.0406)	0.107*** (0.00629)	-0.0117 (0.00833)
Hukou_nonrestrictive	0.701*** (0.0300)	0.00364 (0.00447)	-0.00118 (0.00582)
Hukou_nonrestrictive*Skill	0.273*** (0.0470)	0.0661*** (0.00707)	0.00422 (0.00923)
Firm, Year FE	Yes	Yes	Yes
Observations	3,611,719	3,003,272	2,821,212
R-squared	0.911	0.922	0.638



## Model Setup

- We build a spatial equilibrium model following Fajgelbaum et al. (2019) and incorporate heterogeneous worker type and policy-induced type-specific labor mobility cost.
  - Bryan and Morten (2019) have heterogeneous worker type and type-specific labor mobility cost, but do not have firm location choice (and thus no endogenous labor demand)
- The model elucidates our key mechanism: labor sort in response to the reduction in mobility cost, and firms sort with labor.

- Closed economy with  $N$  cities indexed by  $o$  or  $d$
- Mass of  $H$ -type workers:  $M_H$ ; mass of  $L$ -type workers:  $M_L$ , distributed across the  $N$  origin cities
- Workers are born in a particular origin indexed by  $o$ , receive **idiosyncratic preference shocks** for each destination city  $d$ — characterized by Fréchet parameter  $\xi$ — and sort across destination cities based on wages and migration costs.
- Migration costs are relative to the birth location, and is modeled as an iceberg cost  $\tau_{od}^s$  for workers of type  $s \in \{H, L\}$  migrating from  $o$  to  $d$
- Workers consume two types of products:  $h$ -sector product  $Q_h$  (high-skill intensity products),  $l$ -sector product  $Q_l$  (low-skill intensity), which are produced by two types of firms.
- The total labor supply in city  $d$  is the total number of workers of type  $s$  from all origin  $o$  who choose city  $d$

- Firms are established and owned by potentially mobile entrepreneurs.
- Firms use  $H$ -type labor and  $L$ -type labor to produce output.
- There is a fixed mass of  $h$ -sector firms producing high-skill products, and a fixed mass of  $l$ -sector firms producing low-skill products, sorting across cities.
- Firms in each sector decide in which city to locate to maximize the profit according to labor costs and agglomeration forces. The Fréchet parameter  $\varepsilon$  characterizes the distribution of firms' preferences.
- Goods are freely traded in the baseline model.

**$h$ -sector Firm:** a fixed mass of firms  $M_h$  decide in which city to locate.

- Cobb-Douglas technology:

$$q_{dh}(\omega) = \varphi_{dh}(\omega) l_{dhH}^\alpha l_{dhL}^{1-\alpha}$$

where  $\varphi_{dh}(\omega) = M_{dh}^\rho z_{dh}(\omega)$  is firm-specific productivity.

- $M_{dh}$  is the mass of  $h$ -type firms choose to locate in city  $d$
- $\rho$  captures the agglomeration effect
- $z_{dh}(\omega)$  is firm-specific idiosyncratic productivity shock for city  $d$  and firm  $\omega$  of  $h$ -type

**$l$ -sector Firm:** a fixed mass of firms  $M_l$  decide in which city to locate.

- For simplicity, assume that firms in the  $l$ -sector only employ low-skill worker

$$q_{dl}(\omega) = \varphi_{dl}(\omega) l_{dl}$$

A general equilibrium of this economy consists of distributions of workers and firms  $\{L_{ods}, M_{dv}\}_{o,d=1}^N$ , aggregate quantities  $\{Q_h, Q_l\}$ , wages  $\{W_{ds}\}_{d=1}^N$ , where  $s \in \{H, L\}$ ,  $v \in \{h, l\}$ , and final good prices  $\{P_h, P_l\}$  such that:

- 1 Firms optimize on their location choice and labor demand, given productivity draws and labor cost;
- 2 Workers make consumption and location decisions optimally, given migration cost, preference draws, and wage;
- 3 Final good markets clear in every sector;
- 4 Labor market clears in every city and skill type.

# Key Parameters

Parameter	Detail
$\xi$	Workers' mobility elasticity on wage
$\tau$	Worker's type- and destination- specific mobility cost
$\epsilon$	Workers' employer preference dispersion
$\varepsilon$	Firms' mobility elasticity on cost
$\alpha$	Firms' production technology parameter
$\sigma$	Firms' market power
$\rho$	Agglomeration effect

## Identification of Key Parameters

- Step 1: City-year level skill-specific wage  $W_H$  and  $W_L$  are calibrated from the firm level wage in the tax survey data (2008-2015). The key source of identification is the firms' skill intensity joint with the firms' average wage.
- Step 2: Firms' production technology parameter  $\alpha$  is then calibrated from the industry-level skill intensity joint with the calibrated skill-specific wage from the step 1.
- Step 3 : Worker's destination-origin-type-year-specific mobility costs  $\tau$  are estimated from regional wage distributions (from step 1) and the migration flow  $L_{ods}$  constructed from the census data.
- Step 4: Workers' mobility elasticity  $\xi$  is estimated from the migration flow and the calibrated wage (from step 1).
- Step 5: Firms' preference over regions  $\varepsilon$  is identified from mover firms' location choice and the estimated labor cost using firm registration data.

# Estimation Results

Parameter	Detail	Value
$\xi$	Workers' mobility elasticity on wage	1.4 (estimated from census panel) <a href="#">more</a>
$\tau$	Worker's type- and destination- specific mobility cost	See Figure <a href="#">τ</a> for estimates
$\epsilon$	Workers' employer preference dispersion	Set to be 5 from (Fajgelbaum et al., 2019)
$\varepsilon$	Firms' mobility elasticity on cost	0.5 (estimated from firm registration mover panel)
$\alpha$	Firms' production technology parameter	See Figure <a href="#">α</a> for estimates
$\sigma$	Firms' market power	Set to be 5 from (Fajgelbaum et al., 2019)
$\rho$	Agglomeration effect	Set to be 0.2 from (Gaubert, 2018)



## Counterfactual - Random 20 Cities

	Biased			Unrestrictive		
	Overall	Relaxed	Unrelaxed	Overall	Relaxed	Unrelaxed
Panel A: Wage						
Wage (High Skill Labor)	0.91%	-4.86%	1.27%	0.91%	-1.87%	1.08%
Wage (Low Skill Labor)	-0.47%	2.93%	-0.69%	-0.36%	-2.40%	0.23%
Panel B: Net Flow						
Labor (High Skill)	-	2.61%	-2.22%	-	4.18%	-2.57%
Labor (Low Skill)	-	0.58%	-0.04%	-	2.67%	-1.73%
Firm (High Skill Sector)	-	2.70%	-2.37%	-	3.99%	-1.25%
Firm (Low Skill Sector)	-	-2.13%	1.82%	-	2.08%	-0.88%
Panel C: Aggregate Welfare (by Destination)						
Welfare (High Skill Labor)	4.46%	17.15%	-0.98%	5.74%	22.68%	-1.52%
Welfare (Low Skill Labor)	-0.30%	3.53%	-0.73%	2.02%	10.23%	-1.50%
Total Welfare	1.23%	6.25%	-0.93%	2.75%	12.72%	-1.52%

- Both biased and nonrestrictive relaxation attract both high-skill labor and low-skill labor.
- Biased relaxation attracts firms in high-skill sector, but crowds out firms in low-skill sector. Nonrestrictive ones attract both.

## Counterfactual - Random 20 Cities

	Biased			Unrestrictive		
	Overall	Relaxed	Unrelaxed	Overall	Relaxed	Unrelaxed
Panel A: Wage						
Wage (High Skill Labor)	0.91%	-4.86%	1.27%	0.91%	-1.87%	1.08%
Wage (Low Skill Labor)	-0.47%	2.93%	-0.69%	-0.36%	-2.40%	0.23%
Panel B: Net Flow						
Labor (High Skill)	-	2.61%	-2.22%	-	4.18%	-2.57%
Labor (Low Skill)	-	0.58%	-0.04%	-	2.67%	-1.73%
Firm (High Skill Sector)	-	2.70%	-2.37%	-	3.99%	-1.25%
Firm (Low Skill Sector)	-	-2.13%	1.82%	-	2.08%	-0.88%
Panel C: Aggregate Welfare (by Destination)						
Welfare (High Skill Labor)	4.46%	17.15%	-0.98%	5.74%	22.68%	-1.52%
Welfare (Low Skill Labor)	-0.30%	3.53%	-0.73%	2.02%	10.23%	-1.50%
Total Welfare	1.23%	6.25%	-0.93%	2.75%	12.72%	-1.52%

- Unrestrictive Hukou relaxation generates larger welfare gains.
  - ▶ With nonrestrictive relaxation, everyone is better off (people who stay benefit from higher wages, people who move benefit from lower migration cost);
  - ▶ With skilled-biased policy, everyone in the destination city is better off, low-skill labor who stay in the origin city get worse off because of lower wages for low-skill workers.

## Counterfactual - Largest 20 Cities

	Biased			Unrestrictive		
	Overall	Relaxed	Unrelaxed	Overall	Relaxed	Unrelaxed
Panel A: Wage						
Wage (High Skill Labor)	1.04%	-7.02%	4.56%	3.66%	-3.73%	4.12%
Wage (Low Skill Labor)	-1.89%	3.89%	-2.25%	-0.77%	-0.84%	-0.77%
Panel B: Net Flow						
Labor (High Skill)	-	6.60%	-4.29%	-	8.96%	-8.38%
Labor (Low Skill)	-	0.22%	-0.13%	-	5.25%	-3.50%
Firm (High Skill Sector)	-	6.65%	-5.53%	-	6.98%	-5.30%
Firm (Low Skill Sector)	-	-5.21%	4.30%	-	6.17%	-5.09%
Panel C: Aggregate Welfare (by Destination)						
Welfare (High Skill Labor)	6.68%	18.94%	0.07%	6.06%	25.87%	-4.61%
Welfare (Low Skill Labor)	-0.10%	4.12%	-2.38%	2.42%	14.80%	-4.24%
Total Welfare	2.21%	7.08%	-0.42%	3.01%	17.02%	-4.53%

- With nonrestrictive relaxation

- ▶ Everyone in the treated cities and who move to the treated cities is better off
- ▶ High-skill labor who stay in the untreated cities is better off
- ▶ Low-skill labor who stay in the untreated cities is slightly worse off

## Counterfactual - Smallest 20 Cities

	Biased			Unrestrictive		
	Overall	Relaxed	Unrelaxed	Overall	Relaxed	Unrelaxed
Panel A: Wage						
Wage (High Skill Labor)	-0.77%	-12.13%	-0.06%	-0.57%	-7.41%	-0.14%
Wage (Low Skill Labor)	0.47%	9.09%	-0.07%	-0.30%	-2.82%	-0.14%
Panel B: Net Flow						
Labor (High Skill)	-	19.55%	-0.13%	-	20.91%	-0.15%
Labor (Low Skill)	-	-0.60%	0.01%	-	6.49%	-0.14%
Firm (High Skill Sector)	-	18.76%	-0.15%	-	19.58%	-0.16%
Firm (Low Skill Sector)	-	-15.03%	0.02%	-	13.24%	-0.13%
Panel C: Aggregate Welfare (by Destination)						
Welfare (High Skill Labor)	1.12%	26.06%	-0.19%	1.44%	34.34%	-0.29%
Welfare (Low Skill Labor)	0.36%	8.44%	-0.06%	0.43%	13.84%	-0.28%
Total Welfare	0.44%	11.96%	-0.16%	0.62%	17.94%	-0.29%

# Conclusion

- We are the first to provide a full picture of the dynamics of Hukou policy in the past three decades and document its *distributional* effect on entrepreneurial activity.
- Reduced-form evidence informs the importance of policy heterogeneity:
  - ▶ Skill-biased policy changes change the composition but not the total number of entrepreneurs; Nonrestrictive policy changes spur overall entrepreneurship.
  - ▶ Better-performing entrepreneurs are moving from smaller cities to larger ones.
  - ▶ Entrepreneurs in low-skill industries are hurt by skill-biased policy change but benefit from nonrestrictive policy change; Entrepreneurs in high-skill industries benefit from both, and more from nonrestrictive ones

# Conclusion

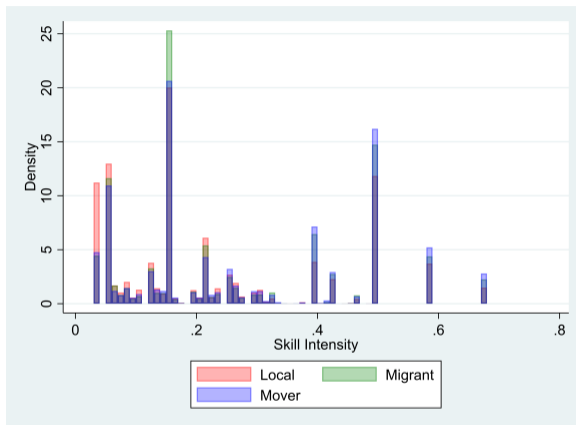
- We build a spatial equilibrium model following Bryan and Morten (2019) and Fajgelbaum et al. (2019) to illustrate our **key mechanism: labor sort in response to the reduction in mobility cost, and firms sort with labor.**
  - ▶ We add to Fajgelbaum et al. (2019) heterogeneous worker type and policy-induced worker type-specific labor mobility cost.
  - ▶ We add to Bryan and Morten (2019) firm location choice (and thus endogenous labor demand)
- **The relaxation of Hukou restrictions may contribute to greater regional inequality, but improves overall efficiency and welfare.**
- In another related project, we document the long-term reversal of the trend— better entrepreneurs are more likely to return to their hometowns.

- Foshan, a manufacturing-agglomeration city in Guangdong (*"Decision on Reform of Household Registration System"* June 1, 2004)
- Approval of local household registration (Hukou) if one of the following criteria is met:
  - ① Public sector employees: family all in.
  - ② With above college education (male<50; female<45): one in.
  - ③ Parents/Children/Couples (at least one is local resident)
  - ④ Entrepreneur with investment here and paying tax > 10,000 RMB: family all in
  - ⑤ Running business or be employed continuously for 7 years: one in
  - ⑥ Owner of a firm with registered capital of more than 200,000 RMB: family all in
  - ⑦ Commercial housing purchase activities: family all in
  - ⑧ ...

- Tongling, a middle-size city in Jiangxi (*"Decision on Advancing Reform of Household Registration System"* September 7, 2017)
- Overall relaxation of Hukou restrictions.
- The document specifically emphasizes that no investment, housing purchase, skill-based point system, or social security status should be used as conditions for local Hukou eligibility.



# Skill distribution



*Notes:* This figure depicts the histogram of the industry-level skill intensity distributions for firms established by local entrepreneurs, migrant entrepreneurs, and movers separately. Skill intensity is defined at the 3-digit industry level as the % of skill workers in the total labor force. [back](#)

# Who Are Responding to Hukou Reforms? [back](#)

Y:1 (Established by Migrant Entrepreneur)

	D:log(Destination GDP)	D:log(Home GDP)	D:log(Previous GDP)	D:Previous Percentile
Hukou_skill	-0.330*** (0.00358)	0.0848*** (0.00269)	-0.0549*** (0.00609)	0.0503*** (0.00219)
Hukou_skill*D	0.0472*** (0.000474)	-0.127*** (0.000362)	-0.00312*** (0.000763)	0.00127*** (0.000395)
Hukou_other	-0.275*** (0.00367)	0.127*** (0.00268)	0.0482*** (0.00602)	0.0205*** (0.00209)
Hukou_other*D	0.0373*** (0.000467)	-0.00901*** (0.000351)	-0.00208*** (0.000736)	0.00178*** (0.000374)
Hukou_nonrestrictive	0.0470*** (0.00276)	0.444*** (0.00173)	0.479*** (0.00381)	0.0844*** (0.00139)
Hukou_nonrestrictive*D	0.00223*** (0.000339)	-0.0485*** (0.000223)	-0.0525*** (0.000451)	0.00776*** (0.000216)
D, Log(Asset)	Yes	Yes	Yes	Yes
City, Year FE	Yes	Yes	Yes	Yes
Observations	27,456,853	27,226,186	7,132,888	7,411,193
R-squared	0.259	0.334	0.215	0.208

- Hukou reforms in large cities are more likely to attract better-performing entrepreneurs from small cities

## The Performance of Migrant Entrepreneurs [back](#)

	log(Revenue)	log(Employment)	log(Profit)	TFP	log(R&D)	log(Wage)
Migrant	0.100*** (0.00495)	0.00645*** (0.00159)	0.0204*** (0.00402)	0.0916*** (0.00221)	0.0619*** (0.00312)	-0.0128*** (0.00114)
Constant	7.037*** (0.00249)	3.064*** (0.000871)	4.993*** (0.00218)	-0.0827*** (0.00114)	0.426*** (0.00166)	-2.970*** (0.000620)
C, I, Y, H FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,144,462	2,858,838	1,549,195	1,452,648	1,528,346	2,693,550
R-squared	0.242	0.393	0.329	0.134	0.184	0.237

- Migrant entrepreneurs perform better!

skill

Households of type  $s \in \{H, L\}$  choose their city  $d$ , employer  $\omega \in \Omega_v$ ,  $v \in \{h, l\}$ , consumption of h-type product  $Q_h$  and l-type product  $Q_l$  to maximize

$$U_{odsw} = b_{d\omega} a_d (1 - \tau_{od}^s) (Q_h)^\beta (Q_l)^{(1-\beta)}, \quad Q_v = \left[ \int_{\omega \in \Omega_v} (q_v(\omega))^{\frac{\sigma-1}{\sigma}} d\omega \right]^{\frac{\sigma}{\sigma-1}}$$

- $b_{d\omega}$  is an household-specific idiosyncratic preference shock for city  $d$  and employer  $\omega$ ;
- $q_v(\omega)$  is the production of type  $v$  good by employer  $\omega$
- $Q_v$  aggregates all product varieties  $w$  available in sector  $v$ , using a constant elasticity of substitution  $\sigma > 1$ ;
- $\beta \in (0, 1)$  is the expenditure share on h-type product;
- Households draw the set of idiosyncratic shocks  $b_{d\omega}$  from a nested Fréchet distribution.

## Household Location Choice [back](#)

Each origin is endowed with a fixed mass of labor with skill level  $s$ , denoted by  $\bar{L}_{os}$ . Households locate to maximize their indirect utility which is a function of wage and mobility cost.

$$\frac{L_{ods}}{\bar{L}_{os}} = \left( \frac{(1 - \tau_{od}^s) W_{ds}}{\tilde{W}_{os}} \right)^\xi$$

The implied regional labor supply, given by the probability that an agent of type  $s$  from origin  $o$  chooses city  $d$ , equals to:

$$L_{ds} = \sum_o L_{ods} = \sum_o \bar{L}_{os} \left( \frac{(1 - \tau_{od}^s) W_{ds}}{\tilde{W}_{os}} \right)^\xi$$

- $L_{ods}$  is the measure of households of type  $s$  from origin  $o$  that choose city  $d$ ;  $L_{ds}$  is the measure of households of type  $s$  that choose city  $d$
- $W_{ds}$  is the regional skill-specific ideal wage index, aggregating the employer-specific wages  $w_{ds}(\omega)$
- $\tilde{W}_{os} = \left( \sum_d ((1 - \tau_{od}^s) W_{ds})^\xi \right)^{\frac{1}{\xi}}$

There exists a fixed mass of firms  $M_h$  which must decide in which city to locate. Assuming that these firms are heterogeneous in terms of their productivity across locations, which are mainly affected by two factors: labor cost and agglomeration effect.

- Cobb-Douglas technology:

$$q_{dh}(\omega) = \varphi_{dh}(\omega) l_{dhH}^\alpha l_{dhL}^{1-\alpha}$$

where  $\varphi_{dh}(\omega) = M_{dh}^\rho z_{dh}(\omega)$  is firm-specific productivity.

- $M_{dh}$  is the mass of h-type firms choose to locate in city  $d$
- $\rho$  captures the agglomeration effect
- $z_{dh}(\omega)$  is firm-specific idiosyncratic productivity shock for city  $d$  and firm  $\omega$  of h-type
- $\sigma$  captures the market power of the firm in product market

Conditional on the firms' location choice, they solve the maximization problem:

$$\max_{l_{dH}, l_{dL}} P_h Q_h^{\frac{1}{\sigma}} (\varphi_{dh}(\omega) l_{dhH}^{\alpha} l_{dhL}^{1-\alpha})^{\frac{\sigma-1}{\sigma}} - \sum_{s \in \{L, H\}} W_{ds} L_{ds}^{-\frac{1}{\epsilon}} l_{dhs}^{1+\frac{1}{\epsilon}}$$

- $P_h Q_h^{\frac{1}{\sigma}}$  and  $W_{ds} L_{ds}^{-\frac{1}{\epsilon}}$  captures the market power of the firm in output and labor market.

For simplicity, assume that firms in the I-sector only employ low-skill worker. The production function of firms in the I-sector is given by

$$q_{dl}(w) = \varphi_{dl}(w)l_{dl}$$

Then firm's maximization problem is.

$$\max_{l_s} P_l Q_l^{\frac{1}{\sigma}} (\varphi_{dl} l_{dl})^{1 - \frac{1}{\sigma}} - W_{dL} L_{dL}^{-\frac{1}{\epsilon}} l_{dl}^{1 + \frac{1}{\epsilon}}$$



A fixed mass of firms in each sector decide in which city to locate to maximize the profit.

**h-sector:** The fraction of firms located in city  $d$  is thus

$$\frac{M_{dh}}{M_h} = \left( \frac{\gamma_{dh}}{\gamma_h} \right)^{\frac{\frac{1}{\psi} \frac{\sigma-1}{\sigma}}$$

where

$$\gamma_{dh} = C_{dh}^{-\frac{1-\psi}{\psi}} M_{dh}^{\frac{\rho}{\psi} \frac{\sigma-1}{\sigma}}, \quad \gamma_h = \left( \sum_{d=1}^N \gamma_{dh}^{\frac{\frac{1}{\psi} \frac{\sigma-1}{\sigma}} \right)^{\frac{\frac{1}{\psi} \frac{\sigma-1}{\sigma}}{\epsilon}}$$

**l-sector:**

$$\frac{M_{dl}}{M_l} = \frac{(C_{dl})^{\frac{(1-\psi)\epsilon\sigma}{1-\sigma}}}{\sum_i (C_{il})^{\frac{(1-\psi)\epsilon\sigma}{1-\sigma}}}$$

A general equilibrium of this economy consists of distributions of workers and firms  $\{L_{ods}, M_{dv}\}_{o,d=1}^N$ ,  $s \in \{H, L\}$ ,  $v \in \{h, l\}$ , aggregate quantities  $\{Q_h, Q_l\}$ , wages  $\{W_{ds}\}_{o,d=1}^N$ ,  $s \in \{H, L\}$  and final good prices  $\{P_h, P_l\}$  such that:

- i) Firms optimize on their location choice and labor demand, given productivity draws and labor cost;
- ii) Workers make consumption and location decisions optimally, given migration cost, preference draws, and wage;
- iii) Final good markets clear in every sector;
- iv) Labor market clears in every city and skill type.

## Proposition

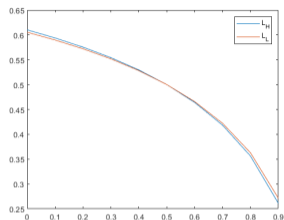
Consider an economy with two cities. Migration costs is denoted as  $\tau = [\tau_{AH}, \tau_{AL}, \tau_{BH}, \tau_{BL}]$

- (a) (The effect of skill-biased hukou policy) For any given level of  $\tau_{AL}, \tau_{BH}, \tau_{BL}$ , we have  $\frac{\partial L_{AH}}{\partial \tau_{AH}} < 0, \frac{\partial L_{AL}}{\partial \tau_{AH}} < 0, \frac{\partial M_{AH}}{\partial \tau_{AH}} < 0, \frac{M_{AL}}{\partial \tau_{AH}} > 0, \frac{W_{AL}}{\partial \tau_{AH}} < 0$ , and the sign of  $\frac{W_{AH}}{\partial \tau_{AH}}$  is not determined.
- (b) (The effect of no-restriction hukou policy) For any given level of  $\tau_{BH}, \tau_{BL}$ , assume that  $\tau_{AH} = \tau_{AL} = \tau_A$ , we have  $\frac{\partial L_{AH}}{\partial \tau_A} < 0, \frac{\partial L_{AL}}{\partial \tau_A} < 0, \frac{\partial M_{AH}}{\partial \tau_A} < 0, \frac{M_{AL}}{\partial \tau_A} < 0$ , and the sign of  $\frac{W_{AL}}{\partial \tau_A}, \frac{W_{AH}}{\partial \tau_A}$  is not determined.

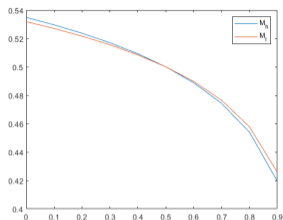
### Proposition

Consider an economy with two cities. Migration costs is denoted as  $\tau = [\tau_{AH}, \tau_{AL}, \tau_{BH}, \tau_{BL}]$ . Under the following two scenarios: 1) For any given level of  $\tau_{AL}, \tau_{BH}, \tau_{BL}$ ; 2) For any given level of  $\tau_{BH}, \tau_{BL}$ , assume that  $\tau_{AH} = \tau_{AL} = \tau_A$ ; we have  $\frac{\partial L_{AH}}{\partial \tau_{AH}} < \frac{\partial L_{AL}}{\partial \tau_{AH}}, \frac{\partial M_{AH}}{\partial \tau_{AH}} < \frac{\partial M_{AL}}{\partial \tau_{AH}}$ .

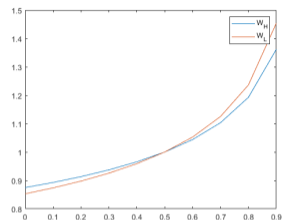
# Model Simulation (Low Agglomeration) [back](#)



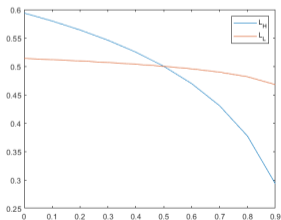
(a) Labor- No restriction



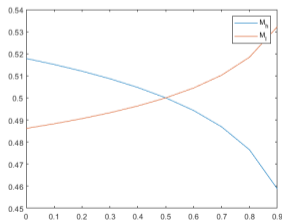
(b) Firm- No restriction



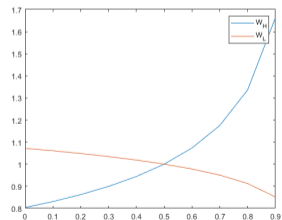
(c) Wage- No restriction



(d) Labor- Skill bias

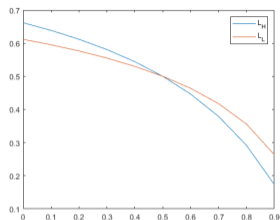


(e) Firm- Skill bias

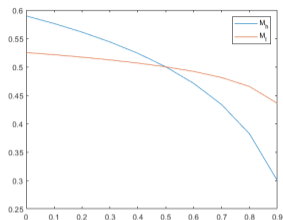


(f) Wage- Skill bias

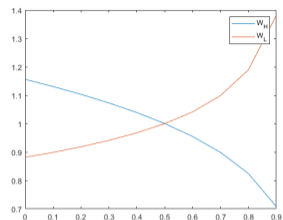
# Model Simulation (High Agglomeration) [back](#)



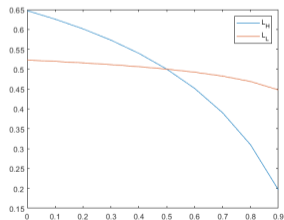
(a) Labor- No restriction



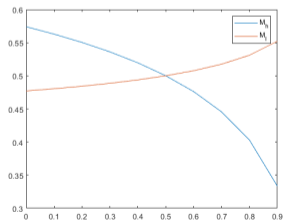
(b) Firm- No restriction



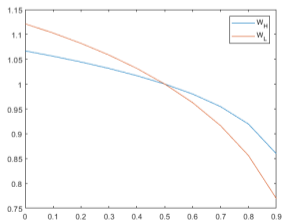
(c) Wage- No restriction



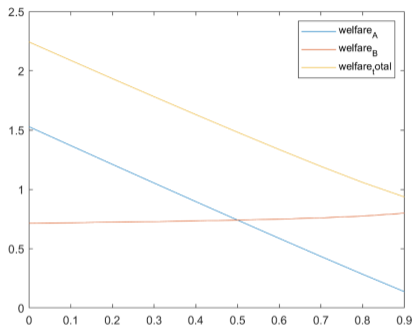
(d) Labor- Skill bias



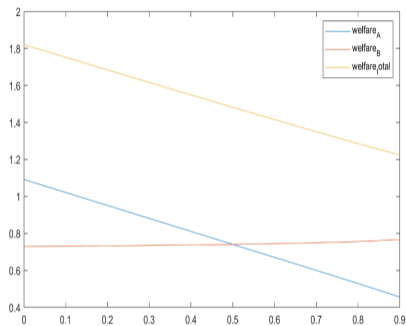
(e) Firm- Skill bias



(f) Wage- Skill bias

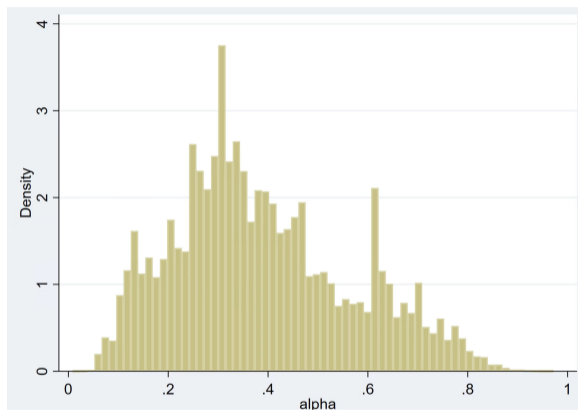


(a) Welfare- No restriction



(b) Welfare- Skill bias

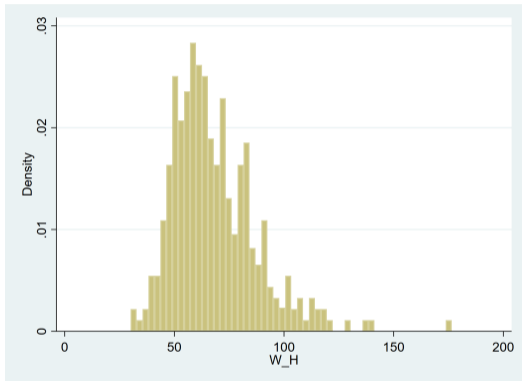
Figure 6: The Effect of Hukou Policy Relaxation on Labor Welfare



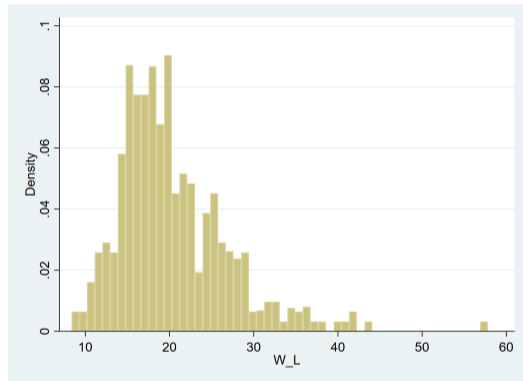
*Notes:* The figure plots the distribution of the calibrated production function parameter  $\alpha$ .



# Calibrated Skill-Specific Wage Distribution [back](#)

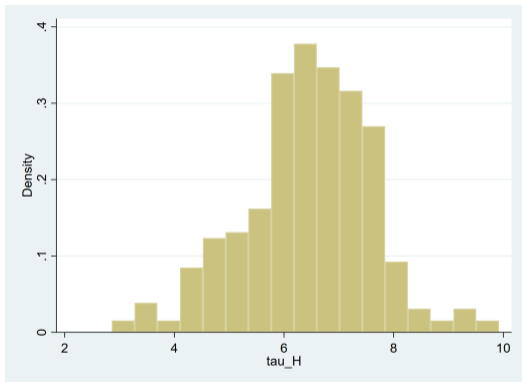


(a) High Skill

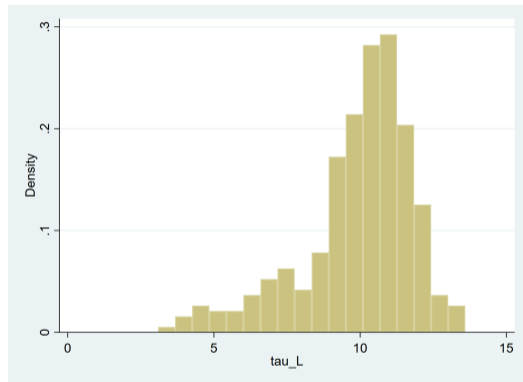


(b) Low Skill

# Calibrated Skill-Specific Migration Cost Distribution (2010) [back](#)



(a) High Skill



(b) Low Skill

## Estimated Migration Cost Reduction [back](#)

	log(Migration cost _ Low skill)	log(Migration cost _ High skill)
Nonrestrictive Hukou	-0.212** (0.107)	0.0448 (0.301)
Skilled-biased Hukou Policy	0.0589 (0.116)	-0.190** (0.083)
Constant	3.064*** (0.0204)	2.112*** (0.0338)
City FE	Yes	Yes
Year FE	Yes	Yes
City trend	Yes	Yes
Observations	1,419	1,167
R-squared	0.705	0.682

Panel A: Labor Mobility Elasticity		
	OLS	IV
log(Destination real income)	0.125*** (0.009)	0.157*** (0.022)
Origin-dest. city FE	Yes	Yes
Cohort FE	Yes	Yes
Skill FE	Yes	Yes
Observations	133958	133958
R2	0.473	0.452
	OLS	IV

Panel A: Firm Mobility Elasticity		
	OLS	IV
log(Labor cost)	-0.193*** (0.069)	-0.363*** (0.098)
City FE	Yes	Yes
Industry FE	Yes	Yes
Observations	35020	35020
R2	0.739	0.711