

Labor Market Integration and Entrepreneurship

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

October 2023

WDR 2024 Seminar

Motivation

- 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.
- Despite the well-known Hukou policies, China has seen a large increase in internal migration in the last 30 years.
 - The overall migrant population grew from 21 million in 1990 to 253 million in 2015.
- There are large variations in the local Hukou policies.

Hukou Policies

Shenzhen:
Whoever comes
is a Shenzhener



Beijing: Eviction of
the 'low-end
population'

《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
年龄	30分	56-60周岁，积5分；年龄每减少1岁，积分增加2分	少1岁 积2分	/
教育背景	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	
专业技术 职称和技能 等级	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	
缴费年限	/	缴纳职工社会保险费， 每满1年	3分	/

Shanghai: Credit
System, education
and skill certificate
get points

Research Question

How does the reduction in institutional migration barriers shape the landscape of human capital flow and entrepreneurship in China?

- Skill-biased Hukou policy attracts migrant entrepreneurs, but crowds out local entrepreneurs.
- Non-restrictive Hukou policy spurs overall entrepreneurship

Exploring the channels—The human capital foundation of entrepreneurship

- Low-skill labor only respond to nonrestrictive Hukou reforms; high-skill labor respond to both;
- Firms in low-skill industries are hurt by biased Hukou reforms but benefit from nonrestrictive Hukou reforms; firms in high-skill industries benefit from both.

Research Question

What is the *equilibrium* effect of Hukou reforms and its welfare implication?

- We build a spatial equilibrium model 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.
- Nonrestrictive Hukou reforms yield larger welfare gains compared to biased Hukou reforms.

Literature

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 its changes in shaping the firms' location choice.
- Identification of policy-induced sorting: We leverage the sample of *mover* entrepreneurs

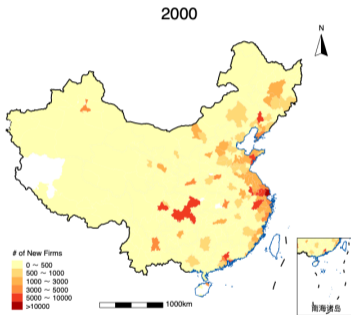
Internal Migration

- 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*

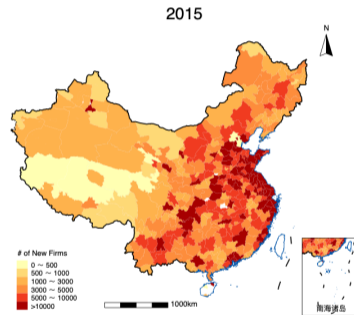
Hukou system

- 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

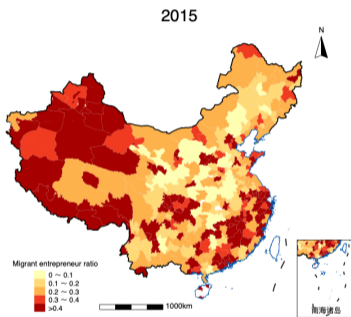


(a) # of New Firms (2000)

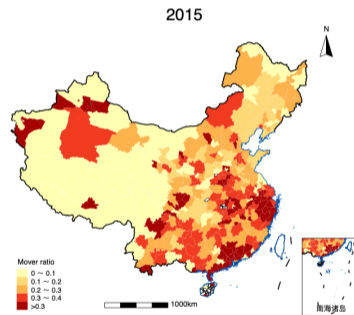


(b) # of New Firms (2015)

Distribution of Entrepreneurial Activities

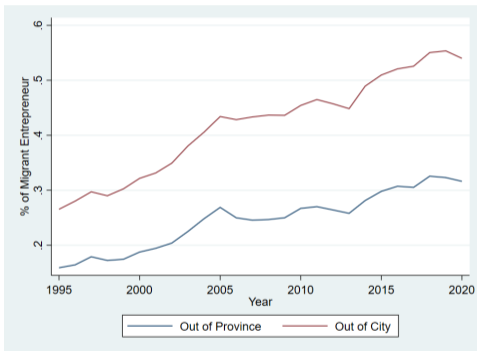


(a) % established by migrant entrepreneurs (2015)

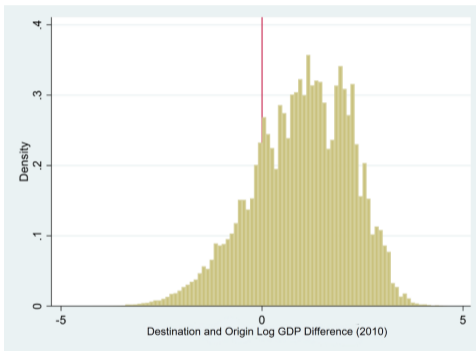


(b) % established by movers (2015)

Migrant Entrepreneurs Favor Larger Cities

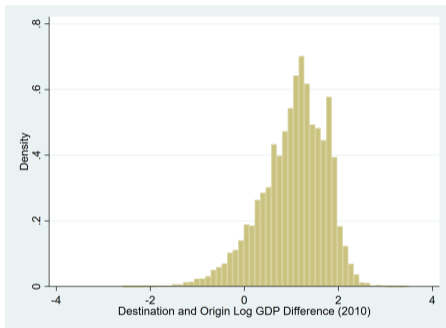


(a) Share of Migrant Entrepreneurs

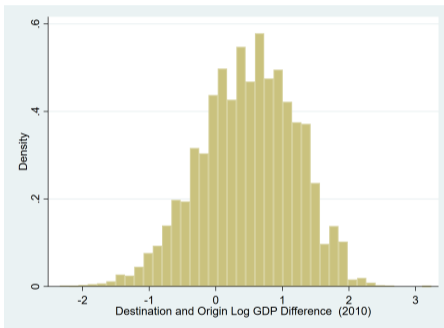


(b) Migrant Entrepreneurs Favor Larger Cities

Labor are migrating to larger cities



(a) Below College Education



(b) College Education and Above

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.

Reforming the Hukou

- Cities may carry out their own policies.
- The policy details are highly heterogenous 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 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

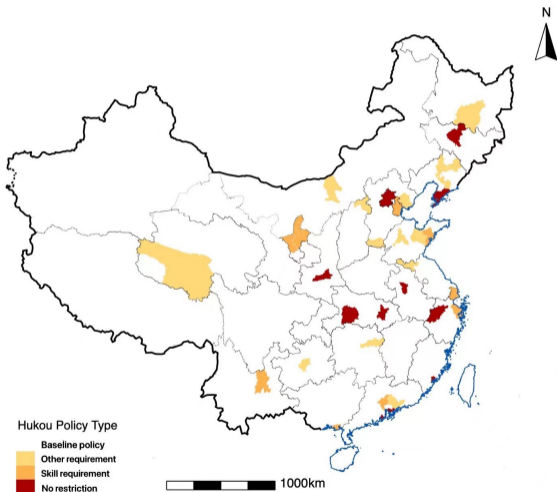


Figure 5 Hukou Policies in 2000

Hukou Policies Over Years

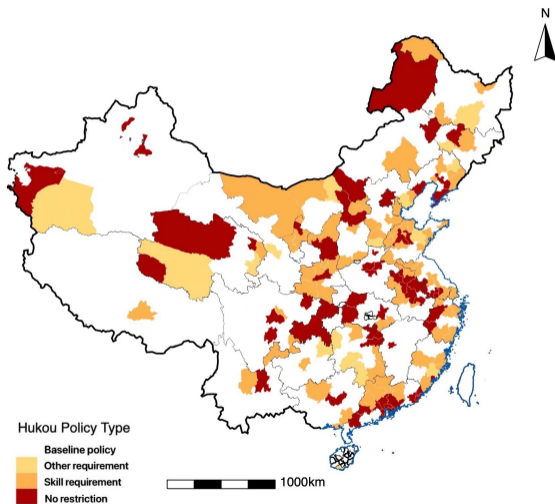


Figure 5: Hukou Policies in 2015

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

Hukou Reform and Entrepreneurship

We employ a diff-in-diff strategy at city level, with various policy measures as the treatment.

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

where

- Y_{ct} : Number of *new* firms (in log) in city c at year t
- $Policy_{ct}$: measured with different types of Hukou policy
 - $Hukou_skill$: education/skill/business investment
 - $Hukou_other$: other requirements such as long-term employment, housing purchase, etc.
 - $Hukou_nonrestrictive$: no requirement or minimum requirement on employment
 - $Hukou$: treatment turns on whenever one of the above three reform takes place

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

Who Are Responding to Hukou Reforms?

Who are the migrant entrepreneurs that are responding to different types of Hukou policies? How does the flow of entrepreneurs affect regional inequality?

- if better entrepreneurs are more likely to move
- if entrepreneurs from poorer regions are more likely to respond to policy change
- if entrepreneurs are more likely to respond to policy change in large cities

... We may expect that the more integrated labor market and the flow of entrepreneurs may increase regional inequality → sorting

Who Are Responding to Hukou Reforms?

For firm i established by entrepreneur j in city c in year t :

$$Mig_{ijct} = \beta_0 + \beta_1 Policy_{ct} + \beta_2 Policy_{ct} D_{ijct} + \beta_3 X_i + \theta_c + \delta_t + (\gamma_j) + \epsilon_{ijct}$$

- Mig_{ijct} : 1 if firm i is established by a migrant entrepreneur j in city c in year t , 0 if established by local entrepreneur
- $D_{i(o)jct}$:
 - Destination city c 's GDP in year t
 - Previous firm $i(o)$'s city GDP in year t
 - Entrepreneur j 's home city GDP in year t
 - Previous firm $i(o)$'s performance in year t
- γ_j : We use specifications with and without entrepreneur individual fixed effect γ_j
 - Only look at serial entrepreneurs when γ_j included

Who Are Responding to Hukou Reforms?

Y:1 (Established by Migrant Entrepreneur)

	D:log(Destination GDP)	D:log(Home GDP)	D:log(Previous GDP)	D: Previous Percentile
Hukou_skill	0.0127*** (0.00457)	0.667*** (0.00413)	0.104*** (0.00717)	-0.0378*** (0.00272)
Hukou_skill*D	0.0126*** (0.000600)	-0.0970*** (0.000551)	-0.0213*** (0.000895)	0.00381*** (0.000474)
Hukou_other	-0.247*** (0.00454)	0.0181*** (0.00412)	0.00213 (0.00708)	0.0565*** (0.00258)
Hukou_other*D	0.0382*** (0.000579)	-0.0127*** (0.000539)	-0.00873*** (0.000869)	0.00149*** (0.000451)
Hukou_nonrestrictive	-0.189*** (0.00317)	0.408*** (0.00285)	0.220*** (0.00456)	0.115*** (0.00157)
Hukou_nonrestrictive*D	0.0332*** (0.000384)	-0.0361*** (0.000366)	-0.0128*** (0.000541)	0.000808*** (0.000266)
D, Log(Asset)	Yes	Yes	Yes	Yes
City, Year, Person FE	Yes	Yes	Yes	Yes
Observations	11,326,829	11,230,443	3,814,290	3,995,702
R-squared	0.820	0.819	0.792	0.791

- Entrepreneurs from small cities respond to Hukou reforms in large cities more. [more](#)

Mechanism

Why entrepreneurs respond to different policies differently?

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

	log(Revenue)	log(Profit)	log(Value-added)	TFP	log(Employment)	log(Wage)
Hukou_skill	-0.078*** (0.0240)	-0.065*** (0.0111)	-0.0947*** (0.0171)	0.0311*** (0.00642)	-0.0227*** (0.00378)	0.0400*** (0.00494)
Hukou_skill*Skill	0.194*** (0.0390)	0.0915*** (0.0178)	0.109*** (0.0273)	0.0593*** (0.0107)	0.0961*** (0.00607)	-0.0347*** (0.00796)
Hukou_other	-0.168*** (0.0253)	-0.0120 (0.0119)	-0.0117 (0.0178)	0.0194*** (0.00685)	-0.0211*** (0.00399)	0.0177*** (0.00526)
Hukou_other*Skill	0.210*** (0.0406)	0.127*** (0.0188)	0.161*** (0.0285)	0.0764*** (0.0113)	0.107*** (0.00629)	-0.0117 (0.00833)
Hukou_nonrestrictive	0.701*** (0.0300)	0.0211* (0.0101)	0.0763*** (0.0231)	-0.0221** (0.00896)	0.00364 (0.00447)	-0.00118 (0.00582)
Hukou_nonrestrictive*Skill	0.273*** (0.0470)	0.0274 (0.0205)	0.116*** (0.0360)	0.0754*** (0.0145)	0.0661*** (0.00707)	0.00422 (0.00923)
Firm, Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	3,611,719	1,770,622	1,508,954	1,422,719	3,003,272	2,821,212
R-squared	0.911	0.902	0.749	0.751	0.922	0.638

- Firms in low-skill industries are hurt by biased policies, but benefit from nonrestrictive policies

Hukou Reform and Firm Performance (By Firm Skill Intensity) [more](#)

	log(Revenue)	log(Profit)	log(Value-added)	TFP	log(Employment)	log(Wage)
Hukou_skill	-0.078*** (0.0240)	-0.065*** (0.0111)	-0.0947*** (0.0171)	0.0311*** (0.00642)	-0.0227*** (0.00378)	0.0400*** (0.00494)
Hukou_skill*Skill	0.194*** (0.0390)	0.0915*** (0.0178)	0.109*** (0.0273)	0.0593*** (0.0107)	0.0961*** (0.00607)	-0.0347*** (0.00796)
Hukou_other	-0.168*** (0.0253)	-0.0120 (0.0119)	-0.0117 (0.0178)	0.0194*** (0.00685)	-0.0211*** (0.00399)	0.0177*** (0.00526)
Hukou_other*Skill	0.210*** (0.0406)	0.127*** (0.0188)	0.161*** (0.0285)	0.0764*** (0.0113)	0.107*** (0.00629)	-0.0117 (0.00833)
Hukou_nonrestrictive	0.701*** (0.0300)	0.0211* (0.0101)	0.0763*** (0.0231)	-0.0221** (0.00896)	0.00364 (0.00447)	-0.00118 (0.00582)
Hukou_nonrestrictive*Skill	0.273*** (0.0470)	0.0274 (0.0205)	0.116*** (0.0360)	0.0754*** (0.0145)	0.0661*** (0.00707)	0.00422 (0.00923)
Firm, Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	3,611,719	1,770,622	1,508,954	1,422,719	3,003,272	2,821,212
R-squared	0.911	0.902	0.749	0.751	0.922	0.638

- Firms in low-skill industries are hurt by biased policies, but benefit from nonrestrictive policies
- Firms in high-skill industries benefit from all kinds of policies

Hukou Reform and Firm Performance (By Firm Skill Intensity) [more](#)

	log(Revenue)	log(Profit)	log(Value-added)	TFP	log(Employment)	log(Wage)
Hukou_skill	-0.078*** (0.0240)	-0.065*** (0.0111)	-0.0947*** (0.0171)	0.0311*** (0.00642)	-0.0227*** (0.00378)	0.0400*** (0.00494)
Hukou_skill*Skill	0.194*** (0.0390)	0.0915*** (0.0178)	0.109*** (0.0273)	0.0593*** (0.0107)	0.0961*** (0.00607)	-0.0347*** (0.00796)
Hukou_other	-0.168*** (0.0253)	-0.0120 (0.0119)	-0.0117 (0.0178)	0.0194*** (0.00685)	-0.0211*** (0.00399)	0.0177*** (0.00526)
Hukou_other*Skill	0.210*** (0.0406)	0.127*** (0.0188)	0.161*** (0.0285)	0.0764*** (0.0113)	0.107*** (0.00629)	-0.0117 (0.00833)
Hukou_nonrestrictive	0.701*** (0.0300)	0.0211* (0.0101)	0.0763*** (0.0231)	-0.0221** (0.00896)	0.00364 (0.00447)	-0.00118 (0.00582)
Hukou_nonrestrictive*Skill	0.273*** (0.0470)	0.0274 (0.0205)	0.116*** (0.0360)	0.0754*** (0.0145)	0.0661*** (0.00707)	0.00422 (0.00923)
Firm, Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	3,611,719	1,770,622	1,508,954	1,422,719	3,003,272	2,821,212
R-squared	0.911	0.902	0.749	0.751	0.922	0.638

- Firms in low-skill industries are hurt by biased policies, but benefit from nonrestrictive policies
- Firms in high-skill industries benefit from all kinds of policies
- Biased policies reduce average labor costs for firms high-skill industries, but increase labor costs for firms in low-skill industries; nonrestrictive policies have no significant effect on wage

Hukou Reform and Firm Performance (By Firm Skill Intensity) [more](#)

	log(Revenue)	log(Profit)	log(Value-added)	TFP	log(Employment)	log(Wage)
Hukou_skill	-0.078*** (0.0240)	-0.065*** (0.0111)	-0.0947*** (0.0171)	0.0311*** (0.00642)	-0.0227*** (0.00378)	0.0400*** (0.00494)
Hukou_skill*Skill	0.194*** (0.0390)	0.0915*** (0.0178)	0.109*** (0.0273)	0.0593*** (0.0107)	0.0961*** (0.00607)	-0.0347*** (0.00796)
Hukou_other	-0.168*** (0.0253)	-0.0120 (0.0119)	-0.0117 (0.0178)	0.0194*** (0.00685)	-0.0211*** (0.00399)	0.0177*** (0.00526)
Hukou_other*Skill	0.210*** (0.0406)	0.127*** (0.0188)	0.161*** (0.0285)	0.0764*** (0.0113)	0.107*** (0.00629)	-0.0117 (0.00833)
Hukou_nonrestrictive	0.701*** (0.0300)	0.0211* (0.0101)	0.0763*** (0.0231)	-0.0221** (0.00896)	0.00364 (0.00447)	-0.00118 (0.00582)
Hukou_nonrestrictive*Skill	0.273*** (0.0470)	0.0274 (0.0205)	0.116*** (0.0360)	0.0754*** (0.0145)	0.0661*** (0.00707)	0.00422 (0.00923)
Firm, Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	3,611,719	1,770,622	1,508,954	1,422,719	3,003,272	2,821,212
R-squared	0.911	0.902	0.749	0.751	0.922	0.638

- Firms in low-skill industries are hurt by biased policies, but benefit from nonrestrictive policies
- Firms in high-skill industries benefit from all kinds of policies
- Biased policies reduce average labor costs for firms high-skill industries, but increase labor costs for firms in low-skill industries; nonrestrictive policies have no significant effect on wage

Recap on Reduced-form Findings

- 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.
 - This is not because the entrepreneurs are attracted by the Hukou policies per se, but because they co-move with labor.
- 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

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.

Model Setup—Worker detail

- A closed economy with N cities indexed by o or d
- A mass of H-type workers M_H and a mass of L-type workers M_L
- Workers are born in a particular origin indexed by o , receive idiosyncratic preference shocks for each destination city d , and sort across destinations according to wages, amenities, and migration costs.
- Migration costs are relative to the birth location, and is modeled as an iceberg cost τ_{od}^s for workers of type $s = H, L$ migrating from o to d
- Workers consume two types of products: h-sector product Q_h , l-sector product Q_l , which are produced by two types of firms.
- The implied regional labor supply is the total number of labor of type s from origin o chooses city d

Model Setup—Firm detail

- Firms are owned by 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.
- Goods are freely traded in the baseline model.

Model Setup—Firm detail

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

- Cobb-Douglas technology:

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

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
- ρ captures the agglomeration effect
- $z_{dh}(\omega)$ is firm-specific idiosyncratic productivity shock for city d and firm ω 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

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

Equilibrium

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.

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. [more](#)
- Step 2: Firms' production technology parameter α is then calibrated from the industry-level skill intensity joint with the calibrated skill-specific wage from the step 1.
- Step 3: Workers' mobility elasticity ξ is estimated from the migration flow and the calibrated wage (from step 1) using 2010 census data following (Tombe and Zhu, 2019).
- Step 4: Firms' preference over regions ε is identified from firms' location choice and the estimated labor cost using firm registration data (2010).
- Step 5: Worker's destination-origin-type-year-specific mobility costs τ are estimated from regional wage distributions (from step 1) and the migration flow L_{ods} constructed from the census data (2008-2015).

Estimation Results

Parameter	Detail	Value
ξ	Workers' mobility elasticity on wage	1.4 (estimated from 2010 census) more
τ	Worker's type- and destination- specific mobility cost	See Figure τ for estimates
ϵ	Workers' employer preference dispersion	Set to be 5 from (Fajgelbaum et al., 2019)
ε	Firms' mobility elasticity on cost	0.5 (estimated from firm registration data)
α	Firms' production technology parameter	See Figure α for estimates
σ	Firms' market power	Set to be 5 from (Fajgelbaum et al., 2019)
ρ	Agglomeration effect	Set to be 0.2 from (Gaubert, 2018)

Counterfactual - Random 20 Cities

	Biased			Unrestrictive		
	Overall	Relaxed	Unrelaxed	Overall	Relaxed	Unrelaxed
Total Welfare	1.50%	14.64%	-0.75%	10.17%	100.96%	-1.50%
Welfare (High Skill Labor)	15.09%	95.24%	-0.98%	16.17%	104.47%	-1.52%
Welfare (Low Skill Labor)	-0.40%	2.33%	-0.73%	9.58%	100.42%	-1.50%
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%
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%

- 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 - Random 20 Cities

	Biased			Unrestrictive		
	Overall	Relaxed	Unrelaxed	Overall	Relaxed	Unrelaxed
Total Welfare	1.50%	14.64%	-0.75%	10.17%	100.96%	-1.50%
Welfare (High Skill Labor)	15.09%	95.24%	-0.98%	16.17%	104.47%	-1.52%
Welfare (Low Skill Labor)	-0.40%	2.33%	-0.73%	9.58%	100.42%	-1.50%
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%
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%

- 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 - Random 20 Cities

	Biased			Unrestrictive		
	Overall	Relaxed	Unrelaxed	Overall	Relaxed	Unrelaxed
Total Welfare	1.50%	14.64%	-0.75%	10.17%	100.96%	-1.50%
Welfare (High Skill Labor)	15.09%	95.24%	-0.98%	16.17%	104.47%	-1.52%
Welfare (Low Skill Labor)	-0.40%	2.33%	-0.73%	9.58%	100.42%	-1.50%
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%
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%

- 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
Total Welfare	1.50%	14.64%	-0.75%	10.17%	100.96%	-1.50%
Welfare (High Skill Labor)	15.09%	95.24%	-0.98%	16.17%	104.47%	-1.52%
Welfare (Low Skill Labor)	-0.40%	2.33%	-0.73%	9.58%	100.42%	-1.50%
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%
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%

- 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 - Largest 20 Cities

	Biased			Unrestrictive		
	Overall	Relaxed	Unrelaxed	Overall	Relaxed	Unrelaxed
Total Welfare	2.56%	17.06%	-2.52%	19.30%	108.88%	-4.27%
Welfare (High Skill Labor)	29.02%	98.23%	-3.06%	31.61%	109.79%	-4.61%
Welfare (Low Skill Labor)	-1.17%	4.12%	-2.47%	18.07%	108.73%	-4.24%
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%
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%

- 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 (due to the loss of labor demand and thus lower wage)
- Skill-biased relaxation generates smaller welfare gains for the treated group, but larger loss for the low-skill labor in the untreated cities

Counterfactual - Smallest 20 Cities

	Biased			Unrestrictive		
	Overall	Relaxed	Unrelaxed	Overall	Relaxed	Unrelaxed
Total Welfare	0.10%	17.50%	-0.08%	0.24%	108.48%	-0.28%
Welfare (High Skill Labor)	0.33%	110.10%	-0.19%	0.30%	123.91%	-0.29%
Welfare (Low Skill Labor)	-0.20%	8.44%	-0.06%	0.23%	106.97%	-0.28%
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%
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%

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.

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

Hukou Reform and Firm Performance [back](#)

	log(Revenue)	log(Profit)	log(Value-added)	TFP	log(Employment)	log(Wage)
Hukou_skill	0.142*** (0.00970)	0.133*** (0.00618)	0.127*** (0.00979)	0.0477*** (0.00377)	0.00684*** (0.00218)	-0.0273*** (0.00295)
Hukou_other	0.0626*** (0.0102)	0.0648*** (0.00668)	0.0403*** (0.0103)	0.0448*** (0.00406)	0.0143*** (0.00230)	-0.0139*** (0.00313)
Hukou_nonrestrictive	0.152*** (0.0128)	0.0322*** (0.00718)	0.137*** (0.0129)	0.00683 (0.00517)	0.0263*** (0.00251)	0.00178 (0.00338)
log(Asset)	Yes	Yes	Yes	Yes	Yes	Yes
Firm, Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	3,611,719	1,770,622	1,508,954	1,422,719	3,003,272	2,821,212
R-squared	0.911	0.908	0.755	0.759	0.927	0.645

- Firms on average benefit from all kinds of Hukou reforms
 - Firm production (size and employment) respond most to non-restrictive policies
 - Profit and TFP respond most to skill-biased policies
- Biased policies reduce average labor cost, nonrestrictive policies have no significant effect on wage

Household back

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 ω ;
- $q_v(\omega)$ is the production of type v good by employer ω
- 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 $w_{ds}(\omega)$
- $\tilde{W}_{os} = \left(\sum_d ((1 - \tau_{od}^s) W_{ds})^\xi \right)^{\frac{1}{\xi}}$

h-Type Firms [back](#)

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
- ρ captures the agglomeration effect
- $z_{dh}(\omega)$ is firm-specific idiosyncratic productivity shock for city d and firm ω of h-type

h-Type Firms [back](#)

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.

I-Type Firms [back](#)

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.

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

Firm Location Choice [back](#)

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

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

where

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

l-sector:

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

Equilibrium [back](#)

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.

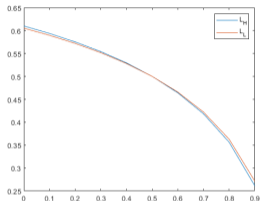
Impact of Labor Mobility Cost in Simplified Model [back](#)

Proposition

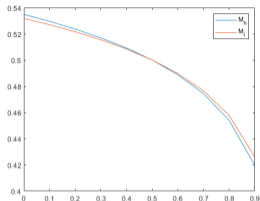
Consider an economy with two cities. Migration costs is denoted as $\tau = [\tau_{AH}, \tau_{AL}, \tau_{BH}, \tau_{BL}]$

- (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 τ_{BH}, τ_{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.

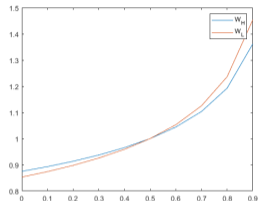
Model Simulation (Low Agglomeration) back



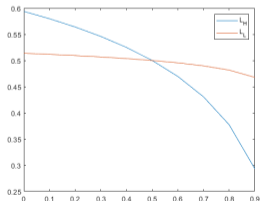
(a) Labor- No restriction



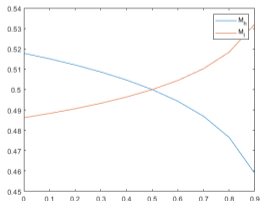
(b) Firm- No restriction



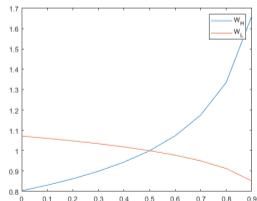
(c) Wage- No restriction



(d) Labor- Skill bias

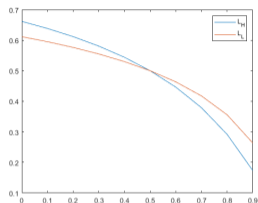


(e) Firm- Skill bias

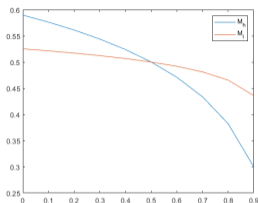


(f) Wage- Skill bias

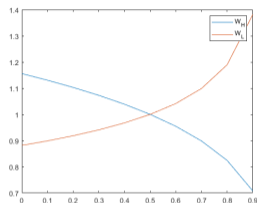
Model Simulation (High Agglomeration) [back](#)



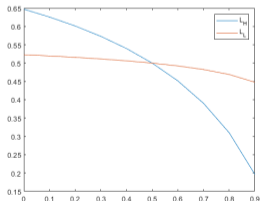
(a) Labor- No restriction



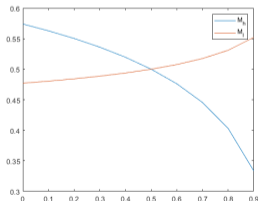
(b) Firm- No restriction



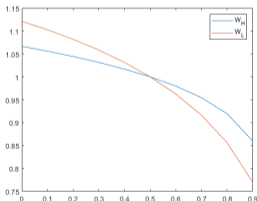
(c) Wage- No restriction



(d) Labor- Skill bias

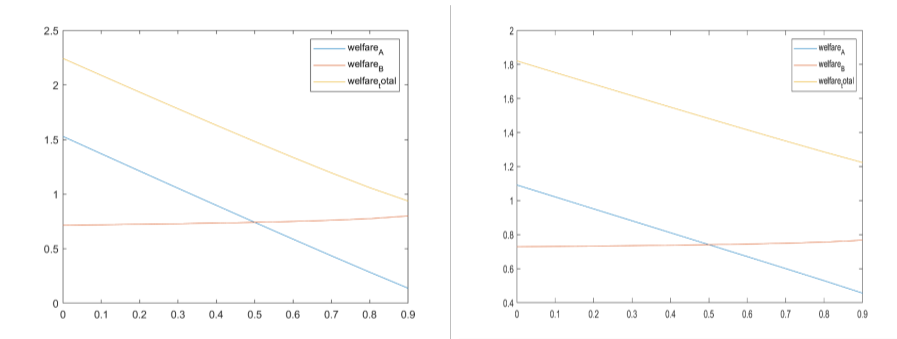


(e) Firm- Skill bias



(f) Wage- Skill bias

Model Simulation - Welfare [back](#)

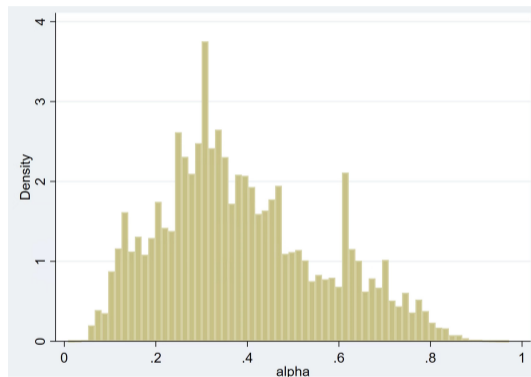


(a) Welfare- No restriction

(b) Welfare- Skill bias

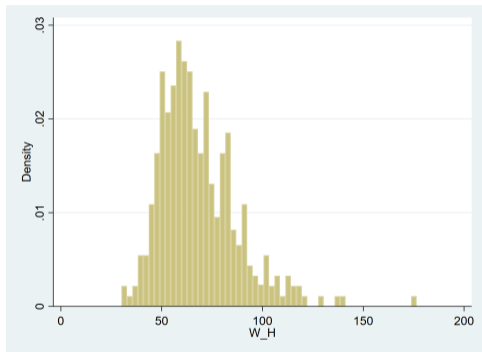
Figure 8: The Effect of Hukou Policy Relaxation on Labor Welfare

Calibrated Production Technology High-skill Labor Share Distribution [back](#)

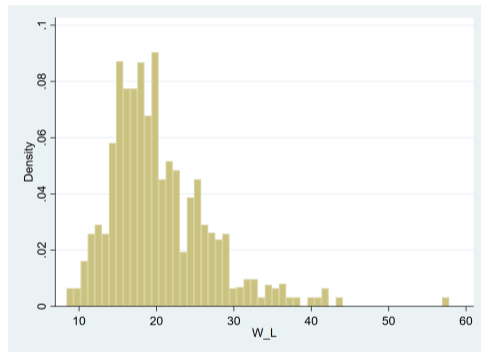


Notes: The figure plots the distribution of the calibrated production function parameter α .

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

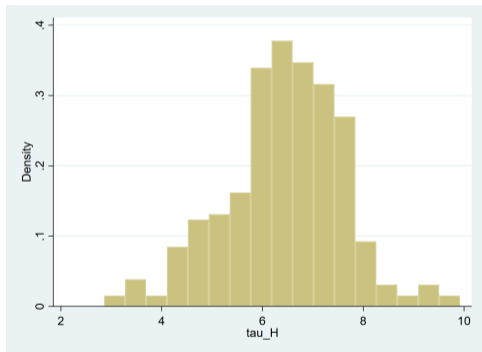


(a) High Skill

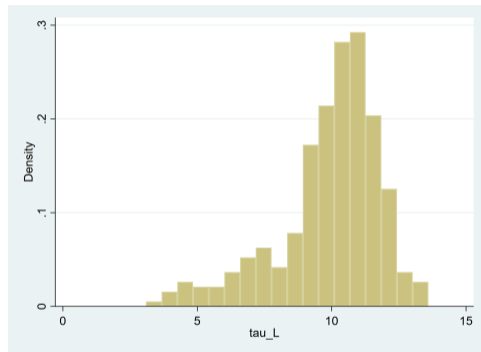


(b) Low Skill

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



(a) High Skill



(b) Low Skill

