Community Networks and The Growth of Private Enterprise in China

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Presented by Duoxi Li and Yuheng Zhao

Agenda

- Introduction
- Model
- Empirical Analysis
- Conclusion

Introduction - Motivation

- Misallocation
  - Market Failure: credit, monopoly power
  - Governance Failure: taxes, regulations, enforcement

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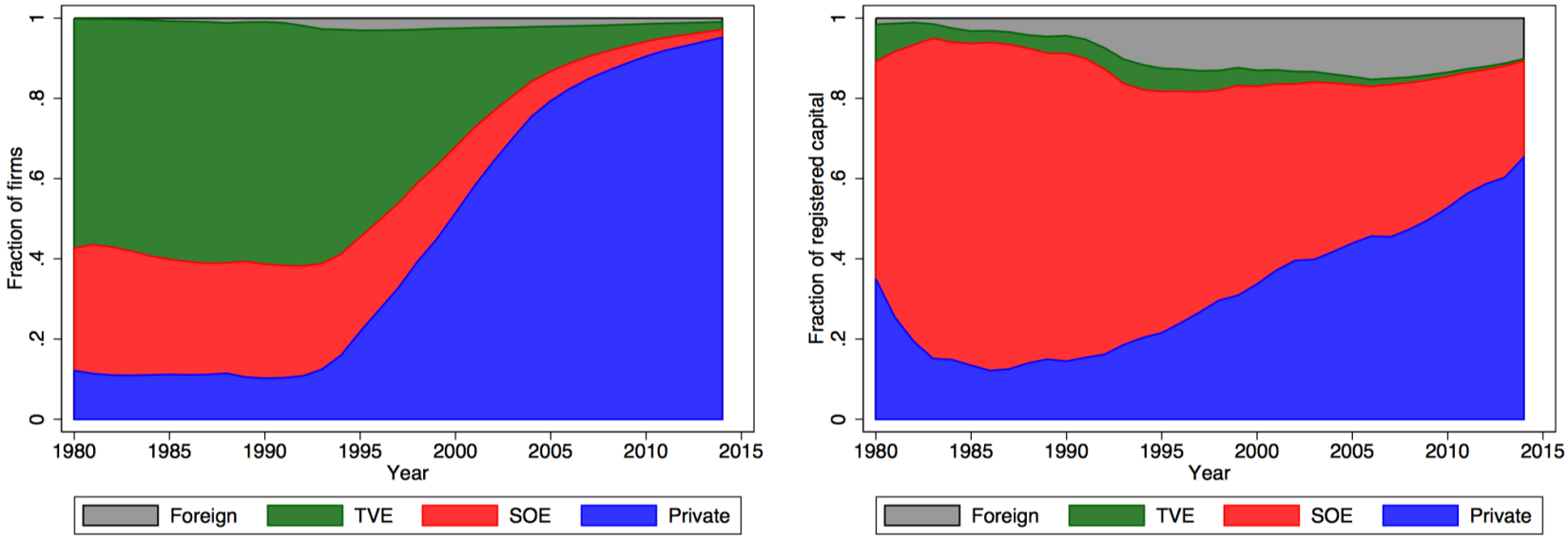
  - Market Failure: credit, monopoly power
  - Governance Failure: taxes, regulations, enforcement
- What else may we miss?
  - Interactions between firms? Spillover effects? Role of community networks?
- Will community network alleviate the misallocation caused by market or government failure? Will it cause new issues?

Introduction - Background

- China provides an example

Figure 1. Distribution of Firms, by Type



(a) Number of Firms

(b) Registered Capital

Source: SAIC registration database.

Firm Classification: Township-Village Enterprises (TVE's), State Owned Enterprises (SOE's), Foreign Owned Firms, and Private (domestically owned) Firms

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  - native-place fellows (*laoxiang*): entrepreneurs from the same province, city or county
  - local custom and dialect: cultural identification
- Effect of community networks
  - alleviate misallocation between SOE and private enterprises
  - cause misallocation within private enterprises

Introduction - Background

- Dispersion according to birth county of entrepreneurs

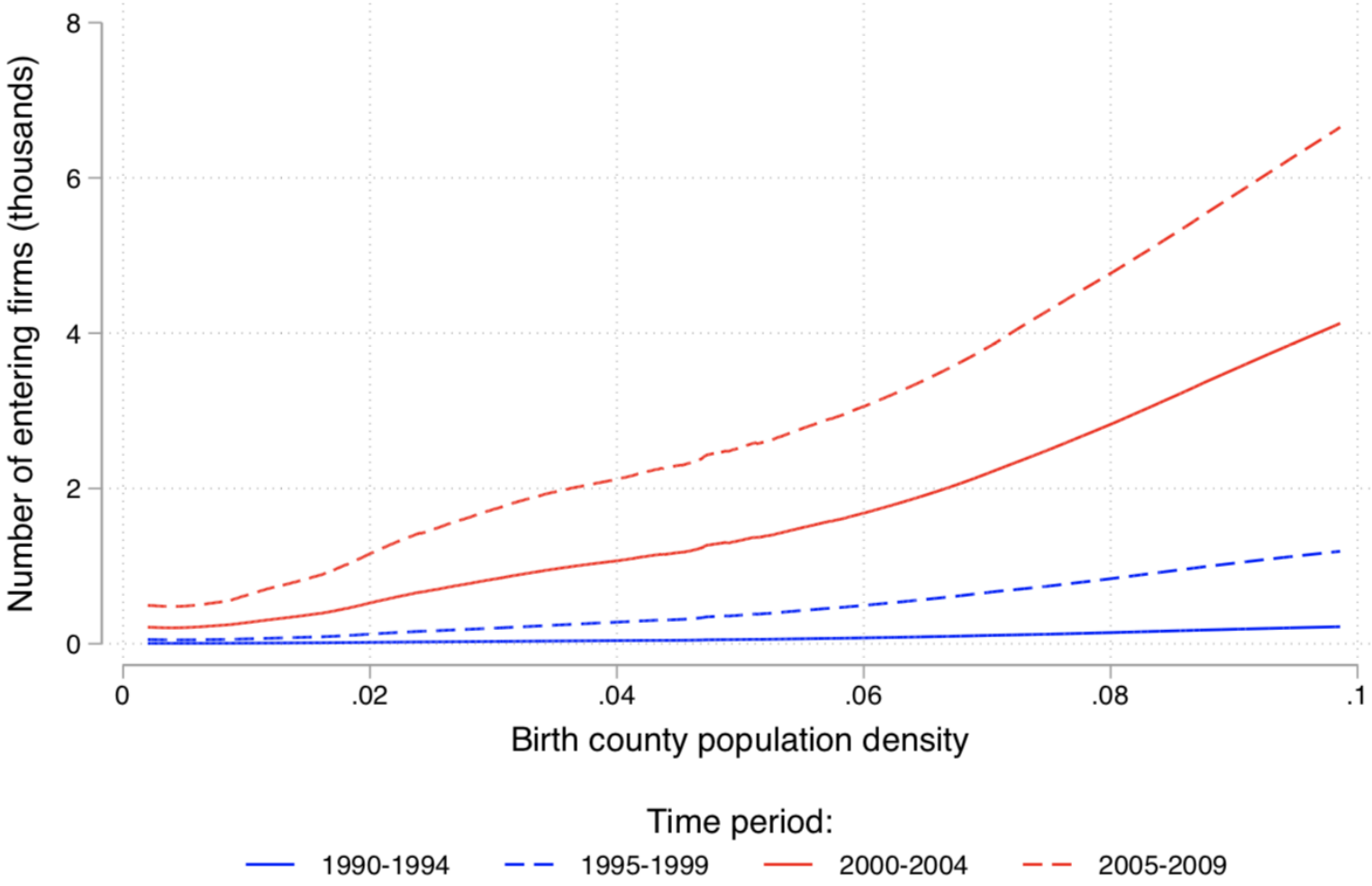

Figure 1: Dispersion in Firm Entry

Introduction - Main Questions

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- How may community network cause the **dispersion** in firm entry, sectoral/spatial concentration, and firm size among private enterprises

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- Empirically testify the predictions of the model
- Quantify the impact of network by structural estimation and counter-factual experiment
  - entry over the 1995-2004 period would have been 40% lower (with a comparable decline in the stock of capital)

Model

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- Two sources of network-based spillovers
  - post-entry cooperation raises the productivity of the entrepreneurs in the network
  - pre-entry referral process
- Two sources of heterogeneity:
  - origin social connectedness
  - individual ability

Model

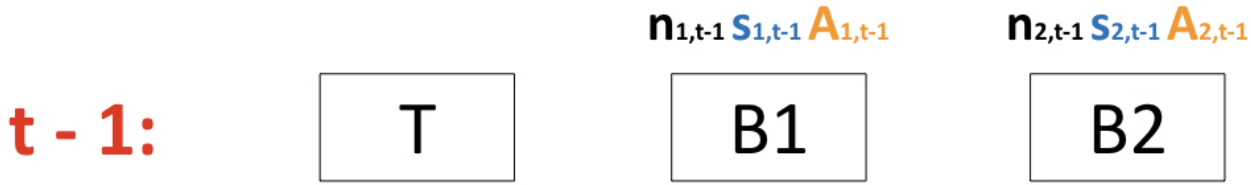
Setup

- Each origin: social connectedness: $p \geq 0 \rightarrow$ speed of learning or productivity spillover
- Three sectors: T, B_1, and B_2
- Initial entrepreneurs: n_{i0} at $t = 0$ in sector B_i
- Equal-sized cohorts of new agents born at $t = 1, 2, ...$ who live forever

Model

Network Dynamics

$$N_{t-1} \equiv n_{1,t-1} + n_{2,t-1}, s_{i,t-1} \equiv \frac{n_{i,t-1}}{N_{t-1}}, A_{it} = A_0 \exp(n_{i,t-1}\theta(p))$$



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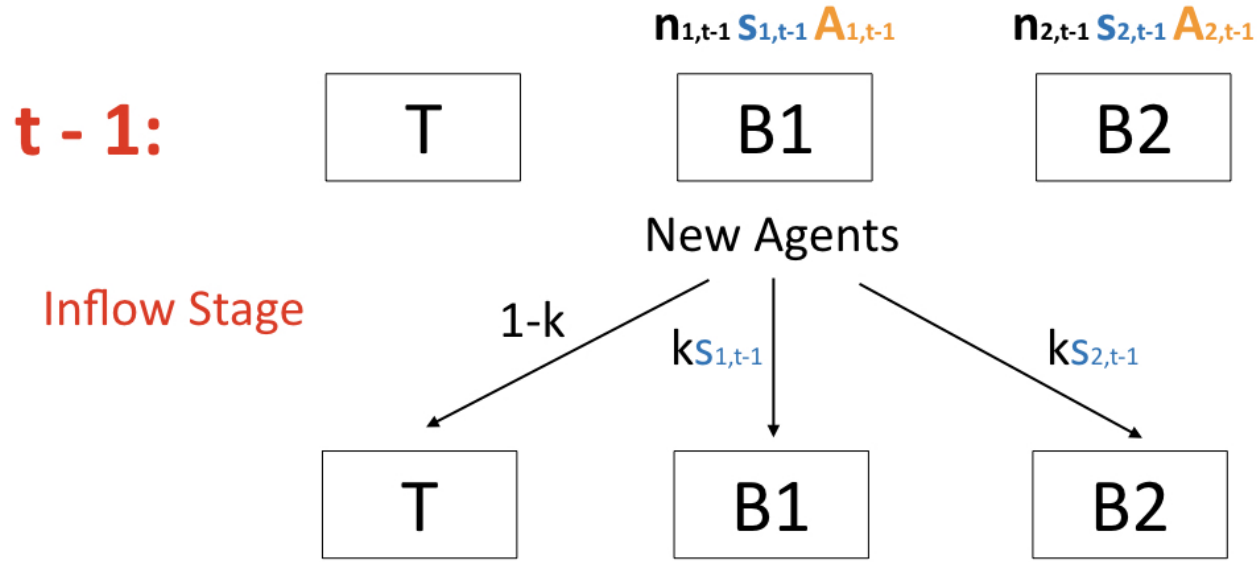

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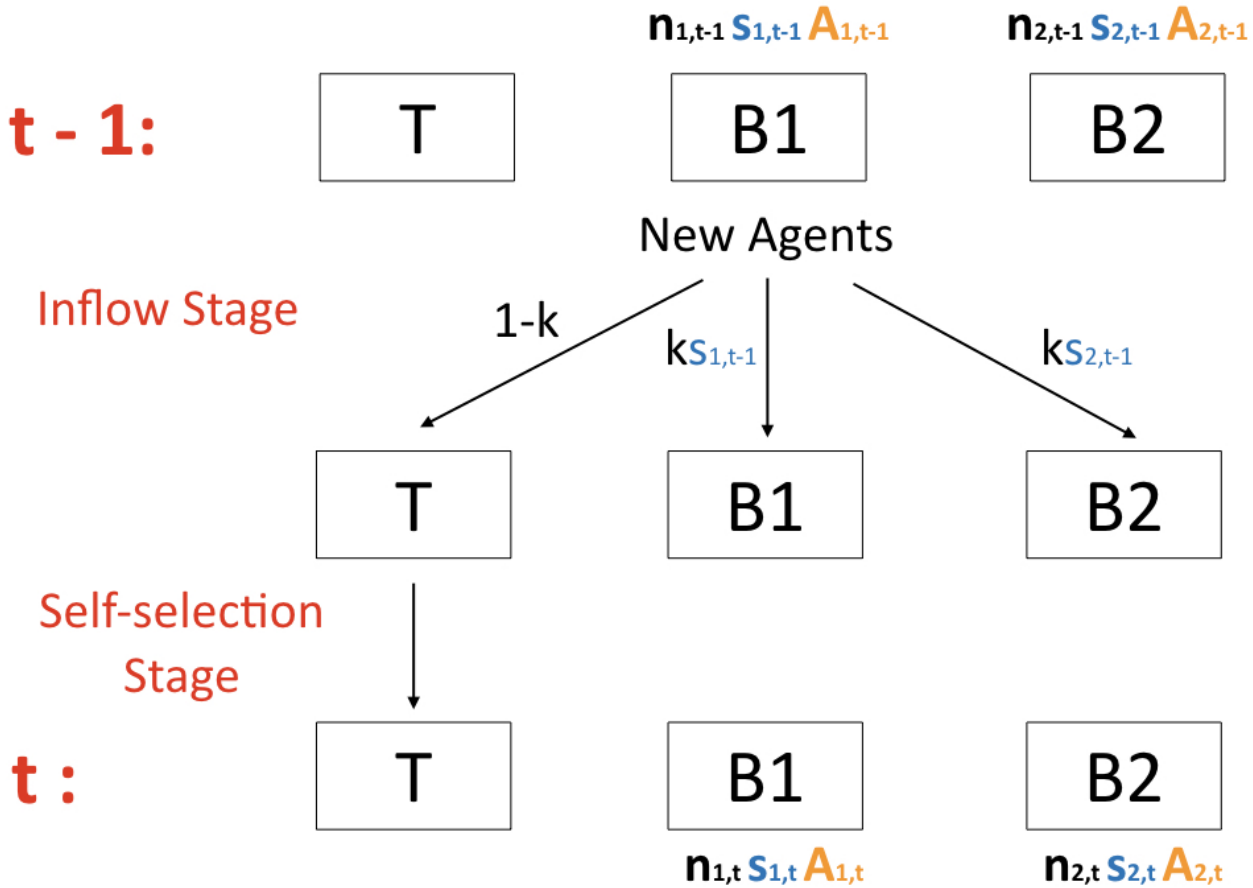

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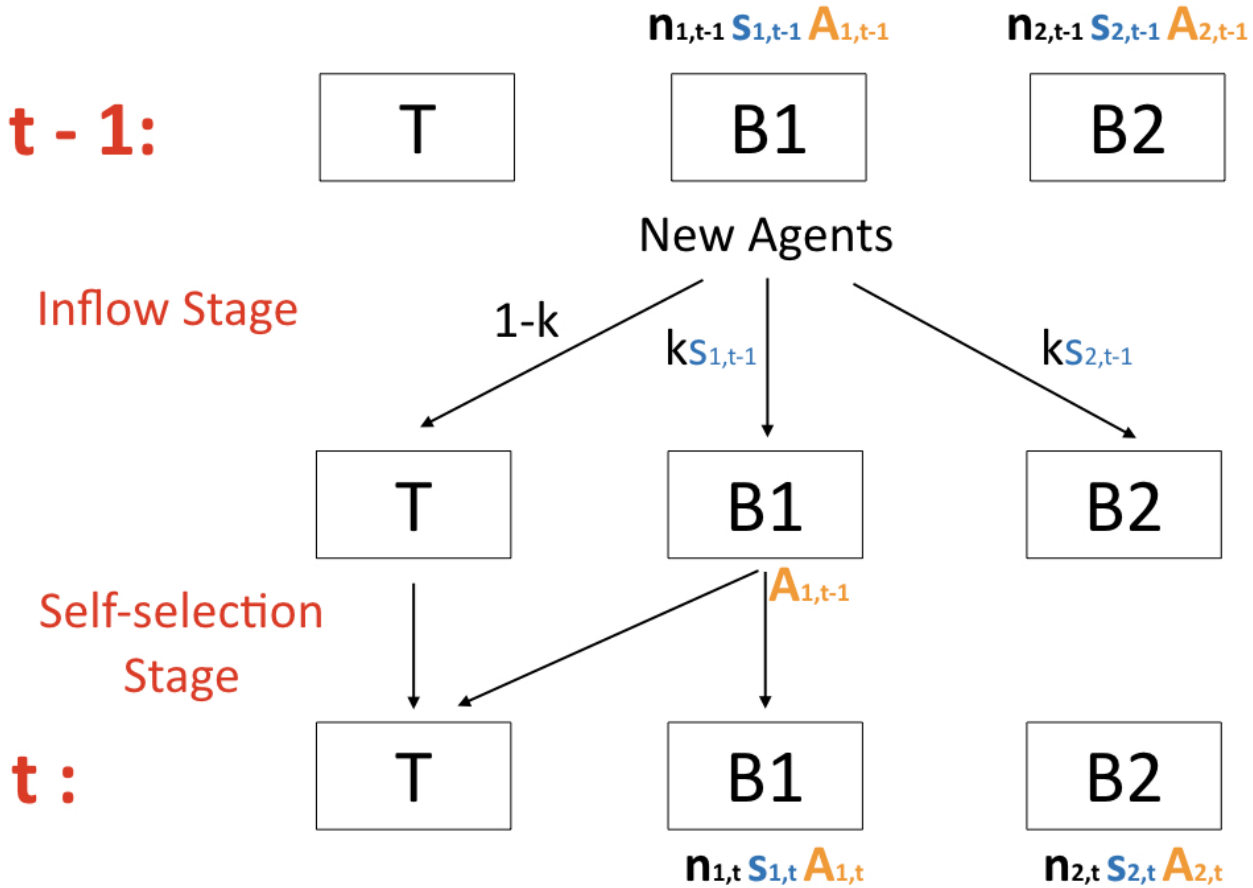

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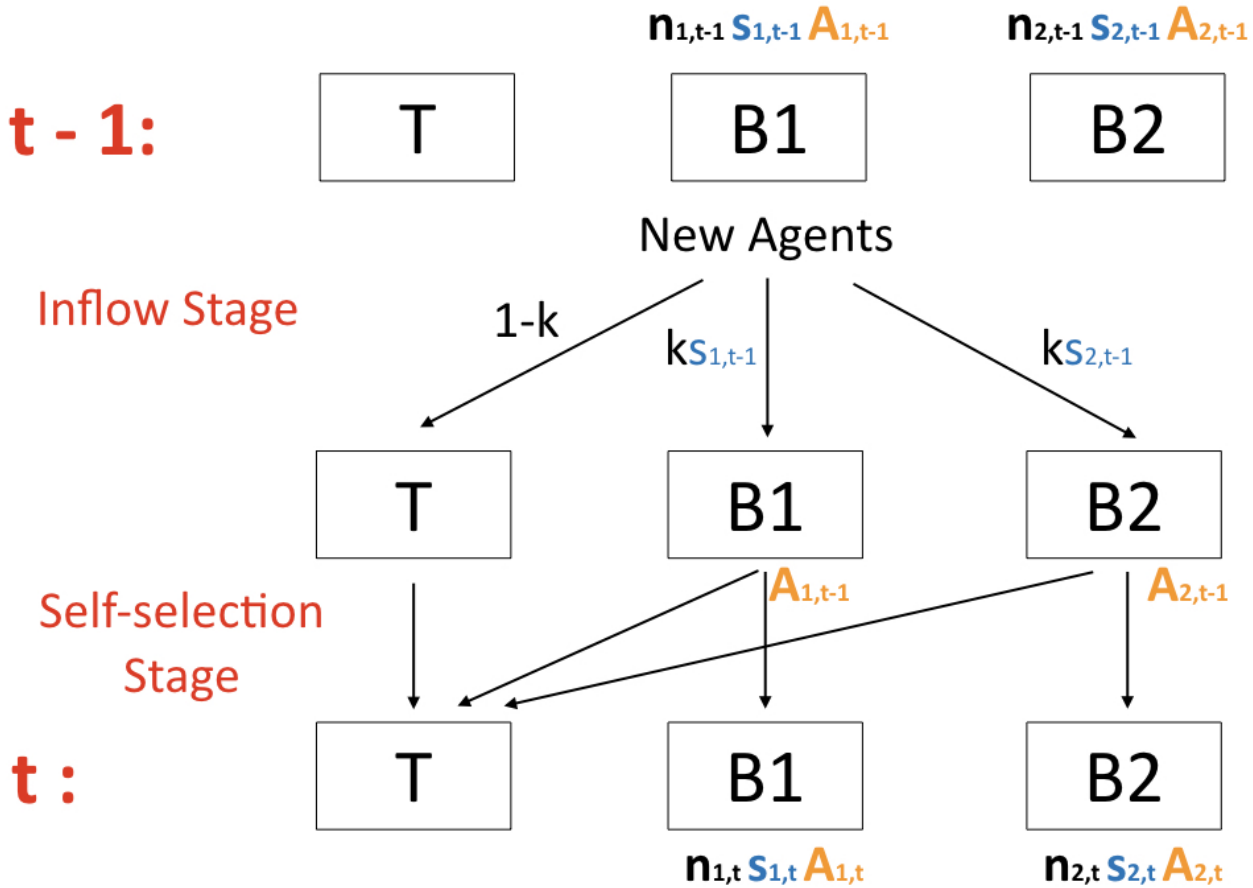

Model

Self-Selection Stage

- Ability: random draw ω, where $\log \omega \sim U[0,1]$
- Production:
  - sector T: profit ω^{σ}
  - sector B_i: production function $y = A_{it}\omega^{1-\alpha}K^{\alpha}$, where the community TFP (CTFP)

$$A_{it} = A_0 \exp(n_{i,t-1}\theta(p))$$

$\theta(p)$ is the network quality, increasing in p

- capital cost r, fixed price, agents are selfish and myopic

Model

Self-selection Stage

- The maximized profit given A

$$\log \Pi^*(\omega, A) = \log \omega + \log \psi + \frac{1}{1-\alpha} \log A - \frac{1}{1-\alpha} \log r$$

where $\phi \equiv \alpha^{\frac{1}{1-\alpha}}$ and $\psi \equiv \phi^\alpha - \phi$

- Enter B_i rather than T iff

$$\log \Pi^*(\omega, A) > \log \omega^\sigma$$

$$\Longrightarrow \text{lower bound } \log \underline{\omega} \equiv \frac{1}{1-\sigma} \left[\log \frac{1}{\psi} - \frac{1}{1-\alpha} \log A + \frac{\alpha}{1-\alpha} \log r \right]$$

- $\underline{\omega} \in (0, 1)$ iff

$$\log A \in \left((1-\alpha) \log \frac{1}{\psi} + \alpha \log r - (1-\sigma)(1-\alpha), (1-\alpha) \log \frac{1}{\psi} + \alpha \log r \right)$$

- Assume $\log A_0$ satisfies this condition and consider the case where CTFP satisfies this condition

Dynamics of Entry and Concentration

- Entry into B_i at t:

$$e_{it} \equiv n_{i,t} - n_{i,t-1}$$

- Aggregate entry

$$E_t \equiv N_t - N_{t-1} = e_{1t} + e_{2t} = L + \kappa(p) N_{t-1} H_{t-1}$$

where $H_{t-1} \equiv s_{1,t-1}^2 + s_{2,t-1}^2 = s_{1,t-1}^2 + (1 - s_{1,t-1})^2$, the Herfindahl Hirschman Index for concentration at $t-1$.

- Greater concentration, higher aggregate entry

Model

PROPOSITION 1

- *Entry E_t, the stock of entrepreneurs N_t and concentration H_t are rising in t (for any given p) and in p (at any given t)*
- *$E_t - E_{t-1}$ and $H_t - H_{t-1}$ are both rising in p if $\kappa(p) < 1$ for all p and the share of the larger sector at $t-1$ is not too close to 1*

Model

PROPOSITION 2

- *Initial capital size of marginal entrants (and of average entrants if $\sigma > \frac{1}{2}$) in cohort t is decreasing in p, and decreasing across successive cohorts for any p, in every sector. Averaging across sectors, the initial capital size of marginal entrants (and of average entrants if $\sigma > \frac{1}{2}$) is decreasing more steeply in p across successive cohorts*
- *Averaging across sectors, the growth rate of capital size of incumbent entrepreneurs of any past cohort t from $t' - 1$ $(> t)$ to t' is rising in t' and in p*

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Network Dynamics

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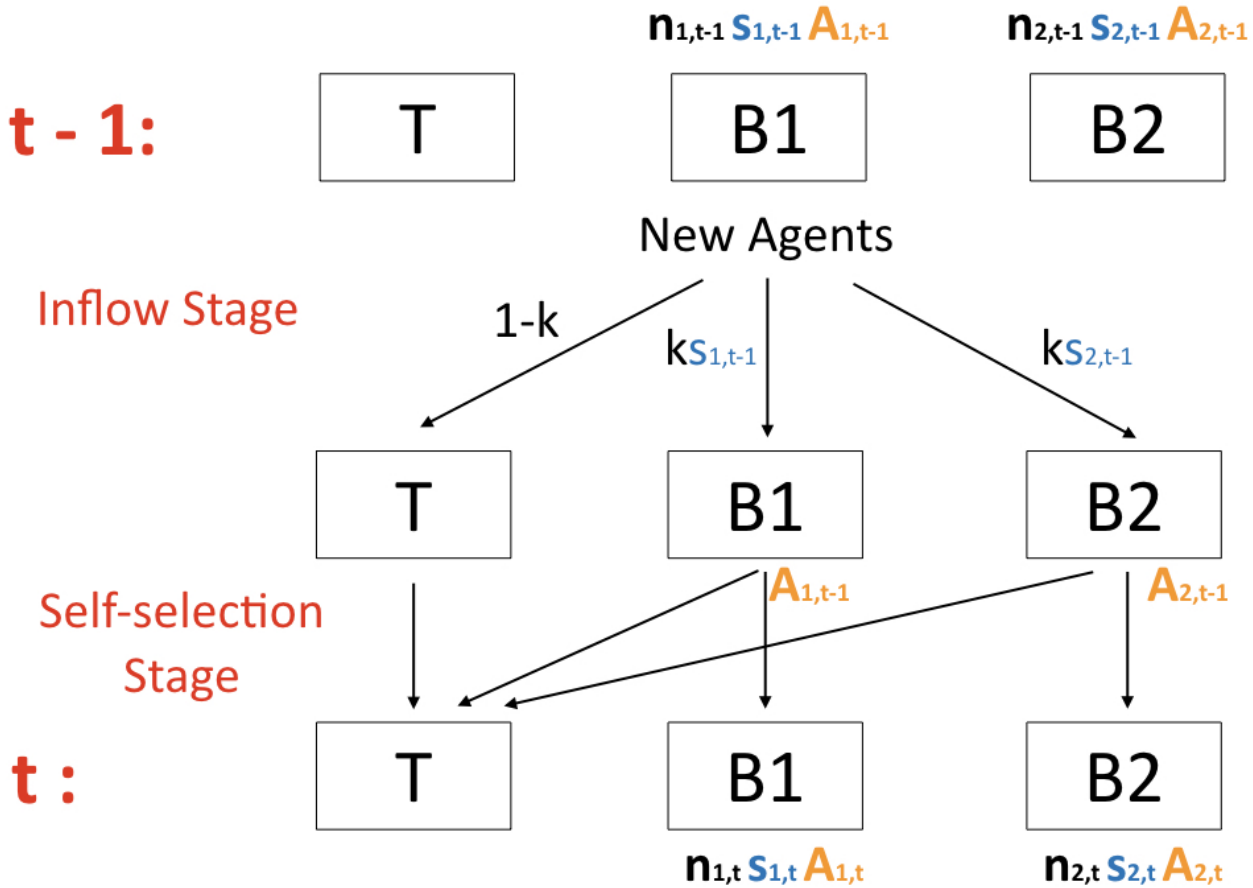

Comments and Critiques 1

- Implication: due to network, people with lower ability and initial capital enter certain sectors $\Longrightarrow$ misallocation
- No negative spillover effects:
  - larger network, more difficult for knowledge sharing
  - no limit on firm entry and sectoral concentration

Alternative Models - No Network Spillovers

- Origin Heterogeneity
  - replace fixed k as $k(p, t)$, increasing in p and t; A_t and s_i invariant in p
  - explain firm entry, get trouble in sectoral concentration and post-entry growth

Alternative Models - No Network Spillovers

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- Destination Heterogeneity
  - effect of geography, support provided by local governments, or agglomeration spillovers
  - Example: high p origins have better and increasing access to the faster growing destinations $\Longrightarrow$ firms from each origin locate at a unique set of destinations
  - Other possible models

Empirical Analysis - Data

Firm Data

- Firm registration database by the State Administrative of Industry and Commerce (SAIC, 1990-2009)
  - establishment date
  - 4-digit sector
  - location
  - registered capital
  - **list of major shareholder and manager (with ID)**
- SAIC's inspection database
  - Annual firm-level information on assets and sales from 2004 onwards.
- Industrial census (1995, 2004, 2008)

Empirical Analysis - Data

Network-related Data

- Population and social connectedness
  - China Family Panel Studies (CFPS, 2010)
    - Family module for frequency of social interactions;
    - Individual module for the people interact most and trust level
  - Population census (1982)
    - Population density on county level
    - Education on county level

Empirical Analysis - Social Connectedness

Network (Social Connectedness)

- Measurement of social connectedness by population density in the entrepreneur's birth county (for county-born ones)
  - Assumption: Social heterogeneity within counties does not increase with pop density.
- Argument for validity of pop density proxy
  - Condition 1: Positively associated with social connectedness;
  - Condition 2: Sufficient variation in pop density across counties.

Empirical Analysis - Social Connectedness

- Evidence from CFPS (2010)
  - More social interaction are connected with county pop density:
    - Higher frequency of visits and chatting;
    - More likelihood of chatting most with local resident ;
    - More trust in local residents;
  - Things are different in city.
- Evidence from population census (1982)
  - Before the rural-urban labor migration in the early 1990's:
  - Ranges from 20-1000 people per km^2

Empirical Analysis - Social Connectedness

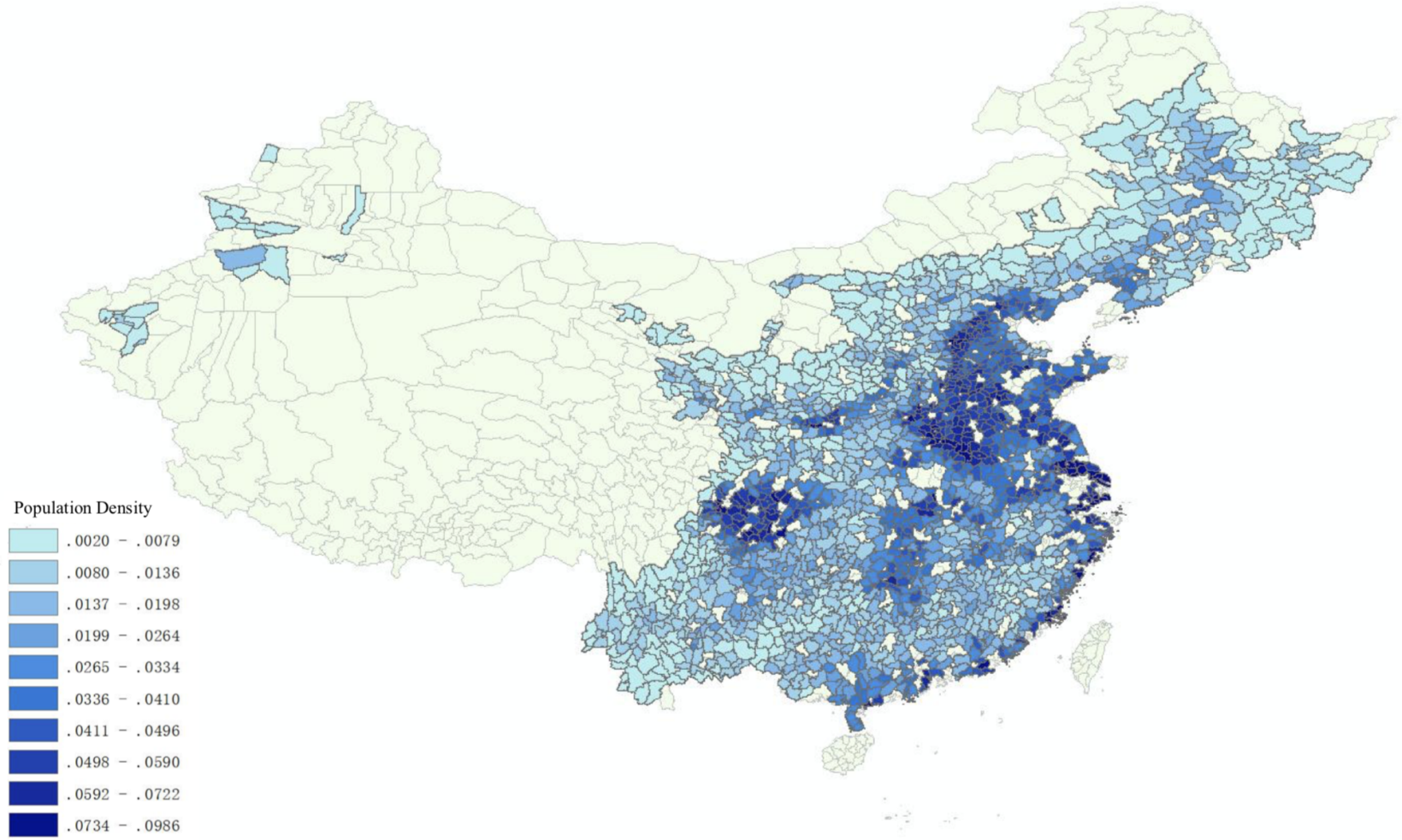


Figure 2: Population density across counties (1982)

Comments and Critiques 2

- There could be heterogeneous community network among different counties.
- The potential alternative measurement for network
  - Counties characterized with more Confucian temples witnessed much less conflicts during economic shock (Kung and Ma, 2014);
  - Religiosity is associated with a higher willingness to help and trust of individuals within one's own community (Gaduh, 2012).
  - Measurement: Number of ancestral shrines or temples.

Comments and Critique 2

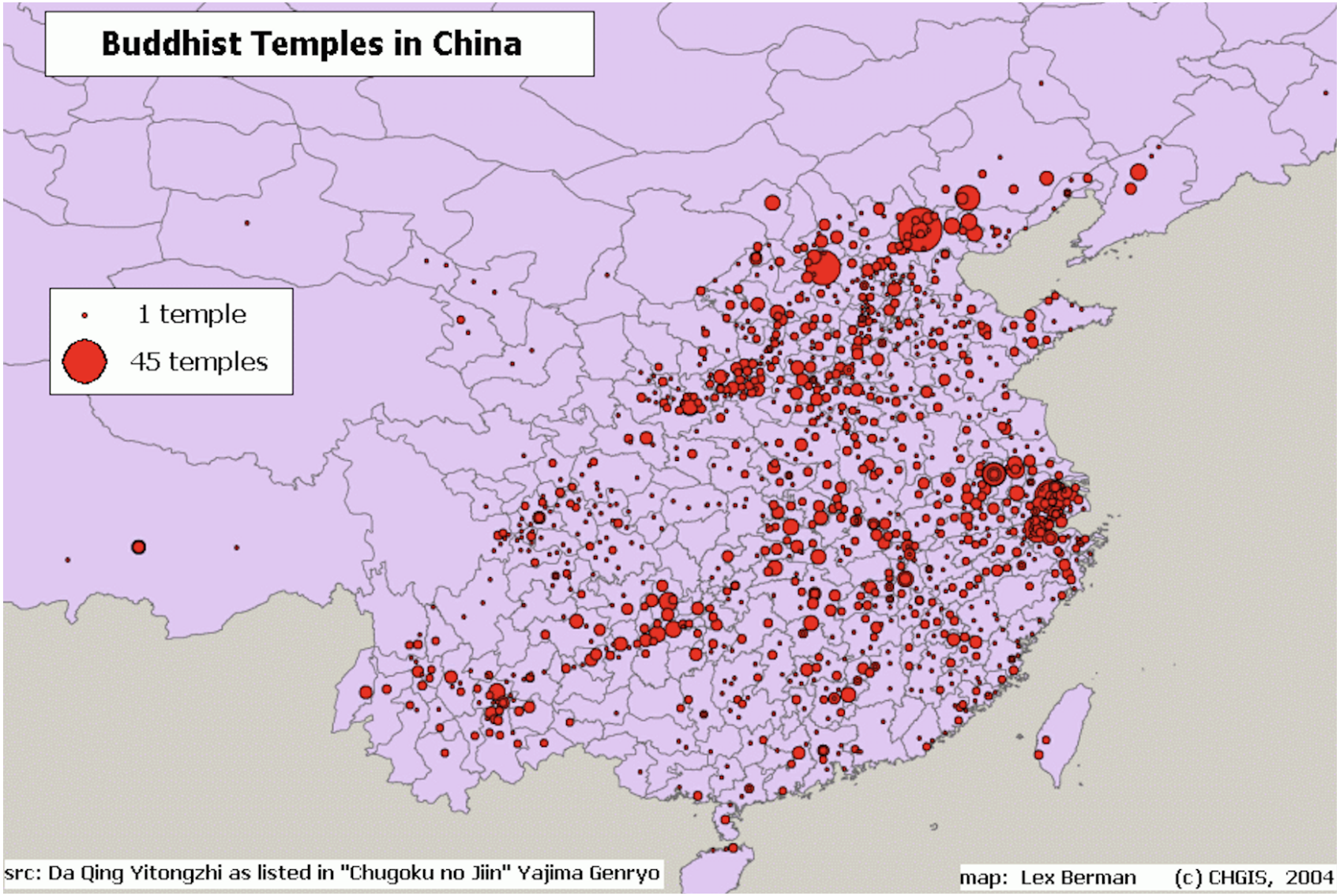


Figure 3: Number of Buddhist temples from 50 CE to late Qing China

Back to the Model's Prediction

- Entry from a given origin is increasing over time and increasing in social connectedness at each point of time;
- Sector/spatial concentration $\uparrow$;
- Ability and initial firm size $\downarrow$;
- Post-entry growth rates of firm size $\uparrow$;

Evidence on Firm Entry

- Nonparametric estimates of relationship between firm entry and pop density
  - The firm entry is:
    - Increasing in pop density at each point in time;
    - Increasing over time;
    - Increasing more steeply in pop density over time.
  - Match with model prediction where pop density is replaced by social connectedness.

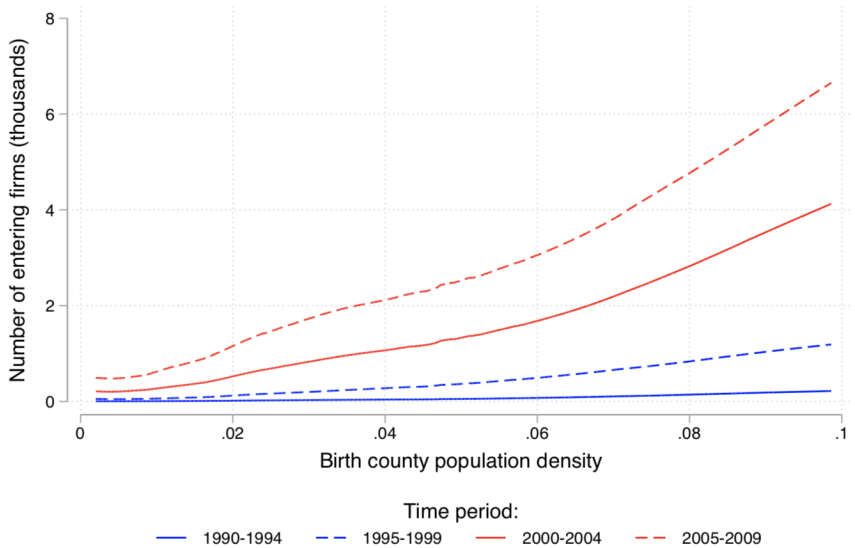


Figure 4: Firm entry

Evidence on Firm Entry (Cont)

- Discussion of other potential explanation
  - Case 1: Pop density may be correlated with other variables (education) that determine the model's outcome.
    - Control for 1982 literacy in an augmented specification;
  - Case 2: Entrepreneurs born in high pop density counties have access to sectors or destinations that grew faster.
    - Sector fixed effect and destination fixed effect;

Comments and Critiques 3

- 60% of county-born entrepreneurs establish their firms outside birth counties, but there are still 40% in their birth county.
- There might be estimation bias in this local group.
  - GDP per capita, infrastructure, financial institutions, labor market etc.
- What's more, there could be substantial difference between these 2 groups (remain local and outside birth counties)
  - Who choose to run business outside of hometown?
  - Would be helpful to compare the result of 2 groups

Evidence on Firm Size

- There was a negative selection process in firm size due to network externality
- The firm's marginal initial capital (bottom 1%) is:
  - Decreasing in pop density at each point in time;
  - Decreasing over time;

Table 9. Evidence on Negative Selection

Dependent variable:	marginal ability	marginal initial capital	average initial capital	marginal initial capital	average initial capital
	(1)	(2)	(3)	(4)	(5)
Time period	-18.532***	-0.882***	-0.115***	-0.655***	-0.109***
	(0.409)	(0.012)	(0.008)	(0.009)	(0.007)
Birth county population density × time period	-1.040***	-0.028**	0.002	-0.069***	-0.022***
	(0.394)	(0.012)	(0.008)	(0.010)	(0.007)
Mean of dependent variable	49.36	-1.744	-0.401	-1.223	-0.374
Origin-sector fixed effects	Yes	Yes	Yes	Yes	Yes
Location fixed effects	No	No	No	Yes	Yes
Observations	21,028	43,579	43,579	46,417	46,417

Testing the Mechanism

- Whether initial entry would generates subsequent entry and how
  - One additional initial entrant generates 7 additional in 2000-2004 and 9 in 2005-2009;
  - Conditional on birth-county initial entry, the total number of entrants has no effect on subsequent entry;
  - Effect of initial entry is larger for county with higher pop density.

Table 11a. The Effect of Initial Entry on Subsequent Entry (within birth place)

Dependent variable:	subsequent entrants from the birth place					
Birth place:	county		county		city district	
Time period:	2000-2004	2005-2009	2000-2004	2005-2009	2000-2004	2005-2009
	(1)	(2)	(3)	(4)	(5)	(6)
Initial entrants from the birth place	7.120***	8.935***	5.239***	5.796***	7.830***	6.994***
	(0.711)	(0.972)	(1.065)	(1.356)	(0.959)	(0.982)
All initial entrants at the location	0.054	-0.020	–	–	–	–
	(0.050)	(0.057)				
Initial entrants from the birth place × birth place population density	–	–	1.361**	2.262**	-0.073	-0.437**
			(0.619)	(0.991)	(0.240)	(0.220)
Mean of dependent variable	3.065	3.128	3.065	3.128	4.001	3.515
Observations	413,452	804,918	413,452	804,918	313,520	449,207

Structural Estimation and Quantification

$$e_{ci,t} = G(\alpha, \sigma, r, A_0) k_c S_{ci,t-1} + \frac{\theta}{(1-\sigma)(1-\alpha)} k_c S_{ci,t-1} \cdot pn_{ci,t-1} + u_{ci,t}$$

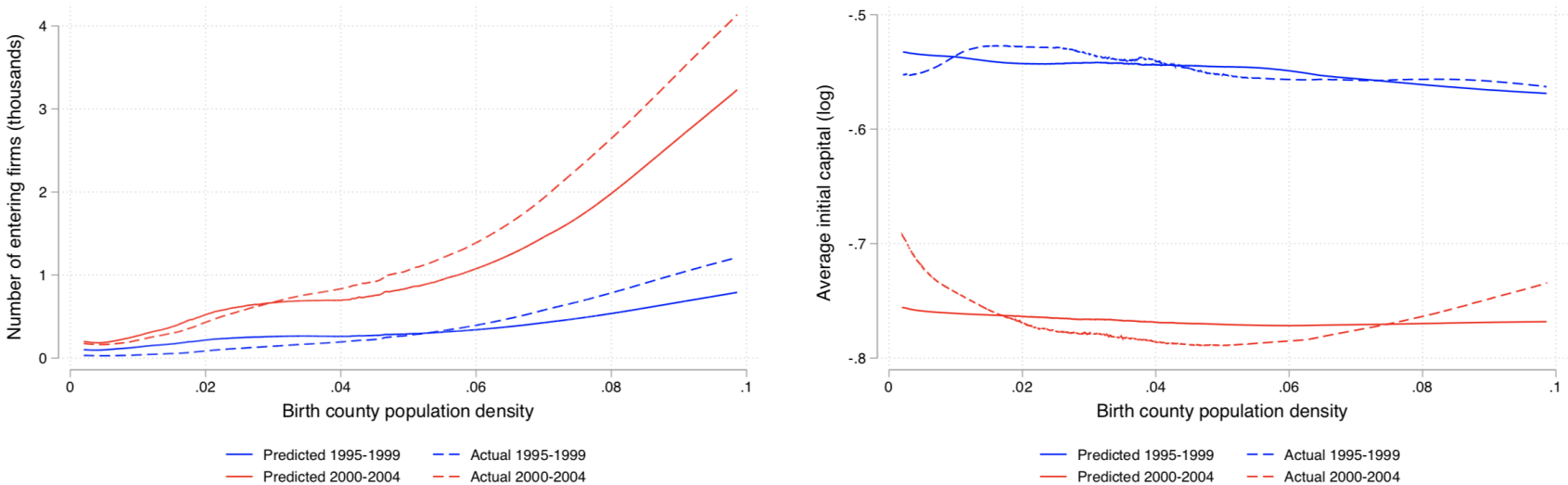
$$\log K^{\alpha}_{ci,t} = H_t(\alpha, \sigma, r, A_0, f_t) + \frac{\theta(1-2\sigma)}{2(1-\sigma)(1-\alpha)} pn_{ci,t-1} + v_{ci,t}$$

- Allow α, which measures the marginal return to capital, to vary across sectors
- 8 structural equations and 6 parameters

$$\alpha_1, \alpha_2, \alpha_3, \alpha_4, \sigma, \theta$$

Structural Estimation and Quantification

- Seems to fit the data well both within and out of sample except for the initial capital 2000-2004
  - U shape vs decline trend;
  - Has the role of network changed?

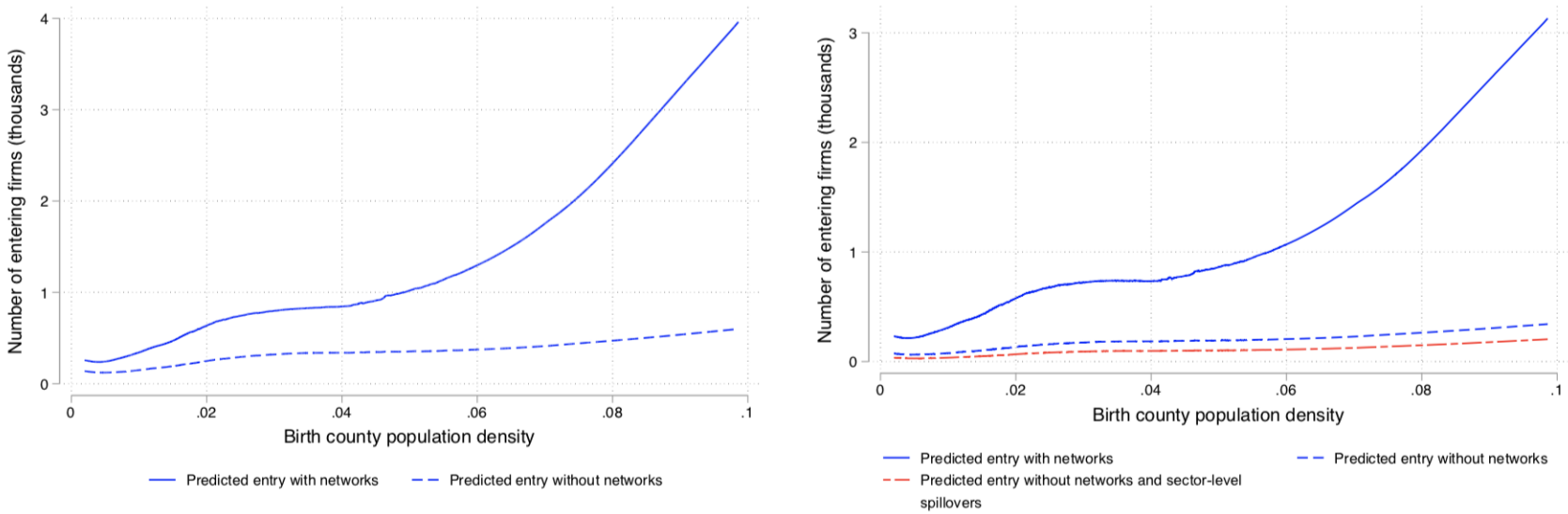


(a) Entry (b) Initial Capital

Figure 5: Actual and predicted, firm entry and initial capital

Structural Estimation and Quantification

- Counter factual analysis 1
  - Setting $\theta = 0$, thus shut down the network effect;
  - Total entrants and stock of capital would have declined by 40% over 1995-2004;
  - Sector-level spillovers has no impact on entry.



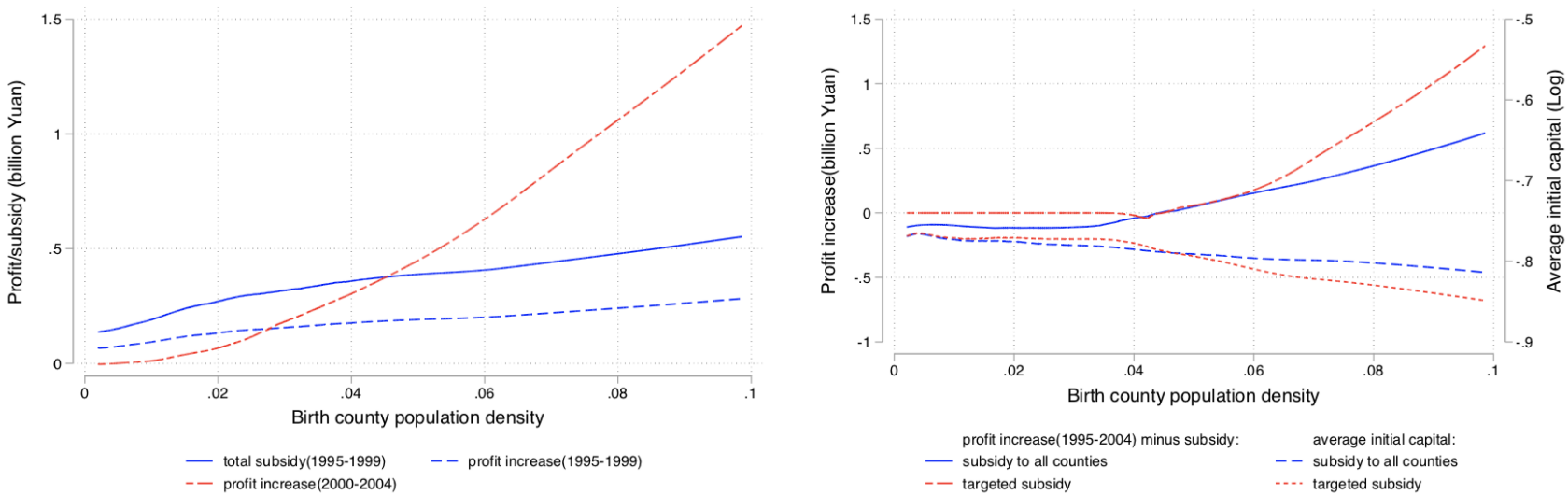
(a) Benchmark quantification

(b) Quantification with sector-level spillovers

Figure 6: Counter-factual simulation: Effect of community networks on entry and total initial capital

Structural Estimation and Quantification

- Counter factual analysis 2
  - Decrease r from 0.2 to 0.15, one-time credit subsidy;
  - Total profits generates are less than cost to government; But the spillover effect is substantial.
  - The targeted program are strictly better in total profits.



(a) Subsidy to all counties

(b) Targeted subsidy vs. subsidy to all counties

Figure 7: Counter-factual simulation: Effect of interest rate subsidy on profits

Structural Estimation and Quantification

- Policy prescriptions
  - May provide subsidized credit to marginal entrepreneurs from high pop density counties due to network externalities
- Potential concerns
  - Will only be effective where community network is active;
  - May cause inter-community inequality.
- Takeaways
  - Lower ability individuals enter business sector in high pop density counties, it is another kind of misallocation, but it's second best.
  - Due to community network, smaller firms or greater dispersion in firm size may not be inefficient, but rather a effective response to missing markets and formal institutions.

Conclusion

- This paper identifies and qualifies the role of community network in the growth of private enterprises in China.

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- Give policy prescription taking consideration of network externality.