Serial Entrepreneurship in China

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Motivation

- **Entrepreneurship**: engine of growth in developed and emerging ec.

    : What drives entrepreneurship? What frictions impede it?

- **Serial entrepreneurs** (SE): entrepr. who start more than one firm

    : Much less is known about serial entrepreneurship

    : Lack of empirical stylized facts on serial entrepreneurship

    : Limited theoretical literature on SE

- China

    : Firm entry accounts for lion's share of TFP growth

    : Large share of new firms started by **serial entrepreneurs** (SE)

    : Informative about frictions and drivers of entrepreneurship

This paper

- Draw on unique data set to document SE in China

    : Document how SE differ from Non-SE (non-serial entrepreneurs)
        - size of firm, productivity, sector choice

    : Differences between 1st and 2nd SE firms

    : Decision to run SE firms concurrently or not

    : Location/sector choice of 2nd-SE firm

- Develop simple model to rationalize observed SE behavior

    : Emphasize role of equity/endowment, ability, and distortions.

Why are Some Entrepreneurs Serial?

Two views

1. **Persistent productivity:** TFP is persistent across firms started by same entrepreneur.

   : Optimal for high-productive entrepreneurs to become SE

2. **Distortions:** some individual owners have advantage in terms of subsidized inputs, market access, etc.

   : Favored individuals end up starting many firms

Data Sources

1. **Business Registry of China**
   - Maintained by State Administration of Industry and Commerce
   - Universe of all firms ever established
   - Information relating to
     - : year of establishment of each firm
     - : investors − individuals and enterprises
     - : initial registered capital
     - : main line of business
     - : firm exit
   - Investors identified through unique ID
     - : also know year of investment

2. **Firm Inspection Data**
   - Self-reported sales, assets, liabilities, and profits of each firm
   - Coverage expanding over time. Extensive from 2008

Business Registry of China: Key Definitions

- **Entrepreneur**

  : Individual investor with the largest share at the time of firm establishment or acquired later

- **Serial Entrepreneur**

  : Individual who is or has been the "Entrepreneur" of more than one firm

  : Backward-looking definition (given info up until last year of data)

Firms in China: Shareholder Information

year	Based on the largest shareholder						Unreported
	Total	Unregistered	Individual			Enterprise	
			Single	Multiple	No citiz. ID		
1995	1,430,103	696,360	**167,405**	**282,714**	23,409	260,215	1,308,997
2000	2,695,474	777,957	**349,285**	**1,126,996**	58,210	383,026	814,285
2005	5,227,288	652,670	**848,383**	**3,149,658**	127,626	448,951	328,340
2010	8,344,938	545,334	**1,763,082**	**5,267,974**	193,274	575,274	180,745
2015	17,823,017	757,257	**5,143,272**	**10,353,350**	585,905	983,233	133,561

- Business Registry of China, 1995-2015

- Based on the largest shareholder

- This paper: **firms in which an individual is the largest shareholder** (single plus multiple)

Role of Serial Entrepreneurs

Year	# of firms	SE(%)	Total K (trill.)	SE(%)	Aver. registered K (mill.)	
					SE	Non-SE
1995	353,319	**30.61**	0.82	**42.58**	**3.22**	**1.91**
2000	1,360,283	**33.14**	2.74	**46.39**	**2.82**	**1.61**
2005	3,906,842	**33.93**	7.83	**47.68**	**2.82**	**1.59**
2010	6,971,506	**32.90**	18.09	**49.48**	**3.90**	**1.95**
2015	15,351,831	**28.21**	60.22	**46.94**	**6.53**	**2.90**

- Increasing role of serial entrepreneurs over time, 1995-2015
  - : **fraction of SE firms** slightly increased
  - : **share of registered capital for SE** slightly increased

- **Average registered capital around 2 times higher for SE**

- 83% of SE establish their second firm **concurrently** with the first firm

Simple Model Setup

- Two periods

- Fixed set of potential entrepreneurs (unit measure)

- Entrepreneurs can start one firm each period

- TFP z_{it} of a potential new firm is stochastic

- TFP of 2nd firm is correlated TFP of 1st firm:

$$\ln(z_{i2}) = \rho \ln(z_{i1}) + \varepsilon_{i2},$$

where $\rho \in [0, 1]$

- Entrepreneurs are risk-neutral. Consume after 2nd period.

Production and Markets

- Firm's production function is

$$y = z^{1-\eta} \left(k^{1-\alpha} n^{\alpha} \right)^{\eta},$$

  where $\eta \in (0,1)$ reflects decreasing returns to scale

- Markets:

  : Banks offer one-period loans at interest rate R

  : **Collateral constraint:** borrowing limited to $b \leq (\lambda - 1)e$, so

  $$k \leq \lambda e,$$

  where e is equity

  : Firms pay workers a wage rate w

Capital and Debt Decisions

- Two possibilities:

    1. Entrepreneur constrained: $k = \lambda e$
    2. Entrepreneur unconstrained: $k < \lambda e$

- Optimal capital and debt weakly increasing in z and e:

$$K^*(z,e) = \begin{cases} \lambda e & \text{if } \lambda e < zk^* \\ zk^* & \text{if } \lambda e \geq zk^*/\lambda \end{cases}$$

$$B^*(z,e) = \begin{cases} (\lambda - 1)e & \text{if } \lambda e < zk^* \\ zk^* - e & \text{if } \lambda e \geq zk^* \end{cases}$$

where (unconstrained) optimal size is zk^*,

$$k^* \equiv \left(\frac{(1-\alpha)\eta}{R} \right)^{\frac{1-\alpha\eta}{1-\eta}} \left(\frac{\alpha\eta}{w} \right)^{\frac{\alpha\eta}{1-\eta}}$$

Summary: Capital & Debt, Given TFP and Equity

Testable Implications 1:

1. Capital is increasing in TFP, conditional on equity

2. Capital is increasing in equity, conditional on TFP

3. Debt-equity ratio is increasing in TFP and decreasing in equity

    : larger equity implies that debt-equity ratio increases less steeply
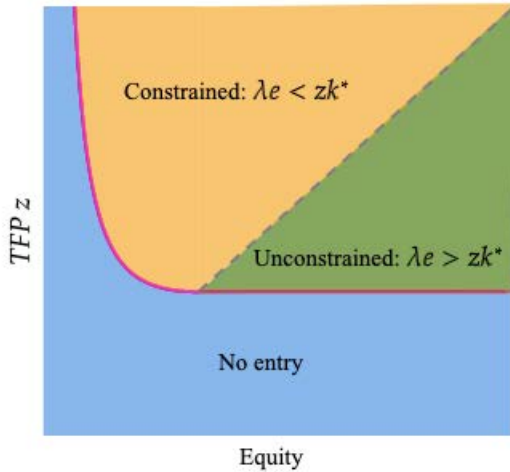   with TFP

Entry Decision in 1st Period

- Study entrepreneur's entry decision

- Entrepreneur has equity e and observes TFP z for a potential firm. Then decides whether or not to operate the firm

- Operating the firm requires a fixed operating cost $v > 0$

- Optimal threshold: operate the firm iff $z \geq z^*(e)$

- Optimal entry threshold function $z^*(e)$ weakly falling in equity e

$$
z^*(e) = \begin{cases} \left(\frac{v + R\lambda e}{1 - \alpha\eta} \right)^{\frac{1 - \alpha\eta}{1 - \eta}} (\lambda e)^{-\frac{(1-\alpha)\eta}{1 - \eta}} \left(\frac{w}{\alpha\eta} \right)^{\frac{\alpha\eta}{1 - \eta}} & e < zk^*/\lambda \\ z^* & e \geq zk^*/\lambda \end{cases},
$$

where

$$
z^* \equiv \frac{\eta}{1 - \eta} \frac{1 - \alpha}{R} \frac{v}{k^*}.
$$

Entry Decision in 1st Period

Serial Entrepreneurship (SE)
Entry Decision in 2nd Period

- Beginning of 2nd period: Entrepreneur gets option to start new firm with TFP z_2

$$\ln(z_2) = \rho \ln(z_1) + \varepsilon_2,$$

- Entrepreneur who operates firm in 1st period can either ...

  1. start new firm, operate new + old firm concurrently (SE)
  2. start new firm, close old firm (SE)
  3. not start new firm, keep operating old firm (Non-SE)

- If no firm in 1st period: by default not serial entrepreneurs (Non-SE)

- Assume zero cost of moving capital and labor across firms

  : Implication: if two firms operate concurrently
  $\Rightarrow$ equalize marginal product of capital and labor across firms

Productivity-Persistence view

Proposition 1: Suppose no financial frictions ($\lambda \to \infty$). Then,

- If some persistence ($\rho > 0$) then
  1st SE firms have larger TFP & size than Non-SE firms

  : **Mechanism:** Positive selection when $\rho > 0$
  If TFP of 2nd firm is sufficiently productive to trigger entry, then 1st-SE is likely to be productive, too

- If ρ sufficiently large, then
  2nd SE firms have larger TFP & size than 1st-SE firms

  : **Mechanism:** when ρ large then 2nd-SE firm positively selected relative to 1st-SE firm

  : Worst outcomes of ε will never be observed

Needed: Assumption on Equity-TFP Distn.

- If $\lambda < \infty$, initial equity and retained earnings affect selection

- Need to make assumption on equity-TFP distribution

- Assumption 2:
  Initial equity is monotone increasing in initial TFP draw z_1.

Productivity-Persistence View w/Financial Frictions

- If Assumption 2 holds and ρ sufficiently large, SE are positively selected and Prop. 1 holds

  : Intuition: when ρ is large then productivity selection channel dominates effects from equity

- **Testable Implications: If ρ sufficiently high then ...**
  : **2nd-SE firm: larger TFP & capital than 1st-SE firm**
  : **1st-SE firm: larger TFP & capital than Non-SE firms**

Distortions View

- Interpret "favored entrepreneur" as individual who can borrow (unlimited) at a lower interest rate

    : Favored entrepreneurs have lower TFP threshold $z(e)$

- If ρ suff. low and some entrepreneurs are sufficiently favored, then the distortion-view dominates

    : SE are negatively selected
    : Intuition: since favored entrepreneurs have lower $z(e)$ they are more likely to start a firm given TFP draw z.
    : **both** lower TFP **and** higher likelihood of becoming SE

- **Implication: lower TFP for SE firms than Non-SE firms**

Inspection Data: Prod.-Persistence Dominates

	Log Registered Capital (1)	Log Assets (2)	Log Equity (3)	Log Revenue (4)	Log Relative TFP (5)
1st-SE	0.35***	**0.41*****	0.36***	0.33***	**0.11***
2nd-SE	0.58***	**0.68***	0.58***	0.53***	**0.18***
age	0.10***	0.17***	0.12***	0.26***	0.41***
age squared	-0.00***	-0.00***	-0.00***	-0.01***	-0.01***
Observations	12,476,788	12,476,788	12,476,788	12,476,788	12,476,788
Adj. R-square	0.06	0.11	0.08	0.08	0.03

- Use the Firm Inspection Data, 2008-2012: Assets, Equity, Revenue, TFP

- Use the Registry Data, 2008-2012: Registered Capital

- Dependent variables computed relative to their averages of all firms in the same province-industry-year cell

- The 1st SE firm has higher values in all variables than the Non-SE firm

- The 2nd SE firm has higher values in all variables than the 1st SE firm

Predictions Concurrent vs. Non-Concurrent Firms

- Assume operating cost is paid each period.

- Entrepreneur's choice: either operate both firms concurrently or operate just the most productive firm

- **Proposition: Number of firms operated concurrently by entrepreneur is ...**

    ... increasing in equity

    ... decreasing in TFP difference $|z_2 - z_1|$

- INTUITION:

    : more equity $\Rightarrow$ lower opportunity cost of equity, lower TFP threshold for least productive firm

    : larger TFP of most productive firm
    $\Rightarrow$ larger opportunity cost of equity

Predictions for Concurrent vs. Non-Concurrent

Testable Implications 3:

- TFP of 2nd-SE lower for concurrently run than for non-concurrently run 2nd-SE

- TFP of 1st-SE higher for concurrently run than for non-concurrently run 1st-SE

- SE with more equity are more likely to operate firms concurrently

Firm Inspection Data: Concurrent SE Firms

	1st-SE		2nd-SE	
	Log TFP	Log Equity	Log TFP	Log Equity
	(1)	(2)	(3)	(4)
Non-concurrent	**-0.06*****	**-0.07*****	**0.23*****	**-0.16*****
age	0.37***	0.14***	0.62***	0.16***
age squared	-0.01***	-0.00***	-0.03***	-0.01***
Observations	2,254,408	2,254,408	1,826,093	1,826,093
Adj. R-square	0.03	0.08	0.02	0.04

- Non-concurrent 1st SE firms have lower TFP and equity than concurrently run 1st SE firms

- Non-concurrent 2nd SE firms have higher TFP, but lower equity, than concurrently run 2nd SE firms

Geographical and Sectoral Migration

- Migration patterns: **Location** and **sector** of **2nd-SE firm**

  : **more likely to be in the same prefecture**

  : **more likely to be in a different 3-digit sector**

3-digit Industry	Same (%)	Similar (%)	Distant (%)	Total (%)
Same Prefecture	12.25	17.68	42.21	**72.14**
Same Province	1.25	2.30	5.98	9.53
Different Province	2.09	4.46	11.78	18.33
Total (%)	15.59	24.43	**59.97**	100.00

Should I Stay or Should I Go?
(Sectoral Choice for 2nd Firm)

Assumptions:

- ∃ many ex ante identical sectors (same dist'n of TFP draws)

- Entrepreneur can choose sector from which she draws 2nd firm TFP

- TFP draws: higher correlation ρ if same sector than in different sector

Implications:

- **Optimal choice**: stay iff TFP of 1st firm is large, $z_{1s} \geq E\{z_1\}$

- **Implication A**: TFP of **1st** firm higher for same-sector firms than different-sector firms

- **Implication B**: TFP of **2nd** firm higher for same-sector firms if ρ is large

Test Assumption on Correlation 1st-SE & 2nd-SE

	Log 2nd-SE TFP		
	Same Industry	Similar Industry	Different Industry
	(1)	(2)	(3)
Log 1st-SE TFP	**0.33*****	**0.24*****	**0.13*****
Age	0.31***	0.34***	0.29***
Age Difference	0.31***	0.33***	0.29***
Observations	52,934	76,223	163,392
R-square	0.11	0.08	0.03

- *** − statistically significant at the 1% level

- similar industries − same 1-digit, but different 3-digit, codes

- different industries − different 1-digit code

TFP for 1st- and 2nd-SE Firms, Conditional on Industry

	log 1st-SE TFP	log 2nd-SE TFP	
	(1)	(2)	(3)
Similar Industry	-0.18***	-0.25***	-0.25***
Distant Industry	-1.08***	-1.11***	-1.12***
Distant Industry * Covariance			0.37***
Age	0.34***	0.67***	0.67***
Age squared	-0.01***	-0.03***	-0.03***
Observations	292,549	292,549	292,549
Adjusted R-squared	0.03	0.03	0.03

- Use the Firm Inspection Data, 2008-2012

- Dependent variables computed relative to their averages of all firms in the same province-industry-year cell

Choice of Sector of 2nd Firm (cont.)

- Suppose entrepreneur obtains 1 draw from each sector

- Alternative theory 1: risk averse entrepreneurs + sector-specific shocks + incomplete insurance = hedging motive

- $\Rightarrow$ incentive to choose 2nd SE in sector with low correlation with 1st SE firm

- $\Rightarrow$ 2nd-SE must be more productive if in sector highly correlated with 1st-SE sector

- Alternative theory 2: Assume there are complementarities across firms with input-output linkages (e.g., mitigate information problems)

- $\Rightarrow$ More likely that 2nd SE will be in upstream or downstream sector relative to 1st SE firm

Determinants of SE Second Firm: Downstream and Upstream Integration

Take a SE with **1st firm in ind.** i and **2nd firm in ind.** j (Fan & Lang, 2000)

- **Upstream index**: dollar value of industry j's output required to produce 1 dollar's worth of industry i's output

- **Downstream index**: dollar value of industry i's output required to produce 1 dollar's worth of industry j's output

- **Output complementarity index**: correlation coefficient between b_{ik} and b_{jk}

    : b_{ik} (b_{jk}) is the percentage of industry i (j) output supplied to each intermediate industry k

    : captures the degree to which industries i and j share outputs

- **Input complementarity index**: correlation coefficient between v_{ik} and v_{jk}

    : v_{ik} (v_{jk}) is the percentage of inputs from each intermediate industry k used in industry i (j) output

    : captures the degree to which industries i and j share inputs

- Use the 2007 Chinese Input-Output table to compute these indices

Determinants of SE Second Firm:
Probability of 2nd Firm in Industry j

Computing an **excess probability** measure

- Consider SE with 1st firm in industry i and 2nd firm in industry j

- Calculate the percentage of SE that move from i to j each year

    : number of SE from i to j divided by total SE in industry i

- Normalize by the share of industry j in total incumbents last year

Sectoral Choice: Business Linkages & Diversification

Dependent variable:	(1)	(2)	(3)	(4)	(5)
			excess probability		
Downstream Integrated	0.52***				**0.47*****
Upstream Integrated		0.57***			**0.46*****
Input/Output complementarity			0.51***		**0.41*****
Covariance				-0.03***	**-0.11*****

Note: *** − statistically significant at 1%; ** − at 5%; * − at 10%.

All regressions have FE for sector 1st-SE and start-year 2nd-SE

Conclusion

- Large literature studying entrepreneurship

    : however, much less known about serial entrepreneurship

- Draw on the universe of all Chinese firms to document key facts on entrepreneurship and serial entrepreneurship in China since early 1990s

- Build a model of serial entrepreneurship

    : financial frictions

- The model captures the main patterns in the data

- Next steps

    : Build a dynamic model of serial entrepreneurship
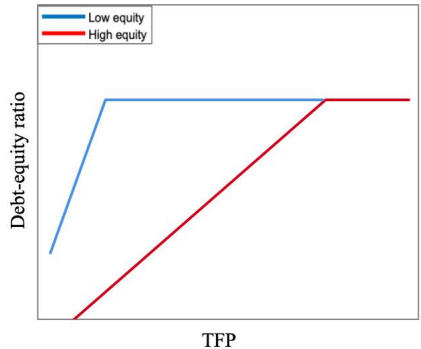   : Allow for heterogeneity in business environment between locality (Brandt, Kambourov, and Storesletten, 2022)

Additional Slides

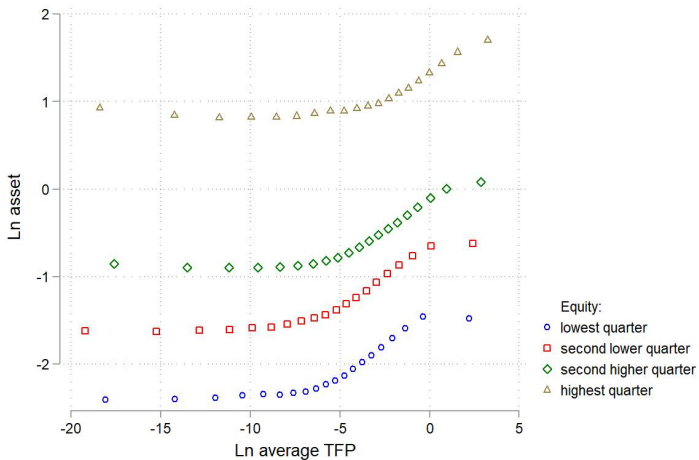# Capital and Debt-Equity Ratio

Installed Capital

Low equity
High equity

Capital

TFP

Debt-Equity Ratio

Low equity
High equity

Debt-equity ratio

TFP
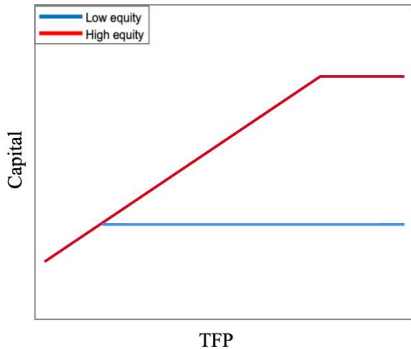
Prediction: Increasing Role of SE over Time

- Over time, the share of SE firms will increase. This is driven by two forces:

    1. More entrepreneurs will have had time to start a second firm (given that no potential entrepreneurs had an existing firm when entering period 1)

    2. Existing entrepreneurs accumulate more equity over time. This increases the probability they will start firms

- **Implication 4: The share of firms operated by serial entrepreneurs increases over time**

Capital: Increasing in TFP and Equity

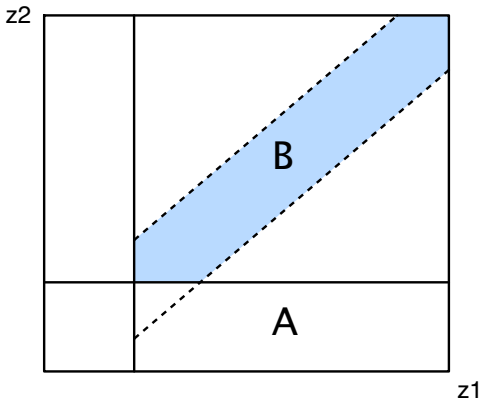# Debt-Equity Ratio: Increasing in TFP
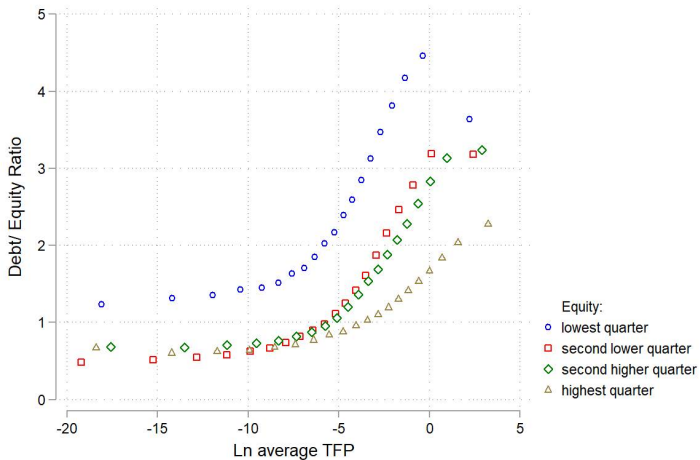
Debt-Equity Ratio, Capital, and Relative TFP

|	Log Assets	Debt-Equity Ratio
	(1)	(2)
Log TFP	0.04***	0.16***
2nd quarter of equity	1.09***	-1.30***
3rd quarter of equity	1.68***	-1.39***
4th quarter of equity	3.10***	-2.23***
TFP*2nd quarter of equity	-0.00***	-0.03***
TFP*3rd quarter of equity	-0.00***	-0.04***
TFP*4th quarter of equity	-0.01***	-0.10***
Age	0.06***	0.15***
Age squared	-0.00***	-0.00***
Observations	12,476,788	12,476,788
Adjusted R-squared	0.64	0.04

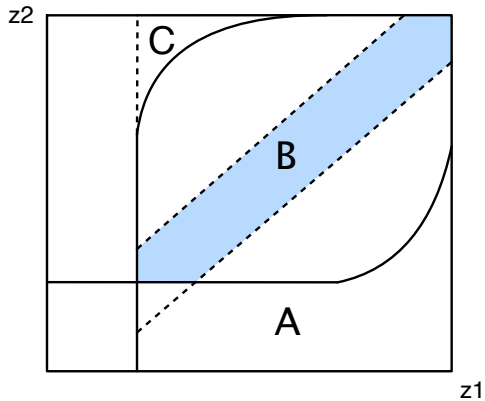# Entry Decision in 2nd Period (No Frictions)
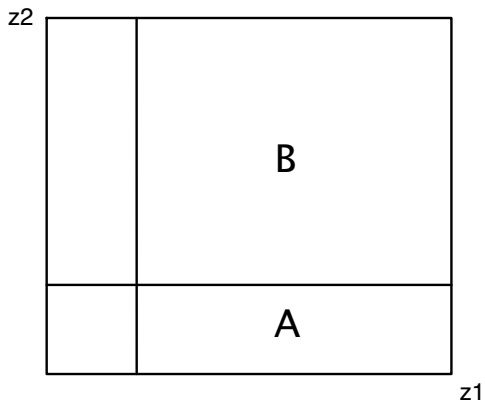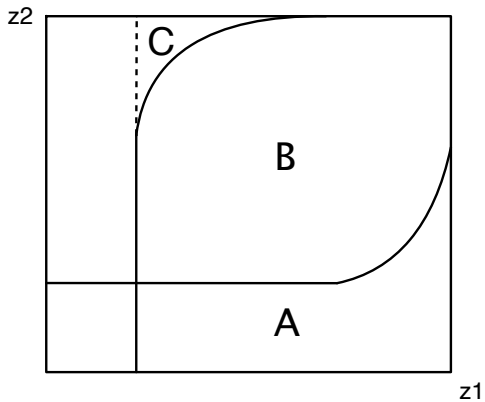
Entry if $\rho = 1$ and No Frictions
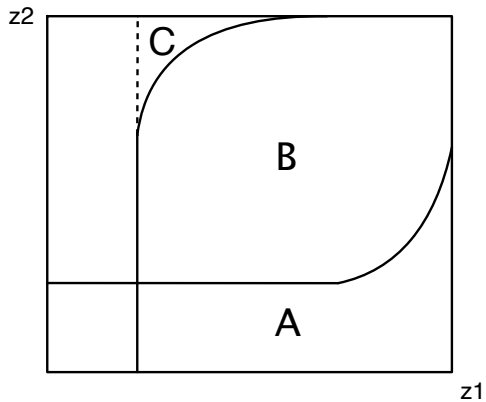
Empirical Relationship TFP vs. Equity
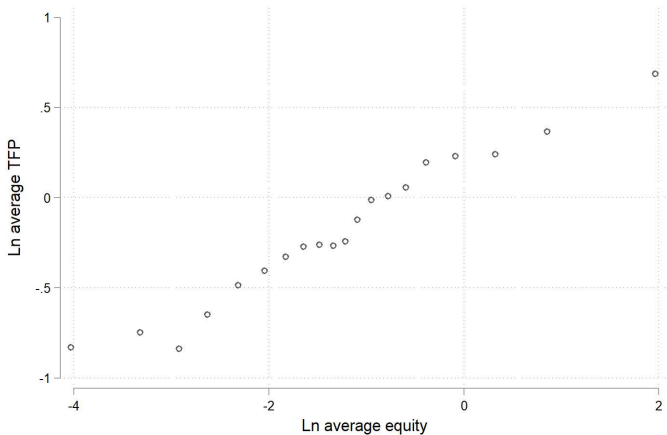
Entry if $\rho = 1$ and Frictions

Concurrent vs. Sequential

Industrial Distribution of Entrants, 2010, Non-SE and SE

Industry	2010					
	Unconditional share			Conditional share		
	Non-SE	1st-SE	2nd-SE	Non-SE	1st-SE	2nd-SE
Agriculture	3.35	2.62	2.54	1.42	1.11	1.08
Mining	0.33	0.43	0.54	0.48	0.63	0.78
Manufacturing	**18.49**	**15.86**	**18.41**	0.73	0.63	0.73
Power	0.18	0.18	0.33	0.39	0.40	0.73
Construction	5.86	5.48	4.86	1.12	1.05	0.93
Wholesale&Retail	**39.16**	**38.23**	**34.45**	1.15	1.12	1.01
Transportation	2.70	2.62	2.32	1.02	0.99	0.87
Accommodation	1.11	1.23	1.67	0.77	0.85	1.16
IT	3.35	3.38	2.89	0.94	0.95	0.81
Finance	0.30	0.54	0.95	1.00	**1.79**	**3.13**
Real Estate	3.00	4.21	5.80	0.97	**1.37**	**1.88**
Enterprise&Business Service	**11.01**	**13.42**	**13.60**	1.13	**1.38**	**1.40**
R&D&Tech Service	6.38	7.32	7.51	1.07	**1.23**	**1.26**
Resident service	2.82	2.42	1.97	0.97	0.83	0.68
Entertainment	1.38	1.45	1.48	0.94	0.98	1.00

- Unconditional share: distribution of entrants over industries

- Conditional share: distribution of entrants **relative to the current distribution** of firms over industries

[2005]

Industrial Distribution of Entrants, 2005, Non-SE and SE

Industry	2005					
	Unconditional share			Conditional share		
	Non-SE	1st-SE	2nd-SE	Non-SE	1st-SE	2nd-SE
Agriculture	2.32	2.09	2.05	1.31	1.18	1.16
Mining	0.77	0.94	0.99	1.08	1.31	1.38
Manufacturing	**23.04**	**20.88**	**22.83**	0.77	0.70	0.76
Power	0.41	0.36	0.54	0.84	0.74	1.10
Construction	5.48	5.46	4.87	1.17	1.16	1.04
Wholesale&Retail	**34.40**	**34.05**	**31.33**	1.00	0.98	0.91
Transportation	3.07	3.18	2.93	1.43	1.49	1.37
Accommodation	1.43	1.49	2.17	0.89	0.92	1.34
IT	3.79	3.62	3.17	1.17	1.12	0.98
Finance	0.19	0.27	0.41	0.94	**1.32**	**2.02**
Real Estate	2.26	3.08	4.17	0.82	**1.13**	**1.52**
Enterprise&Business Service	**10.70**	**12.14**	**12.24**	1.38	**1.57**	**1.58**
R&D&Tech Service	6.18	6.90	6.90	1.20	**1.34**	**1.34**
Resident service	3.41	2.99	2.73	1.17	1.03	0.94
Entertainment	1.64	1.62	1.66	1.36	1.34	1.37

- Unconditional share: distribution of entrants over industries

- Conditional share: distribution of entrants **relative to the current distribution** of firms over industries

[2010]

Detour: Measuring TFP Using Inspection Data

- From the first-order condition for labor

$$
\begin{aligned}
y &= z^{1-\eta} k^{(1-\alpha)\eta} \left(\frac{\alpha\eta}{w} y \right)^{\alpha\eta} \\
&\Rightarrow \\
z &= y^{\frac{1-\alpha\eta}{1-\eta}} \left(\frac{w}{\alpha\eta} \right)^{\frac{\alpha\eta}{1-\eta}} k^{-\frac{(1-\alpha)\eta}{1-\eta}}
\end{aligned}
$$

- Assume wage rate w same for all firms in a province-sector-year cell

- Express the TFP of firm i relative to the average TFP of all firms in a province-sector-year cell

$$
\frac{z_i}{\bar{z}} = \frac{y_i^{\frac{1-\alpha\eta}{1-\eta}} k_i^{-\frac{(1-\alpha)\eta}{1-\eta}}}{\sum_j \omega_j y_j^{\frac{1-\alpha\eta}{1-\eta}} k_j^{-\frac{(1-\alpha)\eta}{1-\eta}}} .
$$

 : ω_j is the relative weight of each observation j

Determinants of SE Second Firm:
Diversification of Risk

- Consider a simple portfolio model

- Assume that entrepreneurs have linear quadratic preferences:

$$a[E(r_p)] - b[Var(r_p)],$$

  where r_p is the portfolio return

- Assume there are entrepreneurs who operate only one firm

  : the value of operating in sector i is $V_i = aE(r_i) - bVar(r_i)$,
  : r_i is the rate of return in sector i

- Assume free entry across sectors and that all sectors have some single entrepreneurs. Then

  : $V_i = V_j$.

Determinants of SE Second Firm: Diversification of Risk

- Consider entrepreneur with 1st firm in sector i, looking to establish (concurrently) a 2nd firm in sector $j \in J = \{1, 2, \ldots\}$:

$$max_{j \in J} \, a[E(r_i) + E(r_j)] - b[Var(r_i) + Var(r_j) + 2Cov(r_i, r_j)]$$

- Since $V_i = V_j$ for all i, j, the objective function becomes

$$min_{j \in J} \, [Cov(r_i, r_j)]$$

  : **entrepreneur chooses sector j with the lowest** $Cov(r_i, r_j)$

- Measurement

  : construct a measure of return on capital in sector i in period t as:

$$r_{i,t} = \frac{profits_{i,t}}{assets_{i,t}}$$

- Use the Inspection Data over the 2010-2012 period across industries to compute a **covariance index**