Limits to Firm Growth: All in the Family?

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Motivation/ Question

- Substantial differences in per-capita income across countries, driven by TFP

- Important differences in organization of production. Poor countries feature:
    - ▸ Smaller firms and establishments, lower growth (see for example, Tybout (2000), Hsieh and Klenow (2014), Hsieh and Olken (2014))

    - ▸ Centralization of decisions within firms in developing countries, e.g., Bloom et al. (2012)

    - ▸ Prominence of family firms, e.g., Bertrand and Schoar (2006) and Bertrand et al. (2008)

- Cross-country differences in the rule of law and contract enforcement, e.g., La Porta et al. (1998)

What do we do?

1. Framework to quantify the role of delegation frictions/ contract enforcement

2. Incorporate family firms
   1. Potentially important avenue for overcoming delegation frictions
   2. Family firm data useful for identifying key parameters

3. Use the model to answer the following questions:
   1. How costly are the delegation frictions?
   2. What is the value of family firms?
   3. What are the distributional implications of family firms?

Preview of Results

1. Delegation friction:
   1. If India had the delegation efficiency of the US, its output per capita would go up by 41%
   2. Model generates the cross-country relationship between firm size and output per capita as seen in data

2. Value of Family Firm:
   1. Aggregate value of family firms is modest (3% of aggregate output)
   2. Large distributional impact: p99/p1 14.6 w/o family firms vs 12.1 w/ family firms (20.6% lower)
   3. W/o family firms missing middle in the size-distribution of firms ⊕
   4. Wealthy small families gain up to 20% w/o family firms while poor small families lose 8%
   5. Large wealthy families lose 10-30% w/o family firms

3. Family size matters
   1. If the families were twice as big, income per capita ↑ 10.8%

Model Elements

1. Generalization of Lucas (1978) span of control:

$$f(\mathbf{z}, \mathbf{l}) = n^{\alpha} \left[\frac{1}{n} \sum_{i=1}^{n} \left(z_i l_i^{\theta} \right)^{\rho} \right]^{\frac{1}{\rho}} \quad \text{Examples}$$

   - $\mathbf{z} = (z_1, ..., z_n)$: Ability of managers
   - $\mathbf{l} = (l_1, ..., l_n)$: Employees of managers
   - n, Number of managers
   - $0 \leq \theta < 1$: Span of control of an individual manager
   - $\alpha \geq 1$: Gains from specialization
   - $\rho \leq 1$ ($\rho \leq 0$: Complementarity across managers)

2. Delegation friction: professional managers can divert part of the output Details

3. Families can overcome delegation frictions Type of Firms

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3. Families can overcome delegation frictions $\boxed{\text{Choice Summary}}$

Family firms data helps us pin down α and ρ

Problem of Professional Firms

- Given complementarities, professional firms are perfectly sorted (theoretical result)

- Professional firm of productivity, z, chooses number of managers, n, labor, l, and monitoring effort, m, given the delegation friction, ϕ

$$\max_{m,n,l} \ n^{\alpha}z l^{\theta} - nm - nw(z) - wnl$$

$$\text{s.t. } w(z) \geq \frac{\phi}{m}(n^{\alpha}z l^{\theta} - wnl)$$

$w(z)$ is an equilibrium outcome: Equal profit sharing among managers in a firm

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ϕ : Delegation friction

In equilibrium, managers don't appropriate any output

Puts limit on firm size

Problem of Pure Family Firm (w/o Professional Managers)

- Given productivities of the family members, choose labor input

- Note: No enforcement friction

$$\max_l \; n_f{}^\alpha \left\{ \frac{1}{n_f} \left[\sum_{i=1}^{n_f} (z_i l_i^\theta)^\rho \right] \right\}^{1/\rho} - \sum_{i=1}^{n_f} l_i w$$

Special Case: Single Manager   With Outside Manager

Occupational Map: Family of Size 2

Both Family Managers
Both Professional Managers
Both Workers
1 Worker, 1 Professional Manager
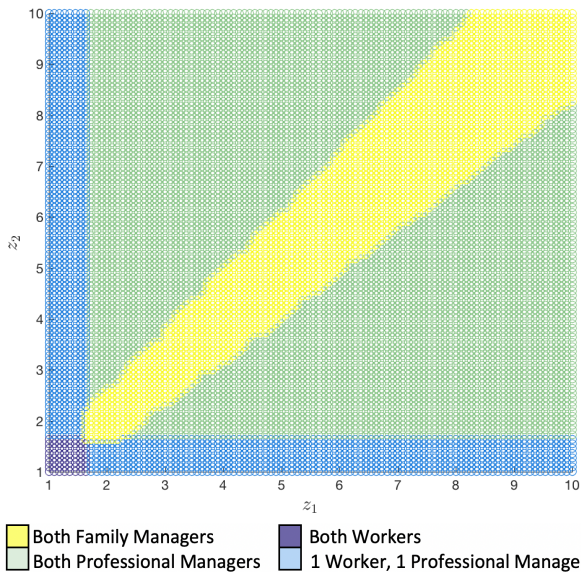
Quantitative Strategy

1. Use rich firm and household level micro-data from India to discipline the model (Calibration)
   - Use surname of board members to estimate the fraction of family firms in data (Example)

2. Use cross-country differences in the size distribution of firms to measure differences in delegation frictions

3. Calculate implied difference in GDP explain by these frictions

4. Calculate counter-factual Indian outcome:
   - W/o family firms
   - Alternative distribution of family sizes

Size Distribution of Firms

Size Distribution
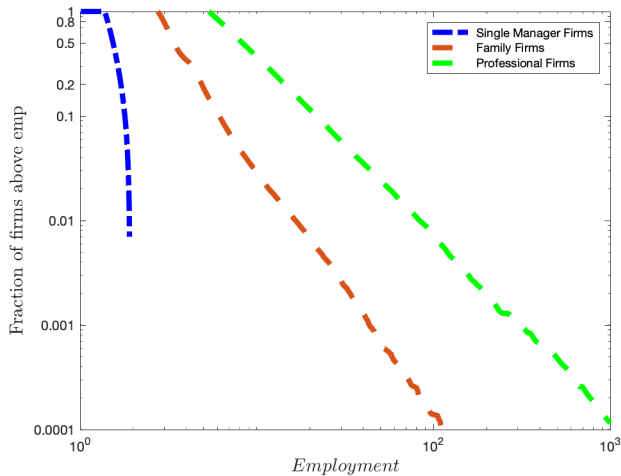
Size Distribution
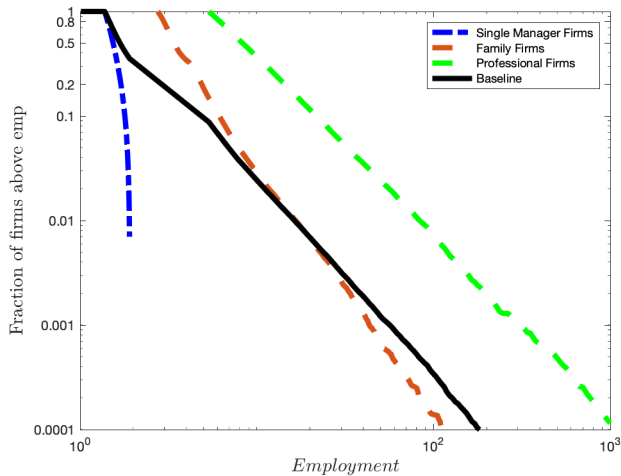
1. Role of Delegation Frictions:
If India had the delegation efficiency of the US, its output per capita would go up by 41%

GDP - Firm Size: Data vs Model
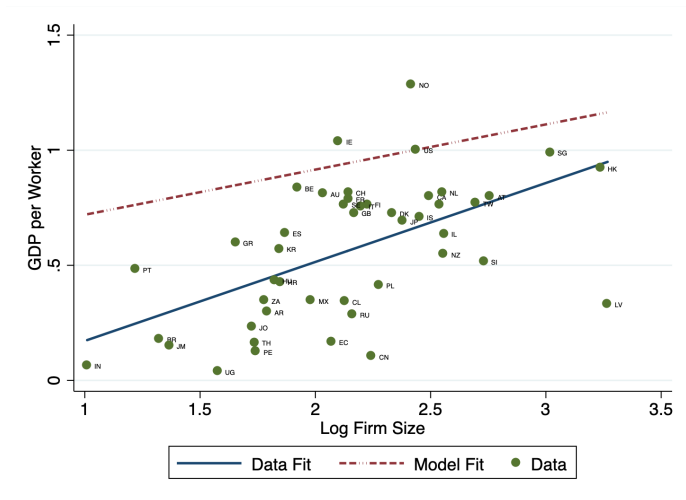
Model generates the cross-country relationship between firm size and output per capita as seen in data
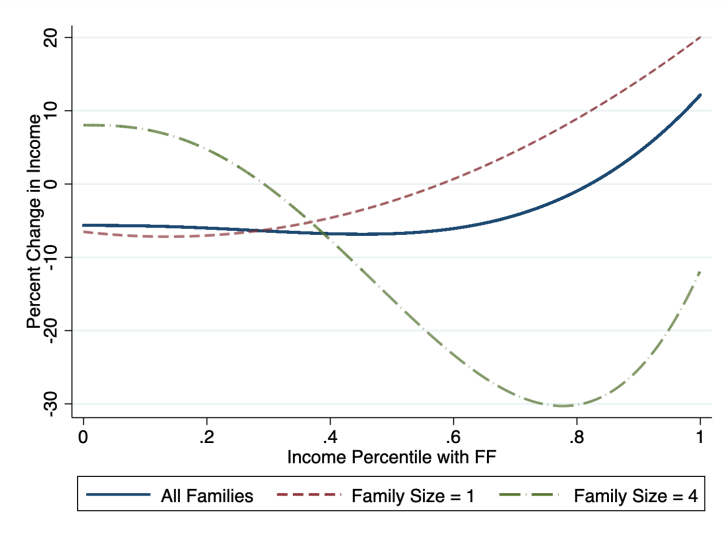
Delegation Friction (ϕ): Data vs Model
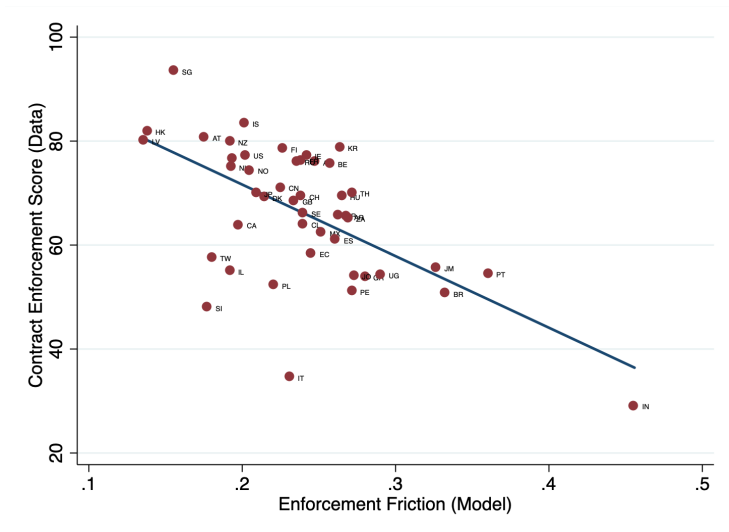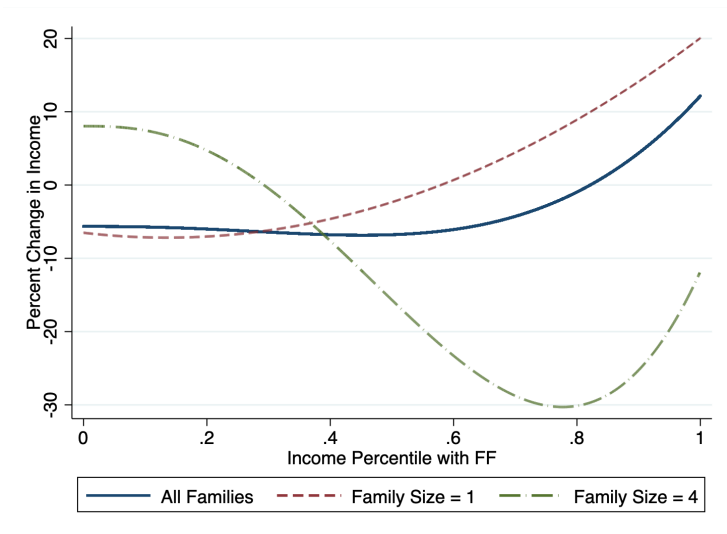
2. Value of Family Firms
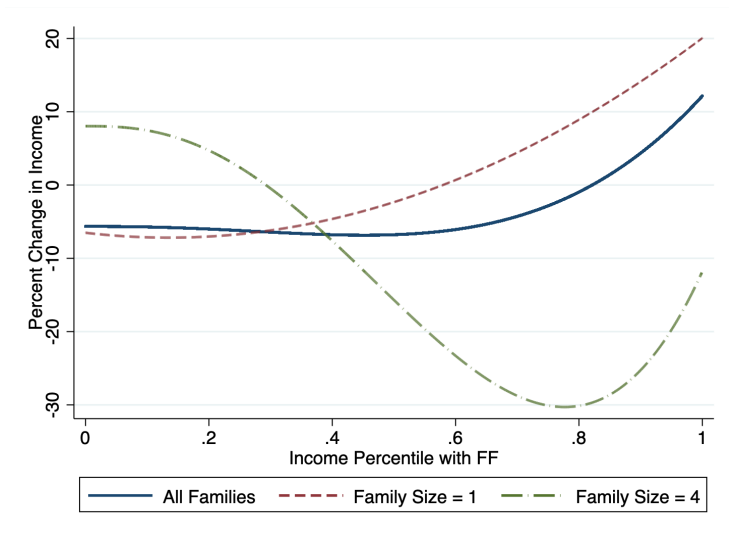
Distributional effect of family firms
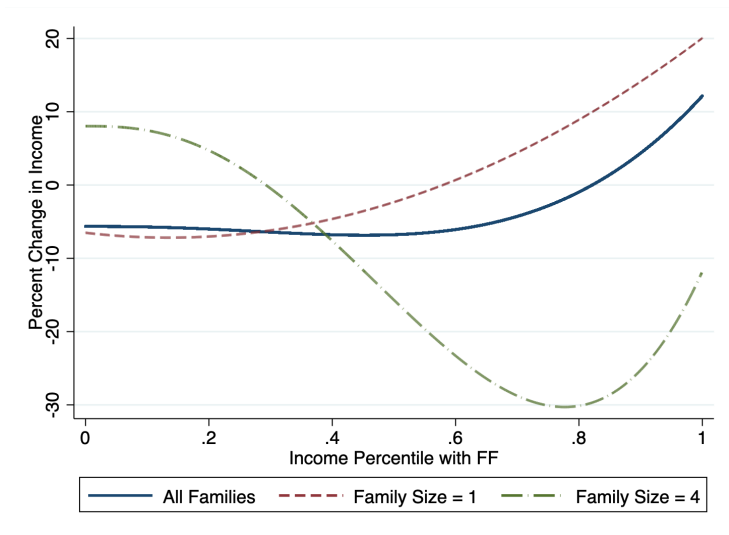
Distributional effect of family firms

Large distributional impact: p99/p1 14.6 w/o family firms vs 12.1 w/ family firms

Distributional effect of family firms

Wealthy small families gain 20% w/o family firms, poor small families lose 8%

Distributional effect of family firms

Large wealthy families lose 10-30% w/o family firms

3. Role of Family Size:
If the families were twice as big, income per capita $\uparrow$ 10.8%

Family Size x 2 Detailed Size Distribution
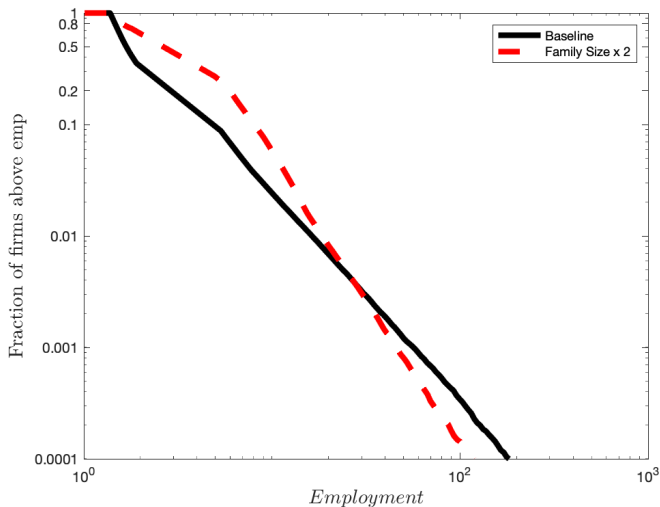
Conclusions

1. Delegation friction:
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Thank you!

Technology of a Firm: Special Cases

- Perfectly sorted firm

$$f(\mathbf{z}, \mathbf{l}) = n^\alpha z l^\theta$$

- No gains from specialization, $\alpha = 1$ and No complementarities, $\rho = 1$,

$$f(\mathbf{z}, \mathbf{l}) = \sum_{i=1}^{n} z_i l_i^\theta$$

Model Summary

Enforcement Constraint

- Managers can appropriate part of the output

- Monitoring costs have to be paid

- If a manager appropriates some of the output,
  - The rest of the output is lost
  - They lose their managerial earnings

- Payments to a manager $w(z)$ must be larger than the output that can be appropriated:

$$w(z) \geq \min \left\{ 1, \frac{\phi}{m} \right\} \times \text{Output}(z, .)$$

- Family managers' joint profits must be larger than the output that can be appropriated:

$$\text{Family Managers' Joint Profit} \geq \min \left\{ 1, \frac{\phi}{m} \right\} \times \text{Output}$$

Model Summary

Type of Firms and Occupational Choice

Types of Firms

1. Professional Firms
2. Family Firms
   - Without outside managers/ pure family firms
   - With outside managers

Occupation Choice at the Household Level

1. Worker
2. Manager
   - Professional manager
   - Self-employed (operate a single manager firm)
   - Operate a Family Firm with family members

Model Summary   Occupational Map

Type of Firms and Occupational Choice

Types of Firms (Enforcement Constraint $\checkmark$)

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2. Family Firms
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Model Summary Occupational Map
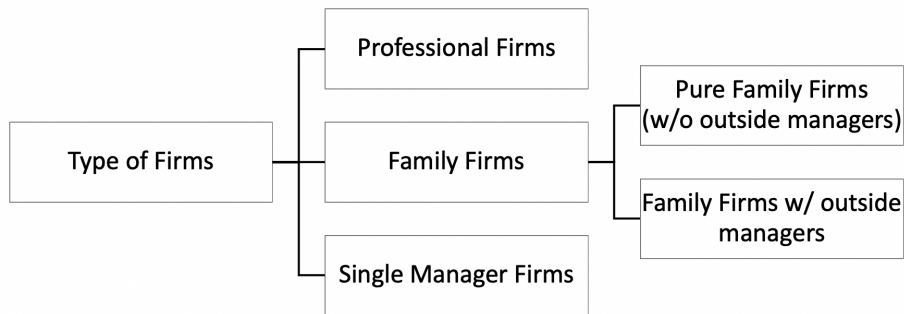
Pure Family Firms

$$\max_l n_f^\alpha \left\{ \frac{1}{n_f} \left[\sum_{i=1}^{n_f} (z_i l_i^\theta)^\rho \right] \right\}^{1/\rho} - \sum_{i=1}^{n_f} l_i w$$

Special Case: Self-employed (operate a single manager firm)

$$\pi^{1SE}(z) = \max_l z l^\theta - lw$$

Effective market wage for professional managers,

$$w^e(z) = \max(\pi^{1SE}(z), w(z))$$

Pure Family Firms

Professional Firms: Number of managers

Figure: Policy Function: Professional Firms $n^{e*}(z)$

$n^*(z)$, $\alpha = 1.02$, $\rho = -0.5$
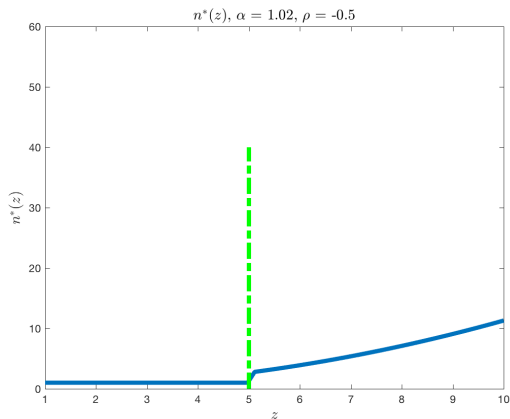
Pure Family Firms

Family Firm with Outside Managers

$$\max_{m,n \geq n_f, z} n^\alpha \left\{ \frac{1}{n} \left[\sum_{i=1}^{n_f} (z_i l_i^\theta)^\rho + (n - n_f)(zl^\theta)^\rho \right] \right\}^{1/\rho}$$
$$- \sum_{i=1}^{n_f} l_i w - (n - n_f)lw - (n - n_f)m - (n - n_f)w^e(z) \tag{1}$$

s.t. 2 Enforcement Constraints (Pure Family Firm)

Occupational Choice: Family of Size 3

Figure: Occupational Choice: $n_f = 3$ (Simple)
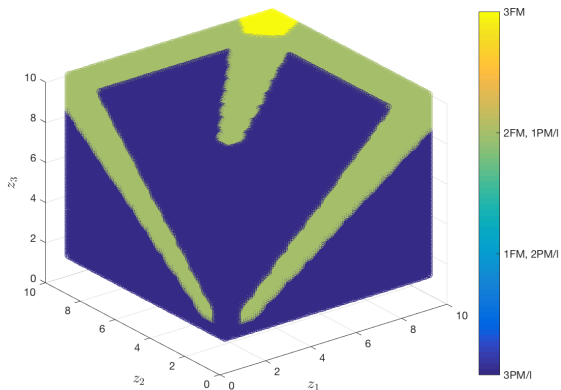
Size 2 Illustration

Targeted Moments

Table: Baseline

Moment	Model	Data	Source
WC to VA bottom 40-ptile	0.38	0.34	NSSUM-ASI
WC to VA Top 5-ptile	0.46	0.56	NSSUM-ASI
Top 10-percentile employment share	0.39	0.43	NSSUM-ASI
Average Firm Size	2.43	2.42	NSSUM-ASI
Average Number of Managers	1.19	1.13	NSSUM-ASI
Fraction FF top 1-ptile	0.28	0.28	Prowess
Fraction households in FF	0.93	0.92	NSSH

Derivatives

Baseline Calibration

Table: Set outside of the Model

Moment	Source	Parameter	Value
Correlation of productivity within Family	ASER	ψ	0.49

Table: Baseline Calibration

| Parameter	FF
α	1.31
ϕ	0.53
ρ	-4.90
θ	0.27
μ	2.96
σ	0.85

Derivatives Quantitative Exercise

Baseline: Derivatives

Table: Baseline: Derivatives

| Moment	α	ρ	ϕ	θ	σ	μ
WC to VA bottom 40-ptile	0.00	0.000	0.00	1.90	0.00	0.00
WC to VA Top 5-ptile	0.56	0.000	-0.22	2.67	0.07	0.02
Top 10-percentile employment share	1.95	0.000	-0.58	2.29	0.28	0.02
Average Firm Size	7.09	0.001	-1.41	11.74	1.05	-0.03
Average Number of Managers	2.44	0.001	-0.63	2.22	0.23	0.05
Fraction FF top 1-ptile	1.95	0.010	-0.27	0.63	0.23	0.12
Fraction households in FF	0.08	0.002	0.05	-0.14	-0.07	0.01

Quantitative Exercise   On ρ

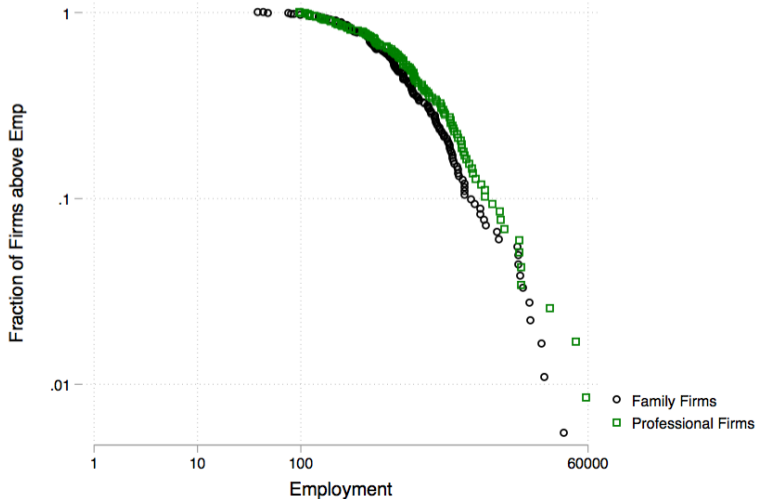# On ρ: Fraction FF in top 1-ptile

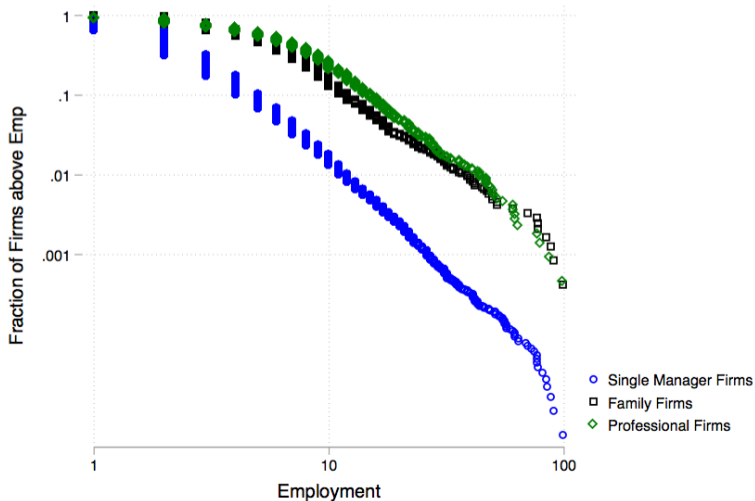Derivatives
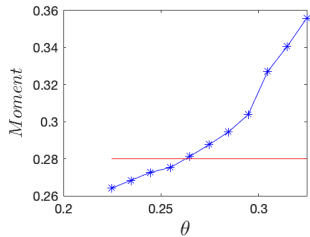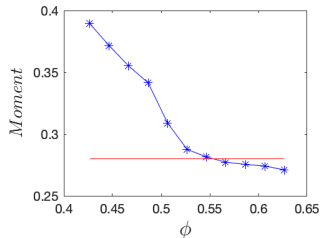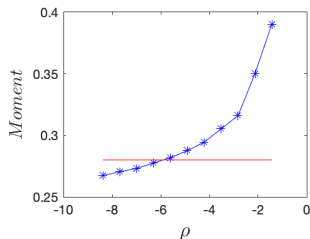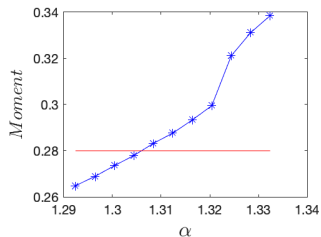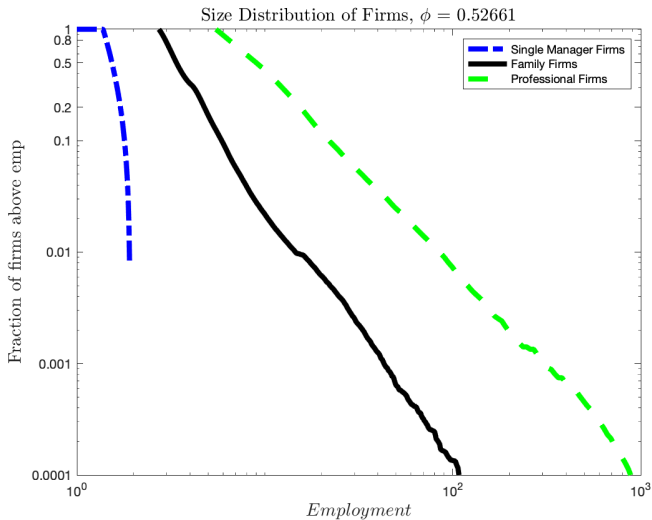
Identification: Score 1
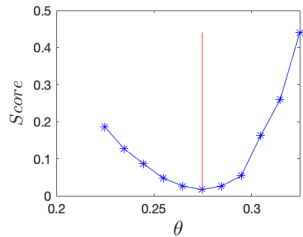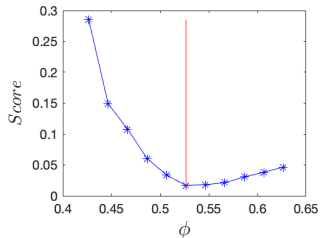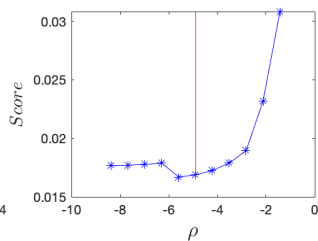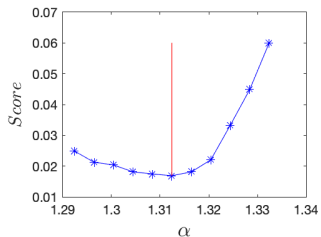
Identification: Score 2
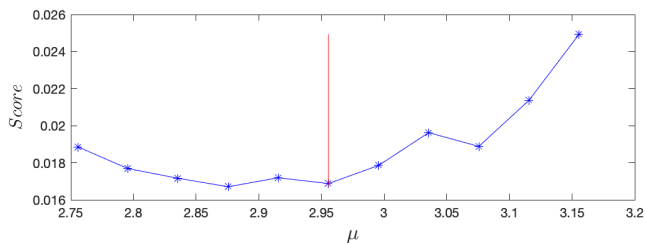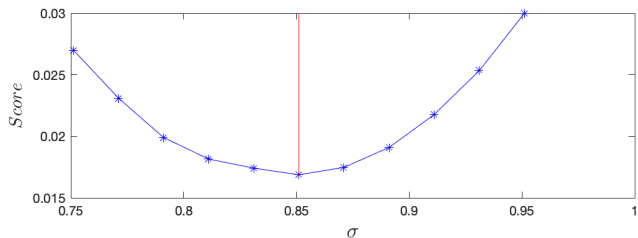
Size Distribution FF vs PF: Prowess

Size Distribution FF vs PF: NSS

With FF

Size Distribution of Firms, $\phi = 0.52661$

Legend:
- Single Manager Firms
- Family Firms
- Professional Firms

Y-axis: Fraction of firms above emp
X-axis: Employment

Without FF

Size Distribution of Firms, $\phi = 0.52661$

With FF

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Without FF

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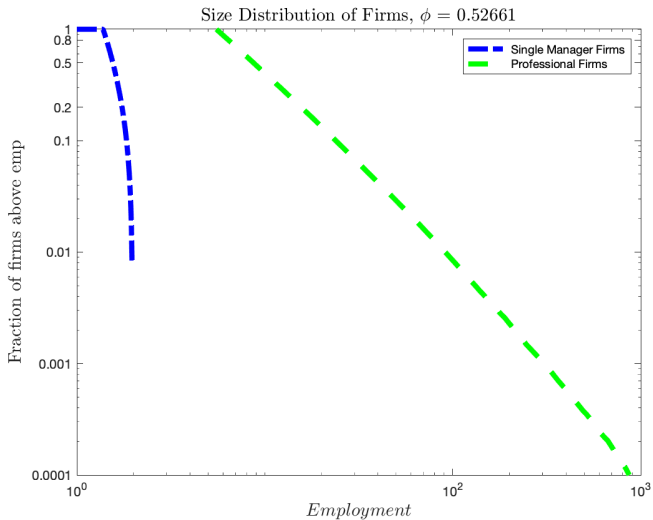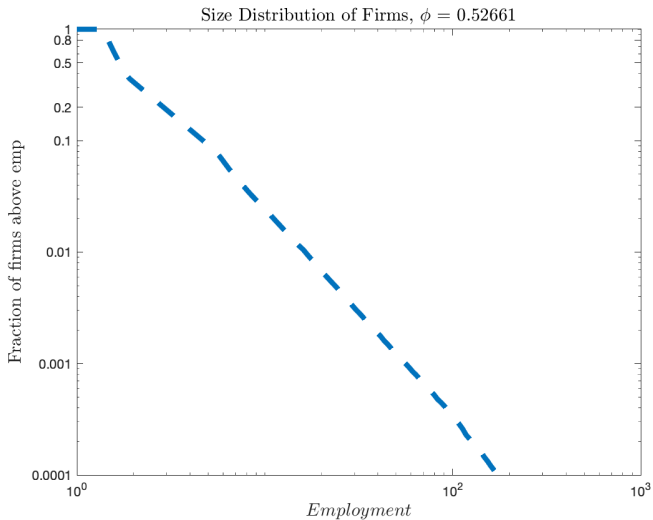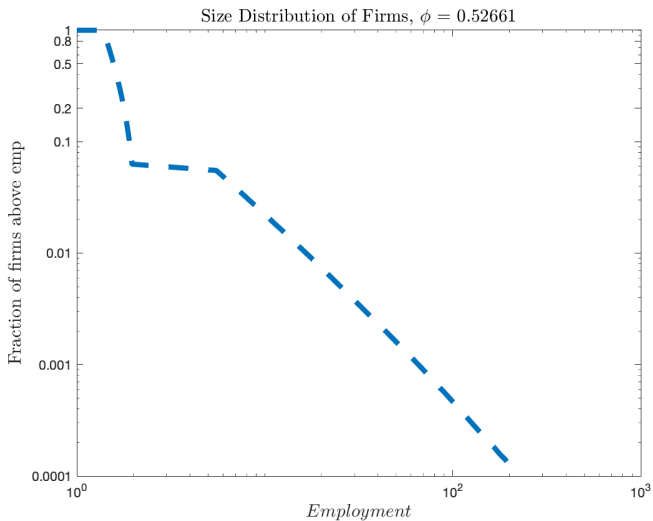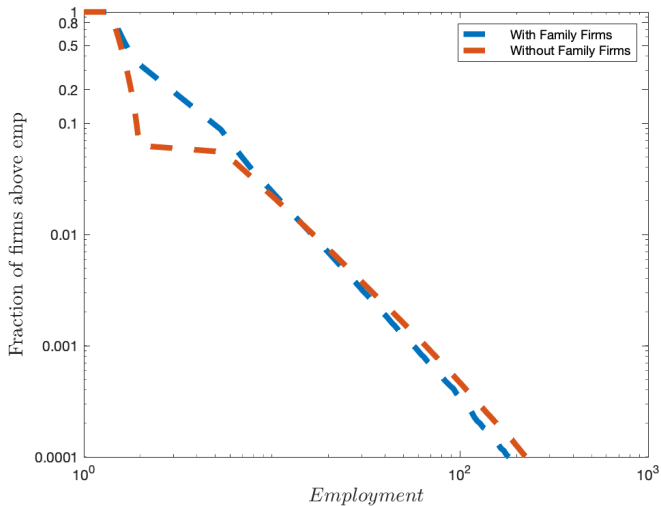
Without FF

Datasets: India

1. Establishment level
   - Annual Survey of Industries (ASI) 1995: census of manufacturing units employees ≥ 100 and $1/3$rd establishments with ≤ 100
   - Unorganized Manufacturing by National Sample Survey (NSS) 1995: survey of establishments that employ ≤ 100
2. Financial statement information from CMIE Prowess 2002
3. Household level occupational choice data from IPUMS-India 1999
4. Household level test scores data from ASER 2013

Family Firms in Data.

Table: Example Family Firm: Essar Steel India Ltd.

| Full Name	Lastname	Manual Search
Vikram Amin	Amin	
Jitender Balakrishan	Balakrishan	
G D Goswami	Goswami	
Jatinder Mehra	Mehra	
G A Nayak	Nayak	
Shashi Ruia	Ruia	Founder
Prashant Ruia	Ruia	Son of Shashi Ruia
Ravi Ruia	Ruia	Brother and Co-Founder
Sanjeev Shriya	Shriya	
S V Venkatesan	Venkatesan	
N B Vyas	Vyas	

Family Firms in Data..

Table: Example Non-family Firm.
Siemens Ltd.

| Full Name	Lastname
H Gelis	Gelis
Ashok P Jangid	Jangid
N J Jhaveri	Jhaveri
Y H Malegam	Malegam
F A Mehta (Dr.)	Mehta
A B Nadkarni	Nadkarni
O P Narula	Narula
O Schmitt (Dr.)	Schmitt
J Schubert	Schubert
D C Shroff	Shroff
Harminder Singh	Singh
S K Thackersey	Thackersey
P M Thampi	Thampi
K Wucherer (Dr.)	Wucherer

Family Firms: Number of Outside Managers

Figure: Policy Function: $n^*(n_f, z_f) - n_f$

$n^*(n_f, z_f) - n_f$, $\alpha = 1.02$, $\rho = -0.5$
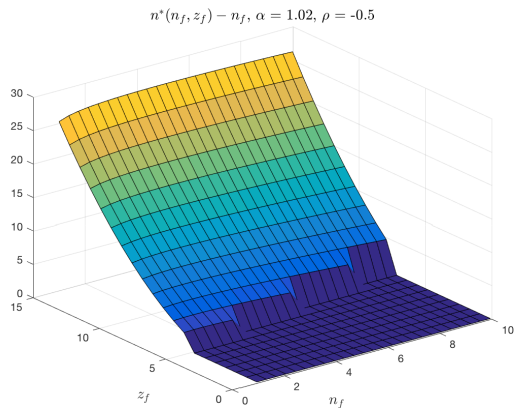
Family Firms: Productivity of Outside Managers

Figure: Policy Function: $z^*(n_f, z_f) - z_f$

$z^*(n_f, z_f) - z_f$, $\alpha = 1.02$, $\rho = -0.5$

Problem
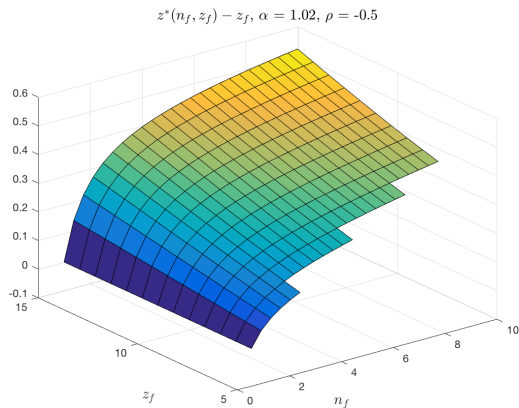
Equilibrium

- Given prices, i.e. worker wage w, effective manager wage w(z) and family size distribution, aggregate labor demand equals labor supply from occupational choice at the family level

- We assume professional managers are in excess supply. Every family firm demanding outside manager is able to get one, so we don't need to clear the managerial market.

- If the enforcement frictions are such that professional managers are in excess demand, they can get part of the rent (not in our baseline calibration for India)

Occupational Map

Family Size x 2

Size Distribution of Firms, $\phi = 0.52661$
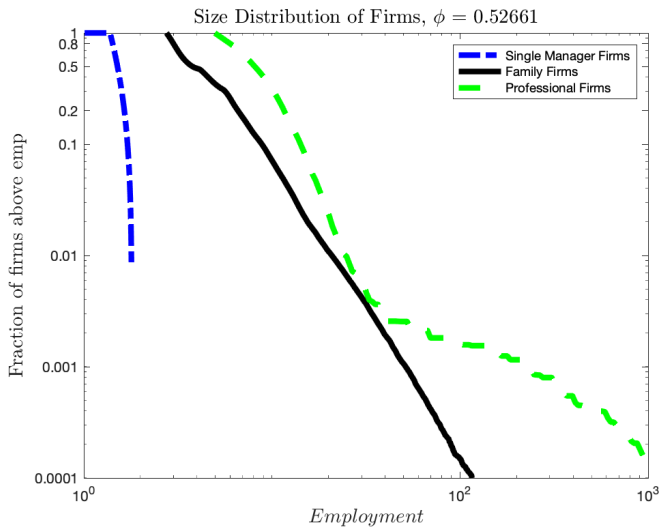
GDP- Friction: Data vs Model
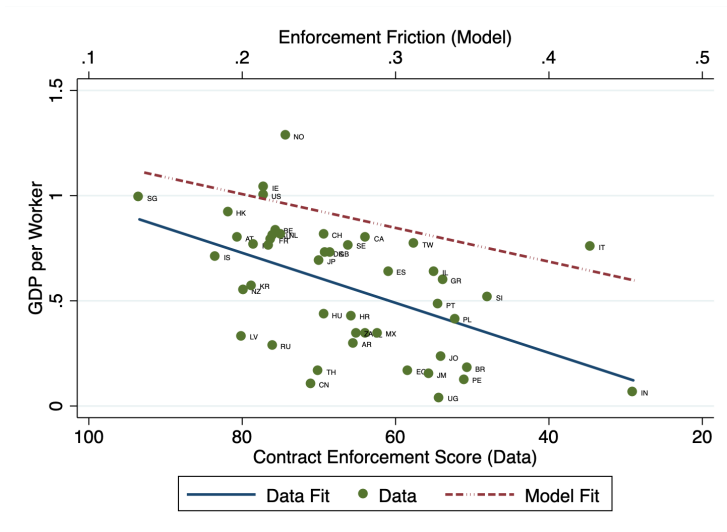
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