

Family Matters: Globalization, Management, and Firm Productivity

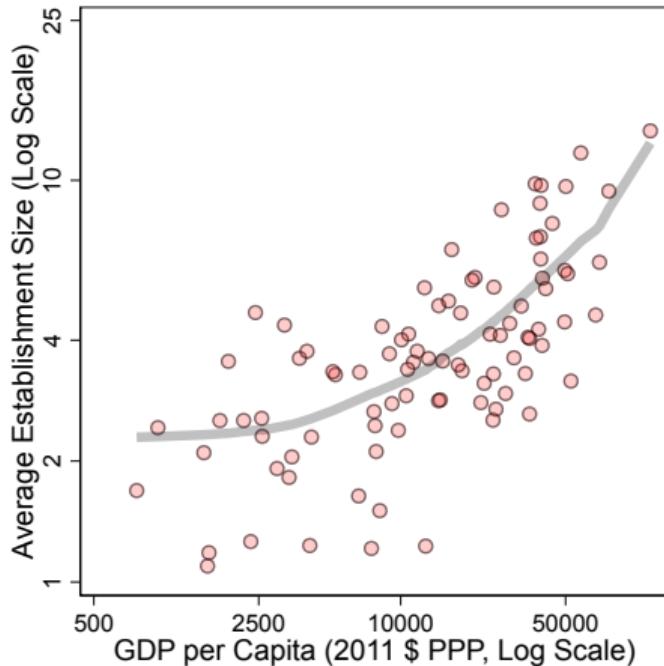
Ananya Kotia

London School of Economics

July 15, 2025

NBER SI 2025 (Macro & Productivity)

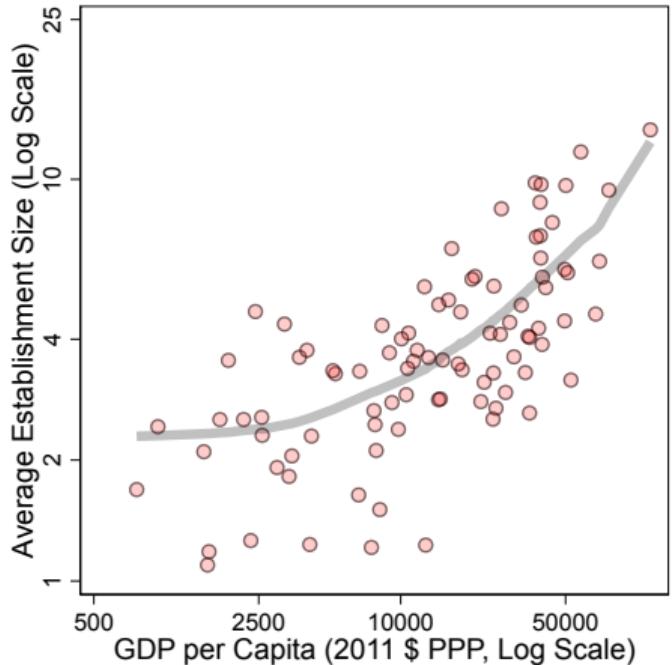
Developing Countries: Small Firms,



Source: Bento and Restuccia (2021) based on country-level economic censuses and surveys

► Manufacturing and Services

Developing Countries: Small Firms, Poor Management

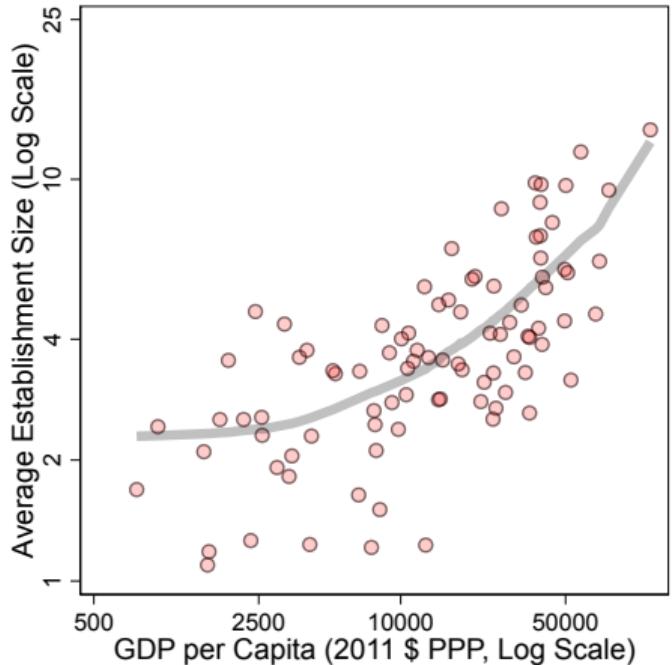


- Poor management quality and firm organization

Source: Bento and Restuccia (2021) based on country-level economic censuses and surveys

► Manufacturing and Services

Developing Countries: Small Firms, Poor Management, Low Competition



- Poor management quality and firm organization

Can import competition help?

Source: Bento and Restuccia (2021) based on country-level economic censuses and surveys

► Manufacturing and Services

Management Quality and Firm Organization

Management Quality and Firm Organization



Shri George Jacob Muthoot

Group Chairman
The Muthoot Group of Companies



V.A. George
Independent Director

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George Alexander
Deputy Managing Director

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George Muthoot Jacob
Deputy Managing Director

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George Muthoot George
Deputy Managing Director

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Alexander George Muthoot
Joint Managing Director

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George Thomas Muthoot
Joint Managing Director

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George Alexander Muthoot
Managing Director

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Family Firms are widespread in ▶ India and across the ▶ Developing World

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Can Import Competition Close the Productivity Gap?

1. **Assemble new firm-manager matched data** to identify **family-managed firms** in India
 - Predominant form of firm organization in developing countries (Bertrand & Schoar, 2006; Lemos & Scur, 2019)
 - Misallocation of talent \implies smaller, less efficient (Bloom et al. 2012; Akcigit Alp and Peters 2021).
2. **Natural Experiment:** large, product-specific import competition shock
 - Event study design: competition induces family firms to **delegate management to professionals**
 - Within-firm productivity gains (Hicks 1935; Leibenstein 1966; Backus 2020; Pavcnik 2002; Chen and Steinwender 2021)
3. **Quantitative Framework:** embed management choice in a Melitz model
 - Why do firms only professionalize after competition?
 - Within firm gains from professionalizing are $\frac{1}{3}$ of total productivity gains from trade

► Related Literature

Outline

Introduction

Natural Experiment

Data

Empirical Results

Model

Estimation & Counterfactuals

Removal of Quantitative Restrictions (QRs): Large, Product-Specific Trade Shock

1950s- India used **Quantitative Restrictions (QRs)** to protect domestic firms

1990s: First-generation reforms in 1991 removed some QRs; many remained

- Mostly final consumer goods
- 3000 HS 8-digit products, almost 30% of all tariff lines
- QRs continued by exploiting GATT rule XVIII:B (QRs on weak BoP grounds)

1998: Second generation WTO-imposed reforms: removal of all remaining QRs

- After complaints to WTO in 1997 from US and EU

2000s: Imports of liberalized products soared after the reform. No impact on exports.

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Data Construction

Digitize Customs Notifications

राजस्मृति नं. दी. प्रा. - 33004/98

REGD. NO. D.L.33004/98



1. QR removal: Identify affected products

Exim Code	Item Description	Policy	Conditions relating to the Policy	Import under SIT/Public Notice
03061301	Shrimp (scampi) macrobactum frozen	Free		
03061302	A/F shrimp frozen	Free		
03061303	Prawns frozen	Free		
03061400	Crabs	Free		
03061900	Other, including flours, meals and pellets of crustaceans, fit for human	Free		

Source: Archives, Ministry of Commerce, Government of India

Data Construction

1. QR removal: Identify affected products
2. QR removal: Identify affected firms

Novel Product Concordances			
Firm Data		Customs Notifications (HS-8)	
3008040800	Sunflower seed oil		
3008040804	Sunflower seed oil, refined	15121910	Sunflower oil edible grade
4012080400	Suitcases	42021204	Plastic moulded suit-cases
5024200404	Distempers	32100001	Distempers
		84501100	Fully - automatic washing machines (upto 10kg)
6308361216	Washing Machines/Laundry Mach	84501200	Other washing machines with built-in centrifugal drier (upto 10kg)
		84501300	Other washing machines (up to 10kg)

Data Construction

1. QR removal: Identify affected **products**
2. QR removal: Identify affected **firms**
3. **Firm panel data** (CMIE Prowess):
 - Balance sheet + financial statements
 - product scope ➔ Summary Statistics

Data Construction

1. QR removal: Identify affected products
2. QR removal: Identify affected firms
3. Firm panel data (CMIE Prowess):
 - Balance sheet + financial statements
 - product scope Summary Statistics
4. Internal organization of firms
 - Family ties among top execs/directors
 - Tenure history
 - > 7 million directors

Families Ties Among Top Executives

Name	Father's Name	Sex	Executive Director
A Khosla	D K Khosla	M	Yes
M Khosla	D K Khosla	M	Yes
P Khosla	D K Khosla	M	Yes
N Khosla	N K Khosla	M	Yes
D K Khosla	K L Khosla	M	Yes
N K Khosla	K L Khosla	M	Yes
M P Gupta	P D Gupta	M	No
V K Sood	H R Sood	M	No
M L Mangla	T Chand	M	No

Note: Names abbreviated and anonymized. Based on a real firm.

Source: Confidential administrative records, Corporate Affairs Ministry

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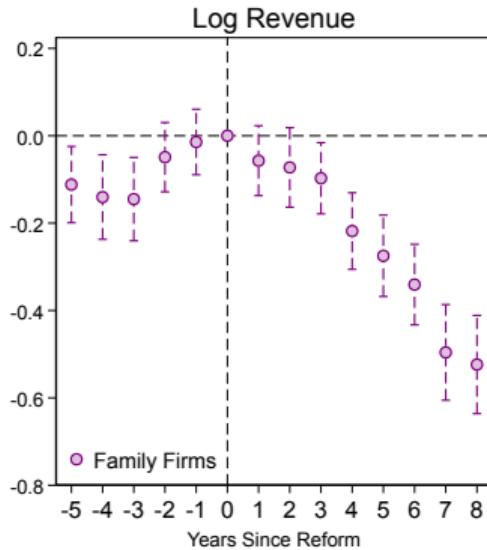
Event-study Design

$$Y_{it} = \sum_{k=\underline{T}}^{\bar{T}} \theta_k D_{it}^k + \delta_i + \lambda_{jt} + \varepsilon_{it}$$

- $D_{it}^k := \mathbb{1}[t = s_i + k]$ are event-time dummies
 - s_i : first year in which QRs are removed on firm i 's highest-revenue (8-digit) product
 - Robust to alternate treatment assignment rules
- δ_i : firm FE
- λ_{jt} : year \times 3-digit industry FE

- Sun and Abraham (2021) estimator
- This presentation: results for family firms only

① Firms Contract



► Family/Professional Firms Separately

► Profits, Wage Bill, Assets, Inputs

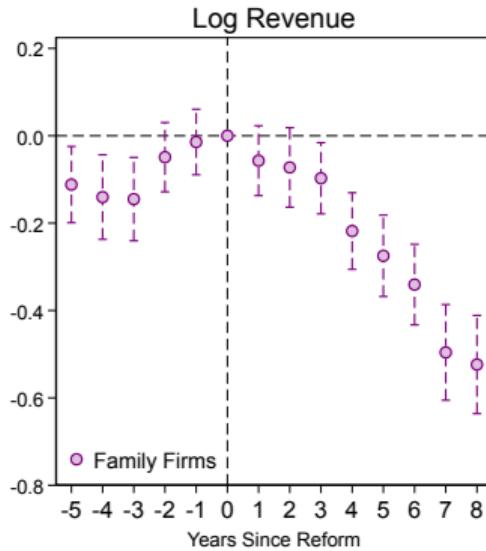
► Exit

► Number of Managers

► Model: Baseline Equilibrium

► Model: Comparative Statics

① Firms Contract & ② Laggards Professionalize



► Family/Professional Firms Separately

► Profits, Wage Bill, Assets, Inputs

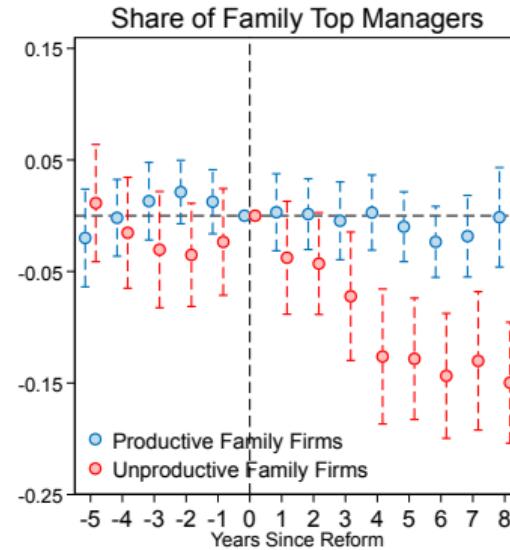
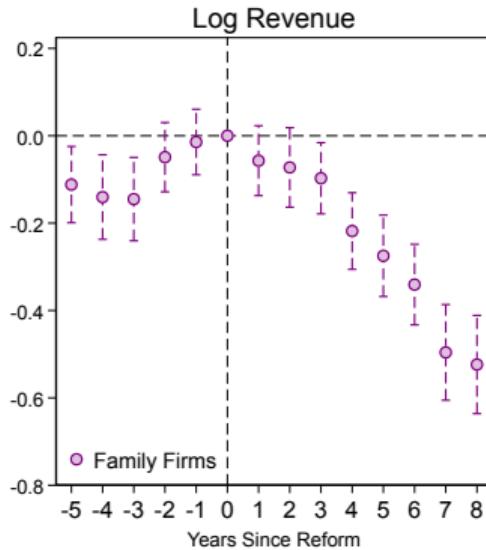
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① Firms Contract & ② Laggards Professionalize



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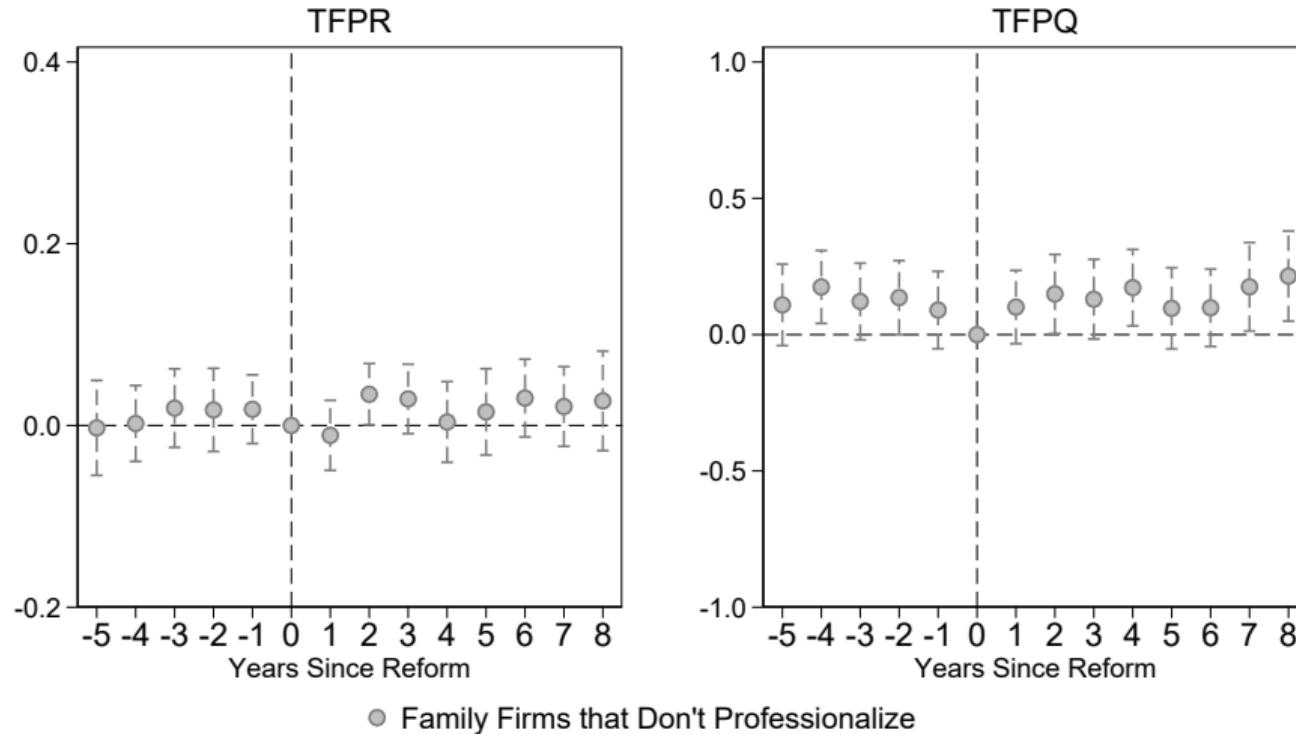
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③ Firms that Professionalize Report Higher TFP & TFPQ



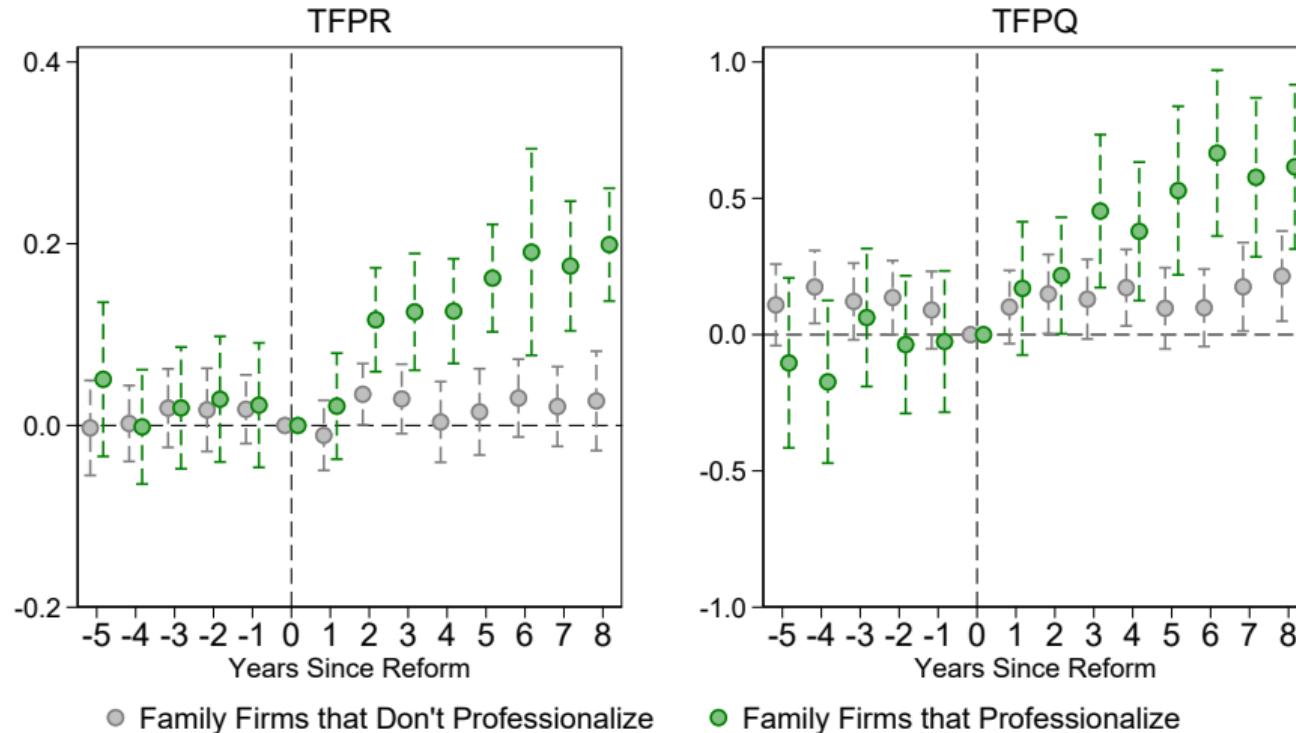
Note: A family firm is defined as having professionalized if its share of family top managers was lower in $t = 8$ as compared to $t = 0$.

► Falsification Test: Already Professionalized Firms

► Triple Difference

► Exit

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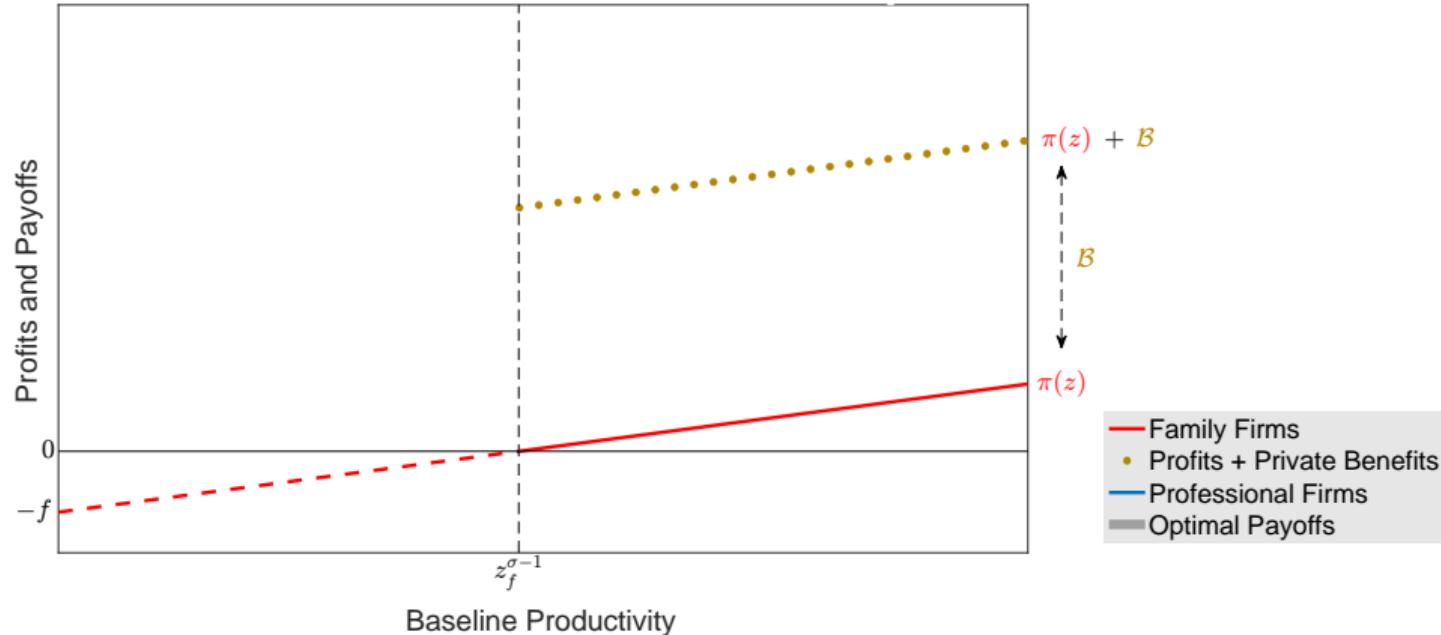
Estimation & Counterfactuals

- Embed management choice in a Melitz Model ▶ Details

Entrants Draw $z \sim G(z)$ \longrightarrow Firm's payoff =
$$\begin{cases} \pi(z) + \beta & \text{if firm stays family} \\ (1 - \tau) \cdot \pi(\gamma z) - f_d & \text{if firm professionalizes} \\ 0 & \text{if firm exits} \end{cases}$$
 ▶ Thresholds

- β : owners derive non-pecuniary private benefits from running a firm as a family firm ▶ Literature
- $\gamma > 1$: gains from professionalizing firm management. Absorbing state ▶ Reputation Cost
- Firm owners are hand-to-mouth: \implies exit if $\pi_i < 0$

Firm Profits and Management Choice: Family Firms



Note: Baseline productivity: before decision to professionalize.

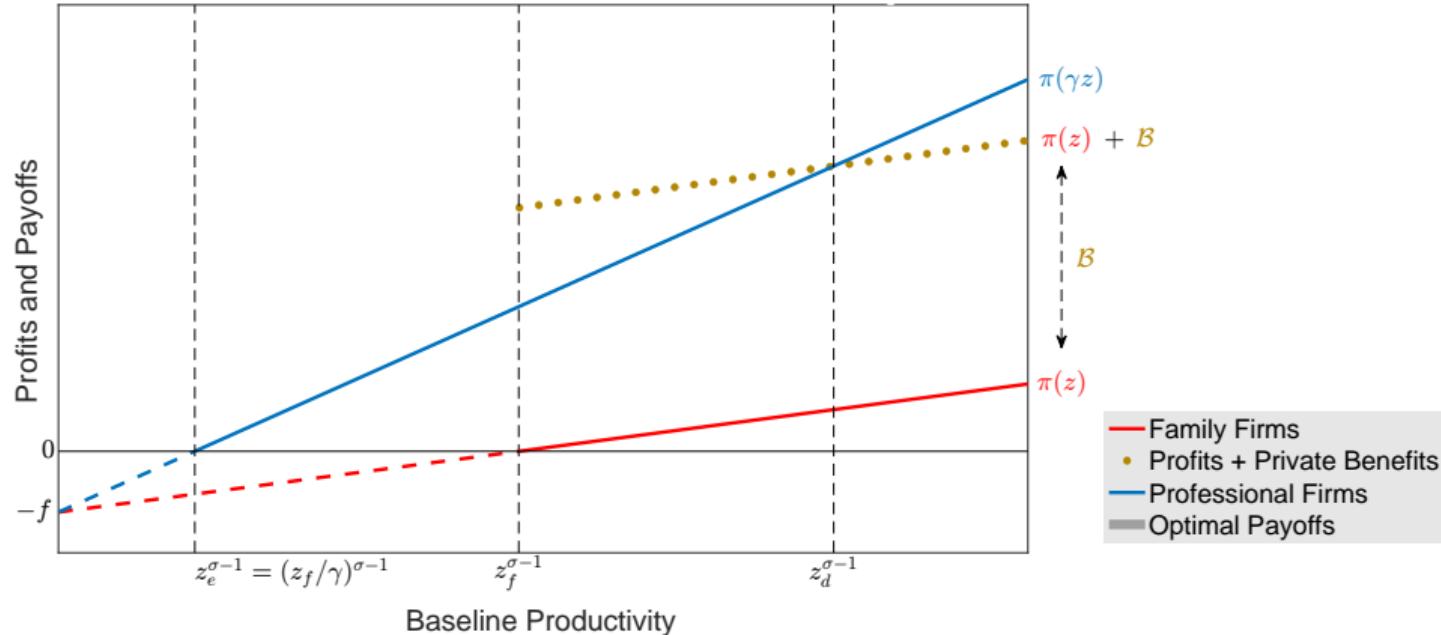
▶ Exit

▶ Contracting Frictions

▶ Data

◀ Event Studies

Firm Profits and Management Choice: Professional Firms



Note: Baseline productivity: before decision to professionalize.

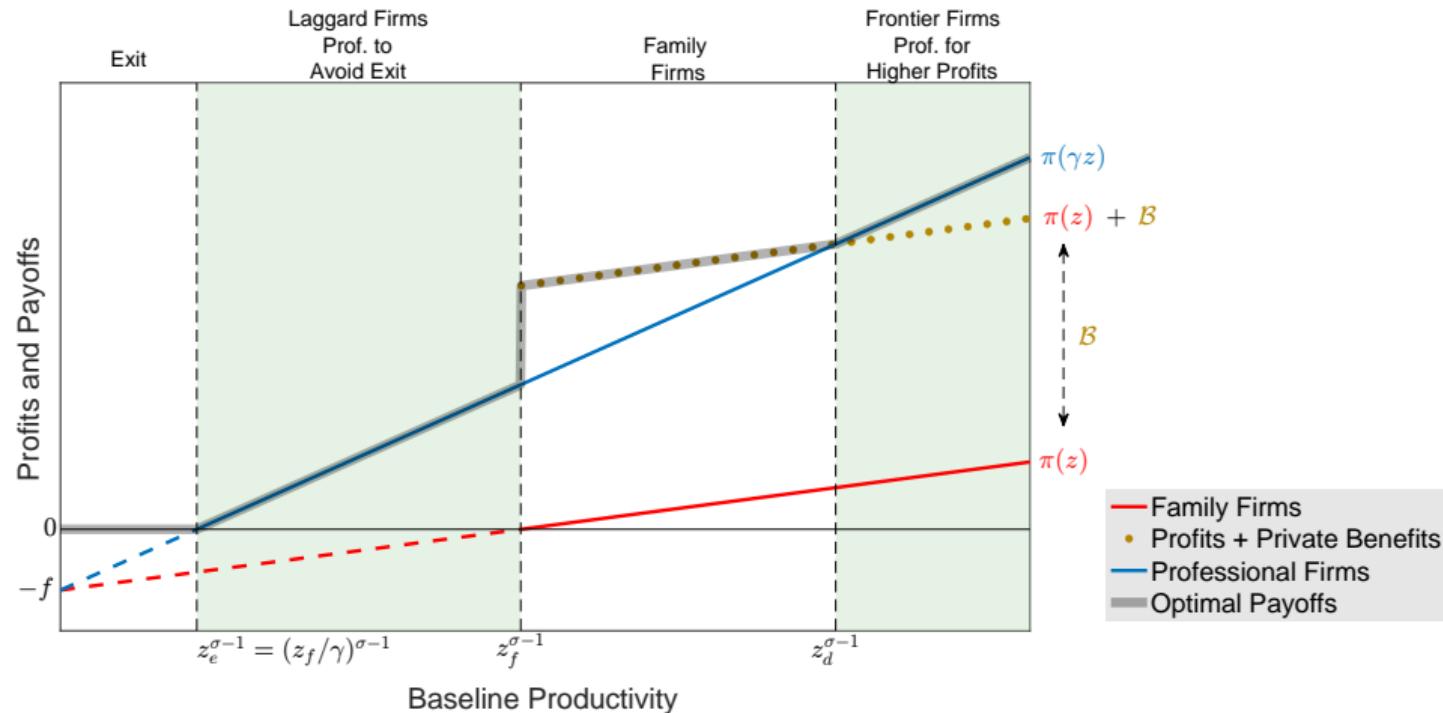
▶ Exit

▶ Contracting Frictions

▶ Data

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Firm Profits and Management Choice: Optimal Payoff



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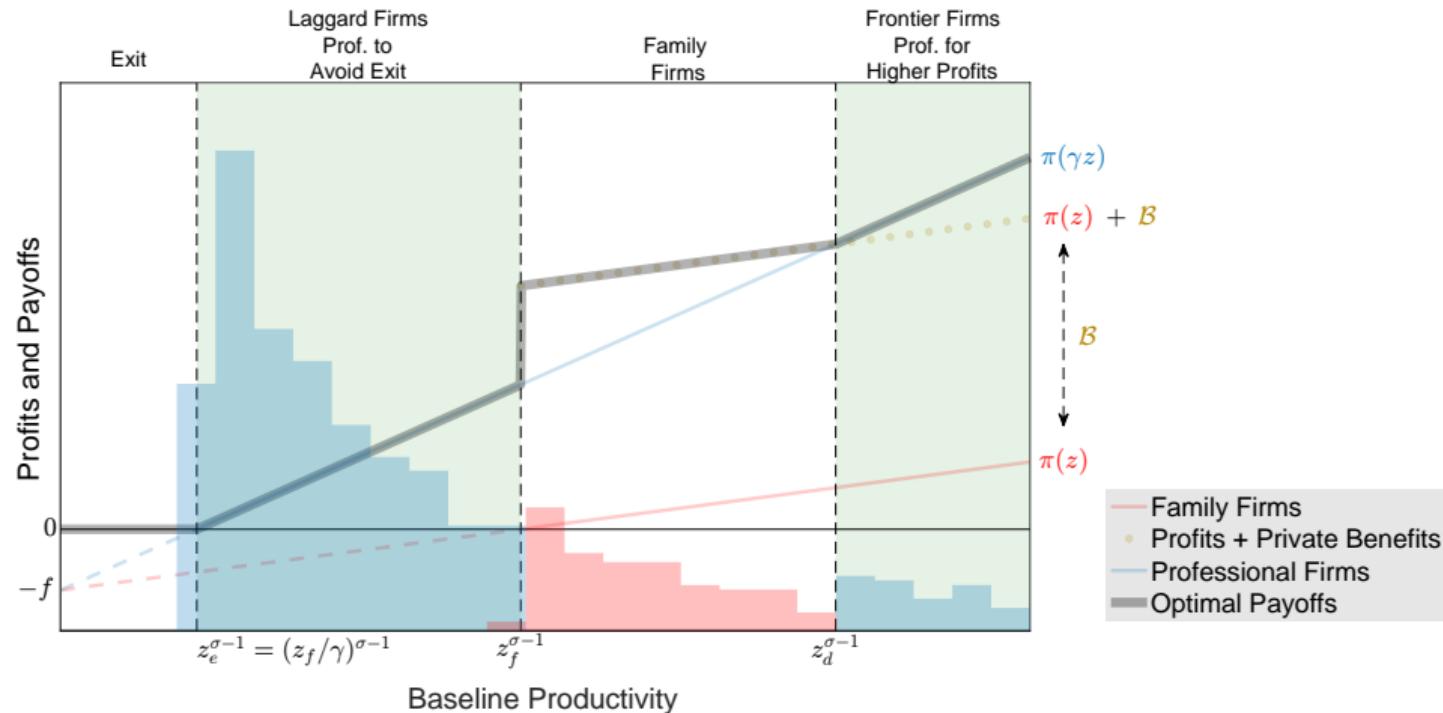
▶ Exit

▶ Contracting Frictions

▶ Data

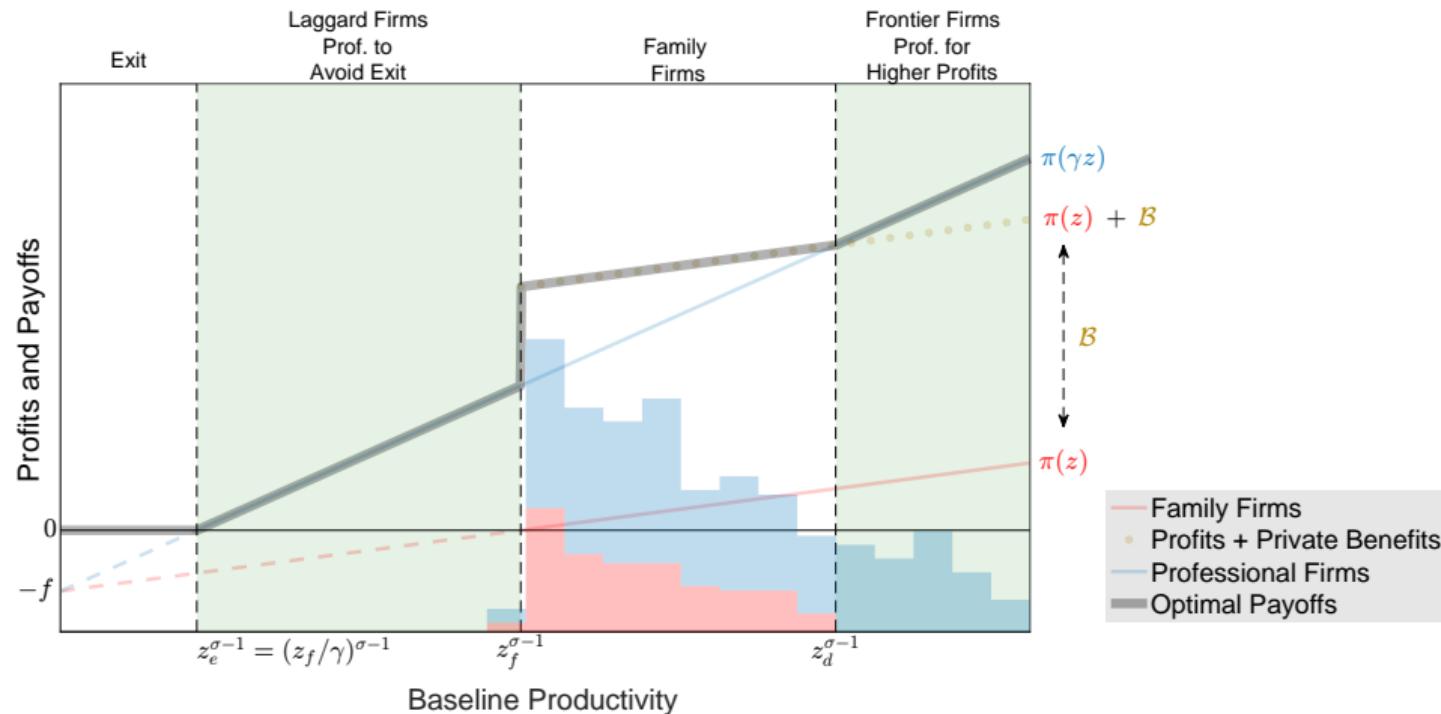
◀ Event Studies

Firm Profits and Management Choice: Baseline Productivity Distribution



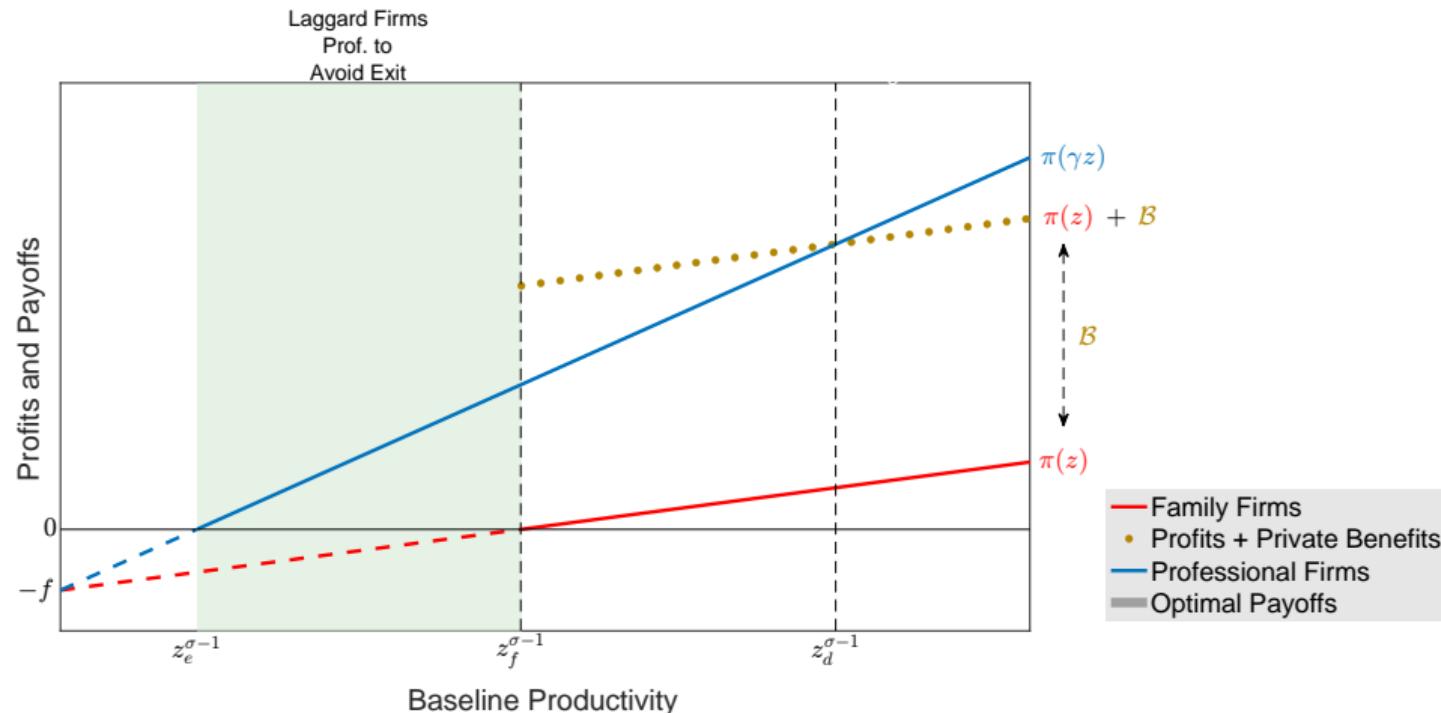
Note: Baseline productivity: before decision to professionalize.

Firm Profits and Management Choice: Observed Productivity Distribution



Note: Baseline productivity: before decision to professionalize.

Family Firms: Response to \uparrow Import Competition, \downarrow Market Demand



Note: Baseline productivity: before the decision to professionalize.

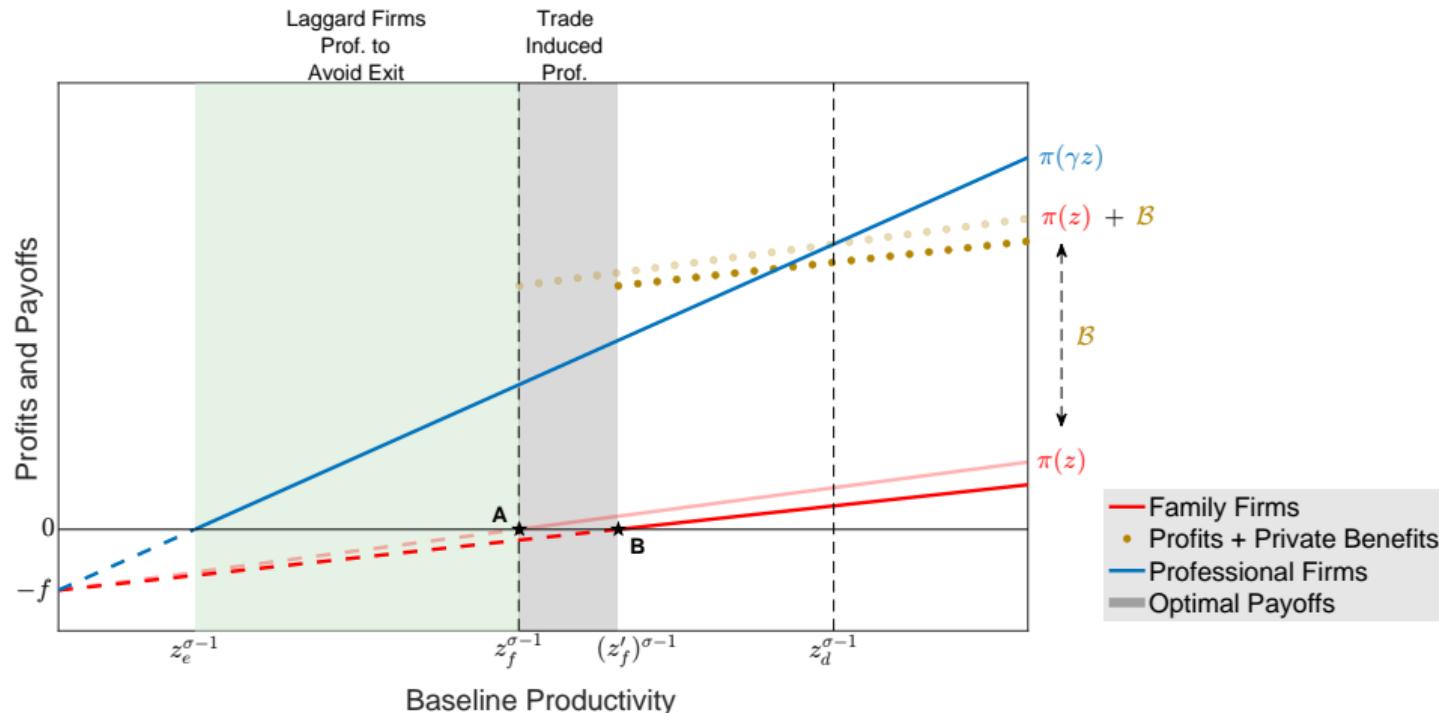
▶ Profits After Trade

▶ Contracting Frictions

▶ Reputation Cost

◀ Event Studies

Family Firms: Response to ↑ Import Competition, ↓ Market Demand



Note: Baseline productivity: before the decision to professionalize.

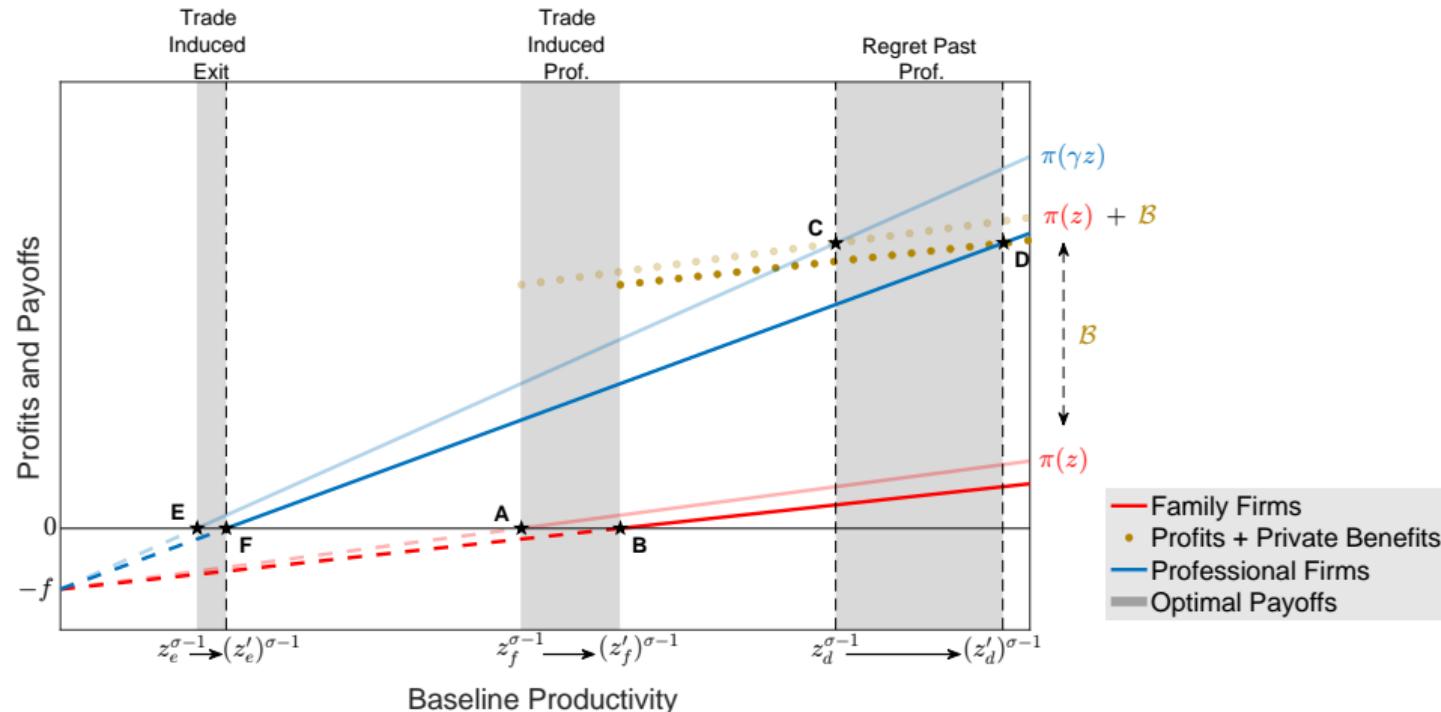
▶ Profits After Trade

▶ Contracting Frictions

▶ Reputation Cost

◀ Event Studies

Professional Firms: Response to \uparrow Import Competition, \downarrow Market Demand



Note: Baseline productivity: before the decision to professionalize.

▶ Profits After Trade ▶ Contracting Frictions ▶ Reputation Cost ▶ Event Studies

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Identification and Key Estimates

$$\Theta = \{\sigma, k, f, \gamma, \mathcal{B}\}$$

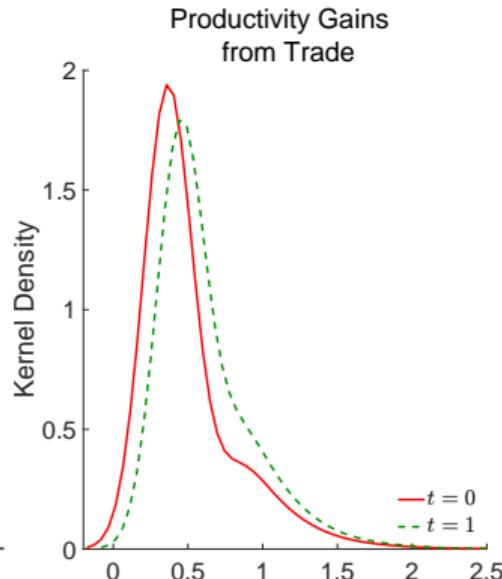
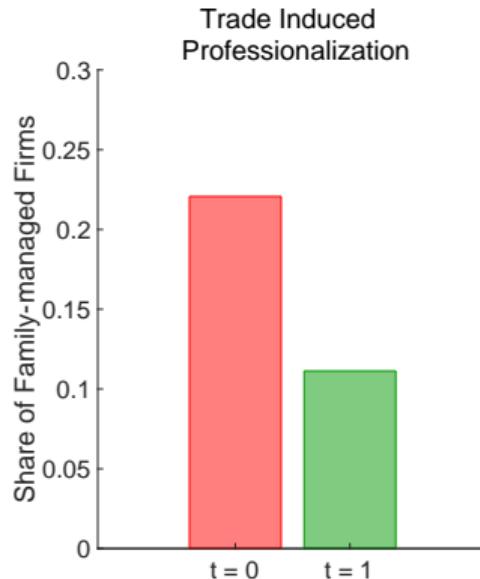
- $\sigma = 4$
- $k = 3.5 \rightarrow$ upper-tail slope in a log-rank vs. log-productivity QQ plot ▶ Head, Mayer, Thoenig (2014)
- \mathcal{B}, γ, f jointly determine management choice and exit ▶ Moment Conditions
 - $f \rightarrow$ Share of firms with negative profits
 - ◊ $\mathcal{B} \rightarrow$ Share of family-managed firms
 - ◊ $\gamma \rightarrow$ Difference in mean log revenue of family and professional firms ▶ Data

Key Estimates

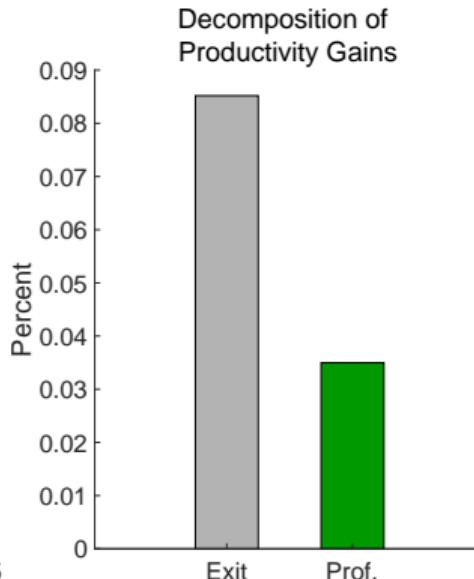
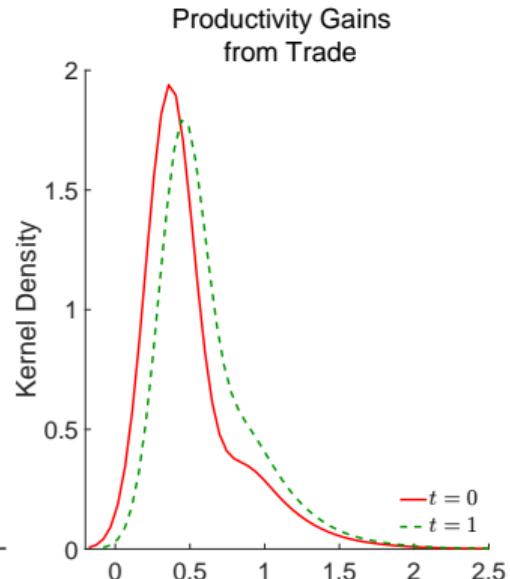
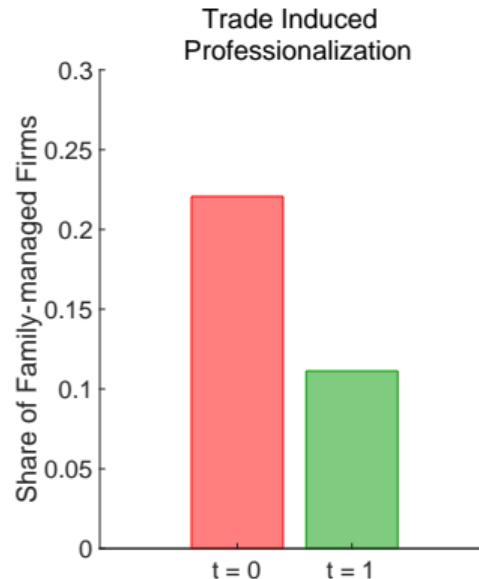
$$\mathcal{B} = 0.05 \quad \gamma = 1.22 \quad f = 0.03$$

(Profits: 25 $p = 0.005$; 50 $p = 0.012$ Mean = 0.16; 75 $p = 0.08$)

Import Competition \implies 12% \uparrow **Productivity**: $\frac{1}{3}$ from Professionalization



Import Competition \implies 12% \uparrow Productivity: $\frac{1}{3}$ from Professionalization



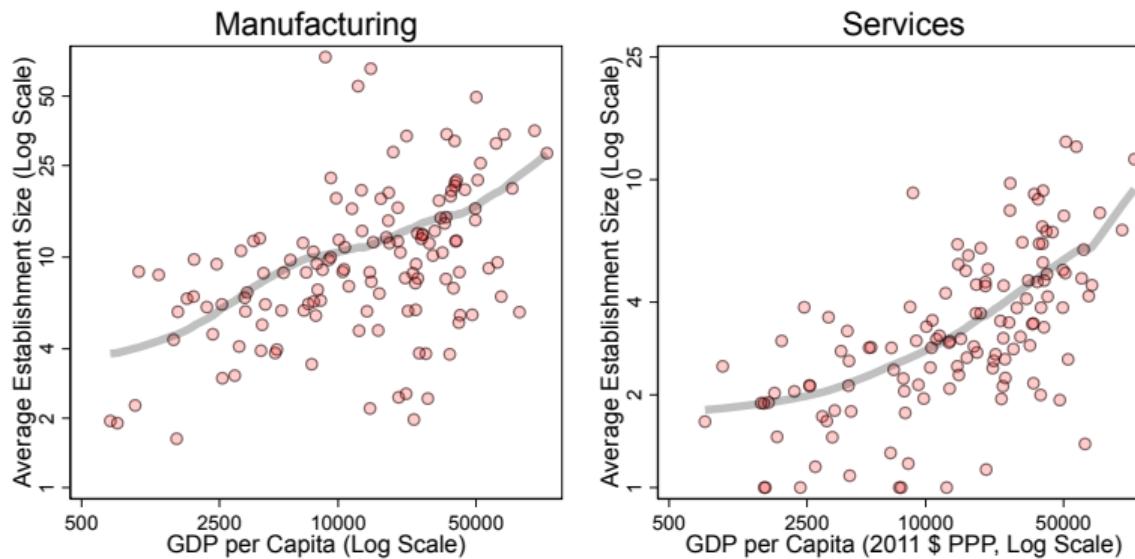
► Details

Conclusion

- Import competition can drive within-firm productivity changes through managerial reorganization
- Large, product-specific import competition shock + novel data on the internal firm organization
- Indian family firms respond to import exposure by professionalizing management
- Globalization is a powerful force that can blunt the effect if taste-based discrimination leading to efficiency gains.

Thank you!

Manufacturing and Services



Source: estimates from Bento and Restuccia (2021) based on country-level economic censuses and surveys

◀ Back

X-Inefficiency

*"monopoly... is a great enemy
to good management"*
– Smith (1776)

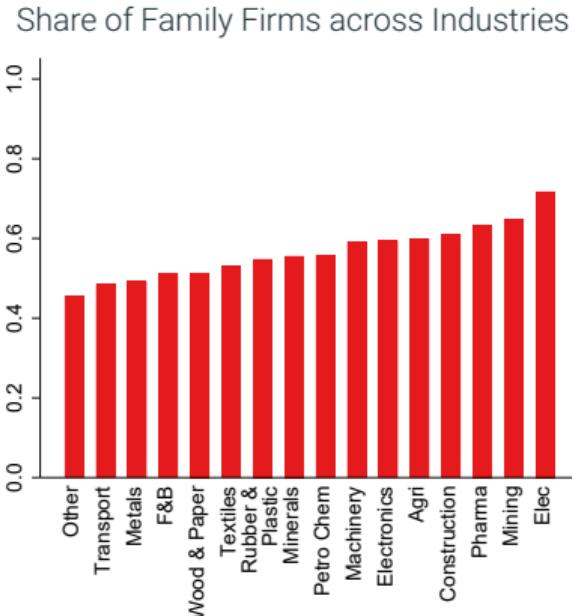
*"the best of all monopoly
profits is a quiet life."*
– Hicks (1935)

*"trade enhances competition, inducing
firms to produce more efficiently."*
– Bernanke (2007)

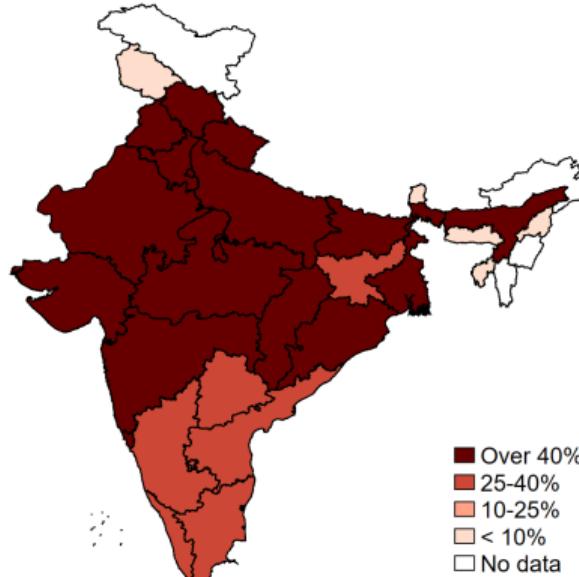
- Alfred Marshall later echoed a similar view, noting that many firms postpone productivity-enhancing changes until external forces compel them *"to exert themselves to the utmost to invent improved methods"* (Marshall, 1926)

Family Firms are Widespread in India

Family Firms: at least two family members on board

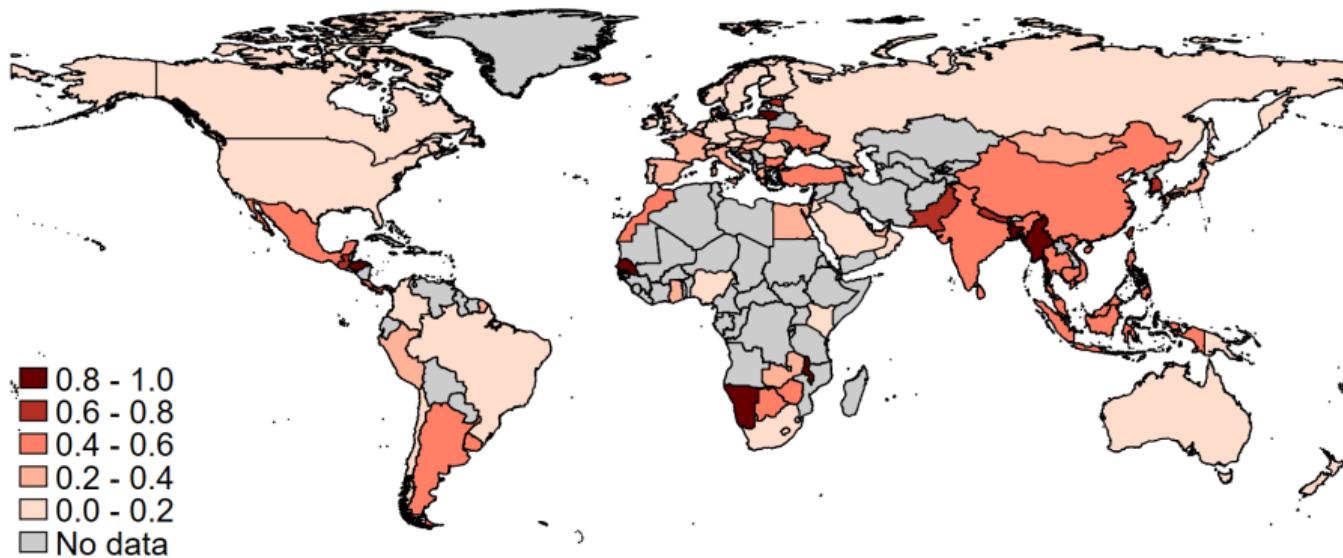


Share of Family Firms across States



Family Firms are Widespread in Developing Countries

Share of Directors Sharing a Surname



Source: BoardEx, Wharton Research Data Service (WRDS) [◀ Back](#)

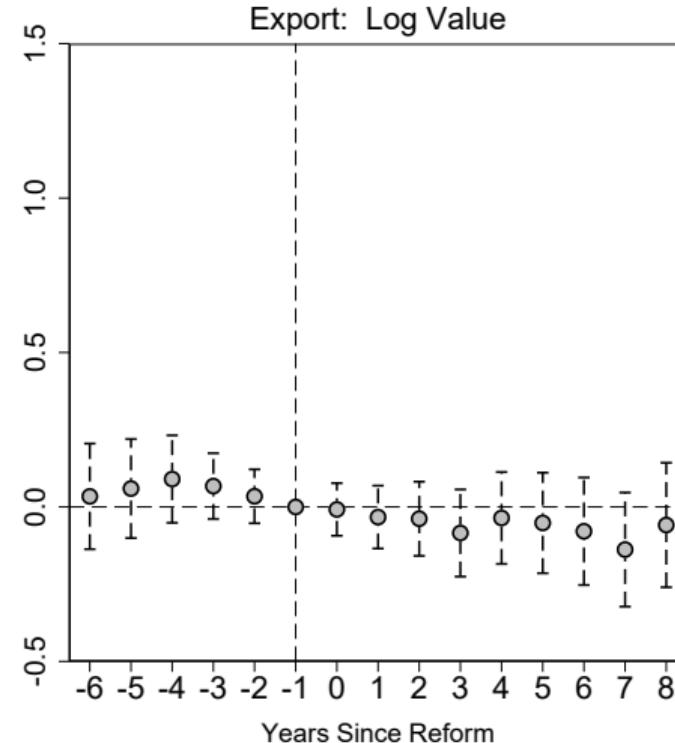
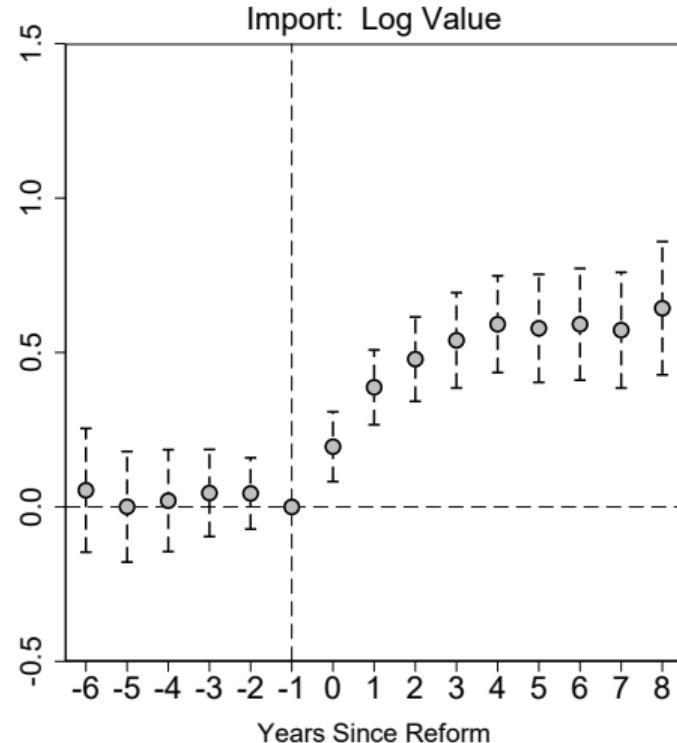
Related Literature

- **Competition and firm productivity:** Hicks (1935); Leibenstein (1966); Nickell (1996); Schmidt (1997); Acemoglu, Aghion, and Zilibotti (2006); Holmes and Schmitz (2010); Van Reenen (2011); Backus (2020)
- **Trade and within-firm productivity:** Topalova and Khandelwal (2010); Lileeva and Trefler (2010); Bernard et al. (2013); Atkin and Khandelwal (2017); Bustos (2011); Bloom et al. (2016); Hombert and Matray (2018); Autor et al. (2020); Alfaro-Urena et al. (2022); Chen and Steinwender (2021)
- **Family firms:** Bertrand and Mullainathan (2002); Burkart, Panunzi, and Shleifer (2003); Bertrand and Schoar (2006); Khanna and Yafeh (2007); Bloom and Van Reenen (2007); Caselli and Gennaioli (2013); Bandiera et al. (2018); Lemos and Scur (2018); Akcigit, Alp, and Peters (2021)
- **Management:** Bloom and Van Reenen (2007); Bloom et al. (2013)
- **Trade and organizations:** Caliendo and Rossi-Hansberg (2012)

HS Codes Example: Electrical machinery

- **8517:** Telephone sets and other apparatus for voice transmission
 - **861711:** Line telephone sets
 - **85171110:** Push button type
 - **85171120:** Rotary dial type
 - **85171130:** Cordless Telephones
 - **861712:** Cellular network sets
 - **85171210:** Push button type
- **8525:** Transmission apparatus and cameras
 - **852550:** Transmission apparatus
 - **85255010:** Radio broadcast transmitter
 - **85255020:** TV broadcast transmitter
 - **85255040:** Jamming equipment
 - **852580:** Cameras
 - **85258010:** Television Cameras
 - **85258020:** Digital cameras
 - **85258030:** Video cameras recorders

QR-Removal: Imports Soar, No Effect on Exports



Note: FEs: year, 6-digit product, 4-digit product \times year

Source: Ministry of Commerce and CMIE Trade_{dx}

Indian Response to WTO's QR Ruling

"The commerce secretary had written to me to say that they intended to make a case for continuing with QRs on consumer goods for BOP reasons, and he wanted confirmation of support from the Ministry of Finance. I promptly wrote back to say that it would be against our national interest because it painted a picture of helplessness that was completely contrary to what we in the Ministry of Finance were projecting to foreign investors."

Excerpt from "Backstage: The Story behind India's High Growth Years, Montek Singh Ahluwalia"

◀ Back

Removal of quantitative restrictions on all imports to transform Indian market

Removal of quantitative restrictions on all imports will transform the Indian market like never before.



PROFUSION OF CHOICE: Shelves like these in a Chennai super store are getting stacked with an array of foreign products

Amma Naana Super Store, TTK Road, Chennai: Heinz spaghetti with sausages in tomato sauce, 220 g for Rs 155; H-Vollmilch low-fat milk with one-year shelf life, 1 litre for Rs 66; Sugar-free chocolate biscuits, 184 g for Rs 98...

Rustom Stores, Colaba, Mumbai: Blue Bunny ice cream, 1.5 litre for Rs 425; St Martin's iced tea, 240 ml for Rs 25; Langnese honey, 500 g for Rs 165

Steak House, Jor Bagh, Delhi: Lake land mayonnaise, 450 g for Rs 98; Laughing Cow cheese, 180 g for Rs 45...

A sample of goodies on the shelves of stores in the three metros on April 3, two days after India abolished all quantitative restrictions (QRs) on imports. On payment of customs duty, anybody can now import any amount of any product. A freedom of economic choice that comes a full 54 years after the freedom of political choice the country attained in 1947.

Unusually Narrow Scope of the 2001 Trade Reform

- Variation in import competition across the **product space** and time
- **Externally imposed**: hinged on IMF technical assessment of India's BoP
- No concurrent domestic deregulation → **isolate trade reform** impact
- No change in export policy → **isolate import competition** impact
- Affected mostly **consumer goods**: limited impact on firms' input costs

◀ Back

▶ HS Product Code Example

Construct Detailed Product Concordances by Hand

Products: Firm Data		Products: Customs Data		Industry Classification	
3008040800	Sunflower seed oil	15121910	Sunflower oil edible grade	15142	Manufacture of vegetable oils and fats, excluding corn oil.
3008040804	Sunflower seed oil, refined				
4012080400	Suitcases	420212.04	Plastic moulded suit-cases	19121	Manufacture of travel goods like suitcases, bags and holdalls etc.
5024200404	Distempers	321000.01	Distempers	24222	Manufacture of paints, varnishes, enamels or lacquers.
6308361216	Washing Machines/Laundry Mach	84501100	Fully - automatic washing machines (upto 10kg)		Manufacture of other electric domestic appliances n.e.c.: dishwashers, household type laundry equipment, electric razors including parts and accessories for electrical domestic appliances
		84501200	Other washing machines with built-in centrifugal drier (upto 10kg)	29308	
		84501300	Other washing machines (up to 10kg)		

- > 2700 HS products mapped to > 6000 Prowess products and 400 industries

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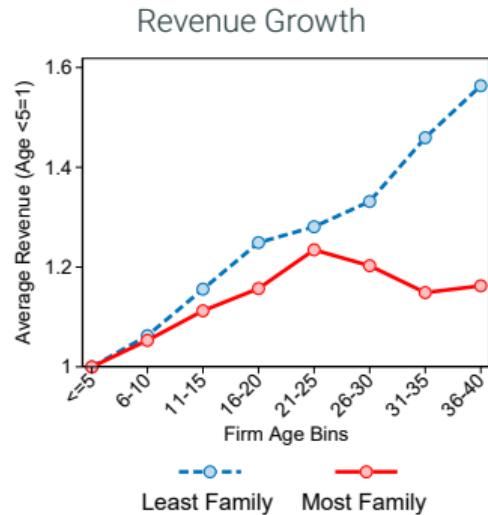
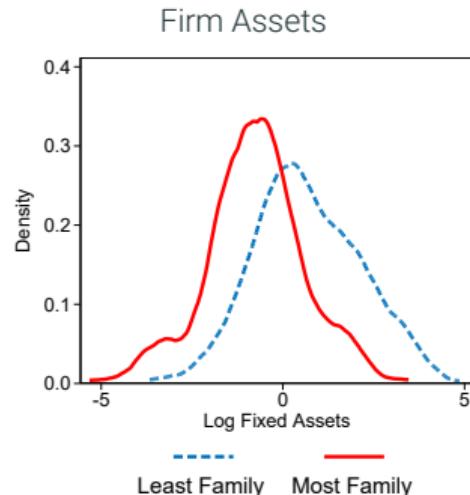
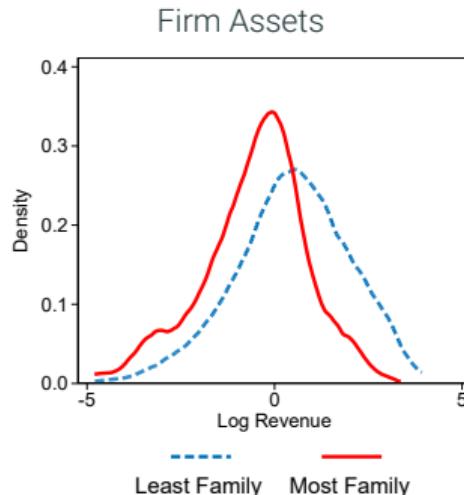
Summary Statistics

	Obs	Mean	p10	p50	p90
Treated Firms (%)	4,996	47	0	0	100
Company Age	83,726	27	7	21	56
Wages	82,745	207	0	21	305
Gross Fixed Assets	82,067	2307	20	213	2618
Revenues	82,745	3399	1	363	4385
Expenses on Raw Materials	82,745	1386	0	136	1785
At least two Family Member on Board (%)	4,852	45	0	0	100
Family Share on Board (%)	39,644	38	10	33	75
Family Share on Executive Board (%)	39,644	64	0	100	100

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Baseline Descriptive Statistics: Family Firms are Smaller and Grow Less with Age

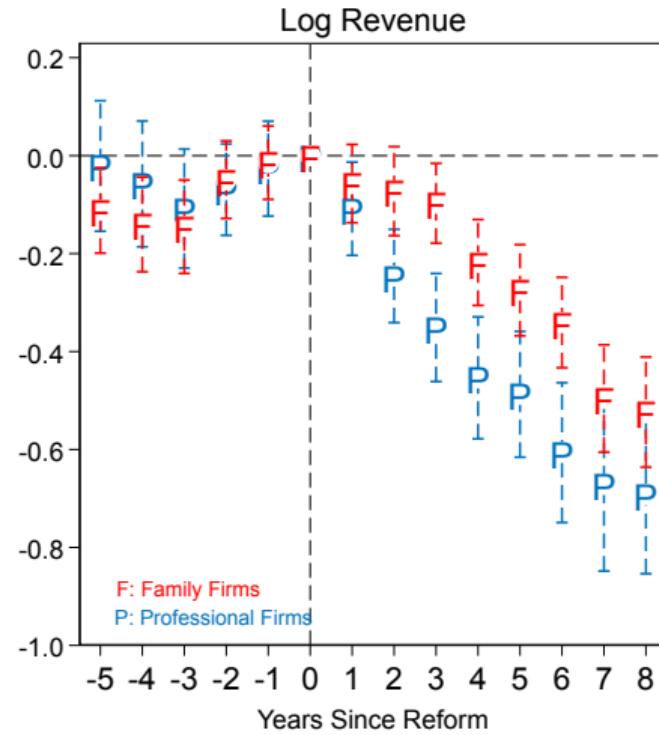
Family Firms (intensive margin): Top/Bottom tercile of family share in board



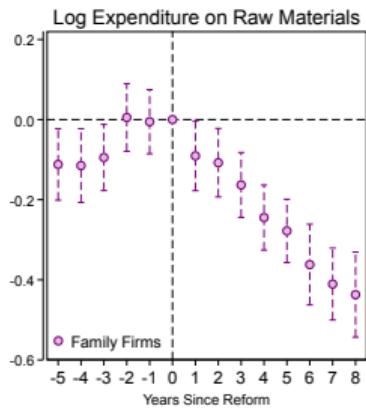
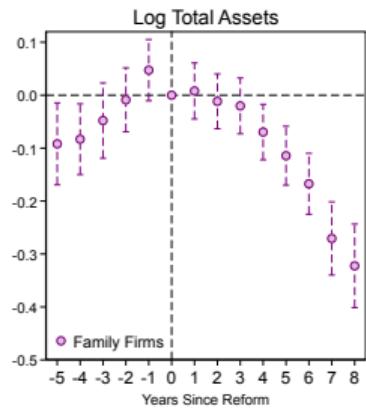
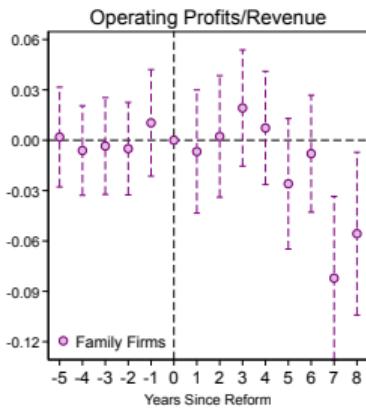
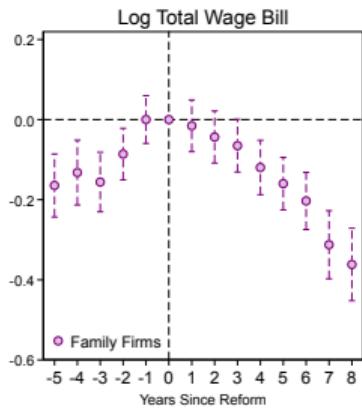
Note:

- Revenues and assets residualized by 5-digit Industry
- Sample: pre-policy data
- Source: Ministry of Corporate Affairs and CMIE Prowess_{dx}

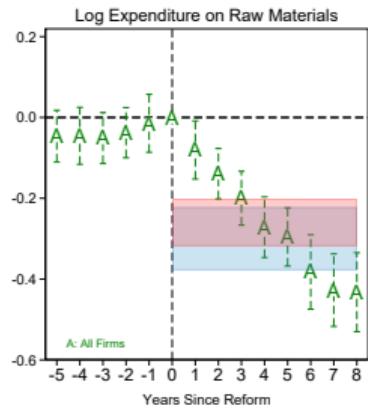
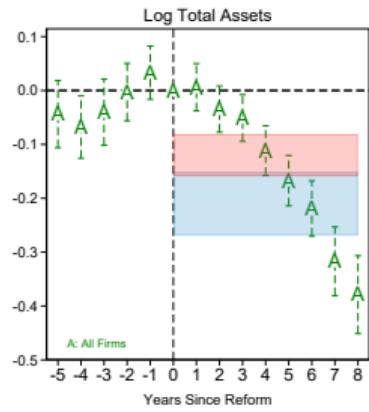
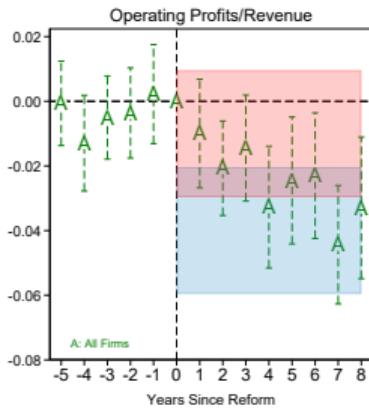
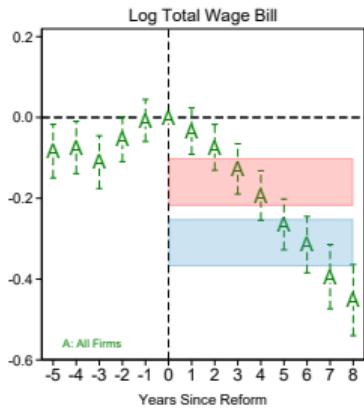
① All Firms Contract



Impact on Wage Bill, Assets, Raw Materials

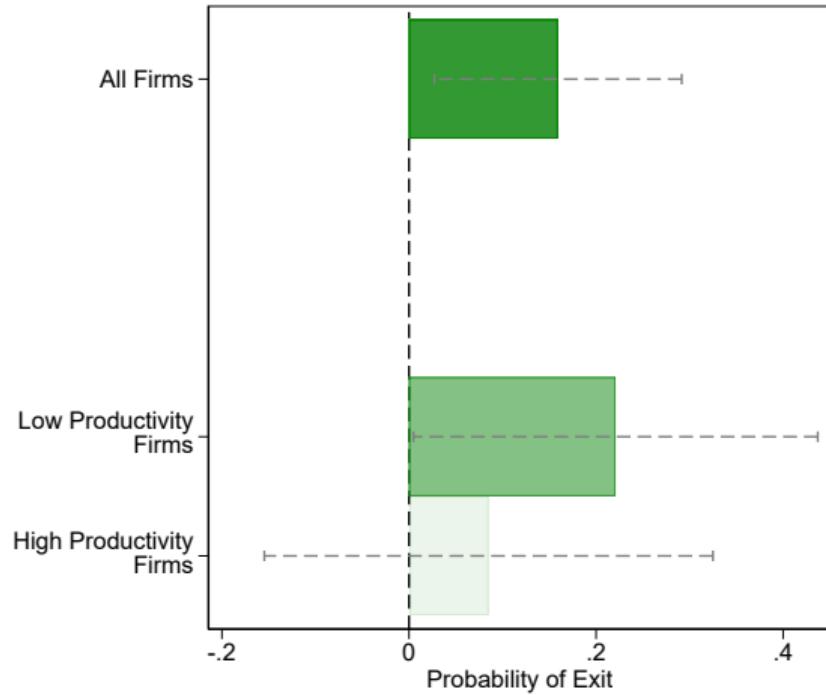


Impact on Wage Bill, Assets, Raw Materials



Exit (in the Long Run)

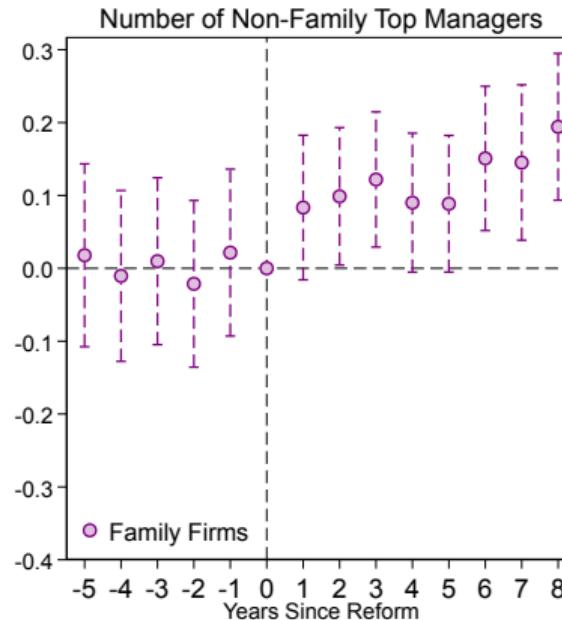
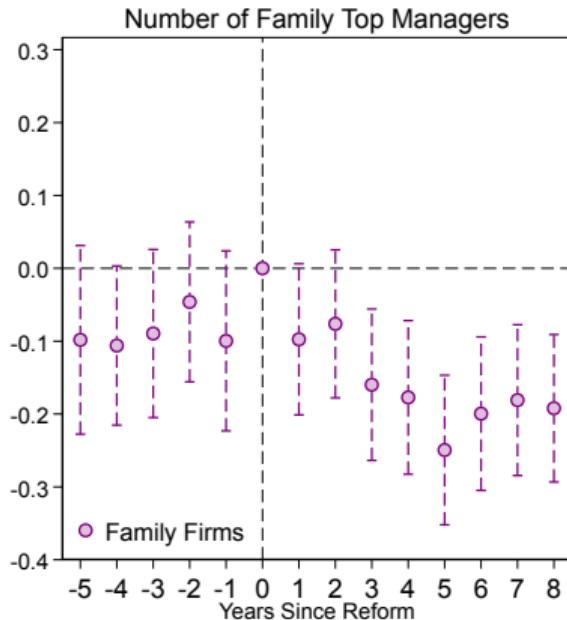
- Cannot confirm exit status or exit year in Prowess data
- Verify exit status by matching firms that drop out of Prowess to MCA admin data
- Long difference: measure whether firm exits in any year from 2001–2021



Note: Results come from a Poisson regression, $\text{EverExit}_i = \alpha + \beta \text{Treated}_i + \Gamma X_i + \varepsilon$, where controls X_i include firm age and industry \times state fixed effects.

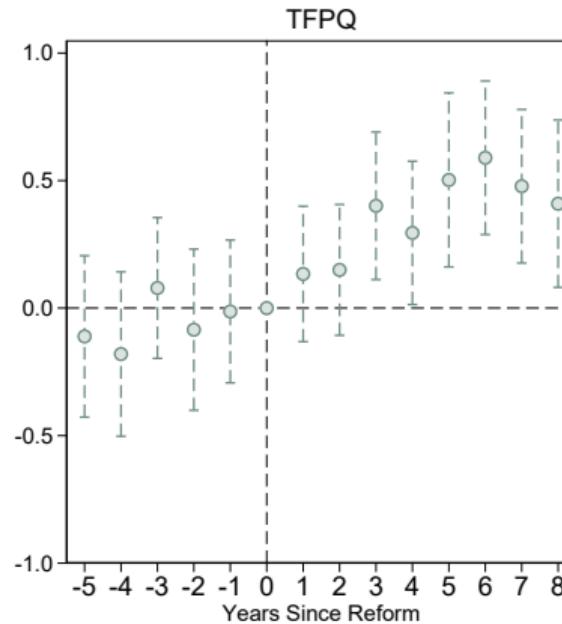
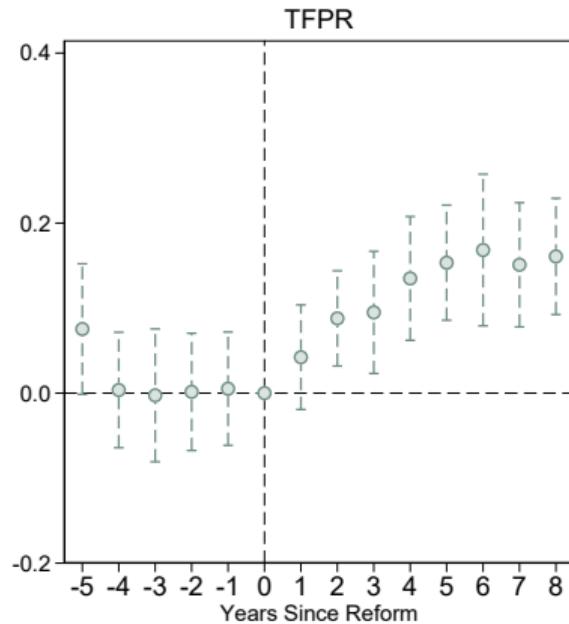
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Professionalization \Rightarrow Replacing Family Managers with Outside Professionals

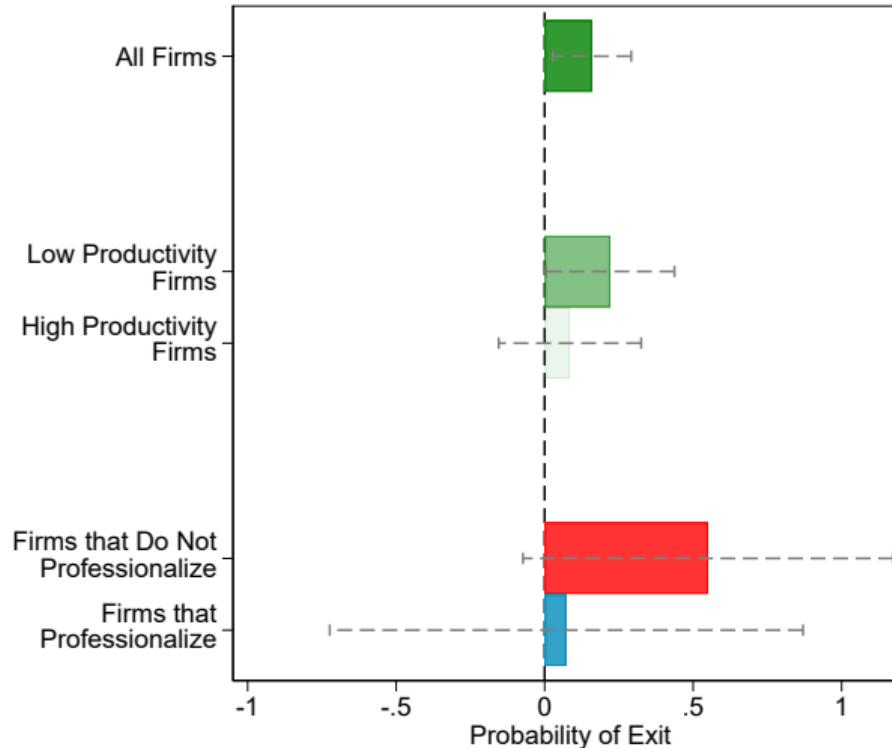


- Note:
- Sample: firms that report at least two family members before treatment
 - Controls: firm age and total board size
 - Pre-shock control group mean = 1.30 for family managers, 0.50 for non-family managers

Firms that Professionalize Report Higher Productivity (Triple Difference)



Exit



No Increase in Productivity for Professional Firms

	(1)	(2)
	Baseline Family Firms	Baseline Professional Firms
TFPR	0.043*	-0.035
	(0.025)	(0.023)
TFPQ	0.18**	-0.076
	(0.077)	(0.076)
Firm FE	✓	✓
Industry × Year FE	✓	✓
Observations	24356	22096

Environment: Details

- Monopolistic competition with CES demand, heterogeneous firm productivity, z_i
- Technology: constant marginal cost with a fixed overhead cost: $\ell_i = w(f + y_i/z_i)$
- Prices: constant markup over marginal cost
- Profits: $\pi_i = Az_i^{\sigma-1} - wf$ (where $A = \frac{1}{\sigma} \rho^{\sigma-1} Y P^\sigma w^{1-\sigma}$ = market demand)
- GDP is a CES aggregate of N intermediates: $Y = \left(\sum_{i=1}^N y_i^{\frac{\sigma-1}{\sigma}} \right)^{\frac{\sigma}{\sigma-1}}$
- Firms produce unique intermediate varieties
- Prices: $p_i^* = \frac{\sigma}{\sigma-1} \cdot \frac{w}{z}$

Productivity Thresholds

$$\pi(\textcolor{red}{z}) = 0 \implies \textcolor{red}{z}_f = \left(\frac{wf}{A} \right)^{\frac{1}{\sigma-1}}$$

Exit Threshold: Fam Firms

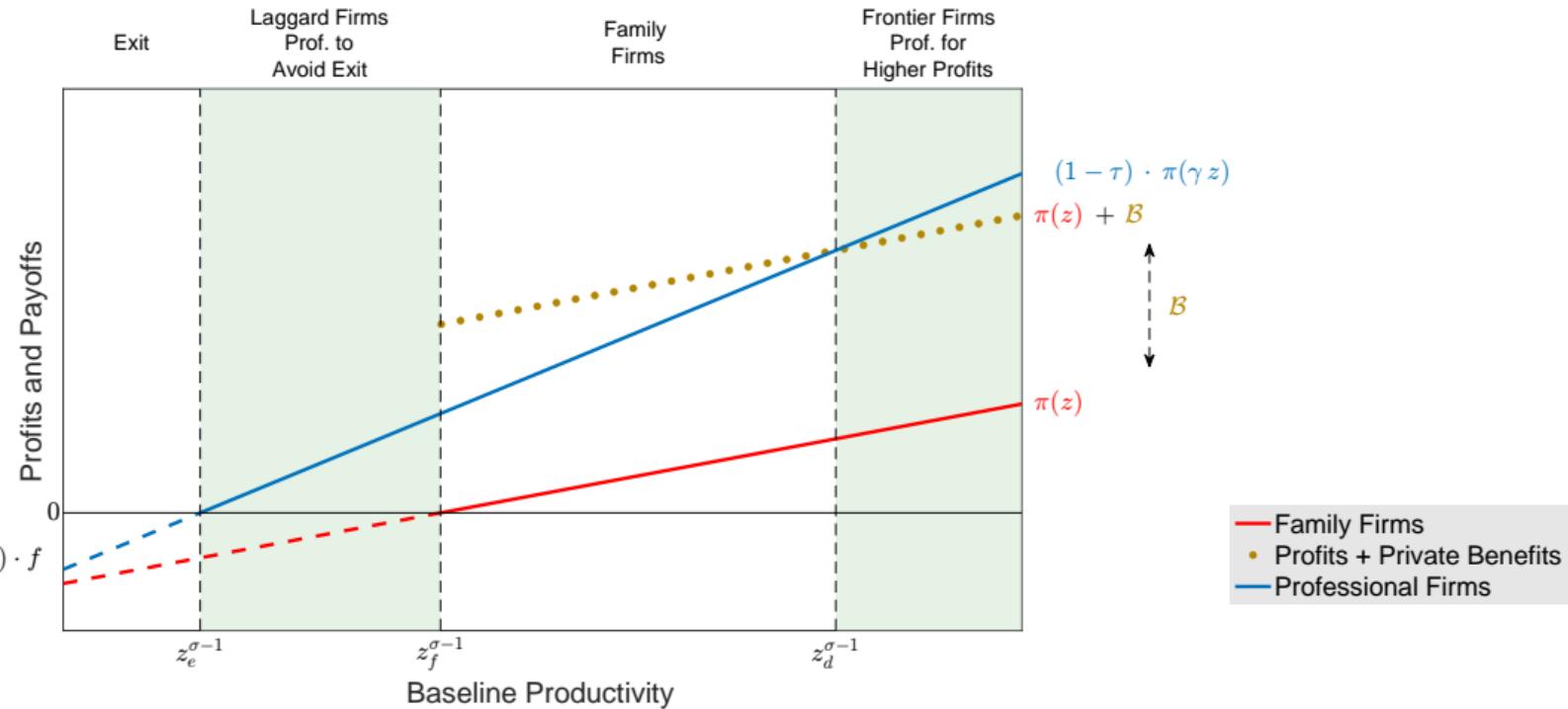
$$\pi(\gamma \textcolor{red}{z}) = 0 \implies z_e = \frac{1}{\gamma} \cdot \textcolor{red}{z}_f$$

Exit Threshold: Prof. Firms

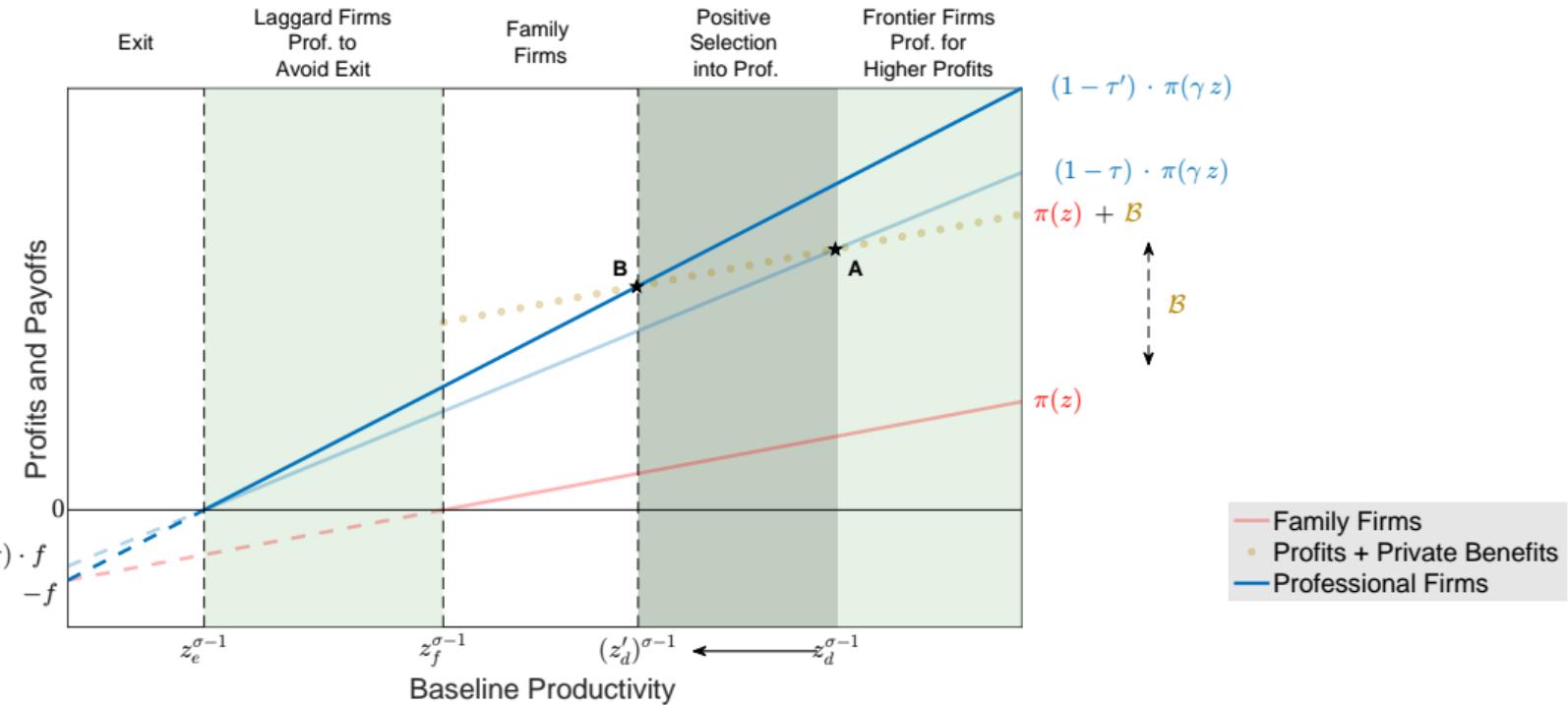
$$\pi(\textcolor{red}{z}) + \mathcal{B} = \pi(\gamma \textcolor{red}{z}) \implies z_d = \left(\frac{\mathcal{B}}{wf(\gamma^{\sigma-1} - 1)} \right)^{\frac{1}{\sigma-1}} \cdot \textcolor{red}{z}_f$$

Prof. Threshold

Contracting Frictions



Contracting Frictions



Profits After Trade Liberalization ($t = 1$)

- Switching from professional to family management incurs (reputational) cost κ ▶ Example
- Payoff $(z, \mathcal{P}_0, \mathcal{P}_1) = \mathcal{P}_1 \pi(\gamma z) + (1 - \mathcal{P}_1) [\pi(z) + B - \kappa \mathcal{P}_0]$
- When $\mathcal{P}_1 = 1$ (the firm upgrades management in $t = 1$), the payoff is $\pi(\gamma z)$ regardless of the past choice
- When $\mathcal{P}_1 = 0$ (the firm is family-managed in $t = 1$), the payoff is:
 - $\pi(z) + B$ if it was family in $t = 0$ (i.e., $\mathcal{P}_0 = 0$)
 - $\pi(z) + B - \kappa$ if it was professionally-managed in $t = 0$ (i.e., $\mathcal{P}_0 = 1$)

◀ Model: Baseline Equilibrium

◀ Model: Comparative Statics

Reputational Cost of Switching Back to Family Management



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Infosys CEO resigns after long-running feud with founders

By Samantha Karen Nair and Sankalp Phartiyal

August 18, 2017 3:58 PM GMT+1 · Updated 8 years ago

Aa



BENGALURU/MUMBAI (Reuters) - Vishal Sikka, the chief executive brought in to turn around India's Infosys three years ago, resigned on Friday, blaming a "continuous drumbeat of distractions" and a long-running row with the founders over company strategy.

Sikka's resignation spooked investors in India's second-biggest IT services company and sent its shares down nearly 10 percent, wiping \$3.45 billion off its market value. The stock touched its lowest level since the start of Sikka's tenure.

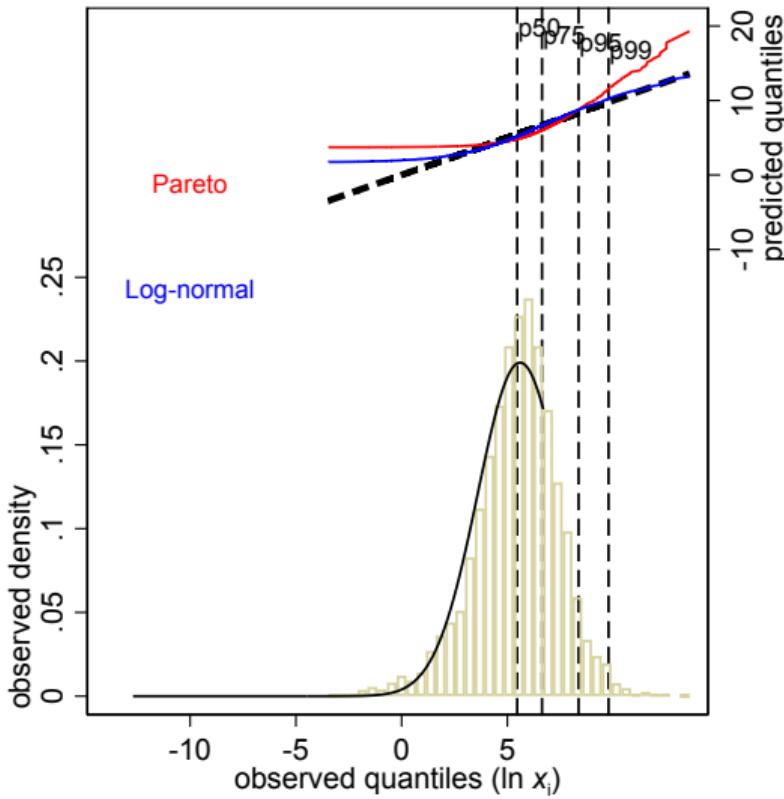
◀ Environment

◀ Profits After Trade

◀ Model: Comparative Statics

Calibrating the Pareto Tail (k)

- **Sample.** Rank firms by revenue, keep 95th–99th pct.
- **Transform.** F_i = empirical CDF $\Rightarrow z_i = -\ln(1 - F_i)$ (linearizes a Pareto tail).
- **QQ-regression.** $\ln x_i = \alpha + \underbrace{\beta}_{=(\sigma-1)/k} z_i + \varepsilon_i$.
- **Result.**
 $\hat{\beta} = 0.87 \Rightarrow \hat{k} = \frac{\sigma - 1}{\hat{\beta}} = \frac{3}{0.87} \approx 3.5$.
- **Robustness.** Cut-offs from 95th to 99th give $k \in [3.4, 3.6]$ ✓



QQ-plot of $\ln x_i$ (log revenue) against $z_i = -\ln(1 - F_i)$ for the top

Analytical Moment Conditions for β, γ

- Difference in mean log revenue of family and professional firms:
$$(\sigma - 1) \log \gamma + \log \left[\frac{\gamma^{-(\sigma-k-1)} - 1 + \delta^{\sigma-k-1}}{\gamma^k - 1 + \delta^{-k}} \cdot \frac{1 - \delta^{-k}}{1 - \delta^{\sigma-k-1}} \right]$$
- Share of family-managed firms: $\gamma^{-k} (1 - \delta^{-k})$

$$\text{where } \delta = \left[\frac{B}{f(\gamma^{\sigma-1} - 1)} \right]^{1/(\sigma-1)}$$

◀ Back

Aggregate Productivity: Exit vs. Professionalization

$$\underbrace{\bar{z}_1 - \bar{z}_0}_{\Delta \text{ aggregate productivity}} = \underbrace{(\bar{z}_1^{\text{sel}} - \bar{z}_0)}_{\text{exit / selection}} + \underbrace{(\bar{z}_1 - \bar{z}_1^{\text{sel}})}_{\text{professionalization}}$$

$$\bar{z}_0 = \frac{1}{N_0} \sum_{i \in S_0} z_{i0}$$

mean realised productivity at $t = 0$

$$\bar{z}_1^{\text{sel}} = \frac{1}{N_1} \sum_{i \in S_1} z_{i0}$$

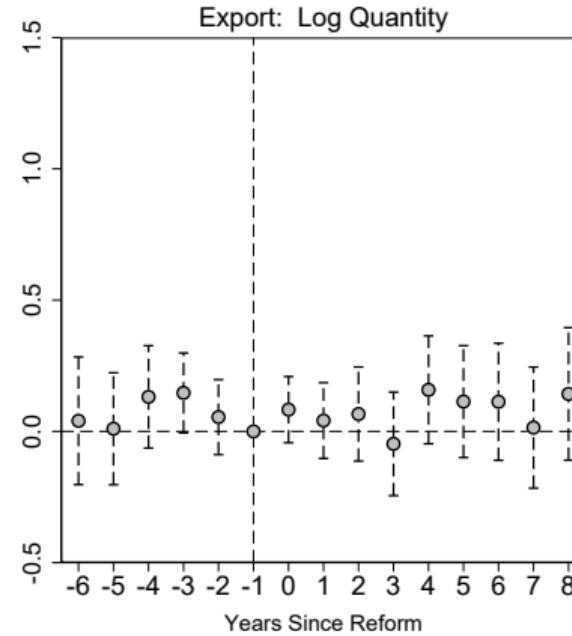
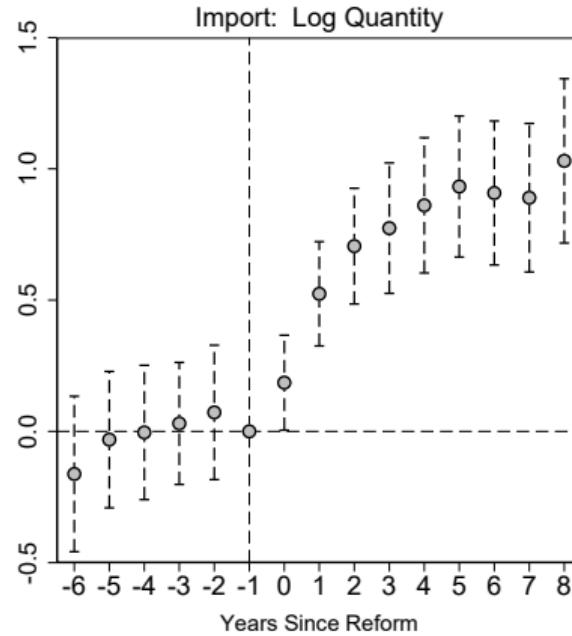
survivors (S_1) but with $t = 0$ productivities

$$\bar{z}_1 = \frac{1}{N_1} \sum_{i \in S_1} z_{i1}$$

post-shock mean

where N_t is the number of active firms in period t ; S_0 : set of active firms at $t = 0$; $S_1 \subseteq S_0$: survivors after the trade shock; z_{i0} : realized productivity at time t (z_i if family, γz_i if professional)

QR removal: which products are affected?



Note: FEs: year, 6-digit product, 4-digit product \times year

Source: Ministry of Commerce and CMIE Trade_{dx}

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