

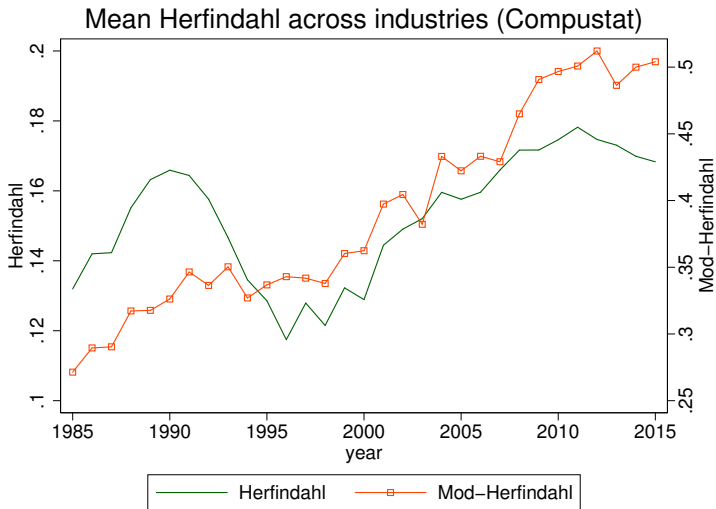
Declining Competition and Investment in the U.S.

German Gutierrez and Thomas Philippon

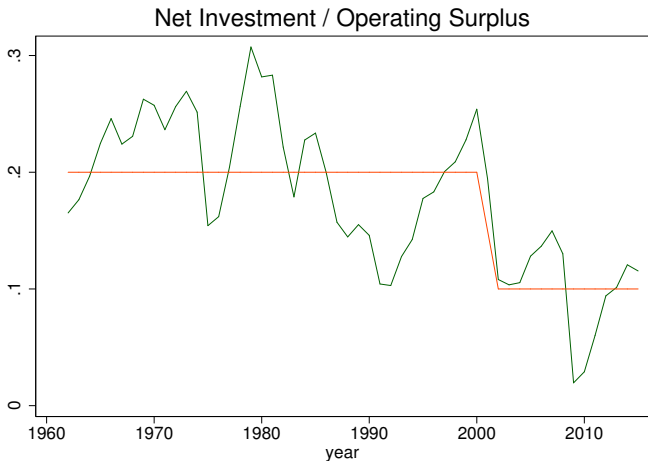
NYU, NBER, CEPR

May 2017, ESSIM

Stylized Fact #1: Increased Concentration

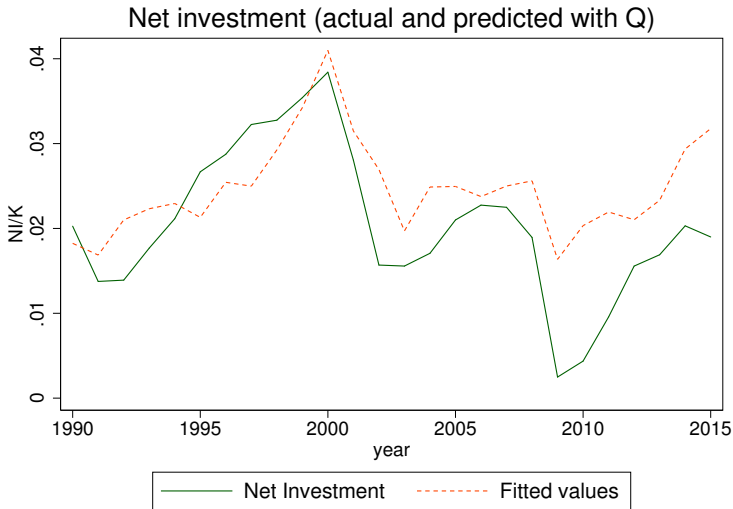


Stylized Fact #2: Profits Are High But Investment Is Low



Notes: Annual data for Non financial Business sector (Corporate and Non corporate).

Fact #2: I/K is low while Q is High



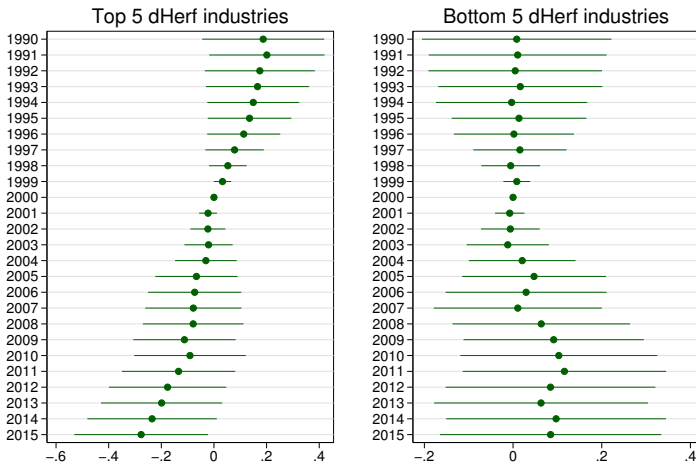
Note: Annual data. Q for Non Financial Corporate sector from Financial Accounts.

Theory

- Theories that predict low I/K because they predict low Q
 - E.g.: spreads & risk premia, low expected TFP growth, low expected demand, etc.
 - Solve the wrong puzzle: Q is high, but I/K is low.
- Theories that predict a gap between Q and I/K
 - monopoly rents
 - governance issues
 - intangible investment?

Motivation: Investment gap largest for concentrating industries

Capital Gap vs. Q



Identification Issue: Model

- Monopolistic competition, firm i in industry j
 - Fixed entry cost $\kappa_{j,t-1}^e$
 - Production

$$y_{i,t} = A_{j,t} k_{i,t}^\alpha l_{i,t}^{1-\alpha}$$

- Industry demand

$$Y_{j,t}^D = D_{j,t} P_{j,t}^{-\sigma}$$

- Aggregator

$$Y_{j,t}^S \equiv \left(\int_0^{N_{j,t-1}} y_{i,t}^{\frac{\varepsilon_j-1}{\varepsilon_j}} di \right)^{\frac{\varepsilon_j}{\varepsilon_j-1}}$$

Industry Equilibrium

- Entry in industry $j = 1..J$

$$\frac{\varepsilon_j - \sigma}{\varepsilon_j - 1} \log N_{t-1} = \log(\mu_j - 1) \mu_j^{-\sigma} + \log \mathbb{E}_{t-1} \left[\chi_{j,t}^{1-\sigma} D_{j,t} \right] \\ - \log(1 + r_{t-1}) \kappa_{j,t-1}^e$$

- Investment

$$\log K_{j,t} = \log \alpha \frac{\chi_{j,t}^{1-\sigma}}{\rho_t} + \log D_{j,t} - \sigma \log \mu_j + \frac{\sigma - 1}{\varepsilon_j - 1} \log N_{j,t-1}$$

Competitive Limit with Anticipated Demand Shocks

- Entry in industry $j = 1..J$

$$\log N_{j,t-1}^c = \log \frac{\psi \chi_t^{1-\sigma}}{1+r_{t-1}} + \log \mathbb{E}_{t-1} [D_{j,t}]$$

- Investment

$$\log K_{j,t} = \log \alpha \frac{\chi_{j,t}^{1-\sigma}}{\rho_t} + \log D_{j,t} + \log N_{j,t-1}$$

- **Prop 1**

- *Cross-industry OLS regression of log-investment on log-Herfindahl gives a slope of minus one.*

Industry Equilibrium & Identification

- Entry in industry $j = 1..J$

$$\frac{\varepsilon_j - \sigma}{\varepsilon_j - 1} \log N_{t-1} = \log(\mu_j - 1) \mu_j^{-\sigma} + \log \mathbb{E}_{t-1} \left[\chi_{j,t}^{1-\sigma} D_{j,t} \right] \\ - \log(1 + r_{t-1}) \kappa_{j,t-1}^e$$

- Investment

$$\log K_{j,t} = \log \alpha \frac{\chi_{j,t}^{1-\sigma}}{\rho_t} + \log D_{j,t} - \sigma \log \mu_j + \frac{\sigma - 1}{\varepsilon_j - 1} \log N_{j,t-1}$$

- **Prop 2:** *Variation in entry costs κ_j^e that are uncorrelated with future demand $D_{j,t}$ and productivity $A_{j,t}$ would be valid instruments for concentration.*

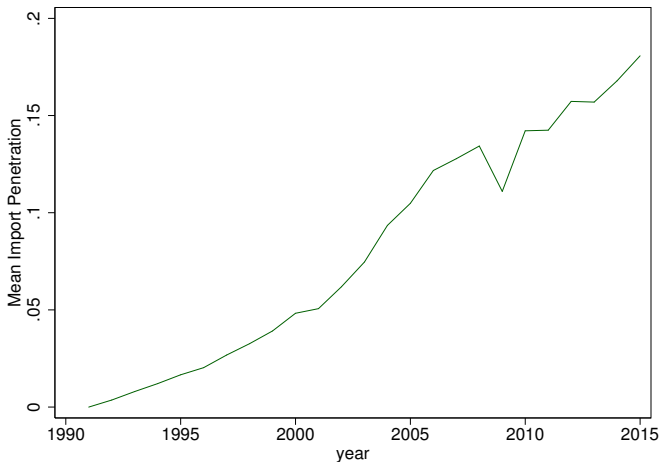
Our Strategy

- Natural experiment
 - Chinese import competition
- Instrument for Herfindahl
 - Excess entry in the 1990s
- Explaining the broad increase in concentration in the 2000's
 - Regulations, etc.

Chinese Competition

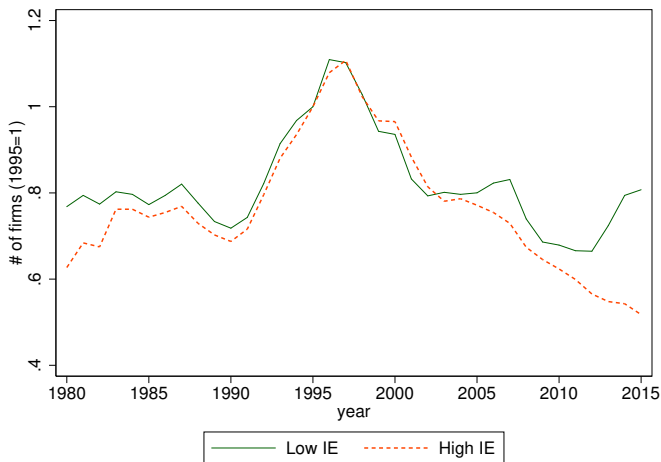
- Good
 - Orthogonal to industry demand & supply shocks
- Bad
 - Ambiguous effect on domestic industry investment
 - Test firm-level predictions
- Write model of vertical differentiation with heterogeneous firms
 - Leader has higher quality / lower cost
- **Prop 3:**
 - *The more efficient the leader, the more it reacts to competition by increasing investment.*
 - *Domestic industry investment ambiguous because laggards exit or downsize.*

Average China Import Competition



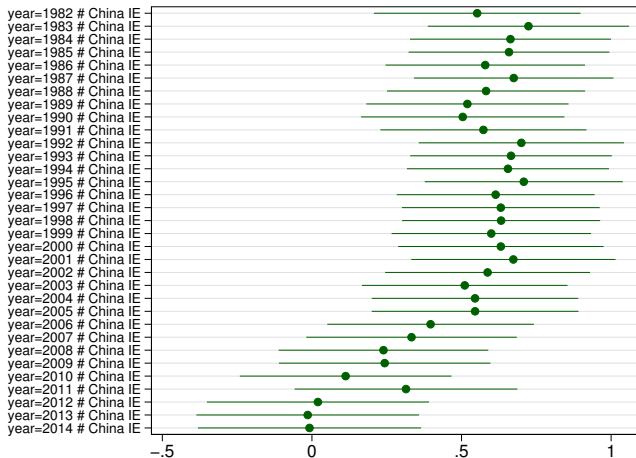
Note: Annual data. Import penetration defined as $\Delta IP_{jt} = \frac{\Delta M_{jt}}{Y_{j,91} + M_{j,91} - E_{j,91}}$

Number of US Firms, by Exposure to China



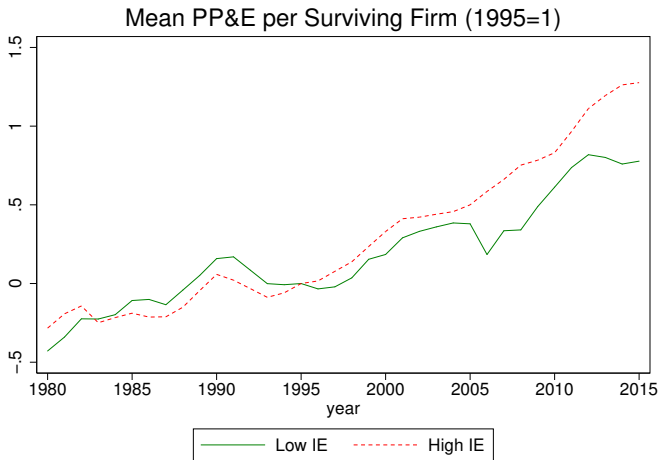
Notes: Annual data. US incorporated firms in manufacturing industries only.
Industries assigned to exposure based on median 91-11 exposure. (1995 = 1)

Impact of Exposure to China on N firms



Notes: Plot shows β_t from $\log(N_{i,t}) = \mu_i + \eta_t + \beta_t \Delta IP_{j,99-11} \times 1\{year\} + \varepsilon_{i,t}$.

PP&E of *Surviving* Firms



Notes: Annual data. US incorporated firms in manufacturing industries only. Industries assigned to exposure based on median 91-11 exposure. Similar patterns for Assets, Intangibles, etc.

China IV regressions: NTR Gap

	(1) $\log(AT_t) \geq 1980$	(2) $\log(PPE_t) \geq 1980$	(3) $\log(Intan_t) \geq 1980$	(4) $\log(AT_t) \geq 1980$	(5) $\log(PPE_t) \geq 1980$	(6) $\log(Intan_t) \geq 1980$
<i>Post01</i> \times <i>NTR Gap</i>	-0.693** [-3.38]	-0.911** [-2.99]	-0.552 [-0.90]	-1.265** [-5.77]	-1.519** [-4.83]	-1.167+ [-1.81]
<i>Post01</i> \times <i>NTR Gap</i> \times <i>Lead₉₉</i> [§]				1.164** [7.65]	1.239** [7.46]	1.321** [4.47]
$\log(Age_{t-1})$	0.240** [8.01]	0.340** [9.79]	0.01 [0.13]	0.240** [8.17]	0.340** [10.26]	0.019 [0.25]
Observations	49971	49831	29698	49971	49831	29698
Within R^2	0.457	0.223	0.352	0.468	0.234	0.356
Overall R^2	0.093	0.078	0.096	0.113	0.103	0.108
Industry controls [†]	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES
Firm FE	YES	YES	YES	YES	YES	YES

Notes: T-stats in brackets. + $p < 0.10$, * $p < 0.05$, ** $p < 0.01$. Standard errors clustered at industry-level.

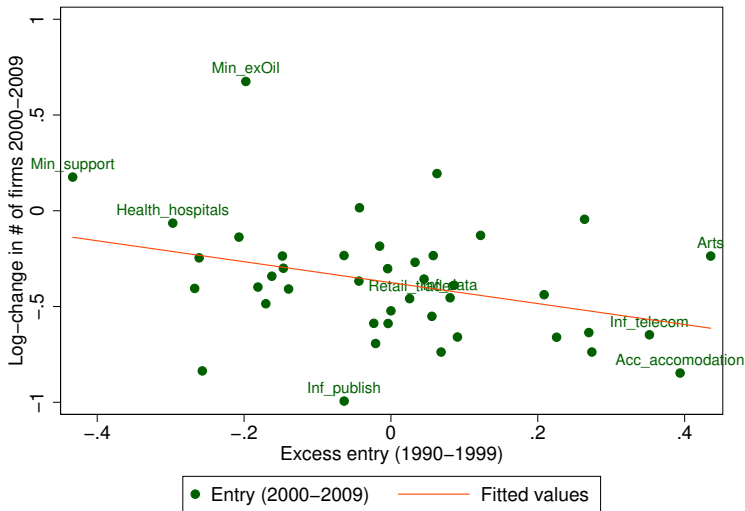
[§] Leaders defined as firms with above-median Q as of 1999 within each NAICS Level 4 industry

[†] Industry controls include measures of industry-level production structure (e.g., K/Emp) as of 1991

Competition & Investment: Beyond Manufacturing

- Chinese import competition
 - clean identification
 - but experiment is an increase in competition in one sector
- Excess entry in 1990s
 - we can show it varies a lot across sectors, and it is orthogonal to future demand
 - VCs, entry costs, etc.

IV: Entry post-2000 vs. Excess entry in 1990s



Entry (sometimes) predicts sales but Excess Entry does not

	(1)	(2)	(3)	(4)
	$\Delta \log(\text{Sale})_{99-04}$		$\Delta \log(\text{V.Add})_{99-04}$	
$\Delta \log(\# \text{ firms})_{94-99}$	0.102		0.321*	
	[0.85]		[2.64]	
$\text{Excess Entry}_{90-99}(i)$		-0.08		-0.06
		[-0.40]		[-0.28]
Observations	43	42	43	42
R^2	0.017	0.004	0.145	0.002

Notes: T-stats in brackets. + $p < 0.10$, * $p < 0.05$, ** $p < 0.01$

IV: Panel Regression Results

	(1) 1st St. $HHI_{j,t-1}$ ≥ 2000	(2) 2nd St. Net I/K ≥ 2000	(3) 1st St. $HHI_{j,t-1}$ ≥ 2000	(4) 2nd St. Net I/K ≥ 2000
Mean Stock Q (t-1)	0.01 [1.34]	0.036** [7.42]	0.03** [3.53]	0.043** [6.89]
<i>Excess Inv</i> ₉₀₋₉₉	-1.51** [-2.82]	-1.270** [-3.48]		
<i>Excess Entry</i> ₉₀₋₉₉ (i)	-0.11** [-3.04]			
<i>Excess Entry</i> ₉₀₋₉₉ (i) \times Med HHI_t			2.66** [3.22]	
$HHI_{i,t-1}$		-0.504** [-5.81]		-0.602** [-5.17]
Age controls	Yes		Yes	
Year FE	No		Yes	
Industry FE	No		Yes	
Observations	672	672	672	672
R^2		0.052		0.036

Notes: T-stats in brackets. + p<0.10, * p<0.05, ** p<.01.

Competition and Investment: Summary

- Most domestic industries have become MORE concentrated
 - Lower competition/entry means less investment by leaders and less investment at the industry level
- Some manufacturing industries have seen increased competition from China
 - Domestic leaders have increased investment, R&D, and employment
 - But overall effect on domestic investment somewhat negative

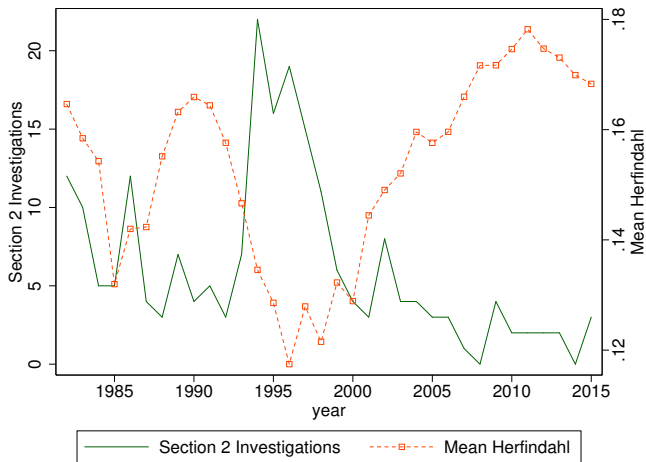
What explains the broad increase in concentration?

1. **Enforcement and regulation:** declined antitrust enforcement + increased regulation
2. **Superstar firms:** 'winner-takes-most'; incumbent innovation

Other explanations

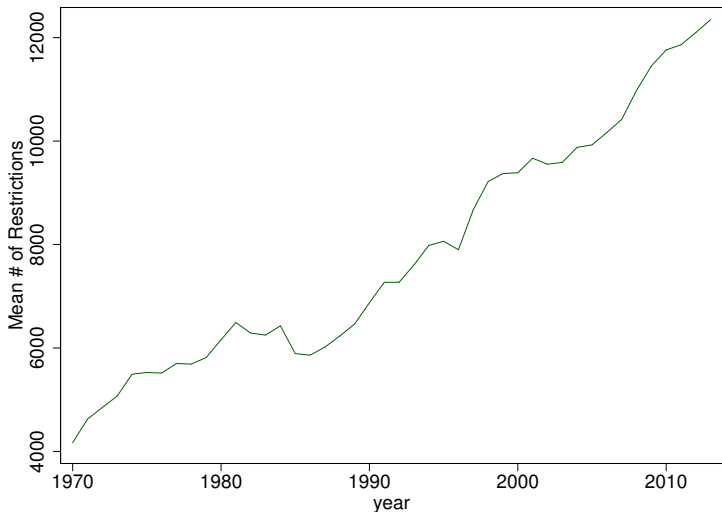
1. Omission of private firms in Compustat
 2. Foreign competition (other than China)
 3. Intangible
 4. Population aging and decreased start-up rates
- 1-2 discussed (and discarded) in Grullon-Larkin-Michaely (2016); 3-4 discussed in Gutierrez and Philippon (2016b)

Antitrust enforcement



Note: Figure plots the average HHI across BEA industries along with the number of investigations filed by the Department of Justice under Section 2 of the Sherman Act of 1890. See Grullon-Larkin-Michaely (2016).

Regulation



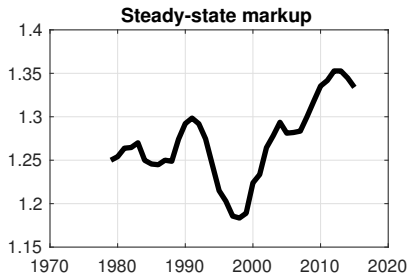
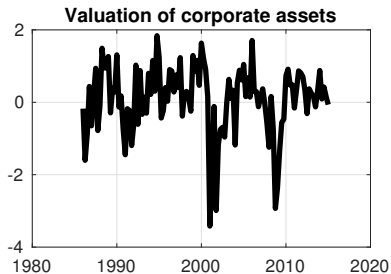
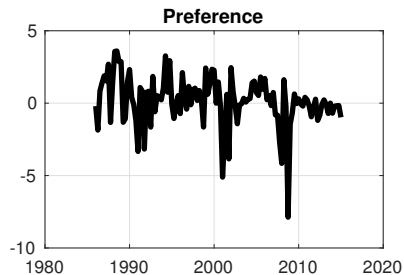
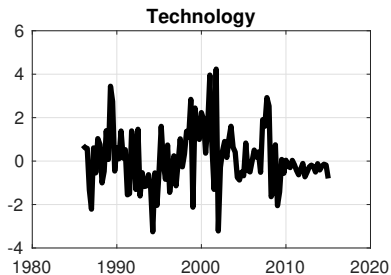
Note: Annual data. Mean number of relevant restrictions across BEA industries in our sample. Based on Mercatus Regulation index.

Regulation & Concentration Across Industries

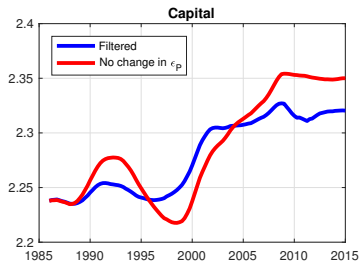
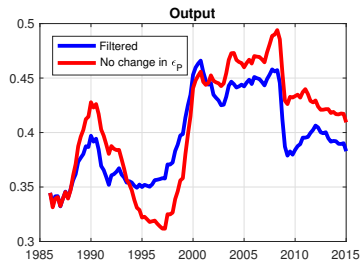
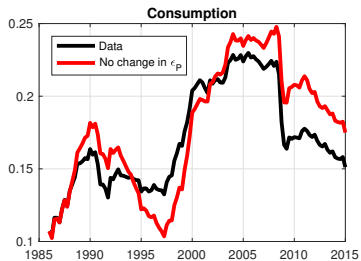
	(1)	(2)
	$CR4_{i,t}$	$HHI_{i,t-1}$
	≥ 1980	≥ 1980
Log(Reg index)MA2_(t-3)	0.047*	0.022*
	[2.53]	[2.29]
Mean Stock Q (t-1)	0.031	0.026+
	[1.58]	[1.93]
Mean log(age) (t-1)	0.070*	0.055*
	[2.22]	[2.30]
Year FE	Yes	Yes
Industry FE	Yes	Yes
Observations	1004	1004
Within R^2	0.181	0.113

Notes: T-stats in brackets. + $p < 0.10$, * $p < 0.05$, ** $p < 0.01$. Omits Non-durable textile industry

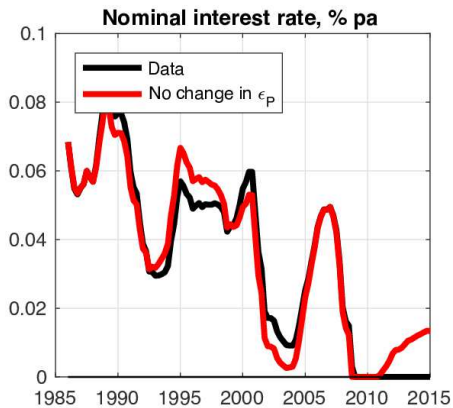
Macro-Economic Implications (with C. Jones)



Counter-Factual



Counter-Factual



EXTRA: Measures of Concentration & Entry

- Traditional Herfindahl + Common ownership adjustment (Azar, et. al. (2016))

$$\begin{aligned} MHHI &= \sum_j s_j^2 + \sum_j \sum_{k \neq j} s_j s_k \frac{\sum_i \beta_{ij} \beta_{ik}}{\sum_i \beta_{ij}^2} \\ &= HHI + HHI^{adj} \end{aligned}$$

- Other measures including entry, share of sales by top #10 firms, etc. also significant