

Financial Heterogeneity, Investment, and Firm Interactions

Yang Liu

Boston College

August 29, 2023

Outline

- Introduction
- Empirical Results
- Theoretical Intuition
- Conclusions

Motivation I

Financial heterogeneity attracts increasing attention in the macro literature:

- Micro-level studies usually show negative effects of financial constraints during recessions, implying amplified aggregate output loss and impeded recoveries

So corporate finance matters to the macroeconomy, or does it? But recent macro estimates sometimes say the opposite...

- Jordà **and others** (2022): Corporate debt alone has no significant role on aggregate output
- Mian, Sufi **and** Verner (2017): Weak impact of corporate debt on GDP as opposed to household debt
- Giesecke **and others** (2011): Large U.S. corporate bond defaults had little real effect in the past 150 years as opposed to banking crises

Motivation II

Financial heterogeneity attracts increasing attention in the macro literature:

- Micro-level studies usually show negative effects of financial constraints during recessions, implying amplified aggregate output loss and impeded recoveries

So corporate finance matters to the macroeconomy, or does it? **But recent macro estimates sometimes say the opposite...**

- Jordà **and others** (2022): Corporate debt alone has no significant role on aggregate output
- Mian, Sufi **and** Verner (2017): Weak impact of corporate debt on GDP as opposed to household debt
- Giesecke **and others** (2011): Large U.S. corporate bond defaults had little real effect in the past 150 years as opposed to banking crises

Motivation III

There can be a thousand reasons why micro and macro estimates differ...

I only focus on one specific aspect: **the equilibrium effects of firm interactions**

- Rich financial heterogeneity often leads to rich interactions among product market competitors, as known in the finance-IO literature
 - Competitive interactions, strategic interactions, deterrence effect, etc.
 - Chevalier (1995), Khanna **and** Tice (2005), Rauh (2006) ...
- But in the macro-finance literature, there is little answer to:
 - How firm interactions are shaped by financial constraints and macro shocks
 - Whether these presumably "second-order" interactions matter at the macro level

Research Question

In this paper, I do two things:

- Whether and how product market competitors respond to each others' financial constraints over the cycle
- Empirically examine alternative explanations and test equilibrium implications

Findings I

Interactions among financially heterogeneous firms are significant during downturns:

- For **financially unconstrained firms with financially constrained competitors**, an industry downturn is followed by increased capital expenditure amounting to 1-1.5% in two years, compared to **unconstrained firms with unconstrained competitors**
- Large magnitude: \approx positive idiosyncratic shock of two standard deviations

But causality can go either way! Only the competitive interaction channel has unambiguously countercyclical equilibrium effects

- **Competitive interaction channel:** Unconstrained firms increase investment to substitute depressed investment by constrained competitors
- **Strategic deterrence channel:** Unconstrained firms proactively increase investment to crowd out investment by constrained competitors

Findings II

Use a simple model with empirically testable predictions to distinguish the two channels:

- Investment determined by financial constraints, expected returns, and nonconvex adjustment costs
- Strategic deterrence is only possible when unconstrained firms over-invest so much that constrained firms are pushed into the inaction regime - huge future payoff

Corollary: More financially constrained → closer to the inaction regime → more likely be deterred

- But empirically, we don't see the most constrained firms are differentially affected than moderately constrained firms
- **Strategic deterrence is negligible in the whole sample**

Contributions

- Macroeconomics and corporate finance: A new channel to potentially reconcile the discrepancy between micro and macro estimates
 - Kalemli-Özcan, Laeven **and** Moreno (2022), Giroud **and** Mueller (2016), Jordà **and others** (2022), Giesecke **and others** (2011), Mian, Sufi **and** Verner (2017), Brunnermeier **and** Krishnamurthy (2020) ...
- Finance-IO: Examine the macro implications of firm interactions using a feasible empirical strategy
 - Rauh (2006), Grieser **and** Liu (2019), Khanna **and** Tice (2005), Bao **and** Eeckhout (2023) ...
- Financial heterogeneity models: A new channel that was not often discussed previously
 - Ottonello **and** Winberry (2020), Caglio, Darst **and** Kalemli-Özcan (2021) ...

Outline

- Introduction
- Empirical Results
- Theoretical Intuition
- Conclusions

Data

Balance sheet data, financial constraints, and product markets

- Balance sheet: Compustat
- Financial constraints: Text-based measure by Hoberg **and** Maksimovic, 2015.
Cross-checked by using plain leverage
- Product markets: Text-based measure by Hoberg **and** Phillips (2016)

Triple Interaction

The main specification builds on the triple interaction between:

$$\text{Shocks} \times \text{Firm's own financial constraints} \times \text{Peers' financial constraints} \quad (1)$$

- The first two are the usual heterogeneous responses to common shocks
- The triple interaction isolates firm interactions from the heterogeneous responses to shocks

But wait... what shocks?

Shock Decomposition

Shocks are industrywide demand shocks estimated à la di Giovanni, Levchenko **and** Mejean (2014). For firms in the same industry n , I estimate

$$\gamma_{i,t} = \delta_{n,t} + \epsilon_{i,t}$$

- $\gamma_{i,t}$: firm i 's year-over-year revenue growth
- $\delta_{n,t}$: industrywide component (essentially industry fixed effects)
- $\epsilon_{i,t}$: the firm-specific idiosyncratic component

Then I convert it into **upturn** ($\delta_{n,t}^+$) and **downturn** ($\delta_{n,t}^-$) dummies using the 25th and 75th percentiles.

▶ δ distribution

▶ Industry details

Full Specification

So now we have industry upturns, downturns, and idiosyncratic residuals. Pooling together:

$$\begin{aligned}
 \text{CAPX}_{i,t+h} = & \underbrace{\beta_1 \cdot \delta_{n,t}^- \cdot \text{FC}_{i,t-1} \cdot \text{FC}_{n,t-1}^{\text{peer}} + \beta_2 \cdot \delta_{n,t}^- \cdot \text{FC}_{i,t-1}}_{\text{Downturns}} \\
 & + \underbrace{\beta_1' \cdot \delta_{n,t}^+ \cdot \text{FC}_{i,t-1} \cdot \text{FC}_{n,t-1}^{\text{peer}} + \beta_2' \cdot \delta_{n,t}^+ \cdot \text{FC}_{i,t-1}}_{\text{Upturns}} \\
 & + \underbrace{\tilde{\beta}_1 \cdot \epsilon_{i,t} \cdot \text{FC}_{i,t-1} \cdot \text{FC}_{n,t-1}^{\text{peer}} + \tilde{\beta}_2 \cdot \epsilon_{i,t} \cdot \text{FC}_{i,t-1} + \tilde{\beta}_3 \cdot \epsilon_{i,t} \cdot \text{FC}_{n,t-1}^{\text{peer}} + \tilde{\beta}_4 \cdot \epsilon_{i,t}}_{\text{Idiosyncratic}} \\
 & + \beta_5 \cdot \text{FC}_{i,t-1} \cdot \text{FC}_{n,t-1}^{\text{peer}} + \beta_6 \cdot \text{FC}_{i,t-1} \\
 & + \text{Full interaction controls}_{i,t} + \text{Other controls}_{i,t-1} + \text{Lags} \\
 & + \text{Firm FE}_i + \text{Industry} \times \text{Time FE}_{n,t} + \zeta_{i,t}
 \end{aligned}$$

Full interaction controls: Size, productivity, Tobin's Q, past lumpy investment. Lags: 3 quarters.

Two Potential Channels

Does a positive β_1 lead to countercyclical aggregate effects? Not necessary. Two channels give exactly the same firm-level estimates.

- **Competitive interaction channel:** Unconstrained firms substitute depressed investment by constrained competitors, positive equilibrium effects
- **Strategic deterrence channel:** Unconstrained firms proactively increase investment to crowd out investment by constrained competitors, ambiguous equilibrium effects

We need some theoretical intuition...

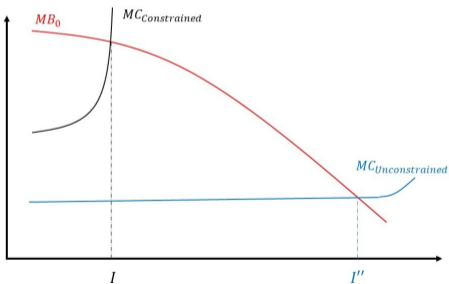
Outline

- Introduction
- Empirical Results
- Theoretical Intuition
- Conclusions

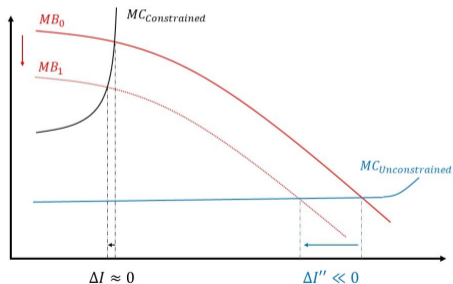
Competitive Interactions

Stylized diagrams following Ottonello **and** Winberry (2020):

- Unconstrained firms more responsive to changes in marginal benefits (MB)
- If constrained competitors forgo investment ($MB \uparrow$), unconstrained firms respond strongly



Static

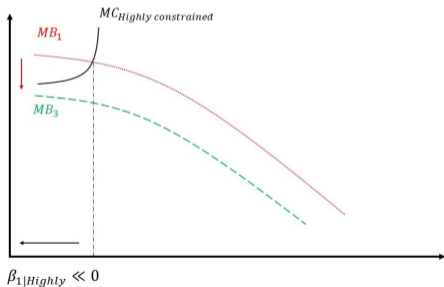


Changes in expected returns

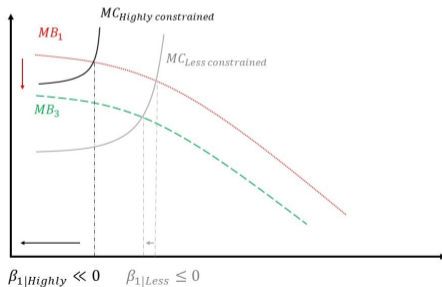
Strategic Deterrence

Alternatively, unconstrained firms can over-invest as strategic deterrence

- Highly constrained firms will stop investment completely and shrink gradually
- But less constrained firms are far less affected



Highly constrained firms (black)



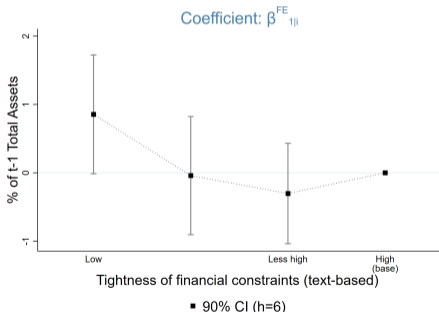
Less constrained firms (light color)

Hypothesis testing

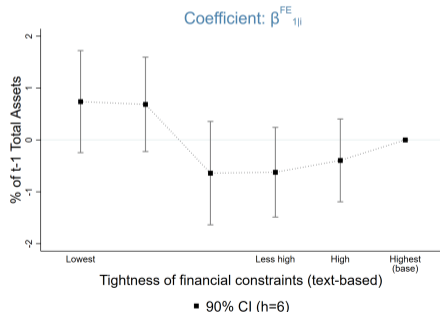
Strategic deterrence exists only when

$$\beta_1 | \text{Highly constrained} \ll \beta_1 | \text{Less constrained} \leq 0 \ll \beta_1 | \text{Unconstrained} \quad (2)$$

which is not what we see empirically:



In constrained industries ($n = 4$)



In constrained industries ($n = 6$)

Conclusions

- During industry downturns, financially unconstrained firms increase investment to substitute depressed investment by constrained competitors
- Aggregate effects of such interactions during downturns are countercyclical, which partially offset adverse effects on constrained firms
- A new channel that has not been emphasized in the recent macro-finance literature

Appendix

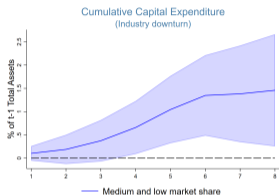
- Appendix

Full Regression Table (Tables 2 & A.3 in the WP)

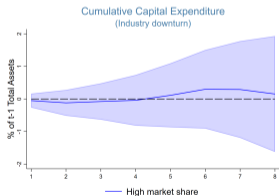
[▶ Back](#)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Financially unconstrained firms							
	Leverage dummy				Text-based dummy			
Industry downturns								
Downturn x Dummy	-0.07 (0.25)	-0.16 (0.28)	-0.19 (0.30)	-0.12 (0.25)	0.13 (0.16)	0.09 (0.19)	0.03 (0.21)	-0.00 (0.17)
Downturn x Dummy x Constrained peers (β_1)	1.21** (0.47)	1.72** (0.67)	1.51** (0.68)	1.43** (0.69)	0.53 (0.37)	1.06*** (0.38)	1.25*** (0.43)	1.16*** (0.38)
Industry upturns								
Upturn x Dummy	0.10 (0.28)	-0.15 (0.32)	-0.18 (0.34)	-0.17 (0.32)	-0.27** (0.12)	-0.16 (0.14)	-0.03 (0.17)	-0.04 (0.15)
Upturn x Dummy x Constrained peers	-0.07 (0.42)	0.25 (0.45)	0.42 (0.48)	0.37 (0.43)	0.09 (0.44)	0.26 (0.44)	0.39 (0.46)	0.25 (0.37)
Idiosyncratic shocks								
Idiosyncratic shocks (β_4)	0.73*** (0.09)	0.74*** (0.10)	0.62*** (0.08)	0.63*** (0.07)	0.74*** (0.09)	0.75*** (0.09)	0.60*** (0.08)	0.65*** (0.07)
Idio. shocks x Dummy	0.02 (0.13)	0.06 (0.15)	0.07 (0.16)	0.09 (0.14)	-0.03 (0.08)	0.01 (0.08)	0.09 (0.10)	-0.02 (0.10)
Idio. shocks x Constrained peers (β_3)	-0.36*** (0.09)	-0.41*** (0.11)	-0.23** (0.09)	-0.23** (0.09)	-0.33*** (0.12)	-0.36*** (0.13)	-0.18 (0.11)	-0.23** (0.11)

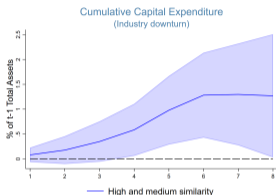
Firm and Industry Characteristics



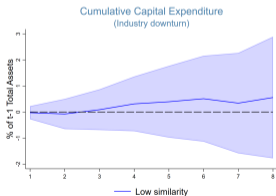
Market share \leq 75th



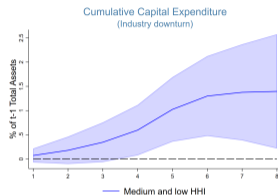
Market share $>$ 75th



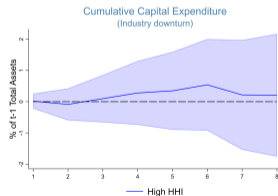
Product similarity $>$ 25th



Product similarity \leq 25th



HHI \leq 75th



HHI $>$ 75th

Notes: This figure extends the main specification by splitting the sample by firm market share, firm product similarity, and industry HHI. Confidence intervals are 95% in all panels. Thresholds are indicated in panel titles.