

Macro Shocks and Firm Dynamics with Oligopolistic Financial Intermediaries

Alessandro T. Villa

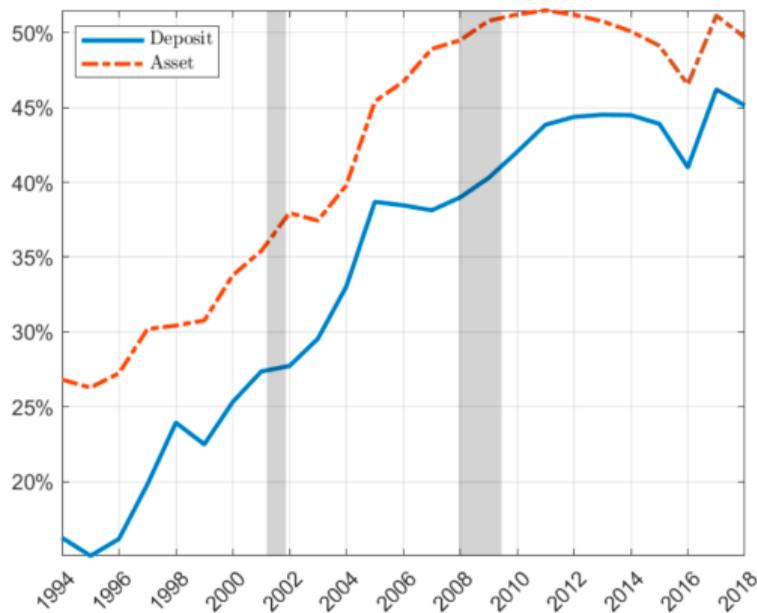
Discussion by Tim Landvoigt
Wharton & NBER

Dallas Fed / CEMLA Financial Stability Workshop
November 30, 2023

Background

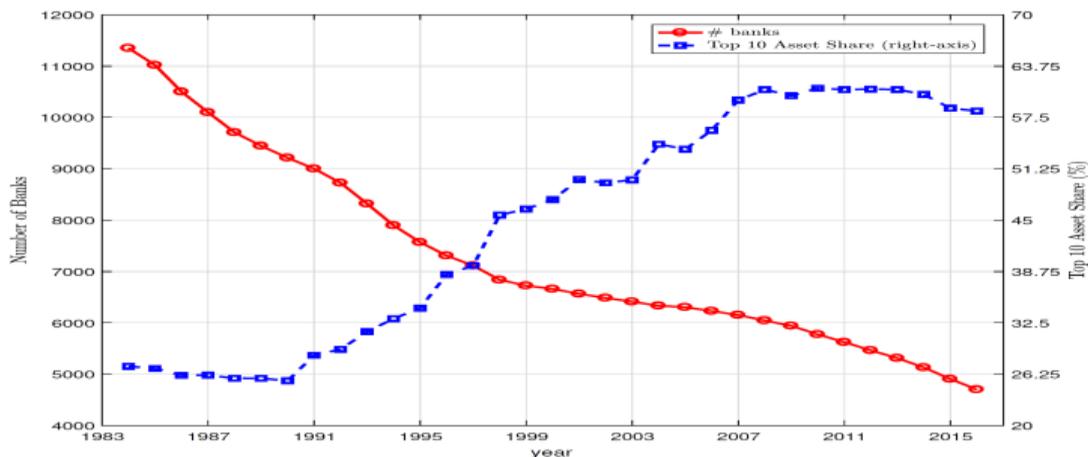
- ▶ Banking sector in U.S. is very concentrated
 - ▶ Largest 5 national banks have 40-50% market share in C& I lending

Figure C5. MARKET SHARE OF THE TOP 5 US BANKS



Background

- ▶ Banking sector in U.S. is very concentrated
 - ▶ Largest 5 national banks have 40-50% market share in C& I lending



- ▶ High concentration suggests that largest banks have market power, although extent strongly debated (figure from Corbae & D'Erasmus 2021)

Background

- ▶ Banking sector in U.S. is very concentrated
 - ▶ Largest 5 national banks have 40-50% market share in C& I lending
 - ▶ High concentration suggests that largest banks have market power, although extent strongly debated (figure from Corbae & D'Erasmus 2021)
- ▶ This paper combines dynamic model of heterogeneous firms with imperfect competition among lenders
 - ▶ Methodological contribution: compute Markov-perfect equilibrium of bank oligopoly and cross-section of firms
 - ▶ Main mechanism: banks internalize high MPK of young firms, charge mark-ups \Rightarrow endogenous financial constraints due to imperfect competition
 - ▶ Rise in market power can exacerbate macro shocks through reduction in credit supply in crises

Outline

- ▶ Review model structure
- ▶ Main results
 1. Loan pricing in the cross-section
 2. Imperfect competition and macro shocks
- ▶ Comments / Suggestions
 1. Model versus Data
 2. Market Power and Aggregate Shocks
 3. Wish List

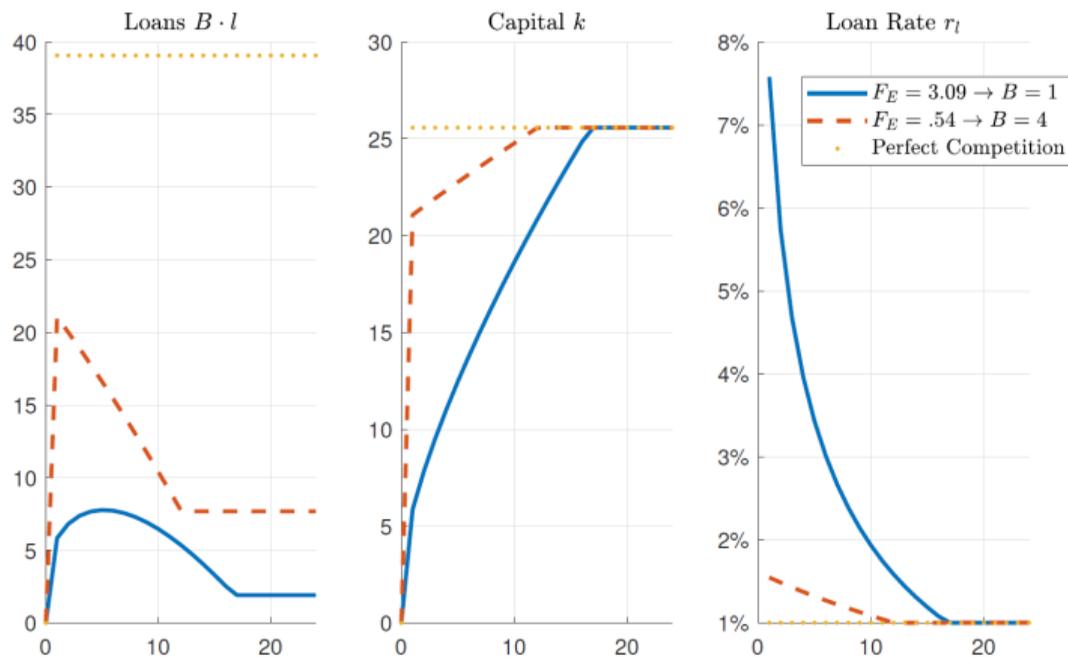
Model Structure

- ▶ Cross-section of firms with DRS and equity issuance costs
 - ▶ Firms start small and grow to optimal size
 - ▶ Borrow one-period debt, do **not** face “hard constraints” on debt financing
 - ▶ Constant exogenous risk of exit (=default)
- ▶ N incumbent intermediaries lend to firms, issue deposits to household
 - ▶ Symmetric Cournot game in loan markets
 - ▶ Can choose to default and exit
 - ▶ Entry cost limits number of incumbents
 - ▶ No capital regulation / leverage constraint
- ▶ No aggregate risk; only source of firm risk are exit shocks
 - ▶ Transition paths after MIT shocks to aggregate TFP and firm exit rate

Loan Pricing in Cross-section of Firms

- ▶ Banks condition loan rates on firm size \propto age

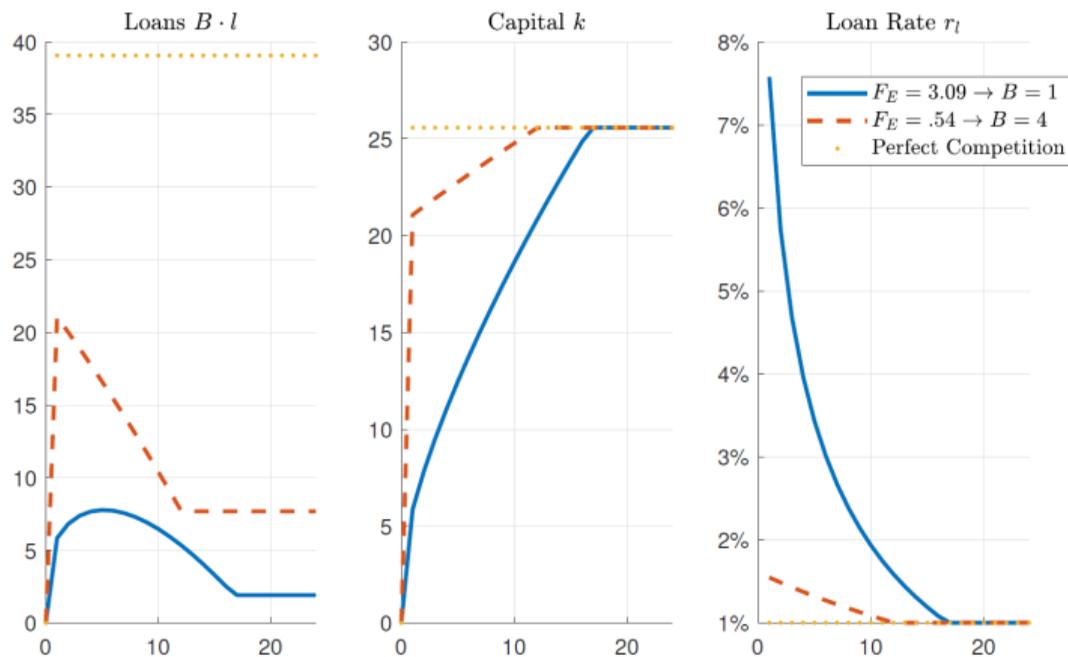
Figure 1. STATIONARY EQUILIBRIUM AND FIRMS' LIFE CYCLE



Loan Pricing in Cross-section of Firms

- ▶ Imperfect competition \Rightarrow price discrimination

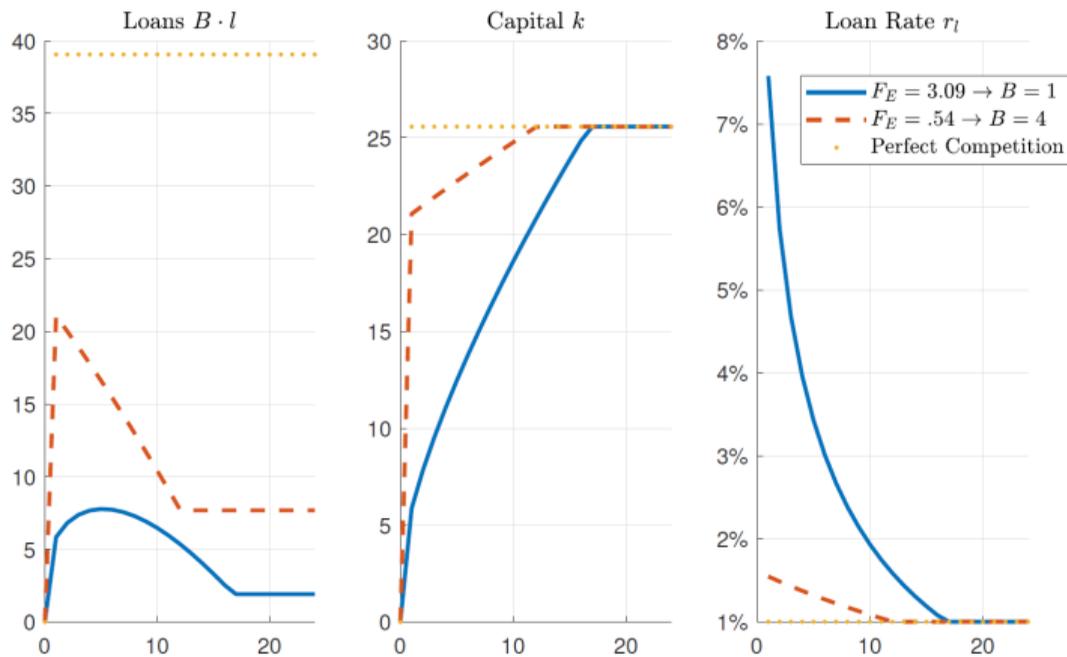
Figure 1. STATIONARY EQUILIBRIUM AND FIRMS' LIFE CYCLE



Loan Pricing in Cross-section of Firms

- ▶ By internalizing high MPKs of young/small firms, banks impose financial constraints on firm growth

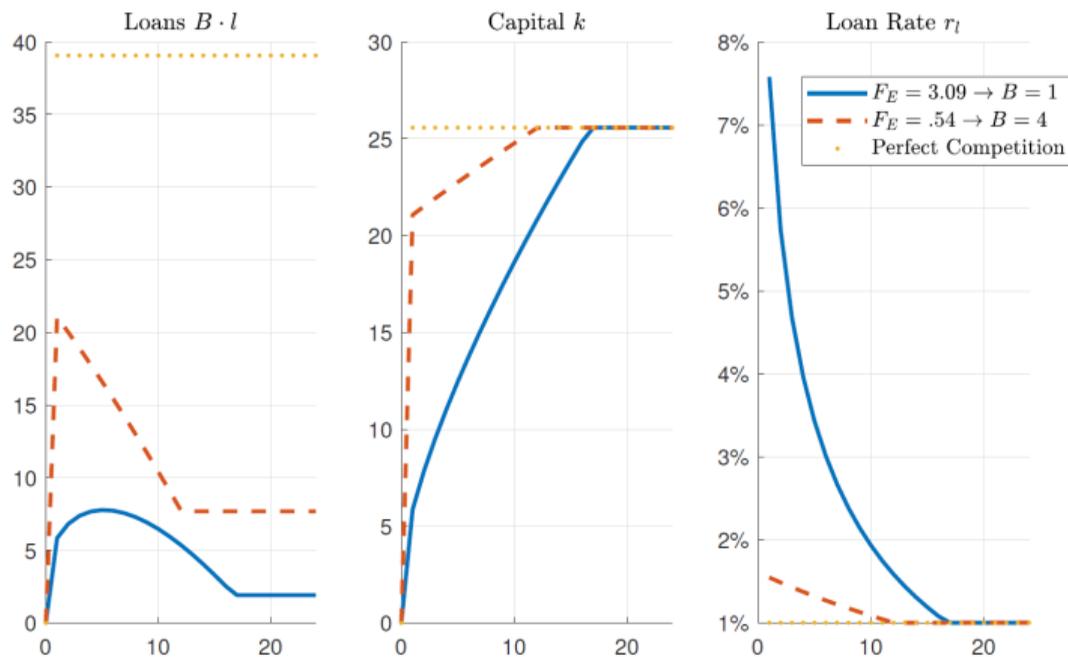
Figure 1. STATIONARY EQUILIBRIUM AND FIRMS' LIFE CYCLE



Loan Pricing in Cross-section of Firms

- ▶ Perfect competition benchmark: firms borrow from HH in frictionless debt market

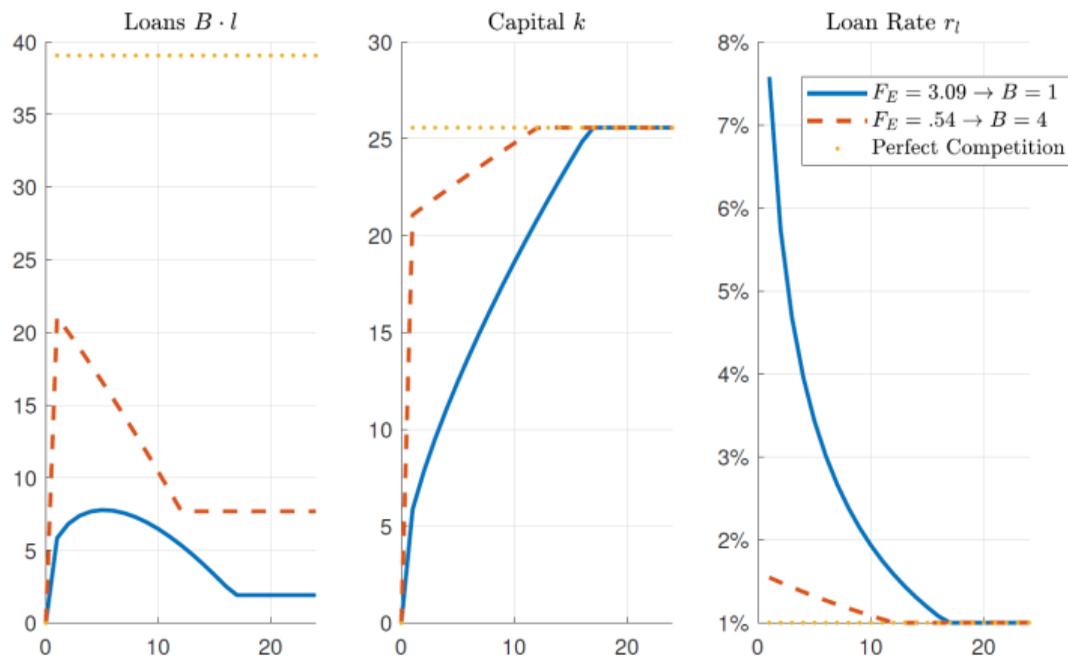
Figure 1. STATIONARY EQUILIBRIUM AND FIRMS' LIFE CYCLE



Loan Pricing in Cross-section of Firms

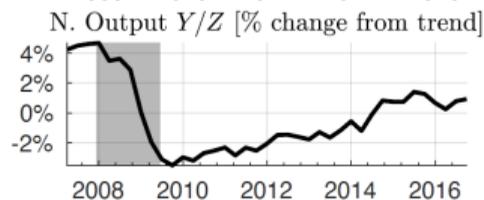
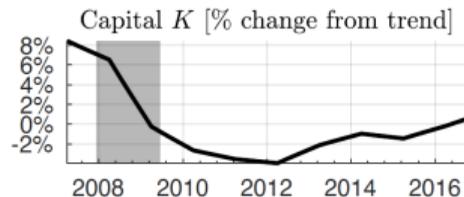
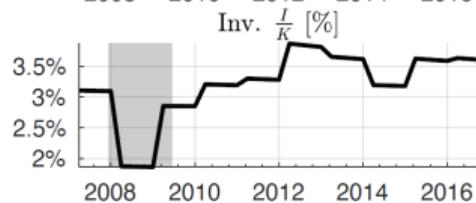
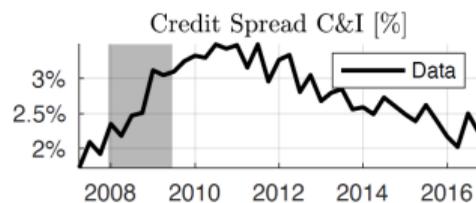
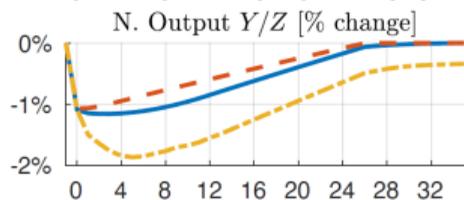
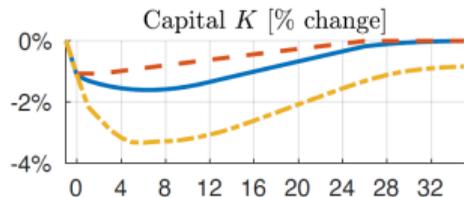
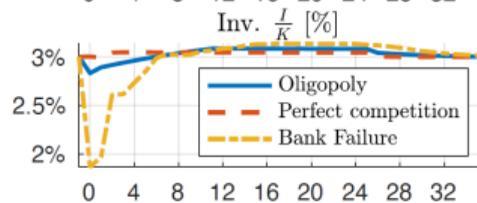
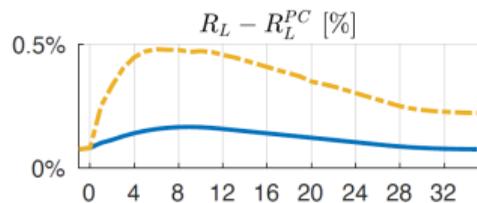
- ▶ Loan markups in 4-bank oligopoly close to perfect competition

Figure 1. STATIONARY EQUILIBRIUM AND FIRMS' LIFE CYCLE



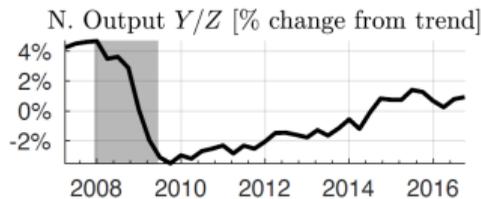
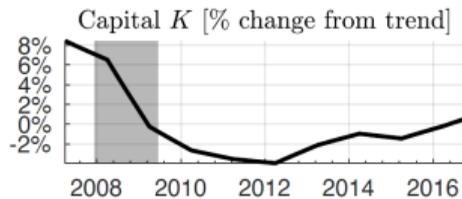
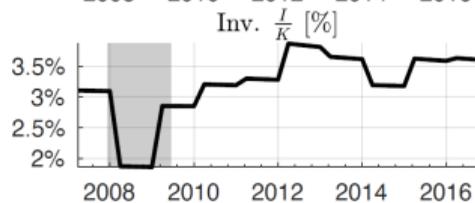
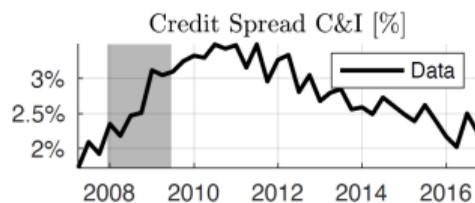
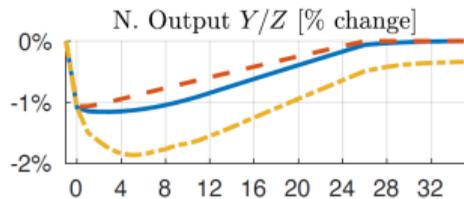
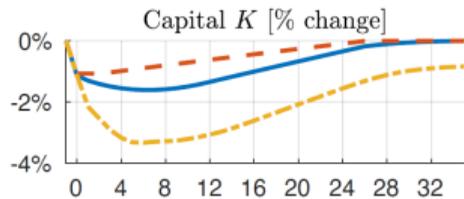
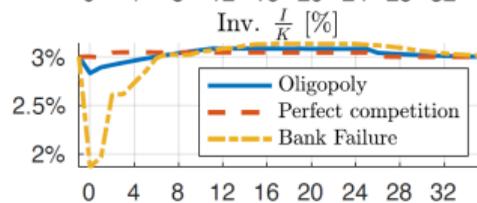
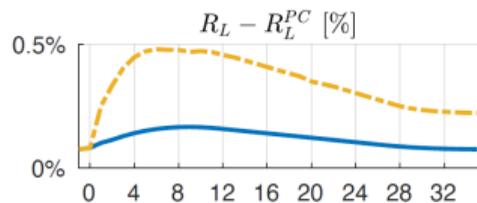
Credit Supply and Macro Shocks

- ▶ With only 4 banks, one bank failure = 25% of banking system goes down!



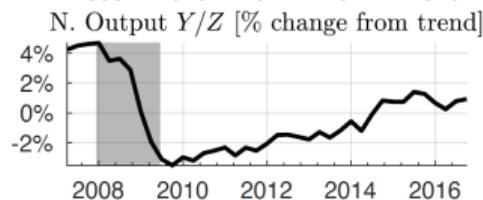
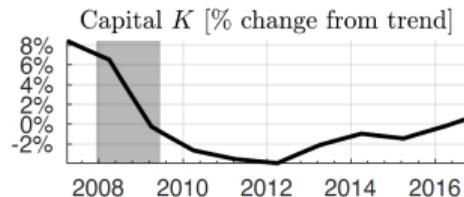
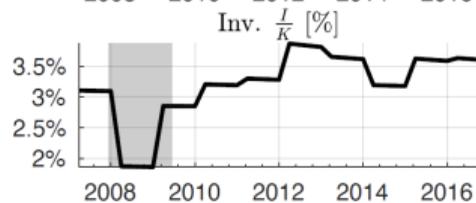
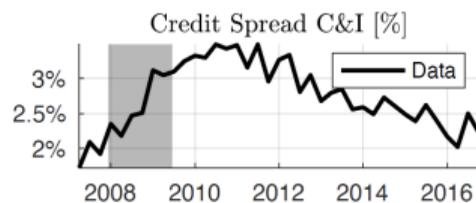
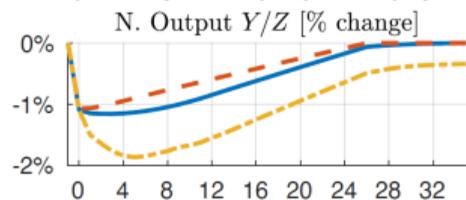
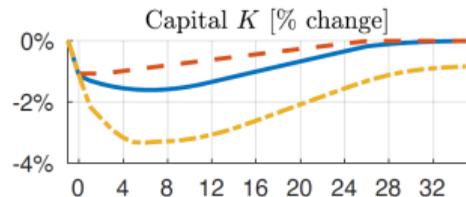
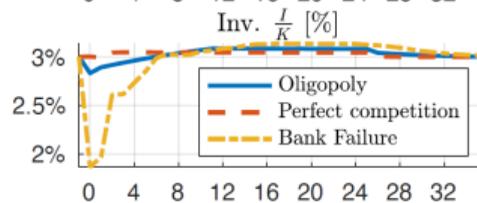
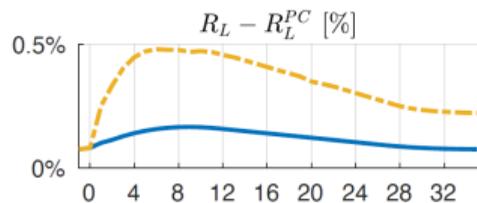
Credit Supply and Macro Shocks

- ▶ Dramatic effects on loan supply; surprisingly moderate effects on investment



Credit Supply and Macro Shocks

- ▶ Likely means not many constrained firms in baseline steady state



Comment #1: Reality is Complicated

from Begenau-Stafford 2022

Table 1: **Summary Statistics by Bank Decile**

	Bank Deciles									
	1	2	3	4	5	6	7	8	9	10
Number of Banks	599	599	599	599	599	599	599	599	599	599
Number of Banks using Networks	330	355	373	393	423	445	469	507	553	573
Number of Branches	702	797	918	1043	1150	1337	1582	1995	3038	28010
Number of Rate Setting Branches	341	403	431	448	440	448	431	432	450	1054
Number of Network Branches	428	545	685	815	949	1151	1419	1858	2926	27745
Number of Independent Branches	274	252	233	228	201	186	163	137	112	265
Network Branches to Total Ratio	0.61	0.68	0.75	0.78	0.83	0.86	0.90	0.93	0.96	0.99
Number of high HHI Follower Branches	176	198	231	277	323	437	463	618	948	7617
Followers in high HHI to Total Branch Ratio	0.25	0.25	0.25	0.27	0.28	0.33	0.29	0.31	0.31	0.27
Agg. Asset Share	0.00	0.00	0.00	0.01	0.01	0.01	0.02	0.02	0.04	0.89
Agg. Deposit Share	0.00	0.00	0.01	0.01	0.01	0.01	0.02	0.03	0.04	0.87
Agg. Loan Share	0.00	0.00	0.01	0.01	0.01	0.01	0.02	0.03	0.04	0.87
Agg. Business Loan Share	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.02	0.03	0.90
Deposits per Branch (\$ M)	16.0	22.9	26.2	29.6	31.9	30.8	35.4	35.9	37.1	45.1
Deposits per Branch in High HHI Counties (\$ M)	15.0	22.3	25.2	27.8	29.2	26.4	32.3	30.8	30.9	43.8
Deposits per Branch in Low HHI Counties (\$ M)	15.8	21.3	26.3	31.5	33.0	29.9	36.0	40.3	37.5	44.6
Sum of Deposits in High HHI Counties (\$ B)	5	9	12	14	16	19	22	26	36	341
Sum of Follower Branch Deposits in High HHI Cts (\$ B)	2	4	5	7	9	11	15	18	30	314
Geographic HHI range of Follower Br.	0.08	0.08	0.08	0.09	0.09	0.11	0.11	0.16	0.18	0.31
Geographic Rate range of Follower Br.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Comment #1: Bank Competition in Model versus Data

- ▶ Top decile of banks by size has 599 banks with 28,000 branches
- ▶ Most counties, especially large MSAs where most firms are located, have 10+ different banks

Comment #1: Bank Competition in Model versus Data

- ▶ Top decile of banks by size has 599 banks with 28,000 branches
- ▶ Most counties, especially large MSAs where most firms are located, have 10+ different banks
- ▶ Cournot with 4 symmetric banks probably not good representation of competitive behavior
 - ▶ May overstate market power due to small number of players
 - ▶ But likely understates market power for realistic N , since Cournot game known to converge rapidly to perfect competition as N increases ($10 \approx$ perfect competition)
 - ▶ Even with only 4 players, model produces aggregate loan rate markup of 0.06%
 - ▶ Some evidence that bank market power mainly on liability side (deposits)

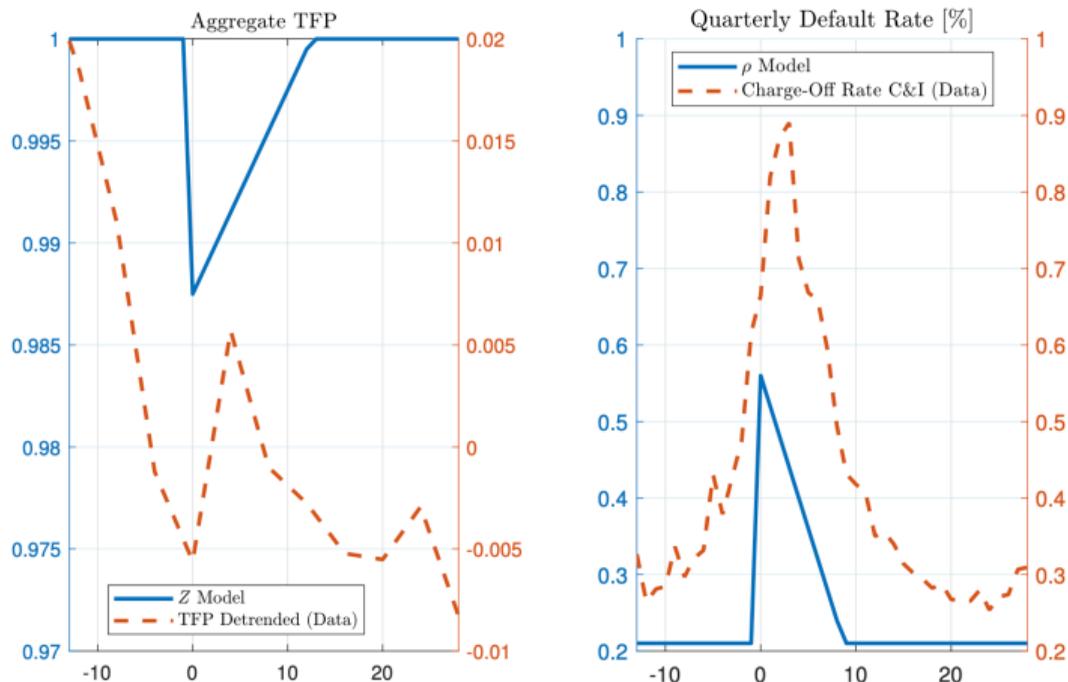
Comment #1: Bank Competition in Model versus Data

- ▶ Top decile of banks by size has 599 banks with 28,000 branches
- ▶ Most counties, especially large MSAs where most firms are located, have 10+ different banks
- ▶ Cournot with 4 symmetric banks probably not good representation of competitive behavior
 - ▶ May overstate market power due to small number of players
 - ▶ But likely understates market power for realistic N , since Cournot game known to converge rapidly to perfect competition as N increases ($10 \approx$ perfect competition)
 - ▶ Even with only 4 players, model produces aggregate loan rate markup of 0.06%
 - ▶ Some evidence that bank market power mainly on liability side (deposits)
- ▶ Model provides technical advancement over literature, but too stylized to match to data? Combine oligopoly with “competitive fringe” of small banks (Corbae & D’Erasmus 2021)?

Comment #2: Market Power and Aggregate Shocks (1/3)

- ▶ Shock I combines small TFP drop with small rise in defaults

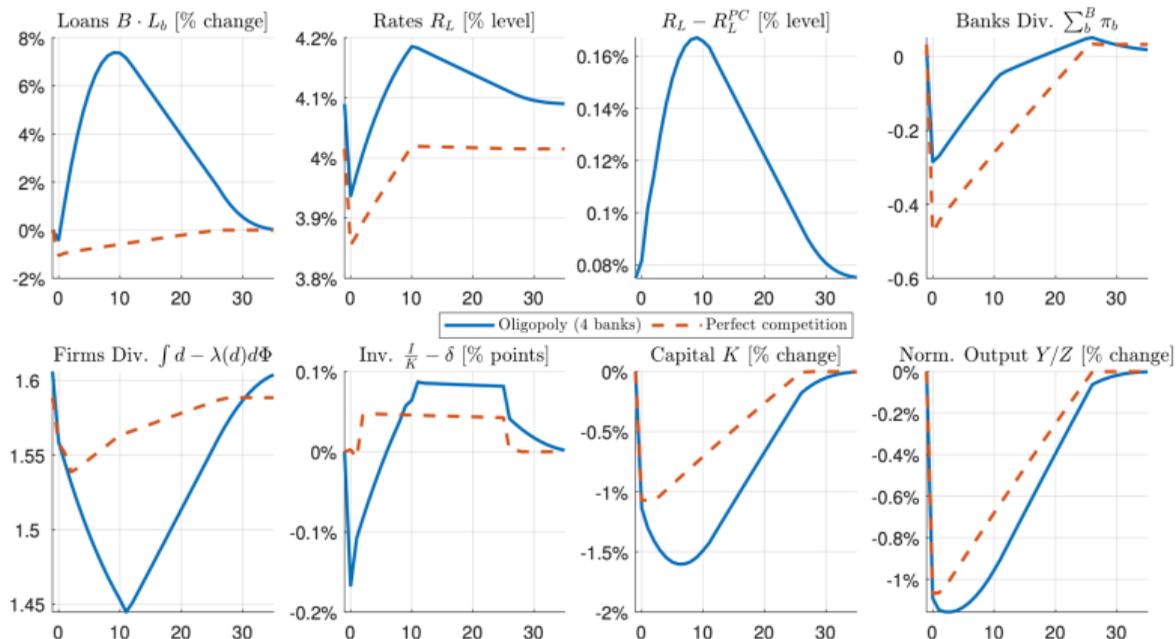
Figure C3. SHOCK I



Comment #2: Market Power and Aggregate Shocks (1/3)

- ▶ If shock doesn't trigger bank default, imperfect competition causes **increase** in lending

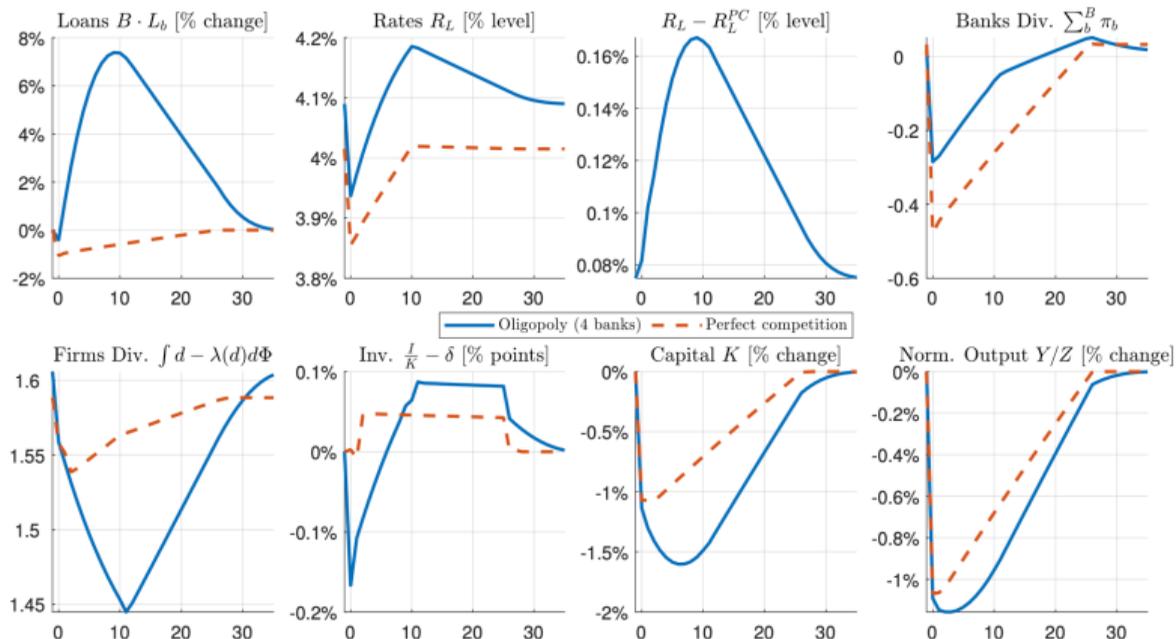
Figure 2. CREDIT QUALITY SHOCK, FINANCING, AND REAL ACTIVITY



Comment #2: Market Power and Aggregate Shocks (1/3)

- Reason: banks happy to accommodate surge in demand for loans, earn higher markup

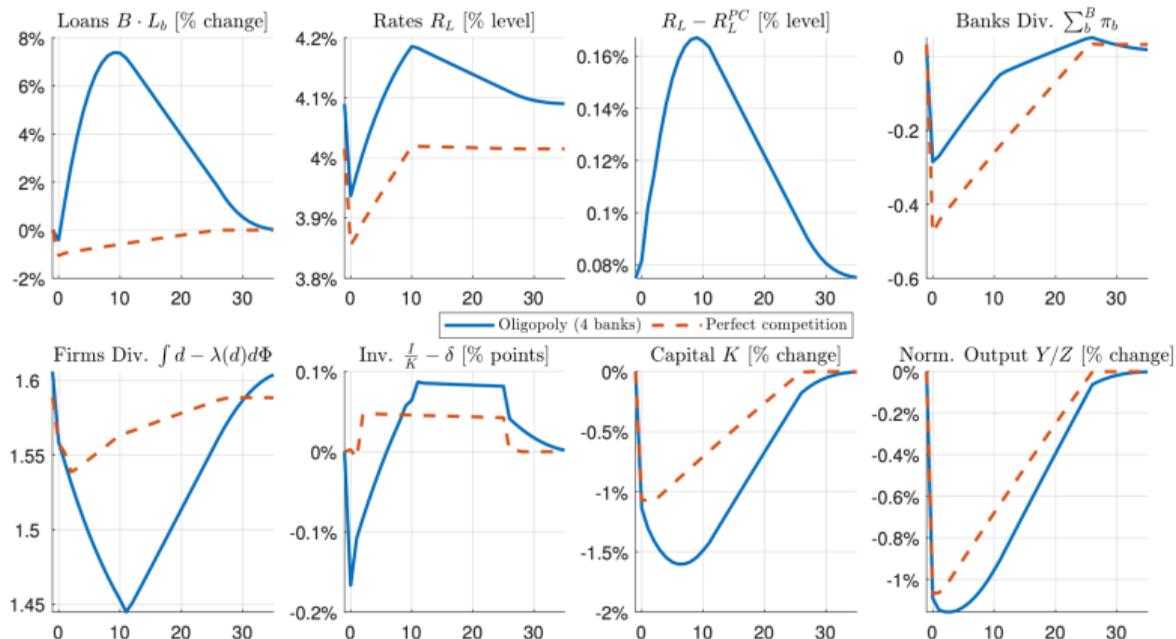
Figure 2. CREDIT QUALITY SHOCK, FINANCING, AND REAL ACTIVITY



Comment #2: Market Power and Aggregate Shocks (1/3)

- ▶ Is this a clean counterfactual? Firm size distribution likely very different under perfect competition

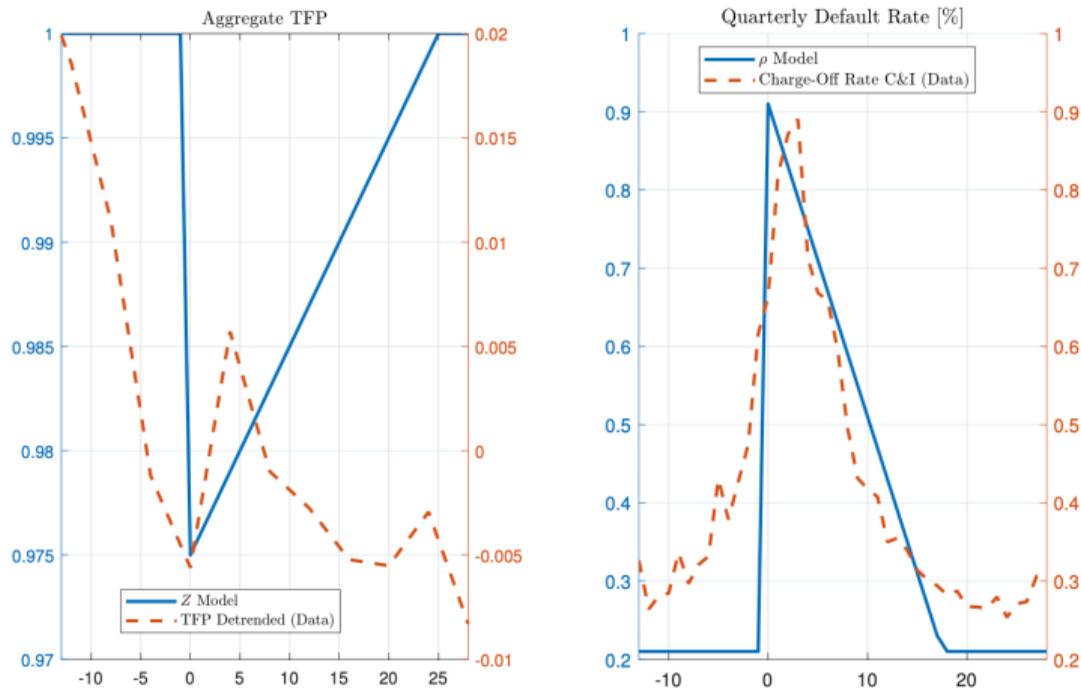
Figure 2. CREDIT QUALITY SHOCK, FINANCING, AND REAL ACTIVITY



Comment #2: Market Power and Aggregate Shocks (2/3)

- ▶ Shock II combines moderate TFP drop with larger rise in defaults

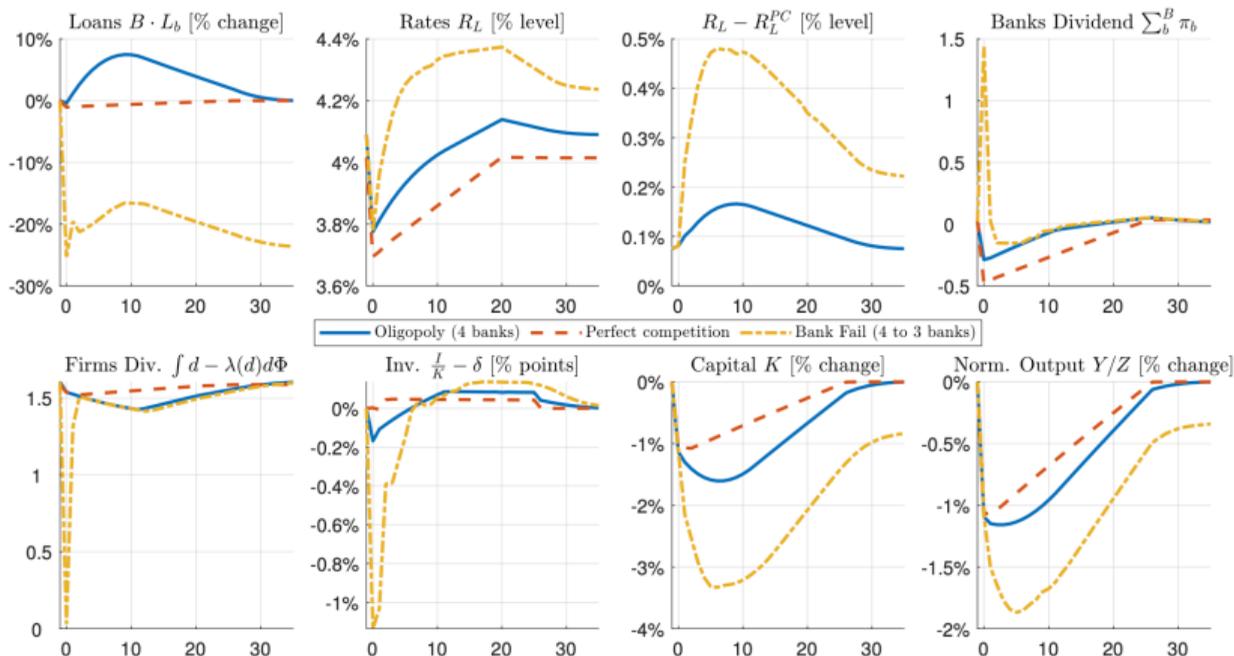
Figure C4. SHOCK II



Comment #2: Market Power and Aggregate Shocks (2/3)

- ▶ Shock triggers bank default \Rightarrow surviving banks take advantage of new market power

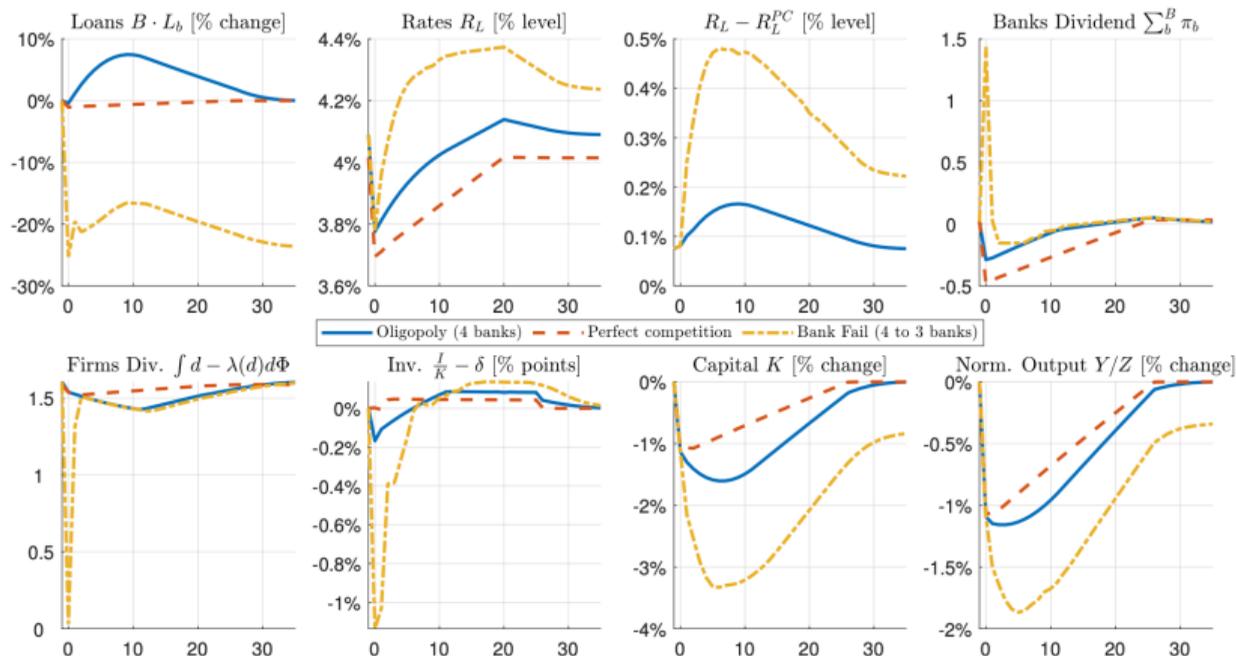
Figure 5. BANK DEFAULT, FINANCING, AND REAL ACTIVITY



Comment #2: Market Power and Aggregate Shocks (2/3)

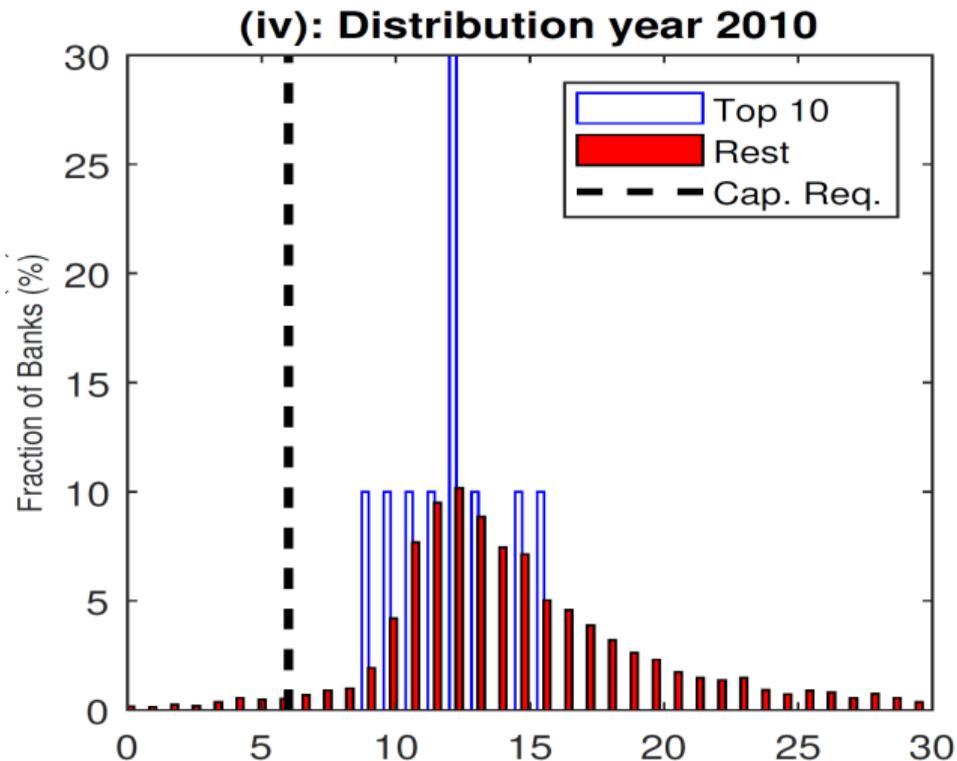
- ▶ Why does moderate shock trigger bank default? Likely answer: MIT shock, no aggregate risk.

Figure 5. BANK DEFAULT, FINANCING, AND REAL ACTIVITY



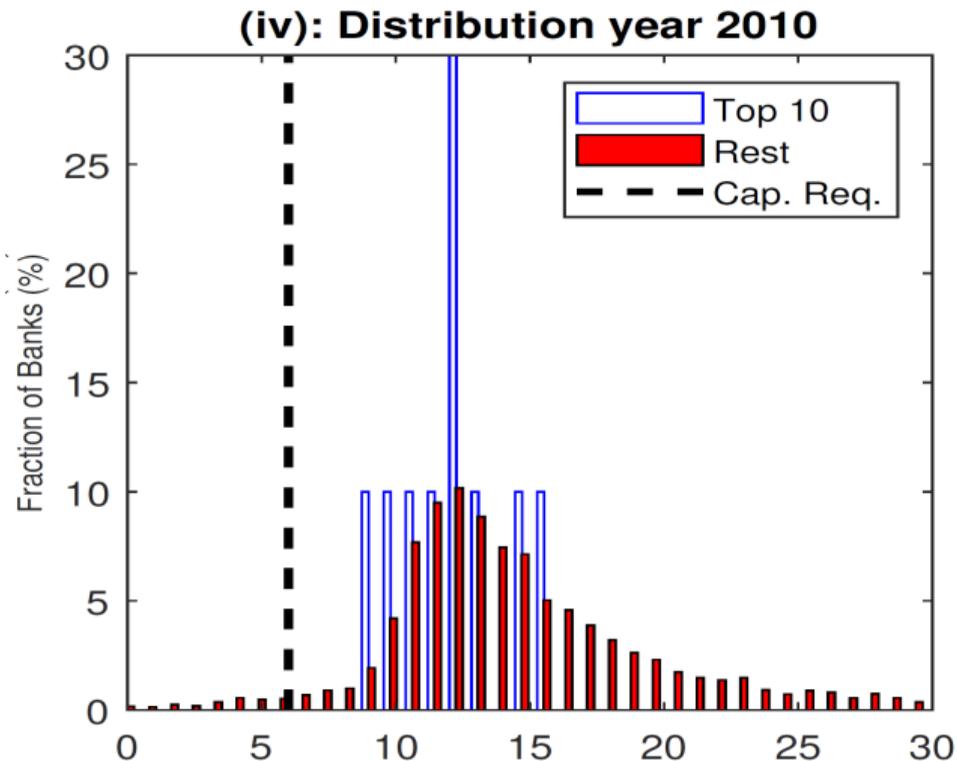
Comment #2: Market Power and Aggregate Shocks (3/3)

- ▶ When facing aggregate risk, banks want to protect franchise value, hold precautionary equity buffer (figure from Corbae & D'Erasmus 2021)



Comment #2: Market Power and Aggregate Shocks (3/3)

- ▶ Would expect imperfect competition to make banking system less fragile



Comment #3: Wish List

- ▶ How does market power interact with deposit insurance and implicit bailout guarantees (too-big-too-fail)?
- ▶ Interaction of imperfect competition with regulation such as capital requirements? Would effectively increase cost of entry?
- ▶ More realistic model of firm distribution (paper already has extension with idiosyncratic productivity shocks)
 - ▶ Does rising bank concentration beget rising firm concentration, since young/small firms more reliant on bank financing?
 - ▶ Or does rising firm concentration cause rising bank concentration, because large firms don't need banks?
- ▶ Monetary policy pass-through with imperfectly competitive banking sector

Summary

- ▶ Combining heterogeneous firm model with non-competitive banking sector
 - ▶ Parsimonious model with transparent economics
 - ▶ Methodological contribution on solution technique
 - ▶ Highly educational paper; will teach to PhD students
- ▶ Endogenous financial constraints on growing firms due to price discrimination
 - ▶ Promising extension with idiosyncratic firm productivity
- ▶ Hard to map model of Cournot competition to bank data
 - ▶ Likely understates degree of market power even with only 4 banks due to rapid convergence
 - ▶ Maybe combine with “sticky deposits” to get larger markups over deposit rates?