Regulation, Competition, and Stability in the Banking Industry

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- If there is a tradeoff between competition and stability, how should macro-prudential policy be designed?

Competition vs. Stability: Theory

Competition-fragility view (e.g. Allen & Gale (2000))

- Increased competition can reduce bank profit margins and charter values, encouraging banks to increase the riskiness of their loan portfolios.
- Yields adverse effects on bank stability.

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U-shaped relation between competition and stability (e.g. Martinez-Miera & Repullo (2010))

- At low levels of competition, risk shifting dominates (lowering bank failure) while at high levels of competition, margin effects dominate (raising bank failure).

Competition vs. Stability: Empirics

- Regressions of risk measures like
  - nonperforming loans,

  on competition measures like
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  yield conflicting findings.

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- **Jiang, Levine, Lin (2017) Innovation**: A new measure of regulation induced competition using pre-Riegle-Neal (1995) deregulation and distance induced measures of competition.
- **JLL results**: Increased competition leads to more instability (lower profitability and charter values).

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- In a dynamic model, the possible loss of bank charter value tempers bank risk taking.
- However, as in JLL, policy changes may reduce bank profitability and charter values inducing costly exit (Granga et. al. (2017) estimate 28% loss).

Model Essentials

Banks intermediate between

- Unit mass of identical risk averse households who are offered insured bank deposit contracts or outside storage technology (Deposit supply). Insurance funded by lump sum transfers.
- Unit mass of identical risk neutral borrowers who demand funds to undertake i.i.d. risky projects with unobservable outside nonbank option (Loan demand).
- By lending to a large # of borrowers, a given bank diversifies risk (banks as delegated monitors as in Diamond (1984)).
- Loan market clearing determines interest rate $r_t^L(\eta_t, z_t)$ where η_t is the cross-sectional distribution of banks and z_t are beginning of period t shocks.

Model Essentials - cont.

Deviations from Modigliani-Miller for Banks (influence costly exit):

- Limited liability and deposit insurance (moral hazard)
- Equity finance and bankruptcy costs
- Noncontingent loan contracts
- Market power by a subset of banks

Stochastic Processes

- Aggregate Technology Shocks $z_{t+1} \in \{z_b, z_g\}$ follow a Markov Process $F(z_{t+1}, z_t)$ with $z_b < z_g$ (business cycle).
- Conditional on z_{t+1}, project success shocks which are iid across borrowers are drawn from $p(R_t, z_{t+1})$ (non-performing loans).
- "Liquidity shocks" (capacity constraint on deposits) which are iid across banks given by $\delta_t \in \{\underline{\delta}, \ldots, \overline{\delta}\} \subseteq \mathbb{R}_{++}$ follow a Markov Process $G^{\theta}(\delta_{t+1}, \delta_t)$ (buffer stock). ▸ Table

Banks - Cash Flow

For a bank of type θ which

- makes loans ℓ_t^θ at rate r_t^L
- accepts deposits d_t^θ at rate r_t^D,
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Its end-of-period profits are given by

$$\pi_{t+1}^\theta = \left\{ p(R_t, z_{t+1})(1 + r_t^L) + (1 - p(R_t, z_{t+1}))(1 - \lambda) - c^\theta \right\} \ell_t^\theta + r^a A_t^\theta - (1 + r^D) d_t^\theta - \kappa^\theta.$$

where

- $p(R_t, z_{t+1})$ are the fraction of performing loans which depends on borrower choice R_t and shocks z_{t+1},
- Charge-off rate λ,
- $(c^\theta, \kappa^\theta)$ are net monitoring and fixed operating costs.

Banks - Capital Ratios and Borrowing Constraints

- After loan, deposit, and security decisions have been made, we can define bank equity capital $\tilde{e}_t^\theta$ as

$$e_t^\theta \equiv \underbrace{A_t^\theta + \ell_t^\theta}_{\text{assets}} - \underbrace{d_t^\theta}_{\text{liabilities}} .$$

- Banks face a Capital Requirement:

$$e_t^\theta \geq \varphi^\theta(\ell_t^\theta + w \cdot A_t^\theta) \qquad \text{(CR)}$$

where w is the "risk weighting" (i.e. $w = 0$ imposes a risk-weighted capital ratio).

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- Banks face an end-of-period Borrowing Constraint:

$$a_{t+1}^\theta = A_t - (1 + r^B)B_{t+1} \geq 0 \qquad \text{(BBC)}$$

Banks - Optimization

- When $\pi^{\theta}_{t+1} < 0$ (negative cash flow), bank can issue equity (at unit cost $\zeta^{\theta}(\cdot)$) or borrow ($B^{\theta}_{t+1} > 0$) against net securities (e.g. repos) to avoid exit.

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- Bank type θ chooses loans, deposits, net securities, non-negative dividend payouts, exit policy to maximize the future discounted stream of dividends

$$E\left[\sum_{t=0}^{\infty} \beta^t \mathcal{D}^{\theta}_{t+1}\right]$$

Defn. Markov Perfect Industry EQ

Given policy parameters:

- Capital requirements,φ^{θ}, and risk weights, w.
- Borrowing rates, r^{B}, and securities rates, r^{a},

a pure strategy Markov Perfect Industry Equilibrium (MPIE) is:

1. Given r^{L}, loan demand $L^{d}(r^{L}, z)$ is consistent with borrower optimization.
2. At r^{D}, households choose whether to deposit at a bank.
3. Bank loan, deposit, net security holding, borrowing, exit, and dividend payment functions are consistent with bank optimization and reaction of other banks.
4. The law of motion for cross-sectional distribution of banks η is consistent with bank entry and exit decision rules.
5. The interest rate $r^{L}(\eta, z)$ is such that the loan market clears.
6. Across all states, taxes cover deposit insurance.

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- More concentrated industry (loan market share of small banks drops (-3.3%)).

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- C-D (2013) conduct too-big-to fail counterfactual - national bank is guaranteed a subsidy in neg. cash-flow states.
  - National bank increases loan exposure to region with high downside risk while loan supply by other banks fall. Taxes to fund deposit insurance rise by nearly 10%.
  - Market share of national banks rise by 50% while regional banks fall by 21% and fringe by 7%.

Empirical Studies of Stability and Concentration

Model Dependent Variable	Logit Crisis$_t$	Linear Default Freq.$_t$
Concentration$_t$	-3.77	0.0294
	(0.86)***	(0.001)***
GDP growth in t	0.81	-1.423
	(0.09)***	(0.021)***
Loan Supply Growth$_t$	-3.38	1.398
	(1.39)**	(0.0289)***
R^2	0.76	0.53

Note: SE in parenthesis.

- As in Beck, et. al. (2003), concentration (market share of top 1%) negatively related to prob. of a banking crisis (e.g. 2xhigher exit rate) (consistent with A-G).
- As in Berger et. al. (2008) concentration is positively related to default frequency (consistent with B-D).

Conclusion

- Stackelberg game implies policy impacting big banks spills over to smaller banks even without balance sheet linkages.
- Can nest IO in general equilibrium (e.g. C-D (2015)).
- Imperfect competition in uninsured funding inflows and possibility of runs (see Egen, Hortascu, and Matvos (2017)).
- A dynamic model with mergers to understand rising concentration trend is on the agenda. ▸ Figure
- Can regulation account for the large differences in concentration across countries (e.g. from World Bank data: asset market share of the top 3 banks in Portugal is 89% versus 35% in the U.S.)?

Deposit Process Estimation

- x_{it}^{θ} is sum of deposits & other borrowings for bank type θ.
- Regress $\log(x_{it}^{\theta})$ on firm and year fixed effects and a linear trend:

$$\log(x_{it}^{\theta}) = b_i^{\theta} + b_{2,t}^{\theta} + b_3^{\theta} t + e_{it}^{\theta}$$

- Let $\log(\delta_{it}^{\theta}) = e_{it}^{\theta}$ and use Arellano and Bond to estimate the AR(1) for deposit shocks:

$$\log(\delta_{it}^{\theta}) = (1 - \rho_d^{\theta}) k_0^{\theta} + \rho_d^{\theta} \log(\delta_{it-1}^{\theta}) + u_{it}^{\theta}, \qquad (1)$$

where u_{it}^{θ} is iid, distributed $N(0, \sigma_u^{\theta})$ and $\sigma_d^{\theta} = \frac{\sigma_u^{\theta}}{(1-(\rho_d^{\theta})^2)^{1/2}}$.

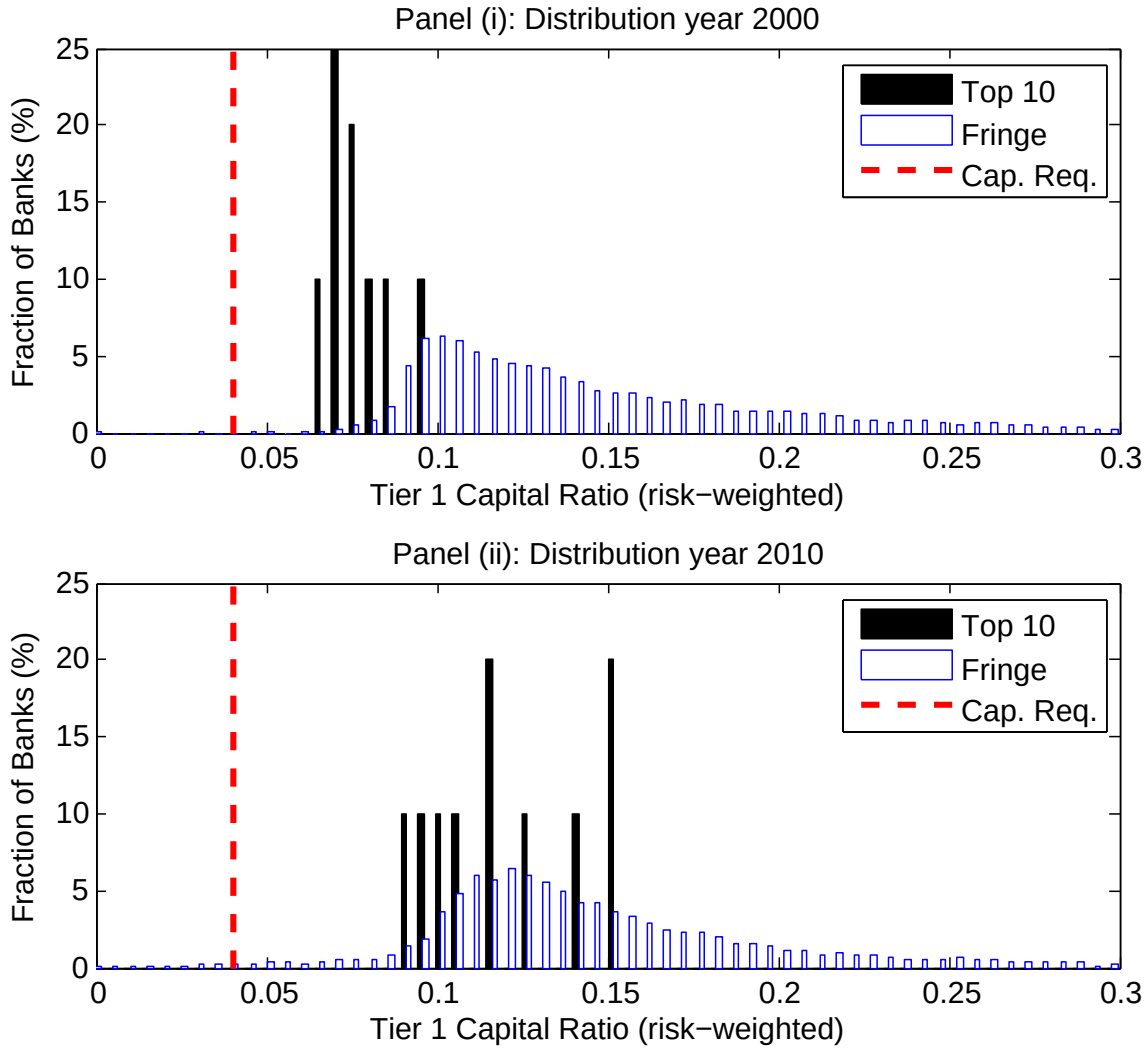
- Discretize using Tauchen (1986) method with 5 states.
- Results:
  - Fringe: $\sigma_u^f = 0.182$, $\rho_d^f = 0.885 \Rightarrow \sigma_d^f = 0.389$
  - Top 10: $\sigma_u^b = 0.157$, $\rho_d^b = 0.384 \Rightarrow \sigma_d^b = 0.191$

- Bigger banks have less volatile funding inflows (implications for buffers). ▸ Return

Capital Ratios by Bank Size from C-D (2014a)

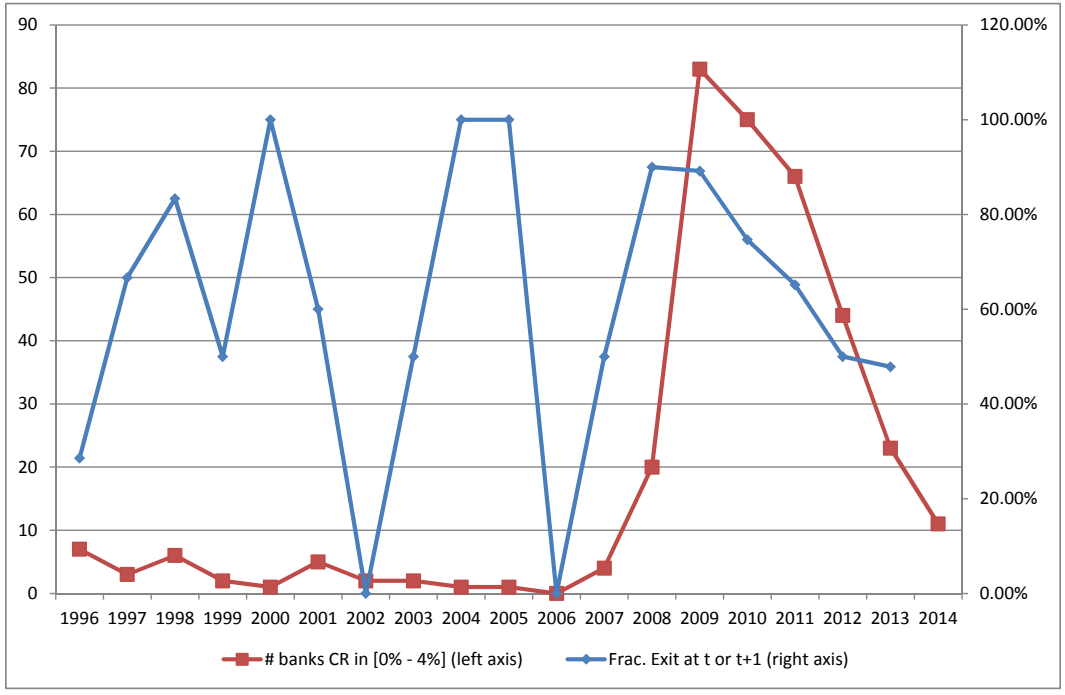
- Risk weighted capital ratios ((loans+net assets-deposits)/loans) are larger for small banks.
- On average, capital ratios are above what regulation defines as "Well Capitalized" ($\geq 6\%$) suggesting a precautionary motive. ▸ Return

Distribution of Bank Capital Ratios



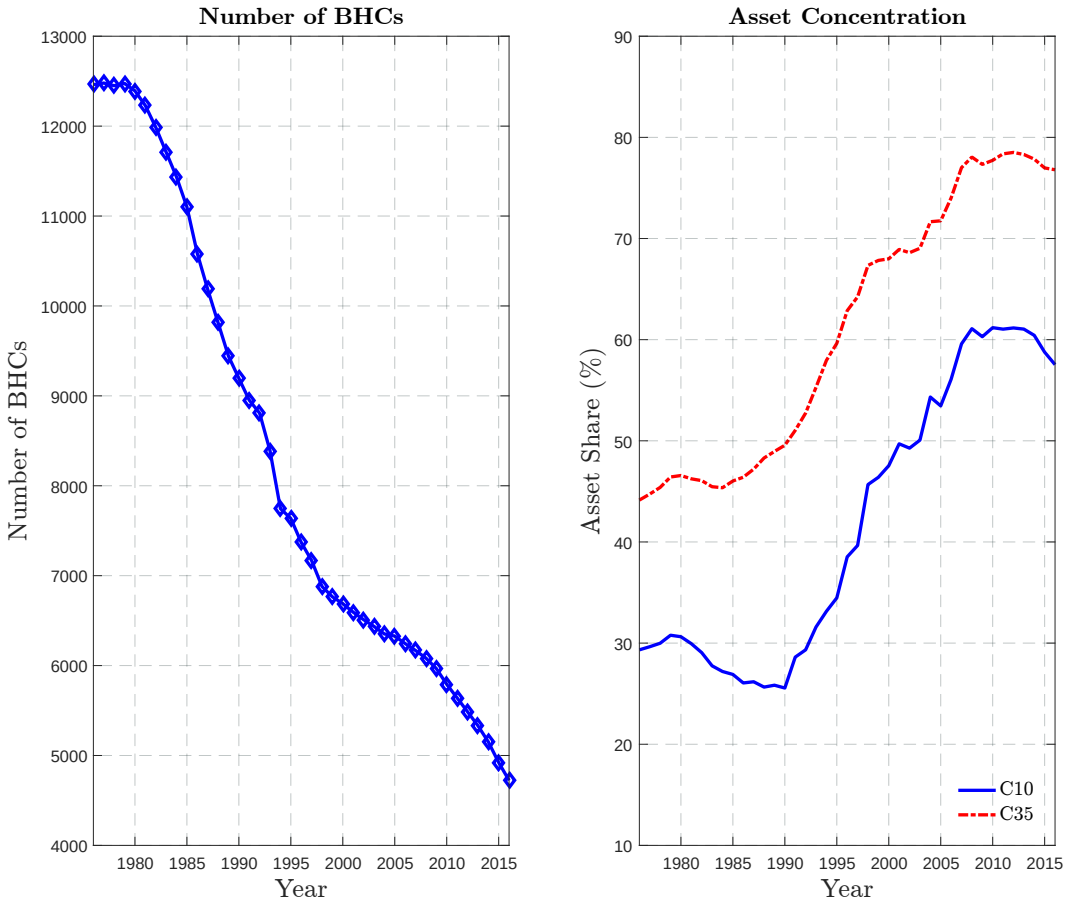
▸ Return

Undercapitalized bank exit



- Number of small U.S. banks below 4% capital requirement rose dramatically during crisis and most exited. ▸ Return

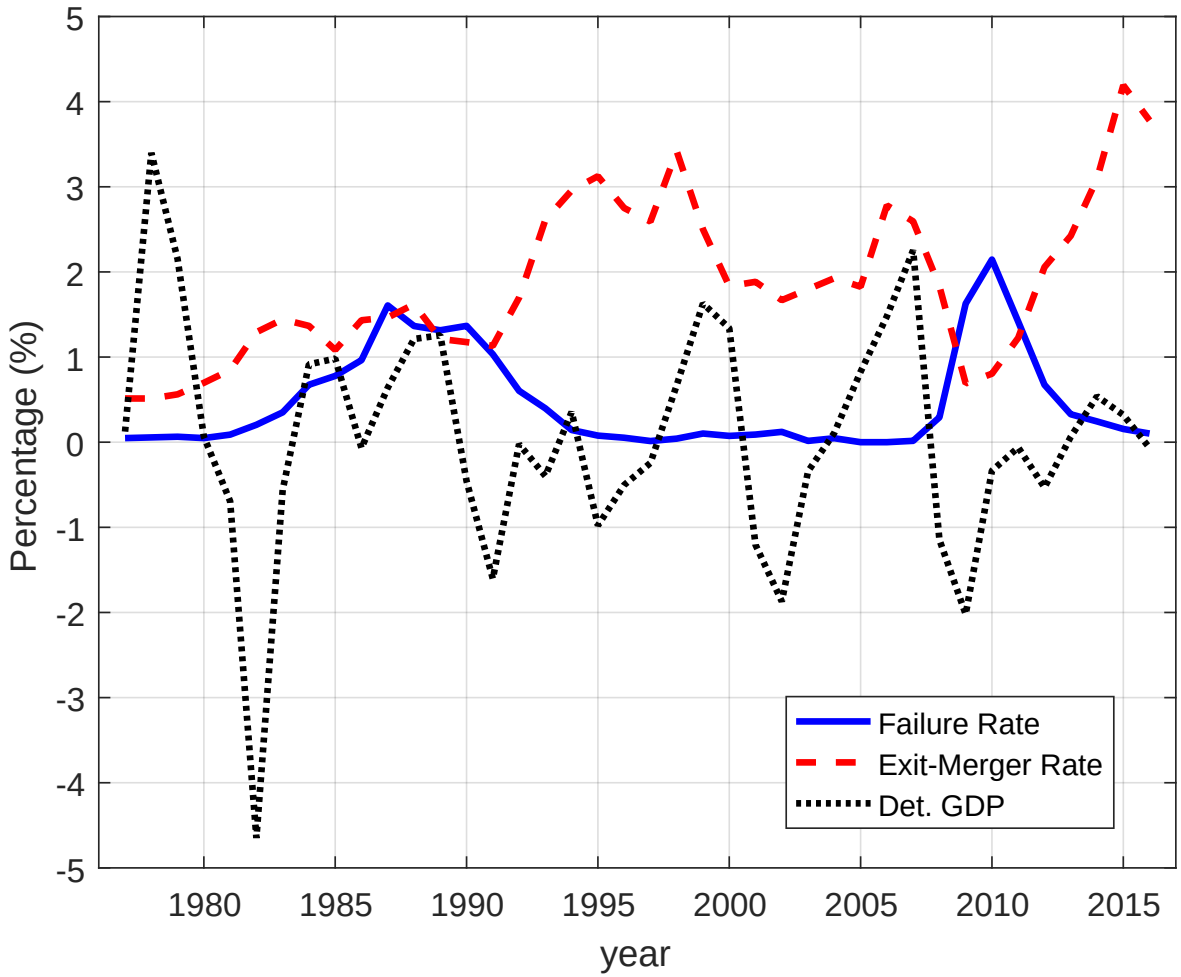
Evolution Number of Banks



- Trends: big drop in number of banks (esp. preceding Riegle-Neal in 1994) and Concentration of Top 10 has nearly doubled.

Return

Exit Rates Decomposed



- Merger waves around deregulation and post crisis. Failures in crisis. ▸ Return

U.S. Policy Concerns over Competition vs. Stability

- In a speech to Penn Law, Fed Governor Tarullo (2012) explained that the primary aim of the Dodd-Frank Act was to contain systemic risk, even if it reduces the competitiveness and efficiency of banks. ▸ Return