Monetary policy and bank competition

David Martinez-Miera

Introduction

- Monetary policy is a key policy instrument for Central Banks
  - Main objective: to stabilize inflation
  - Probably the main reason of existence of Central Banks
- Large body of literature of effects of MP on the real economy
  - Many Macro models
  - With important focus on inflation effects "sticky prices"
  - Difference between real and nominal value
- How does banking affect MP transmission?

Introduction

- Banks are key players of monetary policy transmission
  - Set deposit rates –> affects savings decisions
  - Set loan rates –> affects borrowing –> investment decisions
- A cost view of monetary policy
  - Monetary policy affects outside option of depositors and banks
  - Banks react by changing deposit and lending rates
- How does bank competition affect this reaction?

The deposit channel of monetary policy

- Dreschler Savov and Schnabel (2017)
  - Theory and evidence
- IO intuition monopolist and competitive firms react to marginal cost shocks differently
- Theory (Based on Dixit-Stiglitz competition setup)
  - Depositors choose between deposits (liquid) and bonds
  - Bonds pay the MP rate banks set a spread (pay less for deposits)
  - Banks that compete more strongly for deposits
  - React more to MP changes (increase deposit rate more)
  - Lose less depositors to bond market (as deposit spread does not widen)
  - Hence they have more money to invest
- Implications consistent with empirical results
- Hence bank competition affects the transmission of MP to deposit market
  - More transmission in competitive markets
  - Counterevidence? Begenau and Stafford (2024)

The risk channel of monetary policy

- Dell'ariccia Marquez and Laeven (2014)
  - Focus on the effect of MP on bank margins
  - Mainly effects work through leverage (capital) decisions
  - Lower MP leads to higher leverage and higher risk-taking
- Martinez-Miera and Repullo (2017) and (2024)
  - Focus on the effect of MP on bank margins
  - Effects on economic cycles in competitive market (2017)
  - Relevance of different competitive setups (2024)
- Main intuition of these models
  - MP affects bank funding costs - deposit rates
  - Banks react by changing loan rates - margins change (in general)
  - Also by changing their leverage
  - As monitoring depends on leverage and margins
  - Banks incentives to monitor change!

Martinez-Miera and Repullo (2024)

- Based on MMR 2024
- One period (2 dates)
- Three types of agents
  - Entrepreneurs require bank finance
  - Banks raise funds from (uninsured) investors
  - Investors: infinitely elastic supply at an expected return R_0
  - R_0 is the exogenous safe rate - measure of monetary policy

MMR (2024) - Entrepreneurs

- Infinite amount of penniless entrepreneurs
  - Have an exogenous probability of default p
  - Can invest one unit in a given project with the following return structure

$$\widetilde{R} = \begin{cases} R, & \text{with probability } 1 - p + m, \\ 0, & \text{with probability } p - m, \end{cases}$$

- m is the unobservable monitoring of the bank
  - m reduces the probability of failure of an entrepreneur

MMR (2024) - Entrepreneurs

- All entrepreneurs are exposed only to a common risk factor
  - If they all have the same m defaults are perfectly correlated
- Success return R a decreasing function of the aggregate investment of entrepreneurs.
  - Aggregate investment equals the aggregate supply of loans L.
  - Success return is $R(L)$ and assume linear relationship

$$R(L) = a - bL,$$

  where $a > 0$ and $b > 0$.
- Free entry of entrepreneurs
  - Success return $R(L)$ equals the rate at which they borrow from banks,
  - $R(L)$ is also the inverse loan demand function.

The risk channel of monetary policy

- n symmetrical banks compete to grant loans
- Cournot competition among banks
- Strategic variable of bank j is its lending l_j to entrepreneurs

$$L = \sum l_j$$

- No inside capital
- Monitoring is costly and non contractible

$$c(m) = \frac{\gamma}{2} m^2$$

Structure of the game

- 1 Bank j decides on supply l_j
  - This determines $L = \sum l_j$
  - which determines $R(L)$
- 2 Bank j offers deposit rate B_j to investors
- 3 Bank j (privately) chooses monitoring intensity m_j

Structure of the game

- Game solved backwards
  - Stages 2 and 3 first, and then stage 1
  - No strategic interaction in stages 2 and 3, only in stage 1
- Problem in stages 2 and 3 is the same for all banks
  - Depends on lending L in stage 1
  - Write $B_j = B(L)$and $m_j = m(L)$

Characterization of equilibria

- The problem of bank j may be written as

$$\max_{(l_j, B_j, m_j)} \{l_j [(1 - p + m_j)(R(L) - B_j) - c(m_j)]\}$$

- Subject to the incentive compatibility constraint that determines its optimal choice of monitoring

$$m_j = \arg\max[(1 - p + m_j)(R(L) - B_j) - c(m_j)]$$

- Subject to the participation constraint of the investors

$$(1 - p + m_j)B_j = R_0.$$

Characterization of equilibria

- Banks' choice of monitoring $m(L)$is given by

$$m(L) = \arg\max_{m} \{(1 - p + m)[R(L) - B(L)] - c(m)\}.$$

- The first-order condition that characterizes an interior solution is

$$R(L) - B(L) = \gamma m(L).$$

- $m(L)$ proportional to intermediation margin $R(L) - B(L)$.
- Investors' participation constraint is $[1 - p + m(L)]B(L) = R_0$.
- Solving for $B(L)$ in this constraint, substituting it into the first-order condition, and rearranging gives

$$\gamma m(L) + \frac{R_0}{1 - p + m(L)} = R(L). \rightarrow$$

$$m(L) = \frac{1}{2\gamma}\left[R(L) - \gamma(1-p) + \sqrt{[R(L) + \gamma(1-p)]^2 - 4\gamma R_0}\right].$$

Characterization of equilibria

- Banks' choice of monitoring $m(L)$

$$m(L) = \frac{1}{2\gamma}\left[R(L) - \gamma(1-p) + \sqrt{[R(L)+\gamma(1-p)]^2 - 4\gamma R_0}\right].$$

- Decreasing in R_0
- Increasing in $R(L)$
- Decreasing in total lending L

Characterization of equilibria

- Stage 1 equilibria
- Define profits per unit as

$$\pi(L) = (1 - p + m)[R(L) - B(L)] - c(m(L))$$

- Bank j FOC is

$$l_j \pi'(L) + \pi(L) = 0$$

- SOC (assumed to be satisfied)

$$l_j \pi''(L) + 2\pi'(L) < 0$$

- Symmetric equilibria $l_j = l$ allows us to determine

$$L\pi'(L) + n\pi(L) = 0$$

Effect of R0 on Lending

- **Proposition 2** *An increase in the safe rate R_0 leads to a reduction in equilibrium lending L^*.*
- Differentiating the modified first-order condition and using the assumption SOC$<$0 gives

$$\frac{\partial L^*}{\partial n} = -\frac{\pi(L^*)}{L^*\pi''(L^*) + (n+1)\pi'(L^*)} > 0.$$

Effect of R0 on monitoring

- Totally differentiating $m(L)$

$$\frac{dm^*}{dR_0} = \frac{\partial m^*}{\partial L^*}\frac{\partial L^*}{\partial R_0} + \frac{\partial m^*}{\partial R_0}$$

- Another way

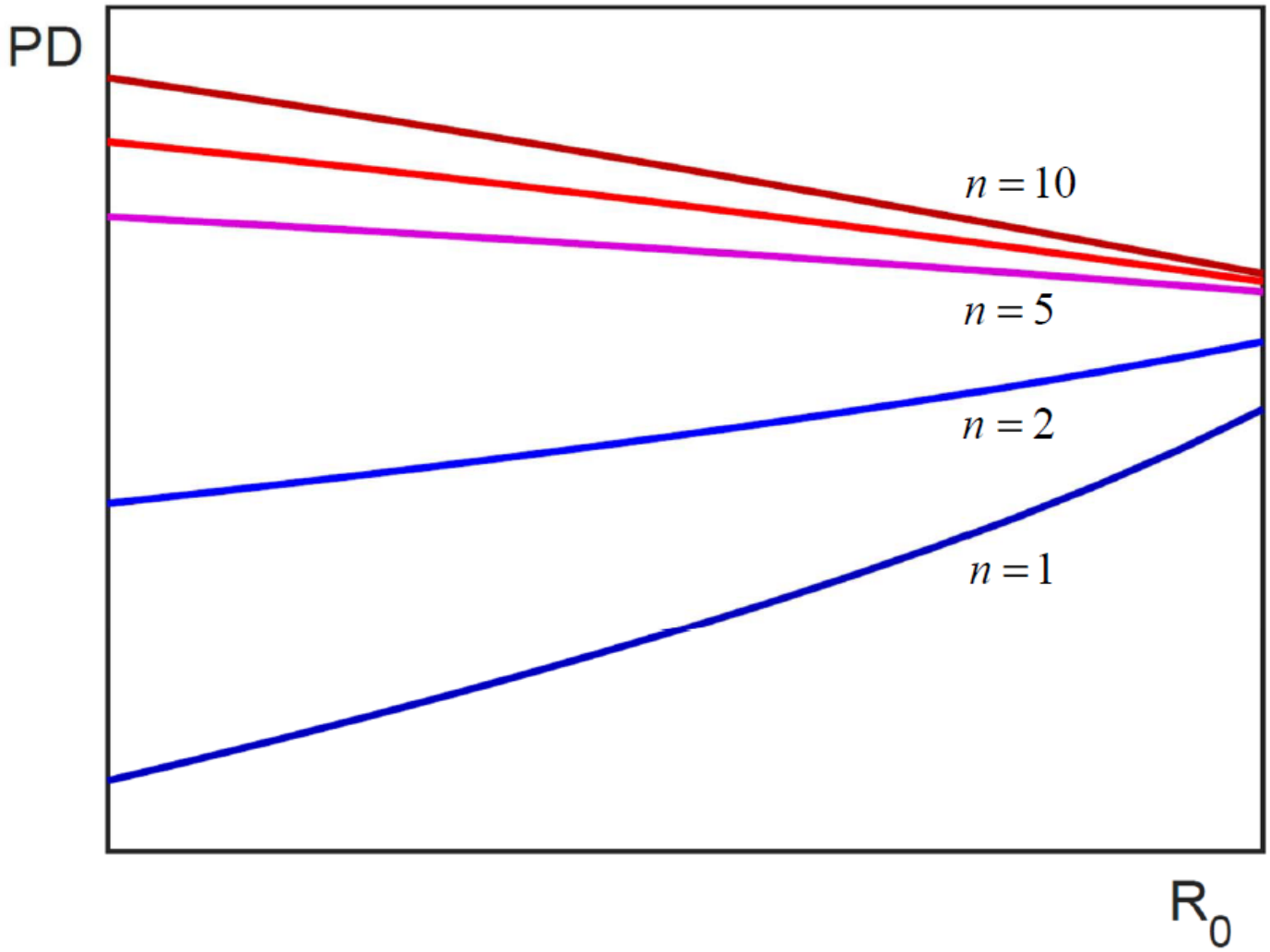
$$\begin{aligned} m(L) &= R(L) - B(L) \\ \frac{dm(L)}{dR_0} &= \frac{dR(L)}{dR_0} - \frac{dB(L)}{dR_0} \end{aligned}$$

- Two effects
  - Funding rate effect$\longrightarrow \frac{dB(L)}{dR_0} > 0(-)$
  - Lending rate effect $\longrightarrow \frac{dR(L)}{dR_0} > 0(+)$
  - Effect on intermediation margin is not clear cut

Effect of R0 on monitoring

- n relevant driver of the relationship $\frac{dm(L)}{dR_0}$
- $n \longrightarrow \infty \longrightarrow \frac{dm(L)}{dR_0} > 0$
  - Lending rate effect dominates
- $n \longrightarrow 1$
  - Lending rate effect is smaller
  - More probable that the funding rate effect dominates

Effect of R0 on monitoring



Suggestive Evidence - Data

- Estimate sensitivity of loan rates and intermediation margins to changes in the Federal funds rate
  - for different deciles of the distribution of banks' market power.
- Quarterly data from the U.S. Call Reports for the period 1994 to 2019
- Loan rates and intermediation margins for each bank.
  - Loan rates = the interest and fee income on loans / total loans.
  - Intermediation margins = difference between loan rates and deposit rates
- Federal funds target rate as the monetary policy rate.
- Proxy for market power = data on new mortgage lending by banks from the Home Mortgage Disclosure Act (HMDA) to compute an average Herfindahl index (HHI) for each bank.
  - In particular, we first obtain for each year a county level HHI using new mortgages originated by banks.
  - We then compute the weighted average of county HHIs across the counties in which a bank operates.
  - Finally, we take the average HHI for each bank in all years.

Suggestive Evidence

- Estimation
- We divide the bank-quarter observations into 10 equal-sized bins from lowest to highest HHI,
- Run the following regression with quarterly data for each bin:

$$\Delta y_{bt} = \alpha_b + \beta_i \Delta FF_t + \varepsilon_{bt}.$$

  where Δy_{bt} is the change in either the loan rate or the intermediation margin of bank b that belongs to bin $i = 1, ..., 10$ at date t, ΔFF_t is the change in the Federal funds target rate at date t, and α_b are bank fixed effects.
- We refer to β_i as the sensitivity of loan rates or intermediation margins of banks belonging to bin i to changes in the Federal funds rate.

Suggestive evidence

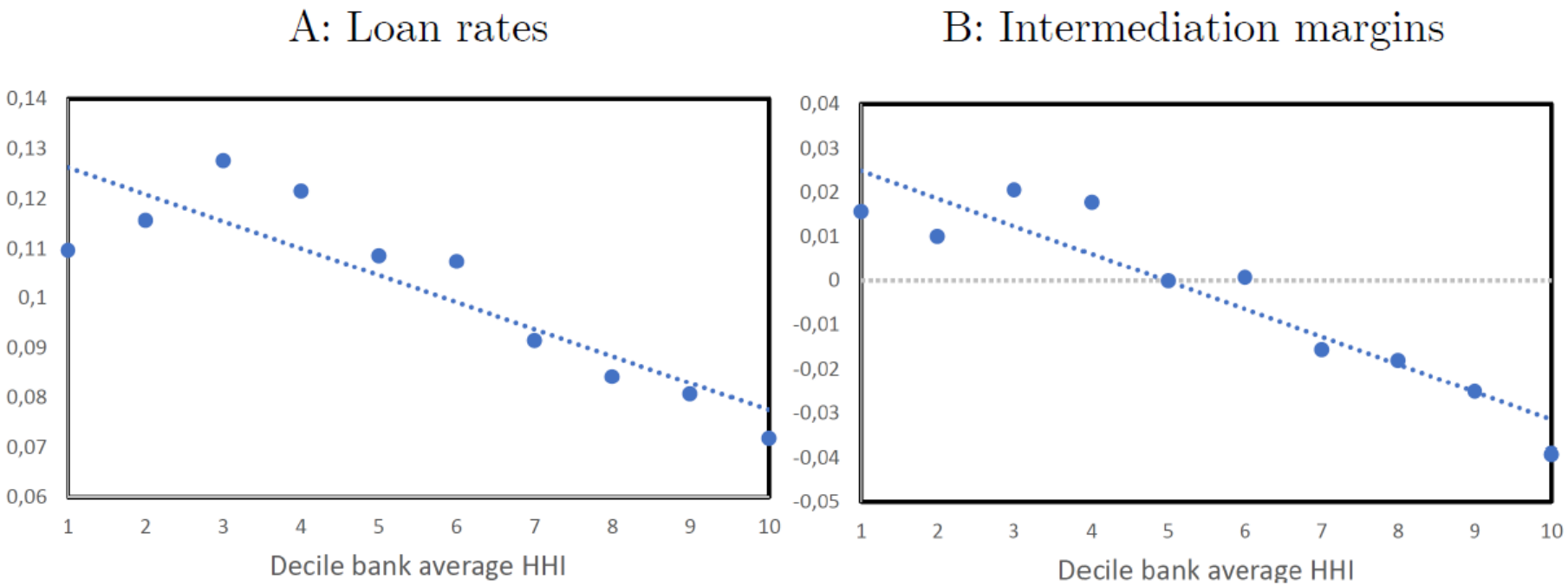


Figure 1A. Sensitivities of loan rates and intermediation margins to the Federal funds rate for different levels of banks' market power

This figure shows the relationship between market power (from the lowest to the highest decile in banks' average Herfindahl index) and the sensitivity of loan rates (Panel A) and intermediation margins (Panel B) to changes in the Federal funds rate.

The risk channel of monetary policy

- What other things matter?
- Choice of leverage - DLM (2014)
  - Higher $R_0 \longrightarrow$ less leverage $\longrightarrow$more monitoring
  - Dell'ariccia Laeven and Suarez. (2017)-empirical findings-
- Existence of direct market finance (shadow banks)
  - Low rates makes them more competitive
  - This affects the price setting incentives of monopolistic banks
  - U-shaped relationship between MP rates and bank risk for monopolistic banks
  - Martinez-Miera and Repullo (2024)
- Deposit insurance
  - With fully insured deposits the relationship is always positive
  - Prove it