Comments by Rafael Repullo on

# How do bank-specific characteristics affect lending?

Carlos Cantú, Stijn Claessens, and Leonardo Gambacorta

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# Purpose of paper

- Two objectives
  - → How bank-specific characteristics affect loan supply?
  - → How do banks react to monetary policy and global shocks?
- Summary of results for five LATAM countries
  - → Brazil, Chile, Colombia, Mexico, and Peru
- Common empirical strategy (with some differences)
  - → Use credit registry data + multiple bank relationships
  - → To control for loan demand shocks

# Estimated equations (i)

- First equation

$$\Delta \ln L_{fbt} = \beta X_{bt-1} + \gamma_{ft} + \text{error}$$

→ $L_{fbt}$ = value of loans to firm $f$ by bank $b$ at date $t$

→ $X_{bt-1}$ = vector of characteristics of bank $b$ at date $t-1$

→ $\gamma_{ft}$ = time-variant firm fixed effect

→ $\beta$ = parameter of interest

# Estimated equations (ii)

- Second and third equations

$$\Delta \ln L_{fbt} = \beta X_{bt-1} + \delta(S_{t-1} * X_{bt-1}) + \gamma_{ft} + \text{error}$$

→ $L_{fbt}$ = value of loans to firm $f$ by bank $b$ at date $t$

→ $X_{bt-1}$ = vector of characteristics of bank $b$ at date $t-1$

→ $\gamma_{ft}$ = time-variant firm fixed effect

→ $S_{t-1}$ = monetary policy or global shock at date $t-1$

→ $\delta$ = parameter of interest

# Comment on the equations (i)

- Follow Khwaja and Mian (2008) approach

  → Introduce time-variant firm fixed effects $\gamma_{ft}$

  → Control for credit demand shocks

  → Identify credit supply effects

- To identify these fixed effects

  → Focus on firms with multiple banking relationships

# Comment on the equations (ii)

- Estimated equations are not identical

  → Different bank characteristics used by different countries

- Different institutional features taken into account

  → Large state-owned bank in Chile

  → Subsidiaries abroad in Colombia

  → Foreign subsidiaries in Mexico

- Time periods are not identical

  → Common intersection: 2009(4)-2015(4)

# Explanatory variables (i)

- Main characteristics

  → Log total assets, capital ratio, liquidity ratio

- Other characteristics

  → Risk (loan-loss provisions, NPLs, etc.)

  → Revenue (share of commission and trading income, etc.)

  → Funding (share of deposit, short-term, foreign, etc.)

  → Profitability (ROA, ROE, efficiency, etc.)

# Explanatory variables (ii)

- Monetary policy shock

  → Change in domestic monetary policy rate

- Global shock

  → VIX, US rates, commodity prices, policy uncertainty

# Some baseline results

- Different effects of size (log total assets)
  - → Positive and significant for Brazil
  - → Negative and (marginally) significant for Chile
- Different effects of liquidity ratio (cash & securities over assets)
  - → Negative and significant for Mexico
  - → Positive and (marginally) significant for Peru
- Positive effects of capital ratio (equity over assets)
  - → **High capital implies higher loan growth**

# Some monetary policy results

- Different effects of size (log total assets)
  - → Positive and significant for Brazil
  - → Negative and significant for Mexico
- Different effects of liquidity ratio (cash & securities over assets)
  - → Positive and significant for Brazil and Mexico
  - → Negative (but insignificant) for other countries
- Mostly positive effects of capital ratio (equity over assets)
  - → **High capital implies less sensitivity to MP shocks**

# Overview of discussion

- Can we interpret the results as credit supply effects?

  → Review the Khwaja and Mian (2008) approach

- Can we control for credit demand effects in another way?

  → Add macro/sectoral/firm controls as explanatory variables

- Can we assume that explanatory variables are exogenous?

  → Joint determination of capital, liquidity and lending

- What about the meta-analysis?

# Part 1

# Credit supply effects

# Khwaja and Mian approach

- Estimated equation

$$\Delta \ln L_{fbt} = \beta X_{bt-1} + \gamma_{ft} + \text{error}$$

- Demand shocks (captured by firm-time fixed effect $\gamma_{ft}$)

  → Identical effect on loan growth of all banks lending to $f$

- Supply shock to bank $b$ (captured by variable $X_{bt-1}$)

  → Effect on loan growth of bank $b$ (measured by $\beta$)

  → No effect on loan growth of all other banks lending to $f$

- **Is this a reasonable model?**

# A model of firm borrowing (i)

- Consider a firm that is borrowing $L_1$ and $L_2$ from two banks

  → Decreasing returns and concave production function

$$Y = f(L_1, L_2)$$

  → Profit maximization

$$\max_{L_1, L_2} \left[ f(L_1, L_2) - R_1 L_1 - R_2 L_2 \right]$$

  → First-order conditions

$$f_1(L_1, L_2) = R_1$$
$$f_2(L_1, L_2) = R_2$$

# A model of firm borrowing (ii)

- Differentiating first-order conditions gives

$$\frac{\partial L_1}{\partial R_1} < 0, \quad \frac{\partial L_1}{\partial R_2} < 0, \quad \frac{\partial L_2}{\partial R_2} < 0, \quad \frac{\partial L_2}{\partial R_1} < 0$$

→ Higher $R_1$ reduces $L_1$ and also $L_2$

→ Higher $R_2$ reduces $L_2$ and also $L_1$

# A model of firm borrowing (iii)

- Assume that loan rate $R_i$ depends on bank $i$'s characteristics $X_i$

$$R_i = g_i(X_i)$$

- Hence we conclude

$$L_i = h_i(X_1, X_2)$$

→ Change in $X_1$ changes $L_1$ and also $L_2$

→ Change in $X_2$ changes $L_2$ and also $L_1$

- Moreover under strategic interaction between the two banks

→ Loan rate $R_i$ depends on characteristics of its competitor $X_j$

→ Same general result

# Summing up

- Demand shock (shift of production function) changes $L_1$ and $L_2$
- Supply shock to bank 1 (change in $X_1$) changes $L_1$ and $L_2$
- Supply shock to bank 2 (change in $X_2$) changes $L_1$ and $L_2$
- Contrast this result with assumption in Khwaja and Mian (2008)

  → Supply shock to bank 1 (change in $X_1$) only changes $L_1$

  → Supply shock to bank 2 (change in $X_2$) only changes $L_2$

- **Can we then interpret $\beta$ as the effect of credit supply shock?**

# Not a novel criticism

"We illustrate the difficulty of disentangling demand from supply of credit in the presence of sectoral or aggregate shocks that affect the activity in which banks specialize. **The results in this paper call for caution when applying the empirical strategy – now standard in identifying the lending supply channel– of absorbing the demand for credit with firm-time fixed effects**."

*Paravisini, Rappoport, and Schnabl* (*2017*)

# Part 2

# Controlling for credit demand effects

# An alternative approach

- To control for credit demand shocks

  → Introduce macro/sectoral/firm control variables $Z_{ft-1}$

$$\Delta \ln L_{fbt} = \beta X_{bt-1} + \gamma Z_{ft-1} + \text{error}$$

  → Replace black-box $\gamma_{ft}$ by term that can be interpreted

- Approach followed by Peru's paper

  → Interestingly, little change in estimated $\beta$'s and $\delta$'s

# Assessment of alternative approach

- No need to restrict attention to firms with multiple relationships

  → Significant increase in sample size

  → In Mexican sample

  From 3.4 million observations from 113,548 firms

  To 9.2 million observations from 611,194 firms

- Avoids self-selection of firms with multiple relationships

- Provides estimation of effects of credit demand variables

- Better assessment of effects of public banks, foreign banks, etc.

# Part 3

# Capital, liquidity, and lending

# A model of asset-liability management (i)

- Consider a bank with a balance sheet at $t = 0$

$$L_0 + A_0 = D_0 + K_0$$

$\rightarrow L_0$ = loan portfolio

$\rightarrow A_0$ = liquid assets

$\rightarrow D_0$ = deposit liabilities

$\rightarrow K_0$ = equity capital

# A model of asset-liability management (ii)

- Bank has to decide at $t = \varepsilon$

  $\rightarrow \Delta L = L - L_0$ = change in loans

  $\rightarrow \Delta A = A - A_0$ = change in liquid assets

  $\rightarrow \Delta K = K - K_0$ = change in equity capital

  $\rightarrow$ Assume $\Delta D = D - D_0 = 0$ (exogenous deposits)

- Balance sheet at $t = \varepsilon$

$$L + A = D_0 + K$$

# A model of asset-liability management (iii)

- Assume

  → Deposit rate = Return of liquid assets = 0

  → Loan rate = $r$

  → Cost of capital = $\rho$

  → Proportional loan losses = $\lambda$ (a random variable)

- Bank profits at $t = 1$

$$\pi = L(r - \lambda)$$

- Bank capital at $t = 1$

$$K_1 = K + \pi$$

# A model of asset-liability management (iv)

- Bank's maximization problem

$$\max_{L,A,K} E\left[ L(r-\lambda) - \rho K - F(\max\left\{kL - K_1, 0\right\}) \right]$$

→ First term: expected profits

→ Second term: cost of equity capital

→ Third term: penalty for violating capital requirement

$$K_1 \geq kL$$

# A model of asset-liability management (v)

- Let $(L^*, A^*, K^*)$ denote solution to this problem
- Any shock to bank at $t = 0$ will change solution

  → Bank will immediately adjust $(L^*, A^*, K^*)$
- For example, following a tightening of capital requirements

  → $L^*$ might decrease (to reduce risk-weighted assets)

  → $K^*$ might increase (to comply with the regulation)

  → Hence negative correlation between $\Delta L$ and $\Delta K$

# Discussion

- In the context of the estimated model

$$\Delta \ln L_{fbt} = \beta X_{bt-1} + \gamma_{ft} + \text{error}$$

→ Lagged capital or liquidity may be correlated with error

- What can be done?

→ Maybe use previous year instead of previous quarter

→ Or find some instrumental variables

# Part 4

# Meta-analysis

# What about meta-analysis?

- Statistical tool for combining results of multiple studies

  → Pooled estimate of true underlying parameters

  → Weighted average of results of individual studies

- Suitable tool for improving estimate of a treatment effect

  → Randomized control trials (RCTs)

- Not so clear in case of multiple regression coefficients

- Key issue: Should we pool or try to account for the differences?

  → Especially since we have opposite signs for some countries

# Concluding remarks

# Concluding remarks (i)

- Studying determinants of bank's lending is very important

  → Given relation between financial deepening and growth

  → Also in the light of possible cyclical credit crunches

- Using common empirical strategy is useful

  → To understand possible differences among countries

  → Especially in relation with the effects of policy variables

- Exploiting credit registry individual data is most useful

  → To distinguish credit supply and demand effects

# Concluding remarks (ii)

- But being eclectic in econometric approach is desirable

  → Explore alternative ways of dealing with demand effects

- Potential endogeneity issues may be a concern

  → Higher capital requirements affect capital and lending

  → Over an extended time period

- Not clear that meta-analysis adds much value

  → Better to account for differences in estimates

# References


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