Comments by Rafael Repullo on

How do bank-specific characteristics affect lending?

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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

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

→ $L_{f_{bt}} =$ 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 \( \gamma_{ft} \))
  \[ \rightarrow \text{Identical effect on loan growth of all banks lending to } f \]

• Supply shock to bank \( b \) (captured by variable \( X_{bt-1} \))
  \[ \rightarrow \text{Effect on loan growth of bank } b \text{ (measured by } \beta) \]
  \[ \rightarrow \text{No effect on loan growth of all other banks lending to } f \]

• 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 $t = 0$

\[ L_0 + A_0 = D_0 + K_0 \]

\[ \rightarrow L_0 = \text{loan portfolio} \]

\[ \rightarrow A_0 = \text{liquid assets} \]

\[ \rightarrow D_0 = \text{deposit liabilities} \]

\[ \rightarrow K_0 = \text{equity capital} \]
A model of asset-liability management (ii)

• Bank has to decide at $t = \varepsilon$
  
  $\Delta L = L - L_0 =$ change in loans
  
  $\Delta A = A - A_0 =$ change in liquid assets
  
  $\Delta K = K - K_0 =$ change in equity capital
  
  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

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

→ 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
  \[\implies\] Bank will immediately adjust \((L^*, A^*, K^*)\)

• For example, following a tightening of capital requirements
  \[\implies\] \(L^*\) might decrease (to reduce risk-weighted assets)
  \[\implies\] \(K^*\) might increase (to comply with the regulation)
  \[\implies\] 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

