Discussion of "*(Unobserved) Heterogeneity in the bank lending channel: Accounting for bank-firm interactions and specialization*" by B. Gutierrez, A. Villacorta and L. Villacorta

Víctor Sancibrián

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Summary

- Interest in heterogeneity in the transmission of bank credit supply shocks
- Khwaja and Mian (2008) rely on matched bank-firm credit data and postulate

$$y_{f,b} = \alpha_f + \beta_b + \varepsilon_{f,b}, \quad E\left[\varepsilon_{f,b} \middle| \alpha_f, \beta_b\right] = 0, \tag{1}$$

  where $y_{f,b}$ is the loan growth rate of firm f with bank b over two periods
- For the two-way specification to be a reasonable model of average credit growth, any predictable bank-firm interactions must be accounted for
- One possibility is to reestimate (1) separately for different groups of firms $g = 1, \ldots, G$
  - Group membership is based on *observables*; e.g., firm sectors or export markets

- Given a rule $g(f)$ that assigns firms to groups, this is analogous to

$$y_{f,b} = \alpha_f + \sum_{j=1}^{G} 1\{g(f) = \boldsymbol{j}\}\,\beta_{\boldsymbol{j},b} + \varepsilon_{f,b} = \alpha_f + \beta_{\boldsymbol{g(f)},b} + \varepsilon_{f,b} \tag{2}$$

  - Conditional on $g(f) = j$, we are back to Khwaja and Mian's (2008) setup
- **GVV** allow group membership $g(f)$ to be ***unrestricted***
  - This is in the spirit of k-means or clustering algorithms (here for each period)
  - An application of Bonhomme and Manresa (2015) to matched bank-firm data
- They bring this to Peruvian data and uncover substantial group-level heterogeneity
  - Group effects correlate with observables, but not the whole story!
- A lot more in the paper: results when ignoring heterogeneity, estimation with credit supply shocks x_b, implications of bank-firm interactions for aggregate credit growth...

Comment #1: on identification via credit supply shocks x_b

- Group effects $\beta_{g(f),b}$ might capture both credit supply shocks x_b or demand shocks that lead to differential borrowing. When x_b are observable, **GVV** consider

$$y_{f,b} = \alpha_f + \theta_{g(f),b} x_b + \epsilon_{f,b}, \quad E\left[\epsilon_{f,b} \middle| \alpha_f, \theta_{1:G,b}, x_b\right] = 0 \tag{3}$$

- Given this emphasis, it is worth decomposing $\beta_{g(f),b}$ more explicitly as

$$\beta_{g(f),b} = \theta_{g(f),b} x_b + u_{g(f),b}, \tag{4}$$

  where $u_{g(f),b}$ captures interactions beyond x_b and is left implicit in (3)

- Note that given $E\left[u_{g(f),b} \middle| x_b\right] = 0$, $\beta_{g(f),b}/x_b$ is an unbiased estimator of $E\left[\theta_{g(f),b}\right]$
- The two-step estimator based on (4) tends to be more robust than the one based on (3)

Comment #2: quantifying unobserved heterogeneity

- Given the goals of the paper, it is natural to try to quantify the extent of heterogeneity in the transmission of credit shocks
- A simple summary is given by

$$\mathrm{Var}_b\left(\beta_{g,b}\right) = \frac{1}{G}\sum_{j=1}^{G}\pi_j\left(\beta_{j,b} - G^{-1}\sum_{g=1}^{G}\beta_{g,b}\right)^2, \quad \pi_j = P\left(g(f) = j\right),$$

which is identified from $E_{f\in g, f\in I(b,b_0)}\left[y_{f,b} - y_{f,b_0}\right]$ for all g without a normalization

- A feasible counterpart might use $\hat{\beta}_b^g$ and $\hat{\pi}_j = N_F^{-1}\sum_{f=1}^{N_F}\{\hat{g}(f) = j\}$
- An open question is whether we can construct bias-corrected estimators à la Arellano and Bonhomme (2012) using $y_{f,b} - y_{f,b_0}$ over firms as repeated measurements

Comment #3: heterogeneous sorting

- Consider the variance decomposition

$$\text{Var}\left(y_{f,b}\right) = \text{Var}\left(\alpha_f\right) + \text{Var}\left(\beta_{g(f),b}\right) + \text{Cov}\left(\alpha_f, \beta_{g(f),b}\right) + \text{Var}\left(\varepsilon_{f,b}\right)$$

- An alternative way to think about the paper is about endogenizing sorting
- Positive assortative matching $\text{Cov}(\alpha_f, \beta_b) > 0$ is allowed under Khwaja and Mian's (2008)
- **GVV** allow for group-specific $\text{Cov}_g\left(\alpha_f, \beta_{g,b}\right)$
  - E.g., heterogeneous borrower-bank matching patterns along bank specialization
  - Persistence over time might suggest endogenous matching based on fundamentals
- From a methodological point of view, there is interest in studying finite-sample biases in these variance components
  - "Limited diversification bias" akin to the limited mobility bias from the AKM literature

Concluding remarks

- Great paper!
  - A substantial step forward relative to current applied practice
  - Methods grounded in empirical content
- Opens the door to several potential extensions and methodological questions
  - From Comments #1 + #2: a simple measure of how much we don't know about heterogeneity in the bank lending channel is

$$R_x^2 = 1 - \text{Var}\left(u_{g,b}\right) / \text{Var}\left(\beta_{g,b}\right)$$

  - Despite the intuitive appeal of these objects and the richness of the data, many statistical challenges remain (e.g., see Comment #3)
  - It is worth keeping in mind advances in the matched employer-employee data literature; e.g., Bonhomme, Holzheu, Lamadon, Manresa and Mogstad (2023)