Granular Credit Risk

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This Paper: Idiosyncratic Risk of Large Borrowers Affect Banks and the Real Economy

Research question: "What is the impact of granular credit risk on banks and on the economy?"

Real effects of **single-name credit concentration risk**:
idiosyncratic risk of large borrowers

- is not diversified away in bank portfolios
- affects credit supply to smaller borrowers
- small borrowers reduce investments, more likely to go bankrupt

Paper relies on

- a novel administrative firm-bank matched dataset from Norway (2003-2015)
- merged with firm and bank balance sheet data
- Granular Instrumental Variable (GIV) approach of Gabaix and Koijen (2020, 2021)

Methodology (Idiosyncratic shocks, Khwaja Mian, & GIV)

1. Idiosyncratic borrower risk of firm f in year y: residuals of

$$\ln(VA_{fy}) = \alpha_f + \alpha_{icy} + \beta_1 \ln K_{fy} + \beta_2 \ln W_{fy} + \gamma X_{fy} + e_{fy}$$

where $VA_{fy} = Sales_{fy} - Costs_{fy}$, α_f are firm fixed effects, and α_{icy} are industry×country×year fixed effects.

2. Effect of firm f idiosyncratic risk ("demand effect") on loan interest rate collected by bank b in year y: $R_{fby} = \alpha_{bycl} + \delta e_{fy} + \varepsilon_{fby}$.

3. Effect of large borrowers' idiosyncratic risk on the return on the loan portfolio of bank b: $R_{by} = \alpha_b + \alpha_y + \beta_{OLS} \bar{e}_{by} + \varepsilon_{by}$ with $\bar{e}_{by} = \sum_f s_{fby} e_{fy}$
Issue: want to isolate a demand effect in regression 3 too but cannot include α_{by} → Solution: $GIV_{by} := \sum_f s_{fby} e_{fy} - \frac{1}{F_b} \sum_{f \subset b} e_{fy}$
   - first stage: $\bar{e}_{by} = \alpha_b + \alpha_y + \rho\, GIV_{by} + \zeta_{by}$
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4. Effect of large borrowers' idiosyncratic risk on credit supply to small ("non granular") borrowers: restrict sample on small loans
$\triangle loan_{fby} = \alpha_b + \alpha_{fyic} + \phi \triangle \hat{u}_{by} + \upsilon_{fby}$.

5. Effect of large borrowers' idiosyncratic risk on firm f policy in year y:
$\triangle policy_{fy} = \alpha_{icy} + \psi \triangle \hat{u}_{fy} + \varsigma_{fy}$ (with $\triangle \hat{u}_{fy} = \sum_b s_{fby} \hat{u}_{by}$).

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Main Results

Fact: 80% of all bank credit is concentrated in 20% of the loans.

Result 1: pass-through from idiosyncratic borrower shocks to loan-level returns

- $\hat{\delta} > 0$: 1 std deviation negative firm shock causes annual loan-level returns to fall by 36 bps.

Result 2: idiosyncratic borrower shocks affect banks' portfolio-level outcomes

- $\hat{\beta} > 0$: 1 std deviation negative granular credit shock causes portfolio bank loan portfolio return to drop by 11.6 bps.
- asymmetric result (effect disappears for positive idiosyncratic shocks) + firm and bank heterogeneity.

Result 4: banks pass on granular credit shocks to their non-granular borrowers

- $\hat{\phi} > 0$: 1 std deviation bank-level negative granular credit shock reduces loan supply and increases interest rates by as much as 71.7 and 63.4 bps, respectively.

Result 5: affected non-granular firms experience negative real economic outcomes

- cut investments ($\hat{\psi} > 0$), higher bankruptcy rates ($\hat{\psi} < 0$).

My comments

This paper shows evidence that under-diversification of borrower credit risk has macroeconomic implications.

- contributions to the literature on the "granular hypothesis" and on bank portfolio concentration

Comment 1: What are the frictions to single-name concentration?

Comment 2: Choice of instrumented variable

Comment 3. GIV for single-name concentration

Comment 1: Frictions to Single-Name Concentration

Most of the banking literature has focused on sectoral or geographic concentration (Goetz et al. (2016), Agarwal et al. (2020), Paravisini et al. (2020), ...).

This paper: concentration at the firm/borrower level (**"single-name"** concentration).

What is the friction to single-name concentration?

- mentioned in the paper: asymmetric information (Ivashina, 2009), behavioral biases, firm size distribution
- exposure to systemic joint liquidation costs (Wagner, 2011)
- bank profit maximization under **regulatory constraints**: limits the set of profitable loans
  - external financing frictions and bank regulation
  - demand for bank capital determines the composition of credit (Harris, Opp and Opp, 2020)
  - imperfect risk weights & banks deriving their own risk weights under Basel III internal rating based approach: risk weight optimization for large exposures
  - regulatory risk weights ignore the subadditivity feature of portfolio risk (Acharya et al. 2014): no incentives for banks to diversify

Comment 2: Choice of Instrumented Variable

Idiosyncratic borrower risk: residuals of

$$\ln(VA_{fy}) = \alpha_f + \alpha_{icy} + \beta_1 \ln K_{fy} + \beta_2 \ln W_{fy} + \gamma X_{fy} + e_{fy}$$

- idiosyncratic vs. unanticipated
- risk vs. shock to firm profits
- credit risk: leverage, asset volatility, ...

Effect of large borrowers' idiosyncratic risk on the return on the loan portfolio of bank b: $R_{by} = \alpha_b + \alpha_y + \beta_{OLS} \bar{e}_{by} + \varepsilon_{by}$ with $\bar{e}_{by} = \sum_f s_{fby} e_{fy}$

Choice of instrumented variable: $\bar{e}_{by}$

- first stage: $\sum_f s_{fby} e_{fy} = \alpha_b + \alpha_y + \rho \left[\sum_f s_{fby} e_{fy} - \frac{1}{F_b} \sum_{f \subset b} e_{fy} \right] + \zeta_{by}$
  - $y = \alpha + \beta(y - x) + \varepsilon \rightarrow y = \alpha^* - \beta/(1-\beta)x + \varepsilon^*$
- exclusion restriction: $GIV_{by} := \left[\sum_f s_{fby} e_{fy} - \frac{1}{F_b} \sum_{f \subset b} e_{fy} \right]$ only affects R_{by} through $\sum_f s_{fby} e_{fy}$.
- what should the instrumented variable capture?
  - loan portfolio credit risk?
  - loan portfolio single-name concentration?

Comment 3: GIV for Single-Name Concentration

Instead of $R_{by} = \alpha_b + \alpha_y + \beta \bar{e}_{by} + \varepsilon_{by}$:

$$R_{by} = \alpha_b + \alpha_y + \beta \triangle HHI_{by} + \varepsilon_{by}$$

Concentration is an equilibrium outcome

GIV for $\triangle HHI_{by} = \sum_f s^2_{fby} - \sum_f s^2_{fby-1}$ (Schubert, Stansbury, and Taska, 2020)

$$\triangle HHI^{inst}_{by} = \sum_f s^2_{fby-1} \left(\frac{(1+g_{fy})^2}{(1+g_{by})^2} - 1 \right)$$

where g_{fy} is the (leave-one-bank-out) firm loan growth in year y, and g_{by} is the bank loan portfolio growth in year y.

Comment 4: Interpretation of Main Results

Effect of large borrowers' idiosyncratic risk on the return on the loan portfolio of bank b : $R_{by} = \alpha_b + \alpha_y + \beta \bar{e}_{by} + \varepsilon_{by}$ with $\bar{e}_{by} = \sum_f s_{fby} e_{fy}$

Expected β sign: reflects the risk-return tradeoff of the bank

Borrower experiencing a loss ($e_{fy} < 0$)

- demands more credit: $\beta < 0$ as ex ante loan rate increases (shift in the demand curve)
- assigned with higher credit risk : $\beta < 0$ because ex ante loan rate increases
- repays less ex post (non-performing or defaulted loan): $\beta > 0$

Summary

This paper shows evidence that under-diversification of borrower credit risk has macroeconomic implications.

- contributions to the literature on the "granular hypothesis" and on bank portfolio concentration

Comment 1: What are the frictions to single-name concentration?

- importance of regulatory constraints

Comment 2: Choice of instrumented variable

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