Discussion:

Systemic Implications of Financial Inclusion

by Naceura, Candelon, and Mugrabic

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The views are those of the authors and do not represent the views of the OeNB or the Eurosystem.

Short summary

- The paper studies how **financial inclusion (FI)** affects **bank-level systemic and idiosyncratic risk**.
- Data: Unbalanced panel (2009–2021), 574 commercial banks across 31 countries; main outcomes: SRISK (systemic), Z-score and CDS-based idiosyncratic measures.
- Main empirical strategy: difference GMM (Arellano–Bond / Holtz-Eakin style) with instruments; controls for macroprudential policy and bank-level Basel compliance.
- Key findings:
  - Credit expansion (loans/GDP) tends to **raise** systemic and idiosyncratic risk, while deposit inclusion reduces them — but effects differ by country group (Dev vs Ad).
  - Broader % adults with loan accounts can **reduce** risks (portfolio atomization effect).
  - Greater penetration of non-commercial banks (NCB) raises both systemic and idiosyncratic risk for commercial banks. Macroprudential alignment with credit developments mitigates these effects.

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Measuring Financial Inclusion

- **Loans and Deposits relative to GDP**
  - Outstanding deposits with commercial banks (*Dep.CB*) to GDP
  - Outstanding deposits with non-commercial banks (*Dep.NCB*) to GDP
  - Outstanding loans from commercial banks (*Loan.CB*) to GDP
  - Outstanding loans from non-commercial banks (*Loan.NCB*) to GDP

- **Percentage of adults with loan accounts (Adu.Loan)** – to capture broader inclusion beyond aggregate credit volumes.

- **Borrowers and depositors per 1,000 adults (from FAS)** – considered in the discussion as alternative proxies for the use dimension.

- **Relative dominance of non-commercial banks (NCB)** – measured as the share of outstanding loans (or deposits) provided by NCB divided by total loans (or deposits) in the system.

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Are these useful measures?

- **Loans and Deposits relative to GDP?**
  - It reflects how much people and firms are actually depositing in the formal banking system, i.e., using banking services rather than just having "access".
  - A high level of deposits relative to GDP may reflect deposits from a few wealthy households or corporations, not broad participation of low-income or previously excluded groups.
  - The highest level of financial inclusion might mean that all people hold crypto assets in a virtual asset service provider (Saggese et al., 2024).
- I think the other three FI measures are more promising.

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Is SRisk a useful measure for systemic risk?

- SRISK and ΔCOVAR are not very useful measures for systemic risk.
- Balance-sheet-based view of each institution in the financial system and models the risk stemming from writedowns on bilateral exposures. This approach was pioneered by Eisenberg and Noe (2001); Elsinger et al. (2006); Rogers and Veraart (2013); Barucca et al. (2016). Siebenbrunner et al. (2017) who argue that the balance-sheet-based approaches provide a better basis for financial regulation, as they provide a better estimate of the "*systemic loss given default*" (FED, 2015) of individual institutions and most importantly can be performed for all institutions, regardless of whether they are publicly listed or not.

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# Identification: Integration in a Structural Causal Model (SCM)

1. Draw a causal Directed Acylic Graph (DAG) to clarify your assumptions.
2. Use do-calculus to proof that a causal effect can be identified.
3. Model counterfactuals: What would risk be under alternative FI scenarios?
4. Test for confounding using methods like d-separation.
5. Explore mediation: Is the effect of FI on risk mediated by regulation?

Important contributions in this field are Pearl (1995); Huang and Valtorta (2006); Shpitser and Pearl (2006); Pearl (2009, 2015); VanderWeele (2015).

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SCM Would Transform Economics: Correlation ⇒ Causation

1. The model of Heckman (1979) is not identified in a general setting, shown by Bareinboim and Pearl (2012): Sample Selection.

2. Neither the zombie nor the zombie congestion effects are not identified in Caballero et al. (2008) as shown by Ernst and Sigmund (2023): Collider stratification bias due to sample selection. Adalet McGowan et al. (2018); Albuquerque and Iyer (2023) also do not estimate zombie congestion effect, since they do not include the variable share zombie.

3. The TLTRO effects on lending by Benetton and Fantino (2021) are biased due to the violation of the exclusion restriction in their IV estimator. The effects of TLTRO are described here: Sigmund et al. (2025).

4. The female board ratio effects in Adams and Ferreira (2009) are not identified. Again, caused by the violation of the exclusion restriction in their IV estimator Huebler and Sigmund (2025).

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What are DAGs?
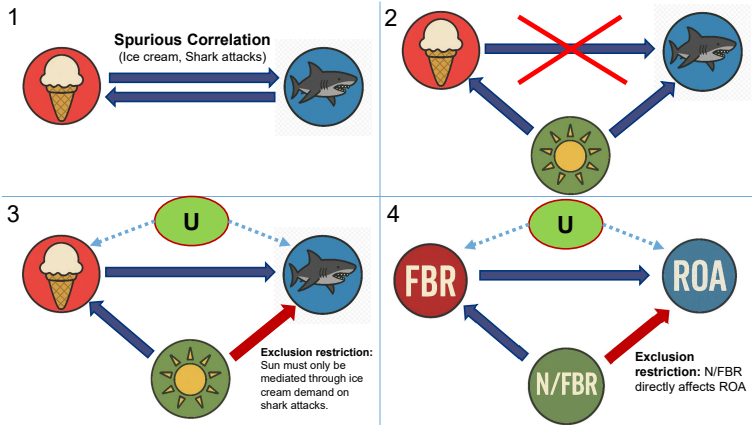
(1) Spurious correlation between ice cream and shark attacks? (2) If we control for sunshine, there is no correlation between ice cream and shark attacks. (3) The instrumental variable (IV) approach is incorrect here because of the red arrow: Sun → Shark. (4) IV approach from Adams and Ferreira (2009). The exclusion restriction is violated by definition: if FBR → ROA, then also N/FBR → ROA. N is the percentage of independent male directors.

DAG: Based on the Empirical Specification in the Paper

1. As shown in Pearl (2009), every DAG corresponds to a structural causal model.

2. A structural causal model (Pearl, 2009, Definition 7.1.1) is a triple of background variables (e.g., exogenous variables), endogenous variables that are determined by variables in the model, and a set of functions that define mappings from exogenous variables to endogenous variables.
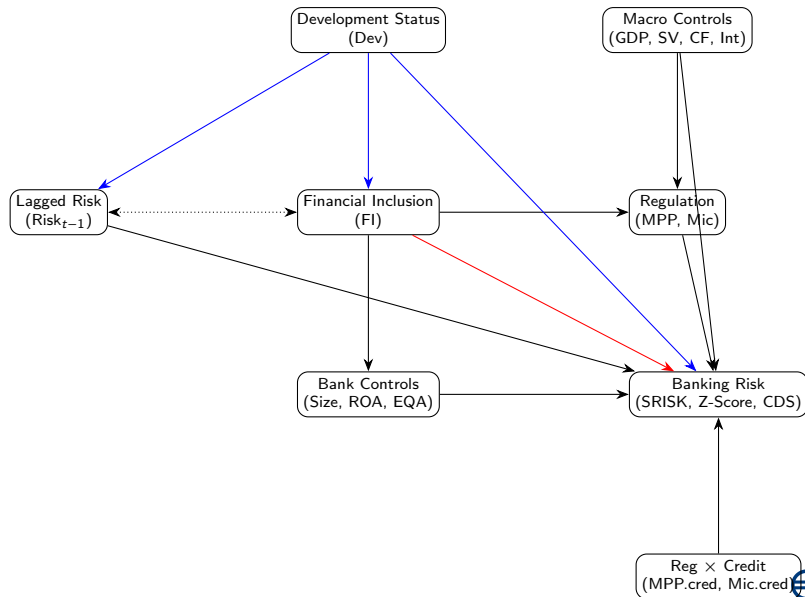
$$FI_{j,t-1} \leftarrow f_1(U_{t-1,FI})$$
$$Reg_{j,t} \leftarrow f_2(FI_{j,t-1}, Macro_{j,t-1}, U_{t-1,Reg})$$
$$Bank_{i,j,t-1} \leftarrow f_3(FI_{j,t-1}, Reg_{j,t-1}, U_{t-1,Bank})$$
$$Risk_{i,j,t} \leftarrow f_4(Risk_{i,j,t-1}, FI_{j,t-1}, Bank_{i,j,t-1},$$
$$Macro_{j,t-1}, Reg_{j,t}, RegCred_{j,t-1}, U_{t,Risk})$$

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DAG: Based on the Empirical Specification in the Paper

Causal Patterns and the Backdoor Criterion

Causal Patterns:

- **Fork:** $X \leftarrow Z \rightarrow Y$; Z confounds X and Y.
- **Chain:** $X \rightarrow Z \rightarrow Y$; Z mediates the effect.
- **Collider:** $X \rightarrow Z \leftarrow Y$; conditioning on Z induces spurious correlation.

Conditioning:

- Blocks forks and chains $\Rightarrow$ removes spurious paths.
- Opens colliders $\Rightarrow$ introduces bias.

Backdoor Criterion:

- A set Z blocks all paths into X and contains no descendants of X.
- Ensures identification of the causal effect of X on Y.
- FI $\Rightarrow$ Bank Risk? Total Effect: $Z = \{$ Development Status, Lagged Risk$\}$.

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Main Results of the Paper

Table 1: Summary of Main Results: Financial Inclusion and Banking Risks

Financial Inclusion Dimension	Systemic Risk (SRISK)	Idiosyncratic Risk (Z-Score, CDS)	Effect in Developing Economies
Loans to GDP (Loan.CB)	Increases SRISK	Increases Z-Score and CDS	Effect mitigated due to loan diversification
Deposits to GDP (Dep.CB)	Reduces SRISK (except in Dev. countries)	Reduces Z-Score and CDS	Still reduces idiosyncratic risk; systemic risk effect weaker
Adults with Loan Accounts (Adu.Loan)	Reduces SRISK	Reduces Z-Score and CDS	Stronger reduction in both risk types
NCB Share in Loans (SLoan.NCB)	Increases SRISK	Increases Z-Score and CDS	Amplifies risk in Dev. countries
NCB Share in Deposits (SDep.NCB)	Increases SRISK	Increases Z-Score and CDS	Amplifies risk in Dev. countries
Macroprudential Policy (MPP)	Reduces SRISK, especially when aligned with credit growth (MPP.cred)	Reduces idiosyncratic risk	Effective across all contexts
Basel III Compliance (Mic)	Reduces SRISK	Reduces idiosyncratic risk	Banks tend to relax compliance during credit booms

$\Rightarrow$ Banks should not grant loans and should have more deposits.

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Minor comments & presentation suggestions

- ▸ Improve clarity on variable constructions in one compact table in main text (currently split across tables/appendix). The paper is too long.
- ▸ Clarify why some FI indicators (e.g. adults with deposit accounts) were omitted (data coverage) and report any tests using World Bank Global Findex where possible.
- ▸ Typos / editorial: run a careful proofreading pass (some sentences are long and can be tightened; some figure captions miss axis labels in the draft).
- ▸ Make figures in the appendix (Mic, Mic.cred, etc.) larger and easier to read; consider moving the most relevant robustness tables to main text if space allows.

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