Granular Credit Risk

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SED Annual Meeting
June 29, 2022

THIS PAPER

- **Research question**: does single-name credit concentration risk have aggregate implications?
- **Data**: bank-firm matched database from the Tax Authority of Norway
  - Distribution of loan shares is fat-tailed. Diversification effects may be small
- **Empirical approach**: granular instrumental variable (GIV) (Gabaix-Koijen 2022a, 2022b)
  - Estimate idiosyncratic firm shocks
  - Use GIV to trace out the impact on bank outcomes and the economy
- **Main empirical results**: granular credit risk does not wash out in bank portfolios
  - GIV-instrumented firm shocks explain 8.6% of corporate returns' st. dev.
  - Concave relationship; no evidence of hedging
  - Spillover effects: banks respond by cutting lending and raising interest on non-granular firms
  - Real consequences: non-granular firms lower investment, bankruptcy risk goes up
- **Theoretical motivation**: introduce bank credit into the canonical Gabaix (2011) framework

Literature

- **Granular origins**: Gabaix (2011), Carvalho and Gabaix (2013), di Giovanni et al. (2018), Gaubert and Itskhoki (2021), Chodorow-Reich et al. (2021), Camanho et al. (2022)
- **Granularity in banking**: Amiti and Weinstein (2018), Bremus et al. (2018), Kundu and Vats (2021)
- **Calibration for quantitative models**: Mendicino et al. (2020), Jamilov and Monacelli (2021)

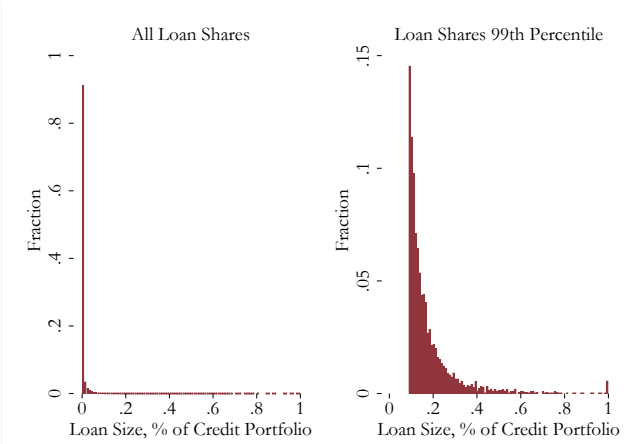
Data

We combine annual data from three sources:

- Matched firm-bank loan database from the Norwegian Tax Authority
  - $\sim$ 0 measurement error
  - Covers all credit to limited-liability firms over 2003-2015
  - We observe: annual interest paid (R_t) and end-of-year stock of debt (D_t)
- Firm data from credit rating agency Bisnode
  - Balance sheet, income statement, and ratings data on all limited-liability Norwegian firms
- Bank data from financial supervisory database ORBOF
  - Balance sheet and income statement data on all Norwegian banks

In the end: 330,000 firm$\times$bank$\times$year observations Summary Table

DISTRIBUTION OF BANK LOANS IS VERY CONCENTRATED



- **80% of corporate credit in Norway is in 20% of loans**. Pareto tail $\alpha = 1.15$
- External validity: granularity in equity holdings of U.S. institutional investors Go

Imputing return on loans

- Key variable: return on a credit relationship (RoL)
- Not directly observable, but can be imputed

$$\text{RoL}_t = \frac{R_t}{0.5 \times (D_t + D_{t-1})}$$

- Ex-post interest rate measure
- Comparison with Statistics Norway Go

ESTIMATING FIRM SHOCKS

- Follow the literature (Guiso et al. 2005, Hsieh-Klenow 2009, Fagereng et al. 2018)
- Baseline regression:

$$\ln VA_{jt} = \beta^0 + \beta^1 \ln K_{jt} + \beta^2 \ln W_{jt} + \beta^3 X_{jt} + \mu_j^1 + \mu_{s(j)z(j)t}^2 + \boxed{\varepsilon_{jt}}$$

- VA_{jt}: value added of firm j in industry s, county z, and year t
- K: book capital
- W: wage bill
- X: leverage, liquidity, credit rating, age, age^2
- μ_j^1 and $\mu_{s(j)z(j)t}^2$: firm and industry $\times$ county $\times$ year fixed effects
- $\boxed{\varepsilon_{jt}}$: idiosyncratic firm shock
- Distribution of estimated shocks Go

LOAN OUTCOMES: IDENTIFICATION

- Estimate impact of shock from firm *j* on relationship-level return of bank *i*

$$RoL_{ijt} = \beta^0 + \beta^1 \varepsilon_{jt} + \mu_{its(j)z(j)l(ij)} + \nu_{ijt}$$

- RoL_{ijt}: return on loan of bank i from firm j in industry s, county z, loan type l, and year t
- ε_{jt}: estimated firm shock from before
- $\mu_{its(j)z(j)l(j)}$: bank $\times$ industry $\times$ county $\times$ loan type $\times$ year fixed effect
- l(ij) captures credit line vs. other loans

Loan outcomes: results

	(1)	(2)	(3)	(4)	(5)
	Dependent Variable: Return on Loan (RoL)				
Firm shock (standardized)	0.134	0.146	0.334	0.335	0.361
	(0.012)	(0.013)	(0.015)	(0.017)	(0.019)
Bank x Industry x Year FE	No	No	No	Yes	No
Bank x Industry x Year x Loan-type x County FE	No	Yes	No	No	Yes
Additional controls	No	No	Yes	Yes	Yes
Observations	479754	434662	333289	317186	292825
R^2	0.000	0.195	0.001	0.114	0.167
$\mathbb{E}$(RoL)	7.988%	7.975%	9.012%	9.029%	9.098%
SD(RoL)	7.993%	7.928%	8.921%	8.928%	8.923%

- 1 st. dev. ↑ in firm shock ⇒ RoL ↑ by 33-36 bps (4% of st. dev.)
- Dynamic effects Go
- Latent factor extraction with PCA Go

BANK OUTCOMES: GRANULAR IDENTIFICATION

- Generic bank outcome y_{it}, **bank-side** factor η_{it}, and **firm-side** disturbance ε_{ijt}:

$$y_{it} = \beta \sum_j s_{ijt}\varepsilon_{ijt} + \varphi_i \eta_{it}$$

- Identification problem:

$$\varepsilon_{ijt} = \delta_i \eta_{it} + u_{ijt}$$

- Gabaix-Koijen (2022a, 2022b) **solution** removes η_{it}:

$$GIV_{it} = \sum_j s_{ijt}\varepsilon_{ijt} - \sum_j \frac{1}{N_i}\varepsilon_{ijt} = \sum_j s_{ijt}u_{ijt} - \sum_j \frac{1}{N_i}u_{ijt}$$

- Run 2SLS with **GIV-instrumented** firm shocks:

$$R^b_{it} = \alpha_i + \alpha_t + \beta \hat{u}_{it} + \nu_{it}$$

- Where $\hat{u}_{it}$ are fitted values from first stage of $\bar{\varepsilon}_{it}$ on GIV_{it}

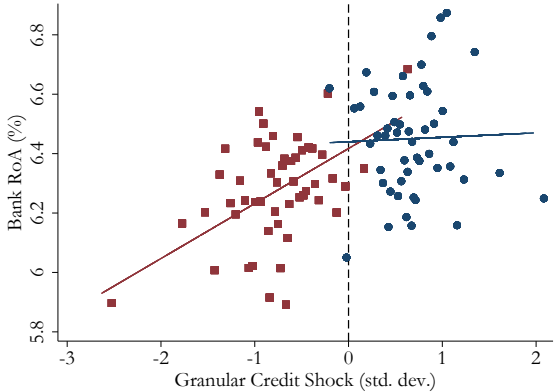
Granular identification

- **Key restriction**

$$\sum_{j}^{N} \mathbb{E}\left[s_{ijt} u_{ijt} v_{it}\right] = 0$$

- **Our validation**
  - ε_{jt} uncorrelated with firm characteristics (size, costs, etc.) that influence credit demand
  - ε_{jt} not auto-correlated
  - ε_{jt} cross-sectional correlation ~ 0
  - ε_{jt} uncorrelated with loan shares: ρ with $s_{ijt} \sim 0$
  - s_{ijt} use average stock of debt $\frac{d_{ijt-1}+d_{ijt}}{2}$
  - Additional bank controls: (lagged) total assets, leverage, liquidity, number of loans, deposit / total assets, financial assets / total assets

BANK OUTCOMES



- Granular credit shock ↓ by 1 s.d ⇒ RoA ↓ by 11.7 bps
- **Asymmetric effects:** negative GCR ↓ by 1 s.d ⇒ RoA ↓ by 19.4 bps
- Additional results: ▸ Table ▸ Dynamic Effects ▸ First Stage
- Heterogeneous bank factor loadings δ_{ij} with PCA ▸ Go

FIRM SPILLOVERS: IDENTIFICATION

- What do banks, hit by a granular credit shock, do?
- Khwaja-Mian 2008 approach: impact on credit supply or prices from banks that experience high/low granular firm shocks to firms which borrow **from multiple banks**, in the same year, county, industry, and loan type

$$\Delta y_{ijt} = \alpha_i + \alpha_{jts(j)z(j)} + \beta \Delta \hat{u}_{it} + \nu_{ijt}$$

  - Δy_{ijt}: change in loan volumes or interest flows
  - $\Delta \hat{u}_{it}$: GIV-instrumented firm shock aggregated to bank level
  - $\alpha_{jts(j)z(j)}$: firm x year x industry x county fixed effect
  - α_i: bank fixed effect
- Focus on **non-granular borrowers**: loan share < median or 1st quartile; $\sim$ 15% of aggregate capital

Firm spillovers: credit supply

	(1)	(2)	(3)	(4)	(5)	(6)
	Dependent Variable: Δ Loans					
Δ Bank Shock	0.023	0.022	0.165	0.625	0.168	0.717
	(0.043)	(0.043)	(0.129)	(0.288)	(0.136)	(0.311)
Year x Industry x County x Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Bank FE	No	No	No	No	Yes	Yes
Non-Granular Firms (50%)	No	No	Yes	No	Yes	No
Non-Granular Firms (25%)	No	No	No	Yes	No	Yes
Instrumented by GIV	No	Yes	Yes	Yes	Yes	Yes
Observations	15279	15279	3449	348	3413	322
R^2	0.484					

- Granular credit shocks lead banks to **reduce credit supply** to non-granular clients
- Continuous measure of non-granularity: Go

FIRM SPILLOVERS: INTEREST FLOWS

	(1)	(2)	(3)	(4)	(5)	(6)
	Dependent Variable: Δ Interest Flow					
Δ Bank Shock	-0.004	-0.017	-0.361	-0.341	-0.421	-0.634
	(0.064)	(0.066)	(0.189)	(0.417)	(0.190)	(0.448)
Year x Industry x County x Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Bank FE	No	No	No	No	Yes	Yes
Non-Granular Firms (50%)	No	No	Yes	No	Yes	No
Non-Granular Firms (25%)	No	No	No	Yes	No	Yes
Instrumented by GIV	No	Yes	Yes	Yes	Yes	Yes
Observations	15279	15279	3449	348	3413	322
R^2	0.533					

- Granular credit shocks lead banks to **raise interest payments** on non-granular clients
- Continuous measure of non-granularity: Go

Firm outcomes: identification

- Textbook negative credit supply shock: quantities ↓, prices ↑
- Does it matter for the real economy? How do affected firms respond?

$$\Delta y_{jt} = \alpha_{szt} + \beta \Delta \hat{u}_{jt} + \nu_{jt}$$

  - Δy_{ijt}: change in loan volumes or interest flows
  - $\Delta \hat{u}_{jt}$: GIV-instrumented firm shock aggregated to firm level
  - α_{szt}: industry x county x year fixed effect

Firm spillovers: balance sheet effects

	(1) Capital	(2) Capital	(3) Capital	(4) Sales	(5) Wages	(6) Cash
ΔBank shock	0.040	0.241	0.129	0.001	0.007	0.142
	(0.030)	(0.095)	(0.251)	(0.031)	(0.040)	(0.146)
E(dependent variable)	-0.081	-0.095	-0.105	0.026	0.034	0.067
SD(dependent variable)	0.603	0.640	0.683	0.290	0.344	1.037
Year-industry-county FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Non-Granular Firms (50%)	No	Yes	No	Yes	Yes	Yes
Non-Granular Firms (25%)	No	No	Yes	No	No	No
Instrumented by GIV	Yes	Yes	Yes	Yes	Yes	Yes
Observations	90800	39861	15444	44547	45452	43994

- Affected non-granular firms are more likely to **cut investment (capital)**
- Robustness to production network effects; Norwegian input-output table Go

Firm spillovers: probability of bankruptcy

Probit Model	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Probability of bankruptcy$_t$							Ever bankrupt
ΔBankShock$_t$	-0.609	-0.680	-1.056					
	(0.110)	(0.196)	(0.307)					
ΔBankShock$_{t-1}$				-0.322	-0.965	-0.946		
				(0.123)	(0.203)	(0.334)		
ΔBankShock$_{t-3}$							-0.703	
							(0.239)	
ΔBankShock$_t$								-1.273
								(0.281)
Non-Granular Firms (50%)	No	Yes	No	No	Yes	No	Yes	Yes
Non-Granular Firms (25%)	No	No	Yes	No	No	Yes	No	No
Instrumented by GIV	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	61819	35965	20161	50897	29451	16302	16648	35965

- Affected non-granular firms are more likely to **file for bankruptcy**
- Robustness to production network effects; Norwegian input-output table Go

Select Additional Results

- Hedging granular credit risk ▸ Go
- Estimating AR(1) on granular shock series ▸ Table
- Loan outcomes
  - Heterogeneity by ▸ Geography [Map] ▸ Extensive Margin ▸ Industry ▸ Ownership
- Placebo regressions ▸ Table
- Pairwise correlation ▸ Results
- Robustness to the Great Financial Crisis ▸ Table
- Home bias in regional lending ▸ Figure
- GCR vs aggregate shocks ▸ Go
- Estimated regressor correction ✓
- More in paper: bank heterogeneity, theoretical motivation

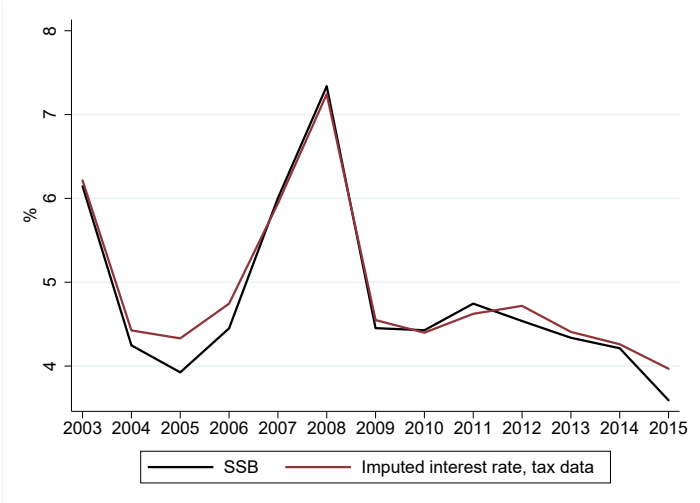
Conclusion

- We provide causal empirical evidence on the role of **single-name** credit concentration risk
- Shocks to granular borrowers survive **portfolio aggregation** and affect bank returns
- Banks respond by reducing supply and raising interest on **non-granular firms**
- Impacted non-granular firms **cut investment; bankruptcies go up**
- Quantification of models with **idiosyncratic borrower risk**
- Ongoing work: Granular Deposit Risk

Additional Slides

Imputed vs. Official Corporate Credit Rate

Back



- SSB: Statistics Norway

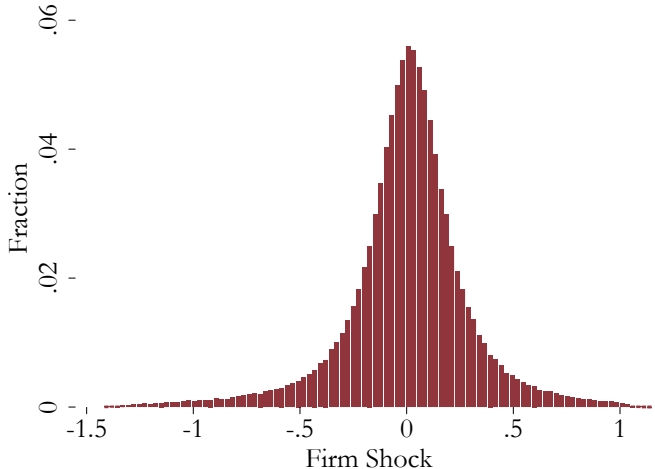
Select Summary Statistics

Back

Variable	Observations	Mean	Std. Dev	Min	Max
		Loans			
Interest Received	333289	196645.31	1620919.78	1.00	2.67e+08
Loan Amount Outstanding	333289	4035259.25	43884811.59	1.00	7.00e+09
Return on Loan (%)	333289	9.01	8.92	0.00	100.00
		Banks			
Return on Loans (%)	1380	6.40	1.46	0.06	14.39
Total Assets (1000NOK)	1377	21130037.71	1.35e+08	92384.00	1.96e+09
Total Equity (1000NOK)	1377	1491611.98	8512785.73	16139.00	1.51e+08
Assets / Equity Ratio	1377	10.90	3.20	1.32	41.48
Cash Balances / Assets	1377	0.03	0.03	0.00	0.33
Number of Loans	1380	220.88	854.18	1.00	8940.00
Loan Herfindahl Index	1380	0.10	0.12	0.00	1.00
Share of 10% Largest Loans	1380	0.54	0.13	0.20	1.00
Share of 5 Largest Loans	1380	0.51	0.20	0.07	1.00
		Estimated Idiosyncratic Shocks			
Firm-level	277707	0.02	0.27	-1.42	1.15
Bank-level (size-weighted)	1380	-0.02	0.11	-0.78	0.69
Granular IV	1380	-0.02	0.09	-0.76	0.46

Distribution of Idiosyncratic Firm Shocks

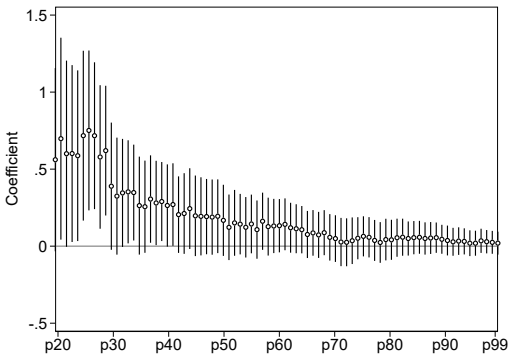
Back



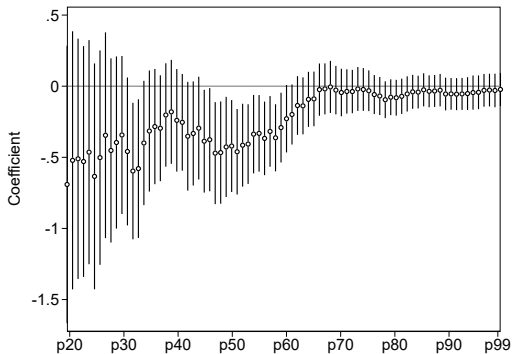
Spillovers: Continuous Measure of Non-Granularity

Back

(A) Credit Supply



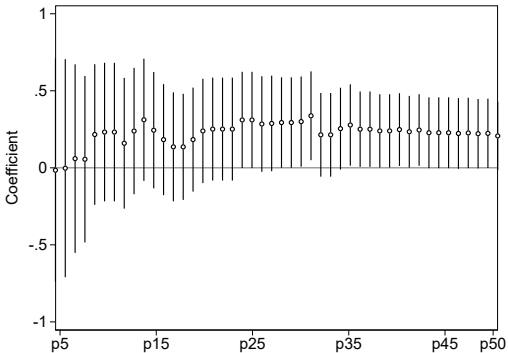
(B) Interest Flow



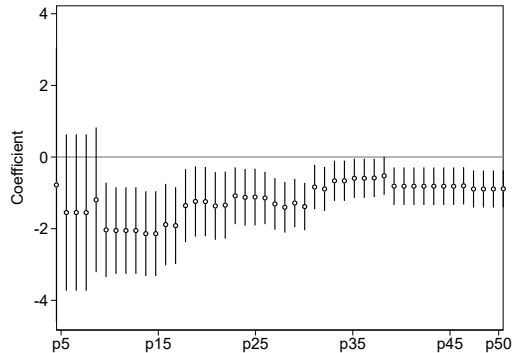
Firm Outcomes: Accounting for Production Networks with Continuous Measure of Non-Granularity

Back

(A) Capital



(B) Probability of Bankruptcy



- The sample is restricted only to firms operating in "downstream" sectors for which other sectors (including the firm's own sector) account for at most 6.7% of the total demand (first quartile of inter-sector exposures).

Loan outcomes with factor extraction

Back

	(1)	(2)	(3)
	Dep. Var.: Return on Loan		
(1) Firm Shock: $\check{\varepsilon}_{jt}$	0.307	0.307	0.333
	(0.016)	(0.017)	(0.018)
(2) Firm Shock: u^1_{jt}	0.279	0.279	0.299
	(0.016)	(0.017)	(0.018)
(3) Firm Shock: u^2_{jt}	0.239	0.237	0.255
	(0.016)	(0.017)	(0.018)
Bank x Industry x Year FE	No	Yes	No
Bank x Industry x Year x Loan-type x County FE	No	No	Yes

- $\check{\varepsilon}_{jt}$: firm shock, robust to parametric common components
- u^1_{jt}: firm shock, robust to one non-parametric factor
- u^1_{jt}: firm shock, robust to two non-parametric factors

BANK OUTCOMES - CONTROLLING FOR FACTORS

BACK

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Dependent Variable: Bank Return on Loans (RoA)							
	OLS		Instrumented with GIV					
	Pooled	Pooled	Pooled	Positive	Negative	Pooled	Positive	Negative
Granular Credit Shock: $\bar{\varepsilon}_{jt}$	0.125	0.122	0.105	0.027	0.186	0.103	0.026	0.180
	(0.026)	(0.025)	(0.030)	(0.071)	(0.073)	(0.029)	(0.071)	(0.073)
Bank FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bank Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
η_{it} controls	No	Yes	No	No	No	Yes	Yes	Yes

- $R^b_{it} = \alpha_i + \alpha_t + \beta_1 \hat{u}_{it} + \beta_2 \eta^1_{it} + \beta_3 \eta^2_{it} + \nu_{it}$
- Use PCA on each bank to extract non-parametric common factors η^1_{it} and η^2_{it}

BANK OUTCOMES: TABLE

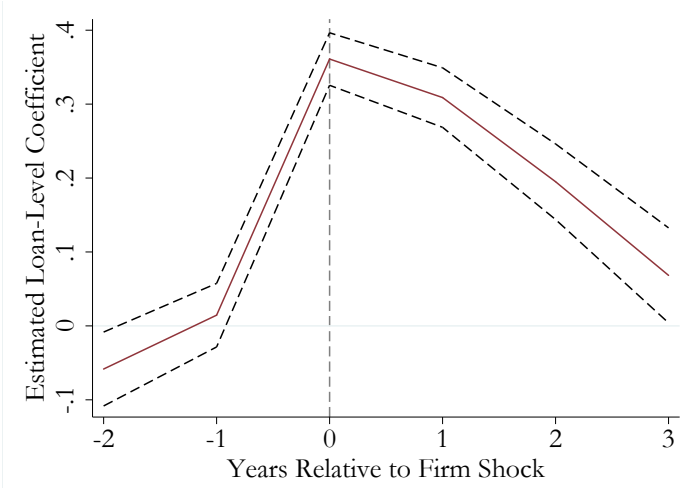
BACK

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Dependent Variable: Bank Return on Loans (RoA)							
	OLS		Instrumented with GIV					
	Pooled	Pooled	Pooled	Positive	Negative	Pooled	Positive	Negative
Granular Credit Shock	0.129	0.136	0.116	0.016	0.194	0.117	0.056	0.176
	(0.027)	(0.025)	(0.034)	(0.075)	(0.068)	(0.029)	(0.067)	(0.065)
First stage F-stat			1429.683	138.772	396.907	1137.722	150.136	263.982
J-statistic			0	0	0	0	0	0
Bank FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bank Controls	No	Yes	No	No	No	Yes	Yes	Yes
Observations	1211	1211	1211	508	694	1211	508	694
R^2	0.752	0.770	0.599	0.646	0.569	0.627	0.683	0.592
$\mathbb{E}$(RoA)	6.350%	6.350%	6.350%	6.460%	6.289%	6.350%	6.460%	6.289%
Sd(RoA)	1.354	1.354	1.354	1.403	1.295	1.354	1.403	1.295

- RHS variable standardized; LHS variable in level

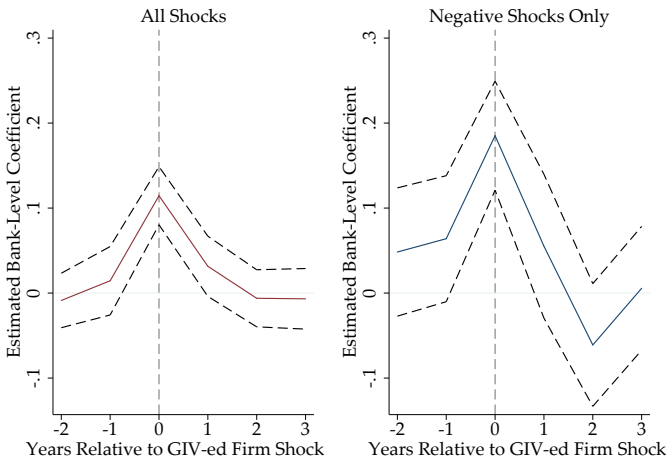
LOAN OUTCOMES: DYNAMICS

BACK



BANK OUTCOMES: DYNAMICS

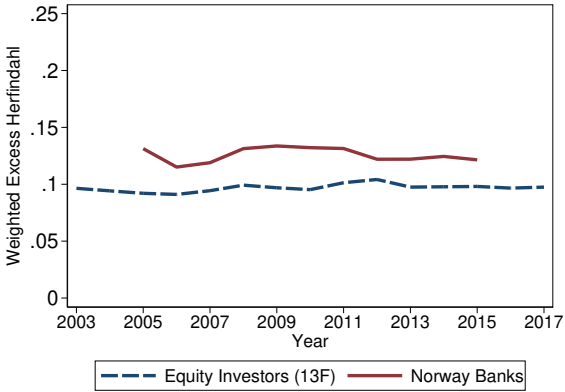
BACK



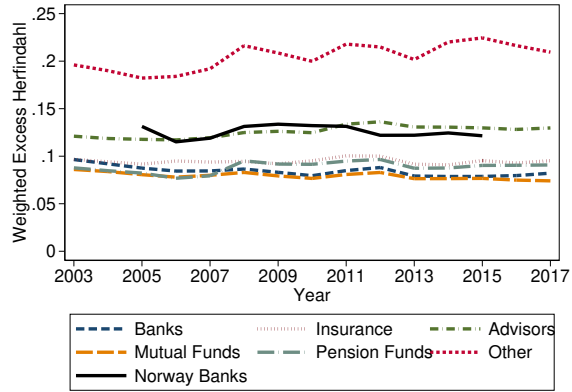
Granularity in Equity Portfolios of U.S. Investors

Back

(A) All Investors



(B) Investor Types



- Excess Herfindahl: $\text{eHHI}_{it} = \sqrt{\sum_j s_{i,j,t}^2 - \frac{1}{N_{it}}}$

HEDGING GRANULAR CREDIT RISK

BACK

	(1)	(2)	(3)	(4)	(5)
Dependent Variable: Δ Income from	Fees	Derivatives	Equity	Bonds	Dividends
			Pooled		
Granular Credit Shock	0.219	-0.658	-1.323	0.163	0.173
	(0.131)	(1.214)	(1.477)	(0.140)	(0.631)
Bank FE	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes
Observations	1211	344	1058	1197	1174
R^2	0.010	0.049	0.011	0.013	0.046
			Negative Shocks Only		
Granular Credit Shock	0.330	-0.133	-3.420	0.461	-0.209
	(0.236)	(2.944)	(5.466)	(0.470)	(0.170)
Bank FE	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes
Observations	697	197	606	690	680
R^2	0.021	0.037	0.023	0.021	0.164

- **No association** between granular credit risk and banks' non-interest income

Estimating granular shock process

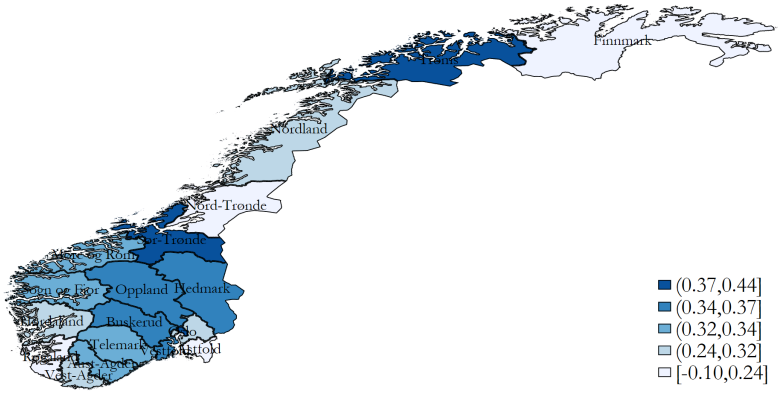
Back

	Borrower Level	Bank Level	Firm Industry Level	County Level
Autoregressive Coef.	0.318	0.122	0.241	0.223
Standard Deviation	0.267	0.107	0.254	0.251

- Fit Baltagi-Wu (1999) fixed effects model with AR(1) disturbance
- Specification: $y_{it} = \beta_0 + \mu_i + \varepsilon_{it}$ with $\varepsilon_{it} = \rho\varepsilon_{it-1} + \sigma_\eta\eta_{it}$ where y_{it} is idiosyncratic firm shock
- Different levels of aggregation, annual data

Loan outcomes: geographical heterogeneity

Back



- Loan-level specification with regional slope shifters μ_z: $\text{RoL}_{ijt} = \beta^0 + \beta^1 \left(\mu_z \times \varepsilon_{jt}\right) + \mu^2_{its(j)l(ij)} + \nu_{ijt}$
- Map plots cross-section of β^1_z

Loan outcomes: extensive margin

Back

	(1)	(2)	(3)	(4)	(5)
	Dependent Variable: Return on Loan				
	Baseline	Firm Exit	Firm Entry	Firm Bankruptcy	Ever Bankrupt
Firm Shock	0.361	0.387	0.322	0.365	0.360
	(0.018)	(0.019)	(0.019)	(0.018)	(0.019)
Exit / Entry / Bankruptcy		0.613	-1.707	0.699	0.572
		(0.075)	(0.073)	(0.161)	(0.079)
Interaction		-0.259	0.260	-0.133	0.014
		(0.067)	(0.059)	(0.133)	(0.068)
Full Fixed Effects	Yes	Yes	Yes	Yes	Yes
Observations	292825	292825	292825	292825	292825
R^2	0.167	0.167	0.169	0.167	0.167

- ”Firm bankruptcy”, ”exit”, and ”entry” is contemporaneous; “Ever Bankrupt” tags firms that go bankrupt at least once at any point in the sample, not necessarily contemporaneously to shock

Loan outcomes: industry heterogeneity

Back

	(1)	(2)	(3)	(3)	(4)	(5)
	Dependent Variable: Return on Loan					
	All Firms	Manufacturing	Mining	Construction	Real Estate	Agriculture
Firm Shock	0.335	0.356	0.401	0.414	0.064	0.215
	(0.016)	(0.050)	(0.251)	(0.040)	(0.034)	(0.055)
Bank x Year x County FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	330490	34232	1097	60169	8531	7773
R^2	0.051	0.091	0.364	0.082	0.197	0.201

- Results are not driven by industry outliers

Loan outcomes: ownership heterogeneity

Back

	(1)	(2)	(3)	(4)	(5)
	Dependent Variable: Loan RoA				
	All Firms	Private Firms	State Firms	Community Firms	Financial Vehicles
Firm Shock	0.335	0.336	0.478	0.089	1.145
	(0.016)	(0.019)	(0.654)	(0.120)	(0.966)
Bank x Year x County FE	Yes	Yes	Yes	Yes	Yes
Observations	330490	234074	162	2526	389
R^2	0.051	0.053	0.243	0.282	0.214

- Results are concentrated almost fully in private firms

Placebo regressions: permutation tests

Back

	Simulations	True Coefficient	Event Frequency	Event P-value
		Loan Outcomes		
Permuted Firm Shock	1000	0.361	0	0.000
		Bank Outcomes		
Permuted Firm Shook, Pooled	1000	0.116	0	0.000
Permuted Firm Shock, Positive Only	1000	0.016	838	0.838
Permuted Firm Shock, Negative Only	1000	0.194	0	0.000

- Monte Carlo permutation regressions where loan or bank returns are regressed on firm shocks that are randomly permuted
- True coefficients are baseline estimates
- Event frequency is number of times the simulated coefficient is greater (in absolute terms) than true coefficient by chance

PLACEBO REGRESSIONS: RANDOMNESS TESTS

BACK

	Number of Draws	Mean	Std. Dev.	Min	Max
		Loan Outcomes			
Placebo Firm Shock	1000	0.001	0.007	-0.018	0.021
		Bank Outcomes			
Placebo Firm Shook, Pooled	1000	0.000	0.005	-0.016	0.018
Placebo Firm Shock, Positive Only	1000	0.001	0.018	-0.053	0.049
Placebo Firm Shock, Negative Only	1000	-0.000	0.014	-0.041	0.046

- A placebo exercise where loan or bank outcomes are regressed on sequences of randomly generated numbers.
- In each row, placebo shocks are randomly drawn from the interval of the true shock. The last two rows report results when shocks are positive or negative only, respectively.
- Columns report the number of random draws and summary statistics of the regression coefficients: mean, standard deviation, minimum, and maximum.

Impact of Aggregate Shocks

Back

	(1)	(2)	(3)
Granular Credit Shock	0.117		
	(0.030)		
Log (GDP)		0.348	
		(0.075)	
Log (Oil Price)			0.522
			(0.029)
Bank FE	Yes	Yes	Yes
Year FE	Yes	No	No
Bank Controls	Yes	Yes	Yes
Observations	1211	1211	1211
R^2	0.627	0.152	0.242

- Results from bank-level regressions with different main regressors

Robustness to Great Financial Crisis

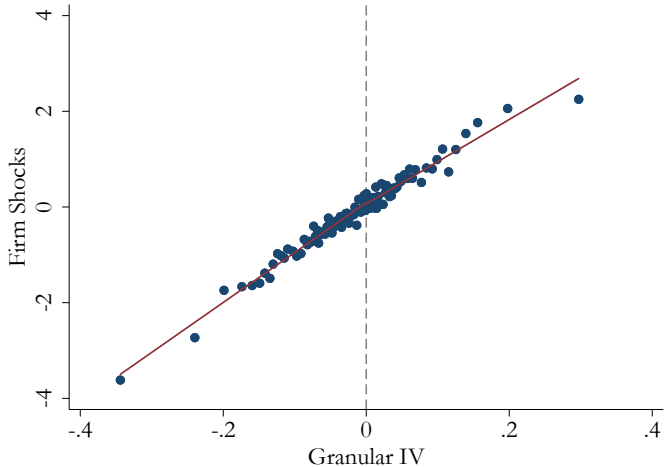
Back

	(1)	(2)	(3)	(4)	(5)	(6)
	Loan-Level			Bank-Level		
Firm Shock	0.361	0.432	0.322	0.117	0.091	0.108
	(0.018)	(0.032)	(0.022)	(0.029)	(0.051)	(0.037)
All Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Bank Controls				Yes	Yes	Yes
Observations	292825	102879	189946	1211	472	737
R^2	0.167	0.158	0.172	0.101	0.066	0.127

- Columns (1) and (4) are baseline estimates. Columns (2) and (5) include the pre-2009 period. Columns (3) and (6) include the post-2009 period.

FIRST STAGE

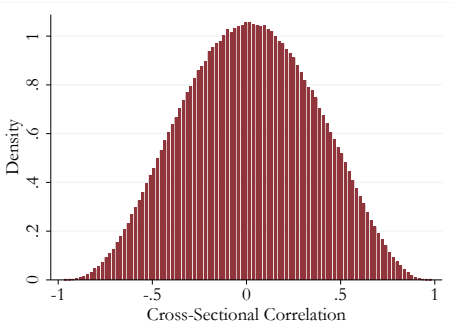
BACK



- Regression of size-weighted firm shocks on the granular instrument

Pairwise cross-sectional correlation of firm shocks

Back

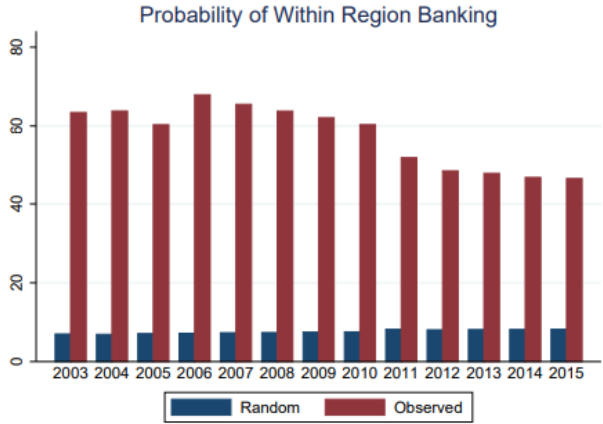


	Number of Pairs	Mean	Std. Dev.	Min	Max
Firm Shock	1,861,485	0.019	0.342	-0.977	0.985

- All pairwise cross-sectional correlation coefficients for idiosyncratic firm shocks. The sample includes a balanced panel of firms over 2003-2015.

Home Bias in Within-Region Banking

Back



- Source: Juelsrud and Wold (2020). Red bars show the *observed* fraction of loans within a given year in our sample where the firm and the bank are located in the same county (within-region loans). The blue bars show the counterfactual share of within-region loans, where we assume random matching between firms and banks. Given random matching, the probability that a firm i borrows from a bank j operating in that region is the sum of the aggregate/national market share of bank j.