The Real Effects of Financial Networks[1]

Co-Pierre Georg

Deutsche Bundesbank
and
University of Cape Town

Boston Policy Workshop
09 July 2017

[1] Joint work with Christian Bittner (Deutsche Bundesbank) and Falko Fecht (Frankfurt School). The views expressed are not necessarily the views of the Deutsche Bundesbank.

Motivation

- Kashyap and Stein (2000): Impact of monetary policy on bank-lending is more pronounced for banks with lower market liquidity
- Interbank markets are major source of private funding liquidity for German banks ($\sim$ 25-30% balance sheet size)
- Banks engage in bilateral over-the-counter lending to one another

$\Rightarrow$ Interbank **network**

Motivation

- Kashyap and Stein (2000): Impact of monetary policy on bank-lending is more pronounced for banks with lower market liquidity
- Interbank markets are major source of private funding liquidity for German banks ($\sim$ 25-30% balance sheet size)
- Banks engage in bilateral over-the-counter lending to one another

$\Rightarrow$ Interbank **network**

Hypothesis: Some positions in interbank network make it easier to access private funding liquidity

Some Stylized Facts About the German Interbank Market

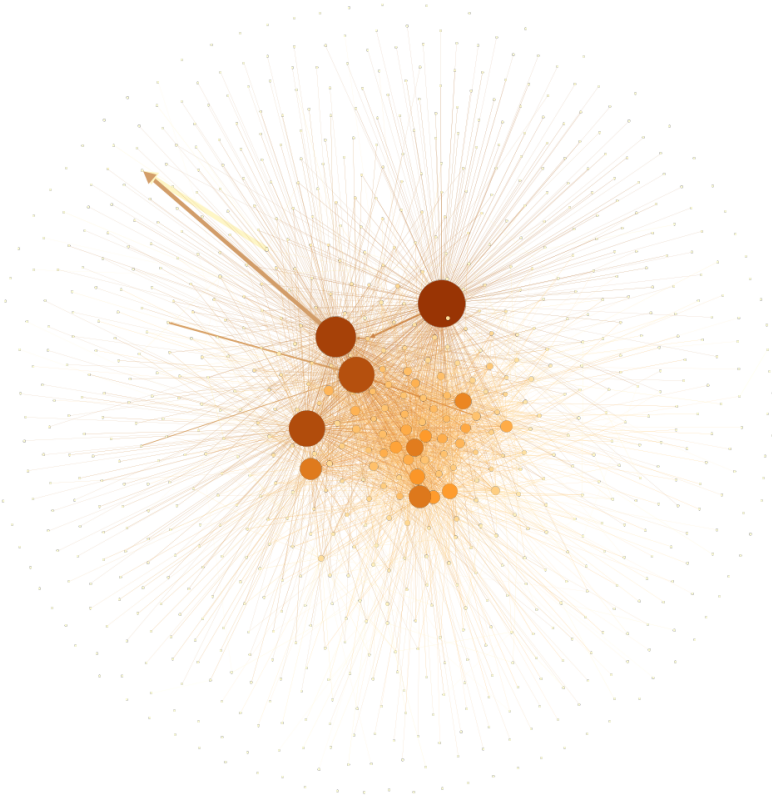


Figure: The German interbank market at the end of 2008

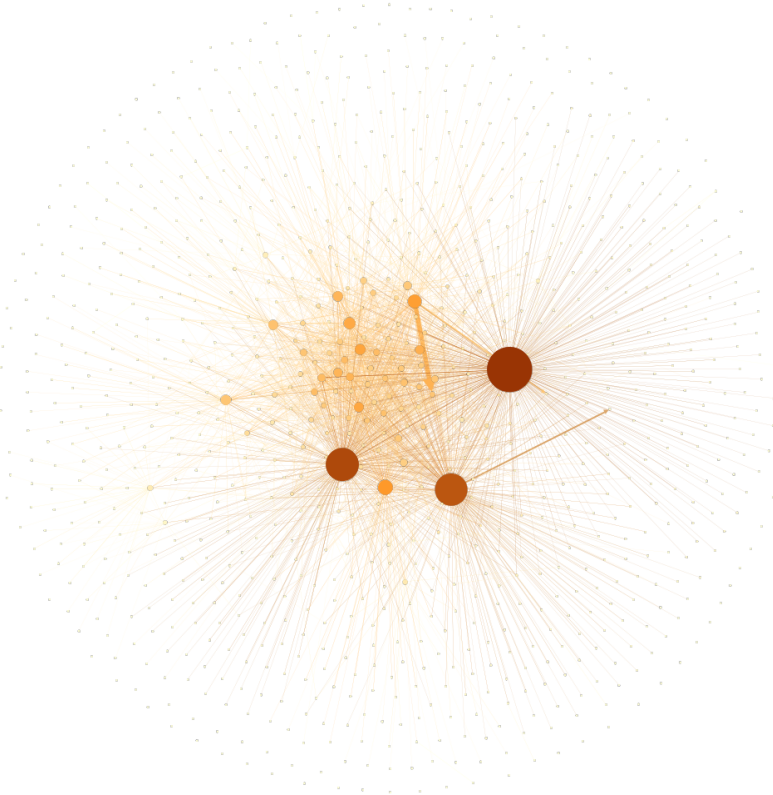


Figure: The German interbank market at the end of 2014

Intuition why Network Structure Matters for Liquidity Access

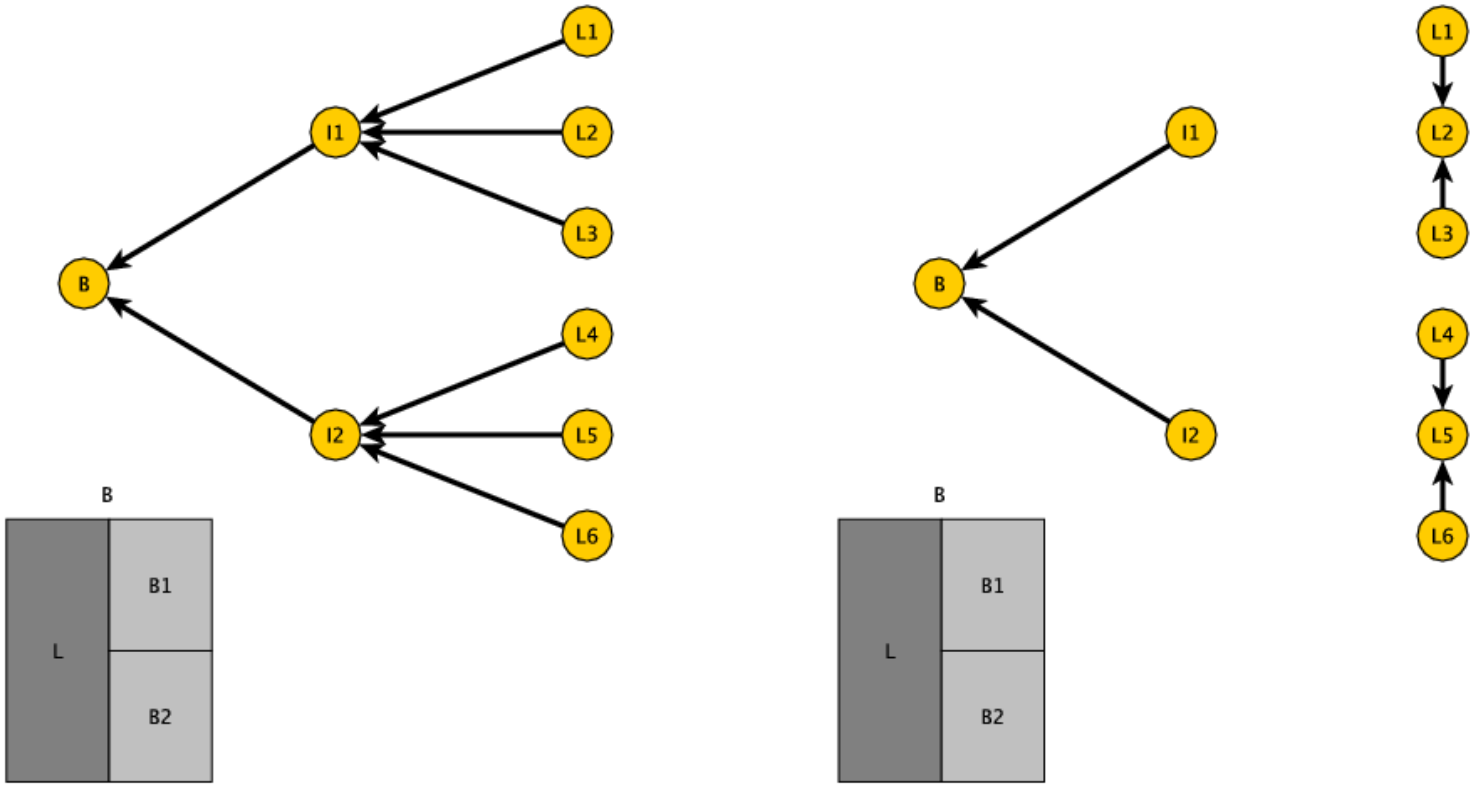


Figure 3: Borrower B has identical balance sheet in both cases, but the global network structure is different.

Overview of Identification and Results

Identification

- Dependent variable: Bilateral bank-firm lending before and after sovereign debt crisis [Bear Stearns; Lehman]
- Key independent variable: Indirect access to private liquidity (change + level)
- Two approaches:
  1. Difference-in-differences approach, including controls for firm demand
  2. Dynamic panel controlling for observed and unobserved bank and firm heterogeneity

Overview of Identification and Results

Identification

- Dependent variable: Bilateral bank-firm lending before and after sovereign debt crisis [Bear Stearns; Lehman]
- Key independent variable: Indirect access to private liquidity (change + level)
- Two approaches:
  1. Difference-in-differences approach, including controls for firm demand
  2. Dynamic panel controlling for observed and unobserved bank and firm heterogeneity

Results

1. Diff-in-Diff: Increase in centrality implies more loans to firms (intensive margin), and more new loans to firms (extensive margin)
2. Dynamic panel: Increase in centrality implies more credit to firms with more tangible assets, in particular following a shock

Overview of Identification and Results

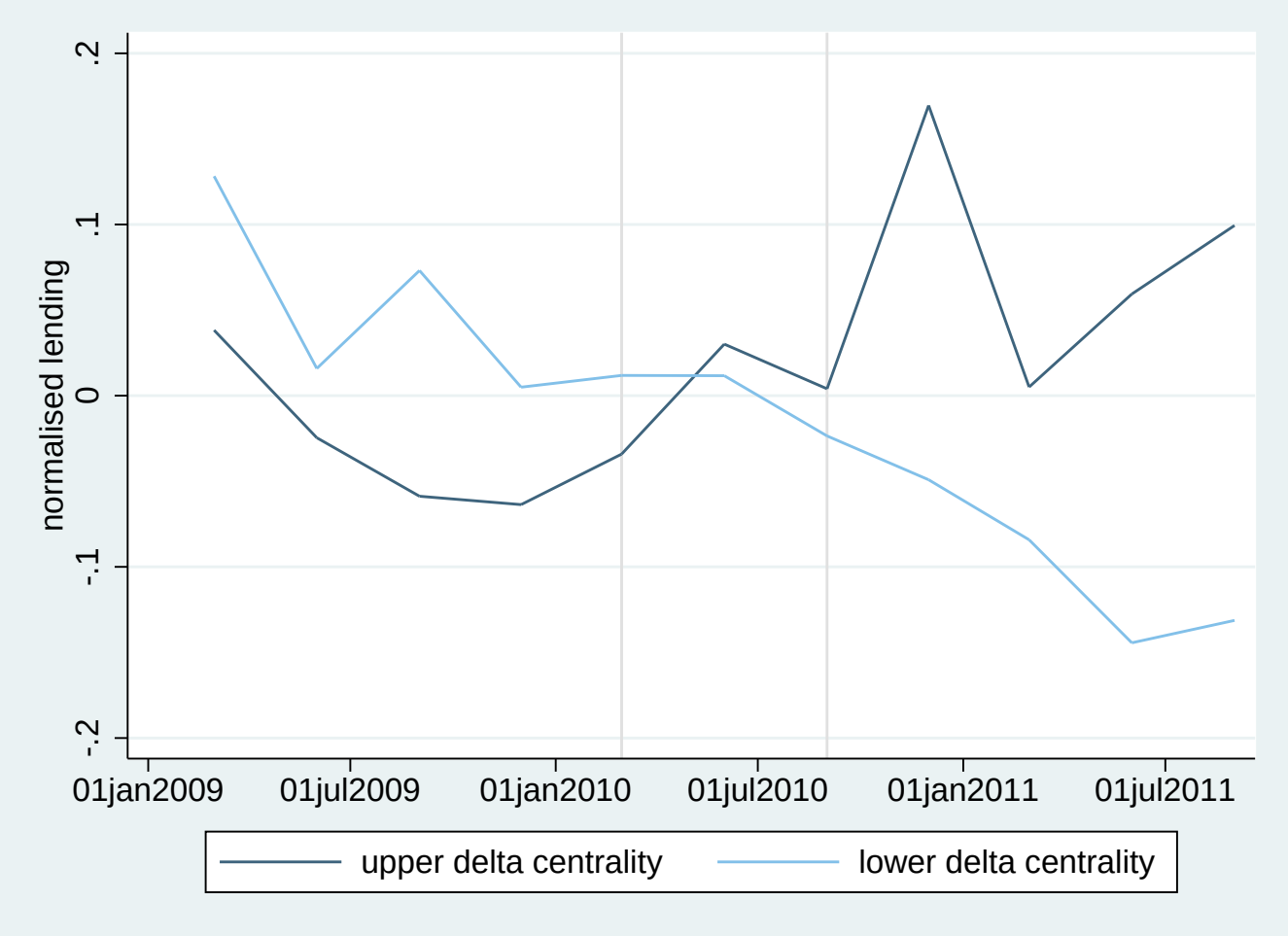


Figure: Normalised (to mean of shock period) lending from banks above and below the median centrality.

Contribution to the Literature

- Bank-lending channel
  Kashyap and Stein (2000); Khwaja and Mian (2008); Jimenez et al. (2011, 2013)
- Interbank markets as mechanism to manage liquidity risk
  Rochet and Tirole (1996); Iyer et al. (2014)
- Efficient re-allocation of liquidity within markets
  Di Maggio et al. (2016); Li and Schuerhoff (2014); Gabrieli and Georg (2016)
- Interbank markets as source of interconnectedness
  Allen and Gale (2000); Freixas et al. (2000); Elliott et al. (2015); Acemoglu et al. (2016)

The Institutional Framework

- May 2010: Greek bailout and SMP (around EUR60 billion bond purchases within a week)
- Pre-Shock period: Q1/2009 - Q4/2009
- Shock period: Q1/2010 - Q2/2010
- Post-Shock period: Q3/2010 - Q2/2011

The Institutional Framework

- May 2010: Greek bailout and SMP (around EUR60 billion bond purchases within a week)
- Pre-Shock period: Q1/2009 - Q4/2009
- Shock period: Q1/2010 - Q2/2010
- Post-Shock period: Q3/2010 - Q2/2011

- German banks differentially affected by sovereign debt crisis: some banks had sizable holdings of GIIPS sovereign and corporate bonds, others didn't

High-exposure banks lose funding & cut back lending

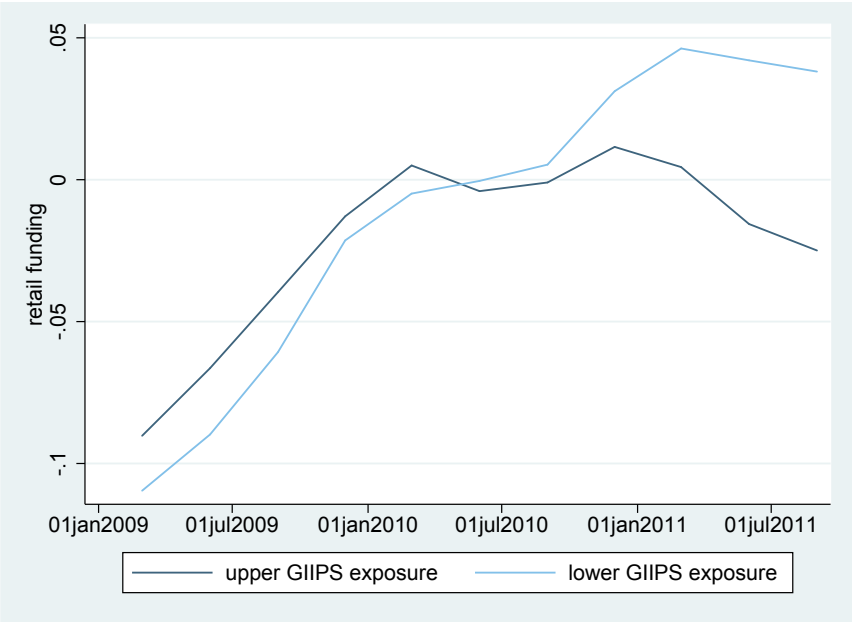


Figure: Normalized retail funding for banks above and below median of GIIPS exposure

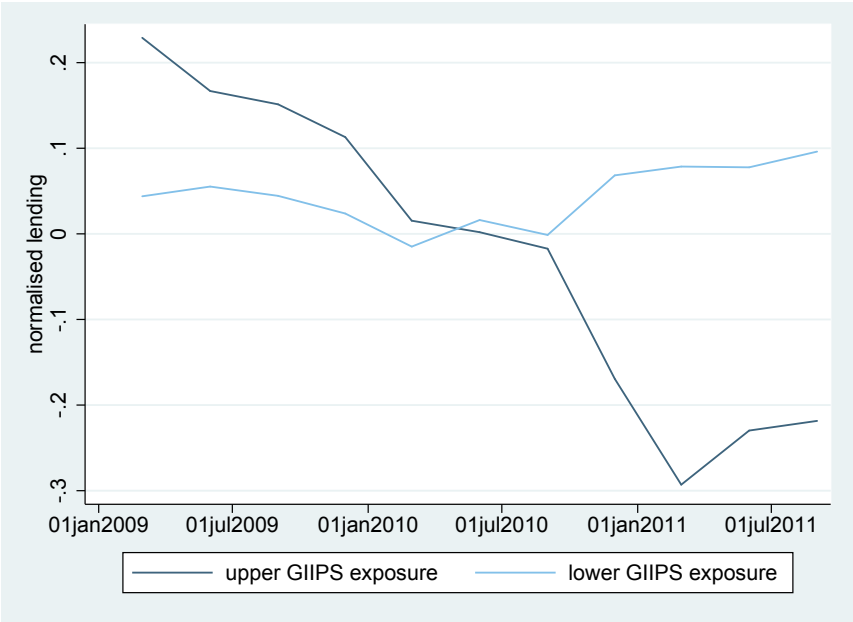


Figure: Lending to non-financial firms by banks in upper and lower tercile of GIIPS exposure

High-exposure banks borrow less on IB market after shock

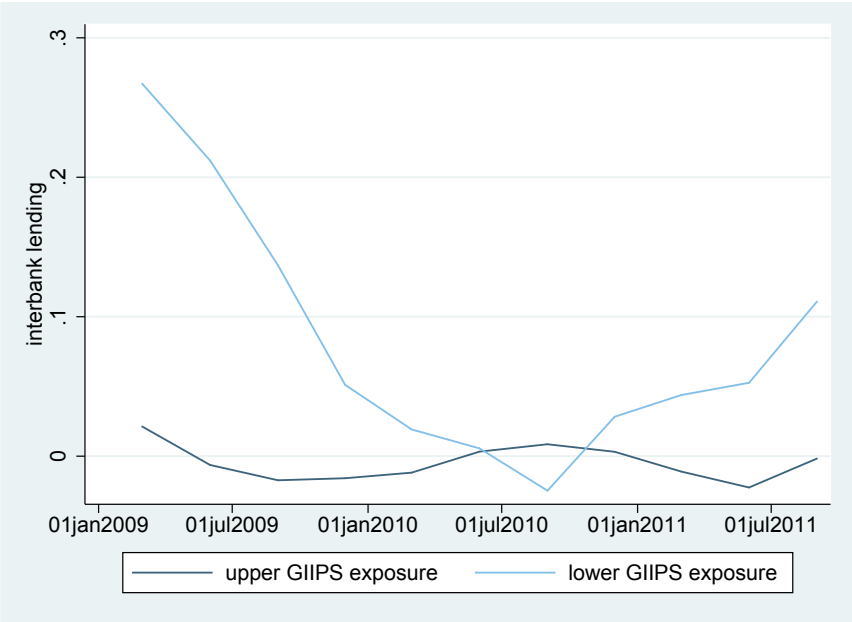


Figure: Interbank lending for banks above and below median of GIIPS exposure

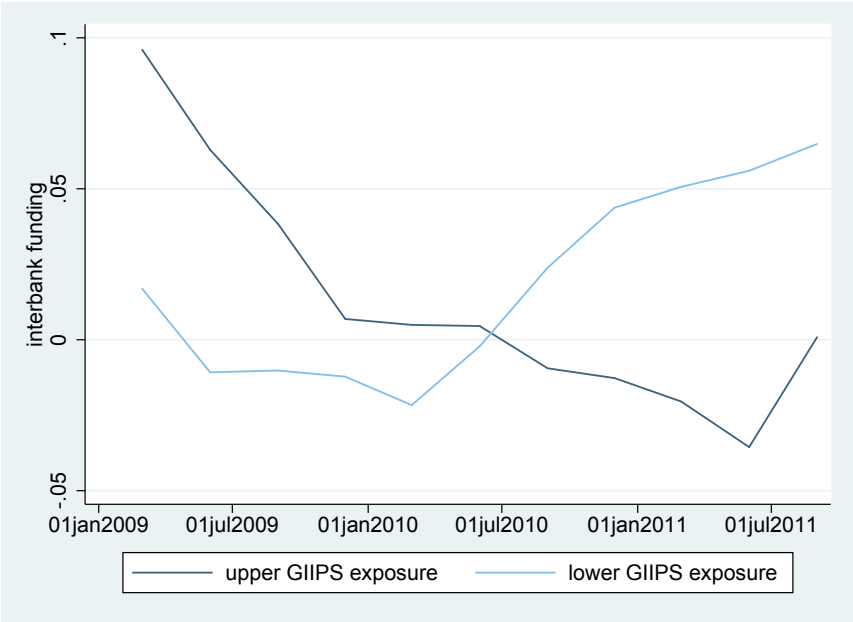


Figure: Interbank funding for banks above and below median of GIIPS exposure

No difference in CB funding, but in CB lending

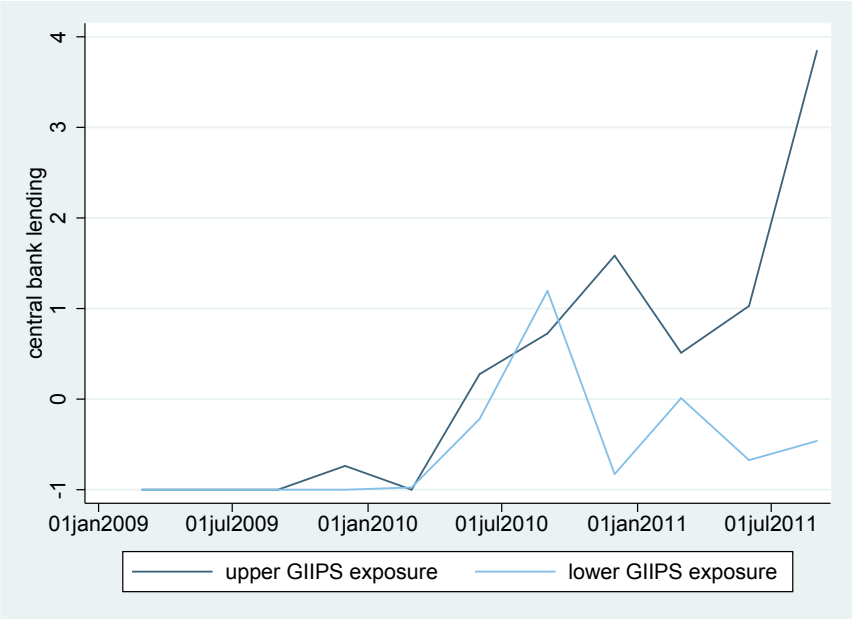


Figure: Lending to central bank for banks above and below median of GIIPS exposure

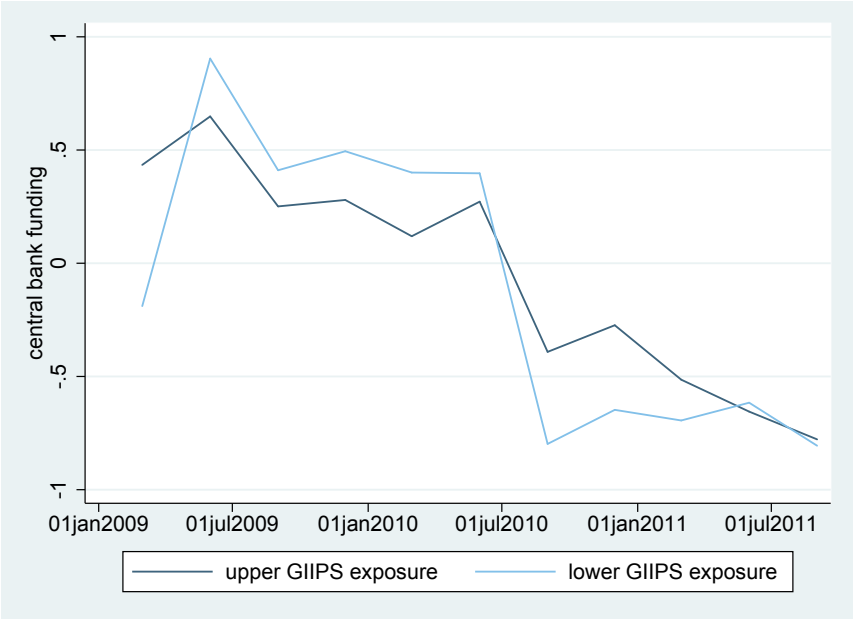


Figure: Central bank funding for banks above and below median of GIIPS exposure

Data

We use data from four main sources:

- Quarterly bank-firm and bank-bank lending from large credit registry ("Millionenkredit-Evidenzzentrale" - MiMiK)
  Value of loans that exceed EUR1.5 million during a quarter
- Annual firm balance sheet information from Bureau van Dijk ("DAFNE")
  Match with clear name of firm using simple ML
- Monthly bank characteristics from balance sheet statistics ("BISTA")
- Quarterly information about bank securities holdings ("WPInvest") matched with ECB list of eligible collateral
- We use 4,822 bank-firm relationships from 98 commercial banks to 1,302 randomly drawn firms that borrow from at least two banks

Difference-in-Differences, Controlling for Demand

- Sovereign debt crisis possibly affects firms as well as banks
  $\Rightarrow$ Khwaja and Mian (2008)
- Collapse quarterly observations into pre- and post-shock period

Difference-in-Differences, Controlling for Demand

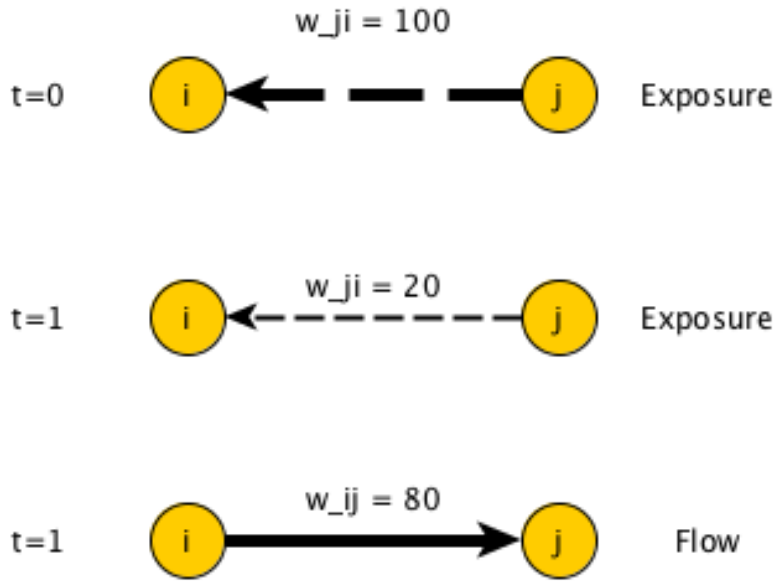
- Sovereign debt crisis possibly affects firms as well as banks
  $\Rightarrow$ Khwaja and Mian (2008)
- Collapse quarterly observations into pre- and post-shock period
- We estimate the following model:

$$\begin{aligned}\Delta \log \text{Volume}_{ij} &= \beta_j + \beta_l + \beta \text{Controls}_i + \beta_1 \text{NetPos}_{i,\text{pre}} \\ &\quad + \beta_2 \Delta \text{NetPos}_i + \varepsilon_{ij}\end{aligned}$$

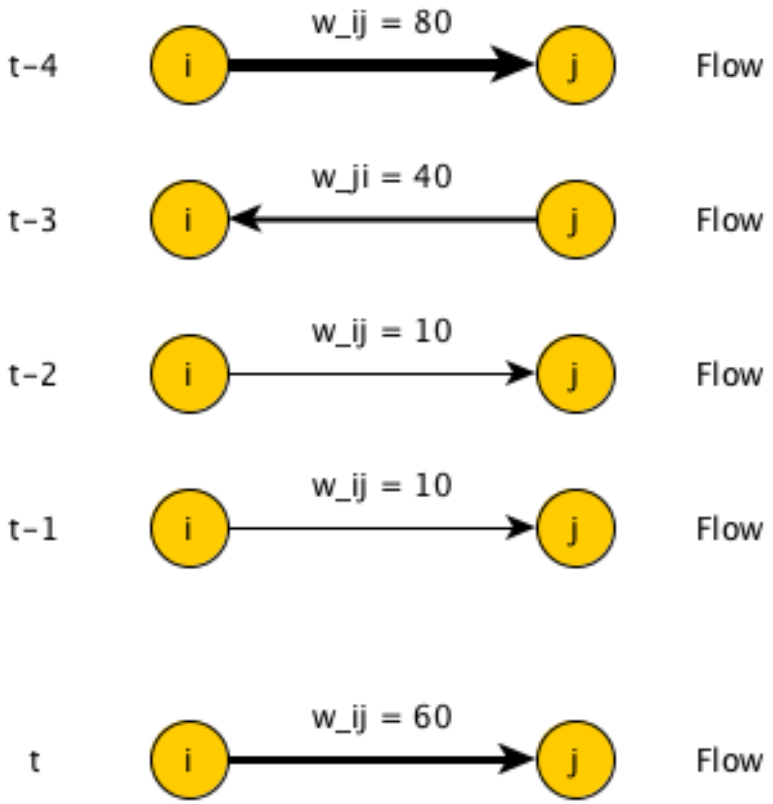
  where β_l is a dummy for the bank-type and Controls_i is a vector of bank-specific controls

- $\log \text{Volume}_{ij,t}$ log of volume from bank i to firm j at time t, obtained from MiMiK
- And similarly for extensive margin (Exit, Entry, Access)

The Network of Liquidity Transfer



Step 1: From stocks to flows



Step 2: Aggregating the networks

Computing the Network Mean

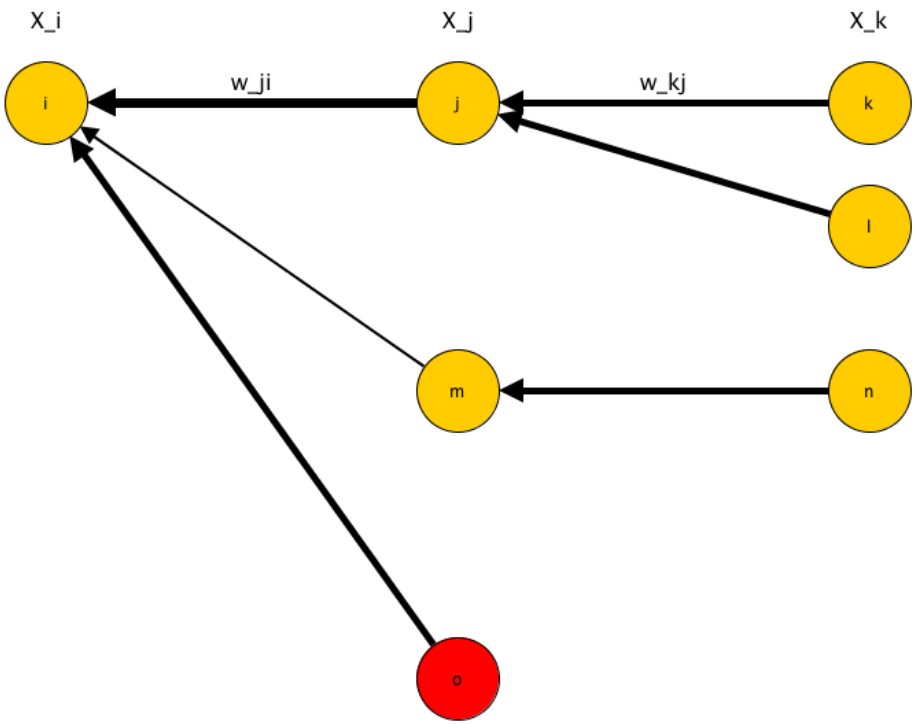


Figure: Schematic for computation of network mean

- X_j is the variable of interest, i.e. characteristic of node i.
- Network mean is defined as:

$$\widehat{X}_{i,t}^{(1)} = \sum_{j:i} \frac{w_{ji,t} \cdot X_{j,t}}{W_{i,t}} \Bigg|_{d_{j,t} \geq 1} \quad (1)$$

  where $w_{ji,t}$ is volume of loan from j to i at t and $W_{i,t}$ is total borrowing by i at t.

- Only neighbors who have neighbors themselves are counted in the mean.

Main Explanatory Variables

- Most straightforward variable: $X_{i,t} = 1$
  $\Rightarrow$ (weighted) in-degree of i at t as proxy for access.

- Access can be computed iteratively, e.g. for second neighbors:

$$\widehat{X}_{i,t}^{(2)} = \sum_{j:i} \frac{w_{ji,t} \cdot \widehat{X}_{j,t}^{1}}{W_{i,t}} \Bigg|_{d_{j,t} \geq 1} \tag{2}$$

- Independent variable to measure indirect access to private funding liquidity for DiD specification:

$$\Delta \widehat{X}_{i}^{(n)} = \widehat{X}_{i,\text{post}}^{(n)} - \widehat{X}_{i,\text{pre}}^{(n)}$$

Main Variables

- Betweenness centrality is defined

$$Betweenness_{i,t} = \frac{1}{\alpha} \sum_{j \neq i \neq k} \frac{a_{jk,t|i}}{a_{jk,t}}$$

  where $\alpha = (|N| - 1) \times (|N| - 2)$

- $a_{jk,t|i}$ denotes the number of shortest paths between j and k that contains i, and $a_{jk,t}$ is the total number of shortest paths between j and k.

- Note: betweenness centrality is unweighted and undirected, other measures of access are not

Control Variables

Include controls for **pre-determined levels** of:

- Bank's equity ratio
- The ratio of provision income to total income as a proxy for how actively a bank is involved in financial markets
- The ratio of business loans to total assets as a measure for how focused a bank is on traditional lending
- The bank's access and actual recourse to central bank liquidity, which might serve as a substitute to interbank liquidity
- The bank's dependency on short-term funding

Also **changes** of controls in some specifications

Interlude: What determines centrality?

Does Centrality Measure Balance Sheet Size?

	Δ log Volume	EquityRatio	log BankSize	stLiab/totalLiab	CBFundingBankSize	BusinessLoansTotalAssets	ProvisionTotalIncome	ΔEquityRatio	Δ log BankSize	ΔshorttermLiabtotalLiab	ΔCBFundingBankSize	ΔBusinessLoansTotalAssets	ΔProvisionTotalIncome	NetPos	ΔNetPos	log NetPos	Δ log NetPos
Δ log Volume	1.00																
EquityRatio	0.01	1.00															
log BankSize	-0.01	-0.10	1.00														
stLiab/totalLiab	-0.04	0.02	0.55	1.00													
CBFundingBankSize	-0.04	-0.25	-0.01	0.01	1.00												
BusinessLoansTotalAssets	0.01	0.20	-0.60	-0.47	0.01	1.00											
ProvisionTotalIncome	0.03	0.12	-0.01	0.14	-0.30	-0.39	1.00										
ΔEquityRatio	-0.05	-0.52	-0.35	-0.19	0.13	0.18	-0.20	1.00									
Δ log BankSize	0.07	0.37	0.33	0.28	-0.27	-0.26	0.41	-0.77	1.00								
ΔshorttermLiabtotalLiab	0.04	-0.22	-0.24	-0.54	0.00	0.09	0.05	0.02	0.03	1.00							
ΔCBFundingBankSize	0.03	0.23	0.04	-0.00	-0.87	0.01	0.24	-0.08	0.21	-0.01	1.00						
ΔBusinessLoansTotalAssets	0.01	-0.43	-0.24	-0.34	0.39	0.04	-0.15	0.55	-0.60	0.21	-0.27	1.00					
ΔProvisionTotalIncome	0.03	-0.04	0.00	0.10	0.10	-0.03	-0.10	-0.03	0.09	-0.06	-0.09	-0.04	1.00				
NetPos	0.01	-0.13	0.50	0.25	-0.15	-0.47	0.03	-0.11	0.10	-0.09	0.15	-0.18	0.02	1.00			
ΔNetPos	0.05	0.23	0.15	0.15	0.01	-0.22	0.40	-0.58	0.61	0.05	-0.09	-0.18	0.01	0.04	1.00		
log NetPos	0.01	-0.12	0.52	0.26	-0.16	-0.49	0.03	-0.12	0.11	-0.10	0.15	-0.19	0.02	1.00	0.04	1.00	
Δ log NetPos	0.05	0.23	0.15	0.15	0.01	-0.22	0.40	-0.59	0.62	0.05	-0.09	-0.19	0.01	0.02	1.00	0.02	1.00

Figure: Pearson correlation of dependent and independent variables.

Can Banks Control Their Own Centrality?

Consider the following simple algorithm with seven steps (Gabrieli and Georg (2016)):

1. Select an undirected random network with N nodes. Since interbank networks are typically of core-periphery type, we draw N_G core-periphery networks with N nodes.

2. Select N_r random reference nodes r.

3. Calculate the initial centrality of the reference node C_r^i where $C \in \{Betweenness, Katz\}$.

4. Add N_m random links to/from the reference node r.

Can Banks Control Their Own Centrality?

Algorithm (ctd.):

5. Allow the rest of the network to change: select N_{-r} random nodes in the network and change a random number of links of these, that are not to/from the reference node r.

6. Now calculate the updated centrality of the reference node C_r^u and compute the absolute change in the centrality (relative to the initial centrality):

$$\Delta C_r = \left| \frac{C_r^u - C_r^i}{C_r^i} \right|.$$

7. Calculate the mean of ΔC_r.

Can Banks Control Their Own Centrality?

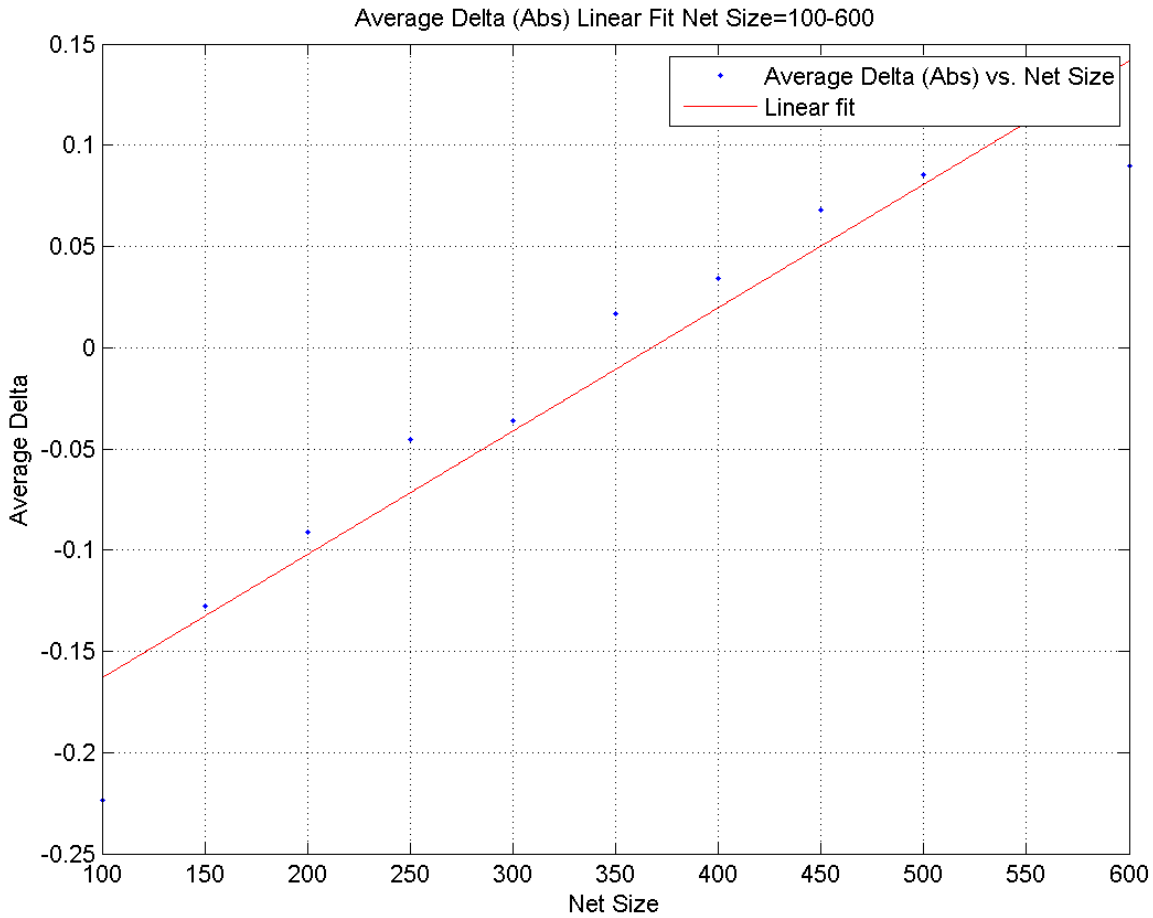


Figure: Log of ΔC_r as a function of an increasing network size for CP network.

Can Banks Control Their Own Centrality?

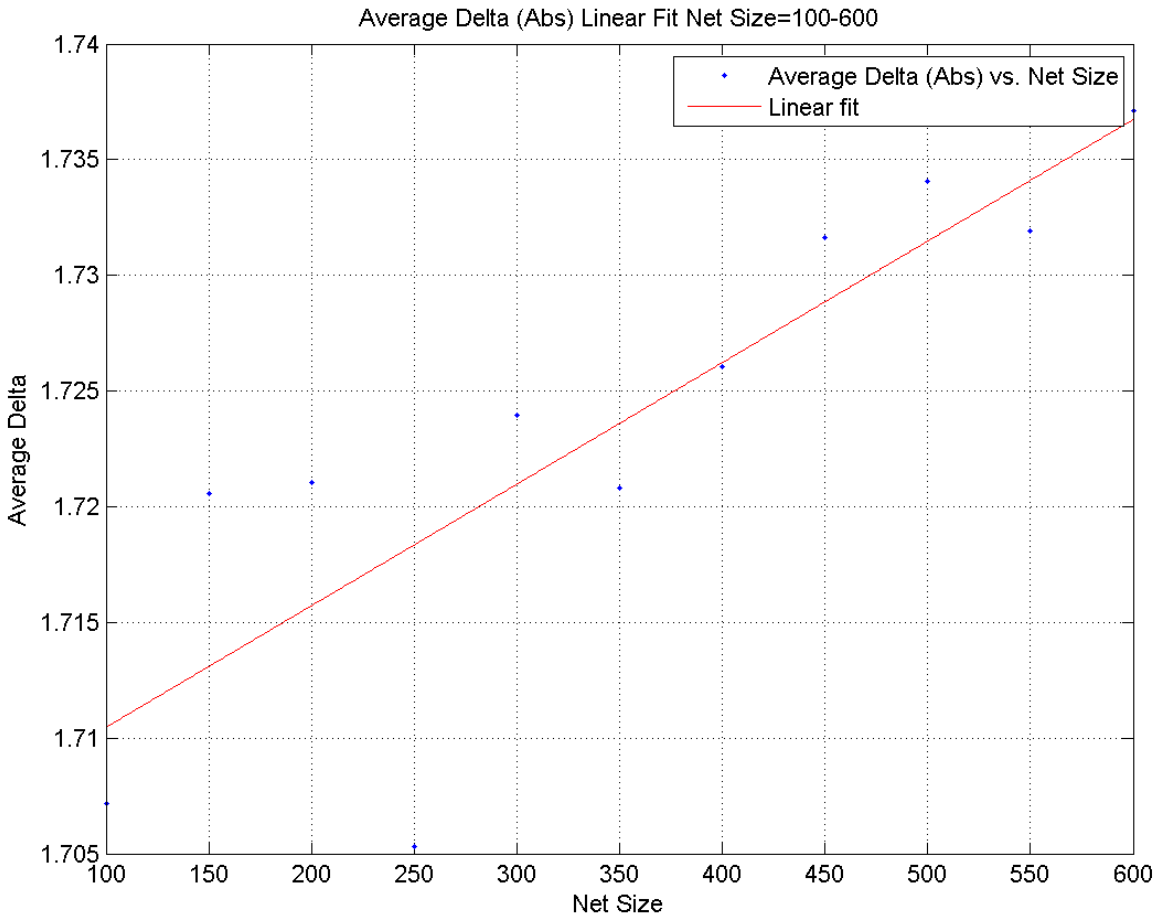


Figure: Log of ΔC_r as a function of an increasing network size for ER network.

Results

Results – Diff-in-Diff, Controlling for Demand

	(1) Δ log Volume$_{ij,t}$	(2) Δ log Volume$_{ij,t}$	(3) EXIT	(4) EXIT	(5) ENTRY	(6) ENTRY
$\Delta \widehat{X}_i^{(2)}$	0.170***	0.188***	-0.00264***	-0.00309***	0.00406***	0.00495***
	(0.0342)	(0.0597)	(0.000827)	(0.000871)	(0.00110)	(0.00154)
$\widehat{X}_{i,\text{pre}}^{(2)}$	0.00363	0.0356**	-0.000172	-0.000316	-0.000174	0.000282
	(0.0125)	(0.0143)	(0.000178)	(0.000315)	(0.000305)	(0.000344)
log BankSize$_{i,T-1}$		-1.012***		-0.00852		-0.00901
		(0.361)		(0.00680)		(0.00954)
EquityRatio$_{i,T-1}$		-82.08***		1.374**		-1.253*
		(27.49)		(0.586)		(0.726)
CollateralRatio$_{i,T-1}$		0.960		0.0946		0.135
		(3.699)		(0.0833)		(0.0970)
stLiab/totalLiab$_{i,T-1}$		-2.080		0.0464		-0.0413
		(2.393)		(0.0435)		(0.0690)
CBFundingRatio$_{i,t-1}$		3.008		0.443		0.0415
		(13.73)		(0.286)		(0.327)
BusinessLoansTotalAssets$_{i,T-1}$		-2.897		-0.101		-0.119
		(3.647)		(0.0616)		(0.0815)
ProvisionTotalIncome$_{i,T-1}$		-2.959		0.110		0.00663
		(6.445)		(0.0992)		(0.128)
Costant	1.521	23.35**	0.360	0.396	0.0186	0.169
	(5.567)	(10.05)	(0.355)	(0.411)	(0.0651)	(0.227)
Firm FEs	Yes	Yes	Yes	Yes	Yes	Yes
N	4822	4818	4822	4818	4822	4818
R^2	0.324	0.333	0.320	0.329	0.338	0.342
R^2 (adjusted)	0.0742	0.0834	0.0688	0.0782	0.0924	0.0964

Standard errors in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Results – Diff-in-Diff, Controlling for Demand

	(1) $\Delta \log \text{Volume}_{ij,t}$	(2) $\Delta \log \text{Volume}_{ij,t}$	(3) EXIT	(4) EXIT	(5) ENTRY	(6) ENTRY
$\Delta Centrality_{i,t}$	0.368**	0.419**	-0.00526	-0.00287	0.0131**	0.0155***
	(0.182)	(0.197)	(0.00316)	(0.00346)	(0.00558)	(0.00393)
$\log \text{BankSize}_{i,t-1}$		-0.128		-0.0147*		-0.0196*
		(0.415)		(0.00758)		(0.0103)
$\text{EquityRatio}_{i,t-1}$		28.70		-1.235***		0.442
		(19.61)		(0.332)		(0.492)
$\text{CollateralRatio}_{i,t-1}$		-3.651		0.0513		-0.133
		(3.669)		(0.0500)		(0.0890)
$\text{stLiab/totalLiab}_{i,t-1}$		-1.057		0.0901*		0.00443
		(2.011)		(0.0465)		(0.0470)
$\text{CBFundingRatio}_{i,t-1}$		36.41**		-0.346		1.417***
		(15.23)		(0.297)		(0.453)
$\text{BusinessLoansTotalAssets}_{i,t-1}$		2.321		-0.0764		0.0443
		(6.194)		(0.134)		(0.144)
$\text{ProvisionTotalIncome}_{i,t-1}$		-0.736		0.0163		0.203
		(6.760)		(0.157)		(0.168)
Constant	-1.771	0.316	0.358	0.664*	0.271	0.603*
	(8.438)	(11.54)	(0.342)	(0.347)	(0.345)	(0.352)
Firm FEs	Yes	Yes	Yes	Yes	Yes	Yes
N	2236	2232	2236	2232	2236	2232
R^2	0.397	0.417	0.419	0.447	0.399	0.423
R^2 (adjusted)	0.0336	0.0594	0.0697	0.108	0.0374	0.0702

Standard errors in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Dynamic Panel with time-varying bank FEs

- Firms with relatively fewer tangible assets depend more on bank funding
- We estimate the following model:

$$\begin{aligned}\log \text{Volume}_{ij,t} = {} & \beta_{i,t} + \beta_j + \beta_0 \log \text{Volume}_{ij,t-1} \\ & + \beta_1 \text{TangibleAssets}_{j,T-1} \\ & + \beta_2 \text{TangibleAssets}_{j,T-1} \times \Delta \log \text{NetPos}_{i,t} \\ & + \beta_3 \text{TangibleAssets}_{j,T-1} \times \text{SHOCK}_{i,t} \\ & + \beta_4 \text{TangibleAssets}_{j,T-1} \times \text{SHOCK}_t \times \Delta \log \text{NetPos}_{i,t} \\ & + \beta_5 \text{TangibleAssets}_{j,T-1} \times \text{SHOCK}_{i,t} \times \Delta \log \text{NetPos}_{i,t} + \varepsilon_{ij,t}\end{aligned}$$

- $\text{TangibleAssets}_{j,T-1}$ is the share of tangible assets to total assets of firm j at the end of the previous year
- $\text{SHOCK}_{i,t}$ is indicator variable whether banks are above/below median of GIIPS exposure before shock

Results – Dynamic Panel

	(1) $\log \text{Volume}_{ij,t}$	(2) $\log \text{Volume}_{ij,t}$	(3) $\log \text{Volume}_{ij,t}$
$\log \text{Volume}_{ij,t-1}$	0.768***	0.768***	0.768***
	(0.0116)	(0.0116)	(0.0116)
$\text{TangibleAssets}_{j,T-1}$	0.0904	0.0914	0.102*
	(0.0564)	(0.0582)	(0.0590)
$\text{TangibleAssets}_{j,T-1} \times \Delta \log \text{NetPos}_{i,t}$	1.438**		
	(0.691)		
$\text{TangibleAssets}_{j,T-1} \times \text{SHOCK}_t \times \Delta \log \text{NetPos}_{i,t}$		2.658	
		(1.831)	
$\text{TangibleAssets}_{j,T-1} \times \text{SHOCK}_{i,t}$			0.0486***
			(0.00935)
$\text{TangibleAssets}_{j,T-1} \times \text{SHOCK}_{i,t} \times \Delta \log \text{NetPos}_{i,t}$			2.253*
			(1.276)
Constant	1.338***	1.322***	1.320***
	(0.146)	(0.152)	(0.145)
Time-Varying Bank FEs	Yes	Yes	Yes
Firm FEs	Yes	Yes	Yes
N	13719	13719	13719
R^2	0.813	0.813	0.813
R^2 (adjusted)	0.794	0.794	0.794

Standard errors in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

The role of interbank relationships

The role of interbank relationships

- Empirical evidence for relationship lending in the interbank market (Furfine (1999); Cocco, Gomes, and Martins (2009); Bräuning and Fecht (2017))
- Measure strength of relationship using Herfindahl index:

$$X_{i,t} \equiv HHI_{i,t} = \sum_{j:i} \left(\frac{w_{ji,t}}{W_{i,t}} \right)^2 \tag{3}$$

- Network mean computed with HHI as main explanatory variable

$$\widehat{X}_{i,t}^{(2)} = \widehat{HHI}_{i,t}^{(2)}$$

- Smaller HHI implies more diversification, less pronounciation of relationships

The role of interbank relationships

	(1) Δ log Volume$_{ij,t}$	(2) Δ log Volume$_{ij,t}$	(3) EXIT	(4) EXIT	(5) ENTRY	(6) ENTRY
$\Delta\widehat{HHI}_i^{(1)}$	26.40	20.71	-0.472	-0.260	0.950*	0.843**
	(22.67)	(18.38)	(0.408)	(0.354)	(0.534)	(0.401)
$\widehat{HHI}_{i,\text{pre}}^{(1)}$	7.096	12.33*	-0.172*	-0.179	0.0394	0.0389
	(6.015)	(6.267)	(0.0883)	(0.117)	(0.136)	(0.140)
log BankSize$_{i,T-1}$		-1.266***		-0.00247		-0.0117
		(0.408)		(0.00756)		(0.00986)
EquityRatio$_{i,T-1}$		-81.62***		1.535***		-1.092
		(27.83)		(0.502)		(0.705)
CollateralRatio$_{i,T-1}$		-6.534		0.215**		-0.0668
		(4.718)		(0.0860)		(0.127)
stLiab/totalLiab$_{i,T-1}$		-1.529		0.0449		0.0145
		(2.827)		(0.0471)		(0.0737)
CBFundingRatio$_{i,t-1}$		19.06*		0.155		0.548*
		(11.38)		(0.277)		(0.307)
BusinessLoansTotalAssets$_{i,T-1}$		-0.685		-0.129*		-0.0218
		(4.117)		(0.0714)		(0.0949)
ProvisionTotalIncome$_{i,T-1}$		0.977		0.0637		0.118
		(5.412)		(0.104)		(0.125)
Constant	-1.554	30.27***	0.421	0.252	-0.0368	0.266
	(5.793)	(11.39)	(0.363)	(0.407)	(0.0729)	(0.248)
Firm FEs	Yes	Yes	Yes	Yes	Yes	Yes
N	4822	4818	4822	4818	4822	4818
R^2	0.315	0.328	0.318	0.326	0.330	0.336
R^2 (adjusted)	0.0616	0.0768	0.0652	0.0745	0.0813	0.0879

Standard errors in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

The role of interbank relationships

	(1) $\Delta \log \text{Volume}_{ij,t}$	(2) $\Delta \log \text{Volume}_{ij,t}$	(3) EXIT	(4) EXIT	(5) ENTRY	(6) ENTRY
$\Delta \widehat{HHI}_i^{(2)}$	7.925	27.33	-0.191	-0.225	0.266	0.920
	(26.26)	(27.86)	(0.365)	(0.418)	(0.580)	(0.650)
$\widehat{HHI}_{i,\text{pre}}^{(2)}$	-29.02	-30.34*	0.524	0.301	-0.431	-0.376
	(19.99)	(17.67)	(0.370)	(0.315)	(0.539)	(0.434)
$\log \text{BankSize}_{i,T-1}$		-1.065***		-0.00643		-0.0141
		(0.383)		(0.00719)		(0.00999)
$\text{EquityRatio}_{i,T-1}$		-54.92***		1.219**		-0.901
		(20.21)		(0.568)		(0.672)
$\text{CollateralRatio}_{i,T-1}$		-8.243*		0.249***		-0.0898
		(4.303)		(0.0869)		(0.132)
$\text{stLiab/totalLiab}_{i,T-1}$		-1.550		0.0327		-0.0233
		(2.453)		(0.0509)		(0.0593)
$\text{CBFundingRatio}_{i,t-1}$		21.37*		0.138		0.547
		(12.29)		(0.276)		(0.331)
$\text{BusinessLoansTotalAssets}_{i,T-1}$		0.919		-0.163**		-0.0280
		(3.556)		(0.0672)		(0.0780)
$\text{ProvisionTotalIncome}_{i,T-1}$		10.36*		-0.0418		0.299**
		(6.224)		(0.114)		(0.141)
Constant	8.243	35.49***	0.225	0.218	0.0864	0.398
	(5.423)	(13.07)	(0.271)	(0.410)	(0.124)	(0.280)
Firm FEs	Yes	Yes	Yes	Yes	Yes	Yes
N	4822	4818	4822	4818	4822	4818
R^2	0.314	0.329	0.316	0.325	0.326	0.336
R^2 (adjusted)	0.0600	0.0777	0.0621	0.0730	0.0758	0.0879

Standard errors in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Discussion and Conclusion

Summary

- Indirect (and direct) access to private funding liquidity enables banks to provide more and more new lending to their non-bank borrowers.
- Effect is stronger for firms that are more dependent on bank funding
- Our paper complements existing work on bank-lending channel through market liquidity and literature on the importance of financial networks.

Open/Interesting Questions:

- What are the underlying (microeconomic) reasons for this channel? E.g. search vs. bargaining.
- Highlights the importance of interbank markets in Germany
  $\Rightarrow$ Policy Q: What happens if we substitute with public liquidity?

Discussion and Conclusion

Summary

- Indirect (and direct) access to private funding liquidity enables banks to provide more and more new lending to their non-bank borrowers.
- Effect is stronger for firms that are more dependent on bank funding
- Our paper complements existing work on bank-lending channel through market liquidity and literature on the importance of financial networks.

Open/Interesting Questions:

- What are the underlying (microeconomic) reasons for this channel? E.g. search vs. bargaining.
- Highlights the importance of interbank markets in Germany
  $\Rightarrow$ Policy Q: What happens if we substitute with public liquidity?

Thank you!