Shock Propagation and Banking Structure

Mariassunta Giannetti
Stockholm School of Economics, CEPR, and ECGI

Farzad Saidi
Stockholm School of Economics and CEPR

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Motivation

- Interconnected firms and industries lead to propagation and amplification of shocks throughout the economy (Acemoglu, Carvalho, Ozdaglar, and Tahbaz-Salehi 2012)
- Negative shocks can lead to fire sales and deplete firms' balance sheets in an industry (Lang and Stulz 1992)
- Shocks may also ripple through the supply chain (Hertzel, Li, Officer, and Rodgers 2008; Barrot and Sauvagnat 2016)

This paper

- Is banking structure related to the extent to which cascade effects due to interconnections propagate?
- **Main idea:**
  Lenders may be prone to internalize externalities of industry distress if they have large shares of the loans outstanding in that industry

Related literature

- Banking literature focuses on bank type/bank-firm relationships
  - Foreign banks, local banks, etc. (Berger et al. 2005)
  - Foreign banks are fickle lenders (Giannetti and Laeven 2012)
  - Close relationships help borrowers during crises (Bolton, Freixas, and Gambacorta 2016; Liberti and Sturgess 2016)
- Notable exception: bank presence
  - Lenders with a large fraction of outstanding mortgages in a neighborhood are more likely to renegotiate defaulting mortgages/less likely to default (Favara and Giannetti 2017)

Related literature

- Bank concentration and market power
  - Affects loan supply (Garmaise and Moskowitz 2006) and the transmission of monetary policy to mortgage rates (Scharfstein and Sunderam 2016)

- Our paper: alternative interpretation to the view that credit-market competition erodes financial stability (Keeley 1990)

Main findings

- Banks with higher market shares are more likely to extend new loans to distressed industries
- Consistent with lenders' desire to minimize externalities
  - More pronounced in industries prone to fire sales
  - New loans to customers and suppliers, especially if relationship disruptions would be costly
- Bright side of credit concentration: fewer firm exits and higher long-term abnormal returns following distress

Data description

- U.S. syndicated loans from DealScan
  - Data aggregated at the bank-industry-time level, *ijt*
  - Loan amount y_{ijt} (t: six months) and *Market share*$_{ijt-2}$ (measured over the previous six years)
- Historical industry stock returns from CRSP
  - *Industry distress*$_{it-1}$ indicates whether industry i experienced a cumulative average stock-return of less than -10% in the previous half-year $t-1$

Sample composition

- 57 industries and 211 banks
- On average, each industry obtains credit from 44 banks, and each bank covers 12 industries
- Our sample includes a total of 2,516 bank-industry relationships

Empirical strategy

- Analyze lending by bank j to industry i following distress as a function of bank j's past market share in i:

$$\begin{aligned} y_{ijt} &= \beta_1 \textit{Market share}_{ijt-2} \times \textit{Industry distress}_{it-1} \\ &\quad + \beta_2 \textit{Market share}_{ijt-2} + \mu_{ij} + \theta_{it} + \psi_{jt} + \epsilon_{ijt} \end{aligned}$$

- θ_{it} and ψ_{jt} absorb shocks to industry demand and credit supply

- Endogeneity of $\textit{Market share}_{ijt-2}$: results robust to using exogenous variation resulting from past bank mergers

Bank lending to distressed industries

	ln(1+Loan volume)			ln(Avg. loan size)	Any loan
Sample	All	All	All	Loan vol. $\neq 0$	All
Regression sample from 1990 to 2013					
Market share $\times$ Ind. distress	4.942***	3.562***	2.177**	-0.186	0.117***
	(1.288)	(0.956)	(0.855)	(0.230)	(0.045)
Market share	8.293***	12.581***	4.806***	-0.199	0.217***
	(1.613)	(1.269)	(0.923)	(0.375)	(0.049)
Industry distress	-0.087				
	(0.065)				
Bank-industry FE	N	N	Y	Y	Y
Bank-period FE	Y	Y	Y	Y	Y
Industry-period FE	N	Y	Y	Y	Y
N	113,494	113,470	113,470	24,292	113,470

$\Rightarrow$ A one-standard-deviation increase in $Market\ share_{ijt-2}$ implies an over 12% increase in lending (column 3)

$\Rightarrow$ Results are not driven by the financial crisis

Are the effects driven by relationship banks?

	ln(1+Loan volume)			ln(Avg. loan size)	Any loan
Sample	All	All	All	Loan vol. $\neq 0$	All
Regression sample from 1990 to 2013, no relationship loans					
Market share $\times$ Ind. distress	3.712**	3.381**	2.650**	-0.021	0.140**
	(1.453)	(1.495)	(1.245)	(0.608)	(0.066)
Market share	21.712***	21.014***	11.400***	-1.989***	0.634***
	(3.745)	(3.527)	(2.832)	(0.395)	(0.145)
Industry distress	0.006				
	(0.066)				
Bank-industry FE	N	N	Y	Y	Y
Bank-period FE	Y	Y	Y	Y	Y
Industry-period FE	N	Y	Y	Y	Y
N	59,444	59,425	59,412	11,026	59,412

Cross-sectional tests

- Are high-market-share lenders more likely to provide liquidity to industries prone to fire sales?
  - Measures of asset specificity: asset redeployability using capital-flow table from the BEA (Kung and Kim 2016) and ratio of machinery and equipment to total assets in year t
- Do high-market-share lenders provide liquidity along the supply chain to stave off externalities?
  - Identify main supplier and customer industries using BEA input-output tables ($1997 - 2013$)

Industry propensity to fire sales and bank lending to distressed industries

	ln(1+Loan vol.)	Any loan	ln(1+Loan vol.)	Any loan
Specificity measure	Low asset redeployability		High M&E/assets	
Market share × Ind. distress × Specific	8.266***	0.372***	4.837**	0.230*
	(2.009)	(0.107)	(2.387)	(0.122)
Market share × Industry distress	1.029	0.065	0.532	0.026
	(1.146)	(0.056)	(0.895)	(0.043)
Market share × Specific	0.919	0.016	-3.269	-0.108
	(2.542)	(0.133)	(2.522)	(0.119)
Market share	-0.864	-0.055	-0.659	-0.076
	(1.494)	(0.073)	(2.297)	(0.112)
Bank-industry FE	Y	Y	Y	Y
Bank-period FE	Y	Y	Y	Y
Industry-period FE	Y	Y	Y	Y
N	80,973	80,973	74,666	74,666

Bank lending to distressed industries' suppliers

	ln(1+Loan vol.)	ln(Avg. loan size)	Any loan	ln(1+Loan vol.)	Any loan
Sample	All	Loan vol. $\neq 0$	All	All	All
Cust. share $\times$ Cust. distress	3.065***	-0.199	0.148***	3.070***	0.148***
	(1.144)	(0.430)	(0.052)	(1.140)	(0.052)
Customer share	2.086	0.291	0.079	2.046	0.078
	(2.173)	(0.310)	(0.098)	(2.100)	(0.095)
Mkt. share $\times$ Ind. distress				2.603	0.130
				(2.127)	(0.105)
Market share				-0.742	-0.057
				(2.039)	(0.103)
Bank-industry FE	Y	Y	Y	Y	Y
Bank-period FE	Y	Y	Y	Y	Y
Industry-period FE	Y	Y	Y	Y	Y
N	51,534	12,530	51,534	51,516	51,516

Bank lending to distressed industries' customers

	ln(1+Loan vol.)	ln(Avg. loan size)	Any loan	ln(1+Loan vol.)	Any loan
Sample	All	Loan vol. $\neq 0$	All	All	All
Supp. share $\times$ Supp. distress	2.289*	0.028	0.116**	2.008	0.103*
	(1.170)	(0.359)	(0.057)	(1.241)	(0.059)
Supplier share	-0.075	-0.362	-0.018	-0.148	-0.020
	(2.399)	(0.225)	(0.115)	(2.257)	(0.109)
Mkt. share $\times$ Ind. distress				3.880**	0.188**
				(1.666)	(0.083)
Market share				-0.538	-0.044
				(2.268)	(0.116)
Bank-industry FE	Y	Y	Y	Y	Y
Bank-period FE	Y	Y	Y	Y	Y
Industry-period FE	Y	Y	Y	Y	Y
N	46,228	11,071	46,228	46,210	46,210

Bank lending over the supply chain: relationship industries

	ln(1+Loan vol.)	Any loan	ln(1+Loan vol.)	Any loan
Cust. share × Cust. distress × Rel. industries	7.475**	0.389**		
	(3.075)	(0.160)		
Customer share × Customer distress	1.399	0.060		
	(1.523)	(0.070)		
Customer share × Relationship industries	-1.769	-0.125		
	(3.178)	(0.151)		
Customer share	2.735	0.124		
	(3.088)	(0.142)		
Supp. share × Supp. distress × Rel. industries			6.230*	0.265*
			(3.275)	(0.155)
Supplier share × Supplier distress			-0.213	0.010
			(1.584)	(0.072)
Supplier share × Relationship industries			-2.148	-0.112
			(2.182)	(0.114)
Supplier share			0.621	0.018
			(2.712)	(0.131)
Bank-industry FE	Y	Y	Y	Y
Bank-period FE	Y	Y	Y	Y
Industry-period FE	Y	Y	Y	Y
N	51,534	51,534	46,228	46,228

Bank mergers as source of variation in market shares: IVE

- Bank merger in $t-2$, market share in industry i instrumented by sum of historical market shares of surviving bank j and target bank in $t-4$

	ln(1+Loan volume)		
Market share × Industry distress (instrumented)	6.249*		
	(3.366)		
Market share (instrumented)	-27.469***		
	(5.810)		
Customer share × Customer distress (instrumented)		3.788**	
		(1.536)	
Customer share (instrumented)		24.781***	
		(3.904)	
Supplier share × Supplier distress (instrumented)			2.293
			(2.012)
Supplier share (instrumented)			14.087
			(15.865)
Bank-industry FE	Y	Y	Y
Bank-period FE	Y	Y	Y
Industry-period FE	Y	Y	Y
N	43,931	27,065	24,415

To which customers do banks extend new loans?

Strategic dimension of banks' decision to extend new loans to distressed industries' customers

1. Customers less levered than distressed suppliers Table
2. Highly concentrated customers to distressed suppliers Table
   - No differential effect for distressed suppliers that are important for their customers

Alternative explanations

- Less diversified lenders may be better informed (Acharya, Hasan, and Saunders 2006; Loutskina and Strahan 2011)
  - Stronger effects for industries prone to fire sales, but fixed assets associated with lower degree of information asymmetry
  - Variation in market shares due to bank mergers (IVE) unlikely to capture lenders' informational advantage, especially along the supply chain
  - No effect of lenders' portfolio diversification Table
- No evidence of differential rents accruing to high-market-share lenders after distress (Wilner 2000) Table

Real effects

Does higher industry-wide credit concentration alleviate consequences of distress?

1. Fewer firm exits following industry distress Table
2. Higher long-run abnormal returns after industry distress Table
   - $3-4\%$ higher return p.a. up to seven years after distress
   - High-market-share banks' lending decisions are efficient

Conclusion

- Lenders' liquidity provision is affected by the degree to which they internalize potential feedback effects of negative shocks
- Lenders with a larger share of the loans outstanding to an industry in distress more likely to extend credit, also along the supply chain
- Transmission of industry shocks depends on concentration of outstanding loans

Bank lending to distressed industries' customers: relative leverage of suppliers vs. customers

Sample	ln(1+Loan volume) All	ln(Avg. loan size) Loan volume $\neq 0$	Any loan All
Supp. share $\times$ Supp. distress $\times$ Relative leverage	4.187***	0.334	0.204***
	(1.406)	(0.339)	(0.074)
Supplier share $\times$ Supplier distress	-2.949*	-0.500	-0.131
	(1.714)	(0.641)	(0.091)
Supplier share $\times$ Relative leverage	2.206*	-0.199	0.096
	(1.160)	(0.324)	(0.062)
Supplier share	-0.977	-0.152	-0.054
	(3.868)	(0.560)	(0.188)
Bank-industry FE	Y	Y	Y
Bank-period FE	Y	Y	Y
Industry-period FE	Y	Y	Y
N	43,476	10,493	43,476

Back

Bank lending to distressed industries' customers: importance of customers for their suppliers

Sample	ln(1+Loan volume) All	ln(Avg. loan size) Loan volume $\neq 0$	Any loan All
Supp. share $\times$ Supp. distress $\times$ Customer HHI	10.971**	-3.838**	0.584**
	(5.445)	(1.582)	(0.268)
Supplier share $\times$ Supplier distress	0.852	0.566	0.037
	(0.977)	(0.397)	(0.053)
Supplier share $\times$ Customer HHI	3.744	2.239**	-0.100
	(9.573)	(0.977)	(0.490)
Supplier share	-0.667	-0.671***	-0.004
	(2.794)	(0.224)	(0.139)
Bank-industry FE	Y	Y	Y
Bank-period FE	Y	Y	Y
Industry-period FE	Y	Y	Y
N	46,228	11,071	46,228

Back

Impact on cost of debt

	ln(Spread)	ln(TCB)	ln(Spread)	ln(TCB)
Horizon	After 12 months		After 24 months	
Sample	Loan volume $\neq 0$			
Market share $\times$ Industry distress	0.033	0.057	0.002	-0.119
	(0.139)	(0.398)	(0.139)	(0.272)
Market share	0.102	0.441**	0.143	0.419**
	(0.218)	(0.168)	(0.243)	(0.161)
Bank-industry FE	Y	Y	Y	Y
Bank-period FE	Y	Y	Y	Y
Industry-period FE	Y	Y	Y	Y
N	16,160	6,635	14,998	6,104

Back

Distressed industries' shares in banks' loan portfolios

	ln(1+Loan volume)		
Portfolio share of industry × Industry distress	-1.831***		
	(0.609)		
Portfolio share of industry	-0.448		
	(0.375)		
Portfolio share of supplier × Supplier distress		0.191	
		(0.904)	
Portfolio share of supplier		0.480	
		(0.715)	
Portfolio share of customer × Customer distress			-0.505
			(1.809)
Portfolio share of customer			1.316
			(0.953)
Bank-industry FE	Y	Y	Y
Bank-period FE	Y	Y	Y
Industry-period FE	Y	Y	Y
N	71,983	41,845	46,607

Back

Industry-wide credit concentration and firm exit

	Any bankruptcy-related delisting in industry					
Horizon	After 6 months			After 12 months		
HHI measure	All banks		Top 1	All banks		Top 1
Market HHI × Ind. distress	-0.409**	-0.341**	-0.218	-0.403**	-0.346***	-0.268**
	(0.161)	(0.151)	(0.144)	(0.166)	(0.130)	(0.134)
Market HHI	-0.642***	-0.016	-0.064	-0.646***	-0.010	-0.044
	(0.151)	(0.084)	(0.095)	(0.150)	(0.082)	(0.093)
Industry distress	0.197***	0.131***	0.137**	0.199***	0.133***	0.153***
	(0.045)	(0.041)	(0.053)	(0.045)	(0.035)	(0.049)
Industry FE	N	Y	Y	N	Y	Y
Time FE	Y	Y	Y	Y	Y	Y
N	2,633	2,633	2,633	2,579	2,579	2,579

Back

Credit concentration and long-run abnormal returns of industries following distress

α (in % per month)	Top-quintile credit concentration	Bottom-quintile credit concentration	Long-short
Three years	-0.858***	-1.127***	0.336**
	(0.170)	(0.129)	(0.158)
N	288	287	287
Five years	-0.812***	-1.048***	0.288**
	(0.158)	(0.122)	(0.133)
N	288	287	287
Seven years	-0.775***	-0.978***	0.243**
	(0.157)	(0.117)	(0.119)
N	288	287	287

Back