

Shock Propagation and Banking Structure

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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)

- Is banking structure related to the extent to which cascade effects due to interconnections propagate?
- **Main idea:**
Lenders should 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)
 - Distinct from bank diversification and industry exposure (Strahan 2017)

- 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 median stock return of less than -10% in the previous half-year $t - 1$ (in the spirit of Opler and Titman, 1994)

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 :

$$y_{ijt} = \beta_1 \text{Market share}_{ijt-2} \times \text{Industry distress}_{it-1} \\ + \beta_2 \text{Market share}_{ijt-2} + \mu_{ij} + \theta_{it} + \psi_{jt} + \epsilon_{ijt}$$

- θ_{it} and ψ_{jt} absorb shocks to industry demand and credit supply
- Endogeneity of $\text{Market share}_{ijt-2}$: results robust to using exogenous variation resulting from past bank mergers

Bank lending to distressed industries

Sample	ln(1+Loan volume)			ln(Avg. loan size)	Any loan
	All	All	All	Loan vol. $\neq 0$	All
Regression sample from 1990 to 2013					
Market share \times Ind. distress	4.468*** (1.294)	3.136*** (0.934)	1.805** (0.838)	-0.193 (0.213)	0.097** (0.043)
Market share	8.369*** (1.622)	12.654*** (1.271)	4.870*** (0.927)	-0.198 (0.374)	0.221*** (0.049)
Industry distress	-0.070 (0.069)				
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

- ⇒ A one-standard-deviation increase in $Market\ share_{ijt-2}$ implies a 10% increase in lending (column 3)
- ⇒ Results are not driven by the financial crisis
- ⇒ Effects are not driven by relationship banks or acquisition loans

Are the effects driven by relationship banks?

Sample	ln(1+Loan volume)			ln(Avg. loan size)	Any loan
	All	All	All	Loan vol. $\neq 0$	All
Regression sample from 1990 to 2013, no relationship loans					
Market share \times Ind. distress	3.712** (1.453)	3.381** (1.495)	2.650** (1.245)	-0.021 (0.608)	0.140** (0.066)
Market share	21.712*** (3.745)	21.014*** (3.527)	11.400*** (2.832)	-1.989*** (0.395)	0.634*** (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

The role of the nature of industry distress

- Results robust to using mean, rather than median returns
- Effects not driven by idiosyncratic shocks to few large firms

Sample	ln(1+Loan volume)			ln(Avg. loan size)	Any loan
	All	All	All	Loan vol. \neq 0	All
Market share \times Transitory shock	6.000*** (2.056)	4.671*** (1.494)	2.700** (1.137)	-0.033 (0.307)	0.142** (0.057)
Market share \times Permanent shock	2.748 (1.663)	1.228 (1.636)	0.508 (1.172)	-0.342 (0.281)	0.032 (0.060)
Market share	8.365*** (1.627)	12.660*** (1.272)	4.888*** (0.922)	-0.200 (0.374)	0.222*** (0.049)
Transitory shock	-0.019 (0.097)				
Permanent shock	-0.085 (0.081)				
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

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 $t - 3$

	Market share	Market share × Ind. distress	ln(1+Loan volume)	Any loan
Merger-implied mkt. share × Ind. distress	0.018 (0.015)	0.504*** (0.080)		
Merger-implied market share	0.207*** (0.064)	-0.041*** (0.012)		
Mkt. share × Ind. distress (instrumented)			5.696* (3.087)	0.277* (0.147)
Market share (instrumented)			-24.142** (9.384)	-1.037** (0.496)
Bank-industry FE	Y	Y	Y	Y
Bank-period FE	Y	Y	Y	Y
Industry-period FE	Y	Y	Y	Y
<i>F</i> -statistic	7.83	21.95		
N	43,849	43,849	43,849	43,849

High-market-share lenders more likely to provide liquidity to industries prone to fire sales

- Asset redeployability using capital-flow table from the BEA (Kung and Kim 2017)
- Ratio of machinery and equipment to total assets in year t (Acharya, Bharath, and Srinivasan 2007)
- Industries with high fraction of maturing long-term debt (Almeida et al, 2012)

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)

Bank lending over the supply chain: relationship industries

	ln(1+Loan vol.)	Any loan	ln(1+Loan vol.)	Any loan
Cust. share \times Cust. distress \times Rel. industries	6.931** (2.929)	0.372** (0.164)		
Customer share \times Customer distress	1.466 (1.848)	0.068 (0.087)		
Customer share \times Relationship industries	-0.826 (2.908)	-0.081 (0.138)		
Customer share	3.307 (3.110)	0.160 (0.142)		
Supp. share \times Supp. distress \times Rel. industries			7.059* (3.911)	0.314* (0.190)
Supplier share \times Supplier distress			-0.491 (1.932)	-0.005 (0.090)
Supplier share \times Relationship industries			-2.664 (2.169)	-0.139 (0.114)
Supplier share			0.952 (3.210)	0.035 (0.157)
Bank-industry FE	Y	Y	Y	Y
Bank-period FE	Y	Y	Y	Y
Industry-period FE	Y	Y	Y	Y
N	43,058	43,058	38,348	38,348

Relationship industries defined as in Cremers, Nair, and Peyer (2008)

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

1. Fewer firm exits following industry distress [Table](#)
2. Partly due to intra-industry mergers [Table](#)
3. 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

- 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
- Transmission of industry shocks depends on concentration of outstanding loans
 - Concentration in the credit market may enhance financial stability (Keeley 1990)

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

Sample	ln(1+Loan volume)	ln(Avg. loan size)	Any loan
	All	Loan volume \neq 0	All
Supp. share \times Supp. distress \times Relative leverage	3.981** (1.567)	0.334 (0.372)	0.194** (0.081)
Supplier share \times Supplier distress	-2.598 (1.861)	-0.527 (0.684)	-0.112 (0.095)
Supplier share \times Relative leverage	2.680** (1.185)	-0.352 (0.296)	0.121* (0.062)
Supplier share	-1.546 (4.433)	0.169 (0.513)	-0.085 (0.214)
Bank-industry FE	Y	Y	Y
Bank-period FE	Y	Y	Y
Industry-period FE	Y	Y	Y
N	36,334	10,946	36,334

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

Sample	ln(1+Loan volume)	ln(Avg. loan size)	Any loan
	All	Loan volume \neq 0	All
Supp. share \times Supp. distress \times Customer HHI	10.701* (5.846)	-4.010** (1.729)	0.581** (0.286)
Supplier share \times Supplier distress	0.938 (1.083)	0.565 (0.394)	0.041 (0.058)
Supplier share \times Customer HHI	5.789 (9.545)	2.512* (1.421)	-0.023 (0.473)
Supplier share	-0.844 (3.258)	-0.681*** (0.241)	-0.009 (0.159)
Bank-industry FE	Y	Y	Y
Bank-period FE	Y	Y	Y
Industry-period FE	Y	Y	Y
N	38,348	11,533	38,348

Retention of loans and non-loan exposure

	ln(1+Loan volume)	Any loan	ln(1+Loan volume)	Any loan
Market share × Ind. distress × Retention	4.867** (2.341)	0.235* (0.124)		
Market share × Industry distress	0.958 (0.784)	0.056 (0.040)		
Market share × Retention	-2.179 (1.812)	-0.057 (0.098)		
Market share	5.273*** (0.997)	0.231*** (0.053)		
Underwriting market share × Ind. distress			1.294* (0.746)	0.074* (0.041)
Underwriting market share			3.596** (1.493)	0.122 (0.076)
Bank-industry FE	Y	Y	Y	Y
Bank-period FE	Y	Y	Y	Y
Industry-period FE	Y	Y	Y	Y
N	113,470	113,470	113,470	113,470

Distressed industries' shares in banks' loan portfolios

Sample period	ln(1+Loan volume)			
	1990 – 2013	1997 – 2013	1997 – 2013	1990 – 2013
Portfolio share of industry × Industry distress	-1.229** (0.468)			
Portfolio share of industry	1.611*** (0.377)			
Portfolio share of supplier × Supplier distress		-1.595 (1.248)		
Portfolio share of supplier		0.798 (1.006)		
Portfolio share of customer × Customer distress			0.352 (2.361)	
Portfolio share of customer			1.296 (0.920)	
Underwriting portfolio share × Industry distress				0.525 (0.660)
Underwriting portfolio share				1.220** (0.549)
Bank-industry FE	Y	Y	Y	Y
Bank-period FE	Y	Y	Y	Y
Industry-period FE	Y	Y	Y	Y
N	113,470	38,348	43,058	113,470

Impact on cost of debt

Horizon Sample	ln(Spread)	ln(TCB)	ln(Spread)	ln(TCB)
	After 12 months		After 24 months	
	Loan volume $\neq 0$			
Market share \times Industry distress	-0.053 (0.126)	0.119 (0.290)	-0.150 (0.127)	-0.144 (0.209)
Market share	-0.022 (0.108)	0.382** (0.144)	-0.006 (0.139)	0.384** (0.162)
Bank-industry FE	Y	Y	Y	Y
Bank-period FE	Y	Y	Y	Y
Industry-period FE	Y	Y	Y	Y
N	23,176	9,236	23,245	9,071

Industry-wide credit concentration and firm exit

Horizon HHI measure	Any bankruptcy-related delisting in industry					
	After 6 months			After 12 months		
	All banks	Top 1		All banks	Top 1	
Market HHI × Ind. distress	-0.456*** (0.166)	-0.384** (0.156)	-0.244* (0.145)	-0.392** (0.168)	-0.330** (0.132)	-0.252* (0.137)
Market HHI	-0.635*** (0.150)	-0.011 (0.084)	-0.059 (0.095)	-0.648*** (0.149)	-0.012 (0.082)	-0.046 (0.093)
Industry distress	0.210*** (0.045)	0.142*** (0.042)	0.150*** (0.054)	0.191*** (0.047)	0.123*** (0.036)	0.141*** (0.052)
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

Industry-wide credit concentration and intra-industry mergers

Horizon HHI measure	Proportion of intra-industry mergers as acquirer					
	After 6 months			After 12 months		
	All banks		Top 1	All banks		Top 1
Market HHI × Ind. distress	0.640** (0.244)	0.417* (0.209)	0.293* (0.149)	0.385* (0.228)	0.164 (0.227)	0.007 (0.174)
Market HHI	-0.391*** (0.138)	-0.187 (0.180)	-0.111 (0.131)	-0.332** (0.154)	-0.115 (0.195)	0.005 (0.139)
Industry distress	-0.113** (0.046)	-0.088** (0.039)	-0.104** (0.046)	-0.081 (0.053)	-0.056 (0.041)	-0.033 (0.050)
Industry FE	N	Y	Y	N	Y	Y
Time FE	Y	Y	Y	Y	Y	Y
N	2,508	2,508	2,508	2,459	2,459	2,459

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	-0.855*** (0.170)	-1.121*** (0.129)	0.332** (0.156)
<i>N</i>	288	287	287
Five years	-0.810*** (0.159)	-1.050*** (0.121)	0.293** (0.132)
<i>N</i>	288	287	287
Seven years	-0.771*** (0.157)	-0.980*** (0.116)	0.250** (0.118)
<i>N</i>	288	287	287