Transmission of Industry-Specific Shocks: The Role of Bank Specialization

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This paper

Research question:

Is bank specialization a mechanism for transmitting sector-specific negative shocks to the rest of the economy?

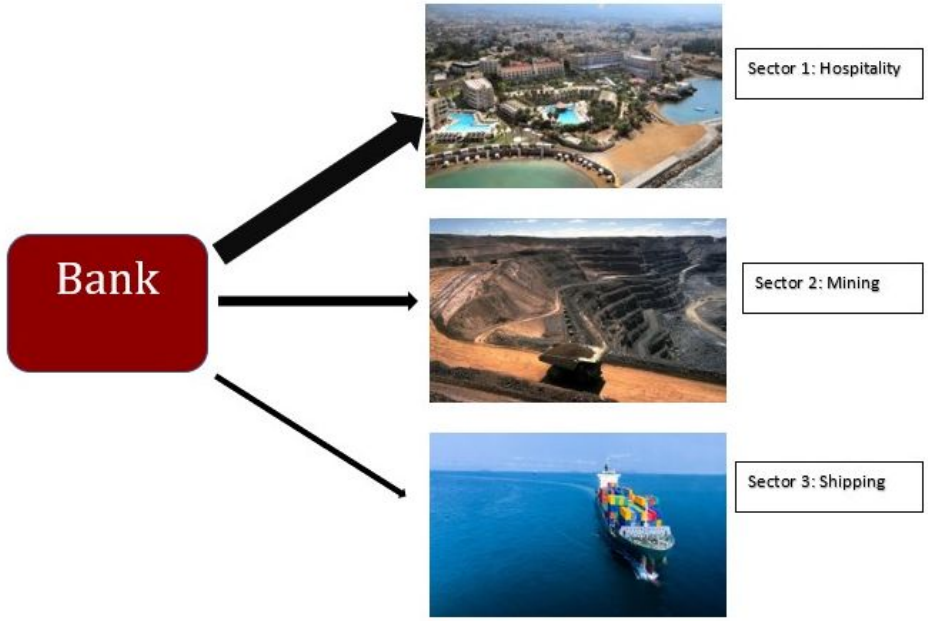
- We examine the propagation of sector-specific shocks, via linkages arising due to common lenders.
- We focus on the role of sectoral specialization in lending by banks as the mechanism.
- We investigate the conditions under which this propagation (if any) has an effect on real economic activity.

Motivation

Why micro shocks may lead to aggregate fluctuations?

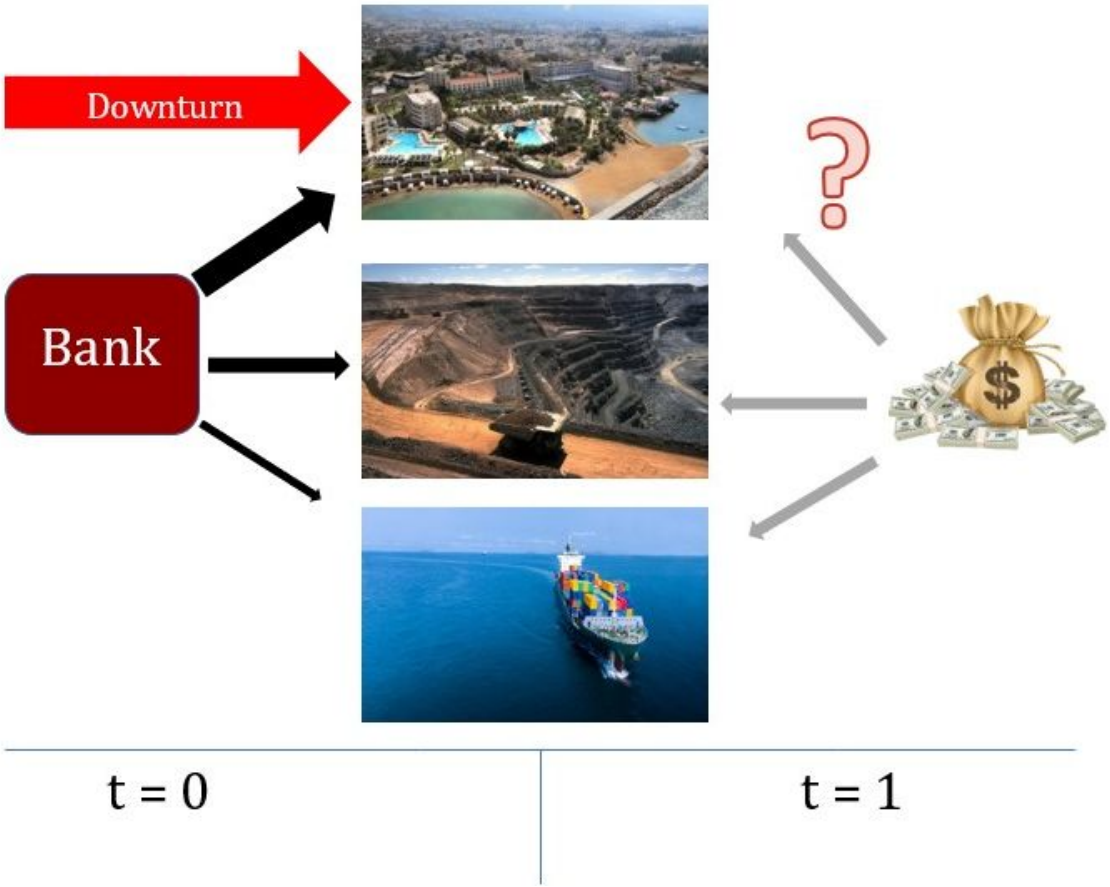
- Idiosyncratic shocks to large firms can generate aggregate shocks (Gabaix, 2011).
- "Financing frictions" (Gilchrist and Zakrajsek, 2012).
- Network spillovers via input-output linkages (Acemoglu et al., 2012).
- Financial intermediation channel (Iyer et al., 2011; Giannetti & Saidi, 2019)

Framework



- Thicker lines indicate higher sectoral specialization

t = 0


Downturn
Bank
?
t = 0
t = 1

Data

- **Dealscan (1990-2015)**: Information on loan characteristics; Lenders' name; Borrowers' name; SIC, etc
- **Call Reports**: Balance-Income sheet information on the lender
- **Compustat**: Balance-Income sheet information on the borrower
- **CRSP**:Calculate the stock returns of each sector
- **Oil shock**: Kilian and Hamilton
- **Rauch**: Product complexity
- **BEA IO Matrix**: Client and supplier industries of each sector

Statistics Univariate Identification

Results

Part A: Firms in distressed sectors

Loan-level analysis for firms in distressed sectors

- Specialized banks increase lending to firms in negatively affected sectors and charge higher interest rates. Table Table
- Specialized banks lend to firms that perform on average better ex-post, providing evidence of "*cherry picking*". Table
- Specialized and lowly capitalized banks are also lending to better-performing firms. Table

Results

Part B: Firms in non-distressed sectors

Loan-level results on spillovers

- Banks with a higher exposure to sectors hit by negative shocks reduce lending to firms in *non-distressed* and *unrelated* sectors. Table
- **Conditions for spillovers**:
  - Sector-specific shock must be of a sufficiently high magnitude.
  - Bank must have high specialization in the distressed sectors.

Results

Part C: Real effects

Firm-level outcomes

- During good times, firms in non-distressed sectors can substitute lending with other unaffected lenders or market debt. Table
- During periods of financial turmoil, firms in non-distressed sectors experience a reduction in credit, overall debt, size, employment and sales. Table

Additional tests

Further tests:

- Analysis at the bank-industry level: Common lenders
- Analysis at the industry level: Aggregate real effects

Sensitivity tests:

- IV estimates: M&A's specialization IV Table
- The role of capital: Alternative definitions Capital Table
- WLS regression analysis WLS Table
- Only lead arrangers Lead Table

Conclusion

- We examine the propagation of sector-specific shocks, via linkages arising due to common lenders.
- We focus on the role of sectoral specialization in lending by banks as the mechanism.

We find:

- Specialized banks lend more and charge higher rates to firms in negatively affected sectors
- Banks reduce credit to unrelated sectors than sectors they specialize and thus creating spillovers
- In bad times, credit supply spillovers have a significant effect on real economic activity

Thank you!

For comments or questions please use skokas@essex.ac.uk

Appendix

Empirical set-up

Loan level, Smolyansky (2019):

- $Ln(amount)_{b,f,t} = \alpha_{f,t} + \alpha_{b,t} + \boxed{\beta * Exposure_{b,t-1}} + \gamma_1 * X_{l,t} + \epsilon_{b,f,t}$.
  - $\beta < 0$ indicates spillovers
  - $Exposure_{b,t-1}$: bank specialization to affected sectors Definitions
  - $\alpha_{f,t}$, $\alpha_{b,t}$: firm*time, bank*time FEs Endogeneity

Firm level, á la Khwaja and Mian (2008)

- $Ln(Y)_{f,t} = \alpha_t + \alpha_f + \boxed{\beta * Exposure_{f,t-1}} + \gamma_1 * X_{f,t} + \epsilon_{f,t}$.
  - Y= Credit, Investment, External debt, Size, Employment, Sales
  - $\beta < 0$ indicates real effects
  - α_f, α_t: firm, time FEs

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Solution to endogeneity

An identification challenge is that β may be biased due to omitted factors and simultaneity issues.

Solutions:

1. Exogenous non-financial shocks:
   - *Industry downturns* $\neq$ bank char.
   - *Oil shocks* $\neq$ bank char.
2. FEs for omitted factors bias:
   - *Firm*Year FEs* for time varying loan demand side
   - *Bank*Year FEs* for time varying supply side
   - *Bank*Firm FEs* for matching
3. IV estimates for simultaneity bias:
   - *M&A's* between banks that are active in the syndicated loan market, six months preceding the origination of the syndicated loan.

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- We define two types of shocks:
  - $Downturn_{s,t} = \begin{cases} \mathbb{1} & \text{if semi-annual returns in } s \text{ at } t < -10\% \end{cases}$
  - Oil $\text{shock}_{s,t} = \begin{cases} \mathbb{1} & \text{if } P_t > E(P_t) \text{ for sector } s \text{ at } t \end{cases}$
- We define bank's sectoral specialization at 2 digit SIC by:

$$Specialization_{b,s,t} = \frac{Loan(\$M)_t^{b \to s}}{\sum_s Loan(\$M)_t^b}, \text{ for any bank } b$$

- Bank exposure to affected sectors:

$$Exposure_{b,t-1} \equiv \begin{cases} Exposure_{b,t-1}^{Dist} = \sum_{s \in Distress_t}^{n} Specialization_{b,s,t-1} \\ Exposure_{b,t-1}^{Oil} = \sum_{s \in Oil\ shock_t}^{n} Specialization_{b,s,t-1} \end{cases}$$

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Table: Summary statistics

	Obs	Mean	SD	Min	Median	Max
Panel A: Loan-level sample						
Ln(amount)	101,333	3.215	1.071	-4.714	3.239	10.222
AISD (bps)	102,069	155.003	112.985	0.700	137.500	1,275
Specialization	102,066	0.107	0.163	0.000	0.053	1.000
$Exposure^{Dist}$	102,069	0.204	0.293	0.000	0.025	1.000
Distress	102,069	0.396	0.489	0.000	0.000	1.000
Panel B: Firm-level sample						
Ln(amount)	34,821	4.872	1.715	0.000	4.932	9.808
Ln(investment)	28,522	0.178	0.328	-0.051	0.125	39.000
Ln(debt)	28,405	-1.656	1.336	-11.567	-1.309	2.061
Ln(size)	30,354	6.676	2.075	-6.215	6.691	14.706
Ln(employment)	29,184	1.169	1.923	-6.908	1.229	7.741
Ln(sales)	30,275	6.563	2.004	-6.215	6.627	13.089
$Exposure^{Dist}$	34,669	0.201	0.291	0.000	0.035	1.000
GFC	35,039	0.068	0.252	0.000	0.000	1.000
Frictions	35,039	0.524	0.499	0.000	1.000	1.000
Firm specificity	35,039	0.180	0.384	0.000	0.000	1.000

Table: Normalized differences in univariate analysis

	I	II	III	IV	V
	Non-Distressed		Distressed		Difference
	(A)		(B)		(B)-(A)
	Mean	SD	Mean	SD	Mean
AISD (bps)	153.414	111.03	161.235	120.13	0.068
Specialization	0.108	0.162	0.106	0.167	0.009
Market shares	0.082	0.092	0.08	0.091	0.027
Tier 2 / TA	0.091	0.037	0.09	0.036	-0.051

The table reports normalized differences for a sample of syndicated loans that were originated in the U.S. from 1987h1 until 2016h1. The difference is defined as $\Delta_X = \frac{\overline{X}_1 - \overline{X}_0}{\sqrt{S_0^2 + S_1^2}}$, where the $\overline{X}$ and S^2 is the sample mean and variance in each subsample, respectively.

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Table: Do banks lend more to firms in affected sectors: Loan level

Dependent variable:	Ln(amount)		
	I	II	III
$Exposure_{t-1}^{Dist}$	0.174***		0.158***
	(3.517)		(3.146)
$Market\ shares_{t-1}^{Dist}$		0.009**	0.005
		(2.542)	(1.288)
Observations	26,987	26,987	26,987
Adjusted R-squared	0.718	0.719	0.718
Bank and loan controls	Y	Y	Y
Bank FE	Y	Y	Y
Firm*Time FE	Y	Y	Y
Clustered standard errors	Bank,Firm	Bank,Firm	Bank,Firm

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Table: Bank lending to distress industries: Firm's performance

Dependent variable:	Ln(amount)			
	I	II	III	IV
Time window:	Post: 1 year	Post: 2 years	Post: 3 years	Pre: 1 year
Panel A: Firm profitability				
$Exposure^{Dist}_{t-1}$	0.143***	0.143***	0.143***	0.124***
$Exposure^{Dist}_{t-1} * \Delta(ROA_{t+1} - ROA_t)$	0.377*			
$Exposure^{Dist}_{t-1} * \Delta(ROA_{t+2} - ROA_t)$		0.720***		
$Exposure^{Dist}_{t-1} * \Delta(ROA_{t+3} - ROA_t)$			0.572***	
$Exposure^{Dist}_{t-1} * ROA_{t-1}$				0.446
Observations	20,976	20,950	21,001	20,029
Adjusted R-squared	0.720	0.721	0.720	0.720
Panel B: The role of capital				
$Low\ capital_t * Exposure^{Dist}_{t-1} * \Delta(ROA_{t+1} - ROA_t)$	0.426*			
$Low\ capital_t * Exposure^{Dist}_{t-1} * \Delta(ROA_{t+2} - ROA_t)$		0.634**		
$Low\ capital_t * Exposure^{Dist}_{t-1} * \Delta(ROA_{t+3} - ROA_t)$			0.563***	
$Low\ capital_t * Exposure^{Dist}_{t-1} * ROA_{t-1}$				0.970**
Observations	17,849	17,823	17,874	17,160
Adjusted R-squared	0.721	0.722	0.721	0.721
Bank and loan controls	Y	Y	Y	Y
Bank FE	Y	Y	Y	Y
Firm*Time FE	Y	Y	Y	Y
Clustered standard errors	Bank,Firm	Bank,Firm	Bank,Firm	Bank,Firm

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Table: Cost of lending

	I	II	III	IV	V	VI
Dependent variable:	AISD (bps)			Margin (bps)		
Panel A: Cost of lending						
Distress	12.161***	10.792***	23.433***	12.021***	11.500***	25.392***
$Specialization_{t-1}$ * Distress	-6.551***	-4.902*	-4.573	-5.141**	-4.687*	-6.888**
Panel B: The role of capital						
Low capital * $Specialization_{t-1}$ * Distress	5.245**	6.004***	7.681**	5.782***	6.572***	7.242**
Observations	84,565	84,306	82,518	84,883	84,627	82,840
Adjusted R-squared	0.713	0.716	0.916	0.646	0.649	0.836
Bank controls	Y	Y	Y	Y	Y	Y
Firm controls	Y	Y	Y	Y	Y	Y
Loan controls	Y	Y	Y	Y	Y	Y
Time FE	Y			Y		
Bank FE	Y		Y	Y		Y
Firm FE	Y	Y		Y	Y	
Bank*Time FE		Y			Y	
Firm*Time FE			Y			Y
Clustered standard errors	Bank,Firm	Bank,Firm	Bank,Firm	Bank,Firm	Bank,Firm	Bank,Firm

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Table: Bank lending to non-distress and non-oil dependent industries

Panel A: Industry downturns				
	I	II	III	IV
Dependent variable:	$Ln(amount)$			
Supply chain: BEA Input-Output				Unrelated
$Exposure_{t-1}^{Dist}$	-0.099***	-0.086***	-0.111***	-0.078**
Observations	85,064	83,229	74,926	62,402
Bank FE		Y		Y
Firm FE	Y			
Bank*Time FE	Y		Y	
Firm*Time FE		Y		Y
Bank*Firm FE			Y	
Panel B: Oil shocks				
	I	II	III	IV
Oil shock group:	Kilian		Hamilton	
Supply chain: BEA Input-Output		Unrelated		Unrelated
$Exposure_{t-1}^{Oil}$	-0.082**	-0.174***	-0.144***	-0.127***
Observations	80,555	48,803	80,555	48,803
Bank,Firm,Loan controls	Y	Y	Y	Y
Bank FE		Y		Y
Firm FE	Y		Y	
Bank*Time FE	Y		Y	
Firm*Time FE		Y		Y
Clustered standard errors	Bank,Firm	Bank,Firm	Bank,Firm	Bank,Firm

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Table: Real effects to non-distressed industries

Dependent variable	Ln(amount)	Ln(investment)	Ln(debt)	Ln(size)	Ln(employment)	Ln(sales)
	I	II	III	IV	V	VI
Panel A: Global Financial Crisis						
$Exposure^{Dist}_{t-1}$	0.081	-0.115***	0.128	-0.057**	0.124	-0.078**
$Exposure^{Dist}_{t-1}$ * GFC_t	-1.600**	0.116	-0.803*	-1.221***	-0.665**	-0.846***
Observations	19,916	18,888	18,812	19,916	19,366	19,913
Adjusted R-squared	0.660	0.209	0.517	0.931	0.927	0.926
Panel B: Financial Frictions						
$Exposure^{Dist}_{t-1}$	-0.249	-0.072***	0.076	-0.179***	0.008	0.055
$Exposure^{Dist}_{t-1}$ * $Frictions_t$	-0.389**	-0.059***	-0.201*	-0.124*	-0.082**	-0.082**
Observations	19,916	18,888	18,812	19,916	19,150	19,689
Adjusted R-squared	0.660	0.209	0.517	0.931	0.926	0.925
Panel C: Firm Specificity						
$Exposure^{Dist}_{t-1}$	-0.721**	-0.042	-0.143	-0.566***	-0.107	-0.063
$Exposure^{Dist}_{t-1}$ * $Frictions_t$	-0.847**	-0.109***	0.134	-0.461**	-0.292***	-0.366***
Observations	3,847	3,783	3,654	3,847	3,723	3,813
Adjusted R-squared	0.575	0.458	0.479	0.918	0.940	0.922
Firm controls	Y	Y	Y	Y	Y	Y
Time FE	Y	Y	Y	Y	Y	Y
Firm FE	Y	Y	Y	Y	Y	Y
Clustered standard errors	Firm,Time	Firm,Time	Firm,Time	Firm,Time	Firm,Time	Firm,Time

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Table: Instrumental-variables estimates

	I	III	IV	V
Dependent variable:	$\Delta Ln(amount)$			
Supply chain: Input-Output				Unrelated
Panel A: First Stage				
Merger implied $Exposure_{t-1}^{Dist}$	0.316***	0.314***	0.314***	0.311***
Adjusted R-squared	0.841	0.840	0.846	0.800
Panel B: Second Stage				
$\widehat{Exposure}_{t-1}^{Dist}$	-2.376***	-2.271***	-2.368***	-1.860***
Observations	69,665	69,609	69,260	60,008
F-stat	21.04	20.44	26.08	10.94
P-value for under identification	0.000	0.000	0.000	0.000
Bank controls	Y	Y	Y	Y
Time FE	Y			
Industry FE	Y			
Bank FE	Y	Y		Y
Industry*Time FE		Y	Y	Y
Bank*Industry FE			Y	
Clustered standard errors	Bank,Industry	Bank,Industry	Bank,Industry	Bank,Industry

Robustness slide

Table: The role of capital: Alternative definitions

	I	II	III	IV
Dependent variable:	$\Delta Ln(amount)$			
Group:	Low: $(\mathbb{1} < 25^{th})$		Low: $(\mathbb{1} < 25^{th})$	
Sector:	Distressed	Non-distressed	Distressed	Non-distressed
$Specialization_{t-1}$	0.619***	-0.346***	0.438**	-0.302***
Low capital (Tier2)* $Specialization_{t-1}$	0.135	-0.249***		
Low capital (Tier1) * $Specialization_{t-1}$			0.298	-0.137*
Observations	13,040	49,189	13,040	49,189
Adjusted R-squared	0.076	0.078	0.076	0.078
Bank controls	Y	Y	Y	Y
Industry*Time FE	Y	Y	Y	Y
Bank*Industry FE	Y	Y	Y	Y
Clustered standard errors	Bank,Industry	Bank,Industry	Bank,Industry	Bank,Industry

Robustness slide

Table: WLS at the bank-industry level

	I	II	III	IV	V	VI
Dependent variable	$\Delta Ln(amount)_{b,f,t}$					
$Exposure^{Dist}_{t-1}$	-0.235***		-0.241***	-0.345***	-0.288***	-0.373***
$Market\ shares^{Dist}_{t-1}$		-0.002	0.005			
Observations	69,655	69,661	69,655	69,653	69,595	69,268
Adjusted R-squared	0.008	0.008	0.008	0.131	0.130	0.087
Time FE	Y	Y	Y			
Industry FE	Y	Y	Y			
Bank FE	Y	Y	Y		Y	
Industry*Time FE				Y	Y	Y
Bank*Idustry FE						Y

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Table: Lead arrangers only

	I	II	III
Dependent variable:		$\Delta Ln(amount)$	
Sample:		Only Lead lenders	
$Exposure_{t-1}^{Dist}$	-0.651***	-0.805***	-0.733***
Observations	15,973	15,553	14,601
Adjusted R-squared	0.059	0.169	0.126
Bank variables	Y	Y	Y
Time FE	Y		
Idustry FE	Y		
Bank FE	Y	Y	
Industry*Time FE		Y	Y
Bank*Industry FE			Y
Clustered standard errors	Bank,Industry	Bank,Industry	Bank,Industry

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