



It Takes More than Two to Tango: Understanding the Dynamics behind Multiple Bank Lending

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Disclaimer



*“Examples of vulnerabilities include high levels of leverage, maturity transformation, **interconnectedness**, and complexity, all of which have the potential to magnify shocks to the financial system.”*

Ben S. Bernanke, Chair of the Federal Reserve, 2013

*“Research suggests that in a world with multiple capital constraints, e.g., a leverage ratio and a risk-based capital, banks face incentives to do the same thing rather than specializing in areas where they each have a natural competitive advantage. This type of academic work provides a conceptual framework for understanding how optimizing behavior against multiple constraints **might lead banks to pursue similar strategies and become more homogenous over time**. I think it is an important area where regulators and supervisors concerned with optimal regulatory design can learn from the [theoretical] literature.”*

Kevin Stiroh, Exec. VP of the Federal Reserve Bank of New York, 2018

Motivation



- Multiple lending is a source of overlapping portfolios and interconnectedness in the banking system
- Therefore, there is a great importance of understanding how it is created
 - what drives borrowers to switch from single to multiple lending relationship?
 - what determines a match between a borrower and a new lending bank?
- Using a confidential database on all (about 305,000) large exposures in the Israeli commercial banks in the period between 2005 and 2015 we find that:

In this study we...



- Regulatory limits on large exposures lead large borrowers to turn to multiple lending
 - systemic externalities of micro-prudential regulation
- The probability for a new lending relationship increases with the level of similarity between the candidate lender and the original lending bank
 - “love for correlation”
 - mimicking
 - banks trying to enjoy the implied “too many to fail” guarantee?

In this study we...



- **Direct Contagion Channel**

- Interbank loans
- Swap agreements
- Bilateral exposures
- Rochet and Tirole, 1996; Allen and Gale, 2000; Allen et al. 2012; Gorton and Metric, 2012

- **Indirect Contagion Channel**

- Common asset holding (common counterparty)
- Fire Sales (Shleifer and Vishny, 2011; Coval and Stafford, 2007)
- Mark-to-Market losses (Ellul et al., 2014)
- Acharya and Yorulmazer, 2008; Acharya, 2009; Wagner, 2010; Wagner, 2011; Ellul et al., 2011

Systemic Risk: Indirect vs. Direct contagion channel

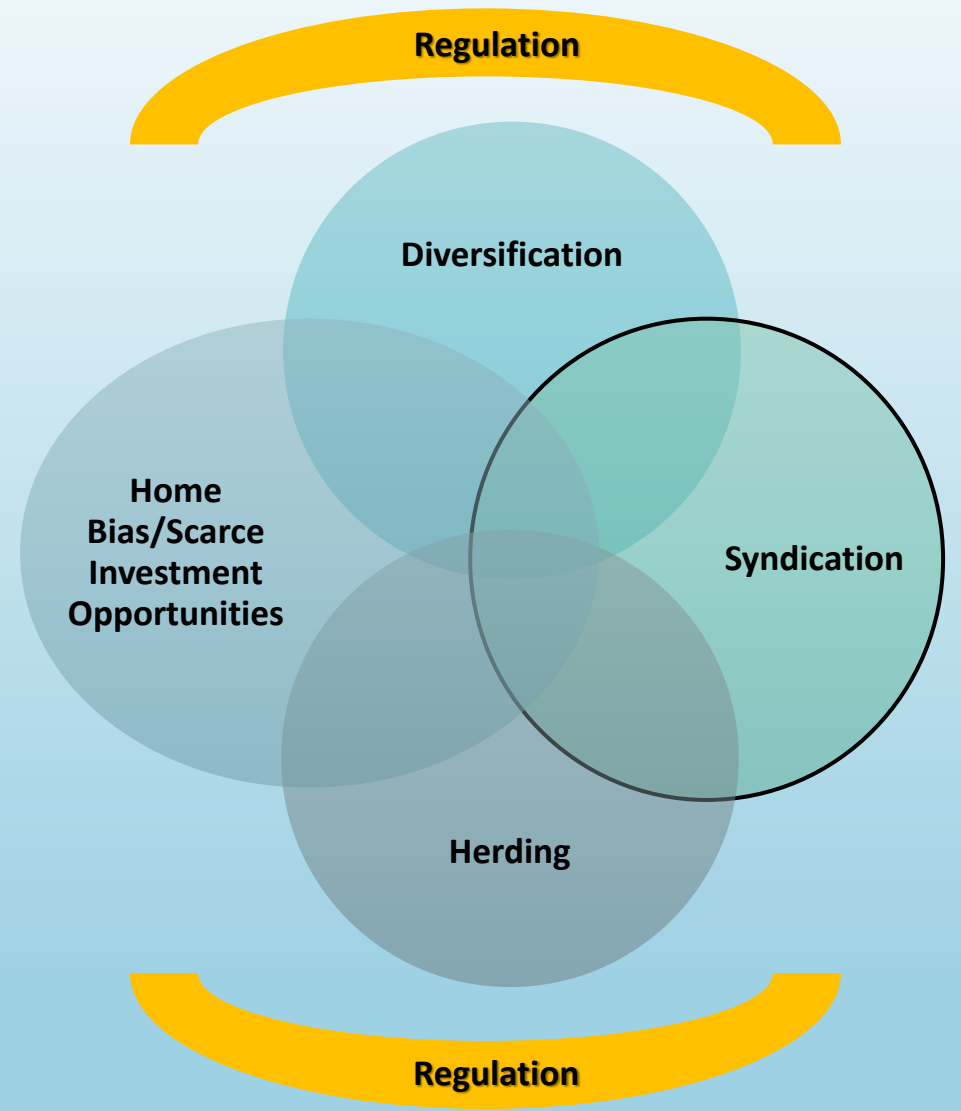


- **Unintentional actions**

- Diversification strategy (methodology)
- Market Investment opportunities

- **Intentional actions**

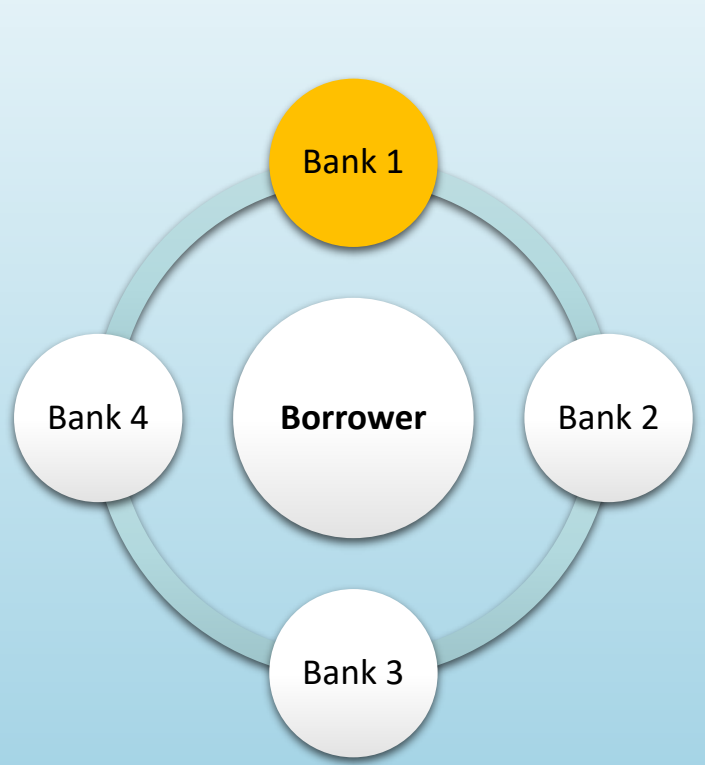
- Syndication (formal)
- Investment herding



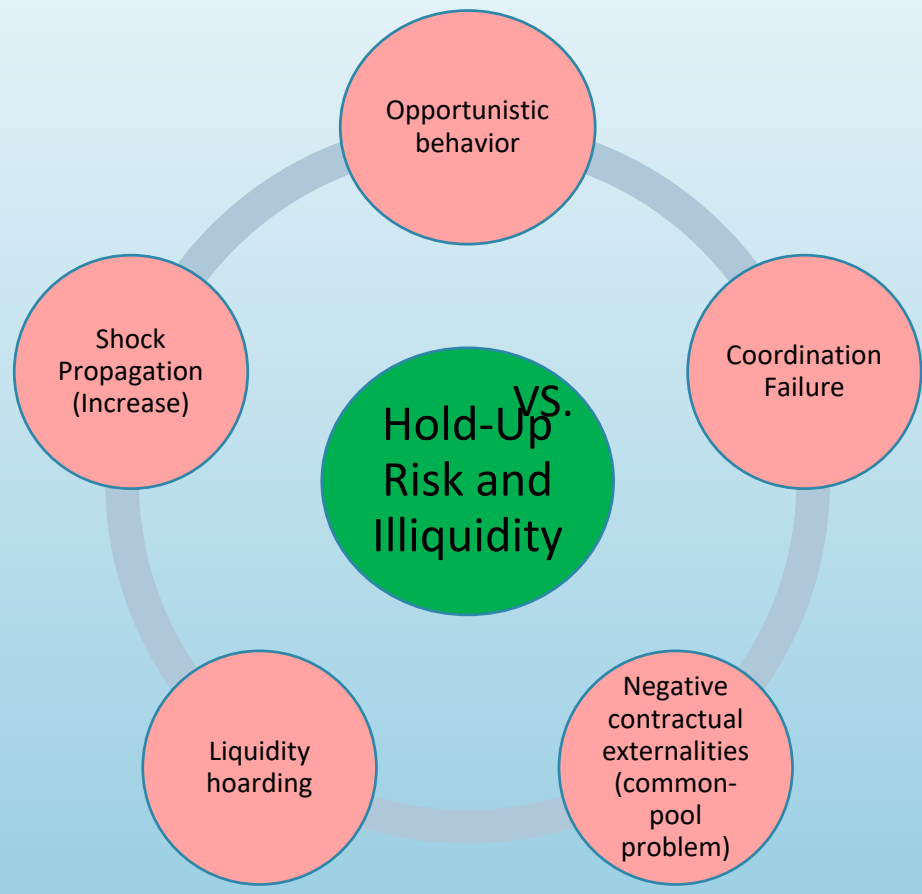
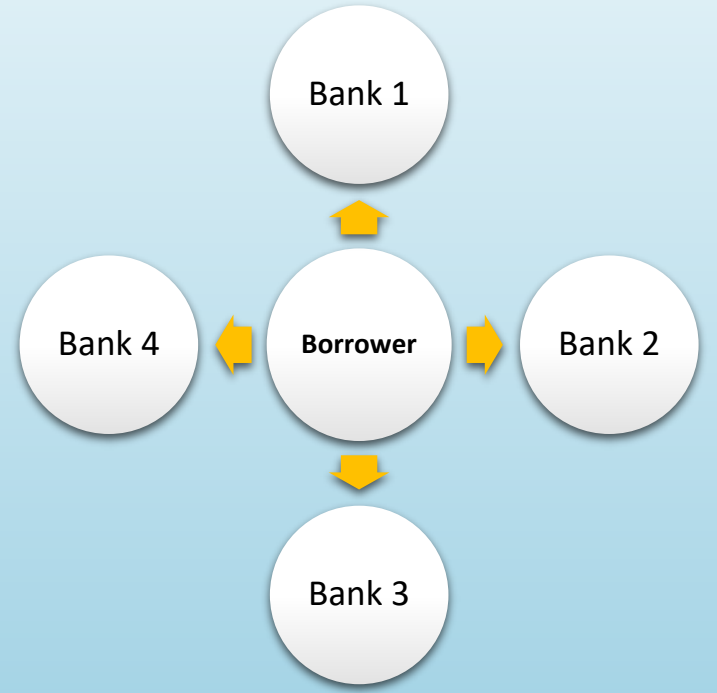
Asset Commonality



Formal



De Facto



Formal vs. De-Facto Syndication



General information

- **7** largest commercial banks (98% of total assets) – highly concentrated banking system, low level of syndication
- **2005-2015** period
- **BSD Large borrowers' exposures data**
 - stock of every exposure above 20 NIS million (4 NIS Mil.)
- **214,000** loans (4,800 loans per quarter, 9,577 unique borrowers) – 269 NIS billion (Q4:2015)
- Local non-financial corporations (**69%** of total non-financial business sector credit provided by domestic banks)

Large exposures

- Borrower characteristics
 - borrower's unique identifying number, legal status (i.e. private or listed), industry affiliation and its affiliation to group of borrowers.
- Exposure composition
 - total and specific banks' balance sheet and off-balance sheet exposure, net exposure, deductions, provisions, non-performing loans, etc.
- Collateral data
 - type of collateral and its value for the bank.

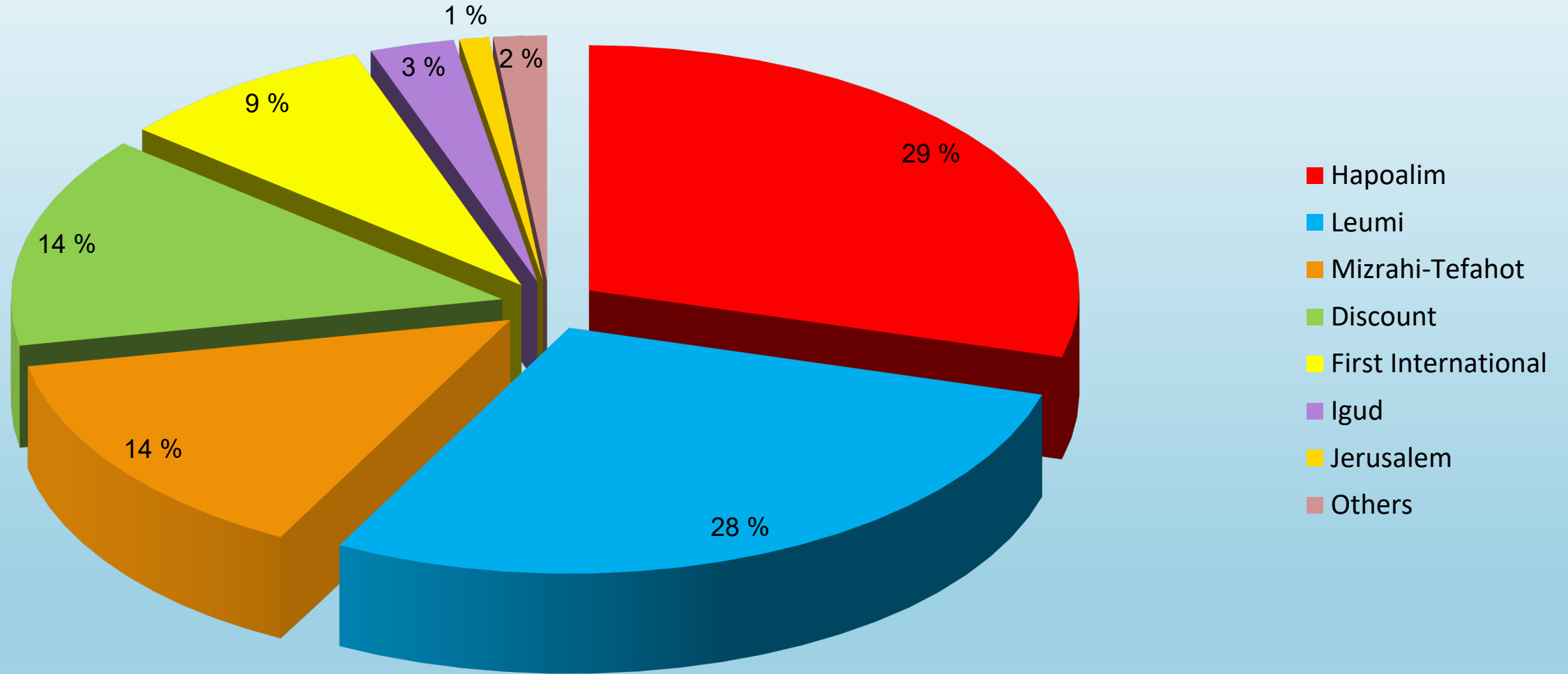
Database



- **Exposure to a single borrower (counterparty)**
 - must not exceed 15 percent of bank capital
- **Exposure to a group of borrowers**
 - (768 groups in our data) - a group of individuals, corporates etc. that are controlled by the same entity, have strong economic affiliation to each other, have significant interests in each other, or which are dependent on each other
 - must not exceed 30% (before 2012) and 25% (afterward) of bank capital
- **Industry exposure**
 - cannot exceed 20% of bank's total credit supply

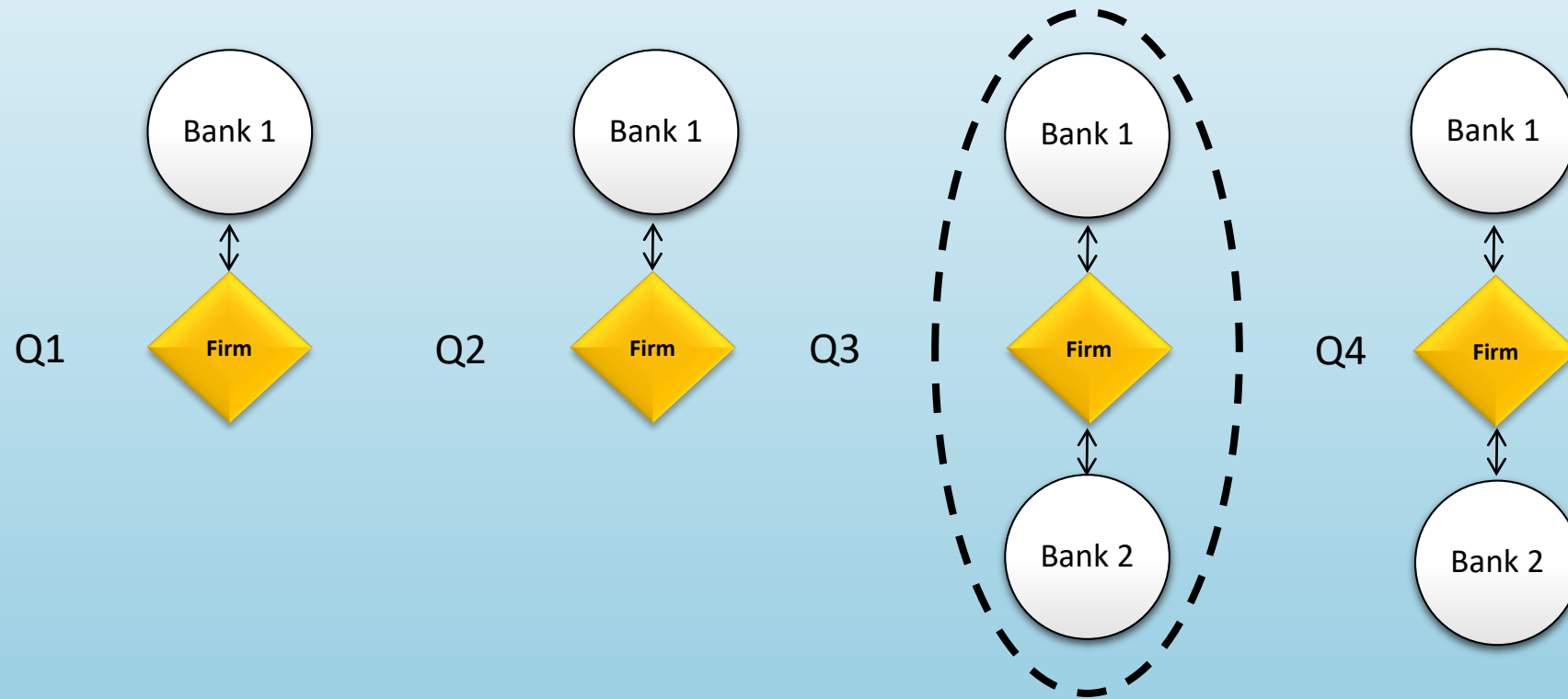
Regulatory Framework

**Distribution of the banking system's assets by banking groups
(2015:Q4, total assets=NIS 1,443 billion)**



Israeli Banking System

1,250 cases (1,027 unique borrowers)



Multiple Lending (from single to multiple relationships)



$$\Pr(\text{new lending relationship} = 1)_{i,q} = \alpha + \beta' \text{borrower}_{i,q-1} + \gamma' \text{exposure}_{i,q-1} + \delta' \text{bank}_{i,q-1} + \theta' \text{borrower_bank}_{i,q-1} + \varepsilon$$

common variables in the literature



Size, public status, non-banking credit (bonds)



Size, Credit, Capital-Assets ratio

our innovation



Net exposure, Secured debt, Problem Loan



Regulatory distance, Duration of relationships

Who? (logit model approach)



	Point Estimate	Odds Ratio
Intercept	yes	
Borrower		
Size	0.112***	1.119
Is it a public firm?	1.003***	2.729
Does the firm have tradeable bonds?	0.132	1.142
Exposure		
The ratio between net and gross exposure	0.02	1.021
% of exposure secured by collateral (out of net exposure)	-0.001	1
% of on-balance exposure (out of net exposure)	-0.409***	0.664
% of problem loans (out of net exposure)	-0.621***	0.538
Bank		
Lending bank (log) total assets	-0.152	0.859
Lending bank (log) total credit	-0.431	0.65
Lending bank (log) total capital	8.278	>999.999
Bank-Borrower Relationship		
% of credit outstanding to the borrower's industry	0.078***	1.082
% of credit outstanding to the borrower's industry sq.	-0.005***	0.996
(single exposure limit) – (exposure to the borrower)	-8.898*	<0.001
(group of borrowers limit) – (exposure to the borrower's group of borrowers)	-2.056***	0.128
Duration of relationship	-0.002	0.999
Quarters dummy		Yes
Banks dummy		Yes
Cox-Snell R-squared		0.041

Logit results

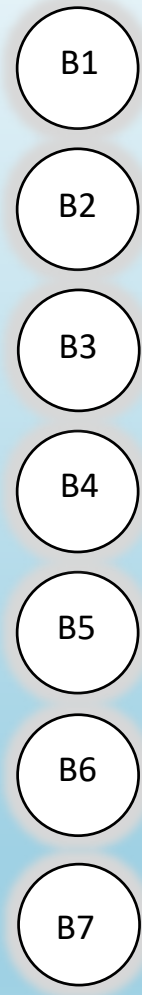


- The likelihood of a firm to substitute a single bank relationship with multiple relationships increases with:
 - its size
 - and its transparency level
- ...and decreases with its:
 - share of problem loans
 - share of on balance credit
- Regulatory limits are binding
 - Idiosyncratic risk decreases but systemic risk increases

Findings



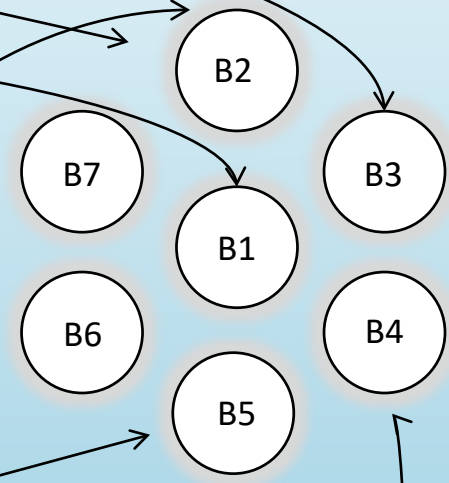
**Original
lending
bank**



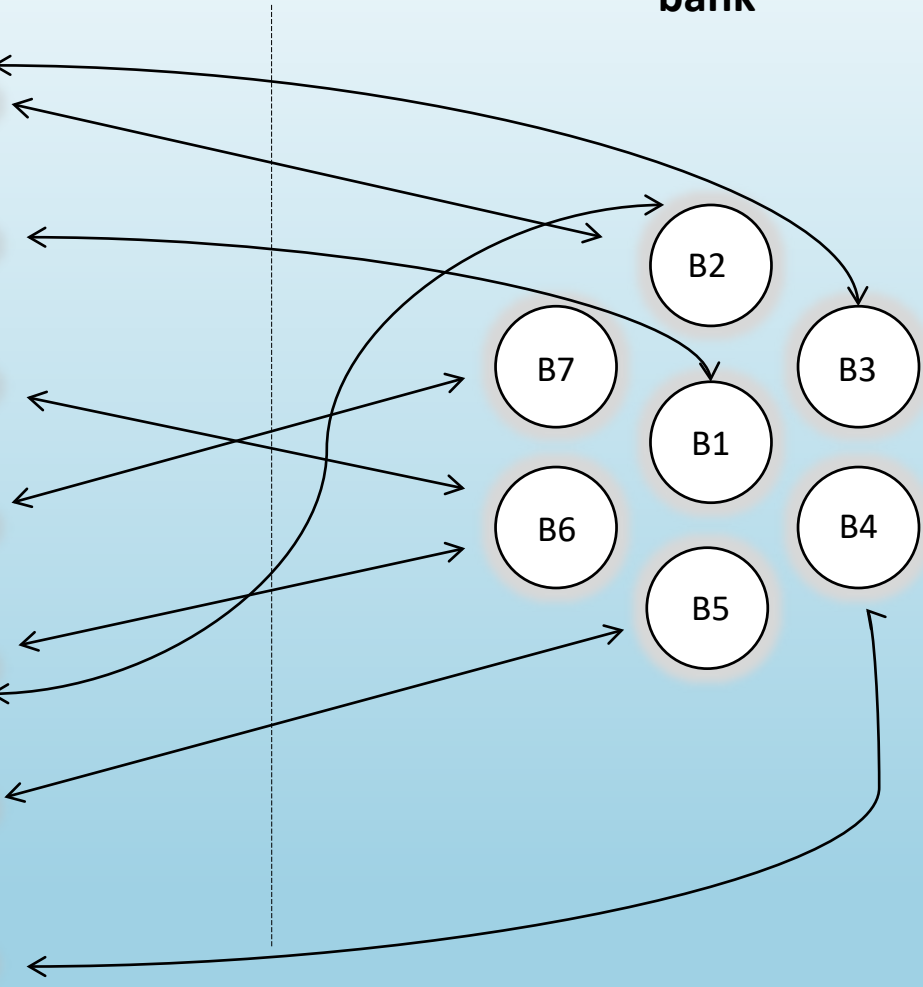
**Borrowing
firm**



**Candidate
lending
bank**



+
+
+
+
+
+
+



Two-sided matching game

$$Pr(\mu_{ij}^t = 1 | \mu_{ij}^{t-1} = 0) = \frac{\exp(\beta_j \text{borrower_bank}_{ji}^{t-1} + \gamma \text{Distance}_{ji}^{t-1})}{\sum_{k \in B} \exp(\beta_j \text{borrower_bank}_{kj}^{t-1} + \gamma \text{Distance}_{kj}^{t-1})}$$



Size (incl. Interactions), Capital to Assets Ratio



Regulatory distance, Past relationships



Risk difference, Equity returns correlation, Distance

How and with whom? (mixed logit approach)



	(1)		(2)		(3)		(4)	
	Sample 1 (6 Banks , Full Period)		Sample 2 (All Banks, 2008-2015)		Sample 1 (6 Banks , Full Period)		Sample 2 (All Banks, 2008-2015)	
	Point estimate	p-value	Point estimate	p-value	Point estimate	p-value	Point estimate	p-value
Candidate Bank size (log assets)	-3.88**	0.017	-0.52	0.68				
Capital to Assets ratio	6.79*	0.09	10.52**	0.012	8.051**	0.0423	13.372***	0.0013
Industry share	0.05***	0.0002	0.05***	0.0006	0.049***	0.0003	0.05***	0.0012
Group regulatory gap	-5.51**	0.033	-6.91**	0.012	-3.995	0.1195	-4.693*	0.09
Borrower - Candidate Bank size	-0.04	0.37	-0.07*	0.066	-0.024	0.5334	-0.06	0.1041
Lender - Candidate Bank size (product)	0.25***	0.003	0.08	0.173				
Lender - Candidate Bank size (difference)					-0.745*	0.0743	-1.058**	0.0102
Group of Borrowers Exposure (dummy)	0.94***	<.0001	0.92***	0.0004	0.978***	<.0001	0.991***	0.0001
Past relationships (dummy)	2.07***	<.0001	2.14***	<.0001	2.064***	<.0001	2.147***	<.0001
Volatility (original vs. candidate)	-0.03**	0.033	-0.04**	0.033	-0.028**	0.0465	-0.035**	0.0431
Equity Correlation	0.63*	0.072	0.86**	0.025	0.879***	0.0081	0.971***	0.0082
Distance	-0.10	0.88	0.22	0.68	-0.042	0.9487	0.200	0.7095
<i>Goodness-of-fit range</i>	0.4558 - 0.6209		0.5315 - 0.7443		0.4536 - 0.6172		0.5314 - 0.7442	
<i>McFadden's LR</i>	0.260		0.317		0.258		0.316	

Mixed logit results



- The likelihood to observe a new match increases with:
 - funding availability of the candidate bank
 - familiarity of the candidate bank with the borrower's activity
 - industry
 - group of borrowers
 - previous lending relationship
 - smaller size of the candidate bank compared to the original bank
 - lower riskiness of the candidate bank compared to the original bank
 - similarity between the candidate and original bank, as perceived by market participants
 - mimicking?
 - If so, we should expect small banks to mimic big banks (Acharya and Yorulmazer, 2007; Farhi and Tirole, 2012; Silva, 2018)

Findings

	(1)		(2)		(3)	
	Full sample (sample 2: All Banks, 2008-2015)		Original lender: a big bank (sample 2: All Banks, 2008-2015)		Original lender: a small banks (sample 2: All Banks, 2008-2015)	
	Point estimate	p-value	Point estimate	p-value	Point estimate	p-value
Candidate Bank size (log assets)	0.153	0.9019	0.611	0.9747	2.651	0.1753
Capital to Assets ratio	7.709*	0.0756	15.49***	0.0059	8.984	0.1641
Industry share	0.052***	0.0004	0.059***	0.0024	0.036	0.118
Group regulatory gap	-6.492**	0.0193	0.402	0.911	-14.946***	0.0004
Borrower - Candidate Bank size	-0.072*	0.0515	-0.047	0.3406	-0.109*	0.0714
Lender - Candidate Bank size	0.056	0.3823	0.019	0.9845	-0.061	0.5659
Group of Borrowers Exposure (dummy)	0.94***	0.0003	1.078***	0.0006	0.839*	0.0809
No past relationships (dummy)	-2.144***	<.0001	-2.191***	<.0001	-2.111***	<.0001
Volatility (original vs. candidate)	-0.04**	0.0199	-0.048**	0.032	-0.017	0.5502
Equity Correlation	-0.46	0.5664	0.865*	0.0866	0.487	0.4428
Equity Correlation X Original bank size	0.093**	0.0484				
Goodness-of-fit range	0.5584 - 0.7898		0.5584 - 0.7898		0.4946 - 0.6811	
McFadden's LR	0.633		0.353		0.273	

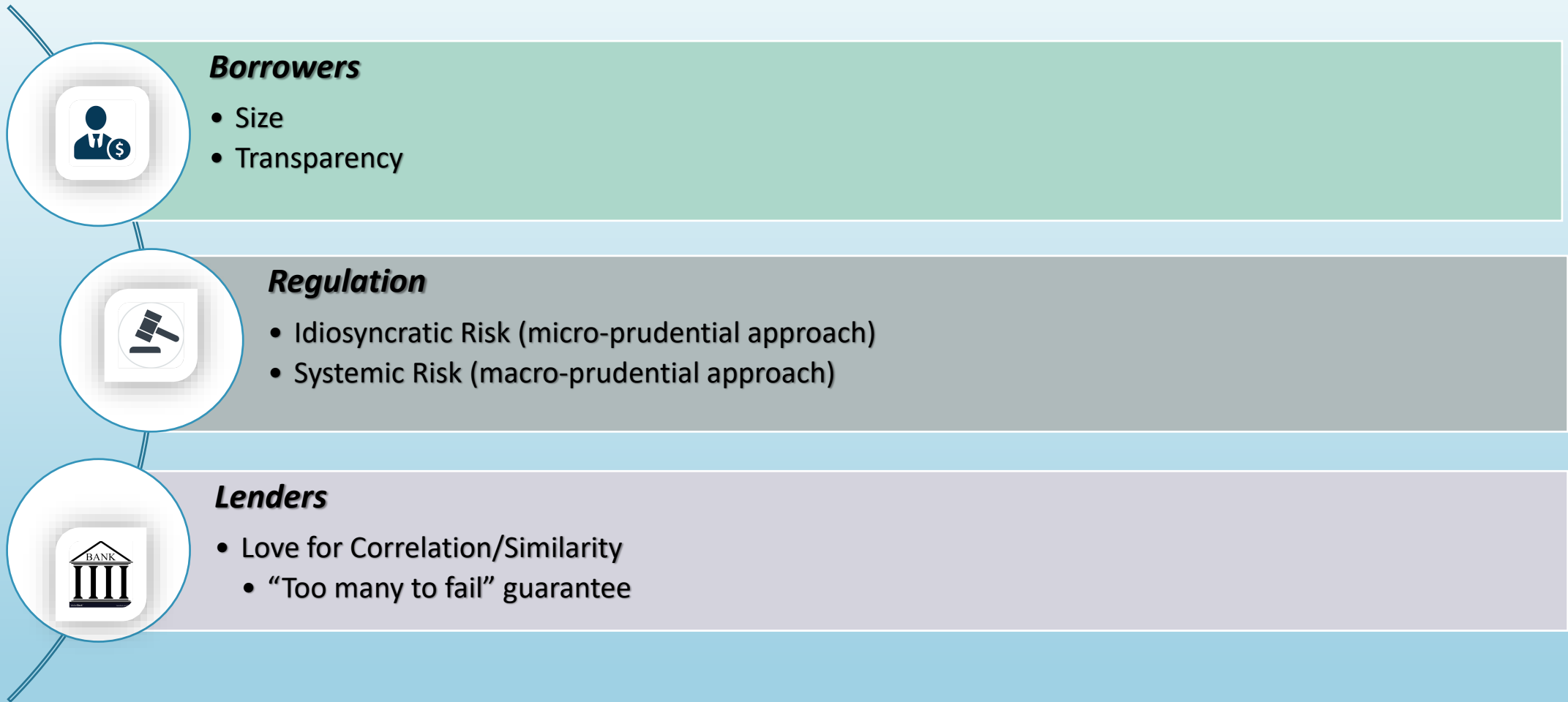
Mixed logit results



- micro-prudential regulations used for reducing idiosyncratic concentration risk...
 - limits on exposures to an industry, a single or a group of borrowers
- ... increase the level of systemic risk
 - that arise from asset commonality
- evidence on mimicking behavior between banks through lending to the same borrower(s)
 - where small banks tend to mimic big banks
- this observation is in line with the expected behavior of banks trying to enjoy the implied “too many to fail” guarantee

Summary

Thank You.



Summary



	(1)		(2)		(3)		(4)		(5)	
	Availability hypothesis		Hold-up hypothesis		Diversification hypothesis		Familiarity hypothesis		Full specification	
	Point estimate	p-value	Point estimate	p-value	Point estimate	p-value	Point estimate	p-value	Point estimate	p-value
Candidate Bank size (log assets)	1.13***	0.001	-1.55	0.145					-0.52	0.68
Capital to Assets ratio	17.53***	<.0001							10.52**	0.012
Industry share	0.06***	<.0001					0.05***	<.0001	0.05***	0.0006
Group regulatory gap	-8.98***	<.0001					-3.56	0.1888	-6.91**	0.012
Borrower - Candidate Bank size	-0.048	0.133							-0.07*	0.066
Lender - Candidate Bank size			0.12**	0.024					0.08	0.173
Group of Borrowers Exposure (dummy)							1.32***	<.0001	0.92***	0.0004
No past relationships (dummy)							-2.44***	<.0001	-2.14***	<.0001
Volatility (original vs. candidate)					-0.04***	0.004			-0.04**	0.033
Equity Correlation					3.05***	<.0001			0.86**	0.025
Distance					-3.79***	<.0001			0.22	0.68
<i>Goodness-of-fit range</i>	0.380 - 0.489		0.348 - 0.445		0.3118 - 0.3988		0.463 - 0.628		0.5315 - 0.7443	
<i>McFadden's LR</i>	0.171		0.149		0.126		0.241		0.317	

Sample 2 (All Banks, 2008 -2015 period)



	Availability	Hold-Up	Diversification	Familiarity	Full Specification
Candidate Bank size (log assets)	+	-			-
Capital to Assets ratio	+				✓
Industry share	-			+	+
Group regulatory gap	+			-	-
Borrower - Candidate size	+				-
Lender - Candidate size		-			+
Group of Borrowers				+	✓
No past relationships				-	✓
Volatility (candidate vs. original)			-		✓
Equity Correlation			-		+
Distance			+		-

“Availability”

- Multiple lending relationships arise when one bank is not able to provide all the firms' funding needs.

“Hold-up”

- New banking relationship mitigates the hold-up problem.

“Diversification”

- Multiple relationships insure a firm against distortion with the relationship bank services due to its distress.

“Familiarity”

- Multiple banking relationships lead to enhanced bank monitoring, which is optimal only if the benefits outweigh the costs.

Four Motives