Social Networks in the Global Banking Sector

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Joint work with

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University of Florida and Financial Conduct Authority

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A Brief Motivation

- Social networks matter!
  - Asset management/Investment (Cohen et al., 2008)
  - Corporate governance and managerial compensation (Hwang and Kim, 2009; Fracassi and Tate, 2012; Engelberg et al.[a], 2012)
  - Bank loans (Engelberg et al.[b], 2012; Ferreira and Matos, 2012)
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  - Bank loans (Engelberg et al.[b], 2012; Ferreira and Matos, 2012)
  - M&A (Cai and Servilir, 2011; Fracassi and Tate, 2012)
- Social networks serve as a conduit for interpersonal (or inter-organizational) support, influence, and information flow (Granovetter, 2005)

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- Globally (i.e., network system-wide)
  - Similar bets made by connected parties could lead to an excessive co-movement of economic outcomes
  - This ”group-think” could lead to instability in the network system, particularly if the agents at the central positions of the network promote common signals to their connected parties in a systematic way

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  - Examine both a "**bright**" side and a "**dark**" side to these social connections
    - Syndicated loan partnership by socially connected banks
    - Lead-arranger role played by network central banks in loan syndication
    - Inter-bank lending/borrowing patterns of network central banks
    - Equity return correlation of socially connected banks
    - Systemic risk vs. Network centrality

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  - Examine how **crisis** affects these network influences

Why Do We Study Banking Industry?

- Relationships and soft information matter in banking!
  - Lender-borrower relationships/information (Rajan, 1992; Houston and James, 1996, among others)
  - Lender-lender relationship/information (Sufi, 2007; Champagne and Kryzanowski, 2007; Cocco et al., 2009; Ivashina, 2009)

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- If social networks lead to similar bets in various inter-bank transactions, such similar bets could increase the systemic risk of the banking system
  - This concern is particularly valid in the aftermath of the recent financial crisis

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- Advisory role of non-manager directors
  - Independent directors not only monitor the managers but also provide useful guide and/or advice to them in their corporate decision making (Coles et al., 2012, among others)

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  - Social networks among top banks are extensive and have become increasingly important over time (**net 47% increase**)
  - Across different types of institutions, **network centrality** is **highest for government credit institutions and investment banks**, and is **lowest for commercial banks and savings institutions**

What We Find - Part II. Relative Values of Network Connections

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- Interbank lending and borrowing
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- Systemic risk of the global banking industry
  - Stock returns co-move more likely when the boards of two banks are socially connected
  - There is a strong link between network centrality and the systemic risk measured by ΔCoVaR (Adrian and Brunnermeier, 2011)

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    - However, there is a remaining or an even stronger link between network centrality and ΔCoVaR during the crisis period
- Diminished role of network central banks during the crisis is likely to be due to the reduced value of centralized information flow within the network
  - We find no evidence that the crisis disproportionately hit the performance of the network central banks

Are These Findings Important?

- ”Social networks between lenders” are relatively under-studied in the banking literature
  - Non-financial firms (Fracassi, 2012)
  - Other types of networks
    - Venture capital firms’ deal syndication network (Hochberg et al., 2007)
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- Policy makers may want to be aware of these correlations in light of the on-going debate on ”too-big-to-fail” banks

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- Balance sheet information from Bankscope and equity data from CRSP/Compustat World
- Global loan syndication from DealScan
  - Collect information on the 300 largest packages each year
  - These packages represent roughly half the aggregate dollar amount of syndicate deals reported in the entire DealScan each year
  - Cover 1,644 borrowers from 66 countries

Network Measures: Pair-wise Connectedness

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- Educational ties only - **Edu**

- All connections other than educational ties - **Professional**

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  - **Scaled version** measures total number of connections between two banks' directors normalized by the average board size
  - **Unscaled version** is just a **binary** variable, either being connected (1) or not (0)
- Educational ties only - **Edu**
  - Scaled version
  - Unscaled version
- All connections other than educational ties - **Professional**
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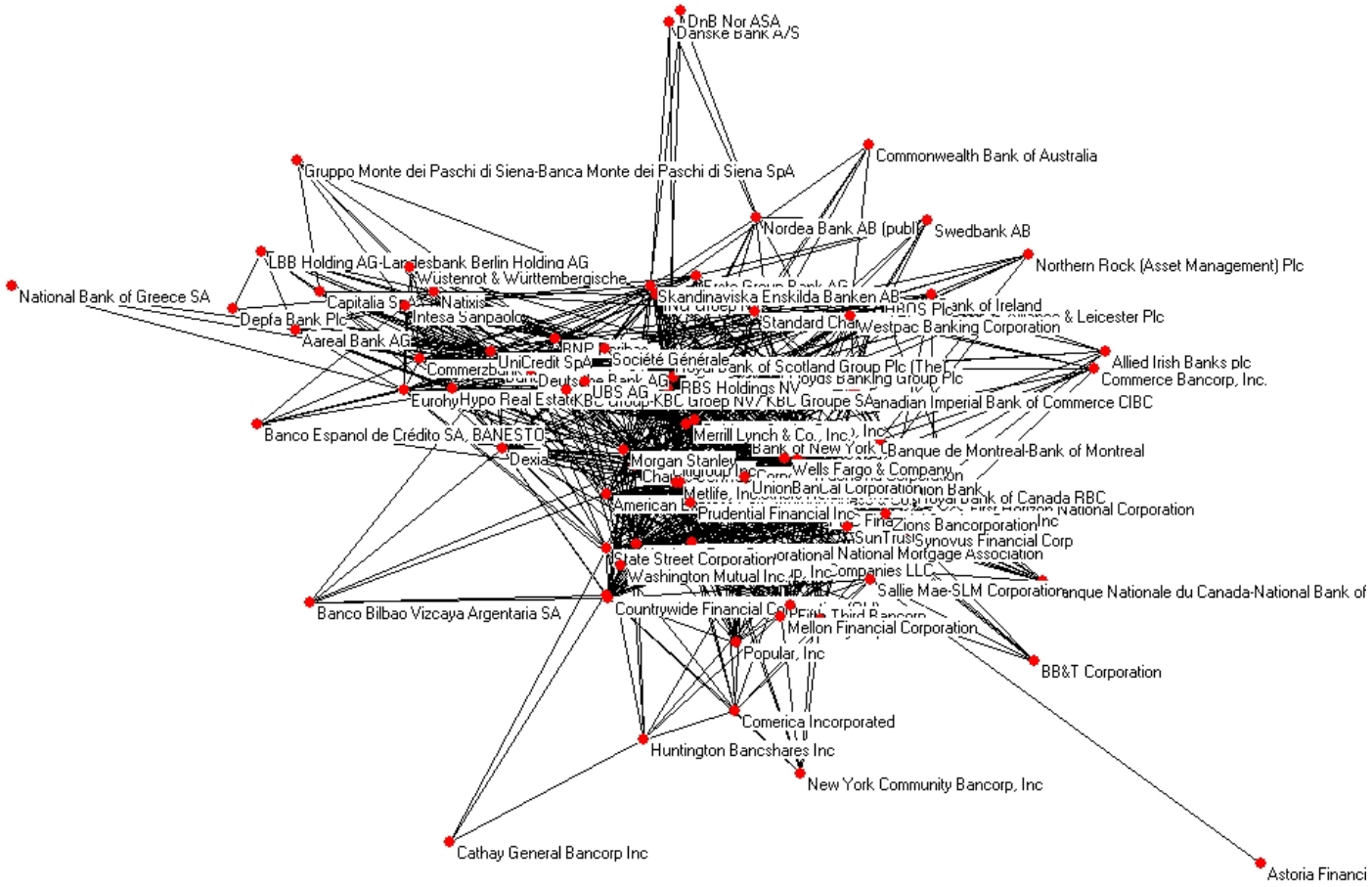
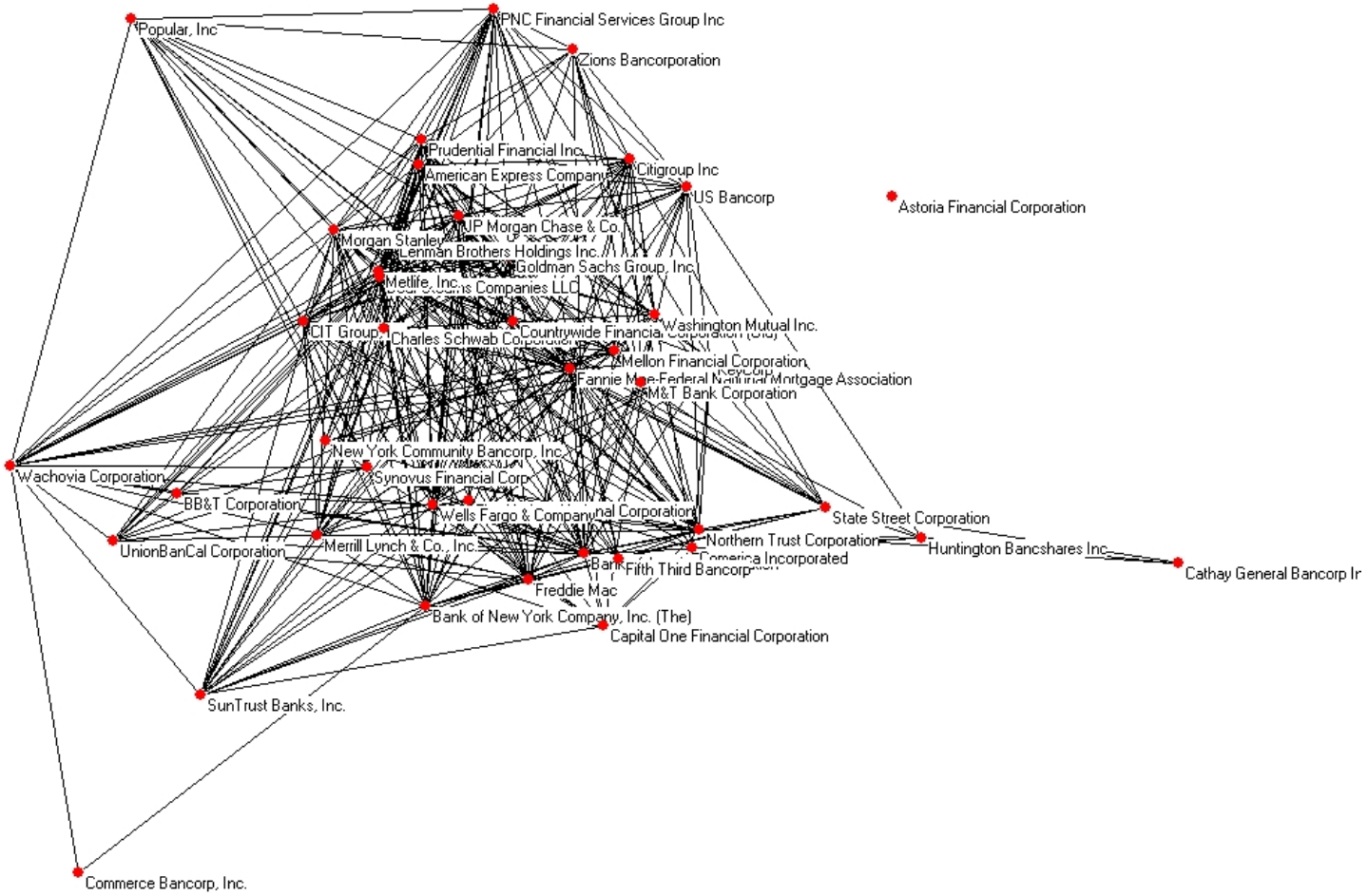
  - **Betweenness**
    - Frequency that a given bank lies on the shortest path between all sets of possible banks pairs in the system
  - **Eigenvector**
    - Assign an eigenvalue of the adjacency matrix to each bank
  - **Closeness**
    - Inverse value of the average distance from a given bank to all other banks in the system
  - **Degree**
    - Number of other banks that a given bank is connected to through first-degree (direct) links

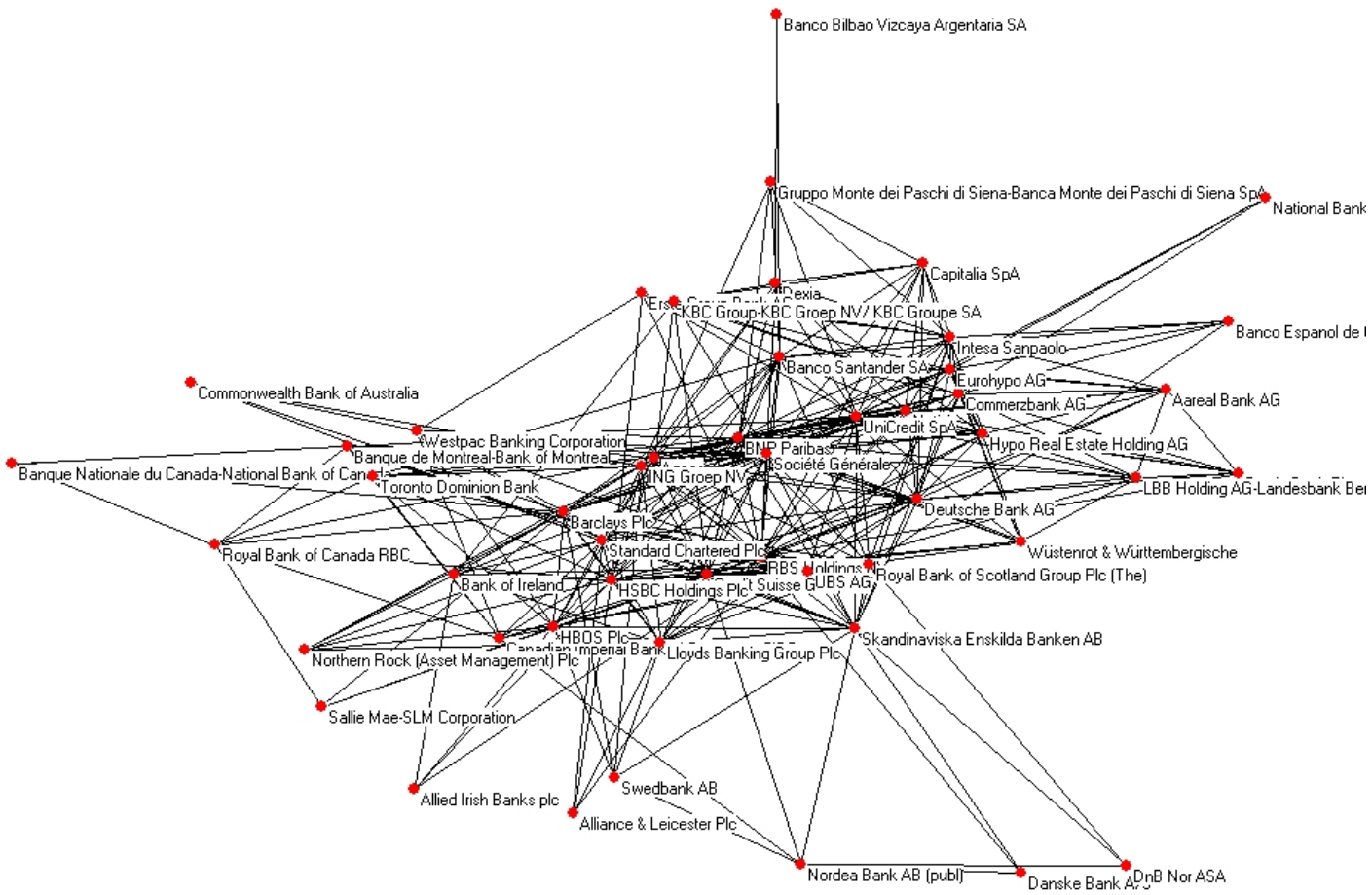
Social Networks in the Global Banking Sector in 2006



Social Networks in the U.S. Only Network in 2006



Social Networks in the Non-U.S. Only Network in 2006



Average Pair-wise Connectedness: SNI

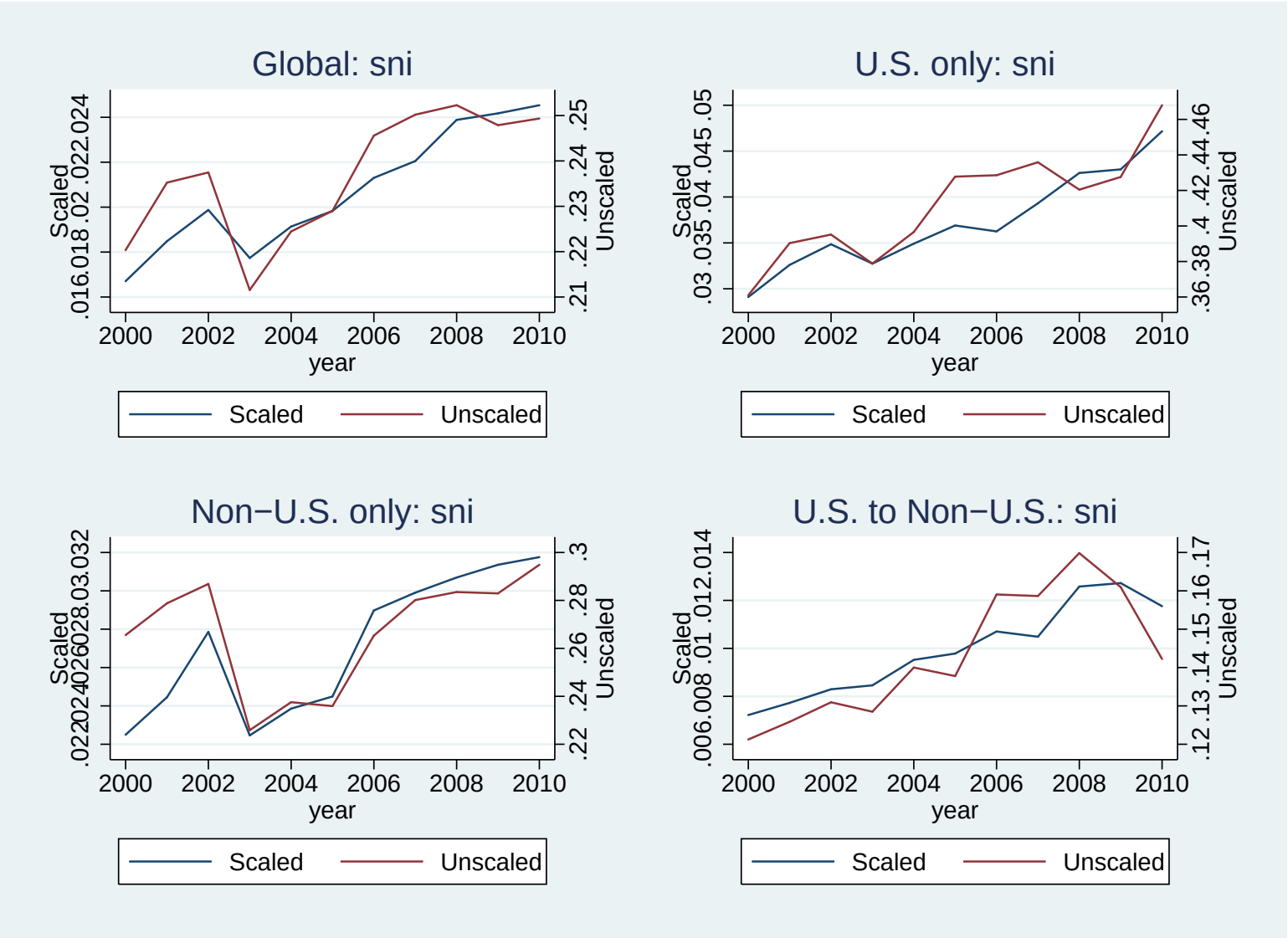


Table 4. Global Syndication Partnership: SNI

Dependent Variable: $Pair_{i,j,k}$	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
L.sni	0.464***	0.450***	0.348***	0.339***		0.168***	0.447***	0.407***
	(0.053)	(0.051)	(0.044)	(0.043)		(0.029)	(0.054)	(0.058)
L.edu					0.174*			
					(0.096)			
opaque							-0.011***	
							(0.001)	
L.sni X opaque							0.054***	
							(0.018)	
L.sni X crisis								0.150***
								(0.049)
country	-0.022***	-0.009	-0.003	0.003	0.015**		-0.022***	-0.022***
	(0.008)	(0.008)	(0.007)	(0.007)	(0.007)		(0.008)	(0.008)
type	0.011**	0.012**	0.010**	0.010**	0.011***		0.011**	0.011**
	(0.005)	(0.005)	(0.004)	(0.004)	(0.004)		(0.005)	(0.005)
rel-bank1-borrower	0.364***	0.089**	0.046	0.227***	0.042	-0.035	0.353***	0.362***
	(0.043)	(0.042)	(0.034)	(0.037)	(0.034)	(0.029)	(0.043)	(0.043)
rel-bank2-borrower	5.080***	4.693***	3.608***	3.798***	3.627***	3.659***	5.073***	5.080***
	(0.381)	(0.355)	(0.269)	(0.275)	(0.271)	(0.267)	(0.381)	(0.381)
cum. lending freq. bank1			-0.016***	-0.002	-0.013***	-0.003		
			(0.003)	(0.003)	(0.003)	(0.002)		
cum. lending freq. bank2			0.438***	0.442***	0.446***	0.320***		
			(0.011)	(0.010)	(0.011)	(0.008)		
Additional controls	Similar size and leverage dummies							
Fixed effects	Year	Year, Borrower	Year, Borrower	Facility	Facility	Year, Pair	Year	Year
Cluster	Pair	Pair	Pair	Pair	Pair	Pair	Pair	Pair
Adj. R^2	0.075	0.107	0.172	0.188	0.169	0.275	0.075	0.075
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country	-0.022***	-0.009	-0.003	0.003	0.015**		-0.022***	-0.022***
	(0.008)	(0.008)	(0.007)	(0.007)	(0.007)		(0.008)	(0.008)
type	0.011**	0.012**	0.010**	0.010**	0.011***		0.011**	0.011**
	(0.005)	(0.005)	(0.004)	(0.004)	(0.004)		(0.005)	(0.005)
rel-bank1-borrower	0.364***	0.089**	0.046	0.227***	0.042	-0.035	0.353***	0.362***
	(0.043)	(0.042)	(0.034)	(0.037)	(0.034)	(0.029)	(0.043)	(0.043)
rel-bank2-borrower	5.080***	4.693***	3.608***	3.798***	3.627***	3.659***	5.073***	5.080***
	(0.381)	(0.355)	(0.269)	(0.275)	(0.271)	(0.267)	(0.381)	(0.381)
cum. lending freq. bank1			-0.016***	-0.002	-0.013***	-0.003		
			(0.003)	(0.003)	(0.003)	(0.002)		
cum. lending freq. bank2			0.438***	0.442***	0.446***	0.320***		
			(0.011)	(0.010)	(0.011)	(0.008)		
Additional controls			Similar size and leverage dummies					
Fixed effects	Year	Year, Borrower	Year, Borrower	Facility	Facility	Year, Pair	Year	Year
Cluster	Pair	Pair	Pair	Pair	Pair	Pair	Pair	Pair
Adj. R^2	0.075	0.107	0.172	0.188	0.169	0.275	0.075	0.075
N	3,228,052	3,228,052	3,228,052	3,228,052	3,228,052	3,228,052	3,228,052	3,228,052

Table 5. Global Syndication Lead/Co-lead: Network Centrality

Dependent Variable: *Arranger*$_{i,k}$	(1)	(2)	(3)	(4)	(5)	(6)	(7)
L.betweenness	1.947***				1.947***	1.947*	
	(0.435)				(0.438)	(1.026)	
L.betweenness X crisis	-1.661**				-1.660**	-1.661**	
	(0.682)				(0.686)	(0.713)	
L.eigenvector		0.351***					
		(0.077)					
L.eigenvector X crisis		-0.387**					
		(0.136)					
L.closeness			0.091				
			(0.062)				
L.closeness X crisis			-0.260*				
			(0.115)				
L.degree				0.126***			
				(0.032)			
L.degree X crisis				-0.154**			
				(0.057)			
L.betweenness-edu							0.731***
							(0.180)
L.betweenness-edu X crisis							-1.134***
Controls	Lagged mtb, capital ratio, ln(TA)						
Fixed effects	Year, Country, Specialization, Borrower Facility						
Cluster	Year	Year	Year	Year	Year	Bank	Year
Adj. R^2	0.183	0.182	0.182	0.182	0.188	0.183	0.188
N	384391	384391	384391	384391	384391	384391	345105

Table 5. Global Syndication Lead/Co-lead: Network Centrality

Dependent Variable: *Arranger*$_{i,k}$	(1)	(2)	(3)	(4)	(5)	(6)	(7)
L.betweenness	1.947***				1.947***	1.947*	
	(0.435)				(0.438)	(1.026)	
L.betweenness X crisis	-1.661**				-1.660**	-1.661**	
	(0.682)				(0.686)	(0.713)	
L.eigenvector		0.351***					
		(0.077)					
L.eigenvector X crisis		-0.387**					
		(0.136)					
L.closeness			0.091				
			(0.062)				
L.closeness X crisis			-0.260*				
			(0.115)				
L.degree				0.126***			
				(0.032)			
L.degree X crisis				-0.154**			
				(0.057)			
L.betweenness-edu							0.731***
							(0.180)
L.betweenness-edu X crisis							-1.134***
Controls	Lagged mtb, capital ratio, ln(TA)						
Fixed effects	Year, Country, Specialization, Borrower Facility						
Cluster	Year	Year	Year	Year	Year	Bank	Year
Adj. R^2	0.183	0.182	0.182	0.182	0.188	0.183	0.188
N	384391	384391	384391	384391	384391	384391	345105

Table 5. Global Syndication Lead/Co-lead: Network Centrality

Dependent Variable: *Arranger*$_{i,k}$	(1)	(2)	(3)	(4)	(5)	(6)	(7)
L.betweenness	1.947***				1.947***	1.947*	
	(0.435)				(0.438)	(1.026)	
L.betweenness X crisis	-1.661**				-1.660**	-1.661**	
	(0.682)				(0.686)	(0.713)	
L.eigenvector		0.351***					
		(0.077)					
L.eigenvector X crisis		-0.387**					
		(0.136)					
L.closeness			0.091				
			(0.062)				
L.closeness X crisis			-0.260*				
			(0.115)				
L.degree				0.126***			
				(0.032)			
L.degree X crisis				-0.154**			
				(0.057)			
L.betweenness-edu							0.731***
							(0.180)
L.betweenness-edu X crisis							-1.134***
Controls	Lagged mtb, capital ratio, ln(TA)						
Fixed effects	Year, Country, Specialization, Borrower Facility						
Cluster	Year	Year	Year	Year	Year	Bank	Year
Adj. R^2	0.183	0.182	0.182	0.182	0.188	0.183	0.188
N	384391	384391	384391	384391	384391	384391	345105

Table 5. Global Syndication Lead/Co-lead: Network Centrality

Dependent Variable: *Arranger*$_{i,k}$	(1)	(2)	(3)	(4)	(5)	(6)	(7)
L.betweenness	1.947***				1.947***	1.947*	
	(0.435)				(0.438)	(1.026)	
L.betweenness X crisis	-1.661**				-1.660**	-1.661**	
	(0.682)				(0.686)	(0.713)	
L.eigenvector		0.351***					
		(0.077)					
L.eigenvector X crisis		-0.387**					
		(0.136)					
L.closeness			0.091				
			(0.062)				
L.closeness X crisis			-0.260*				
			(0.115)				
L.degree				0.126***			
				(0.032)			
L.degree X crisis				-0.154**			
				(0.057)			
L.betweenness-edu							0.731***
							(0.180)
L.betweenness-edu X crisis							-1.134***
Controls	Lagged mtb, capital ratio, ln(TA)						
Fixed effects	Year, Country, Specialization, Borrower Facility						
Cluster	Year	Year	Year	Year	Year	Bank	Year
Adj. R^2	0.183	0.182	0.182	0.182	0.188	0.183	0.188
N	384391	384391	384391	384391	384391	384391	345105

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Dependent Variable: *Arranger*$_{i,k}$	(1)	(2)	(3)	(4)	(5)	(6)	(7)
L.betweenness	1.947***				1.947***	1.947*	
	(0.435)				(0.438)	(1.026)	
L.betweenness X crisis	-1.661**				-1.660**	-1.661**	
	(0.682)				(0.686)	(0.713)	
L.eigenvector		0.351***					
		(0.077)					
L.eigenvector X crisis		-0.387**					
		(0.136)					
L.closeness			0.091				
			(0.062)				
L.closeness X crisis			-0.260*				
			(0.115)				
L.degree				0.126***			
				(0.032)			
L.degree X crisis				-0.154**			
				(0.057)			
L.betweenness-edu							0.731***
							(0.180)
L.betweenness-edu X crisis							-1.134***
Controls	Lagged mtb, capital ratio, ln(TA)						
Fixed effects	Year, Country, Specialization, Borrower Facility						
Cluster	Year	Year	Year	Year	Year	Bank	Year
Adj. R^2	0.183	0.182	0.182	0.182	0.188	0.183	0.188
N	384391	384391	384391	384391	384391	384391	345105

Appendix Table 2. Interbank Lending and Borrowing: Network Centrality

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Dependent Variable	Interbank loans to assets				Interbank deposits to assets			
L.betweenness	1.899*				-0.780			
	(0.984)				(0.692)			
L.betweenness X crisis	-0.060				-0.201			
	(0.530)				(0.617)			
L.eigenvector		0.681**				-0.354		
		(0.306)				(0.277)		
L.eigenvector X crisis		-0.072				0.024		
		(0.129)				(0.163)		
L.closeness			0.528**				-0.261	
			(0.239)				(0.194)	
L.closeness X crisis			-0.098				-0.026	
			(0.088)				(0.113)	
L.degree				0.277**				-0.145
				(0.127)				(0.100)
L.degree X crisis				-0.045				0.011
				(0.045)				(0.062)
Controls	Lagged roa, mtb, capital ratio, Ln(TA)							
Fixed effects	Year, Country, Specialization							
Cluster	Bank	Bank	Bank	Bank	Bank	Bank	Bank	Bank
Adj. R^2	0.248	0.272	0.268	0.271	0.518	0.520	0.523	0.522
N	596	596	596	596	385	385	385	385

Appendix Table 2. Interbank Lending and Borrowing: Network Centrality

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Dependent Variable	Interbank loans to assets				Interbank deposits to assets			
L.betweenness	1.899*				-0.780			
	(0.984)				(0.692)			
L.betweenness X crisis	-0.060				-0.201			
	(0.530)				(0.617)			
L.eigenvector		0.681**				-0.354		
		(0.306)				(0.277)		
L.eigenvector X crisis		-0.072				0.024		
		(0.129)				(0.163)		
L.closeness			0.528**				-0.261	
			(0.239)				(0.194)	
L.closeness X crisis			-0.098				-0.026	
			(0.088)				(0.113)	
L.degree				0.277**				-0.145
				(0.127)				(0.100)
L.degree X crisis				-0.045				0.011
				(0.045)				(0.062)
Controls	Lagged roa, mtb, capital ratio, Ln(TA)							
Fixed effects	Year, Country, Specialization							
Cluster	Bank	Bank	Bank	Bank	Bank	Bank	Bank	Bank
Adj. R^2	0.248	0.272	0.268	0.271	0.518	0.520	0.523	0.522
N	596	596	596	596	385	385	385	385

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Dependent Variable	Interbank loans to assets				Interbank deposits to assets			
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	(0.984)				(0.692)			
L.betweenness X crisis	-0.060				-0.201			
	(0.530)				(0.617)			
L.eigenvector		0.681**				-0.354		
		(0.306)				(0.277)		
L.eigenvector X crisis		-0.072				0.024		
		(0.129)				(0.163)		
L.closeness			0.528**				-0.261	
			(0.239)				(0.194)	
L.closeness X crisis			-0.098				-0.026	
			(0.088)				(0.113)	
L.degree				0.277**				-0.145
				(0.127)				(0.100)
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Controls	Lagged roa, mtb, capital ratio, Ln(TA)							
Fixed effects	Year, Country, Specialization							
Cluster	Bank	Bank	Bank	Bank	Bank	Bank	Bank	Bank
Adj. R^2	0.248	0.272	0.268	0.271	0.518	0.520	0.523	0.522
N	596	596	596	596	385	385	385	385

Table 6. Equity Correlations: SNI

	(1)	(2)	(3)	(4)	(5)	(6)
Dependent Variable	*R52*		*R52_systematic*		*R52_abnormal*	
L.sni	0.283***	0.0736*	0.0682**	0.127***	0.328***	0.0256
	(0.0449)	(0.0433)	(0.0340)	(0.0325)	(0.0505)	(0.0541)
L.sni X crisis	-0.185***	-0.242***	-0.233***	-0.266***	-0.0202	-0.0598
	(0.0473)	(0.0432)	(0.0341)	(0.0334)	(0.0636)	(0.0583)
country	0.169***		0.0557***		0.232***	
	(0.00465)		(0.00319)		(0.00509)	
type	0.0375***		0.0188***		0.0239***	
	(0.00344)		(0.00283)		(0.00371)	
Additional controls	Similar size and leverage dummies					
Fixed effects	Year	Year, Pair	Year	Year, Pair	Year	Year, Pair
Adj. R^2	0.408	0.638	0.096	0.418	0.274	0.526
N	34,261	34,261	34,261	34,261	34,261	34,261

Table 6. Equity Correlations: SNI

	(1)	(2)	(3)	(4)	(5)	(6)
Dependent Variable	*R52*		*R52_systematic*		*R52_abnormal*	
L.sni	0.283***	0.0736*	0.0682**	0.127***	0.328***	0.0256
	(0.0449)	(0.0433)	(0.0340)	(0.0325)	(0.0505)	(0.0541)
L.sni X crisis	-0.185***	-0.242***	-0.233***	-0.266***	-0.0202	-0.0598
	(0.0473)	(0.0432)	(0.0341)	(0.0334)	(0.0636)	(0.0583)
country	0.169***		0.0557***		0.232***	
	(0.00465)		(0.00319)		(0.00509)	
type	0.0375***		0.0188***		0.0239***	
	(0.00344)		(0.00283)		(0.00371)	
Additional controls	Similar size and leverage dummies					
Fixed effects	Year	Year, Pair	Year	Year, Pair	Year	Year, Pair
Adj. R^2	0.408	0.638	0.096	0.418	0.274	0.526
N	34,261	34,261	34,261	34,261	34,261	34,261

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Dependent Variable	*R52*		*R52_systematic*		*R52_abnormal*	
L.sni	0.283***	0.0736*	0.0682**	0.127***	0.328***	0.0256
	(0.0449)	(0.0433)	(0.0340)	(0.0325)	(0.0505)	(0.0541)
L.sni X crisis	-0.185***	-0.242***	-0.233***	-0.266***	-0.0202	-0.0598
	(0.0473)	(0.0432)	(0.0341)	(0.0334)	(0.0636)	(0.0583)
country	0.169***		0.0557***		0.232***	
	(0.00465)		(0.00319)		(0.00509)	
type	0.0375***		0.0188***		0.0239***	
	(0.00344)		(0.00283)		(0.00371)	
Additional controls			Similar size and leverage dummies			
Fixed effects	Year	Year, Pair	Year	Year, Pair	Year	Year, Pair
Adj. R^2	0.408	0.638	0.096	0.418	0.274	0.526
N	34,261	34,261	34,261	34,261	34,261	34,261

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	(1)	(2)	(3)	(4)	(5)	(6)
Dependent Variable	*R52*		*R52_systematic*		*R52_abnormal*	
L.sni	0.283***	0.0736*	0.0682**	0.127***	0.328***	0.0256
	(0.0449)	(0.0433)	(0.0340)	(0.0325)	(0.0505)	(0.0541)
L.sni X crisis	-0.185***	-0.242***	-0.233***	-0.266***	-0.0202	-0.0598
	(0.0473)	(0.0432)	(0.0341)	(0.0334)	(0.0636)	(0.0583)
country	0.169***		0.0557***		0.232***	
	(0.00465)		(0.00319)		(0.00509)	
type	0.0375***		0.0188***		0.0239***	
	(0.00344)		(0.00283)		(0.00371)	
Additional controls			Similar size and leverage dummies			
Fixed effects	Year	Year, Pair	Year	Year, Pair	Year	Year, Pair
Adj. R^2	0.408	0.638	0.096	0.418	0.274	0.526
N	34,261	34,261	34,261	34,261	34,261	34,261

Table 7. Systemic Risk ΔCoVaR: Network Centrality

Dependent Variable: ΔCoVaR	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
L.betweenness	-20.143*				-12.549*			
	(11.276)				(6.708)			
L.eigenvector		-7.831**				-4.690		
		(3.402)				(3.148)		
L.closeness			-6.221**				-3.657**	
			(2.689)				(1.415)	
L.degree				-3.404**				-2.066***
				(1.380)				(0.627)
L.betweenness X crisis					-23.446			
					(21.397)			
L.eigenvector X crisis						-8.938**		
						(4.437)		
L.closeness X crisis							-6.985	
							(4.170)	
L.degree X crisis								-3.508*
								(1.872)
Controls	Lagged mtb, TA, TA^2, TA^3, leverage, and beta							
Fixed effects	Year, Country, Specialization							
Cluster	Bank	Bank	Bank	Bank	Bank	Bank	Bank	Bank
Adj. R^2	0.438	0.443	0.444	0.445	0.439	0.449	0.449	0.450
N	766	766	766	766	766	766	766	766

Table 7. Systemic Risk ΔCoVaR: Network Centrality

Dependent Variable: ΔCoVaR	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
L.betweenness	-20.143*				-12.549*			
	(11.276)				(6.708)			
L.eigenvector		-7.831**				-4.690		
		(3.402)				(3.148)		
L.closeness			-6.221**				-3.657**	
			(2.689)				(1.415)	
L.degree				-3.404**				-2.066***
				(1.380)				(0.627)
L.betweenness X crisis					-23.446			
					(21.397)			
L.eigenvector X crisis						-8.938**		
						(4.437)		
L.closeness X crisis							-6.985	
							(4.170)	
L.degree X crisis								-3.508*
								(1.872)
Controls	Lagged mtb, TA, TA^2, TA^3, leverage, and beta							
Fixed effects	Year, Country, Specialization							
Cluster	Bank	Bank	Bank	Bank	Bank	Bank	Bank	Bank
Adj. R^2	0.438	0.443	0.444	0.445	0.439	0.449	0.449	0.450
N	766	766	766	766	766	766	766	766

Table 7. Systemic Risk ΔCoVaR: Network Centrality

Dependent Variable: ΔCoVaR	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
L.betweenness	-20.143*				-12.549*			
	(11.276)				(6.708)			
L.eigenvector		-7.831**				-4.690		
		(3.402)				(3.148)		
L.closeness			-6.221**				-3.657**	
			(2.689)				(1.415)	
L.degree				-3.404**				-2.066***
				(1.380)				(0.627)
L.betweenness X crisis					-23.446			
					(21.397)			
L.eigenvector X crisis						-8.938**		
						(4.437)		
L.closeness X crisis							-6.985	
							(4.170)	
L.degree X crisis								-3.508*
								(1.872)
Controls	Lagged mtb, TA, TA^2, TA^3, leverage, and beta							
Fixed effects	Year, Country, Specialization							
Cluster	Bank	Bank	Bank	Bank	Bank	Bank	Bank	Bank
Adj. R^2	0.438	0.443	0.444	0.445	0.439	0.449	0.449	0.450
N	766	766	766	766	766	766	766	766

Table 8. Network Central Banks Before/After Crisis: Diff-in-Diff

Variable	(1)	(2)	(3)	(5)	(6)	(7)	(9)
	Pre-crisis (2000-2006)			Post-crisis (2007-2010)			Diff-in-Diff
	High	Low	Diff	High	Low	Diff	DiD
betweenness	0.02	0.00	0.02***	0.02	0.00	0.02***	0.00*
ln(TA)	19.57	18.34	1.23***	20.38	18.88	1.50***	0.27*
roa	0.97	1.06	-0.09*	0.26	0.27	0.00	0.09
leverage	20.79	20.79	-0.01	23.49	20.46	3.04	3.04
equity return	0.00	0.00	0.00	0.00	0.00	0.00*	0.00*
sigma	0.01	0.01	0.00	0.02	0.02	0.00	0.00
beta (Domestic market index)	0.90	0.64	0.26***	1.30	1.14	0.16**	-0.10
beta (Global banking index)	0.98	0.75	0.24***	1.18	1.04	0.14***	-0.09*

Table 8. Network Central Banks Before/After Crisis: Diff-in-Diff

Variable	(1)	(2)	(3)	(5)	(6)	(7)	(9)
	Pre-crisis (2000-2006)			Post-crisis (2007-2010)			Diff-in-Diff
	High	Low	Diff	High	Low	Diff	DiD
betweenness	0.02	0.00	0.02***	0.02	0.00	0.02***	0.00*
ln(TA)	19.57	18.34	1.23***	20.38	18.88	1.50***	0.27*
roa	0.97	1.06	-0.09*	0.26	0.27	0.00	0.09
leverage	20.79	20.79	-0.01	23.49	20.46	3.04	3.04
equity return	0.00	0.00	0.00	0.00	0.00	0.00*	0.00*
sigma	0.01	0.01	0.00	0.02	0.02	0.00	0.00
beta (Domestic market index)	0.90	0.64	0.26***	1.30	1.14	0.16**	-0.10
beta (Global banking index)	0.98	0.75	0.24***	1.18	1.04	0.14***	-0.09*

Conclusion

- We highlight **three important points** regarding social networks in the global banking industry

Conclusion

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    - We extend the recent important findings for U.S. non-financial firms documented by Fracassi (2012)
  - **Point 2**: We also show that banks that play a more central role in the social network are more likely to play leading roles in both the syndicated loan and interbank lending market
    - We introduce the notion that socially central banks serve as ”intermediaries among intermediaries”

Conclusion-continued.

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  - How to better understand and manage these common connections and common actions by key social players in the global banking system would be a bit challenging exercise to policy makers who are charged with controlling the systemic risk of the global banking system