Overlapping Networks of Credit and Control

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Intro: Business groups (BGs)

▶ BG = network of firms with a common controlling shareholder, that are linked through ownership

▶ Prevalent in developed and emerging countries.

▶ Advantages and disadvantages of BGs:
  ▶ **Financial advantage:** relaxing financial constraints, "more-money" effect. Almeida and Wolfenzon (2006, 2011); Gopalan, Nanda, and Seru (2007, 2014), among others
  ▶ **Tunneling:** abuse of minority shareholders. Bertrand, Mehta, Mullainathan (2002), Khanna and Yafeh (2007), Morck, Yeung and Wolfenzon (2005), among others

▶ Long-standing debate about the ultimate purpose of BGs.

Claro Group 2007

Listed Firm | % Ownership
Unlisted Firm

Claro Family — 51% → Quemchi — 76.3% → Navarino — 54.5% → Marinsa

Elecmetal (36.52%, 3.8%, 1.9%, 7.7%)

Vapores (45.4%, 1.9%, 0.7%)

Cristales (34%, 18.1%)

Viña Santa Rita (23.5%, 54%)
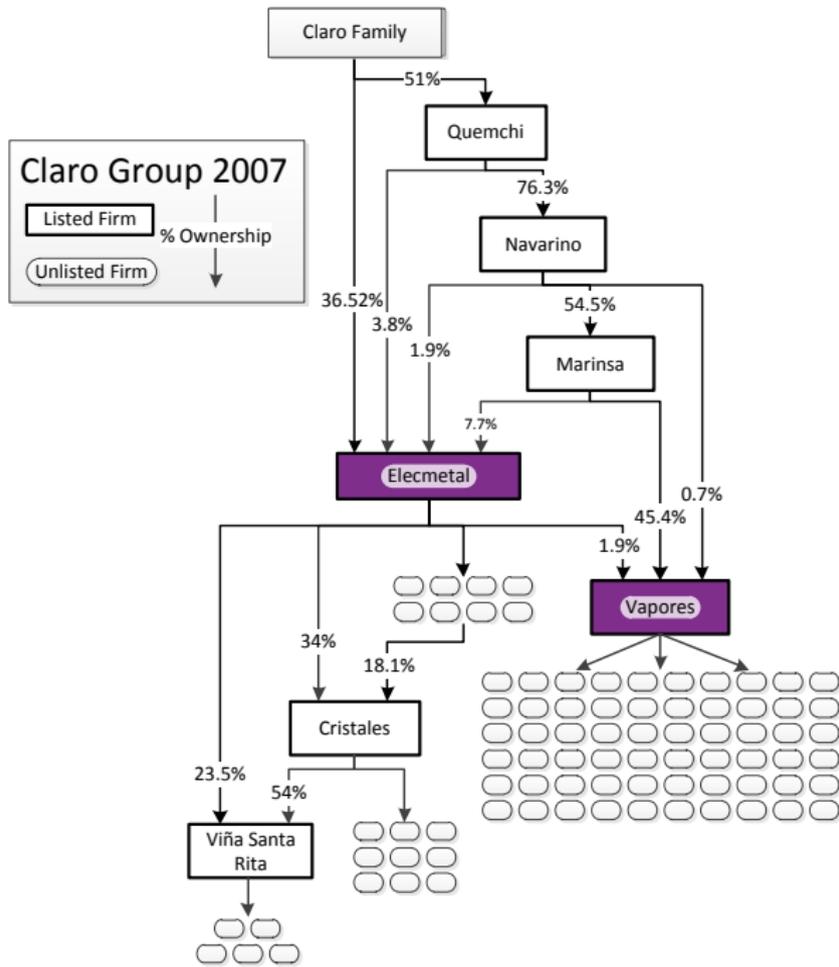
What we do

- ► We explore the *intermediation advantage* of BGs with respect to credit markets:
  - ► Lending relationships are implicitly supported by control rights given by equity links.
  - ► Under the broad umbrella of "financial advantages," but not really pinned down yet.

- ► We (hand-) collected data from 2001 to 2013 on:
  1. Firm-to-firm loans
  2. Firm-to-firm ownership
  3. Balance sheet (only for listed firms)

- ► We test this advantage using intra-group loans in Chilean BGs during the financial crisis

Main findings

1. Intra-group loans increase swiftly during distress period (2009).

2. Intra-group lending and borrowing particularly increase in more central firms in the ownership network.

3. The performance of central firms is not significantly affected. Loan receivers have high ROA/ROE.

   $\Rightarrow$ **Contribution:** apply network perspective to business group to understand how IKM works

Outline

Intermediation advantage

- In a context where controlling shareholders **do not** have an absolute control rights over the rest of the firms, ownership relationships can be used to support credit relationships.

- Ownership link can be used to:
  1. Reduce information asymmetry
  2. Reduce agency problems

- More *central* firms can play the role as intermediaries in business groups, this should be particularly the case during periods of distress.
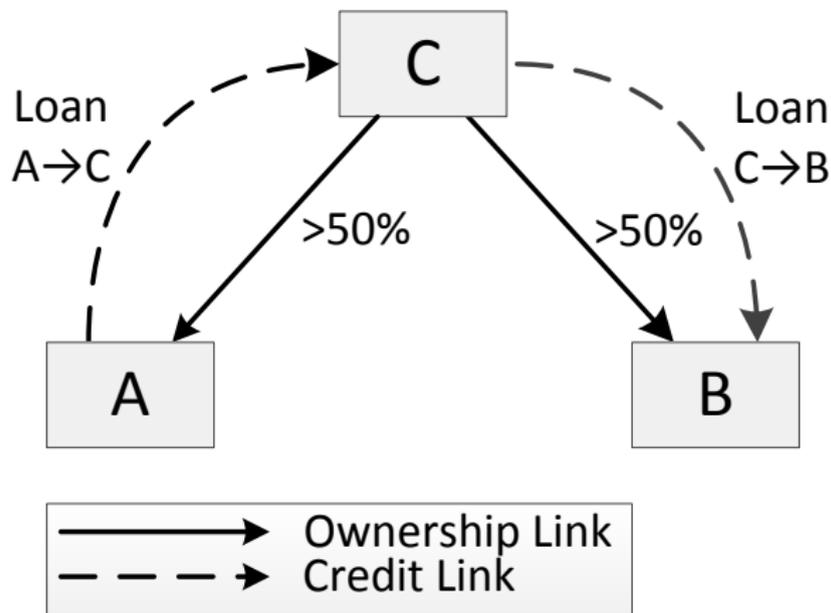
Dataset

- Hand-collected data on firm-to-firm ownership and intra-group loans.

- Balance sheet information for listed firms

- 22 BGs

- ± 80 listed firms, $\pm 1,000$ private firms (all non-financial)

- Sample period: 2001-2013, annual data.

Centrality

▶ Based on our dataset of ownership link and following the literature on intermediation in networks we use *betweenness* as our main measure of centrality.

▶ It measures how important a firm is in terms of connecting other firms.

▶ Betweenness

Intra-group loans and the crisis

- High activity of internal credit market during the crisis (2009).

- Some persistence in credit relationships, but reversion by 2012.

- Internal capital markets are more active during distress.
  (Almeida, Kim, and Kim, 2015)

  ▸ Crisis

Intra-group loans and the crisis
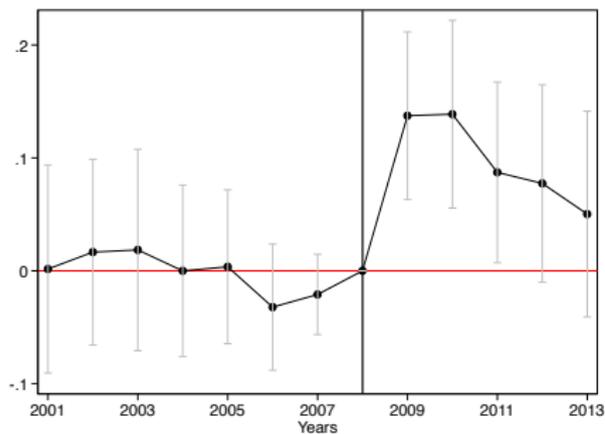
A. Lending - All firms
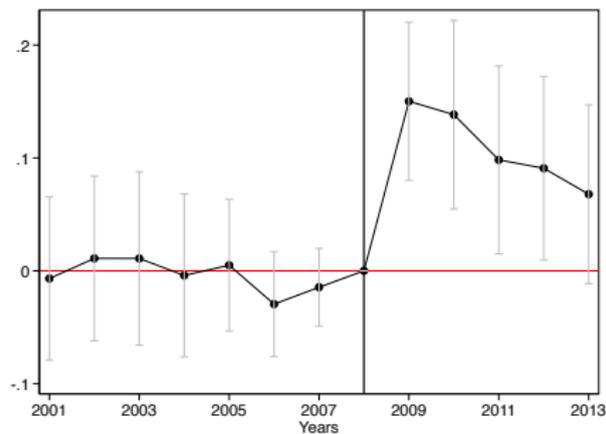
B. Borrowing - All firms

Intra-group loans and the crisis
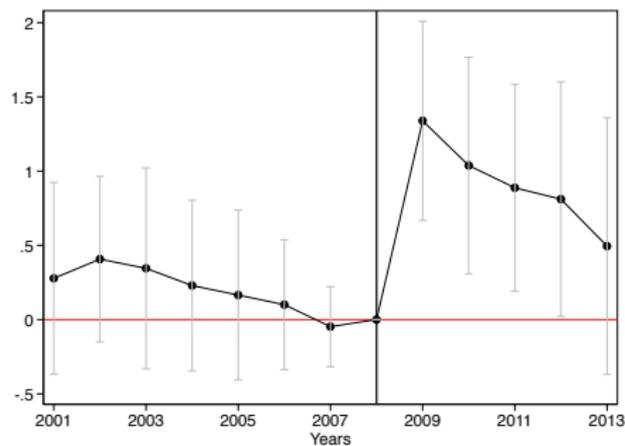
C. Lending - Listed firms
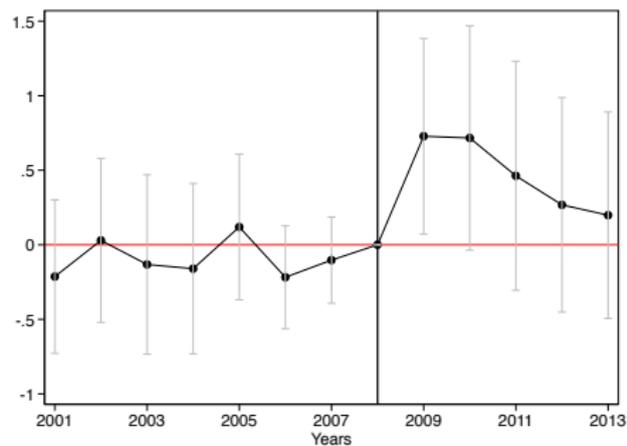
D. Borrowing - Listed firms

Empirical strategy

- Main diff-in-diff:

$$y_{it} = \beta'(crisis_t + recovery_t + post_t) \times centrality_i + \delta_t + \mu_i + \epsilon_{it}$$

- where i and t stand for firm and year.
- y_{it} : number of lending+borrowing relationships
- $centrality_i$ is measured as betweenness centrality in 2007
- $crisis_t$: dummy for year 2009
- $recovery_t$: dummy for year 2010
- $post_t$: dummy for years post 2010
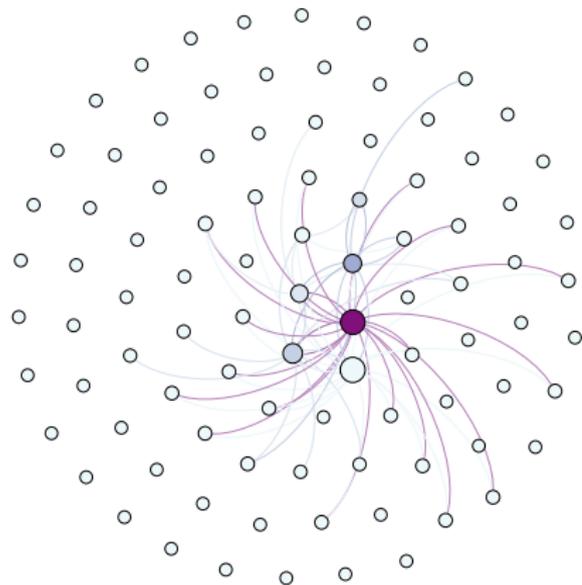
A. Claro Business Group in 2007   **B.** Claro Business Group in 2009
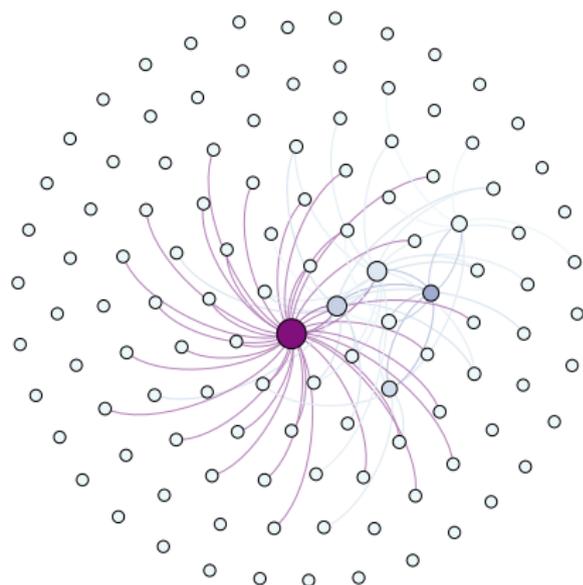
Table: The role of network centrality in credit relationships

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
		All firms				Listed firms		
	L + B	Lending	Borrowing	L-B	L + B	Lending	Borrowing	L-B
Crisis × Centrality in 07'	1.042***	0.585***	0.457**	0.128	1.203**	0.664**	0.538**	0.126
	(0.375)	(0.218)	(0.183)	(0.148)	(0.479)	(0.295)	(0.234)	(0.234)
Recovery × Centrality in 07'	0.875**	0.521***	0.354	0.167	1.036*	0.612***	0.423	0.189
	(0.380)	(0.175)	(0.241)	(0.183)	(0.521)	(0.205)	(0.365)	(0.281)
Post × Centrality in 07'	0.425	0.298	0.128	0.170	0.451	0.335	0.115	0.220
	(0.415)	(0.206)	(0.225)	(0.116)	(0.589)	(0.265)	(0.338)	(0.147)
Observations	10,027	10,027	10,027	10,027	887	887	887	887
R-squared	0.040	0.035	0.026	0.005	0.071	0.059	0.052	0.012
Number of firms	1,034	1,034	1,034	1,034	74	74	74	74
Avg Dep. Var.	1.12	0.56	0.56	0	7.99	4.22	3.77	0.45
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Differential trends?
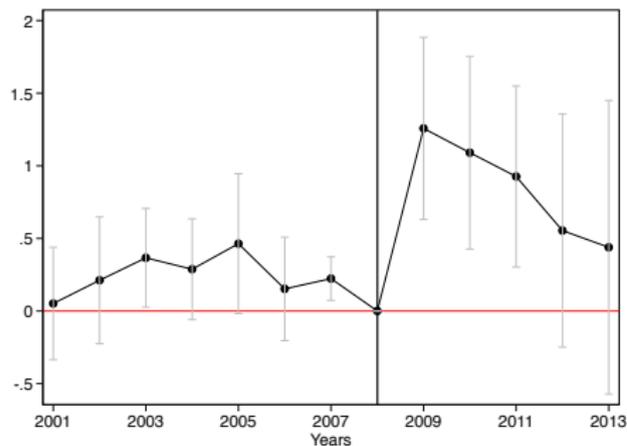
A. Lending + Borrowing - All firms
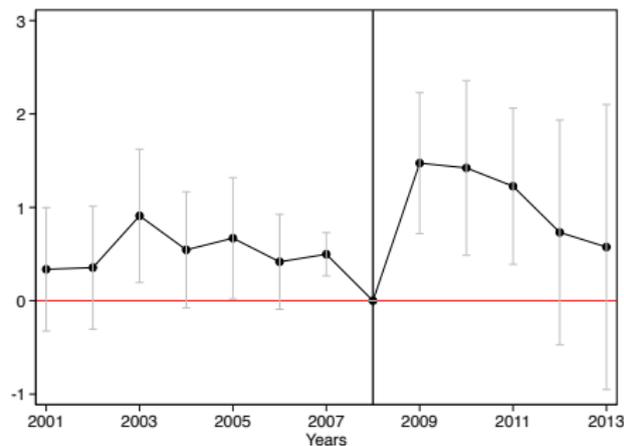
B. Lending + Borrowing - Listed firms

Robustness
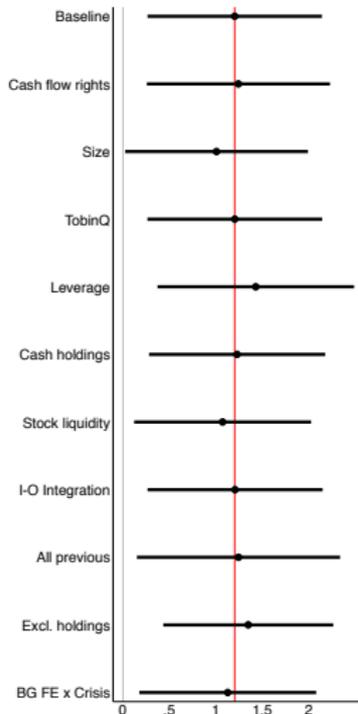
Pairs regression

- Main diff-in-diff:

$$y_{ijt} = \beta'(crisis_t + recovery_t + post_t) \times \text{Max centrality}_{ij}$$
$$+ \gamma'(crisis_t + recovery_t + post_t) \times \text{Ownership Link}_{ij}$$
$$+ \delta_t + \mu_{ij} + \epsilon_{ijt}$$

- where i, j, and t stand for firms and year
- y_{ijt} : dummy for a lending relationship in the (i, j) in year t
- Max centrality$_{ij}$ is the maximum centrality in the pair (i, j) in 2007
- Ownership Link$_{ij}$ dummy for whether there was an ownership link in the pair (i, j) in 2007

Table: Likelihood of lending relationships

	(1)	(2)
	Dummy for lending relationship	
Crisis × Max centrality in 07'	0.074**	0.088**
	(0.037)	(0.038)
Recovery × Max centrality in 07'	0.087**	0.098
	(0.039)	(0.363)
Post × Max centrality in 07'	0.139***	0.139
	(0.040)	(0.917)
Max centrality in 07'	-0.942***	-
	(0.319)	(-)
Crisis × Ownership link in 07'	-0.027	-0.032
	(0.022)	(0.022)
Recovery × Ownership link in 07'	-0.027	-0.036
	(0.026)	(0.026)
Post × Ownership link in 07'	-0.050*	-0.052*
	(0.029)	(0.028)
Ownership link in 07'	0.154***	-
	(0.021)	(-)
Observations	46,651	46,651
R-squared	0.365	0.694
Year Fe	Yes	Yes
Firm1 FE	Yes	No
Firm2 FE	Yes	No
Pair FE	No	Yes
Avg. Dep. Var.	0.094	0.094

Heterogeneous effects

- Higher effect in more pyramidal BG

- Higher effect in less diversified BG

- No clear difference based on Tobin's Q divergence

  ▸ Pyramidal   ▸ Diversified   ▸ Tobin's Q

Real effects

- ▶ Central firms do not have significantly lower performance during the crisis

- ▶ Net loan receivers have high ROA/ROE during crisis, and some evidence of a stronger recovery

Table: Impact on central firms

	(1) ROA	(2) ROE	(3) Mkt to Book Eq	(4) Stock Ret.	(5) Extraordinary Dividends	(6) External Leverage
Crisis × Centrality in 07'	-0.008	-0.035	0.068	0.023	0.003	-0.009
	(0.010)	(0.033)	(0.063)	(0.027)	(0.035)	(0.008)
Recovery × Centrality in 07'	0.010***	0.025*	0.066	0.057*	-0.010	-0.018**
	(0.004)	(0.014)	(0.087)	(0.033)	(0.036)	(0.008)
Post × Centrality in 07'	-0.001	-0.001	0.023	-0.001	0.011	-0.011
	(0.007)	(0.023)	(0.080)	(0.024)	(0.017)	(0.009)
Observations	880	880	834	803	887	877
R-squared	0.070	0.080	0.187	0.222	0.033	0.098
Number of firms	74	74	74	74	73	74
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes

Table: Impact on receivers

	(1) ROA	(2) ROE	(3) Δ PPE	(4) Δ Sales	(5) External leverage
Crisis × Δ Net Receiver in 09'	0.037**	0.107**	-0.207	-0.027	-0.034
	(0.019)	(0.053)	(0.259)	(0.225)	(0.051)
Recovery × Δ Net Receiver in 09'	0.020	0.039	0.626*	0.550*	0.056
	(0.016)	(0.035)	(0.349)	(0.285)	(0.070)
Post × Δ Net Receiver in 09'	-0.001	0.050	0.172	0.225	0.067
	(0.018)	(0.046)	(0.155)	(0.153)	(0.063)
Observations	880	880	877	877	874
R-squared	0.061	0.067	0.047	0.046	0.107
Number of firms	74	74	74	74	74
Firm FE	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes

Conclusions

- We apply network perspective to understand the flow of credit within BGs

- Intermediation advantage: role for central firms.

- Control links ease financial contracting during periods of distress.

Financial crises
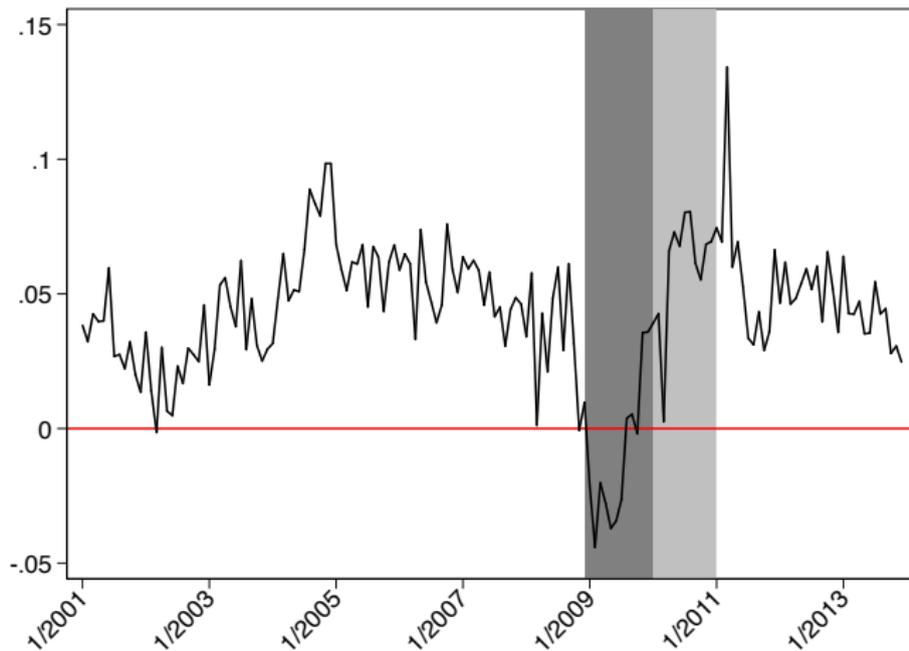
Robustness regression

- Main diff-in-diff:

$$y_{it} = \beta'(crisis_t + recovery_t + post_t) \times centrality_i$$
$$+ \gamma'(crisis_t + recovery_t + post_t) \times X_i$$
$$+ \delta_t + \mu_i + \epsilon_{it}$$

- where i and t stand for firm and year.
- y_{it} : number of lending+borrowing relationships
- $centrality_i$ is measured as betweenness centrality in 2007
- X_i is measured a firm characteristic measured in 2007
- $crisis_t$: dummy for year 2009
- $recovery_t$: dummy for year 2010
- $post_t$: dummy for years post 2010

Table: Impact on providers

	(1) ROA	(2) ROE	(3) Δ PPE	(4) Δ Sales	(5) External leverage
Crisis × Δ Net Provider in 09'	-0.025	-0.146**	-0.040	0.152	0.020
	(0.020)	(0.063)	(0.219)	(0.373)	(0.050)
Recovery × Δ Net Provider in 09'	-0.011	-0.067**	-0.279	-0.589***	-0.039
	(0.016)	(0.030)	(0.322)	(0.217)	(0.059)
Post × Δ Net Provider in 09'	0.002	-0.046	-0.250	-0.393	-0.101*
	(0.020)	(0.053)	(0.208)	(0.237)	(0.054)
Observations	666	666	664	664	664
R-squared	0.046	0.079	0.048	0.058	0.150
Number of firms	56	56	56	56	56
Firm FE	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes

▸ Back to receivers

Table: Impact on providers to central firms

	(1) ROA	(2) ROE	(3) Δ PPE	(4) Δ Sales	(5) External leverage
Crisis × Net provider to central	-0.086*	-0.322*	-0.138	-0.421	0.155**
	(0.046)	(0.185)	(0.291)	(0.326)	(0.060)
Recovery × Net provider to central	-0.024	-0.102**	-0.194	-0.451***	0.129**
	(0.027)	(0.041)	(0.197)	(0.117)	(0.051)
Post × Net provider to central	-0.010	-0.160**	-0.970*	-1.204**	-0.081
	(0.016)	(0.061)	(0.511)	(0.584)	(0.086)
Observations	880	880	877	877	874
R-squared	0.070	0.098	0.059	0.070	0.122
Number of firms	74	74	74	74	74
Firm FE	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes

Table: Heterogeneity: Pyramids

	(1)	(2)	(3)	(4)
		Lending + Borrowing		
	All firms	Listed firms	All firms	Listed firms
	Less pyramidal		**More pyramidal**	
Crisis × Centrality in 07'	0.441	0.040	1.417***	1.681***
	(0.419)	(0.829)	(0.475)	(0.495)
Recovery × Centrality in 07'	0.405	0.256	1.183**	1.342*
	(0.370)	(0.680)	(0.567)	(0.712)
Post × Centrality in 07'	-0.004	-0.189	0.664	0.727
	(0.366)	(0.655)	(0.632)	(0.865)
Observations	4,119	391	5,908	496
R-squared	0.018	0.058	0.064	0.098
Number of firms	420	32	614	42
Firm FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes

Table: Heterogeneity: Industry diversification

	(1)	(2)	(3)	(4)
		Lending + Borrowing		
	All firms	Listed firms	All firms	Listed firms
	High diversification		**Low diversification**	
Crisis × Centrality in 07'	1.034**	0.838	1.060*	1.924**
	(0.496)	(0.693)	(0.583)	(0.844)
Recovery × Centrality in 07'	0.728***	0.496*	1.052	2.141*
	(0.233)	(0.249)	(0.729)	(1.138)
Post × Centrality in 07'	0.071	-0.157	0.832	1.617*
	(0.370)	(0.420)	(0.685)	(0.939)
Observations	5,709	524	4,318	363
R-squared	0.033	0.068	0.066	0.153
Number of firms	591	44	443	30
Firm FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes

Table: Heterogeneity: Tobin's Q divergence

	(1)	(2)	(3)	(4)
		Lending + Borrowing		
	All firms	Listed firms	All firms	Listed firms
	High Tobin's Q Div.		**Low Tobin's Q Div.**	
Crisis × Centrality in 07'	0.989*	1.431	1.123**	1.133**
	(0.600)	(0.966)	(0.454)	(0.559)
Recovery × Centrality in 07'	1.243*	2.162*	0.528**	0.441
	(0.701)	(1.112)	(0.254)	(0.284)
Post × Centrality in 07'	1.026	1.865*	-0.130	-0.294
	(0.671)	(0.927)	(0.318)	(0.362)
Observations	5,037	418	4,990	469
R-squared	0.081	0.164	0.041	0.095
Number of firms	530	35	504	39
Firm FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes