

ON A TIGHT LEASH: DOES BANKS' ORGANIZATIONAL STRUCTURE MATTER FOR MACROPRUDENTIAL SPILLOVERS?

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Introduction

- Recent literature documents that banks reduce their cross-border lending in foreign markets in response to regulatory changes in their home countries (*Peek and Rosengren 1997, AER; Ayiar et al. 2014, JFE*).
- Does the response of foreign banks to changes in macroprudential regulation in home countries depend on organisational structure of the bank?
- Do foreign branches reduce their lending in the host country more than subsidiaries when home regulators tighten
 - **Capital requirements**
 - **Lending standards**
 - **Reserve requirements**
- Mechanism: Can differential responses be attributed to the varying degree of control which parent banks hold over their foreign affiliates?

Literature/Motivation

- **Cross-border transmission of banks' balance sheet shocks:**

Cetorelli and Goldberg (2012, JF); Schnabl (2012, JF) and Chava and Purnanandam (2011, JFE)

- **Heterogeneity in the transmission of shocks:**

De Haas and van Horen (2013, RFS); Popov and Udell (2012, JIE)

- **Macroprudential regulation and cross-border lending:**

Peek and Rosengren (1997, AER); Ongena, Popov and Udell (2013, JFE); Mora (2014, JMCB); Ayiar et al. (2014, JFE)

Background: Foreign banks in the UK

- 294 foreign banks affiliates operated in the UK between 1997-2014
 - *181 foreign banks branches*
 - *113 foreign banks subsidiaries*
- Foreign banks provide approximately 50% of loans in the UK
 - *30% loans to non-bank borrowers*
 - *70% loans to other banks*
- **41 foreign banking groups operate under both organizational structures**

Branches vs. Subsidiaries

Branch :

- Integral part of the parent bank
- Cheaper and more flexible transfer of funds to and from parent bank

Subsidiary :

- Stand alone entity
- Own board of directors
- Subject to host country authorities' regulation

Hypothesis: *Capital requirements*

In response to an increase in capital requirements banks can:

Adjust liabilities:

- Issue new capital
- Retain earnings
- Use capital buffer

Adjust assets:

- Reduce lending in home market
- Reduce lending abroad
- Reduce either interbank or non-bank lending

Foreign branches form integral part of the parent bank ➡ **Easy to control**

Foreign subsidiaries are stand alone entities with their own board of directors ➡ **Less easy to control**

Hypothesis: *Lending standards*

Lending standards - Ongena, Popov and Udell (2013, JFE):

- Reputational risks - perception of bad risk management at an affiliate may have a negative impact on the reputation of the parent bank.
- Adopting parent banks' business model - banks may adopt more conservative lending approaches at home, which they then pass on to their foreign affiliates.
- Alternatively banks may wish to keep their risk profile constant and so take increase risk abroad.

Since foreign branches form integral part of the parent bank reputational risk may play more important role, and passing on business model is more straight forward.

Banks may substitute more risky borrowers with less risky ones without decreasing the volume of lending.

Lending standards do not place a restriction on the balance sheet of the group as a whole.

Hypothesis: *Reserve requirements*

Reserve requirements – Kashyap and Stein (2000, AER); Mora (2014, JMCB):

Increase in the reserve requirements acts as an implicit tax because the interest rates central banks pay on reserves held by banks are often below market rates.

- Increase loan-deposit rate spread, leading to decline in aggregate lending.
- Decrease availability of funds available to lend.

Lower restrictions of capital flows between parent banks and their foreign branches may mean that branches will be more affected.

In normal times parent banks are likely to be able to access wholesale markets in domestic markets to substitute the lost liquidity.

Data

- Macroprudential regulation: changes to macroprudential regulation obtained from:
 - Lim et al. (2000, IMF); Kuttner and Shim (2013, NBER); Borio and Shim (2007, BIS)
 - Hand collected information obtained via contact with regulatory agencies.
 - *Capital requirements: Both aggregate & changes to components*
 - *Lending standards: LTV; DTI; Underwriting standards*
 - *Reserve requirements*
- Financial information: foreign banks' lending provided by the Bank of England (BT Form)
 - *Lending to other banks*
 - *Lending to non-bank borrowers*

Sample description

- Sample period: 1997q4 – 2014q2
- Number of banks: 103 (51 branches; 52 subsidiaries) accounting for approx. 75% of total foreign bank assets.
- Macroprudential regulation: 40% of all tightening cases
 - *Capital requirements tightening – 19 (out of 43)*
 - *Lending standards tightening – 23 (75)*
 - *Reserve requirements – 35 (73)*
- Number of observations: 4,107

Empirical model

- We estimate our baseline results using difference-in-difference estimations.
- We compare changes in the evolution of lending prior to and following the introduction of the change to macroprudential regulation between treatment and control group.

$$\Delta Lending_{ijkt} = \alpha_i + \beta(Regulation_{kt} * Type_{ijk}) + Type_{ijk} + BC_{ijkt} + \delta_{jkt} + \varepsilon_{ijkt}$$

i - bank, *j* - banking group, *k* - country, *t* - quarter

ΔLending – Lending to banks and non-bank borrowers as percent change from previous quarter

Regulation – Dummy variable = 1 if a change to macroprudential regulation is observed; 0 otherwise

Type – Dummy variable = 1 if bank operates under branch structure; 0 if bank is a subsidiary

BC – Bank-time varying control variables: Bank size; Wholesale (interbank loans share of total loans)

δ_{jkt} – Parent bank - Quarter FE, controlling for parent bank specific factors affecting lending decisions

Diff-in-Diff Assumptions

Exogeneity - changes in macroprudential regulation in the home country should not depend on the lending provided by foreign branches and subsidiaries in the UK.

- Home country regulators are more likely to be concerned with banks domestic activities when revising home country macroprudential regulation (*Ayiar et al. 2014*)
- Linear probability model, logistic regressions support exogeneity assumption.

Parallel trends – trends in lending of the treatment and control groups are similar prior to the change in the macroprudential regulation.

- This assumption allows us to believe that absent changes in macroprudential regulation both branches and subsidiaries' lending would continue to grow at the same rate and any divergences in lending are due to changes in regulation.
- Visual inspection and t-tests suggest that foreign banks branches and subsidiaries lending develops in a very similar way.

Diff-in-Diff Assumptions

Table 2
Exogeneity tests

	<i>Capital requirements</i>			<i>Lending standards</i>			<i>Reserve requirements</i>		
Non-bank lending	0.000	0.000		0.002	0.002		0.002	0.002	
	(0.43)	(0.07)		(0.88)	(0.92)		(0.62)	(0.70)	
Non-bank lending (<i>t-1</i>)	0.001	0.000		0.005	0.004		0.002	0.002	
	(0.40)	(0.21)		(1.38)	(1.23)		(0.68)	(0.75)	
Non-bank lending (<i>t-2</i>)	-0.003	-0.003		0.001	0.001		0.002	0.002	
	(-1.47)	(-1.49)		(0.48)	(0.40)		(1.34)	(1.19)	
Non-bank lending (<i>t-3</i>)	-0.001	-0.000		0.002	0.002		-0.003	-0.002	
	(-0.41)	(-0.12)		(0.45)	(0.49)		(-1.18)	(-1.21)	
Interbank lending	-0.002		-0.001	-0.001		0.000	0.002		0.002
	(-0.97)		(-0.86)	(-0.32)		(0.03)	(0.83)		(0.91)
Interbank lending (<i>t-1</i>)	0.000		-0.000	0.000		0.000	-0.000		-0.000
	(0.04)		(-0.11)	(0.12)		(0.16)	(-0.15)		(-0.05)
Interbank lending (<i>t-2</i>)	0.005		0.004	0.000		-0.000	0.000		-0.000
	(1.85)		(1.82)	(0.03)		(-0.01)	(0.09)		(-0.07)
Interbank lending (<i>t-3</i>)	0.000		0.000	0.004		0.004	0.001		0.001
	(0.17)		(0.22)	(1.18)		(1.09)	(0.39)		(0.35)
Controls	YES	YES	YES	YES	YES	YES	YES	YES	YES
Country FE	YES	YES	YES	YES	YES	YES	YES	YES	YES
Quarter FE	YES	YES	YES	YES	YES	YES	YES	YES	YES
Observations	1,178	1,178	1,178	1,178	1,178	1,178	1,178	1,178	1,178
R-squared	0.067	0.063	0.065	0.056	0.054	0.052	0.075	0.074	0.074

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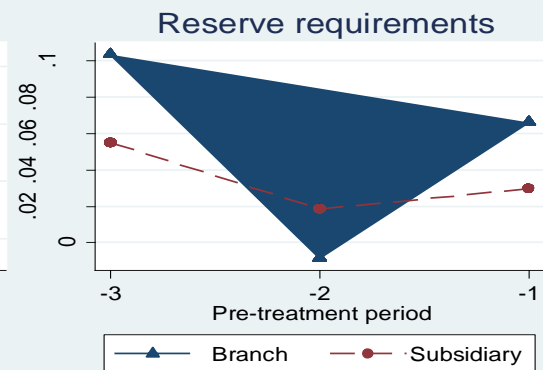
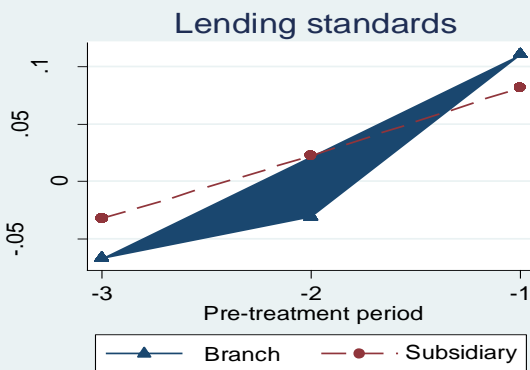
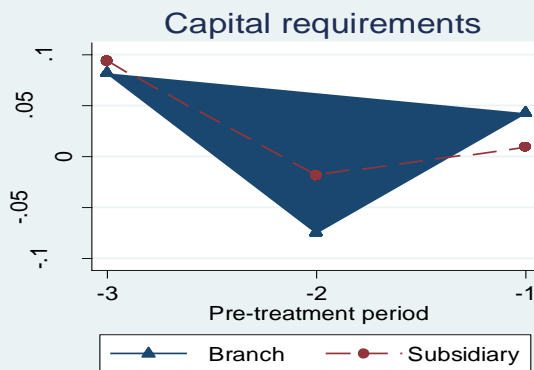
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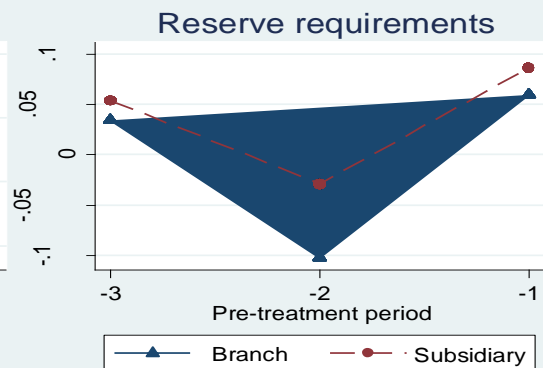
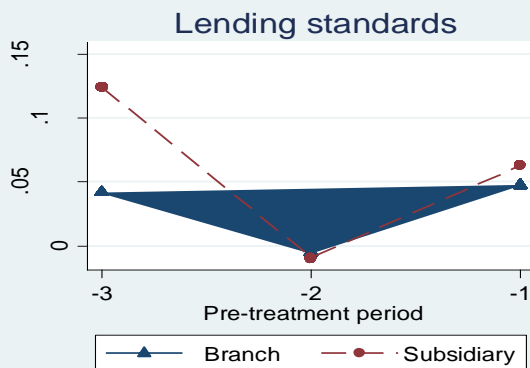
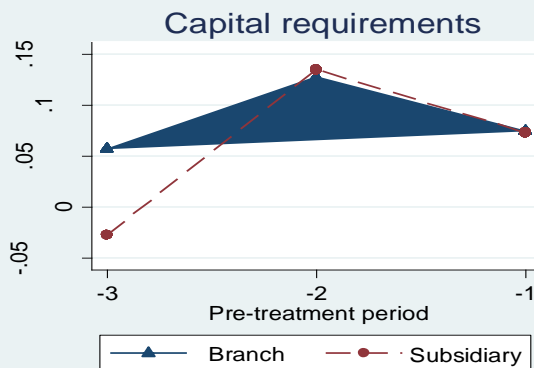
Diff-in-Diff Assumptions

Figure 2
Parallel trends assumption

Panel A: Non-bank lending



Panel B: Interbank lending



Baseline results

Table 4
Macroprudential regulation and cross-border lending

	Non-bank loans				Interbank loans			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Capital regulation*Type	-0.059 (-0.62)	-0.065 (-0.66)			-0.063*** (-3.13)	-0.068*** (-4.13)		
Lending standards*Type	0.034 (0.36)		0.037 (0.40)		0.020 (0.54)		0.024 (0.60)	
Reserve requirements*Type	0.025 (0.27)			0.026 (0.28)	0.084 (1.07)			0.085 (1.08)
Type	0.030* (1.86)	0.031* (1.76)	0.030* (1.89)	0.030 (1.70)	-0.042** (-2.38)	-0.041** (-2.30)	-0.041** (-2.31)	-0.042** (-2.40)
Controls	YES	YES	YES	YES	YES	YES	YES	YES
Bank Group*Quarter FE	YES	YES	YES	YES	YES	YES	YES	YES
Observations	4,107	4,107	4,107	4,107	4,107	4,107	4,107	4,107
R-squared	0.529	0.529	0.529	0.529	0.515	0.514	0.514	0.514
Cluster	Country	Country	Country	Country	Country	Country	Country	Country

- Foreign branches' interbank lending growth reduced by 6.3pp relative to foreign subsidiaries', following tightening of capital requirements.

Transmission mechanism

Why would parent banks delegate more decision making authority to subsidiaries?

Williamson (1967): under more complex hierarchical structure (more management layers) principals substitute information quality for information quantity. Having their own board of directors' subsidiaries hierarchical structure is more complex relative to branches.

Can parent banks reverse delegation?

Hart and Holmstrom (2010) delegation is a commitment device breaching which could have negative consequences, leading to aggravation among the subordinates and affect firms' performance.

Knyazeva, Knyazeva, and Masulis (2013) document that interfering in the independence of the board leads to adverse firm valuation and performance effects of subsidiaries.

Transmission mechanism

Aghion and Tirole (1997): delegation of authority to subordinates as an incentive mechanism for soft information production.

Banking groups focusing on non-bank lending require more soft information (Berger et al., 2005; Berger and Udell, 2002; Stein, 2002) => Banks relying on soft information will delegate more authority to foreign affiliates.

McAfee and McMillan (1995): principals require time to supervise actions of their subordinates. Since their time is limited they will need to delegate some power to sub-principals. Higher number of offices requires more delegation.

Banking groups operating higher number of foreign affiliates are likely to delegate more authority to sub-principals.

Dessein (2002): delegating authority to subordinates allows companies to avoid noisy communication and loss of information, stemming from different objectives of principals and agents, which is amplified by geographical distance (Landier et al., 2007)

Banking groups operating foreign affiliates at greater distance are likely to delegate more authority to sub-principals.

Transmission mechanism

Table 5
Transmission mechanism

	Panel A:		Panel B:		Panel C:	
	Non-bank lending		Number of affiliates		Distance from parent	
	<i>High</i>	<i>Low</i>	<i>High</i>	<i>Low</i>	<i>High</i>	<i>Low</i>
Capital regulation*Type	-0.107***	-0.035**	-0.089***	-0.072***	-0.095**	-0.061**
	(-3.28)	(-3.08)	(-5.65)	(-3.10)	(-3.12)	(-2.49)
Lending standards*Type	-0.084	0.037	-0.097	0.047	0.167***	0.006
	(-0.71)	(0.56)	(-1.74)	(0.51)	(4.61)	(0.19)
Reserve requirements*Type	0.070	0.103	0.015	0.113	0.028	0.097
	(0.59)	(1.70)	(0.14)	(1.11)	(0.44)	(0.94)
Controls	YES	YES	YES	YES	YES	YES
Observations	2,153	1,954	1,520	2,587	1,162	2,945
R-squared	0.520	0.503	0.336	0.639	0.541	0.498
Bank Group*Quarter FE	YES	YES	YES	YES	YES	YES
Cluster	Country	Country	Country	Country	Country	Country

Baseline results are stronger for banking groups where parent banks are more likely to delegate more decision making authority to subsidiaries' boards of directors.

Confounding events

- We remove foreign banks subsidiaries subject to FSA bank specific capital requirements.

Table 6

Robustness test: Subsidiaries subject to bank specific capital requirements removed

	Non-bank loans		Interbank loans	
	(1)	(2)	(3)	(4)
Capital regulation*Type	-0.070 (-0.56)	-0.050 (-0.41)	-0.050*** (-2.94)	-0.055** (-2.76)
Type	0.006 (0.45)	0.027 (1.34)	-0.034** (-2.48)	-0.046** (-2.32)
Controls	YES	YES	YES	YES
Bank Group*Quarter FE	YES	YES	YES	YES
Observations	3,882	3,882	3,882	3,882
R-squared	0.529	0.542	0.528	0.533
Cluster	Country	Country	Country	Country

Falsification tests

Table 7
Falsification tests

Panel A: Falsification test 1		Panel B: Falsification test 2		Panel C: Falsification test 3		
Number of replications: 1000		Number of replications: 1000		Variable	<i>Interbank lending</i>	<i>Non-bank lending</i>
<i>Interbank lending</i>	<i>Non-bank lending</i>	<i>Interbank lending</i>	<i>Non-bank lending</i>	Placebo <i>Capital requirements</i>	0.0301 (0.35)	-0.0192 (0.56)
Rejection rates at 1% level (2-tailed test):		Rejection rates at 1% level (2-tailed test):		Placebo <i>Lending standards</i>	0.0395 (1.15)	-0.0111 (0.96)
1.00%	1.30%	0.70%	1.20%	Placebo <i>Reserve requirements</i>	-0.047 (-0.24)	0.0252 (0.02)
Rejection rates at 5% level (2-tailed test):		Rejection rates at 5% level (2-tailed test):		Controls	Yes	Yes
3.00%	5.50%	3.40%	4.30%	Bank FE	Yes	Yes
Rejection rates at 10% level (2-tailed test):		Rejection rates at 10% level (2-tailed test):		Year FE	Yes	Yes
6.30%	9.60%	6.70%	8.70%	Cluster	Bank	Bank
				Observations	4,852	4,852
				R2	0.077	0.132

Robustness tests

Additional tests:

Placebo regressions – Variable Regulation forwarded by 1, 2, 3 periods. Results show no significant results.

Excluding countries with abnormally high frequency of macroprudential regulation (India, Canada and China)

Control variables removed – Magnitude of the β very similar to the model including control variables.

Alternative clustering of standard errors– Errors clustered on banking group or bank level yield very similar results.

Additional test show that the effects are temporarily and persist only during the first quarter following the tightening of capital requirements.

Summary

- We document heterogeneity in the response of foreign banks lending in the UK to changes in macroprudential regulation in their home markets.
- Branches of foreign banks reduce lending to other banks by 6.3% more relative to subsidiaries.
- Lending to non-bank borrowers shows no disproportionate effects.
- We also find no significant results for lending standards and reserve requirements.
- We show that these results are stronger for banking groups where parent bank is more likely to delegate more decision making authority to subsidiaries' boards of directors.

