Macroprudential Policy Leakage through Firms

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24 November 2023

Background and contribution

Big picture

- After the global financial crisis, many countries introduced the **countercyclical capital buffer (CCyB)** to **reduce procyclicality** of bank lending and **increase bank resilience**.
    Kashyap and Stein (2004); Repullo and Suarez (2013); Chen and Friedrich (2021)

- The CCyB should contain excessive **credit growth** during credit cycle upswings and support credit growth during downturns.

    ➔ requires banks to build up additional capital in normal times that can be used to absorb losses in a crisis

- Regulators included the feature of **automatic reciprocity** to account for potential regulatory arbitrage through the cross-border lending of banks.

    ➔ foreign banks have to reciprocate the capital requirement of domestic banks for their lending to the jurisdiction where the CCyB is in place

    ➔ independent of lender location, the **same CCyB applies to all bank credit in this jurisdiction**

How effective is national macroprudential policy in a globalized world?

- An extensive literature shows the (negative, transitory) effects of higher capital requirements on bank lending.
    e.g. Peek and Rosengren (1995); Bridges, Gregory, Nielsen, Pezzini, Radia and Spaltro (2014); Behn, Haselmann and Wachtel (2016); Deli and Hasan (2017); Imbierowicz, Kragh, Rangvid, 2018; Gropp, Mosk, Ongena and Wix (2019); Imbierowicz, Löffler and Vogel (2021); Gropp, Mosk, Ongena, Simac and Wix (2023)

- Some, but not full, substitution of bank credit by banks with lower capital requiremens.
    Aiyar, Calomiris, Hooley, Korniyenko and Wieladek (2014), Jiménez, Ongena, Peydró and Saurina (2017), Fraisse, Lé and Thesmar (2019), De Jonghe, Dewachter and Ongena (2020)

- Cross-border lending increases in response to higher capital requirements abroad but decreases in response to higher CCyBs abroad.
    Damar and Mordel (2017), Chen and Friedrich (2021)

How do internationally operating firms respond to national macroprudential policies affecting their banks?

- firms tap internal capital markets to minimize their financing costs or tax burden by exploiting differences in

  - international corporate tax rates
    e.g., Mintz and Smart (2004); Buettner and Wamser (2013); Feld, Heckemeyer and Overesch (2013)

  - institutional quality,

  - and financial development
    e.g., Desai, Foley and Hines Jr. (2004); Aggarwal and Kyaw (2008); Egger, Keuschnigg, Merlo and Wamser (2014); Goldbach, Møen, Schindler, Schjelderup and Wamser (2021)

  - <u>Our work:</u> **How do funding structures of multinational corporations (MNCs) change when external borrowing constraints (nationally) increase?**

Research Questions

- **What is the effect of a larger CCyB on lending and risk?**

- **Do affected subsidiaries substitute bank credit by borrowing from their parent company?**

- **Where do parent companies borrow these additional funds from?**

- **Do banks and non-banks shift risks?**

Research Questions & Answers

- **What is the effect of a larger CCyB on lending and risk?**

  - cross-border bank lending: -8.6%

  - cross-border non-bank lending: 0%

  - banks' portfolio PD: changes, but differentially between subsidiaries (↓) and parents (↑)

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- **Do affected subsidiaries substitute bank credit by borrowing from their parent company?** → Yes, 31.2% more internal debt from their parents

  - **Is the credit substitution complete?** → Yes, zero change in subsidiaries' total leverage.

- **Where do parent companies borrow these additional funds from?**

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  - their domestic banks: +5%

  - their domestic non-banks: +13.1%

- **Do banks and non-banks shift risks?**

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  - their domestic banks: +5%

  - their domestic non-banks: +13.1%

- **Do banks and non-banks shift risks? → to a rather small extent**

  - **Is lending to parents heterogeneous with respect to their risk?** → Yes, riskier parents obtain less bank and non-bank credit.

  - **Does the scope of redistribution between parents and their subsidiaries then also depend on the riskiness of the parent?** → Yes, these smaller amounts translate into less internal credit to subsidiaries.

Contribution

- The **change in CCyB in one country might also impact other countries**, especially when the macroprudential stance is heterogeneous between countries. An increase in CCyB:

  - Decreases cross-border bank lending (and portfolio risk) to affected countries

  - Increases domestic bank and cross-border firm lending (and portfolio risk)

➔ **Macroprudential policy might leak through international firms.**
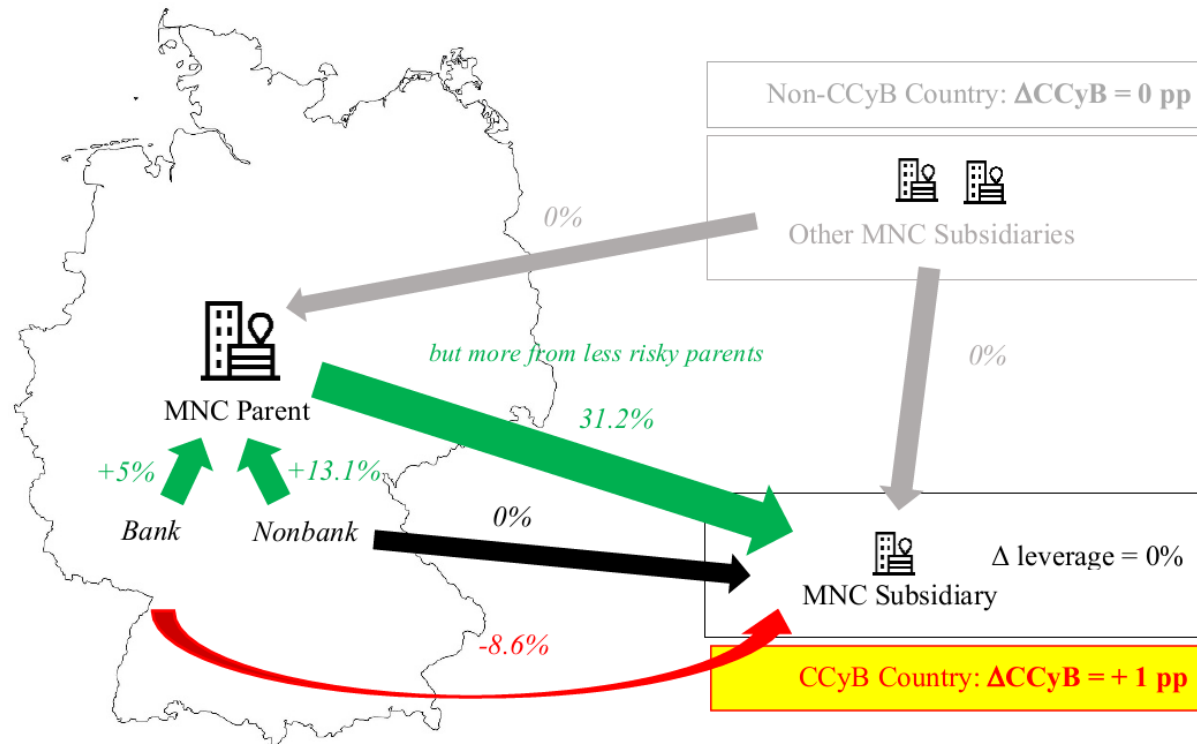
Data

Deutsche Bundesbank – data sets

- Credit register (MiMik =Mikrodatenbank Millionenkredite)

  - Quarterly data on bank-firm and nonbank-firm lending

  - Includes probability of default (PD) estimates of borrowing firms by lenders

- German FDI (MiDi = Microdatabase Direct Investment)

  - Universe of German outward foreign direct investments

  - Includes multinational corporations (MNC) with investor (=parent) in Germany and subsidiaries abroad

  - detailed information on firms' liability structure

→ The data range from 2013:Q1 to 2019:Q4, including borrowers from 30 countries.

Panel A. Number lenders	
Bank	1,075
Nonbank	446
Total	1,521

Panel B. Number borrowers	
Subsidiary	3,676
Parent	702
Total	4,378

The countercyclical capital buffer (CCyB)
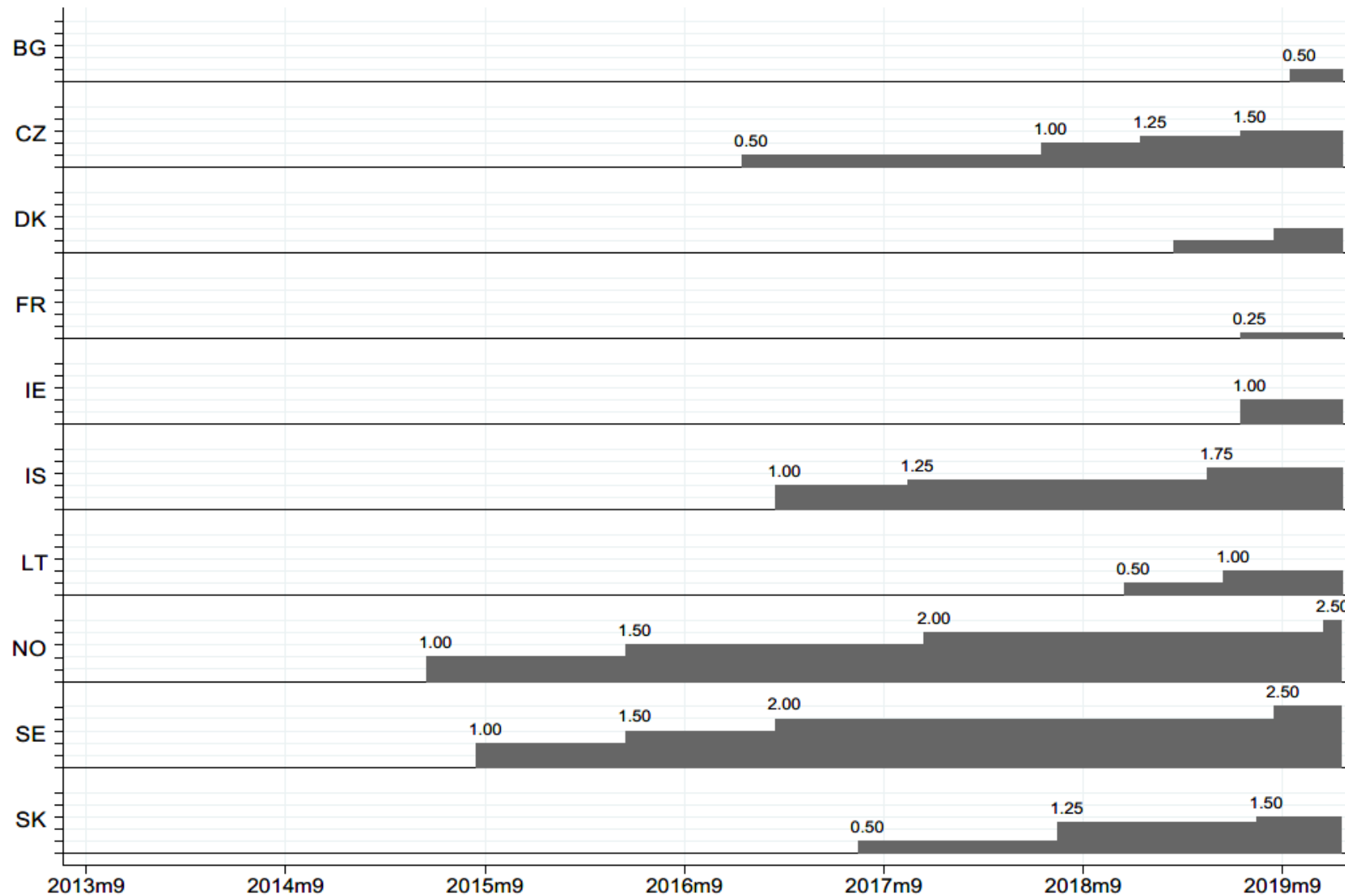
- CCyB conditional on CCyB>0 (overall 30 countries included)

What is the effect of a larger CCyB on bank and nonbank credit volume and borrower probability of default (PD)?

- dependent variable: logarithm of bank credit volume to each country, **bank-country-**year:quarter level

Credit volume of a bank in a given country

	Bank lending			
	(1)	(2)	(3)	(4)
CCyB rate (%)	-1.261***	-1.224***	-0.965***	-0.930***
	(-10.057)	(-11.005)	(-8.875)	(-8.269)
FIXED EFFECTS				
Year:quarter	No	Yes	Yes	Yes
Lender	No	No	Yes	Yes
Lender x Year:quarter	No	No	No	Yes
Observations	37,540	37,540	37,540	37,540
Adj. R-squared	0.035	0.058	0.409	0.291

Cross-border bank lending – bank-firm-time level

- dependent variable: logarithm of bank credit volume to each subsidiary, **bank-subsidiary**-year:quarter level

	(1)	(2)	(3)	(4)	(5)
CCyB rate (%)	-0.447**	-0.132***	-0.101*	-0.107**	-0.136***
	(-2.694)	(-3.060)	(-2.038)	(-2.708)	(-3.329)
FIXED EFFECTS					
Year:quarter	Yes	Yes	Yes	Yes	Yes
Firm	No	Yes	Yes	Yes	Yes
Industry x Year:quarter	No	No	Yes	Yes	Yes
Lender	No	No	No	Yes	Yes
Lender x Year:quarter	No	No	No	No	Yes
Observations	40,567	40,567	40,567	40,567	40,567
Adj. R-squared	0.012	0.806	0.809	0.848	0.844

➔ **a higher CCyB reduces firm borrowing from banks**

- dependent variable: logarithm of nonbank credit volume to each subsidiary, **nonbank-subsidiary**-year:quarter level

	(1)	(2)
CCyB rate (%)	-0.032	-0.060
	(-0.369)	(-0.687)
FIXED EFFECTS		
Time	Yes	Yes
Firm	Yes	Yes
Industry x Time	Yes	Yes
Lender	Yes	Yes
Lender x Time	No	Yes
Observations	25,520	25,520
Adj. R-squared	0.790	0.784

➔ **a higher CCyB has no impact on firm borrowing from nonbanks**

- We know from the literature on microprudential regulation, that a higher capital requirement implies a decrease in banks' risk-weighted assets (Imbierowicz et al., 2018; Gropp et al., 2019).

- Accordingly, in addition to the decrease in bank credit volume, we might also expect a decrease in bank loan portfolio risk. **Bank-country**-year:quarter level:

Probability of default of borrowers of a bank in a given country

	Probability of default (%)			
	(1)	(2)	(3)	(4)
CCyB rate (%)	-0.101***	-0.073***	-0.053***	-0.053***
	(-5.870)	(-5.203)	(-4.477)	(-4.445)
FIXED EFFECTS				
Year:quarter	No	Yes	Yes	Yes
Lender	No	No	Yes	Yes
Lender x Year:quarter	No	No	No	Yes
Observations	27,873	27,873	27,873	27,873
Adj. R-squared	0.009	0.046	0.224	0.138

➔ **a higher CCyB implies a decrease in bank portfolio risk towards affected countries**

Bank portfolio PD - bank-firm-time level

Probability of default of borrowers of a bank within an MNC = the same bank lends to both parent and subsidiaries of the same MNC

	Probability of default (%)				
	Parents & Subsidiaries				Subsidiaries
	(1)	(2)	(3)	(4)	(5)
CCyB rate (%)	-0.089***	-0.102***	-0.096***	-0.083***	-0.035**
	(-4.590)	(-4.530)	(-3.737)	(-4.540)	(-2.174)
Parent with affected subsidiary					
FIXED EFFECTS					
MNC	Yes	Yes	Yes	Yes	Yes
Year:quarter	Yes	Yes	Yes	Yes	Yes
Lender	No	Yes	Yes	Yes	Yes
MNC x Lender	No	No	Yes	Yes	Yes
Lender x Year:quarter	No	No	No	Yes	Yes
MNC x Lender x Year:quarter	No	No	No	Yes	Yes
Observations	16,480	16,480	16,480	16,480	4,499
Adj. R-squared	0.525	0.530	0.536	0.600	0.776

➔ **a higher CCyB implies a decrease in average bank borrower risk in affected countries**

Probability of default of borrowers of a bank within an MNC

	Probability of default (%)					
	Parents & Subsidiaries				Subsidiaries	Parents
	(1)	(2)	(3)	(4)	(5)	(6)
CCyB rate (%)	-0.089***	-0.102***	-0.096***	-0.083***	-0.035**	
	(-4.590)	(-4.530)	(-3.737)	(-4.540)	(-2.174)	
Parent with affected subsidiary						0.068***
						(3.077)
FIXED EFFECTS						
MNC	Yes	Yes	Yes	Yes	Yes	Yes
Year:quarter	Yes	Yes	Yes	Yes	Yes	Yes
Lender	No	Yes	Yes	Yes	Yes	Yes
MNC x Lender	No	No	Yes	Yes	Yes	Yes
Lender x Year:quarter	No	No	No	Yes	Yes	Yes
MNC x Lender x Year:quarter	No	No	No	Yes	Yes	No
Observations	16,480	16,480	16,480	16,480	4,499	7,704
Adj. R-squared	0.525	0.530	0.536	0.600	0.776	0.626

➔The change in bank portfolio risk is heterogeneous!

➔**Decrease in bank portfolio risk towards affected countries but increase to indirectly affected parents (otherwise included in control group)!**

What is the effect of a larger CCyB on the international funding structures of multinational corporations (MNCs)?

Internal capital markets

How do internationally operating firms respond to national macroprudential policies affecting their banks?

- MNCs have the possibility to circumvent unfavorable financing conditions

    → shift bank borrowing to unaffected firms in the MNC

    → use internal capital markets

Our analysis:

- Do (unaffected) parents lend more to affected subsidiaries?

- Is the credit substitution complete?

- **Do (unaffected) parents lend more to affected subsidiaries?**

	log(internal debt from parent)		internal debt from parent / total assets		internal debt from parent / total liabilities	
	(1)	(2)	(3)	(4)	(5)	(6)
CCyB rate (%)	0.280***	0.339***	0.007*	0.009**	0.021***	0.024***
	(4.555)	(3.398)	(1.901)	(2.076)	(5.378)	(4.463)
FIXED EFFECTS						
Time	Yes	Yes	Yes	Yes	Yes	Yes
Firm	Yes	Yes	Yes	Yes	Yes	Yes
Industry x Time	No	Yes	No	Yes	No	Yes
Observations	46,727	46,727	46,727	46,727	46,630	46,630
Adj. R-squared	0.801	0.806	0.791	0.795	0.747	0.752

CCyB ↑ 1 percentage point (pp)

→1 pp ↑ internal debt from the parent to total assets

→2 pp ↑ the ratio of internal debt from the parent to total liabilities.

→roughly one-third of parental debt ↑

Internal capital markets

- **Is the credit substitution complete for the subsidiary firms?**

	log(liabilities)	liabilities / total assets
	(1)	(2)
CCyB rate (%)	-0.021	-0.008
	(-0.498)	(-0.919)
FIXED EFFECTS		
Time	Yes	Yes
Firm	Yes	Yes
Industry x Time	Yes	Yes
Observations	44,398	46,727
Adj. R-squared	0.931	0.901

→**Funding through internal capital markets compensates decrease in bank borrowing!**

Further tests:

→No additional borrowing from other, unaffected, subsidiaries

→No additional external funding from capital markets

Where do parent companies borrow these additional funds from?

Parent company bank and nonbank borrowings

- Domestic bank and nonbank lending to parent companies, **lender-parent-year:quarter level**

	Bank lending		Nonbank lending	
	(1)	(2)	(3)	(4)
Parent with affected subsidiary	0.038**	0.050***	0.113***	0.131***
	(2.325)	(3.329)	(3.513)	(3.567)
FIXED EFFECTS				
Time	Yes	Yes	Yes	Yes
Firm	Yes	Yes	Yes	Yes
Industry x Time	Yes	Yes	Yes	Yes
Lender	Yes	Yes	Yes	Yes
Lender x Time	No	Yes	No	Yes
Observations	137,365	137,365	32,764	32,764
Adj. R-squared	0.491	0.447	0.679	0.652

→**Parent companies borrow more both from domestic banks and nonbanks!**

→Relates to earlier result of higher PD for parents with affected subsidiaries.

Do banks and non-banks shift risks?

- Do banks and nonbanks allocate new lending to parents with affected subsidiaries, irrespective of parent risk?

	Bank lending		Nonbank lending	
	(1)	(2)	(3)	(4)
Parent with affected subsidiary	0.048***	0.061***	0.144***	0.162***
	(3.157)	(4.335)	(3.827)	(3.729)
Parent with affected subsidiary x PD$_{Parent}$	**-0.022****	**-0.028*****	**-0.044****	**-0.043****
	(-2.409)	**(-3.244)**	**(-2.220)**	**(-2.261)**
FIXED EFFECTS & CONTROLS				
Base Effect	Yes	Yes	Yes	Yes
Time	Yes	Yes	Yes	Yes
Firm	Yes	Yes	Yes	Yes
Industry x Time	Yes	Yes	Yes	Yes
Lender	Yes	Yes	Yes	Yes
Lender x Time	No	Yes	No	Yes
Observations	135,471	135,471	31,468	31,468
Adj. R-squared	0.483	0.436	0.660	0.630

→No, less bank and nonbank lending to riskier parents, but

→looking at the distribution of PDs, almost all parent companies increase their borrowings
average (median) value in parent PD is 0.53% (0.25%) with standard deviation of 1.32%

Parent bank and nonbank borrowings by parent risk

- Mechanism: Does this also translate into less internal funding for affected subsidiaries?

	log(internal debt from parent)		internal debt from parent / total assets		internal debt from parent / total liabilities	
	(1)	(2)	(3)	(4)	(5)	(6)
CCyB rate (%)	0.447***	0.698***	0.012**	0.019	0.033***	0.040***
	(3.369)	(3.335)	(2.186)	(1.367)	(5.377)	(3.270)
CCyB rate (%) x $PD_{Subsidiary}$	0.029		-0.000		-0.002	
	(1.185)		(-0.154)		(-1.070)	
CCyB rate (%) x PD_{Parent}		**-0.210*****		**-0.009***		**-0.009***
		(-3.980)		**(-1.925)**		**(-1.996)**
FIXED EFFECTS						
Base Effect	Yes	Yes	Yes	Yes	Yes	Yes
Time	Yes	Yes	Yes	Yes	Yes	Yes
Firm	Yes	Yes	Yes	Yes	Yes	Yes
Industry x Time	Yes	Yes	Yes	Yes	Yes	Yes
Observations	29,688	17,587	29,688	17,587	29,640	17,569
Adj. R-squared	0.798	0.807	0.794	0.804	0.739	0.749

→the smaller additional credit amounts for riskier parents translate into less additional lending to affected subsidiaries

→Not related to risk of subsidiary itself

Conclusion

Conclusion

- Reciprocity rules for CCyBs seem to limit leakages by containing excessive bank credit growth to the CCyB country.

- However, MNCs circumvent CCyBs through their access to internal capital markets.

- This increases bank credit growth again through more credit to firms in countries with no/lower CCyB.

➜ Macroprudential policy might leak through international firms.

➜ Comparable levels of CCyBs across countries would substantially limit the potential arbitrage opportunities for MNC.

- Some words of caution:

  - The effect of the CCyB on the funding of standalone firms might be different.

  - We are silent on potential (longer-term) feedback effects – larger credit growth in low-CCyB countries through MNC redistribution might result in a larger CCyB also there spurring further redistributive effects.