Macroprudential Policy Leakage through Firms

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Background and contribution

Big picture

- After GFC, many countries introduced **countercyclical capital buffer (CCyB)** to **increase bank resilience** and **reduce procyclicality** of bank lending.

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

  → **Our paper**: What are the **effects of the CCyB** in the **build-up phase**?

- Regulators included the feature of **automatic reciprocity** to prevent regulatory arbitrage through international bank lending.

  → Foreign banks have to reciprocate the CCyB for their lending to the jurisdiction where the CCyB is in place.

  → Independent of lender location, the **same CCyB applies to all bank lending to borrowers in the regulating jurisdiction.**

Broad questions & literature
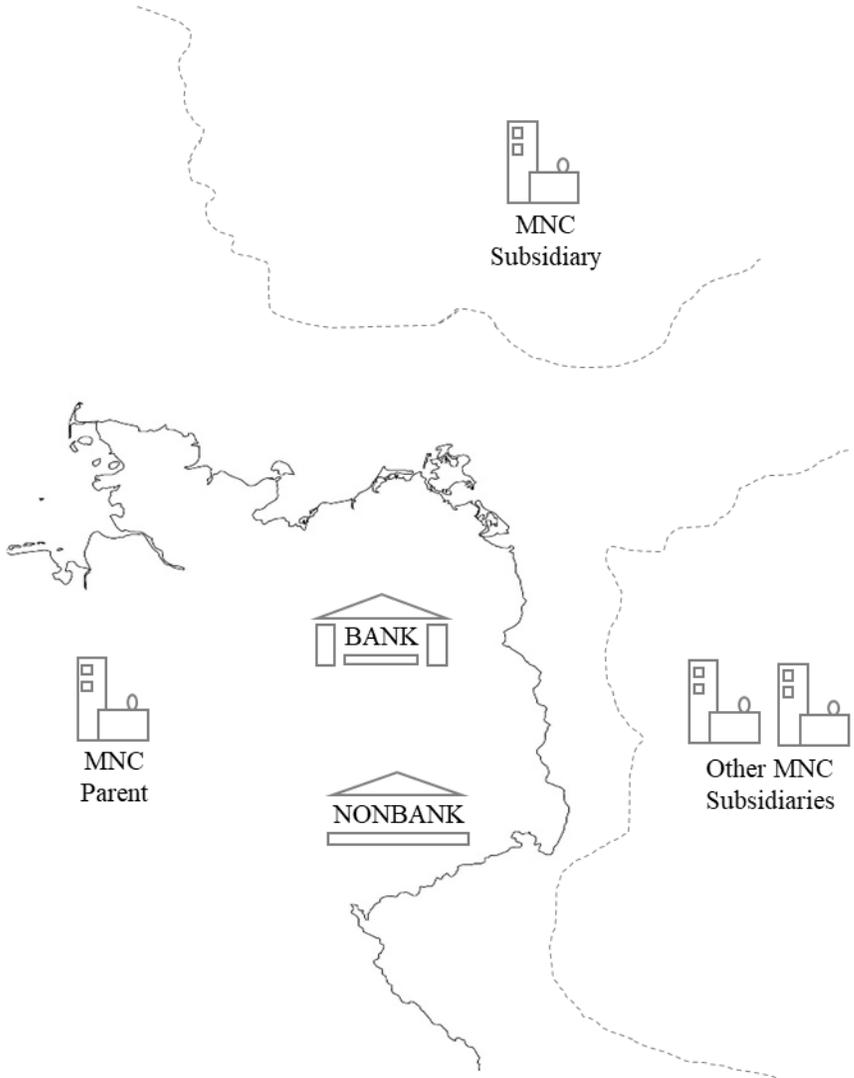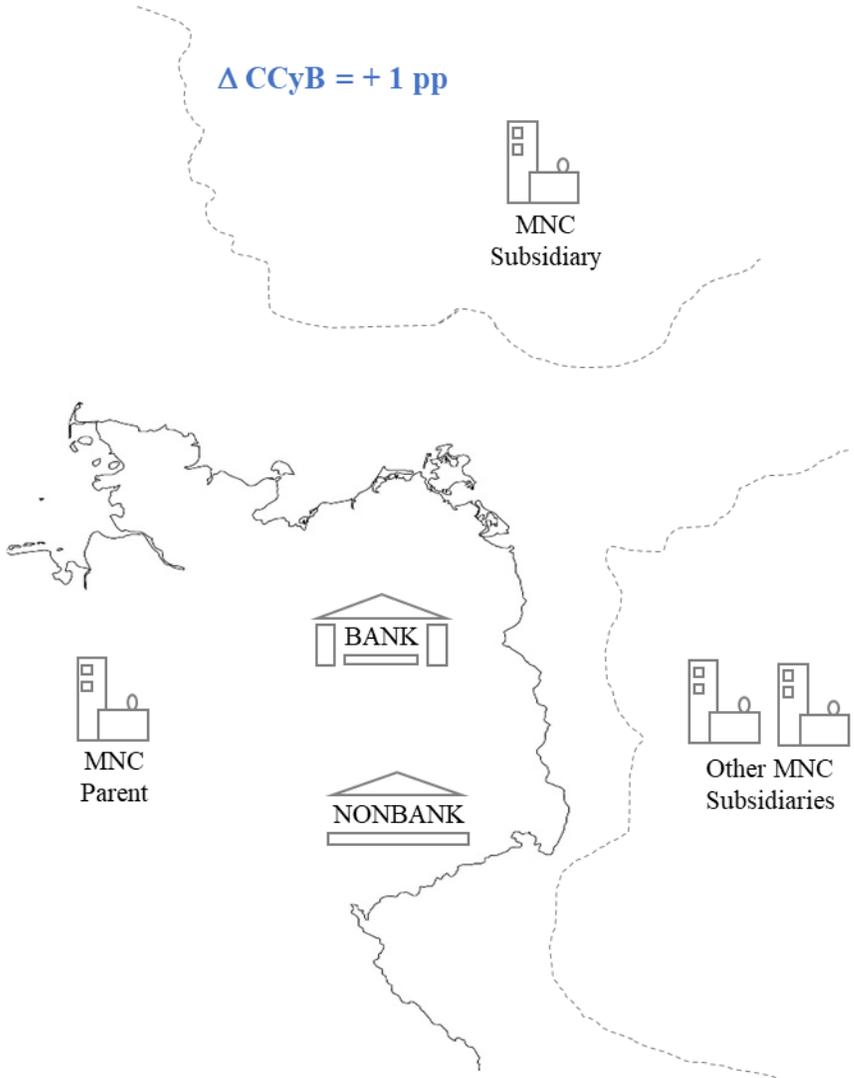
How effective is national macroprudential policy in a globalized world?

- Higher capital requirements have a (negative, transitory) effect 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, Loeffler and Vogel (2021); Gropp, Mosk, Ongena, Simac and Wix (2023)

- Some substitution of bank credit by banks with lower capital requirements (or higher headroom).
    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)
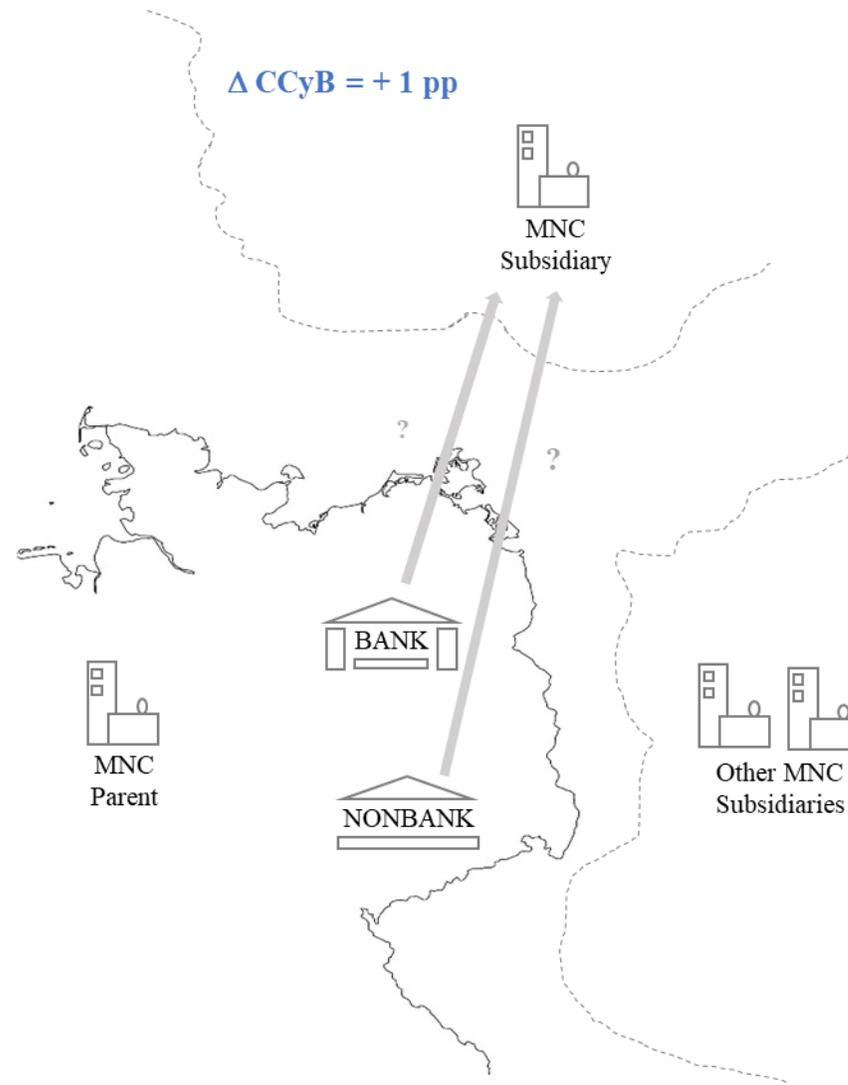
Broad questions & literature

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

- Firms actively use 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?**
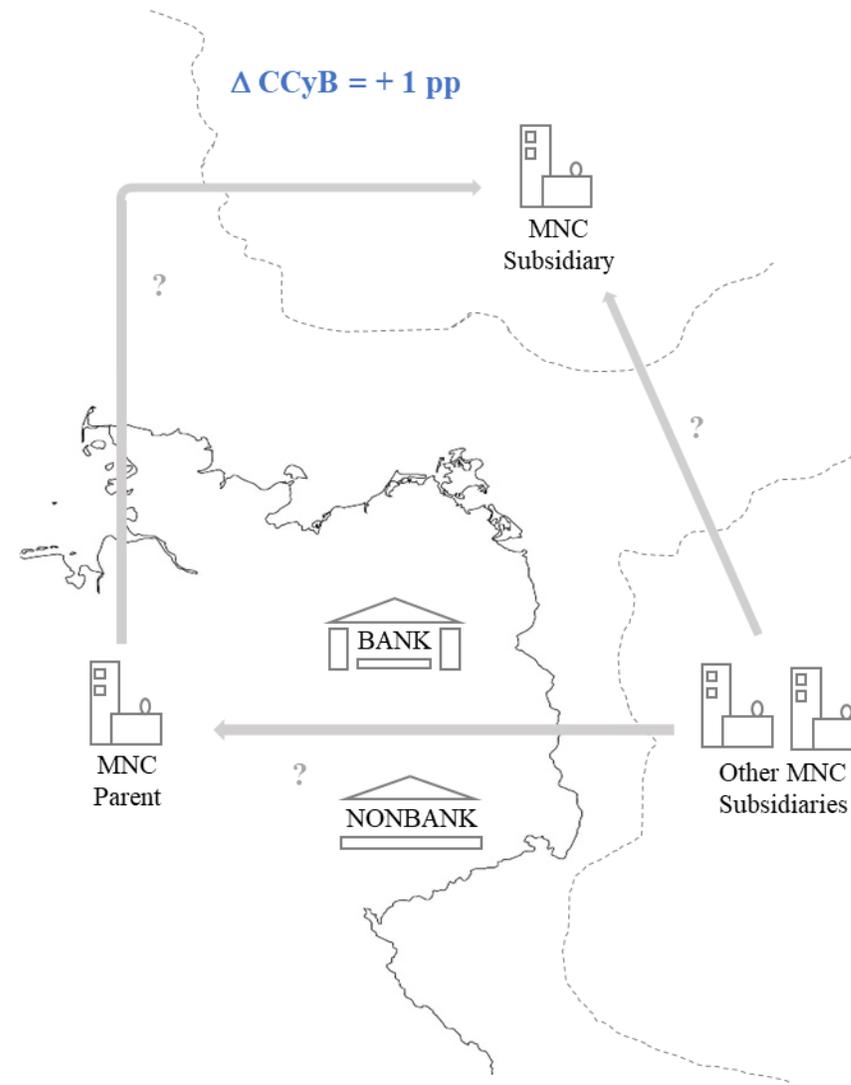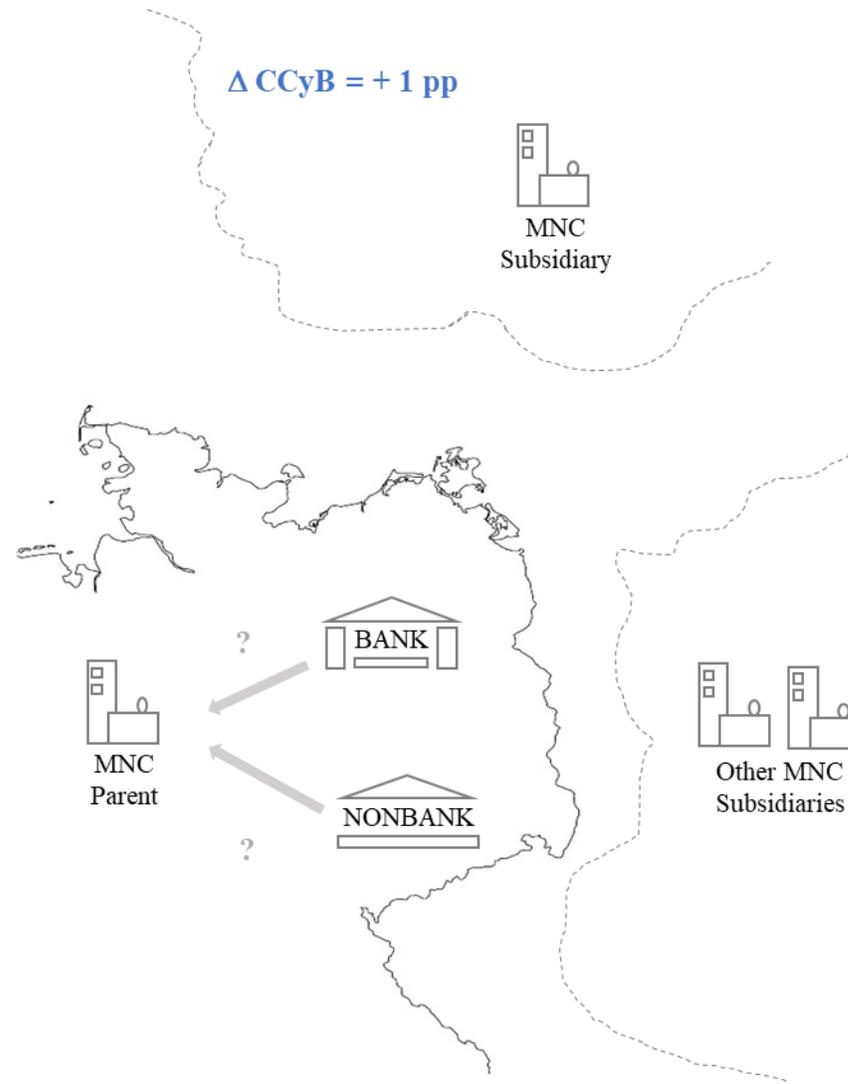
Research Questions

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

- **Do affected firms substitute bank credit with funding from their (unaffected) parent company?**

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

- **Do banks and non-banks change their risk-taking?**

Research Questions & Answers

- **What is the effect of a higher CCyB on lending and risk?**
  - International bank lending: -8.6%
  - International nonbank lending: 0%
  - Banks' portfolio PD: changes, but differentially between subsidiaries (↓) and parents (↑)

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- **Do affected firms substitute bank credit with funding from their (unaffected) parent company?**
  - Yes, 31.2% more internal debt from their parents
  - Credit substitution is complete (zero change in subsidiaries' total leverage)

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

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  - Their domestic banks: +5%
  - and domestic nonbanks: +13.1%

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    - Their domestic banks: +5%
    - and domestic nonbanks: +13.1%

- **Do banks and non-banks change their risk-taking?**

    - To a rather small extent
    - Riskier parents obtain less bank and nonbank credit
    - These smaller amounts translate into less internal credit to subsidiaries
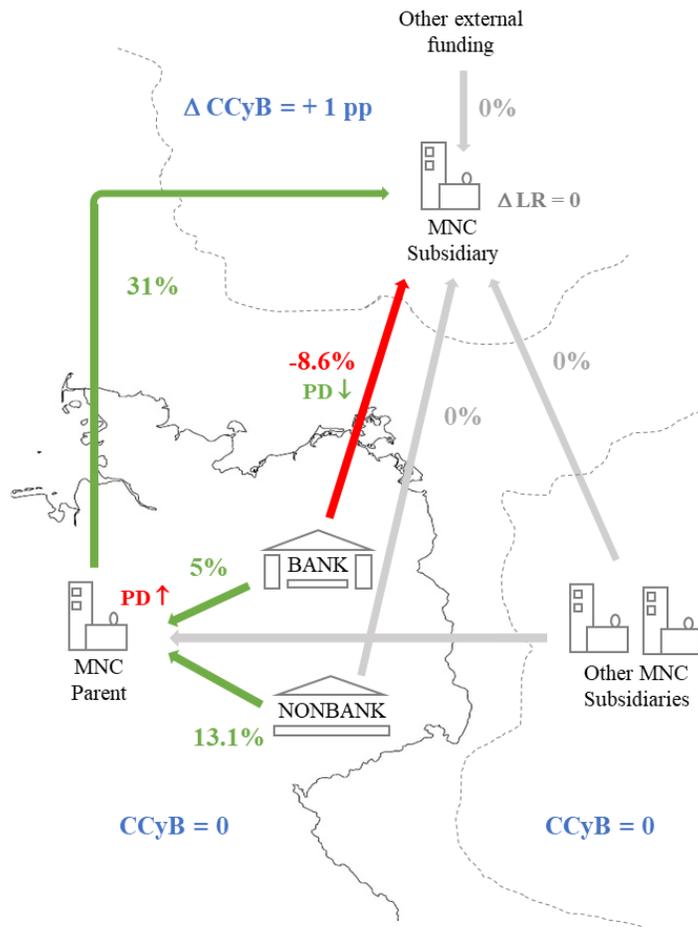
- The **change in CCyB in one country might also impact other countries**, especially when the macroprudential stance is heterogeneous between countries.

- An increase in CCyB:

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

  - Increases domestic bank and firm internal 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 (domestic and international)

  - PD estimates of borrowing firms by lenders

- **German FDI** (MiDi = Microdatabase Direct Investment)

  - Universe of German outward foreign direct investments

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

  - detailed information on firms' liability structure

- Sample period: 2013-Q1 to 2019-Q4, including borrowers from 30 countries (EU27 + IS, NO, UK)

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)
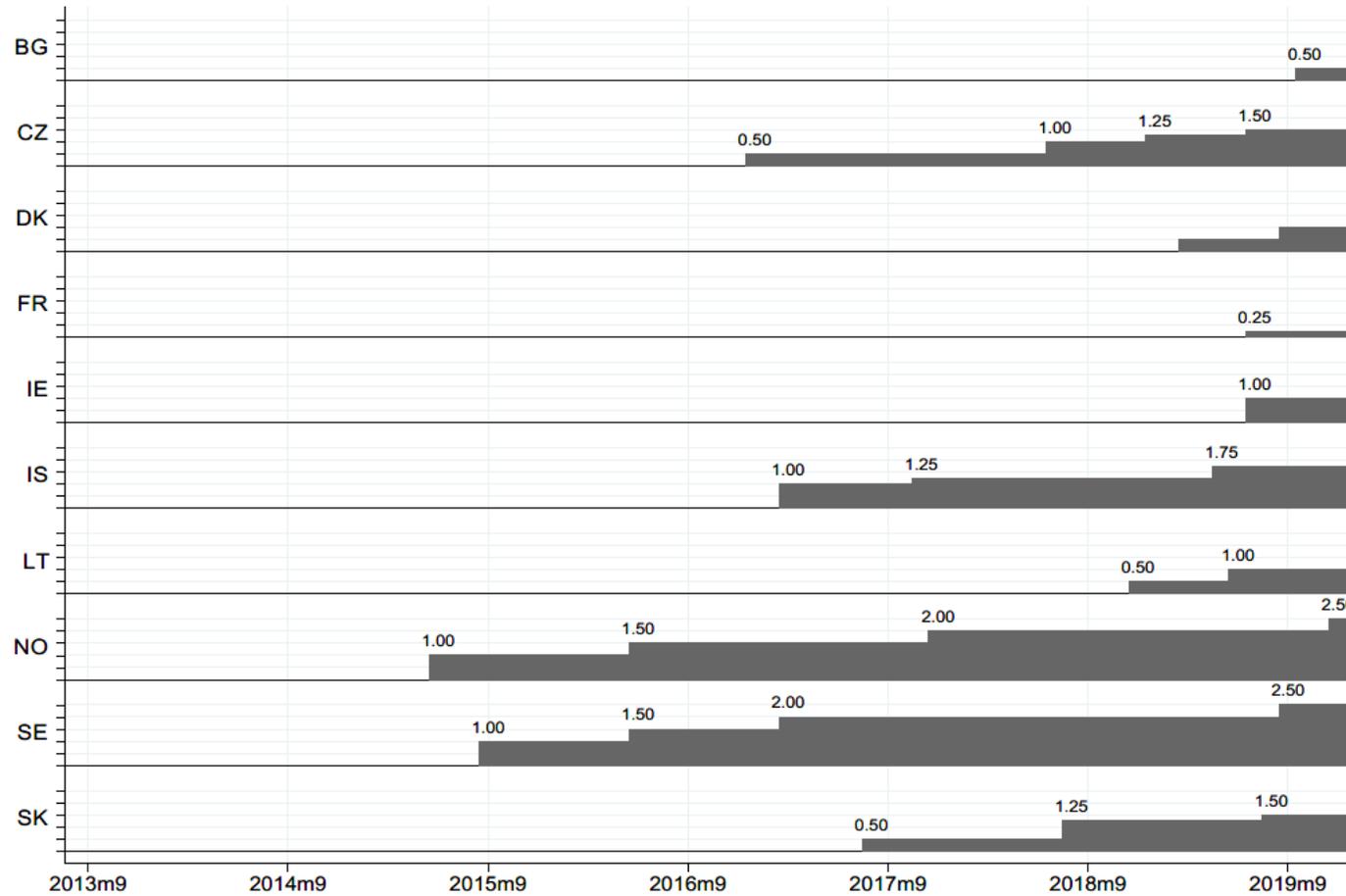
- Countries with CCyB > 0 (overall 30 countries included)

What is the effect of a higher CCyB on bank and nonbank lending and on borrowers' PD?

- Dependent variable: log 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
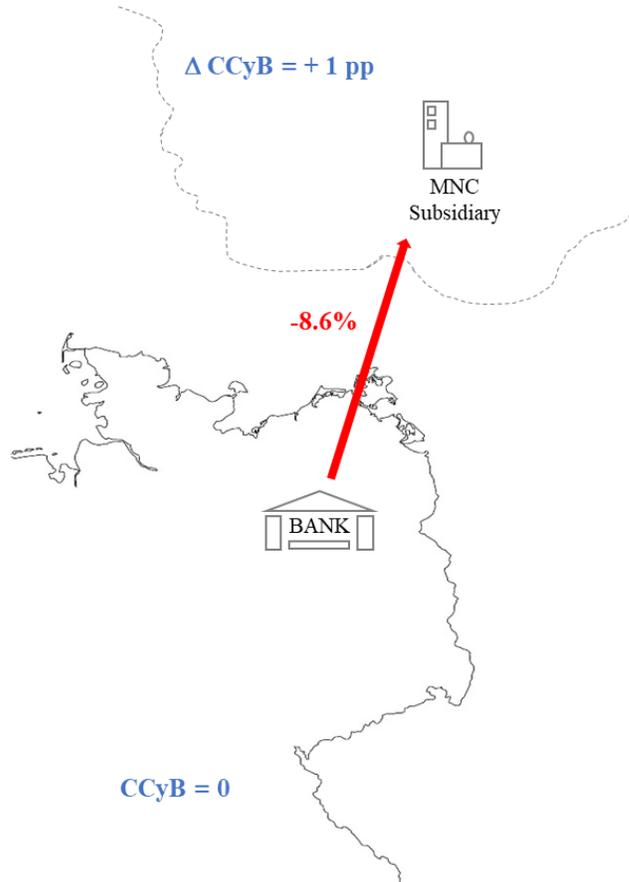
- log of bank credit to each borrowing firm

Panel A. All subsidiaries

	(1)	(2)	(3)	(4)	(5)
CCyB rate (%)	-0.260*	-0.113**	-0.055	-0.073*	-0.086***
	(-1.717)	(-2.591)	(-1.183)	(-1.874)	(-3.014)
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	50,111	50,111	50,111	50,111	50,111
Adj. R-squared	0.017	0.792	0.794	0.845	0.842

→ **a higher CCyB reduces firms' borrowing from banks**
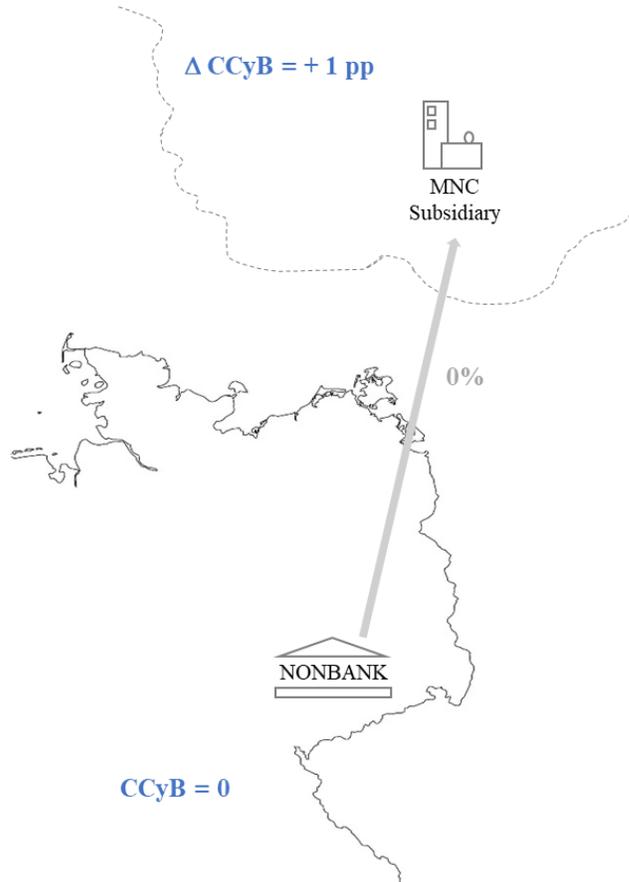
- log of nonbank credit to each borrowing firm

Nonbank Lending

	All subsidiaries		Excluding subsidiaries with other affected subsidiaries in the MNC	
	(1)	(2)	(3)	(4)
CCyB rate (%)	-0.022	-0.053	-0.032	-0.060
	(-0.276)	(-0.703)	(-0.369)	(-0.687)
FIXED EFFECTS				
Time	Yes	Yes	Yes	Yes
Firm	Yes	Yes	Yes	Yes
Industry x Year:quarter	Yes	Yes	Yes	Yes
Lender	Yes	Yes	Yes	Yes
Lender x Year:quarter	No	Yes	No	Yes
Observations	30,774	30,774	25,520	25,520
Adj. R-squared	0.777	0.772	0.790	0.784

→ a higher CCyB does not affect firms' borrowing from nonbanks

Δ CCyB = + 1 pp

MNC Subsidiary

0%

NONBANK

CCyB = 0

Bank portfolio PD - bank-country-time level

- We know from the literature on prudential regulation, that a higher capital requirement may incentivize banks to reduce risk-weighted assets. (Imbierowicz et al., 2018; Gropp et al., 2019)

- Thus, the decrease in bank credit volume might be accompanied by a decrease in banks' loan portfolio risk.

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 decreases banks' portfolio risk in affected countries

Probability of default of borrowers of a bank within an MNC

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

→ **with a higher CCyB the average bank borrower risk in affected countries decreases**

➔ The change in bank portfolio risk is heterogeneous!

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	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

➔ **Banks' portfolio risk decreases in affected countries but increases for indirectly affected parents** (otherwise included in control group)

What is the effect of a higher CCyB on the funding structures of MNCs?

Firms' internal capital markets

How do internationally operating firms respond to national macroprudential policies affecting the banks they borrow from?

- MNCs have the possibility to circumvent unfavorable financing conditions

    → shift bank borrowing to unaffected firms in the MNC

    → use internal capital markets

<u>Our analysis:</u>

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

- Is the credit substitution complete?

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

ΔCCyB = + 1 pp

MNC Subsidiary

31%

MNC Parent

CCyB = 0

Panel A. All 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 (%)	0.261***	0.312***	0.007*	0.009**	0.017***	0.019***
	(4.464)	(4.472)	(2.019)	(2.400)	(4.517)	(4.745)
FIXED EFFECTS						
Year:quarter	Yes	Yes	Yes	Yes	Yes	Yes
Firm	Yes	Yes	Yes	Yes	Yes	Yes
Industry x Year:quarter	No	Yes	No	Yes	No	Yes
Observations	53,050	53,050	53,050	53,050	52,945	52,945
Adj. R-squared	0.805	0.809	0.793	0.797	0.753	0.757

-

CCyB ↑ 1 percentage point (pp)

→ roughly one-third higher parental debt

Δ CCyB = + 1 pp

Δ LR = 0

MNC Subsidiary

31%

-8.6%

BANK

MNC Parent

CCyB = 0

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

	All subsidiaries		Subsidiaries, excl. subs. with other affected subs. in the MNC	
	log(liabilities)	liabilities / total assets	log(liabilities)	liabilities / total assets
	(1)	(2)	(3)	(4)
CCyB rate (%)	-0.017	-0.009	-0.021	-0.008
	(-0.421)	(-0.983)	(-0.498)	(-0.919)
FIXED EFFECTS				
Year:quarter	Yes	Yes	Yes	Yes
Firm	Yes	Yes	Yes	Yes
Industry x Year:quarter	Yes	Yes	Yes	Yes
Observations	50,441	53,050	44,398	46,727
Adj. R-squared	0.930	0.897	0.931	0.901

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

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	log(liabilities)	liabilities / total assets	log(liabilities)	liabilities / total assets
	(1)	(2)	(3)	(4)
CCyB rate (%)	-0.017	-0.009	-0.021	-0.008
	(-0.421)	(-0.983)	(-0.498)	(-0.919)
FIXED EFFECTS				
Year:quarter	Yes	Yes	Yes	Yes
Firm	Yes	Yes	Yes	Yes
Industry x Year:quarter	Yes	Yes	Yes	Yes
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Adj. R-squared	0.930	0.897	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?

ΔCCyB = +1 pp

ΔLR = 0

MNC Subsidiary

31%

5%

BANK

MNC Parent

13.1%

NONBANK

CCyB = 0

	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 nonbanks change their risk-taking?

- **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%

- **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

→ Smaller additional credit amounts for riskier parents translate into less internal funding to affected subsidiaries;

→ not related to risk of subsidiary itself.

Conclusion

Conclusion
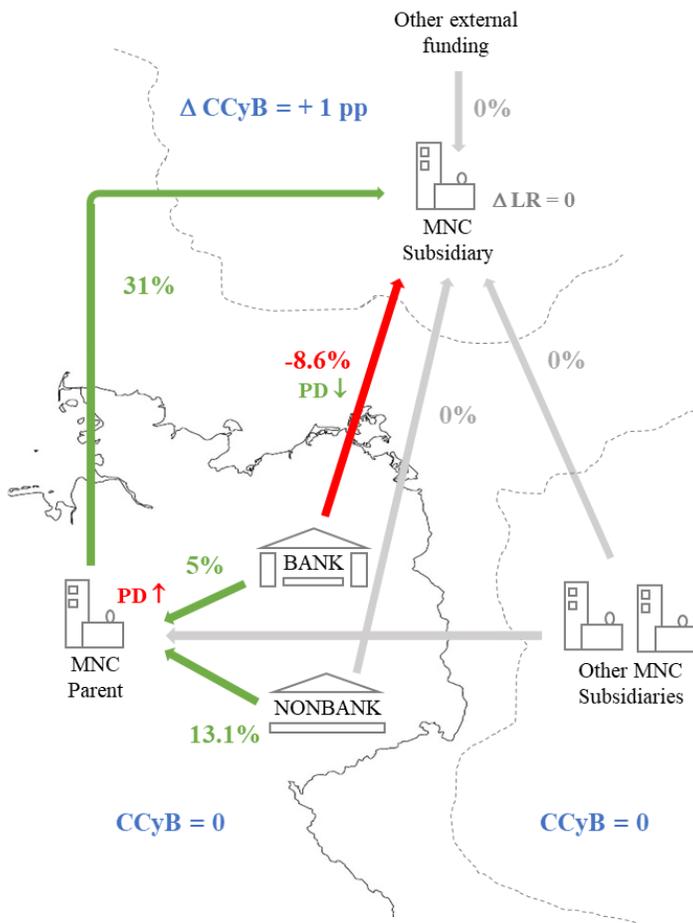
- CCyB reciprocity rules prevent regulatory arbitrage through international bank lending. Banks reduce and nonbanks do not increase their market share.

- However, MNCs circumvent CCyBs through the use of their 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.

Some words of caution
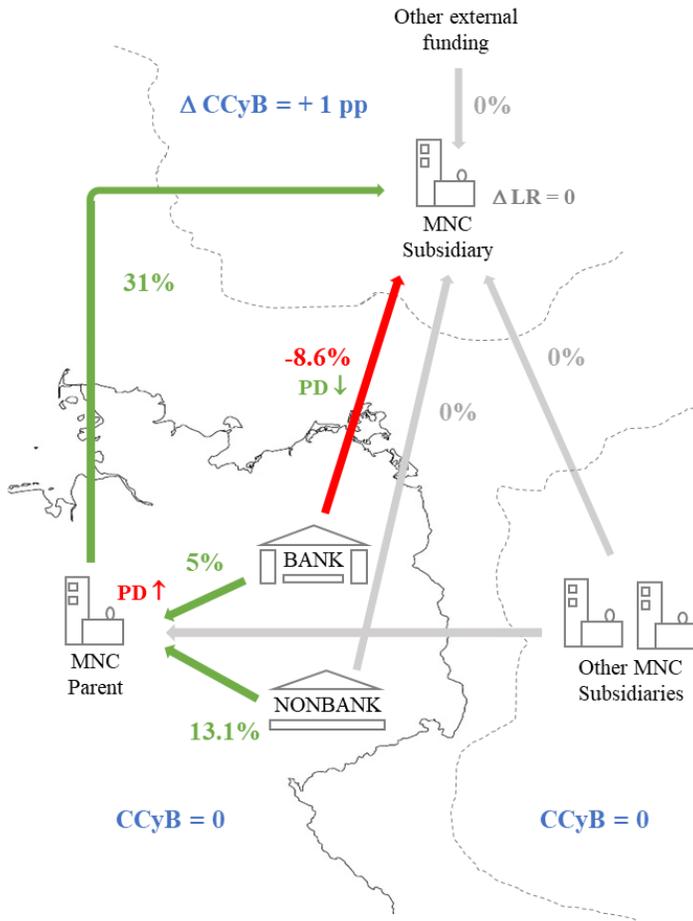
- Effect of CCyB on funding of standalone firms might be different.

- We are silent on potential (longer-term) feedback effects.

- We cannot unveil who triggers the leakage (banks or borrowers).

- We only focused on the build up phase of the CCyB.

- ….