The Shifting Drivers of Global Liquidity

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Motivation

- International capital flows
  - channel large volumes of financial resources across borders
  - critically important for macroeconomic growth and financial stability
  - can be volatile, especially “global liquidity” components

- Understanding the key drivers and volatility are crucial.

- Existing literature has identified two sets of drivers:
  - Local drivers (*GDP growth, Financial openness, Country risk*)
  - Global drivers (*AE MP, Global Risk Aversion, Global GDP growth*)
  - US monetary policy received particular attention (criticism) post crisis

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  - Global drivers (*AE MP, Global Risk Aversion, Global GDP growth*)
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- Little attention has been paid to the time variation in the sensitivities of capital flows to their main drivers, and the reasons for this variation.
  - Focus of this paper!

Main Questions

- How have the sensitivities of international debt flows to the main global drivers changed over time, and since the GFC?

- What are the reasons behind the post-GFC evolution?

  - Transition to more market-based finance

  - Change in the composition of banks involved in global flows

  - Characteristics of the banks involved in global flows

  - Business and policy cycle synchronicity

Key Findings

1. **Large post-GFC changes in global liquidity sensitivity to global factors**
   - **US monetary policy**: stronger impacts on loan and bond flows
   - **Global risk condition:**
     - Bank loan flows: weaker impacts
     - Bond flows: stronger impacts
     - Convergence in sensitivities between loan and bond flows
2. **Behavioral and compositional explanations**
   - US MP: sensitivity changes due to **behaviors of lenders**
     - national banking system creditors became more sensitive to US MP.
     - sensitivity increased with convergence across AE monetary policies
   - Global Risk: sensitivity changes due to **composition of lenders**
     - lending shares shifted towards banking systems with lower-sensitivities.
3. **Better-capitalized banking systems less** sensitive to US MP and global risk;

Key Findings

Chorus of critiques of US monetary policy (eg. Rey 2015) coincided with peak convergence of AE monetary policy paths, weakness of some banking systems previously involved in global liquidity flows, and only partial transition of global roles away from those weaker systems.

Voluminous Literature

On the drivers of international capital flows, push pull factors, the global financial cycle, crises, and increasingly on micro composition and constraints on particular types of players in global finance

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Milesi-Ferretti and Tille (2011)

Forbes and Warnock (2012)

Fratzscher (2012)

Cerutti, Claessens and Ratnovski (2014)

Bruno and Shin (2015a and 2015b)

Rey (2015)

Miranda-Agrippino and Rey (2015)

McCauley, McGuire, Sushko (2015)

Koepke (2015)

Forbes et al (2015)

Correa, Paligorova, Sapriza and Zlate (2017)

Cerutti, Claessens and Rose (2017)

Cerutti and Claessens (2017)

Avdjiev and Hale (2018)

Goldberg and Krogstrup (2018)

Size and drivers of the global factor

Empirical Approach

Part 1

- Global liquidity flows from the **borrowing country perspective**
- Estimate impact of global and local drivers on
  - Cross-border loans
  - International debt securities
- Endogenously identify structural break points
- Quantify (pre- vs. post-break) shifts in sensitivities

Part 2

- Introduce **lending bank nationality** dimension (BIS CBS)
- Decompose changes in the post-GFC sensitivities
  - composition (international lending shares)
  - behaviors (lender-specific sensitivities)

Part 3

- Identify the main determinants of the lender-specific shifts and time variation
  - Bank capitalization, bank size, global banking business model
  - Macro-prudential policy changes
  - Policy cycle convergence (divergence) across AEs

Data

- Quarterly panels
  - 64 borrowing countries
  - 31 lending bank nationalities
  - 2000:Q1 to 2015:Q4
- Main focus is on the **two main components of global liquidity, with distinctions by types of borrowers (bank, nonbank)**.
  - Cross-border bank loans (BIS IBS)
  - International debt securities (BIS IDS)
- **US Monetary Policy**: Wu and Xia (2015) shadow policy rates (plus robustness)
- **Global risk aversion**: VIX (plus robustness)
- **Capital Account Openness**: Chinn-Ito index.
- **Bank characteristics**: capitalization ratios, size, global credit business model

XBL and IDS, typical lenders and borrowers

	Typical Lenders	Typical Borrowers	*Notes*
XB loans to banks	Internationally-active banks	Banks (all sizes)	*Interbank market (unsecured and repo)*
XB loans to nonbanks	Internationally-active banks	Large non-financial corporates; exporting/importing firms; Leveraged non-bank financials	*Syndicated loan market; trade credit; project financing*
IDS issued by banks	Pension funds; Insurance companies; Money Market Mutual Funds; Hedge funds	Large and mid-sized banks	*Smaller investor base than for IDS issued by non-banks*
IDS issued by non-banks	Pension funds; Insurance companies; Mutual Funds; Hedge funds	Non-financial corporates; governments; Insurance companies	*Broader investor base than for IDS issued by banks*

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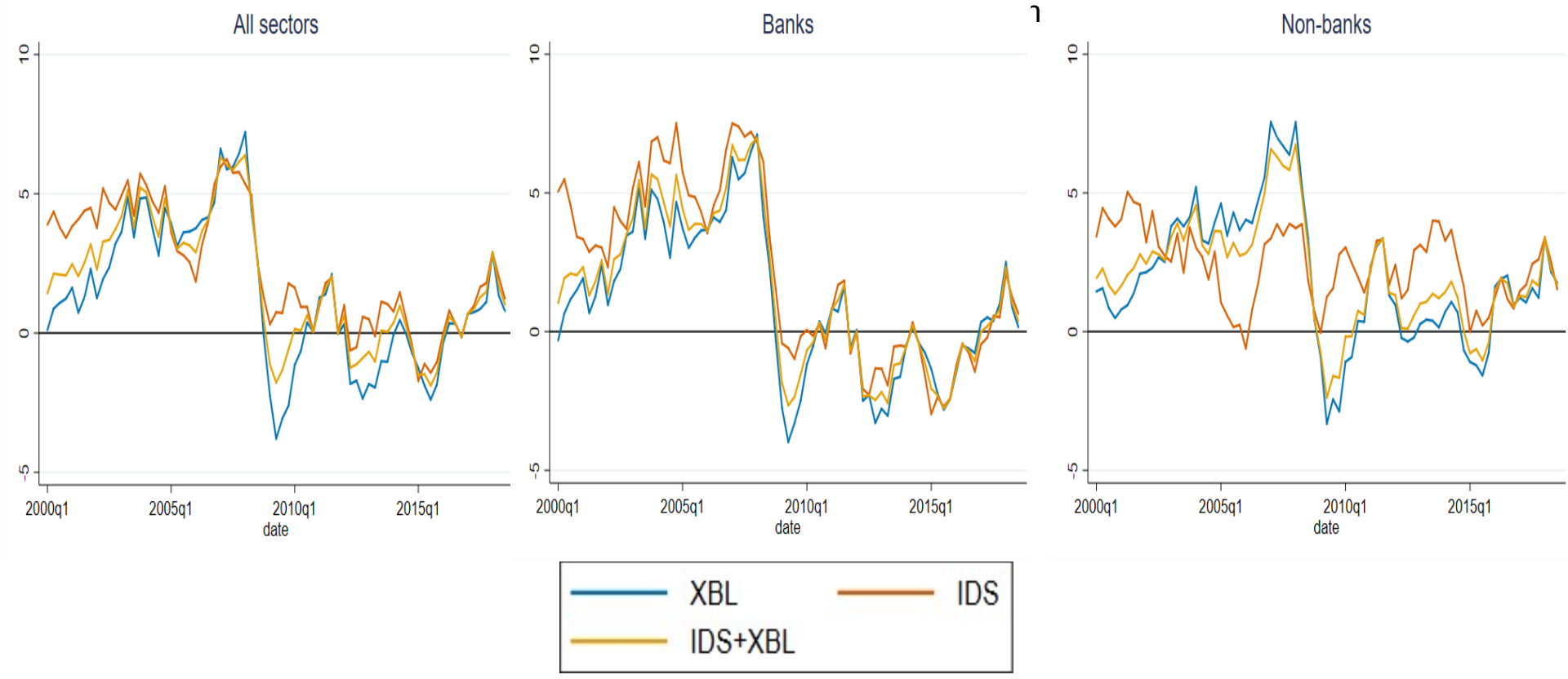
Global liquidity components volatile, strongest for bank lenders to bank borrowers

XB Global Liquidity, all countries, borrower perspective



Quarterly Growth Rate$_t$ = $(Outstanding\ Stock_t / Outstanding\ Stock_{t-1}) - 1$

XBL = Cross-border loans, IDS = International Debt Securities

Data Source: BIS Locational Banking Statistics, International Debt Securities

Baseline Analysis

- Baseline estimation:
  - $GrRateY_t^j = \boldsymbol{\beta_1}\Delta FFR_t + \boldsymbol{\beta_2} logVIX_t + \beta_3 \Delta logGlobalGDP_t + \beta_4 \Delta logGDP_t^j + \beta_5 \Delta SovRating_t^j + \beta_6 ChinnIto_t^j + \mu^j + \varepsilon_t^j$

- Endogenously identify **structural break points**
  - [Bai (1997) and Kurozumi (2002)]
  - Strong evidence of structural breaks in Q1/2009.

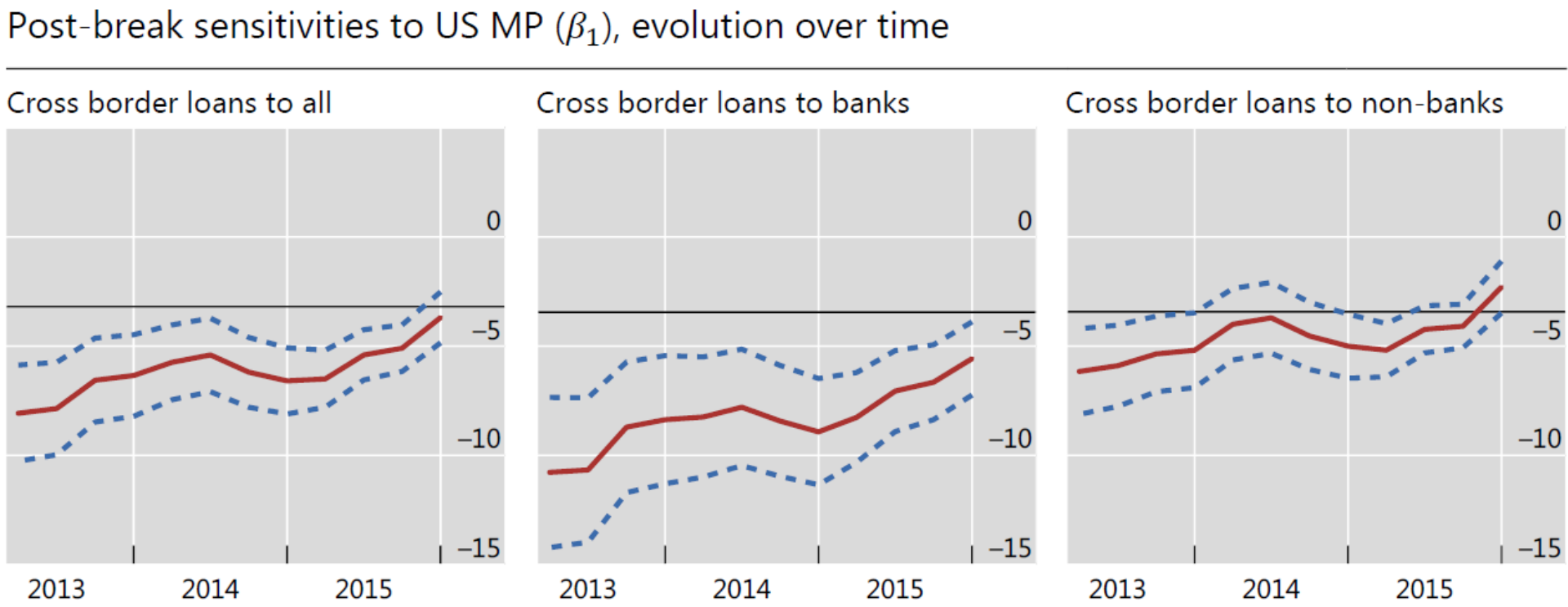
- Benchmark estimation with structural breaks:
  - $GrRateY_t^j = \beta' X_t^j + \mu^j + I\left(t \geq T_{break}^Y\right)\left(\kappa + \gamma' X_t^j\right) + \varepsilon_t^j$

Baseline model confirms findings of prior literature: higher US policy and more risk contract global liquidity flows

	Dependent variable: ΔCross-border loans			Dependent variable: ΔInternational debt securities		
Explanatory variables	All	to banks	to non-banks	All	by banks	by non-banks
ΔFed funds rate	**-1.95*** **	**-2.48*** **	**-1.86*** **	**-1.76*** **	**-2.26** **	**-1.44** **
Log(VIX)	**-2.75*** **	**-2.51*** **	**-3.10*** **	**-2.31*** **	**-5.22*** **	**-1.49***
ΔReal GDP	0.53***	0.57***	0.50***	0.09	0.21	0.08
ΔSovereign rating	2.80***	4.37***	0.03	0.56	-1.50	0.29
Chinn-Ito index	-1.35	-3.03	0.30	8.11***	10.72**	4.87
ΔReal global GDP	0.50***	0.81***	0.34**	0.00	-0.18	-0.15
Observations	3,327	3,327	3,327	3,327	2,961	3,326
R-squared	0.11	0.07	0.07	0.05	0.03	0.03

Structural break tests point to large change in sensitivities to US MP, pre vs post-break

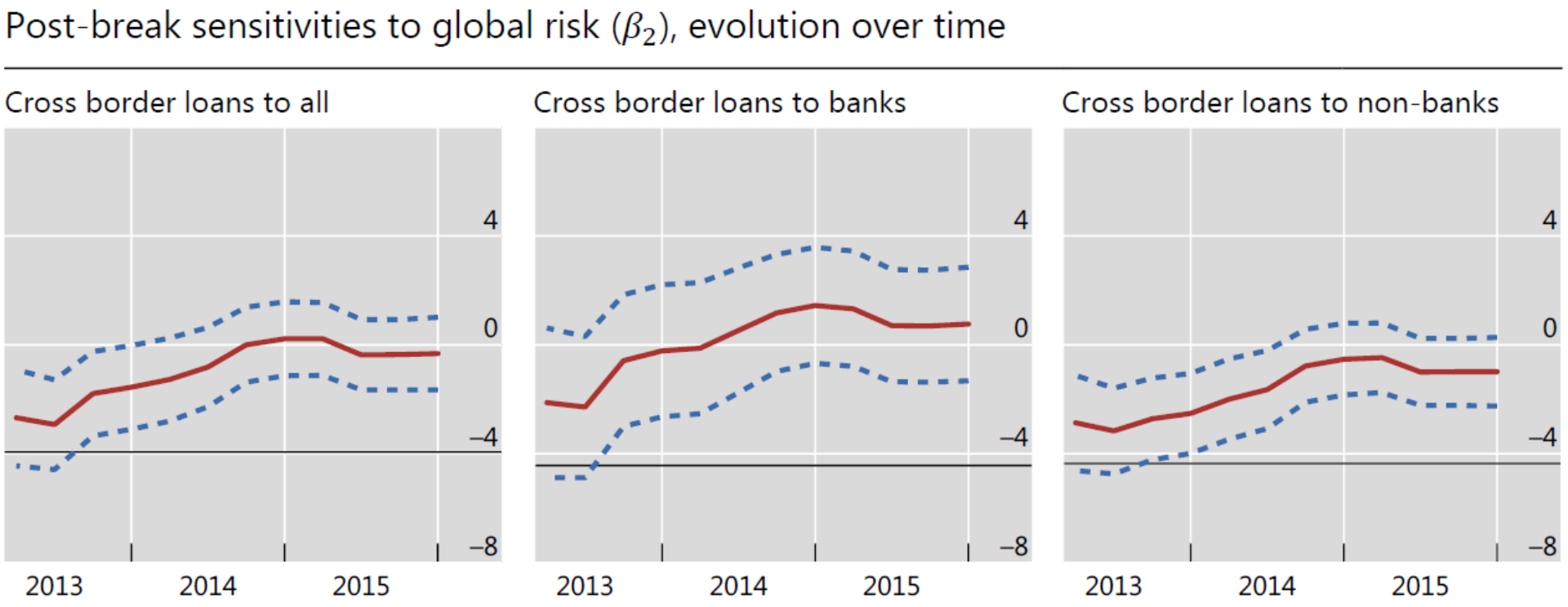
- The sensitivity of international bank lending to **US MP**
  - **rose substantially** in the immediate aftermath of the GFC,
  - **peaked** around the time of the 2013 Fed "taper tantrum",
  - then **partially reverted** towards pre-crisis levels.



Solid black line is pre-break estimate

Bank sensitivities to VIX weakened, pre vs post-break

- The responsiveness of international bank lending to **global risk conditions**
  - **declined considerably** post-crisis;
  - became similar to that of international debt securities.



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Previously distinct sensitivities for bank-based v. market-based finance converge in the post-crisis period.

Table 4 – Convergence between loan and bond sensitivities

	Coefficients (XBL†) – Coefficients (IDS‡)		
Explanatory variables	All	to banks	to non-banks
Pre			
ΔFed funds rate (1)	-1.77*	-2.18*	-2.52**
Log(VIX)	-2.85**	1.20	-4.14**
Post			
ΔFed funds rate (1)	1.51	4.25	2.59**
Log(VIX)	1.23	2.02	-0.15

Notes: The sample includes quarterly data for 64 recipient countries over the period 2000:Q1 - 2015:Q4. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.
† cross-border loans to borrowers in country j.
‡ international debt securities issued by borrowers in country j. (1) Effective federal funds rate for the period 2001:Q1 – 2008:Q4, Wu-Xia Shadow rate for the period 2009:Q1 – 2015:Q4. The regressions include ΔReal GDP, ΔSovereign Ratings, Chinn-Ito Index, ΔReal Global GDP and a break dummy that takes value 1 after the break date (2009:Q1). The regressions also include a full set of country fixed effects.

Decomposing the post-crisis shifts in sensitivities

From a borrower's perspective, shits in sensitivities may be driven by:

- changes in **composition** of lenders (compositional component).
- changes in **sensitivities** of lenders (behavioral component).

Sensitivities to global factors (β_k) are weighted averages of the respective lender-specific sensitivities (β_k^i).

- $\Delta\beta_k$ has a behavioral component and a compositional component:

$$\boldsymbol{\Delta\beta_k} = \sum_i \{ \left(\boldsymbol{\Delta\beta_k^i}\right) \cdot \boldsymbol{w_{pre}^i} + \left(\boldsymbol{\Delta w^i}\right) \cdot \boldsymbol{\beta_{k,post}^i} \}$$

Using the BIS CBS we:

- estimate lending *bank nationality-specific* ***sensitivities***;
- obtain *international lending* ***shares*** for each bank nationality.

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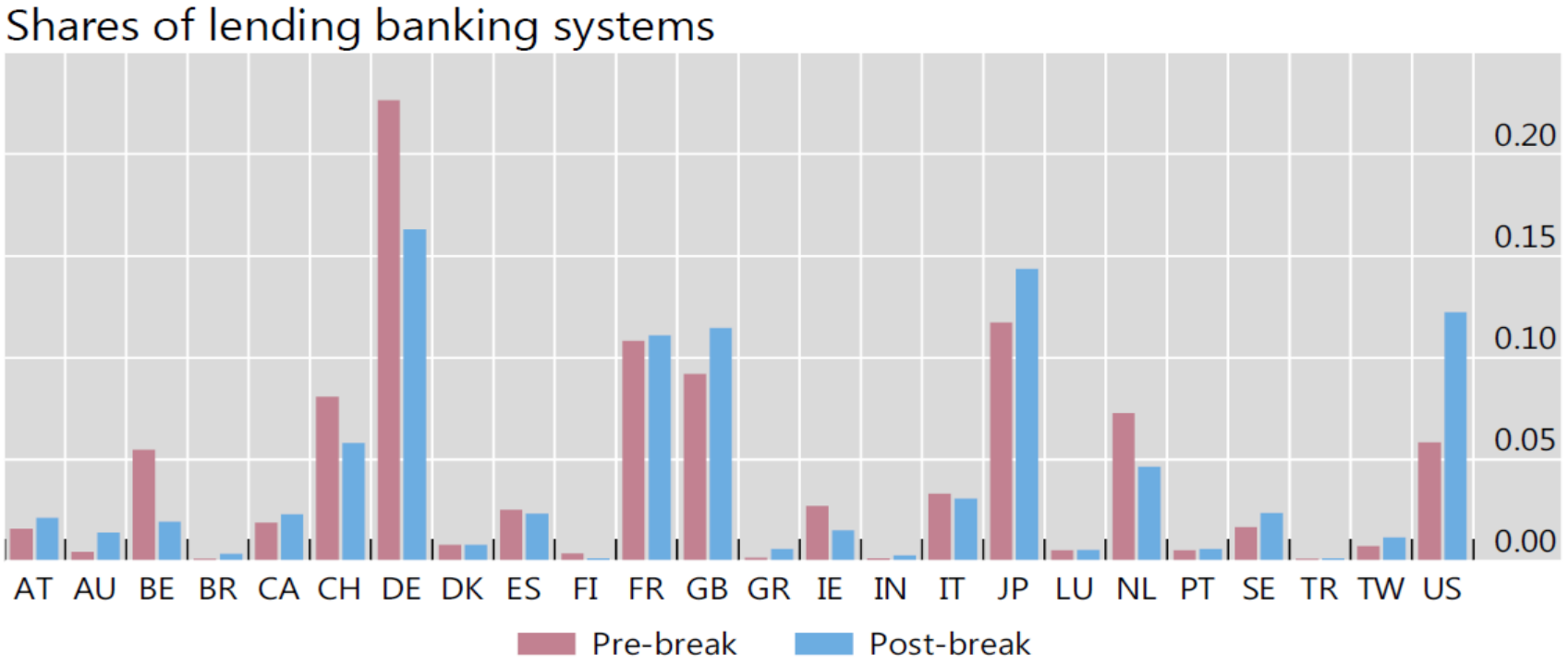
Banking systems more weakly capitalized and with smaller banks were initially most responsive, and lost cross-border lending market share post crisis.

Declined sensitivity to VIX due to a compositional effect, where some of the more responsive banking systems lost market share

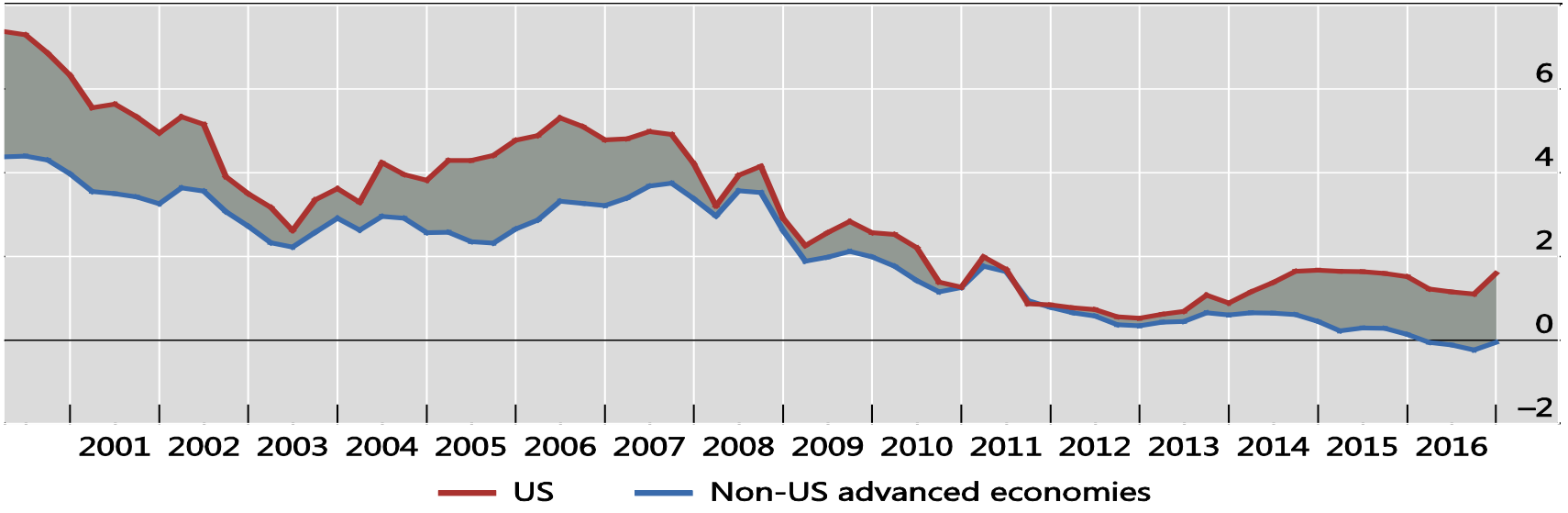
- The post-crisis decline in the responsiveness of international bank lending to global risk was due to a **compositional effect**.
- Market **share increased** for **lower sensitivity** banking systems, which were ex-ante **better capitalized**.
- This effect is likely to be more **persistent**.



Increased sensitivity of lending banking systems to FFR partly due to convergence across AEs in MPs

- Fluctuations in the sensitivities of individual lending banking systems - driven by the post-crisis **convergence in AE MPs**.
- Since MP convergence was temporary, the increase in sensitivities to US MP is also likely to be **transitory**.

2-year futures on the policy rate



Conclusions

Sensitivities of global liquidity components to global drivers **changed** considerably post-crisis

- much m**ore responsive** to changes in **US MP due to policy convergence across AEs** through 2013 **(transitory)**

- responsiveness to global risk conditions converged across types of international debt participants:
  - **declined** for cross-border **loan** flows
    - Lending market **shares shifted** towards **lower-sensitivity** banking systems (better capitalized banks)
    - Regulatory changes reduced incentives to take on risky positions.
  - **increased** for international **bonds** flows
    - Warrants more investigation:
    - Did the marginal more risky borrower move to corporate bonds?
    - How do the financial frictions and reaction functions of banks v. market-based finance compare?
    - What role of regulation?

Invest more in understanding the dynamics and behaviors in the

new global financial configuration!

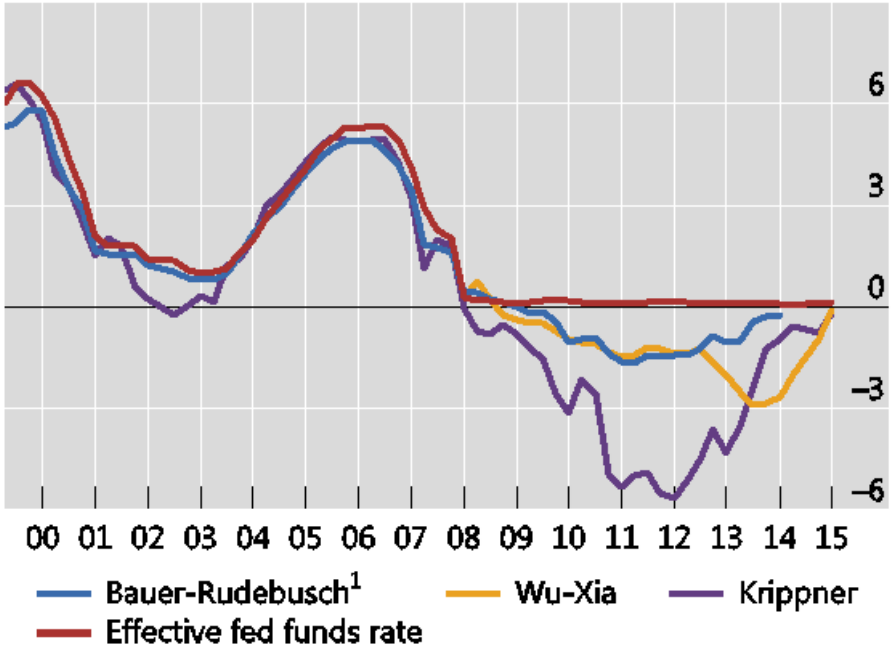
Thank you!

Supplementary Slides

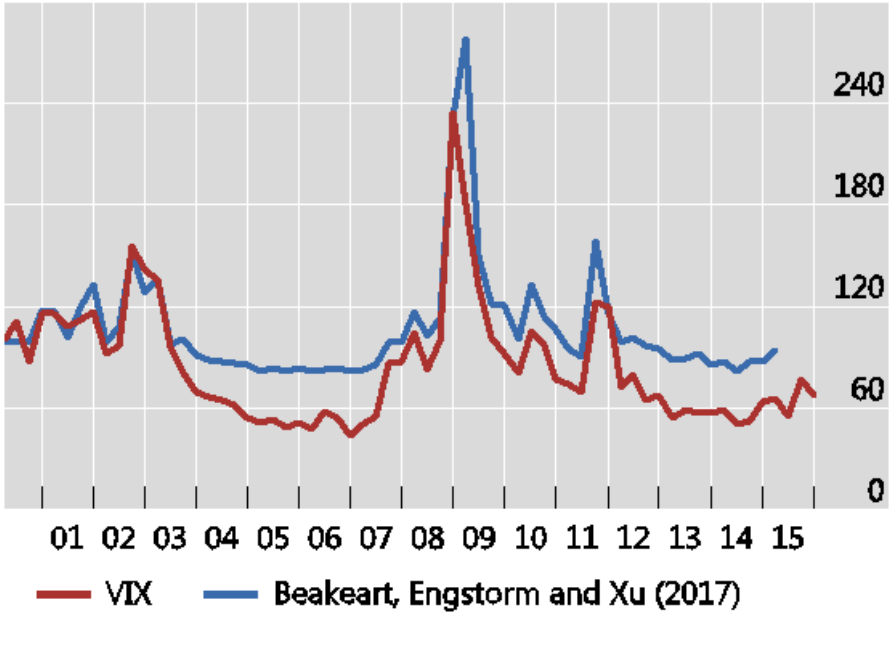
US policy rates and measures of global risk conditions

Graph 2

US policy rates



Alternative measures of global risk conditions



[1] Median of 12 shadow rate estimates.

Sources: Bauer and Rudebusch (2016); Beakeart, Engstorm and Xu (2017); Krippner (2014); Wu and Xia (2015); Datastream.

Table 7 - Monetary Policy Divergence in Time Varying Sensitivities

Explanatory variables	Cross-border loans				
Post					
ΔFFR (1)	-9.437***	-11.31***	-8.428***	-5.913**	-5.987**
Log(VIX)	-4.647***	-3.790	-4.548***	-4.378**	-3.628*
ΔFFR (1) * PolicyDivergence (2)	8.739***	8.334***	8.585***	7.707***	7.963***
Log(VIX) * PolicyDivergence (2)	10.06***	10.28***	10.26***	7.051***	6.702***
Lenders' capitalization (3)	no	yes	no	no	yes
Lenders' profitability (4)	no	no	yes	no	yes
Lenders' interest margins (5)	no	no	no	yes	yes
Borrowing country FE	yes	yes	yes	yes	yes
Observations	3,377	3,327	3,327	3,327	3,327
R-squared	0.168	0.172	0.181	0.176	0.197

Table 7 - Monetary Policy Divergence in Time Varying Sensitivities (cont.)

Explanatory variables	International debt securities				
Post					
ΔFFR (1)	-5.913**	-8.95**	-7.164**	-5.85	-6.86*
Log(VIX)	-4.378**	-8.65**	-5.767**	-3.81	-2.44
ΔFFR (1) * PolicyDivergence	2.789	2.129	0.386	2.670	0.200
Log(VIX) * PolicyDivergence	5.361*	5.012	3.464	4.539	1.564
Lenders' capitalization (3)	no	yes	no	no	yes
Lenders' profitability (4)	no	no	yes	no	yes
Lenders' interest margins (5)	no	no	no	yes	yes
Borrowing country FE	yes	yes	yes	yes	yes
Observations	3,377	3,327	3,327	3,327	3,327
R-squared	0.071	0.075	0.081	0.074	0.089

Changes in sensitivities: pre- vs post-crisis, summary

β_1

Fed Funds rate	Borrower	
	Banks	Non-banks
Loans (LBS)	Strengthens	Strengthens
Bonds (IDS)	Strengthens	Strengthens

β_2

VIX	Borrower	
	Banks	Non-banks
Loans (LBS)	Weakens	Weakens
Bonds (IDS)	Weakens	Strengthens

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Table 6 - Drivers of the shifts in lender-specific weights

	Dependent variable: Change in the lending national banking system weights $w^{Postbreak} - w^{PreBreak}$		
Explanatory variables	(I)	(II)	(III)
Pre-break capital ratio (2008)	0.189**	0.205**	0.238**
Pre-break average bank size (2008)	0.507*	0.464	0.537*
Local claims over Foreign claims (2008)			0.051**
Prudential measures and regulatory stringency index (1)	yes	yes	yes
Other controls (2)	no	yes	yes
Sectoral fixed effects	yes	yes	yes
Observations	87	87	75
Adjusted R-squared	0.097	0.119	0.235

Table 5 - Drivers of the shifts in lender-specific sensitivities

	Dependent variable: Structural change in the coefficient for ΔFed funds rate $\beta_1^{Post} - \beta_1^{Pre}$		Dependent variable: Structural change in the coefficient for Log(VIX) $\beta_2^{Post} - \beta_2^{Pre}$	
Explanatory variables	(I)	(II)	(III)	(IV)
Pre-break capital ratio (2008)	0.507**	0.371*	0.706**	0.788**
Pre-break average bank size (2008)	1.340**	1.343**	1.194	1.369
Prudential measures and regulatory stringency index (1)	yes	yes	yes	yes
Other controls (2)	no	yes	no	yes
Sectoral fixed effects	yes	yes	yes	yes
Observations	275.4	242.6	240.8	230.9
Adjusted R-squared	0.277	0.347	0.245	0.231

Table 3 - Locational baseline regressions (by borrowing country) with structural breaks

	Dependent variable: ΔCross-border loans †			Dependent variable: ΔInternational debt securities ‡			Dependent variable: ΔTotal cross-border flows (loans and debt securities)		
	All	to banks	to non-banks	All	by banks	by non-banks	All	to banks	to non-banks
Pre-break									
ΔFF (1)	-3.19***	-3.44***	-3.42***	-1.42	-1.26	-0.90	-2.07***	-2.57***	-2.09***
	(0.49)	(0.81)	(0.56)	(1.03)	(1.36)	(1.20)	(0.36)	(0.71)	(0.37)
VIX (2)	-3.94***	-4.43***	-4.36***	-1.09	-5.63**	-0.21	-3.11***	-4.09***	-2.70***
	(0.94)	(1.63)	(1.07)	(1.28)	(2.66)	(1.56)	(0.67)	(1.39)	(0.69)
Post-break - up to 2013:Q1									
ΔFF (1)	-8.07***	-10.79***	-6.16***	-8.17***	-20.23	-8.00***	-7.96***	-11.50***	-6.44***
	(1.336)	(2.088)	(1.188)	(2.510)	(12.75)	(2.542)	(1.00)	(1.96)	(0.93)
VIX (2)	-2.68**	-2.12	-2.87***	-3.07**	-5.60	-2.51*	-3.14***	-2.73*	-2.88***
	(1.071)	(1.671)	(1.063)	(1.476)	(5.225)	(1.517)	(0.83)	(1.61)	(0.79)
Post-break - up to 2015:Q4									
ΔFF (1)	-3.68***	-5.56***	-2.29***	-5.19***	-9.82***	-4.88***	-4.37***	-5.84***	-3.85***
	(0.71)	(1.02)	(0.72)	(0.92)	(3.79)	(0.93)	(0.47)	(0.84)	(0.49)
VIX (2)	-0.32	0.77	-0.99	-1.55	-1.25	-0.83	-1.18*	0.41	-1.13*
	(0.81)	(1.27)	(0.77)	(1.06)	(3.12)	(1.04)	(0.60)	(1.18)	(0.58)

Notes: The sample includes quarterly data for 64 recipient countries over the period 2000:Q1 - 2015:Q4. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. † to borrowers in country j. ‡ issued by borrowers in country j. (1) Effective federal funds rate for the period 2001:Q1 – 2008:Q4, Wu-Xia Shadow rate for the period 2009:Q1 – 2015:Q4. (2) Log(VIX). The regressions include ΔReal GDP, ΔSovereign Ratings, Chinn-Ito Index, ΔReal Global GDP and their interaction with a break dummy that takes value 1 after the break date (2009:Q1). The regressions also include a full set of country fixed effects.

Behavioural vs. compositional components

- **Behavioural component (lender-specific sensitivities)**
  - main driver of shifts in sensitivities to US MP;
  - increases (the absolute values of) the estimated sensitivities.
- **Compositional component (lender weights)**
  - decreases (the absolute values of) the estimated sensitivities;
  - main driver of shifts in sensitivity to VIX.