The international bank lending channel of unconventional monetary policy

Johannes Gräb Dawid Żochowski

European Central Bank

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Outline

Motivation

- Sharp increase in international financial integration
  - Tremendous rise in cross-border financial positions has magnified geographical interconnection among financial markets
- Interlinkages between euro area banks and non-euro area financial markets increased
  - Growing foreign claims of EA banks on non-EA residents and increasing claims of non-EA residents on EA banks
- Rise in financial globalization may have resulted in increased spillovers of monetary policy shocks on financial markets

Motivation

- Monetary policy transmission operates through number of channels that potentially propagate monetary conditions abroad
- Increased interconnectedness of global banks has turned attention to international bank linkages (Cetorelli and Goldberg, 2011; Kalemli-Ozcan et al., 2013),
  - including international bank lending channel of monetary policy (Temesvary et al., 2015; Morais et al., 2015).
- Bulk of literature has focussed on standard monetary policy
  - International bank lending channel of unconventional monetary policy somewhat different to traditional bank lending channel (Bernanke and Blinder, 1988; Kashyap and Stein, 1994)

This paper

- Investigates international bank lending channel of both, conventional and unconventional monetary policy
- Uses common methodology put forward in context of International Bank Research Network (IBRN)
- Uses confidential EA bank-level data set on 250 banks
- Assesses inward and outward spillovers
- Distinguish between impact of conventional and unconventional monetary policy changes

Main findings

- EA banks increase lending to rest of the world in response to ECB unconventional monetary policy accommodation
  - No evidence for international bank lending channel of conventional monetary policy accommodation
- EA banks increase lending to domestic non-financial private sector in response to foreign central bank balance sheet expansions
- Strong evidence for existence of international bank lending channel
  - Bank-specific supply effects driver of monetary policy spillovers
  - Inward and outward spillovers stronger for EA banks which are liquidity constraint and rely more on internal capital markets

Traditional bank lending channel

- Existence of bank lending channel in transmission of monetary policy established by Bernanke and Blinder (1988); Kashyap and Stein (1994)
  1. In response to monetary policy tightening interest rates increase and reservable bank deposits drop
  2. Aggregate demand and thus lending demand falls leading to a drop in deposit supply
  3. Banks might have to cut lending if they cannot access alternative sources of funding (commercial papers, intragroup funding)

International bank lending channel of unconventional monetary policy

- Bank lending channel of UMP operates differently compared to traditional bank lending channel
  1. Accommodative UMP shock: interest rates in that country decline across maturity spectrum and supply of money (M3) increases
  2. Greater availability of broad money enables domestic banks to increasingly lend abroad
  3. As a result foreign banks are subject to positive funding shock
- Spillovers particularly pronounced at times of increased international banking flows, and if monetary policy cycles are not perfectly synchronised

Identification challenges—Exogeneity of monetary policy changes

- For inward spillovers, foreign monetary policy changes need to be exogenous to EA economic conditions and ECB monetary policy
  - Should hold for US, Japan; less so for UK
- For outward spillovers, domestic monetary policy needs to be exogenous to foreign monetary policy and to domestic and foreign economic conditions
  - Address endogeneity concerns using Taylor-rule proxy

Identification challenges—Identification of bank-specific shocks

- Isolate bank-specific shock from other macro effects of monetary policy
- Disentangle credit supply from credit demand shocks
  - Credit demand effects: general macro effects of monetary policy
  - Credit supply effects: change in banks' ability to lend following monetary policy shock
- Follow Stein and Kashyap (2000) and test to what extent back balance sheet characteristics matter

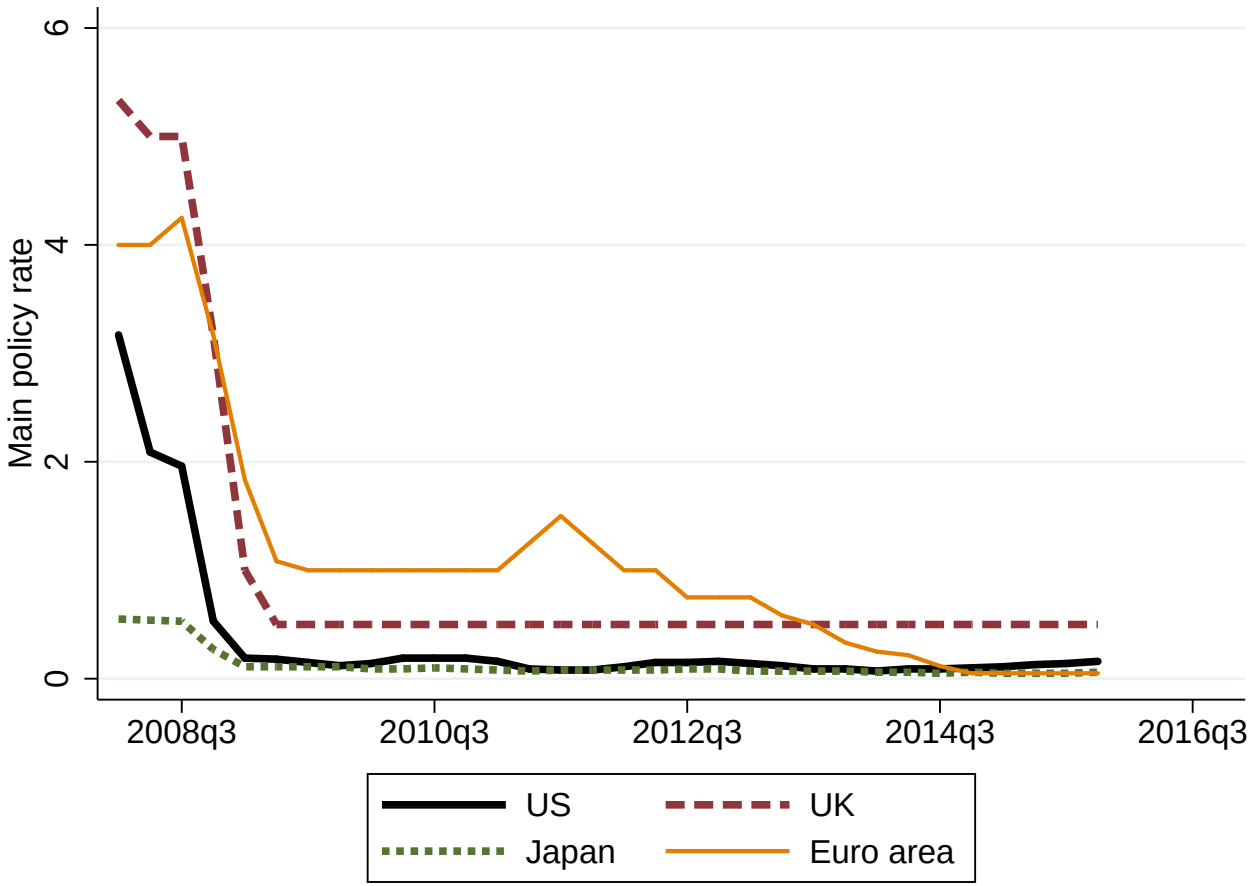
Testable hypothesis

1. Domestic banks should increase lending in response to accommodative unconventional monetary policy measures abroad
2. Domestic banks should increase cross-border lending in response to domestic accommodative unconventional monetary policy
3. Effects should be stronger for banks that have lower liquid asset ratio or larger stronger internal capital market funding
   - Banks which rely more on intra-group funding forms more exposed to foreign monetary policy shocks to extent that foreign banks reduce cross-border claims
   - Banks that have a higher liquid asset ratio could sell those liquid assets without the need to curbing lending

Data

- Bank-level data of MFIs balance sheet items (BSI)
  - Confidential locational BSI (assets and liabilities) statistics for 250 MFIs from all EA countries, excluding France
  - Sample period: July 2007 to September 2016 at monthly frequency (collapsed to quarterly frequency) ▸ Loans
- Country-level data
  - Country-specific estimates of output and credit gaps
- Monetary policy changes
  - Main policy rates to capture conventional monetary policy
  - Changes in central bank balance sheets (over GDP) to capture unconventional monetary policy
  - Shadow policy rates to capture both conventional and unconventional monetary policies (taken from Krippner (2013)) ▸ SSR

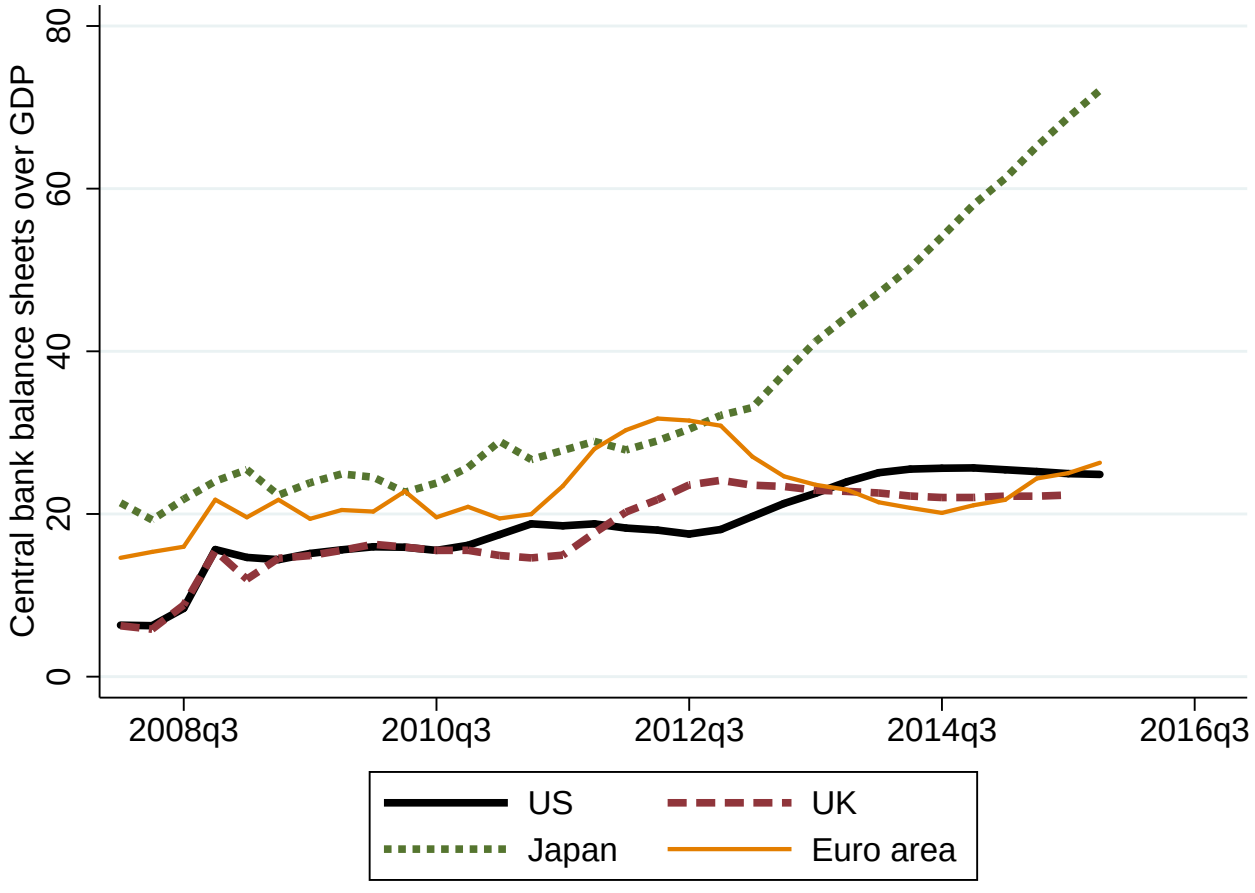
Development of main policy rates across major jurisdictions



Notes: For the euro area the policy rate is the MRO

return

Development of central bank balance sheets



Notes: Central bank balance sheets as a ratio over GDP.

return

Bank controls

- Control for bank characteristics which are important for monetary policy transmission, reflecting both bank credit and bank capital channels
  - Banks' total assets $(Log\ total\ assets_{b,t-1})$
  - Banking organization's regulatory Tier 1 risk-based capital to asset ratio $(Tier1\ ratio_{b,t-1})$
  - Liquid asset ratio or percentage of a bank's portfolio of assets that is liquid $(Liquid\ asset\ ratio_{b,t-1})$
  - Ratio of retail deposits to total liabilities $(Core\ deposits\ ratio_{b,t-1})$
  - Percentage of banking organization's net intragroup funding scaled by total assets $(Net\ intragroup\ funding\ ratio_{b,t-1})$

Transmission channels

- ECB BSI MFI statistics do not contain any bilateral country-specific information on the source (destination) country of cross-border liabilities (assets)
- Bank-specific transmission channels to establish an international bank lending channel
  - Liquid asset ratio
  - Dependence on short-term funding of the domestic bank
  - Dependence on intragroup funding forms
  - Total assets

Outward transmission of monetary policy

- Outward perspective: impact of ECB UMP measures on lending behaviour of EA MFIs to non-EA residents

$$\Delta Y_{b,t} = \alpha_0 + \sum_{k=0}^{K}(\alpha_{1,k}\Delta MP^{EA}_{t-k} + \alpha_{2,k}\Delta QE^{EA}_{t-k}) + \alpha_3 X_{b,t-1} + \alpha_4 Z^{domestic}_{t-1} + \alpha_5 Z^{foreign}_{t-1} + \alpha_6 \Delta MP^{US}_{t-1} + \alpha_7 VIX_{t-1} + f_b + \epsilon_{b,t}, \quad (1)$$

- Outward specification establishing international bank lending channel

$$\Delta Y_{b,t} = \alpha_0 + \sum_{k=0}^{K}(\alpha_{1,k}\Delta MP^{EA}_{t-k} * Channel_{b,t-K-1} + \alpha_{2,k}\Delta QE^{EA}_{t-k} * Channel_{b,t-K-1}) + \alpha_3 * Channel_{b,t-K-1} + \alpha_4 X_{b,t-1} + f_b + \epsilon_{b,t}, \quad (2)$$

Inward transmission of monetary policy

- Inward perspective: impact of foreign UMP on lending behaviour of EA MFIs to the private non-financial sector

$$\Delta Y_{b,t} = \alpha_0 + \sum_{ctry}\left(\sum_{k=0}^{K} \alpha_{1,k}^{ctry} \Delta QE_{t-k}^{ctry}\right) + \alpha_2 X_{b,t-1} + \alpha_3 Z_{t-1} + \alpha_4 \Delta MP^{EA} + \alpha_4 VIX_{t-1} + f_b + \epsilon_{b,t}, \tag{3}$$

- Inward specification testing for international bank lending channel

$$\begin{aligned} \Delta Y_{b,t} = \alpha_0 + \sum_{ctry}\left(\sum_{k=0}^{K}\left(\alpha_{1,k}^{ctry} * \Delta QE_{t-k}^{ctry} * Channel_{b,t-k-1}\right)\right) \\ + \sum_{ctry} \alpha_2^{ctry} Channel_{b,t-k-1} + \alpha_3 X_{b,t-1} + f_b + f_t + Z_{i,t} + \epsilon_{b,t}, \end{aligned} \tag{4}$$

Loans to the Rest of the World

	(1) No channel	(2) Liquid assets	(3) Short-term funding	(4) Intragroup funding	(5) Total Assets
Log total assets_t-1	-0.017^{+}	-0.016^{+}	-0.015	-0.015	-0.015
	(0.14)	(0.20)	(0.25)	(0.25)	(0.24)
Tier1 ratio_t-1	0.067^{+}	0.112**	0.114**	0.114**	0.118**
	(0.16)	(0.02)	(0.02)	(0.02)	(0.02)
Liquid assets ratio_t-1	0.236**	0.420***	0.386**	0.394**	0.388**
	(0.05)	(0.01)	(0.01)	(0.01)	(0.01)
Net IG funding ratio_t-1	-0.048	-0.038	-0.036	-0.090**	-0.040
	(0.29)	(0.42)	(0.42)	(0.03)	(0.40)
Core deposits ratio_t-1	0.212***	0.191**	0.201***	0.199**	0.198**
	(0.00)	(0.01)	(0.01)	(0.01)	(0.01)
L.Credit-to-GDP Gap Estimates	-0.008**				
	(0.01)				
Global Credit Gap_t-1	0.010***				
	(0.00)				
L.Output Gap Estimates	0.013**				
	(0.02)				
Global Output Gap_t-1	-0.011**				
	(0.05)				
D.US MP_t-1	0.271				
	(0.58)				
VIX_t-1	-0.004***				
	(0.00)				
Short-term funding ratio_t-1			0.041		
			(0.72)		
Sum MP t to t-3(* Channel)	0.812	-0.037	0.329	0.318	0.006
	(0.50)	(0.92)	(0.11)	(0.36)	(0.52)
Sum QE t to t-3(* Channel)	0.013***	-0.133***	-0.052**	0.022	0.002
	(0.00)	(0.01)	(0.05)	(0.31)	(0.20)
MP Impact (* Channel)	0.255	-0.250	0.112	-0.042	0.000
	(0.70)	(0.17)	(0.44)	(0.49)	(0.94)
QE Impact * Channel)	0.002	-0.022	-0.015	0.042***	0.002**
	(0.22)	(0.41)	(0.43)	(0.01)	(0.02)
Time fixed effects	No	Yes	Yes	Yes	Yes
Bank fixed effects	Yes	Yes	Yes	Yes	Yes
Observations	6722	6068	6068	6068	6071
R-squared	0.02	0.03	0.02	0.02	0.02
Adj-R-squared	0.01	0.02	0.02	0.02	0.02
N. of banks	239	235	235	235	235

Robust standard errors; p-values in parentheses

$^{+}$ $p < 0.2$, * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Loans to the *domestic non-financial* private sector

	(1) No channel	(2) Liquid assets	(3) Short-term funding	(4) Intragroup funding
Log total assets_t-1	-0.016	-0.021^{+}	-0.021^{+}	-0.021^{+}
	(0.20)	(0.13)	(0.12)	(0.11)
Tier1 ratio_t-1	-0.038**	-0.046*	-0.046**	-0.045*
	(0.04)	(0.06)	(0.05)	(0.05)
Liquid assets ratio_t-1	0.241*	0.210^{+}	0.173^{+}	0.172^{+}
	(0.06)	(0.14)	(0.11)	(0.11)
Net IG funding ratio_t-1	0.004	-0.002	-0.003	0.073
	(0.78)	(0.84)	(0.77)	(0.23)
Core deposits ratio_t-1	0.071***	0.083***	0.083***	0.082***
	(0.00)	(0.00)	(0.00)	(0.00)
US Credit Gap_t-1	0.001^{+}			
	(0.10)			
UK Credit Gap_t-1	0.001			
	(0.36)			
JP Credit Gap_t-1	-0.000			
	(0.93)			
EA Credit Gap_t-1	0.002*			
	(0.09)			
US Output Gap_t-1	-0.007			
	(0.21)			
UK Output Gap_t-1	0.010^{+}			
	(0.18)			
JP Output Gap_t-1	-0.001			
	(0.49)			
EA Output Gap_t-1	0.005			
	(0.50)			
D.MP Domestic_t-1	-0.034^{+}			
	(0.12)			
VIX_t-1	-0.003**			
	(0.03)			
Short-term funding ratio_t-1			0.004	
			(0.89)	
Sum D.QE US t to t-3(* Channel)	0.030	-0.060**	0.007	-0.002
	(0.12)	(0.02)	(0.69)	(0.94)
Sum D.QE UK t to t-3(* Channel)	0.026**	0.021	0.003	-0.048
	(0.03)	(0.46)	(0.86)	(0.22)
Sum D.QE JP t to t-3(* Channel)	-0.009*	0.015	-0.005	-0.018**
	(0.09)	(0.42)	(0.67)	(0.04)
Sum Impact D.QE	0.011*	-0.031	-0.002	0.042*
	(0.10)	(0.26)	(0.85)	(0.09)
Sum all D.QE	0.046	-0.024	0.005	-0.067
	(0.08)	(0.66)	(0.86)	(0.32)
Bank controls	Yes	Yes	Yes	Yes
Time fixed effects	No	Yes	Yes	Yes
Bank fixed effects	Yes	Yes	Yes	Yes
Observations	5520	5847	5847	5847
R-squared	0.02	0.02	0.02	0.02
Adj-R-squared	0.01	0.02	0.01	0.01
N. of banks	236	233	233	233

Robust standard errors; p-values in parentheses

$^{+}$ $p < 0.2$, * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Loans to the *domestic financial* sector

	(1) No channel	(2) Liquid assets	(3) Short-term funding	(4) Intragroup funding
Log total assets_t-1	-0.048**	-0.041**	-0.041*	-0.041**
	(0.03)	(0.04)	(0.06)	(0.04)
Tier1 ratio_t-1	-0.003	-0.015	-0.020	-0.010
	(0.96)	(0.78)	(0.73)	(0.85)
Liquid assets ratio_t-1	-0.090	-0.361*	-0.105	-0.112
	(0.61)	(0.08)	(0.59)	(0.55)
Net IG funding ratio_t-1	-0.093*	-0.060	-0.055	0.084
	(0.08)	(0.26)	(0.29)	(0.63)
Core deposits ratio_t-1	-0.048	0.007	0.004	-0.000
	(0.61)	(0.94)	(0.96)	(1.00)
US Credit Gap_t-1	0.003			
	(0.59)			
UK Credit Gap_t-1	0.001			
	(0.78)			
JP Credit Gap_t-1	0.004			
	(0.78)			
EA Credit Gap_t-1	-0.003			
	(0.85)			
US Output Gap_t-1	0.004			
	(0.90)			
UK Output Gap_t-1	-0.002			
	(0.97)			
JP Output Gap_t-1	-0.024***			
	(0.00)			
EA Output Gap_t-1	0.023			
	(0.74)			
D.MP Domestic_t-1	-0.016			
	(0.80)			
VIX_t-1	-0.003			
	(0.45)			
Short-term funding ratio_t-1			-0.026	
			(0.86)	
Sum D.QE US t to t-3(* Channel)	0.051	0.212***	-0.059	0.168***
	(0.46)	(0.00)	(0.25)	(0.00)
Sum D.QE UK t to t-3(* Channel)	0.076	0.066	-0.015	-0.061
	(0.29)	(0.60)	(0.75)	(0.34)
Sum D.QE JP t to t-3(* Channel)	0.034	0.019	-0.041	-0.076
	(0.34)	(0.74)	(0.30)	(0.10)
Sum Impact D.QE	0.045	0.190*	-0.065	0.057
	(0.16)	(0.07)	(0.13)	(0.52)
Sum all D.QE	0.160	0.297	-0.115*	0.031
	(0.17)	(0.16)	(0.08)	(0.75)
Bank controls	Yes	Yes	Yes	Yes
Time fixed effects	No	Yes	Yes	Yes
Bank fixed effects	Yes	Yes	Yes	Yes
Observations	5493	5807	5807	5807
R-squared	0.01	0.02	0.02	0.02
Adj-R-squared	0.01	0.02	0.02	0.01
N. of banks	241	238	238	238

Robust standard errors; p-values in parentheses

$^{+}\ p < 0.2,\ ^{*}\ p < 0.1,\ ^{**}\ p < 0.05,\ ^{***}\ p < 0.01$

Loans to the Rest of the World—Taylor-shocks

	(1) No channel	(2) Liquid assets	(3) Short-term funding	(4) Intragroup funding	(5) Total Assets
Log total assets_t-1	-0.015^{+}	-0.016	-0.015	-0.015	0.007
	(0.18)	(0.21)	(0.22)	(0.23)	(0.84)
Tier1 ratio_t-1	0.079^{+}	0.111**	0.116**	0.117**	0.114**
	(0.10)	(0.02)	(0.02)	(0.02)	(0.02)
Liquid assets ratio_t-1	0.231**	0.035	0.381**	0.384**	0.389**
	(0.05)	(0.92)	(0.01)	(0.02)	(0.01)
Net IG funding ratio_t-1	-0.045	-0.042	-0.034	0.164	-0.043
	(0.33)	(0.38)	(0.45)	(0.38)	(0.37)
Core deposits ratio_t-1	0.212***	0.200**	0.207***	0.196**	0.196**
	(0.00)	(0.01)	(0.01)	(0.01)	(0.01)
L.Credit-to-GDP Gap Estimates	-0.004				
	(0.22)				
Global Credit Gap_t-1	0.005**				
	(0.02)				
L.Output Gap Estimates	0.016***				
	(0.00)				
Global Output Gap_t-1	-0.009^{+}				
	(0.11)				
VIX_t-1	-0.002***				
	(0.00)				
Sum D.MP EA t to t-3(* Channel)	-0.105***	1.507*	0.328	0.002	-0.014
	(0.00)	(0.07)	(0.25)	(1.00)	(0.48)
Sum D.MP EA*ZLB t to t-3	0.032	-1.073	-0.723*	0.008	0.014
	(0.50)	(0.36)	(0.07)	(0.98)	(0.62)
Sum all MP (*ZLB)	-0.072**	0.435	-0.395	0.010	-0.000
	(0.01)	(0.42)	(0.20)	(0.96)	(0.99)
Sum Impact MP	-0.019**	0.171	0.081	-0.086	-0.007
	(0.03)	(0.48)	(0.43)	(0.43)	(0.18)
Sum Impact MP*ZLB	0.002	-0.164	-0.152	0.022	0.005
	(0.89)	(0.68)	(0.34)	(0.86)	(0.58)
Sum all Impact	-0.017	0.007	-0.071	-0.064	-0.002
	(0.12)	(0.98)	(0.58)	(0.45)	(0.75)
Time fixed effects	No	Yes	Yes	Yes	Yes
Bank fixed effects	Yes	Yes	Yes	Yes	Yes
Observations	6754	6068	6068	6068	6071
R-squared	0.02	0.03	0.03	0.02	0.03
Adj-R-squared	0.01	0.02	0.02	0.02	0.02
N. of banks	239	235	235	235	235

Robust standard errors; p-values in parentheses

$^{+}$ $p < 0.2$, * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Loans to the *domestic non-financial* private sector—Short-term shadow rate (SSR)

	(1) No channel	(2) Liquid assets	(3) Short-term funding	(4) Intragroup funding
Log total assets_t-1	-0.032**	-0.021*	-0.021*	-0.021*
	(0.04)	(0.09)	(0.09)	(0.08)
Tier1 ratio_t-1	-0.055***	-0.052**	-0.052**	-0.050**
	(0.00)	(0.02)	(0.01)	(0.02)
Liquid assets ratio_t-1	0.206+	0.148*	0.168*	0.161+
	(0.11)	(0.07)	(0.10)	(0.12)
Net IG funding ratio_t-1	-0.001	-0.003	-0.006	0.003
	(0.92)	(0.76)	(0.61)	(0.76)
Core deposits ratio_t-1	0.078***	0.087***	0.086***	0.086***
	(0.00)	(0.00)	(0.00)	(0.00)
Credit Gap_t-1	-0.000			
	(0.91)			
Output Gap_t-1	0.000			
	(0.77)			
D.MP Domestic_t-1	0.001			
	(0.80)			
VIX_t-1	-0.000			
	(0.84)			
Short-term funding ratio_t-1			-0.008	
			(0.73)	
Sum D.SSR US t to t-3(* Channel)	-1.349*	11.780	-6.941	-10.080**
	(0.09)	(0.17)	(0.40)	(0.02)
Sum D.SSR UK t to t-3(* Channel)	0.405	-5.103	6.619	5.755*
	(0.51)	(0.36)	(0.30)	(0.05)
Sum D.SSR JP t to t-3(* Channel)	0.241	-21.153	-15.612*	-9.879
	(0.74)	(0.50)	(0.08)	(0.29)
Sum of Impact D.SSR	0.208	-1.860	-5.697*	-4.193
	(0.39)	(0.82)	(0.09)	(0.20)
Sum of all D.SSR	-0.703	-14.476	-15.933	-14.204
	(0.36)	(0.67)	(0.15)	(0.17)
Bank controls	Yes	Yes	Yes	Yes
Time fixed effects	No	Yes	Yes	Yes
Bank fixed effects	Yes	Yes	Yes	Yes
Observations	5605	6059	6059	6059
R-squared	0.02	0.02	0.02	0.02
Adj-R-squared	0.01	0.01	0.02	0.01
N. of banks	231	233	233	233

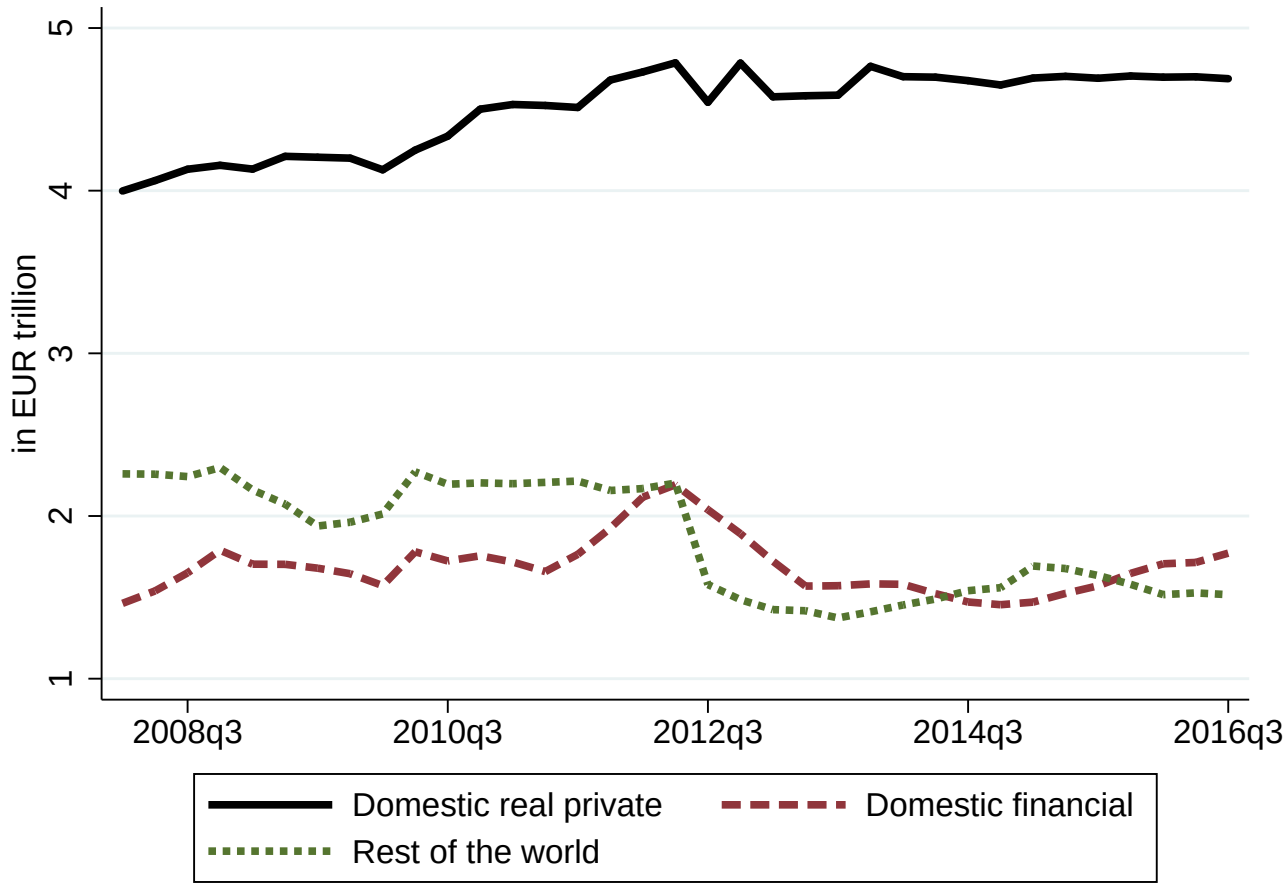
Robust standard errors; p-values in parentheses

$^{+}\ p < 0.2,\ ^{*}\ p < 0.1,\ ^{**}\ p < 0.05,\ ^{***}\ p < 0.01$

Conclusion

- Paper examines spillovers of monetary policy via international bank lending channel using confidential EA bank level dataset
- Evidence for existence of international bank lending channel
  - EA banks significantly increase cross-border lending in response to ECB monetary policy accommodation
  - EA banks significantly increase balance sheets in response to US monetary policy accommodation
  - Spillovers substantially stronger for EA banks which are liquidity constraint and rely more on internal capital markets
- Important implications for coordination of monetary policy
  - With increasing financial interconnectedness, international bank lending additional channel of propagation of monetary conditions abroad

Development of loans by euro area MFIs by counterparty



Source: Euro area MFI BSI statistics.

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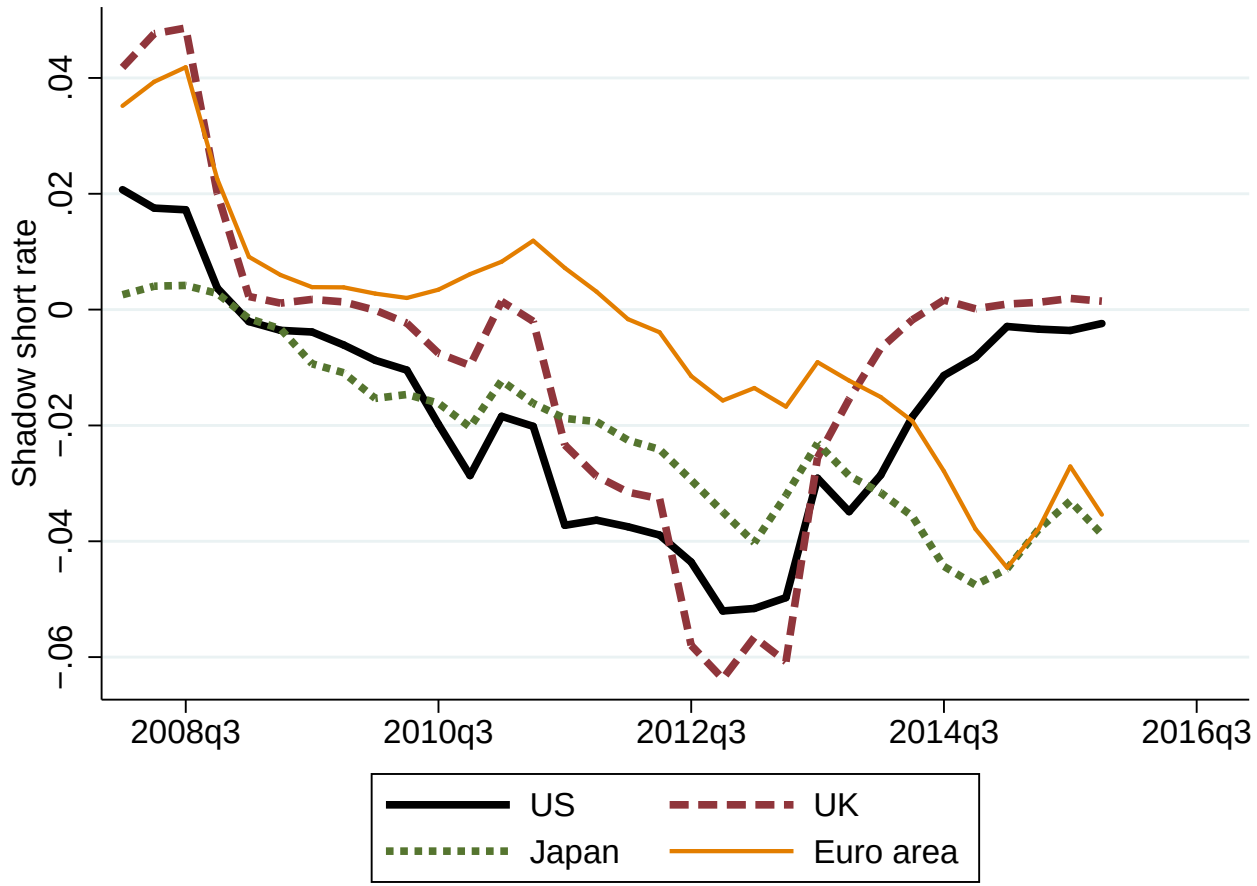
Development of short term shadow rates across major jurisdictions



Notes: Shadow short-term rates based on Krippner (2013).

return

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