Global Dollar Banking

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BIS

De-Risking the Future of Europe
LSE, 11 September 2019

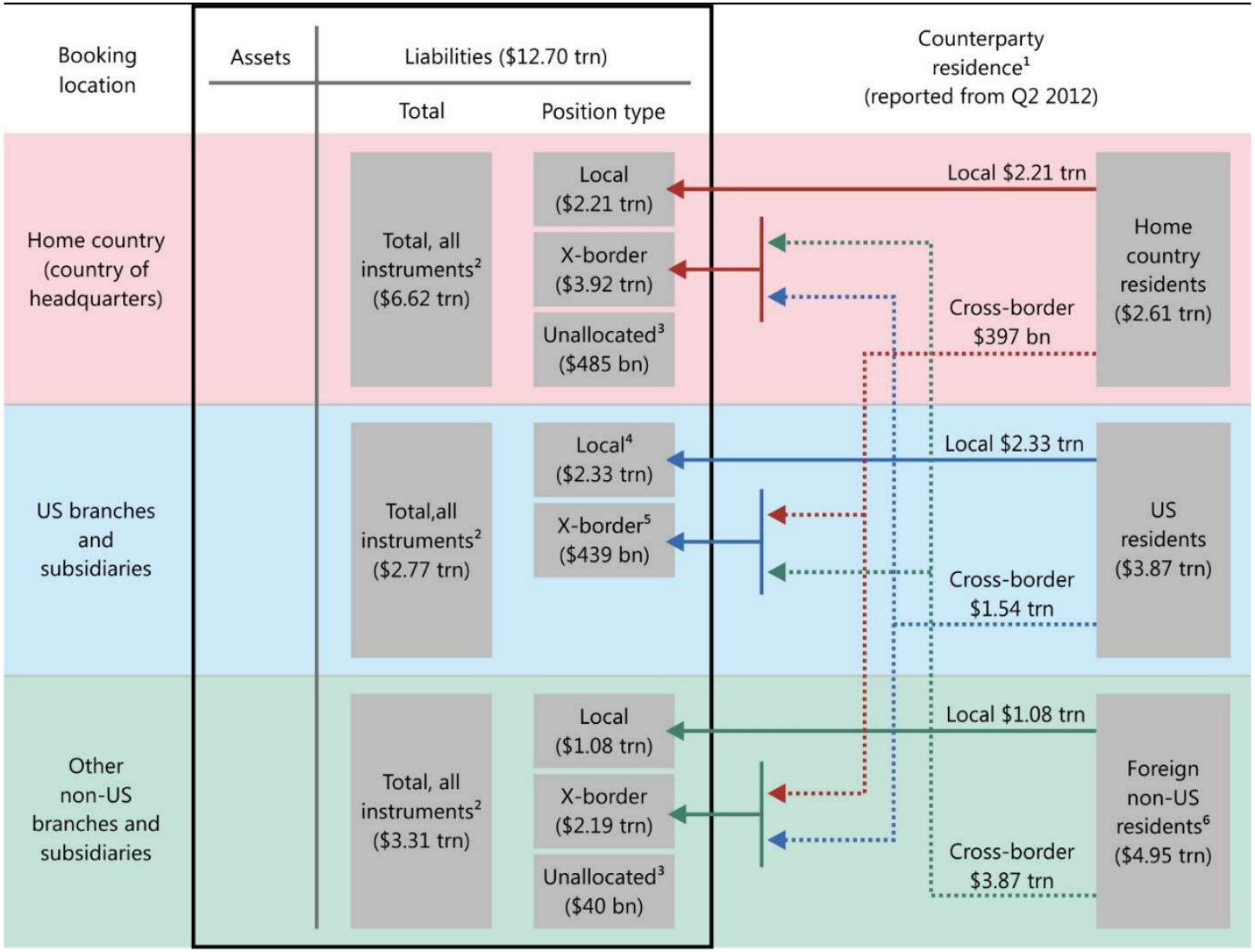
Based on joint work with BIS colleagues
T. Ehlers and E. Eren (Global banks, dollar funding and regulation)
T. Ehlers (The geography of dollar funding of non-US banks)

Disclaimer: The views are those of the authors and do not necessarily represent those of the BIS

Large and complex

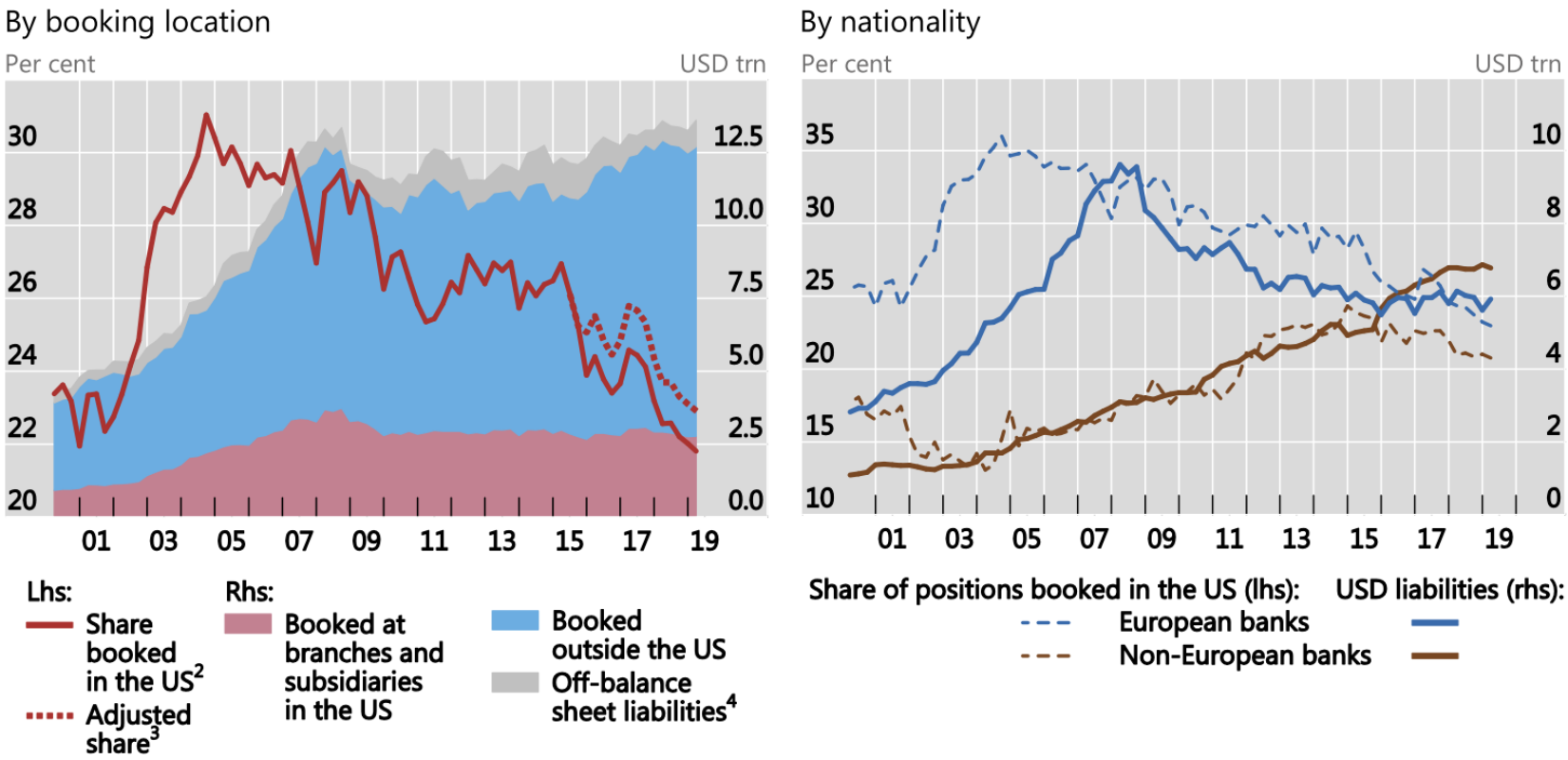
Mapping on-balance sheet US dollar liabilities of non-US banks

At end-March 2019, excludes liabilities within the same banking group (inter-office positions) Graph 1



Less booked in US & divergence by nationality

US dollar liabilities of non-US banks[1] Graph 2



[1] External liabilities. Excludes inter-office positions but includes liabilities vis-à-vis unrelated banks. Reporting of US dollar-denominated inter-office positions improves over time, primarily for non-US reporting countries. From end-December 2015 this includes China and Russia as reporting countries. [2] Share of on-balance sheet liabilities booked in the US in total on-balance sheet liabilities. [3] Share excluding US dollar positions reported by China and Russia, which started reporting only in Q4 2015. [4] Mostly FX swaps. Estimated as the difference between global on-balance sheet dollar assets and liabilities. Total of positive off-balance sheet liabilities for all (non-US) banking systems reporting to the BIS banking statistics.

Sources: BIS consolidated banking statistics (immediate counterparty basis); BIS locational banking statistics (by nationality); BIS calculations; authors' calculations.

Non-US banks and global dollar banking

- At around $13 trillion, $ assets of non-US banks $\approx$ US banks
- Dollar banking is an important channel for international spillovers
  - 2008: bank run on MMFs, 2011: run by MMFs on European banks
- The literature largely treats non-US global banks as homogenous
- No longer the case: divergence between European & JP banks

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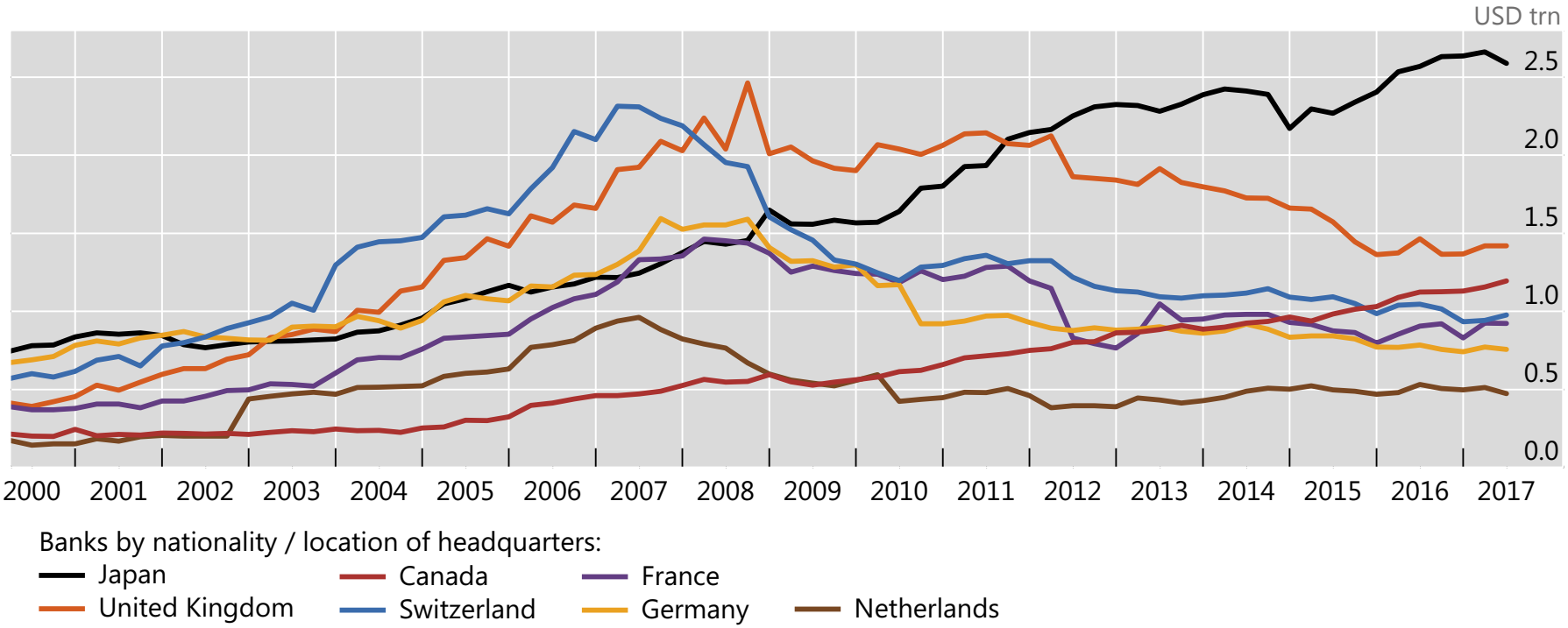

Note: Excludes interoffice positions.

Source: BIS locational banking statistics; BIS consolidated banking statistics.

Summary

- Novel facts on mkt structure of MMF sector & interactions w/ banks
  - **#1** MMF sector highly concentrated Graph
  - **#2** Short (long) maturity funding with repos (non-repos) Graph
  - **#3** WAM of JP banks' funding is greater Graph
  - **#4** Heterogeneity in how diversified banks are Graph

Bargaining power and pricing

- *Repos*: JP banks have low barg. power $\rightarrow$ "Japan repo premium"
  - Identification: Quarter-end window dressing + ON RRP
- *CP, CD, ABCP*: same OTC frictions at play
  - Identification: US MMF reform = exo. $\uparrow$ MMF market power

Implications

- FR banks intermediate repos to JP (regulatory arbitrage)
  - Identification: Spillovers from repo to FX swaps at quarter-ends

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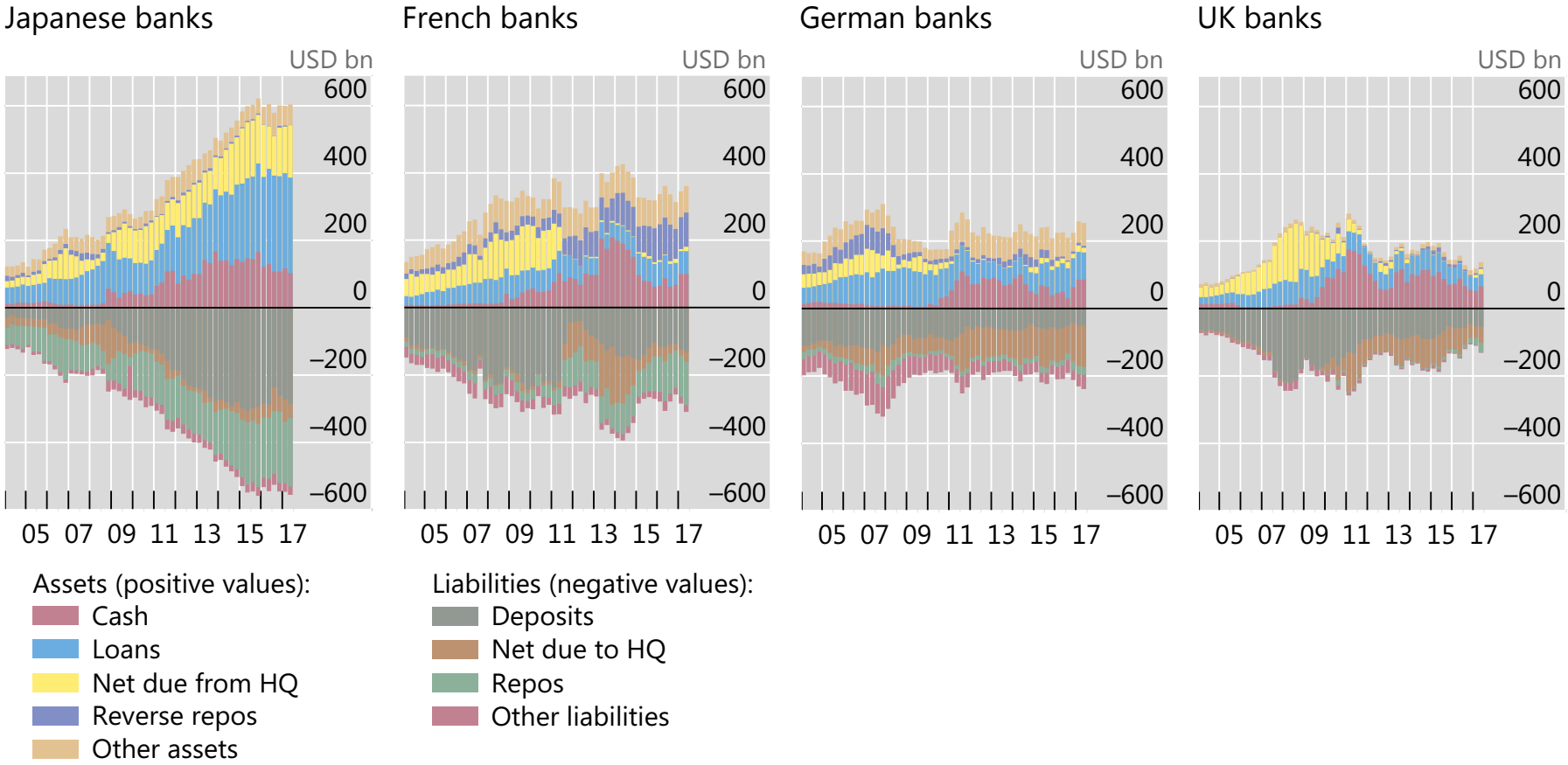
Non-US banks' dollar assets in the United States



Source: FFIEC 002

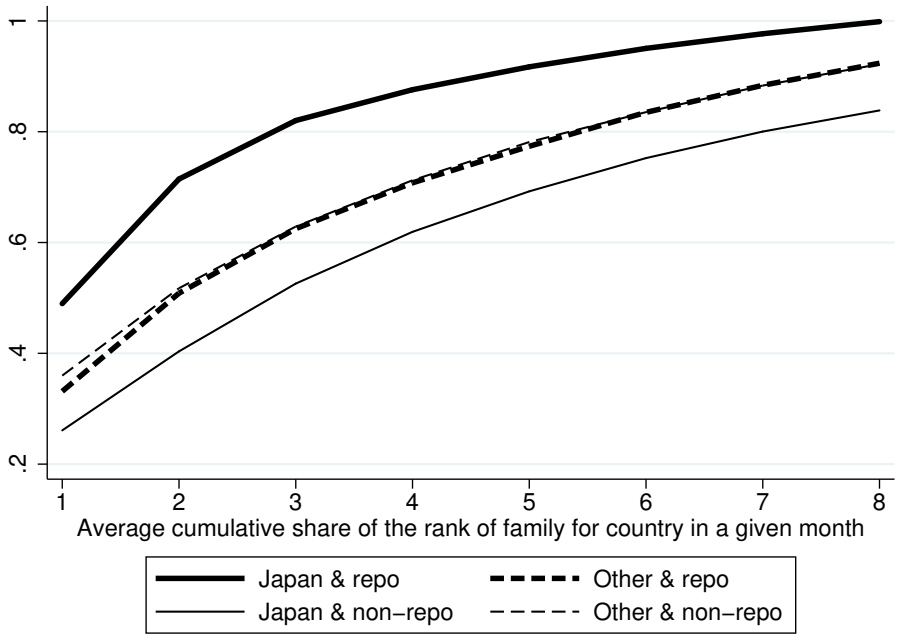
- Drastic changes not only in size, but also composition Dollar funding gap
- Japanese banks: long-term vs. European banks: short-term

Interoffice Repos Consolidated

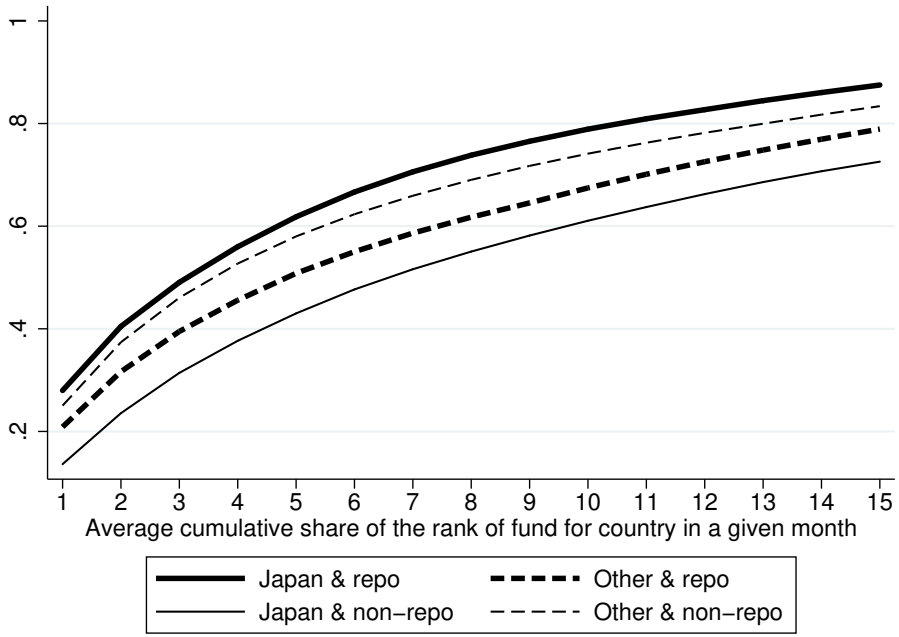
OTC market: Bargaining power with MMFs

- Setting up new relationships takes time. Data: sticky relationships
- Outside options: how many existing counterparties you have
- We expect: a more diversified bank can bargain for better prices
- JP banks: 20% mkt share in non-repo (7% in repo)

Concentration with fund families



Concentration with funds

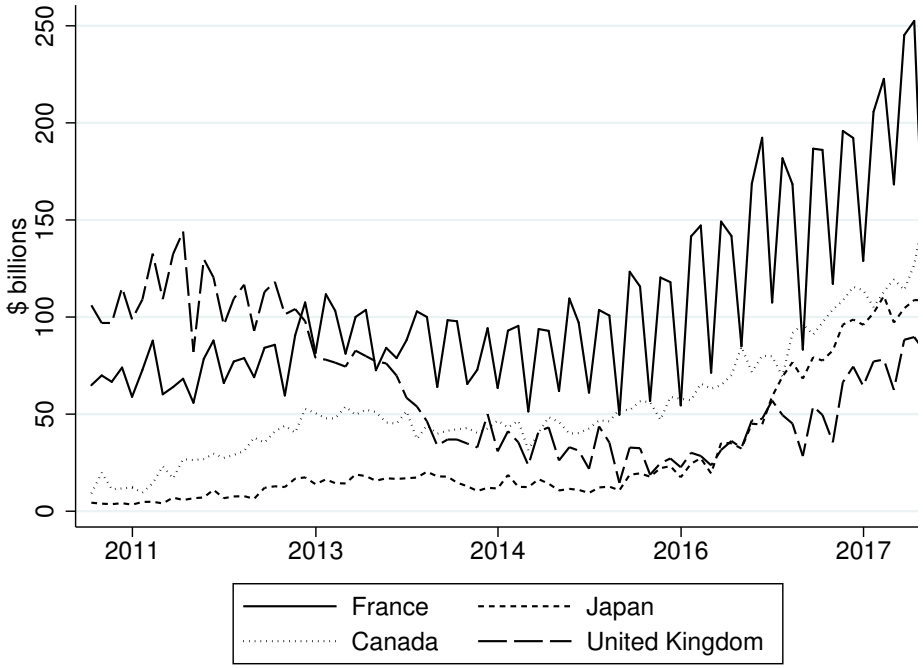


"Japan repo premium" Table **Discount in CPs, CDs, ABCPs** Table

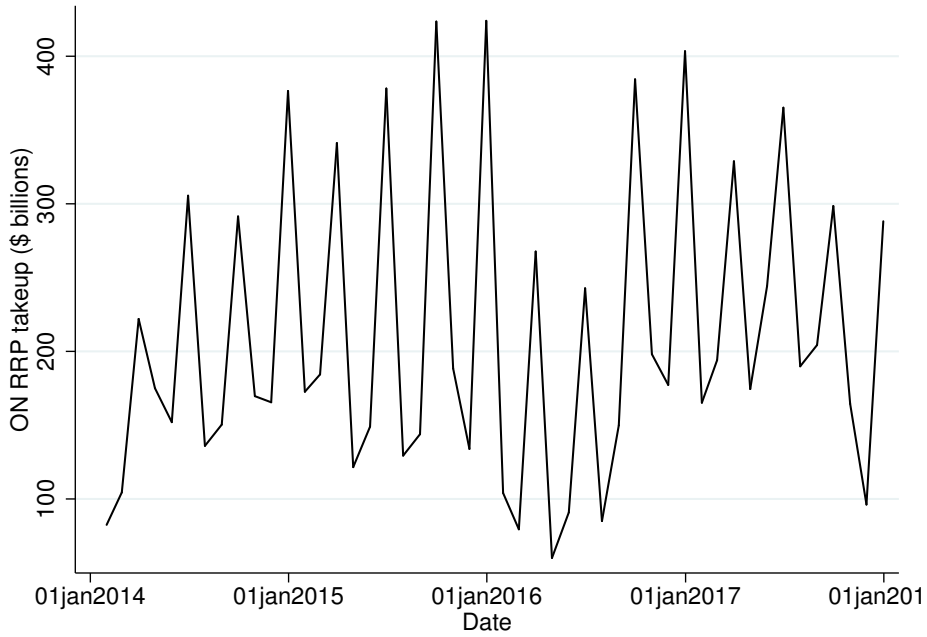
Identification in repo: Quarter-end window dressing

- Heterogenous implementation of Basel III: EU banks withdraw at QEs
- MMFs → ON RRP: lowest outside option, yet large take-up
  - MMF bargaining power is lower for repos overall
  - **Except** for ON Treasury repos for which the Fed is the counterparty

Repo volumes drop at QEs



ON RRP takeup (ON Treasury) rises at QEs



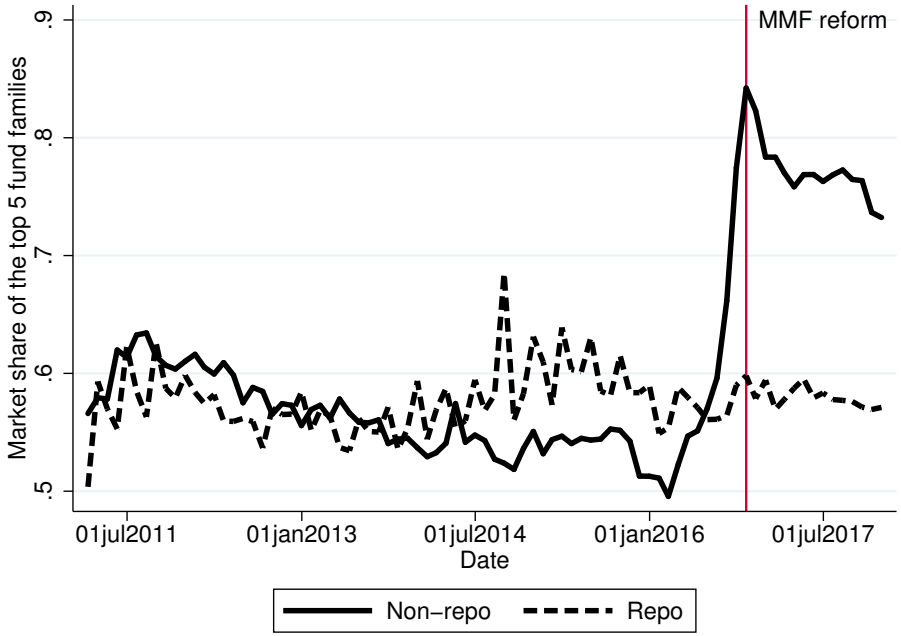
The Japan repo premium is lower at QEs, except for ON UST

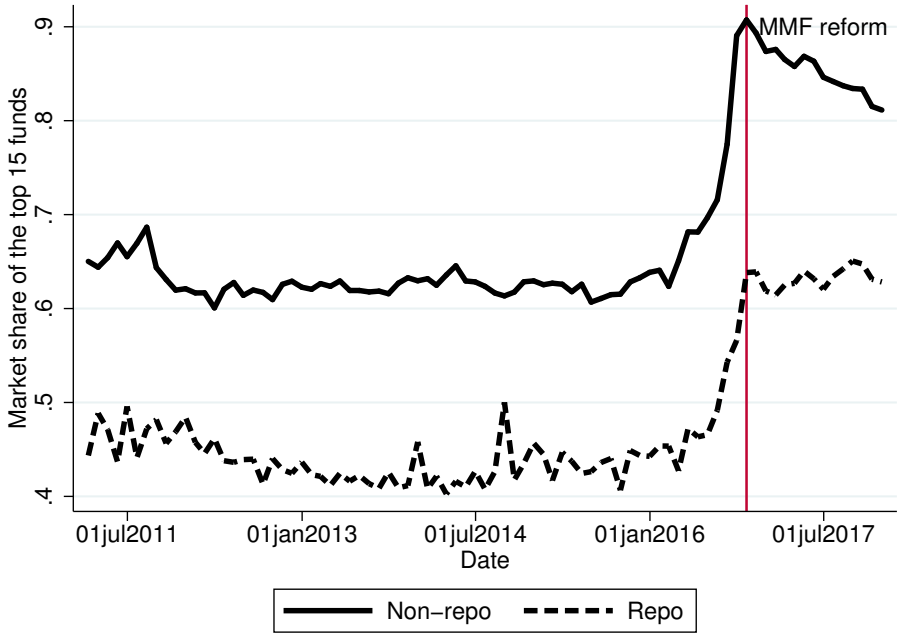
Table

Identification in non-repo: MMF reform

- Funding shock to unsecured funding without a crisis Background
- Conversion from prime to gov.: more pronounced at smaller families
- By merely staying in the mkt, top funds saw their market power rise

Market share top 5 families *Market share top 15 funds*

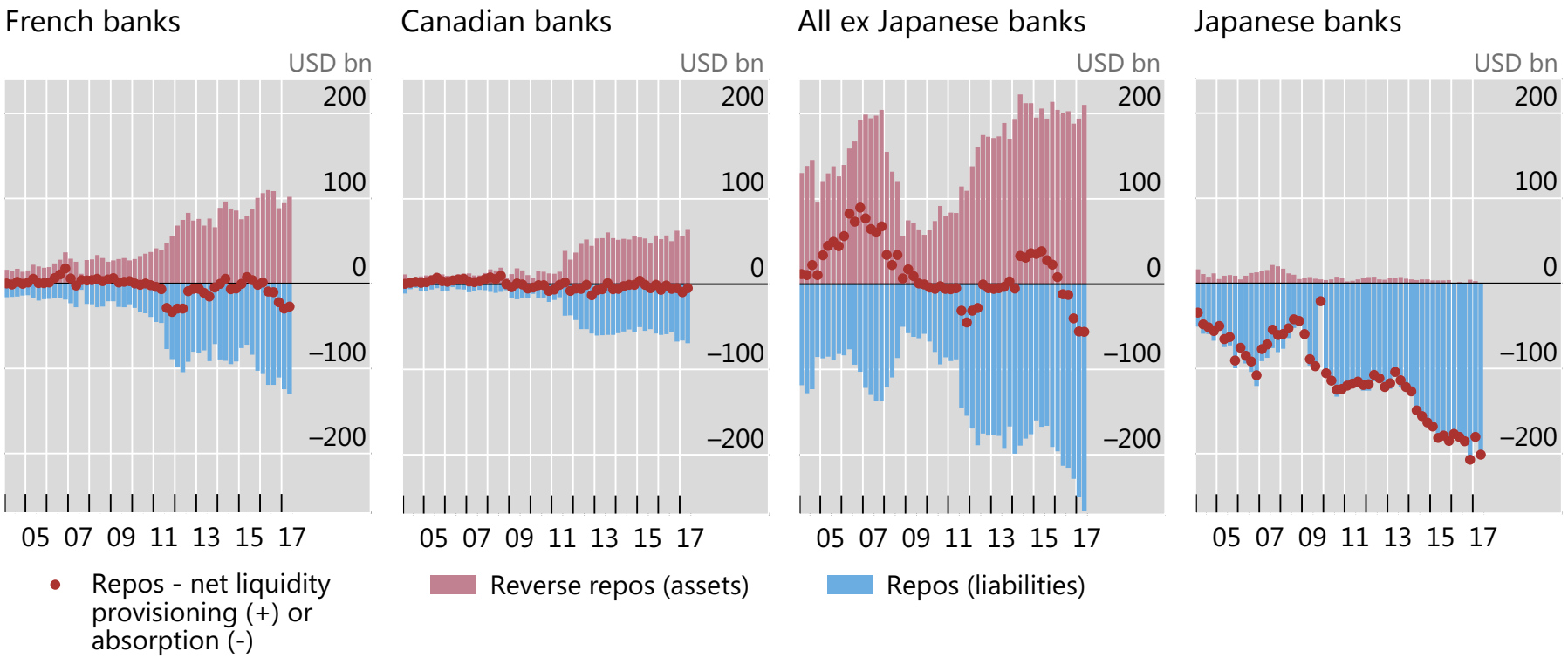




Diff-in-diff-diff: Top fund families charge a higher price to JP banks post-reform

Graph Table

All banks are repo intermediaries, except JP banks



Source: US FFIEC002 Call Reports; authors' calculations.

- Yet, a small fraction of Japanese repos comes from MMFs
  - JP: $\sim 10\%$, FR: $\sim 50\%$, CA: $\sim 55\%$
- Why do Japanese banks rely on other markets?

FR repo intermediation – maturity transformation

Hypothesis

Quarter-end withdrawal of FR banks from repo markets is negatively related to the JPY/USD xccy basis, but only at shorter tenors

	1W	3M	1Y	3Y
Δ FR repo	-0.65***	0.03	0.04	0.01
	(0.20)	(0.08)	(0.04)	(0.04)
$\Delta EUR/USD\ basis$	0.48*	0.58***	0.33*	0.45***
	(0.26)	(0.12)	(0.17)	(0.15)
Observations	23	23	23	23
R-squared	0.71	0.36	0.27	0.34
R-squared w/o control†	0.65	0.00	0.05	0.01

Notes: Robust standard errors in parentheses. ***, **, * denote significance at the 10, 5 and 1% level respectively. 1W, 3M, 1Y and 3Y refer to the contemporaneous changes in the 1-week, 3-month, 1-year and 3-year basis, respectively. The dependent variable is the change in the JPY/USD basis at different maturities. Changes are computed as $month_{quarter-end} - month_{quarter-end-1}$ (the absolute value is taken for changes in French banks' repos with MMFs (in $billions)). The sample runs from December 2011 (Q4 2011) to September 2017 (Q3 2017). The outlier observations corresponding to December 2016 and December 2017 are excluded. Graph

- $MMF \rightarrow FR \rightarrow JP$? 30-day maturity transformation profits: 16 bps

Global banks, dollar funding, and regulation: "unpacking" global financial institutions

Global banks are increasingly different since 2008

- Their demand for dollar funding is also heterogeneous
- One size no longer fits all in global dollar banking

Dollar funding markets are not perfectly competitive

- Supply side is highly concentrated
- OTC: Banks with weaker bargaining positions pay a higher price

Regulation has unintended consequences for dollar funding markets

- Heterogeneous implementation of Basel III: regulatory arbitrage
- US MMF reform
  - Unintended consequences on competition?
  - International spillovers?
    (Aldasoro, Balke, Barth, Eren Spillovers of funding dry-ups)

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Thank you for your attention!

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APPENDIX

Data

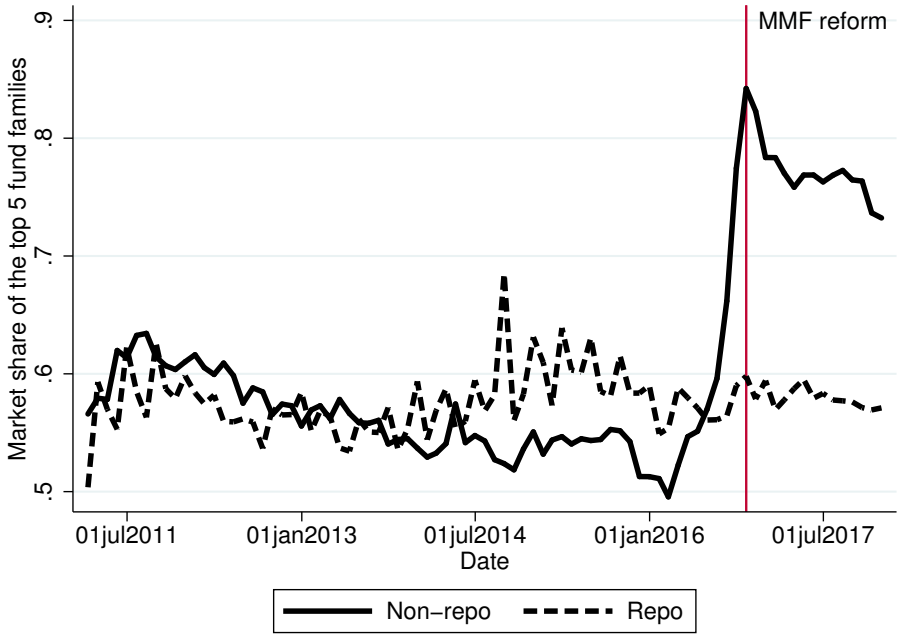
- **Crane Data:**
  - MMF holdings snapshot (regulatory). Monthly, 02/2011-12/2017.
  - Date-fund-bank-instrument-value-price-remaining maturity.
  - Restrict to GSIB and active banks: Repos, ABCP, CP, CD.
    - ★ Prime funds: can invest in all.
    - ★ Government funds: only repos.
  - 205,165 repos; 39 banks, 9 countries.
  - 538,848 ABCP, CP, CDs: 49 banks, 14 countries.
  - 333 distinct funds, 74 distinct fund families.
- **FFIEC 002 filings:**
  - Balance sheets of US branches and agencies of foreign banks.
  - Quarterly: 1994Q1-2017Q2.
- **BIS International Banking Statistics**
- **Bloomberg, Markit, Annual reports**

Concentration in the MMF sector

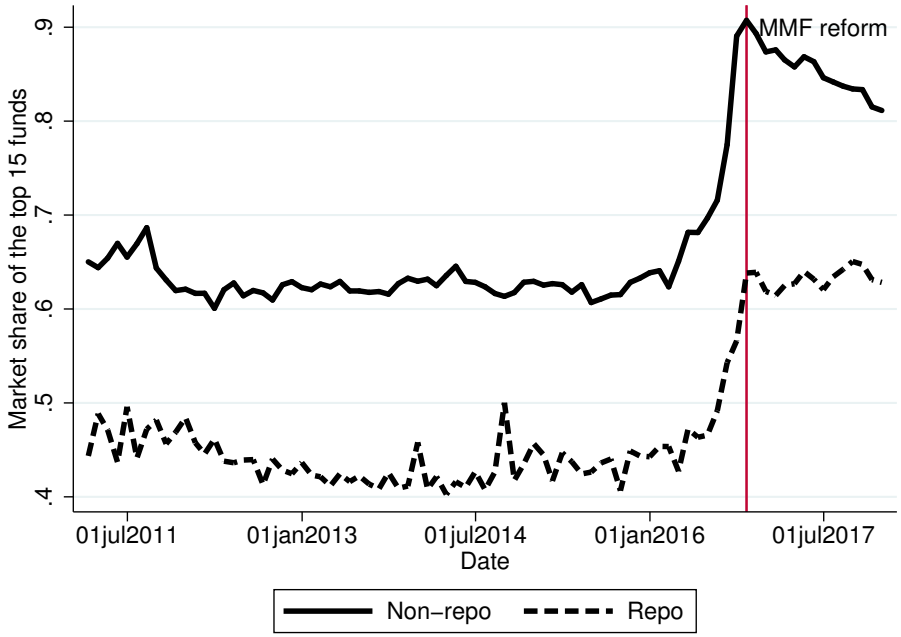
- Few funds and fund families capture a very large share of the market
- Market share of some MMFs rose after the reform

MMF concentration - Market share of the top families and funds

Top 5 families



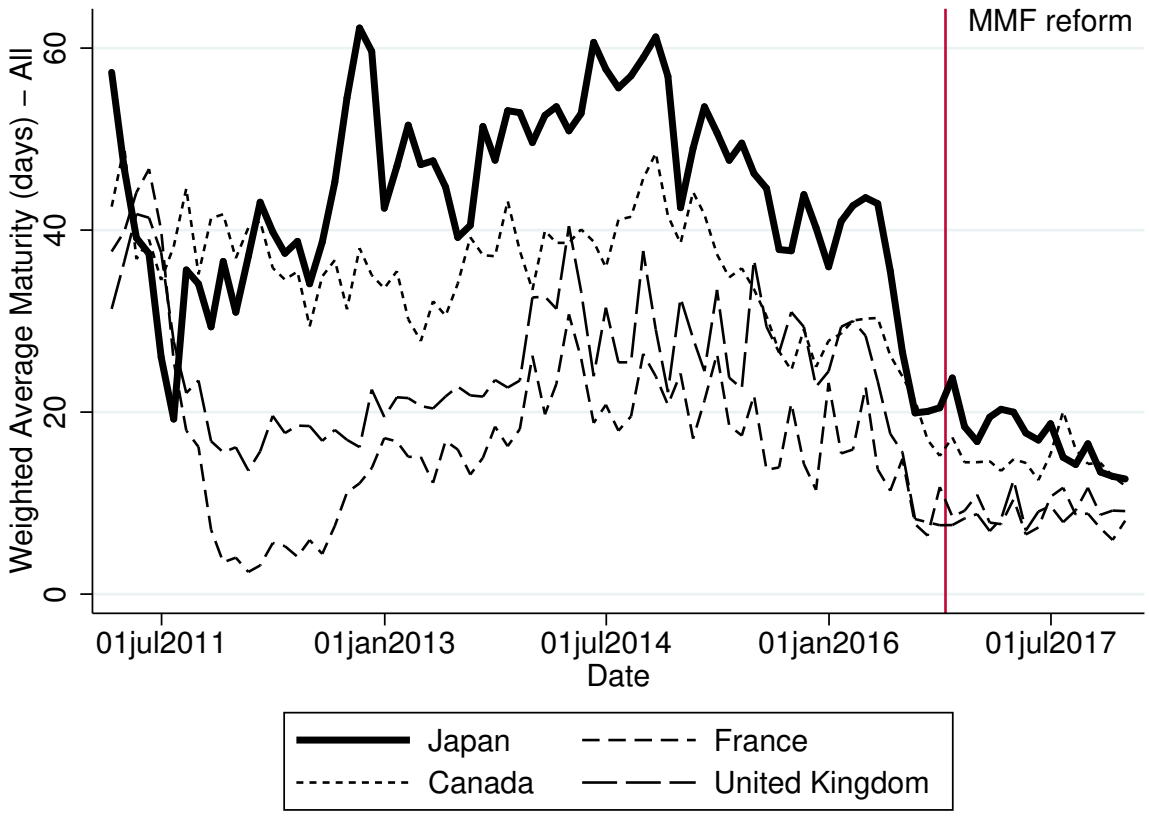
Top 15 funds



Back

Weighted Average Maturity of MMF Funding

- Japanese banks have a demand for longer maturity liabilities
- Average repo vs non-repo maturity: 6 vs ~ 45 days respectively
- Japanese borrowing is tilted more towards non-repos Back



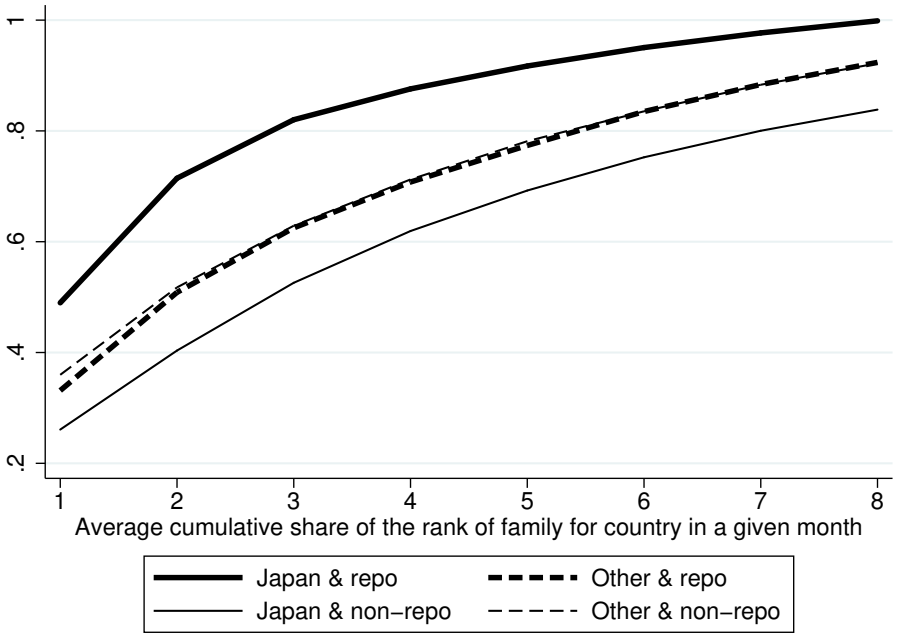
Sources: Crane data; authors' calculations.

Concentration of Japanese banks' counterparties

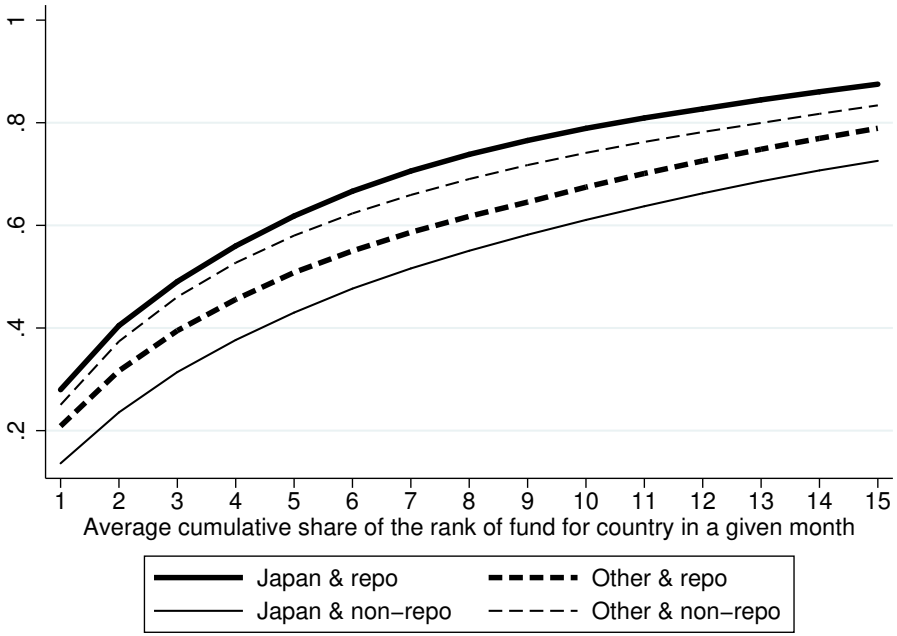
- Around 20% market share in non-repos (7% repos)
- More concentrated set of repo counterparties
- More diversified set of non-repo counterparties

How concentrated are the MMF relationships of global banks?

Fund families



Funds



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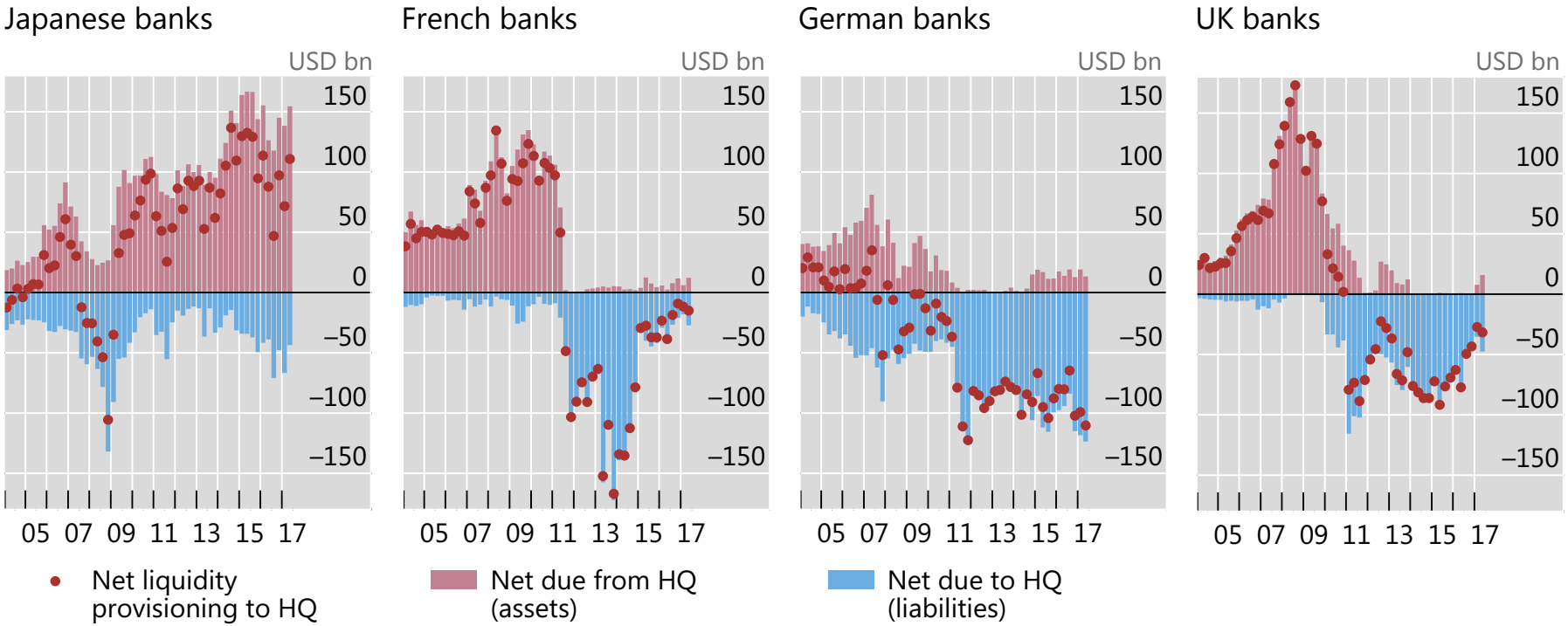
Interoffice positions



Source: US FFIEC002 Call Reports; authors' calculations.

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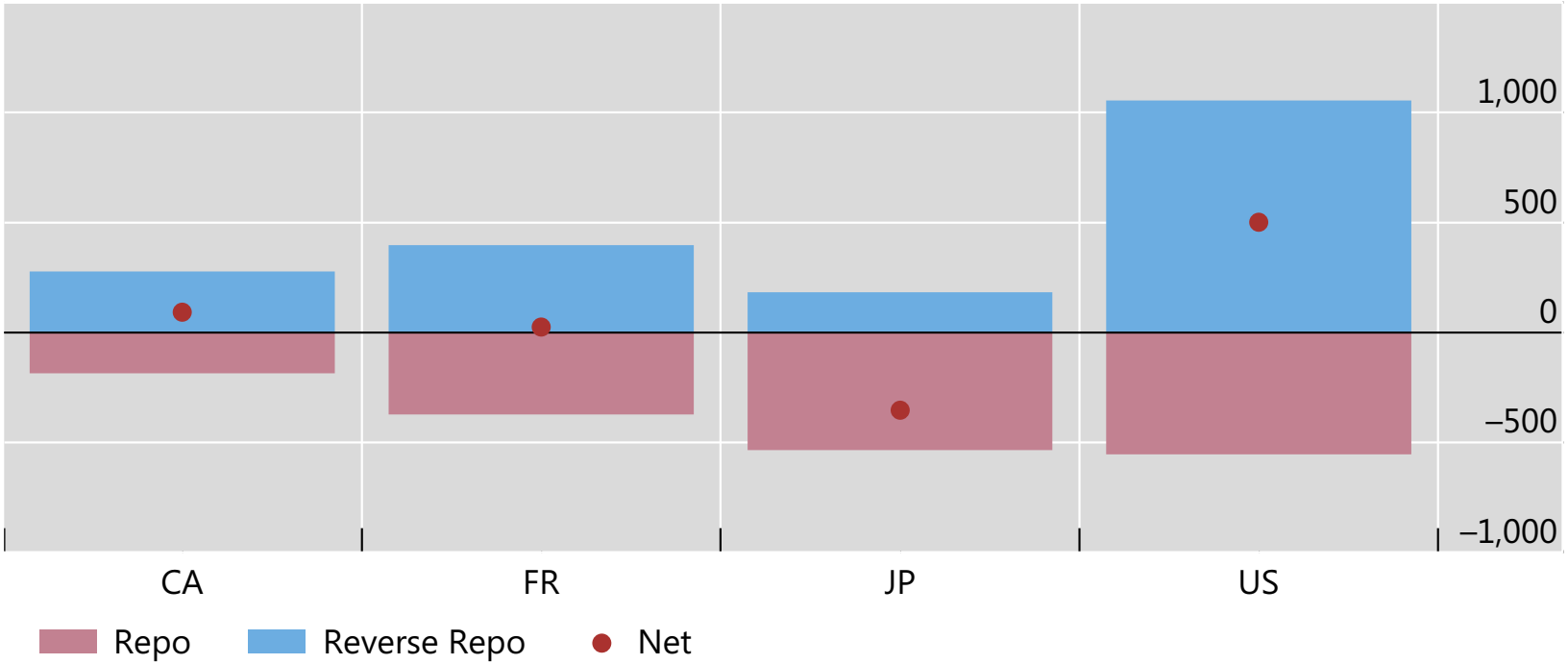
Repo books at the consolidated level

In billions of US dollars

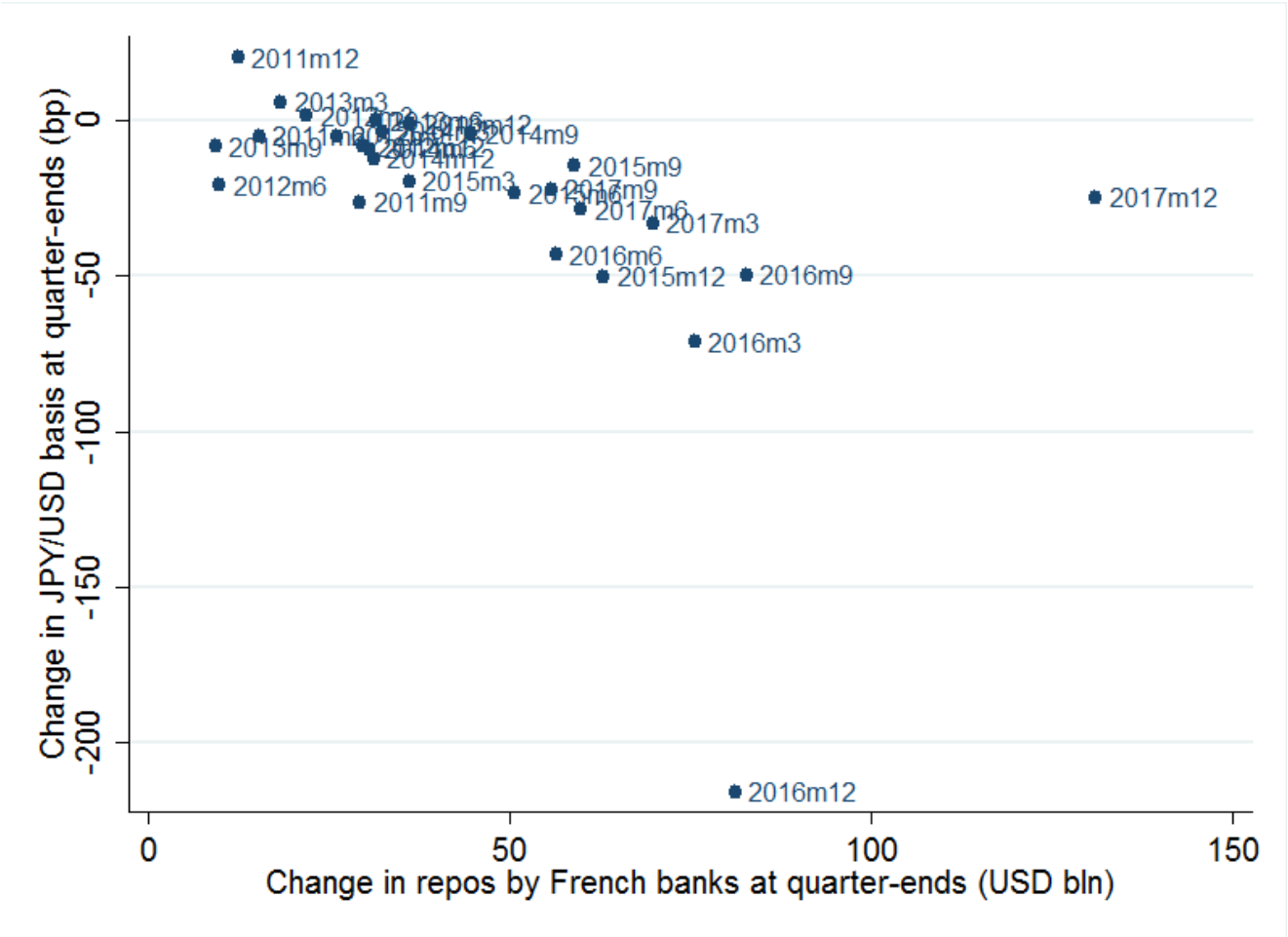


Sources: Banks' Annual Reports, FR-Y9C Reports (Federal Reserve).

Notes: Aggregate by country for all banks active in the MMF data. Data for CA is for end-October 2016, for JP is end-March 2016, and for FR and US is end-December 2016. Includes the aggregate repo book at the consolidated level, encompassing all currencies and geographies.

Back

Scatter plot: Δ JPY/USD basis and Δ FR repos



Sources: Crane data; Bloomberg; authors' calculations.

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Summary statistics by instrument

Instruments	Agg outstanding volume in USD bn			Avg value-weighted maturity in days		
	Repos	Non-repos	All	Repos	Non-repos	All
Japanese banks	29.4	110.1	139.5	6.2	49.3	40.3
Others	449.3	458.3	907.7	6.5	47.6	27.2

Notes: Agg outstanding volume is the average month-end position aggregated across banks of a given nationality.

The Japan repo premium

Sample:	(1) Repo	(2) Repo	(3) Repo	(4) Repo	(5) Repo (O/N UST coll.)†
	$Rate_{ijct}$	$Rate_{ijct}$	$Rate_{ijct}$	$Rate_{ijct}$	$Rate_{ijct}$
$Log(value_{ijct})$	-0.173	0.148	0.0473	-0.00513	0.168*
	(0.220)	(0.172)	(0.137)	(0.145)	(0.0883)
$Rem.\,maturity_{ijct}$	0.462***	0.353***	0.359***	0.359***	
	(0.0424)	(0.0348)	(0.0341)	(0.0343)	
$Agency\,coll._c$		1.383***	1.362***		
		(0.467)	(0.436)		
$Other\,coll._c$		25.58***	26.21***		
		(1.987)	(2.038)		
$5y\,CDS_{it}$			0.0256***	0.0245***	0.00320
			(0.00597)	(0.00629)	(0.00225)
JP_i	4.462***	3.261***	3.023***	2.811**	1.258***
	(0.948)	(1.110)	(1.122)	(1.171)	(0.414)
Observations	193,689	193,689	181,425	181,425	26,113
R-squared	0.814	0.865	0.868	0.872	0.946
Date*Fund Type FE	✓	✓	✓	✓	✓
Date*Collateral FE				✓	
Mean dep. var.	39.46	39.46	39.87	39.87	32.54

Notes: Regressions at the contract level, the dependent variable is the interest rate (in basis points) paid by a bank i when borrowing from a fund j. †: specification (5) represents a regression only for overnight repos with US Treasury collateral. Standard errors clustered at the fund family level are in parentheses. ***, **, * denote significance at the 1, 5 and 10% level respectively.

- Very robust result (see paper for battery of robustness checks)

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The Japan repo premium is lower at quarter ends, except for ON UST

Sample:	(1) Repo	(2) Repo	(3) Repo	(4) Repo	(5) Repo (O/N UST coll.)†
	$Rate_{ijct}$	$Rate_{ijct}$	$Rate_{ijct}$	$Rate_{ijct}$	$Rate_{ijct}$
$Log(value_{ijct})$	-0.172	0.149	0.0481	-0.00451	0.167*
	(0.220)	(0.172)	(0.137)	(0.145)	(0.0883)
$Rem.\,maturity_{ijct}$	0.462***	0.353***	0.359***	0.359***	
	(0.0424)	(0.0348)	(0.0341)	(0.0343)	
$5y\,CDS_{it}$			0.0256***	0.0245***	0.00320
			(0.00597)	(0.00630)	(0.00224)
JP_i	4.985***	3.639***	3.418***	3.137***	1.026***
	(0.894)	(1.047)	(1.063)	(1.106)	(0.351)
$JP_i * QE_t$	-1.631**	-1.178**	-1.231**	-1.015*	2.224
	(0.716)	(0.583)	(0.588)	(0.540)	(2.210)
Observations	193,689	193,689	181,425	181,425	26,113
R-squared	0.814	0.865	0.868	0.872	0.946
Date*Fund Type FE	✓	✓	✓	✓	✓
Collateral FE		✓	✓		
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Notes: Regressions at the contract level, the dependent variable is the interest rate (in bp) paid by a bank i when borrowing from a fund j. †: regression only for overnight repos with US Treasury collateral. Standard errors clustered at the fund family level are in parentheses. ***, **, * denote significance at the 1, 5 and 10% level respectively. The coefficient on QE_t is absorbed by fixed effects.

Bargaining power measures Back

Pricing of CPs, CDs and ABCPs

Sample:	(1) Non-repo	(2) Non-repo	(3) All prime funds	(4) All prime funds exc. US banks	(5) Non-repo	(6) Non-repo
	$Rate_{ijct}$	$Rate_{ijct}$	$Rate_{ijct}$	$Rate_{ijct}$	$Rate_{ijct}$	$Rate_{ijct}$
$Log(value_{ijct})$	-0.119	-0.157	-0.708	-1.074**	-0.157	-1.422***
	(0.233)	(0.244)	(0.432)	(0.465)	(0.244)	(0.528)
$Rem.\,maturity_{ijct}$	0.0628***	0.0658***	0.0921***	0.0814***	0.0658***	0.0675***
	(0.00678)	(0.00651)	(0.0113)	(0.00713)	(0.00651)	(0.00725)
$5y\,CDS_{it}$		0.0370***	0.0322***	0.0366***	0.0370***	0.0299***
		(0.00492)	(0.00306)	(0.00362)	(0.00492)	(0.00576)
JP_i	-4.437***	-4.212***	-3.955***	-3.852***	-4.210***	-4.011***
	(0.710)	(0.695)	(0.605)	(0.623)	(0.725)	(0.650)
$JP_i * \gamma_c^{repo}$			3.331	6.248***		
			(2.019)	(2.235)		
$JP_i * QE_t$					-0.00586	0.214
					(0.234)	(0.247)
Observations	295,842	268,966	353,058	285,531	268,966	267,187
R-squared	0.876	0.881	0.906	0.914	0.881	0.926
Date*Instrument FE	✓	✓			✓	
Date*Instrument*Fund FE			✓	✓		✓
Mean dep. var.	46.30	46.65	45.22	45.12	46.65	46.70

Notes: Regressions at the contract level, the dependent variable is the interest (in basis points) paid by a bank i when borrowing from a fund j. Standard errors clustered at the fund family level are in parentheses. ***, **, * denote significance at the 1, 5 and 10% level respectively.

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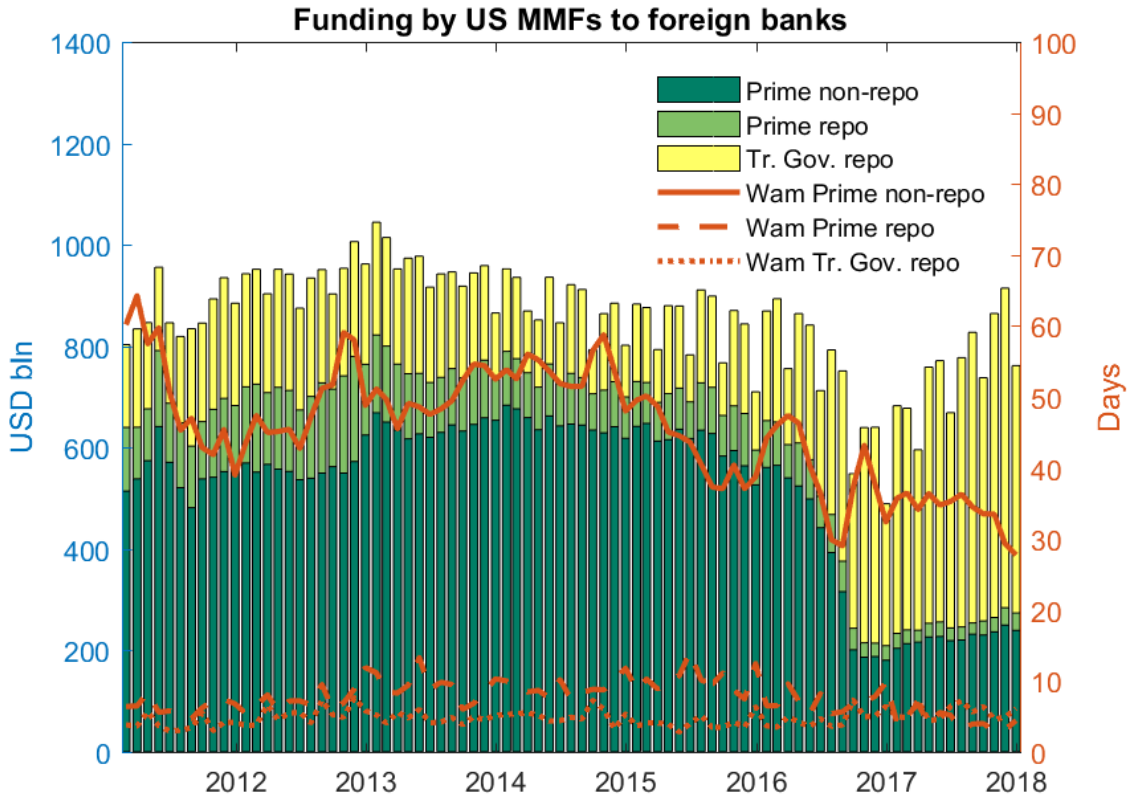
US MMF reform

- Implemented in October 2016 - ideal natural experiment.
  - Funding shock to unsecured funding without a crisis.
- Introduction of floating NAV & redemption gates/fees for prime funds.
- Prime funds are the only ones that can invest in CP, CD, ABCP.
- Prime funds converted to government funds in response.



Repo intermediation spreads through maturity transformation

Sample:	(1) Repo $Rate_{ijct}$
JP_i	1.319
	(1.774)
$Rem.maturity_{ijct}$	0.348***
	(0.0358)
$JP_i * Rem.maturity_{ijct}$	0.141*
	(0.0848)
30-day intermediation spread	16.0 bps***
	(1.1089)
Observations	181,425
R-squared	0.872
Controls	✓
Date*Fund Type FE	✓
Date*Collateral FE	✓

Notes: Regressions at the contract level, the dependent variable is the interest rate (in basis points) paid by a bank when borrowing from a fund in repo contracts. 30-day intermediation spread is calculated by $JP_i + 30 * Rem.maturity_{ijct} + 30 * (Rem.maturity_{ijct} * JP_i)$, in order to estimate how much a non-Japanese bank would earn as a spread if it borrows overnight and lends to a Japanese bank at 30-days, charging the MMF price. Standard errors clustered at the fund family level in parentheses. ***, **, * denote significance at the 1, 5 and 10% level respectively.

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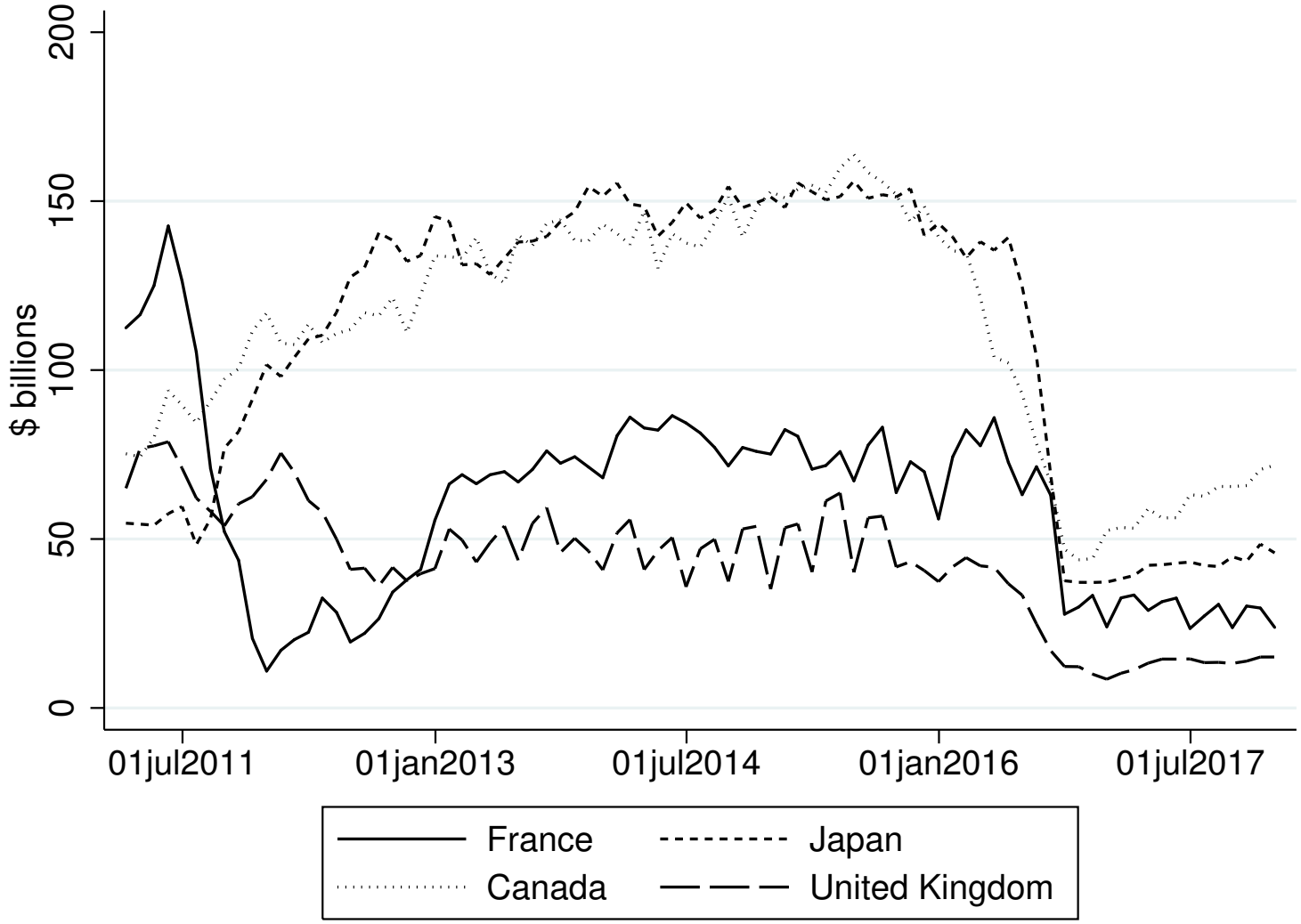
Total non-repo volumes by country



Sources: Crane data; authors' calculations.

Measures of bargaining power and pricing

Sample:	(1) Repo $Rate_{ijct}$	(2) Repo $Rate_{ijct}$	(3) Non-repo $Rate_{ijct}$	(4) Non-repo $Rate_{ijct}$
BV_{ijt-1}	0.0678**		0.0634**	
	(0.0292)		(0.0269)	
FV_{ijt-1}	-0.0104		-0.0330	
	(0.0224)		(0.0600)	
$BV_{ij^{ff}t-1}$		0.0672***		0.0445*
		(0.0165)		(0.0259)
$FV_{ij^{ff}t-1}$		-0.0460***		-0.00855
		(0.0152)		(0.0644)
Observations	164,634	176,573	245,417	253,938
R-squared	0.872	0.873	0.886	0.884
Controls	✓	✓	✓	✓
Date*FundType FE	✓	✓		
Date*Instrument FE	✓	✓	✓	✓

Notes: Regressions at the contract level, the dependent variable is the interest rate (in basis points) paid by a bank when borrowing from a fund. BV_{ijt-1} (j^{ff}) refers to the lagged share of a fund (fund family) for a bank at a given date measured for the repo segment in columns (1) and (2), and for the non-repo segment in columns (3) and (4). FV_{ijt-1} (j^{ff}) refers to the lagged share of a bank for a fund (fund family) at a given date measured for the repo segment in columns (1) and (2), and for the non-repo segment in columns (3) and (4). Controls include $Log(value_{ijct})$ and $5y\,CDS_{it}$ and $Rem.maturity_{ijct}$. Date*Fund Type FE is omitted in (3) and (4) since only prime funds provide non-repo funding. Standard errors clustered at the fund family level are in parentheses. ***, **, * denote significance at the 1, 5 and 10% level respectively.

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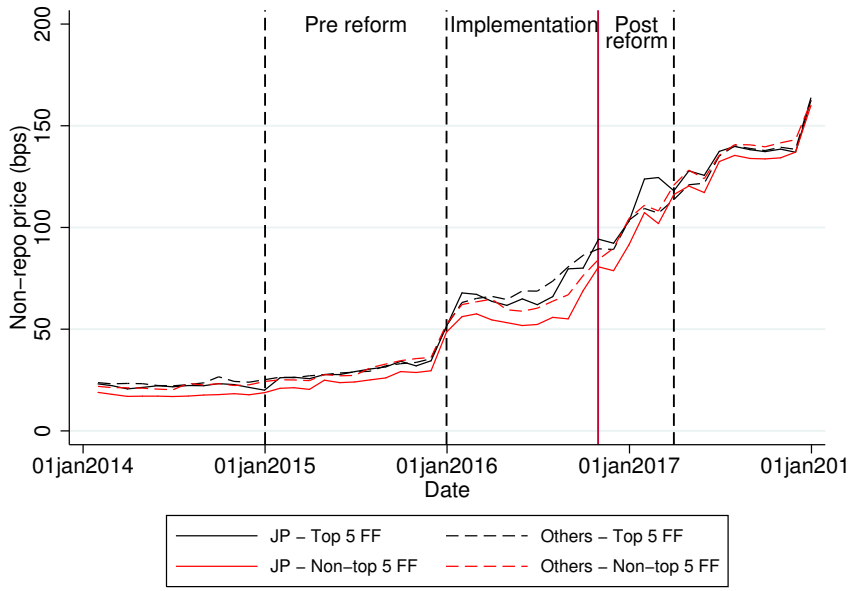
Differences in differences in differences - setup

Hypothesis

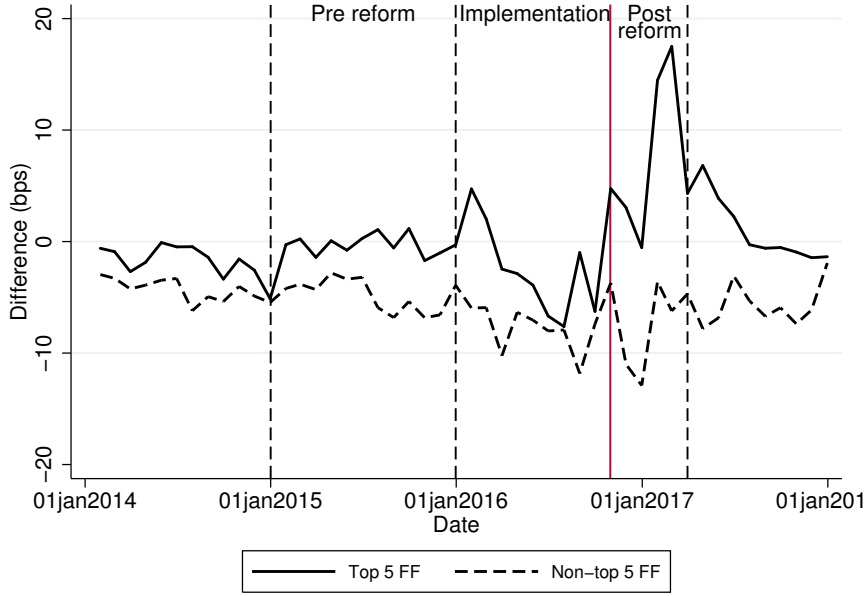
Top fund families charge a higher price to Japanese banks after the implementation of the MMF reform.

The MMF reform and the non-repo pricing of top 5 fund families

Prices by bank's country of HQ



JP difference by top and non-top families



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Differences in differences in differences - results

Sample:	(1) Non-Repo $Rate_{ijct}$	(2) Non-Repo $Rate_{ijct}$	(3) Non-Repo $Rate_{ijct}$	(4) Non-Repo $Rate_{ijct}$
$JP_i * PostReform_t * Top5^{ff}_{jt}$	6.392***	6.131***	4.370**	5.351**
	(2.438)	(2.360)	(2.148)	(2.209)
Observations	59,596	59,576	59,534	59,278
R-squared	0.891	0.901	0.911	0.924
Controls	✓	✓	✓	✓
Date*Instrument FE	✓	✓	✓	✓
Bank FE	✓	✓	✓	✓
Date*FundFamily FE	✓		✓	
Date*Fund FE		✓		✓
Bank*Fund FE				✓
Bank*FundFamily FE			✓	

Notes: Regressions at the contract level, the dependent variable is the interest (in basis points) paid by a bank when borrowing from a fund. All regressions refer to non-repo (CP, CD, ABCP) contracts. The sample contains observations in 2015 as the "pre-period" and between October 2016 and March 2017 (both included) as the "post-period." January 2016 - September 2016 correspond to the implementation period and observations between those dates are omitted. JP_i is a dummy which takes the value 1 if the headquarters of the bank are in Japan. $Top5^{ff}_{jt}$ is a dummy variable if a fund family is one of the top 5 fund families by market share in this segment. $PostReform_t$ is a dummy variable that is one if date is greater than October 14, 2016 - the implementation date of the reform. Controls include $Log(value_{ijct})$, $5y\,CDS_{it}$, $Rem.maturity_{ijct}$, $RelLength^{ff}_{ijt}$, $JP_i * Top5^{ff}_{jt}$ and $JP_i * PostReform_t$. Standard errors clustered at the $fundfamily * date$ level in parentheses. ***, **, * denote significance at the 1, 5 and 10% level respectively. All other variables that should appear in our diff-in-diff-in-diff specification as controls are absorbed in fixed effects.

Bargaining power measures Back

MMF reform robustness - using explicit measures

Sample:	(1) Non-Repo $Rate_{ijct}$	(2) Non-Repo $Rate_{ijct}$	(3) Non-Repo $Rate_{ijct}$	(4) Non-Repo $Rate_{ijct}$
$JP_i * PostReform_t * MktShr^{ff}_{jt-1}$	0.404**			
	(0.186)			
$JP_i * PostReform_t * MktShr_{jt-1}$		0.261		
		(0.302)		
$JP_i * PostReform_t * BV_{ijff\,t-1}$			0.362***	
			(0.122)	
$JP_i * PostReform_t * BV_{ijt-1}$				0.218
				(0.135)
Observations	59,426	58,887	57,352	55,635
R-squared	0.891	0.901	0.895	0.905
Controls	✓	✓	✓	✓
Date*Instrument FE	✓	✓	✓	✓
Bank FE	✓	✓	✓	✓
Date*FundFamily FE	✓		✓	
Date*Fund FE		✓		✓

Notes: Pre-period = Jan-Dec 2015; post-period = Oct2016-Mar2017. $MktShr^{ff}_{jt-1}$ ($MktShr_{jt-1}$) is the lagged value of the market share of the fund family (fund) in the non-repo segment. $BV_{ijff\,t-1}$ (BV_{ijt-1}) is the lagged value of the share of a given fund family (fund) in the borrowing of a given bank. $PostReform_t$ is a dummy variable that is one if date is greater than October 14, 2016 - the implementation date of the reform. Controls include $Log(value_{ijct})$, $5y\,CDS_{it}$, $Rem.maturity_{ijct}$, $RelLength^{ff}_{ijt}$, $JP_i * PostReform_t$ in all columns, $FV_{ijff\,t-1}$ in column (3), measuring how important a bank is for a fund family (similarly FV_{ijt-1} in column (4)). Standard errors clustered at the $fundfamily * date$ level in parentheses. ***, **, * denote significance at the 1, 5 and 10% level respectively.

Why do JP banks not diversify repo borrowing?

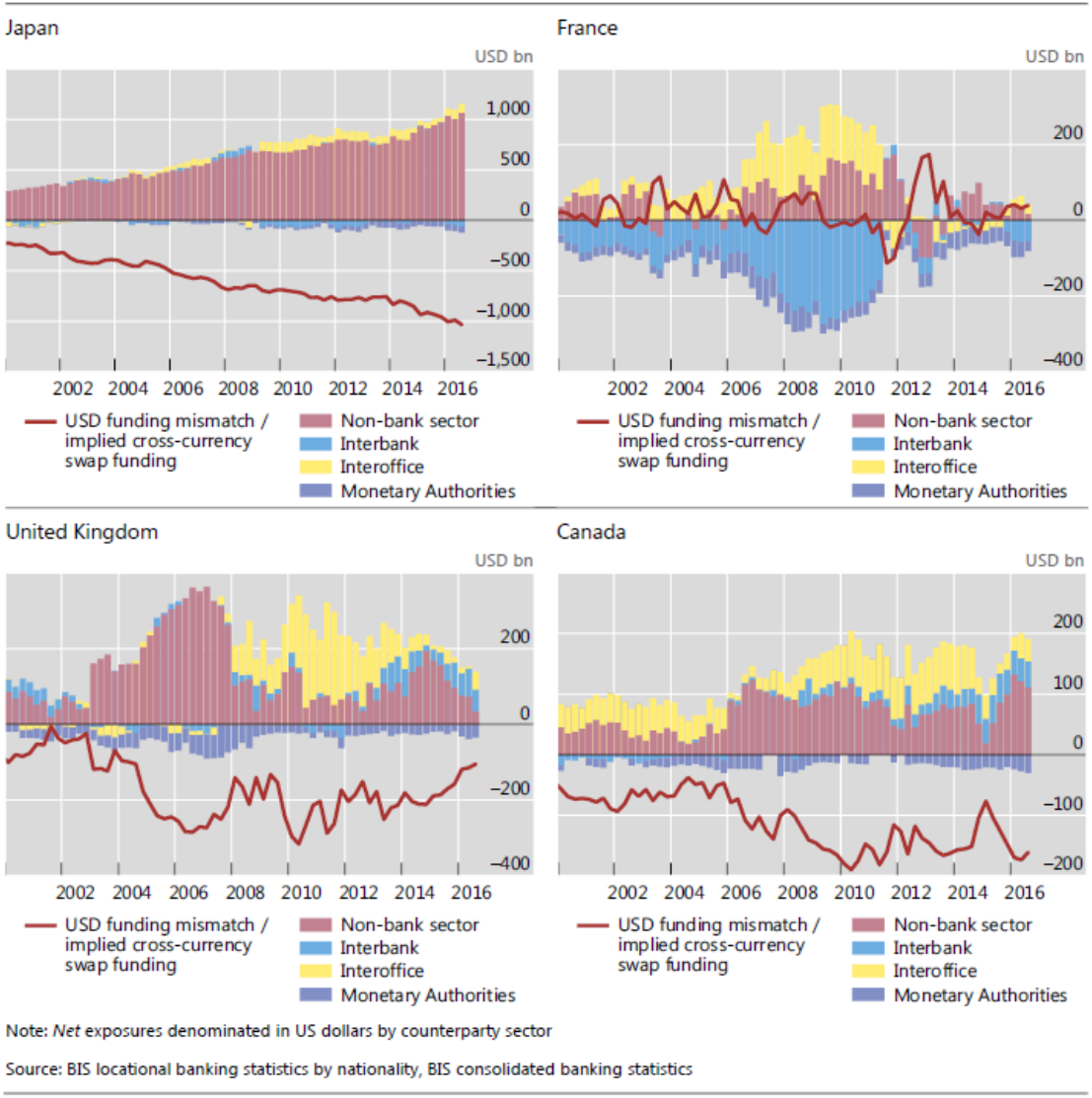
- Long maturity repos are constrained (SEC Rule 2a-7).
- Do MMFs favor longer term counterparties for long maturity repos?
- JP banks trade off ↓ bargaining power with ↑ funding maturity

Sample:	(1) Repo $Rem.\,maturity_{ijct}$	(2) Repo $Rem.\,maturity_{ijct}$	(3) Repo $Rem.\,maturity_{ijct}$
$Rel.\,length^{repo}_{ijff\,t}$	0.00730	0.151**	0.0438
	(0.118)	(0.0733)	(0.0919)
$JP_i * Rel.\,length^{repo}_{ijff\,t}$	0.174***	0.138***	0.222
	(0.0480)	(0.0362)	(0.261)
Observations	124,477	124,325	133,135
R-squared	0.321	0.343	0.372
Controls	✓	✓	✓
Date*Fund Type FE	✓	✓	✓
Date*Collateral FE	✓	✓	✓
Date*FundFamily FE		✓	✓
Date*Bank FE			✓
Bank*FundFamily FE	✓	✓	✓
Mean dep. var.	8.694	8.702	8.629

Notes: Regressions at the contract level, the dependent variable is the remaining maturity of the contract (proxying for maturity at origination). We restrict the sample to repos between January 2012 and October 2016 (due to the US MMF reform potentially causing a structural change in the market). Standard errors clustered at the fund family level in parentheses. ***, **, * denote significance at the 1, 5 and 10% level respectively.

Global dollar balance sheets - Dollar funding gap

US dollar exposures by country



Note: *Net* exposures denominated in US dollars by counterparty sector

Source: BIS locational banking statistics by nationality, BIS consolidated banking statistics

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