The World's Cross-Border Liquidity Lines

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Introduction

- Central bank cross-border liquidity line: agreement to provide a collateralised loan of currency from a lending central bank to a borrowing central bank.
- Various goals:
  1) emergency FX liquidity support to banks,
  2) balance of payments support,
  3) currency internationalization.
- Network of lines since turn of millennium – not just USD.
- This paper and presentation: comprehensive dataset of all lines agreed globally + implications
  → why the network structure + indirect connections matter,
  → fragility of the network,
  → complementarity/substitutability of reserves.

Dataset

https://r2rsquaredlse.github.io/web-lines/

Hand-collected from public sources. Period 2000-24, 1600 lender-borrower-agreement line items.

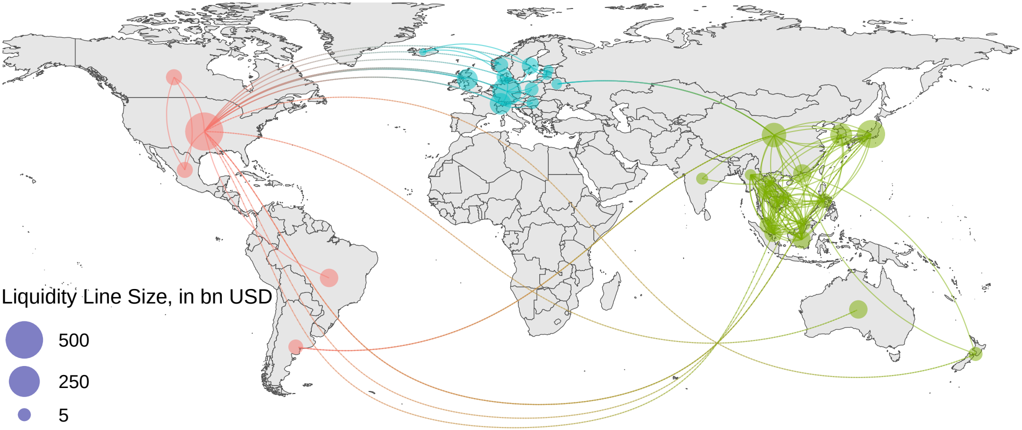
Some key variables:

- Signature date (start date) and agreed end date where available
- Size of the line *Almost all capped in duration and quantity. Big-5 network is the exception*
- Collateral involved *Swap lines dominate repo lines (96%)*
- Reciprocity *Mainly de jure reciprocal deals (70%) but de facto unidirectional (e.g. Fed to ECB)*
- Currencies involved *may be a reserve currency for reserve sharing*
- Bilateral or multilateral & pooled

Geography of connections in 2000

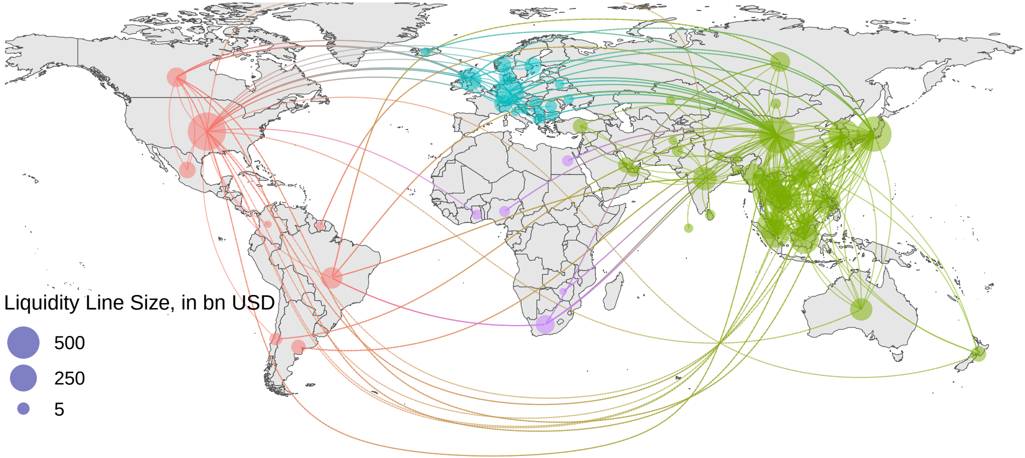
Regional at first: NAFTA and Chiang-Mai

Geography of connections in 2009



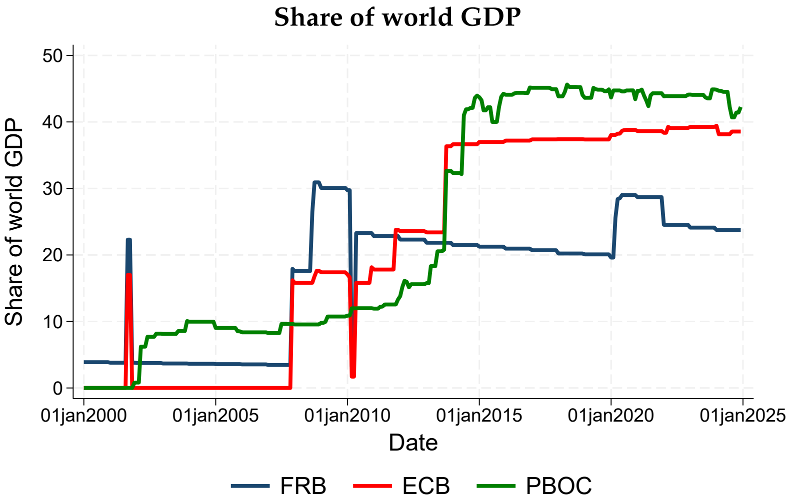
GFC and Fed's response. Expansion of Chiang-Mai and bilateral agreements in Asia.

Geography of connections in 2020



ECB catches up, PBoC vast expansion + Others in Asia, Fed reaction to pandemic

The evolution of the major players



PBoC and ECB kept rising 2010-15, Fed contingent.

Indirect Coverage through the network

Indirect connections

Case: Bank of Korea (BOK)

- no longer has a direct USD liquidity line with the Fed.
- has a yen line with the BOJ.
- BoJ has a USD line with the Fed $\Rightarrow$ *indirect connection*.

Question: Does the indirect connection matter? Would it help a Korean bank that loses its USD funding?

Indirect connections

Case: Bank of Korea (BOK)

Take a step back: ceiling result for a direct connection. Bahaj & Reis (2022)

- Japanese bank can borrow \$ from BoJ (liquidity line rate, $i^{\$,l}$), swap to ¥ (forward premium, $\frac{S^{¥,\$}}{F^{¥,\$}}$), and deposit at the BoJ (deposit rate, $i^{¥,v}$)

- No arbitrage

$$\frac{S^{¥,\$}}{F^{¥,\$}}(1 + i_{¥,v}) \leq (1 + i_{\$,l})$$

- Deviation from covered interest parity: $X^{¥,\$} = (1 + i^{\$}) - \frac{S^{¥,\$}}{F^{¥,\$}}(1 + i^{¥})$ with $i^{¥}$ & $i^{\$}$ market rates.

Liquidity line caps CIP deviation $|X^{¥,\$}| \leq i^{\$,l} - i^{\$}$. assuming $i^{¥} \approx i_{¥,v}$

Empirical evidence: Goldberg & Ravazzolo (2022), Albrizio et al (2023), Ferrera et al (2024), Bahaj & Reis (2025)

Indirect connections

Case: Bank of Korea (BOK)

Liquidity line caps CIP deviation $|X^{¥,\$}| \leq i^{\$,l} - i^{\$}$.

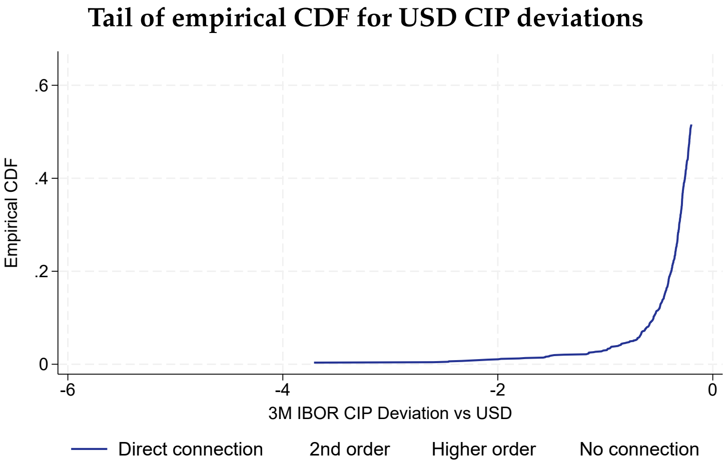
Now **apply to BOK-BoJ** connection

- JPY line ceiling: $|X^{₩,¥}| \leq i^{¥,l} - i^{¥}$.
- Triangular parity: $X^{¥,\$} + X^{₩,¥} \approx X^{₩,\$}$. Somogyi (2024)
- Additive ceilings: $|X^{₩,\$}| \leq i^{¥,l} - i^{¥} + i^{\$,l} - i^{\$}$.

Bottom line: Indirect connection caps Korean bank's cost of synthetic dollar funding.

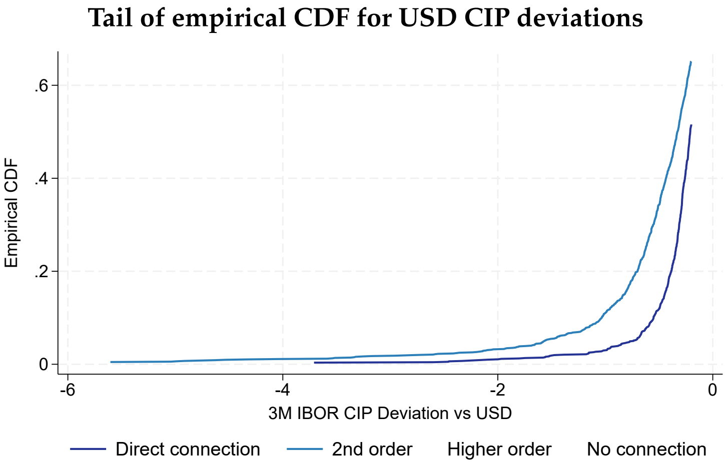
Note: This does not require BoJ to lend USD directly to BoK.

CIP and Network Distance (time-country average)



3 mth USD-IBOR CIP deviations; 40 countries monthly, 2007-2023. Extend Cerutti and Zhou (2024).

CIP and Network Distance (time-country average)



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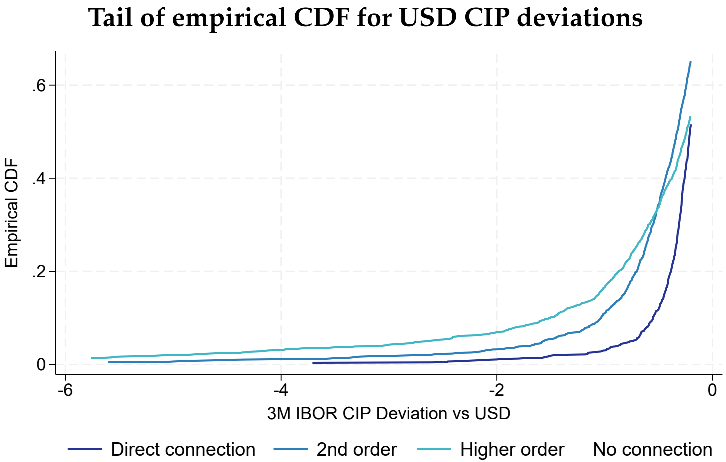

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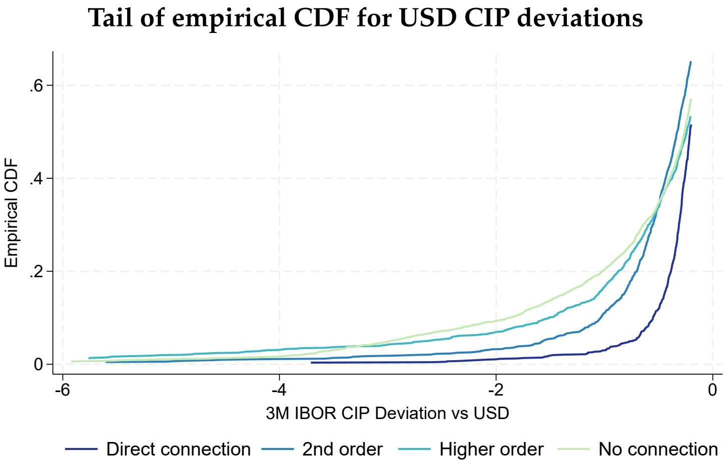
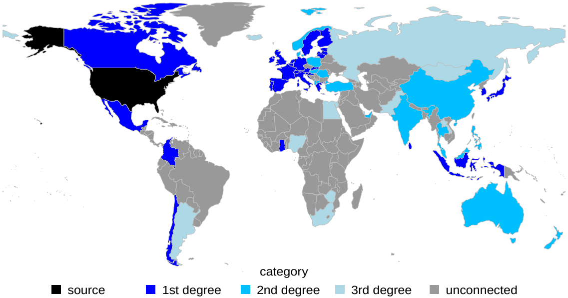


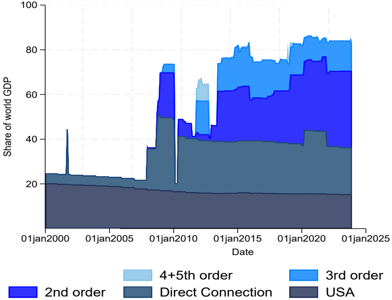
Distribution further to the left when degree of connection is higher Empirical Results

Network: USD (Federal Reserve) in 2023

Geographical coverage

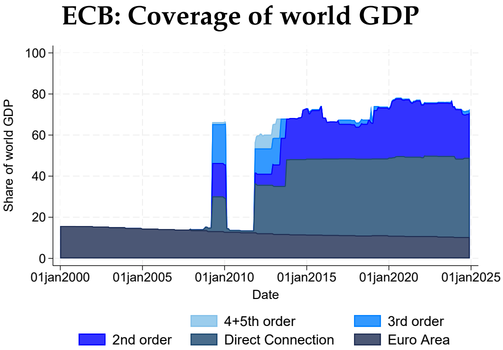


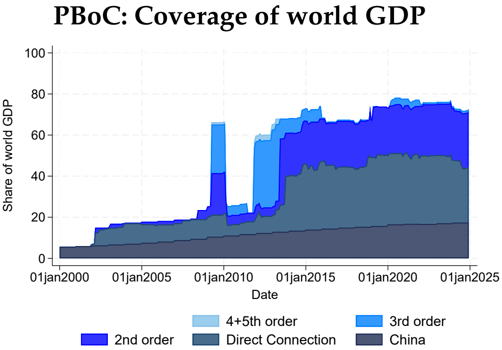
Coverage of world GDP



Through ECB reach Eastern Europe and PBoC, through the latter reach rest of the world.

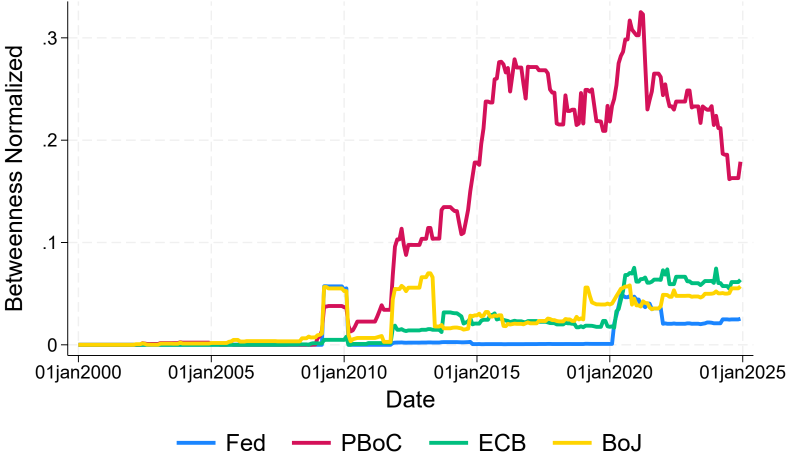
Indirect connections for ECB and PBoC





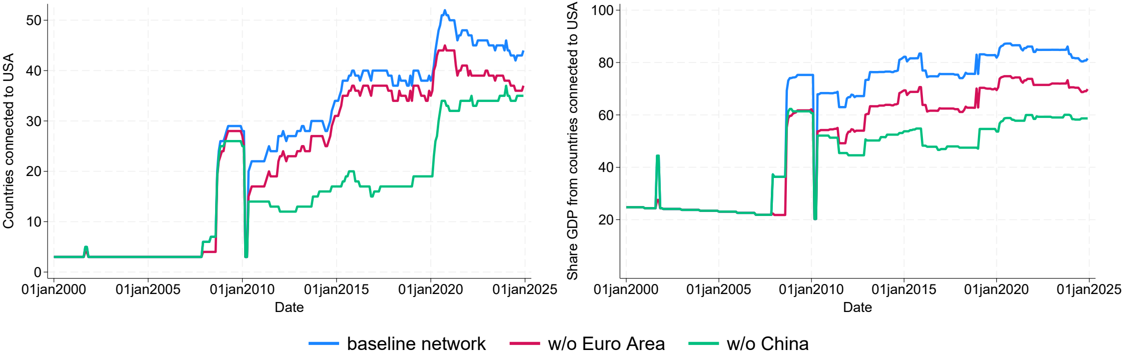
Similar in size but very different sub networks.

Betweenness centrality of central banks



Most indirect connections facilitated by PBoC and ECB, some through BOJ, none through the Fed.

The PBoC and ECB's role in access to the USD



Indirect connections to USD rely on PBoC. ECB less relevant due to substitute counterparties.

Are lines complements or substitutes for FX reserves?

The interaction of liquidity lines and reserves

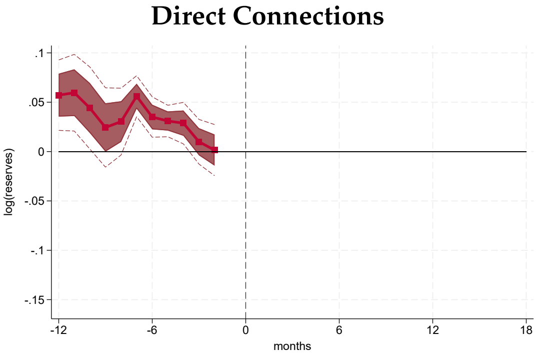
- Central banks could use FX reserves or liquidity lines to provide foreign currency liquidity to its banks or intervene in FX markets. Suggests they are imperfect substitutes.

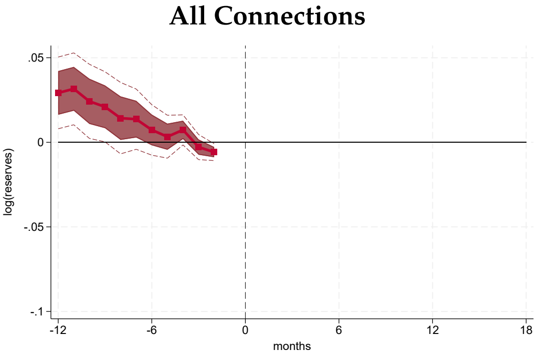
- On the other hand there are complementarities:
  - → Liquidity lines may lead to inflows leading to reserve accumulation.
  - → reserves reduce counterparty risk enabling an improved position in the liquidity line network. Repo lines like FIMA, EUREP make this explicit: tools to convert reserves into currency quickly.

- Confounders: date of agreement may be endogenous to changes in reserves, effects of common shocks like financial crises etc.

- Stacked event study: compare country with similar control countries with similar position in the network. Stronger identification – improvement in position in network through others action.

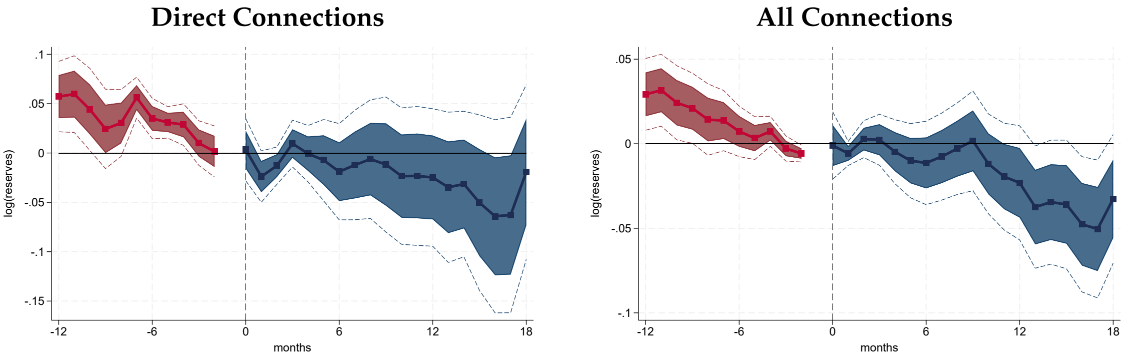
Event Study: Reserves around line signed to USD





Were falling beforehand, “bleeding reserves”.

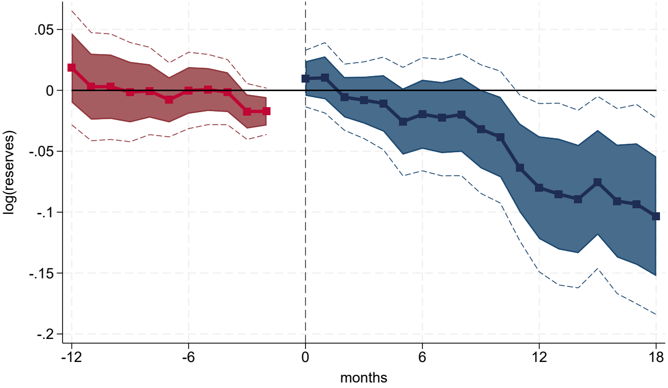
Event Study: Reserves around line signed to USD



Afterwards reserves level out. Some evidence of further decline later.

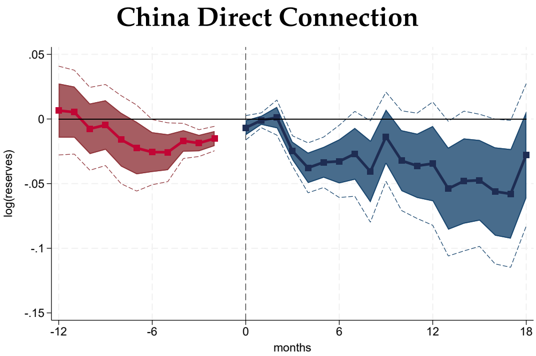
Dealing with endogeneity of signing them

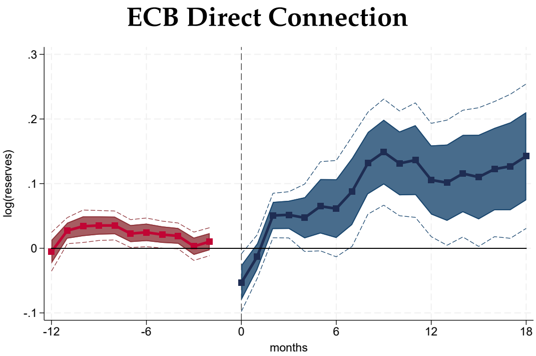
Look at the fall in higher order connection that is not the result of the central bank action.



Only substitution ex-post is visible now

Similar pattern with the yuan, different for the euro





Lessons

1) Comprehensive monthly dataset of cross-border central bank liquidity lines 2000-23. *Much growth in 2010-15, as bilateral lines overtook the big-5 multilateral network*

2) Facts on their spread. *Spurts from Fed 2008 and 2020 get most of the attention, but much of the action is in 2010-15 and involves ECB and PBoC.*

3) The indirect coverage of swap lines and ability to borrow through the network. *Access to USD covers 80% of world GDP.*

4) Systematic cross-country effect of lines on CIP ceilings around the world. *Correlation between (soft) ceilings and size of deviations.*

5) Are swap lines complements or substitutes for FX reserves? *They stop bleeding of reserves in crisis, and afterwards, act as a substitute (apart from direct ECB connections).*

Appendix

Prediction on ceilings over CIP deviations

Return

Table 1: The degree of the liquidity line connection and CIP deviations

	Pooled Quantile Regression	Time Fixed Effects	15th Quantile	5th Quantile	For Euro (ECB)	For Renminbi (PBoC)	Country Fixed Effects	Linear Probability Models	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
2nd degree	-0.450**	-0.235	-0.170	0.048	-0.380	0.364	0.605**	0.083**	0.022*
vs direct	(0.203)	(0.387)	(0.240)	(0.778)	(0.451)	(0.467)	(0.374)	(0.039)	(0.016)
Higher degree	-1.261***	-0.870	-0.561	-1.350	-0.600**	-0.036	-0.637	0.179***	0.089***
vs direct	(0.724)	(0.776)	(0.547)	(1.376)	(0.457)	(0.493)	(0.606)	(0.072)	(0.046)
No connection	-1.234***	-0.891**	-0.549**	-1.002	-1.228***	-0.731 *	0.130	0.173***	0.079***
vs direct	(0.454)	(0.535)	(0.382)	(0.856)	(0.461)	(0.470)	(0.574)	(0.053)	(0.036)
Higher degree	-.810*	-.635	-.391	-1.397	-.22	-.4	-1.243**	.097*	.068**
vs 2nd degree	(0.69)	(0 .681)	(0.504)	(1.207)	(0 .594)	(0.537)	(0.64)	(0.073)	(0.045)
no connection	-.783***	-.657*	-.38*	-1.05+	-.848*	-1.095**	-.475	.09*	.058**
vs 2nd degree	(0.436)	(0 .451)	(0.342)	(0.686)	(0.568)	(0.526)	(0.449)	(0.06)	(0.038)
N	7786	7786	7786	7786	7786	7786	7786	7786	7786
Time F.E.	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country F.E.	No	No	No	No	No	No	Yes	No	No
Counterparty	Fed	Fed	Fed	Fed	ECB	PBoC	Fed	Fed	Fed
Quantile	0.10	0.10	0.15	0.05	0.10	0.10	0.10		
Ceiling								-100	-200