Liquidity Dependence and the Waxing and Waning of Central Bank Balance Sheets

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March 2023

(earlier version “Liquidity Dependence: Why Shrinking Central Bank Balance Sheets is an Uphill Task”, presented at Jackson Hole Economic Symposium 2022

Conundrum: Where did all the liquidity go?

- Unprecedented expansion of central bank balance sheets since the GFC
- Surprisingly fragile financial conditions
  - Repo rate spike in September 2019, Dash for cash in March 2020, Turmoil in UK gilts, Sep-Oct 2022, Silicon Valley Bank and Signature Bank Collapse, March 2023
- Are central bank balance sheet expansion and financial fragility related?
  - Focus on banking sector liability-side (see Acharya-Rajan 2021)
  - In contrast to the more common asset-side and asset-pricing approach to QE
- Key insight:
  - QE is not just an expansion of central bank balance sheet
  - QE is typically also an expansion of commercial banks, mostly via uninsured deposits
    - Risk 1. Time-series: Uninsured deposits don't come off when reserves do
    - Risk 2. Cross-section: Uninsured deposits may not remain where the reserves do

QE : (i) Purchase from banks

Initial Balance Sheet Conditions

FEDERAL RESERVE	
Assets	**Liabilities**
Treasury securities	Reserves held by banks Cash

BANKING SECTOR	
Assets	**Liabilities**
Treasury securities Reserves at the Fed	Deposits Capital

The Fed Purchases Assets from Banks

Balance Sheet Effects

FEDERAL RESERVE	
Assets	**Liabilities**
Treasury securities +$1	Reserves held by banks +$1 Cash

BANKING SECTOR	
Assets	**Liabilities**
Treasury securities -$1 Reserves at the Fed +$1	Deposits Capital

Asset swap with banks

Source: "How the Fed Changes the Size of its Balance Sheet" (Leonard, Martin and Potter, *Liberty Street Economics,* 2017)

QE: (ii) Purchase from public/non-banks

Initial Balance Sheet Conditions

FEDERAL RESERVE	
Assets	**Liabilities**
Treasury securities	Reserves held by banks Cash held by the Treasury

BANKING SECTOR	
Assets	**Liabilities**
Treasury securities Reserves at the Fed	Deposits Capital

PUBLIC	
Assets	**Liabilities**
Deposits Treasury securities	Net worth

The Fed Purchases Assets from the Public

Balance Sheet Effects

FEDERAL RESERVE	
Assets	**Liabilities**
Treasury securities +$1	Reserves held by banks +$1 Cash held by the Treasury

BANKING SECTOR	
Assets	**Liabilities**
Treasury securities Reserves at the Fed +$1	Deposits +$1 Capital

PUBLIC	
Assets	**Liabilities**
Deposits +$1 Treasury securities -$1	Net worth

Bank balance sheets expand, financed with deposits

Source: "How the Fed Changes the Size of its Balance Sheet" (Leonard, Martin and Potter, *Liberty Street Economics,* 2017)

Given different ways of Fed b/s expansion…

We seek to answer the following important questions:

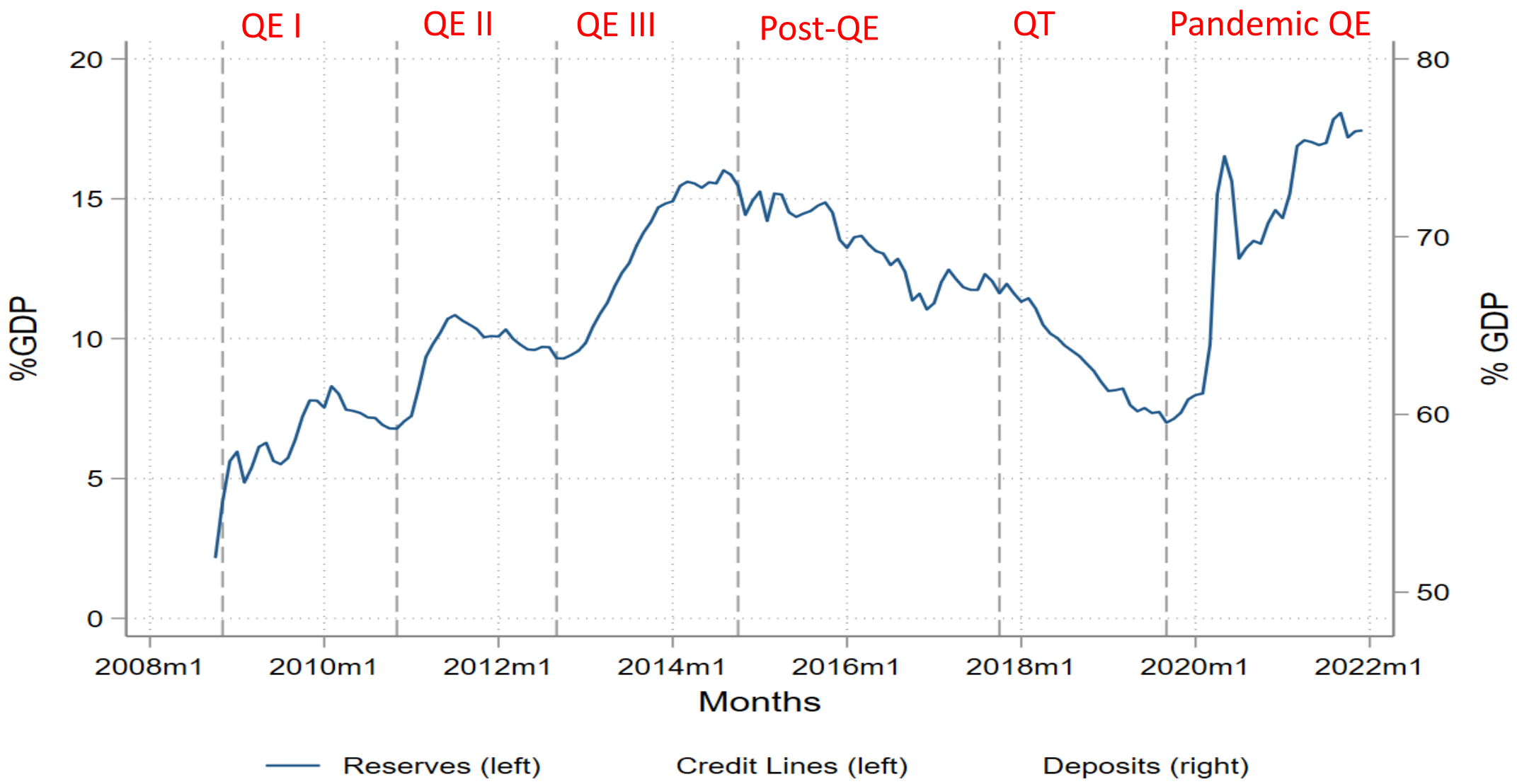
- How does Fed balance-sheet (QE) expansion affect the size, deposits, and "demandability" of deposits of the banking sector?
- Do other demandable liabilities issued by banks such as credit lines to corporations also grow with reserves?
- Do these claims shrink when the Fed shrinks its balance-sheet (QT)?
- Where do the claims to liquidity lie in the cross-section of banks?
- What are its consequences for financial stability?

QT is not simply a reversal of QE!

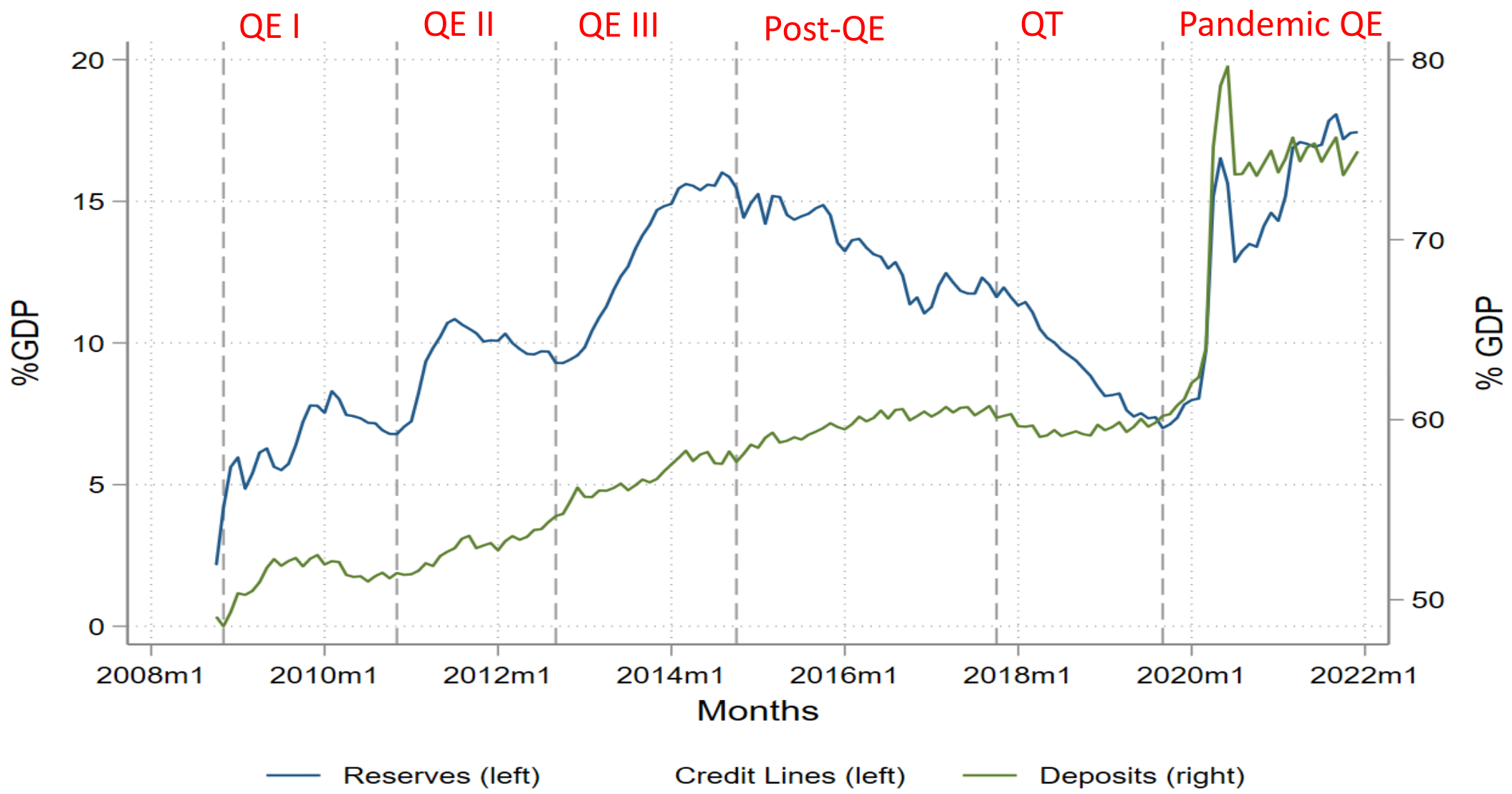
- QE => growth of on- and off-balance-sheet demandable bank liabilities
  - Reserves expand ->
  - (Uninsured) Demand deposits expand
  - Plus shrinkage of deposit maturity; additional writing of credit lines
- QT => Hysteresis: No shrinkage of these liquidity claims
  - Reserve shrink, but liquidity claims keep growing post-QE + remain stable during QT

- "Liquidity dependence" in the banking system in case of (even small) shocks
  - Ratcheting up of central bank b/s size as it injects more reserves with each stress
  - QT can be an uphill task and QE may be less effective than envisaged

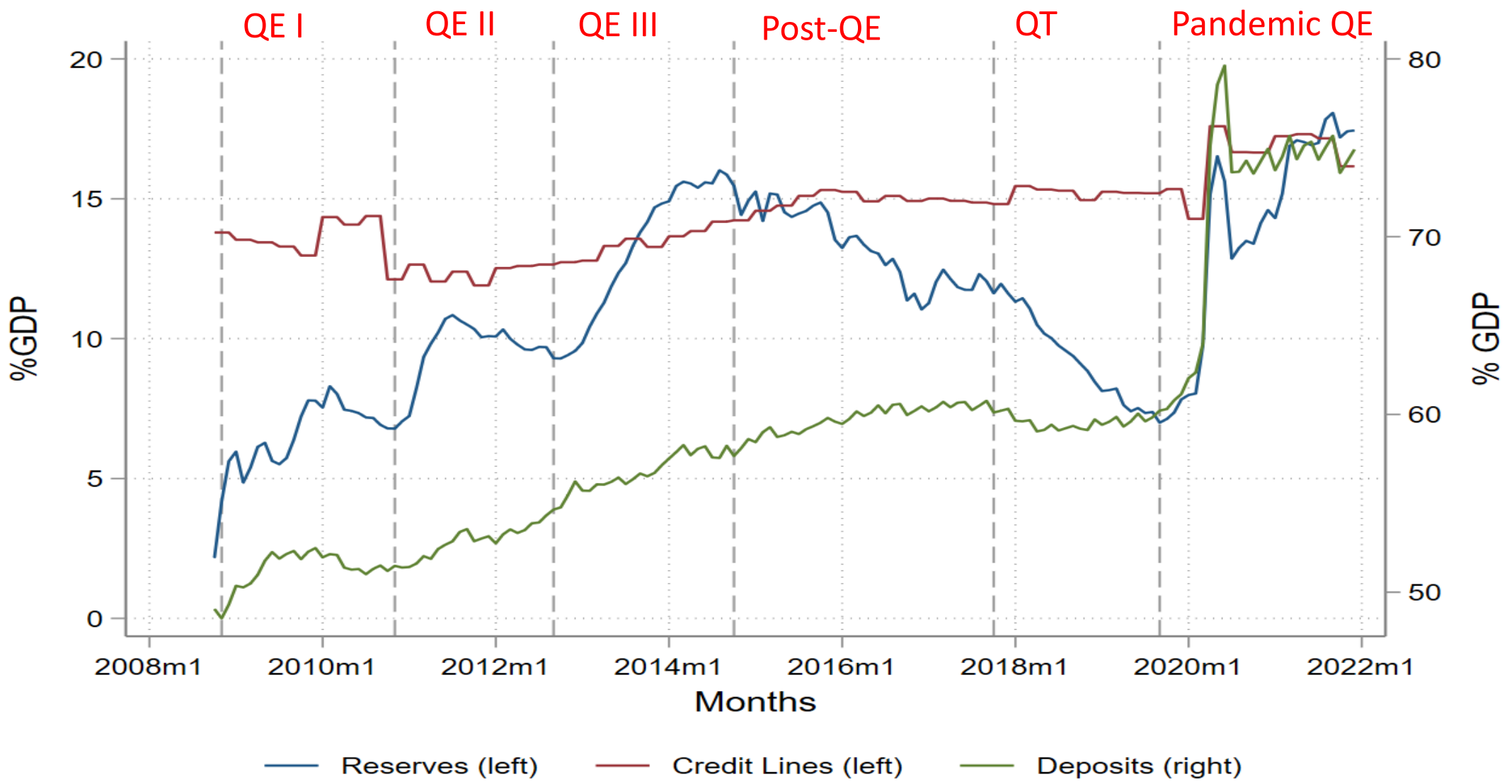
Reserves and Claims (% of GDP)



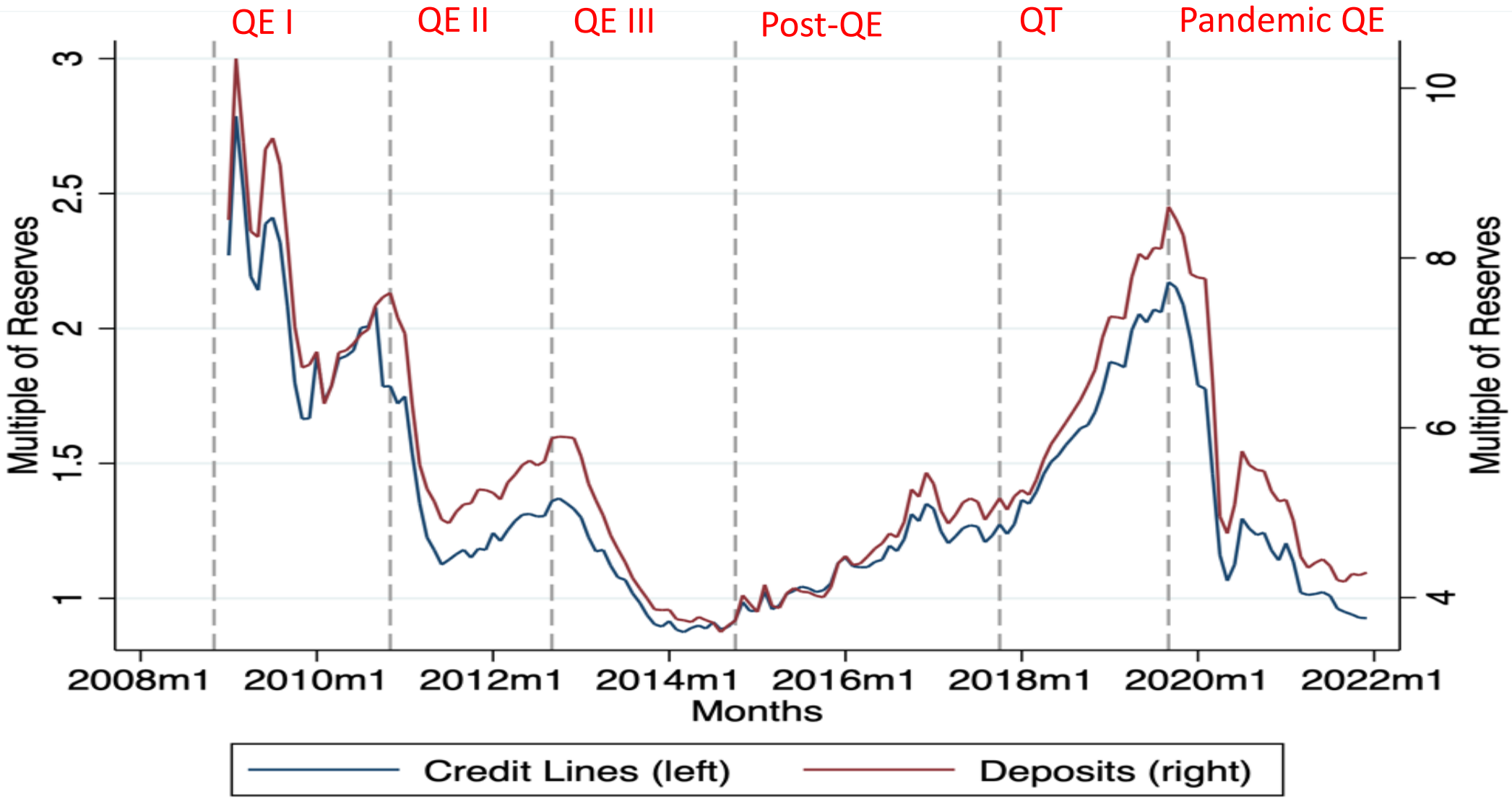
Reserves and Claims (% of GDP)



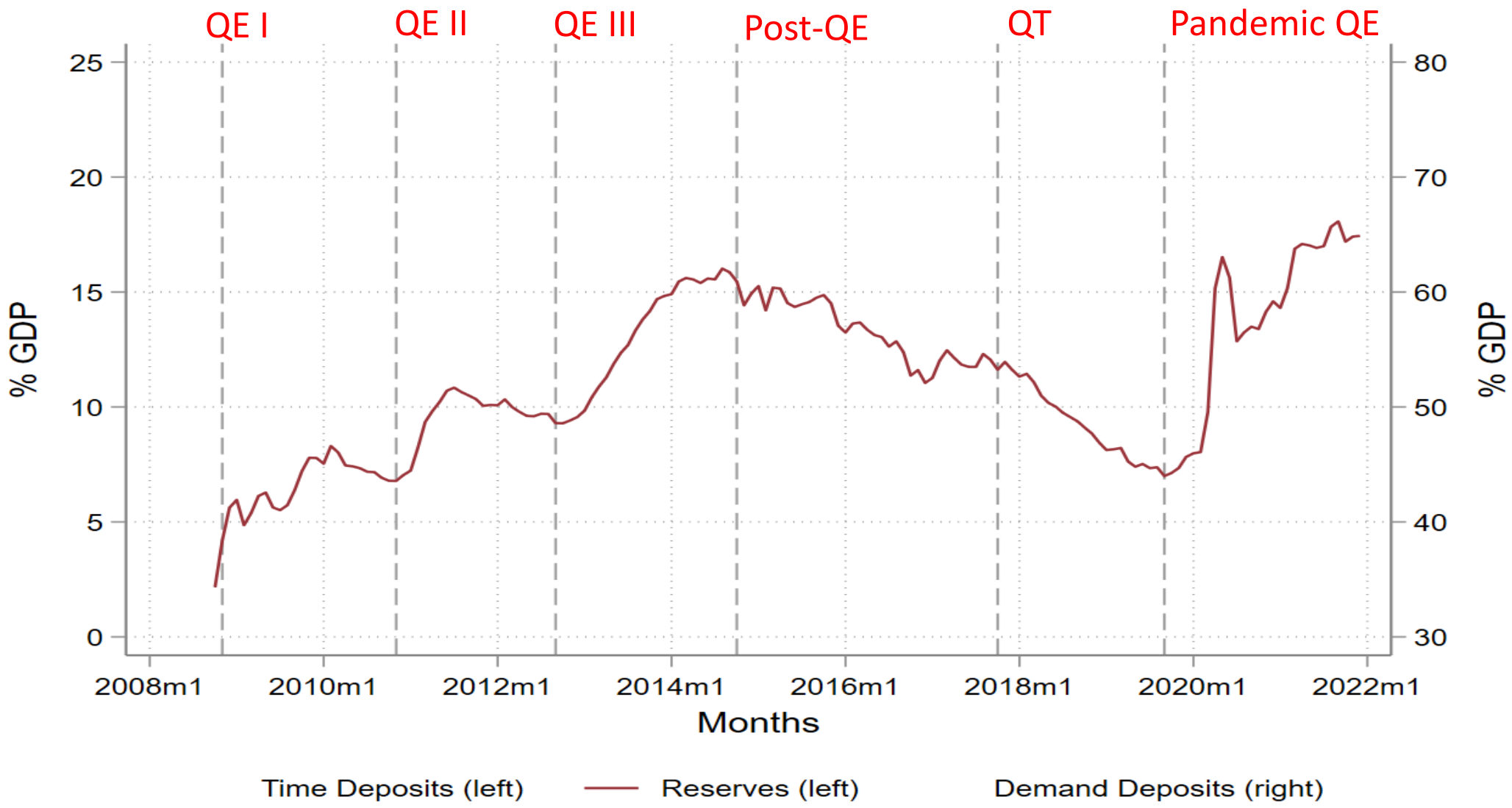
Reserves and Claims (% of GDP)



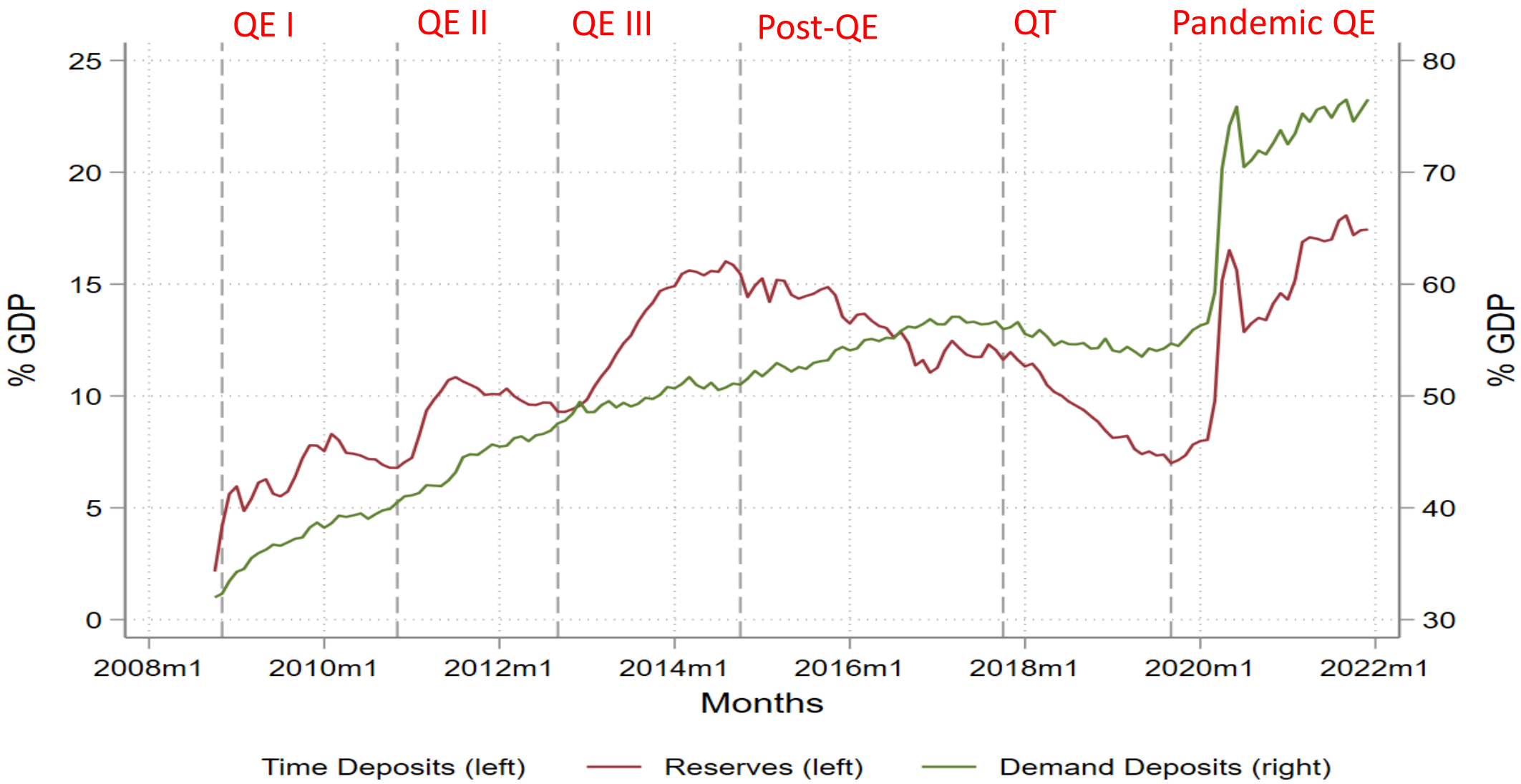
Claims on Liquidity (multiple of reserves)



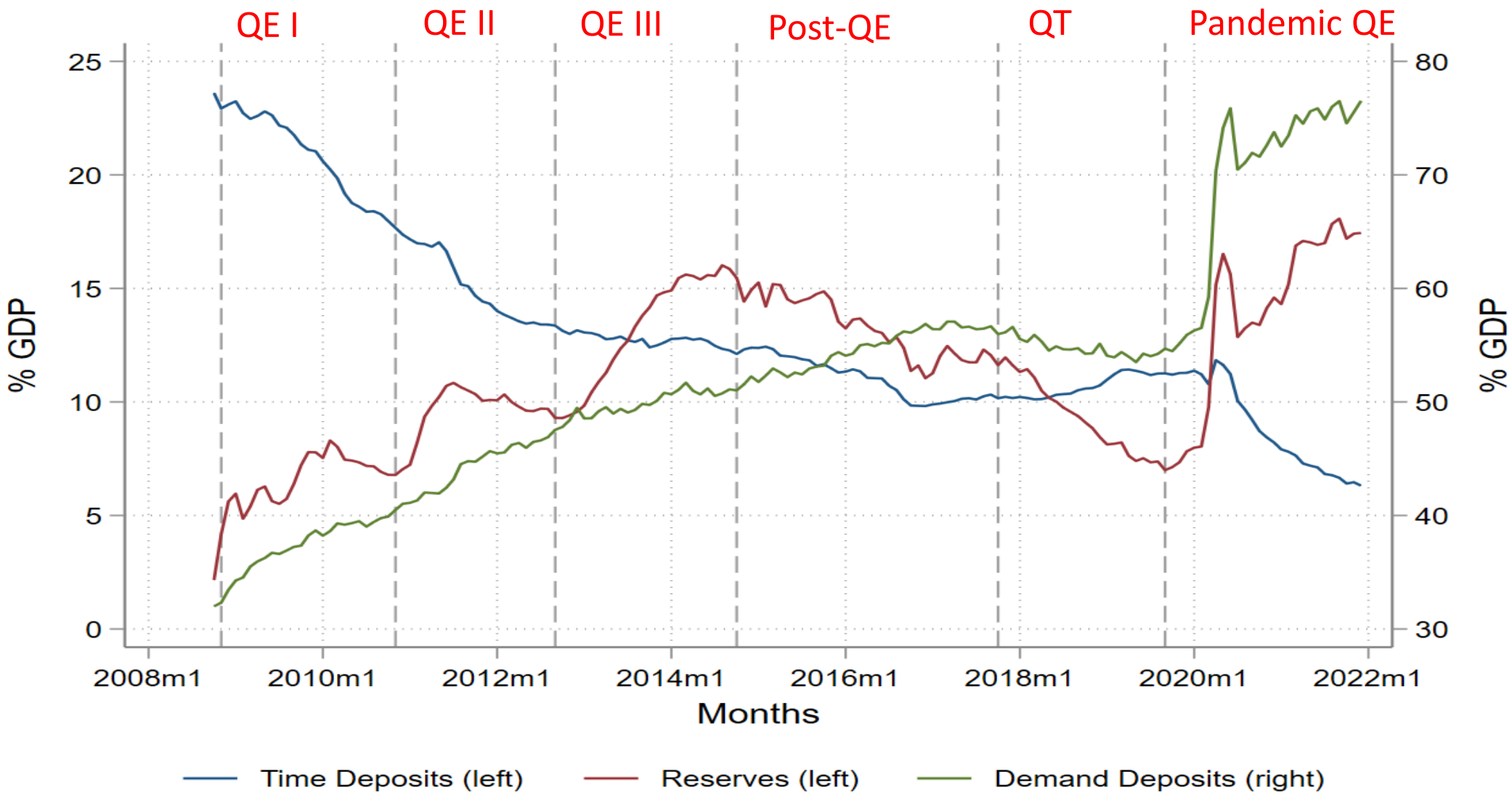
Demandable and Time Deposits (% of GDP)



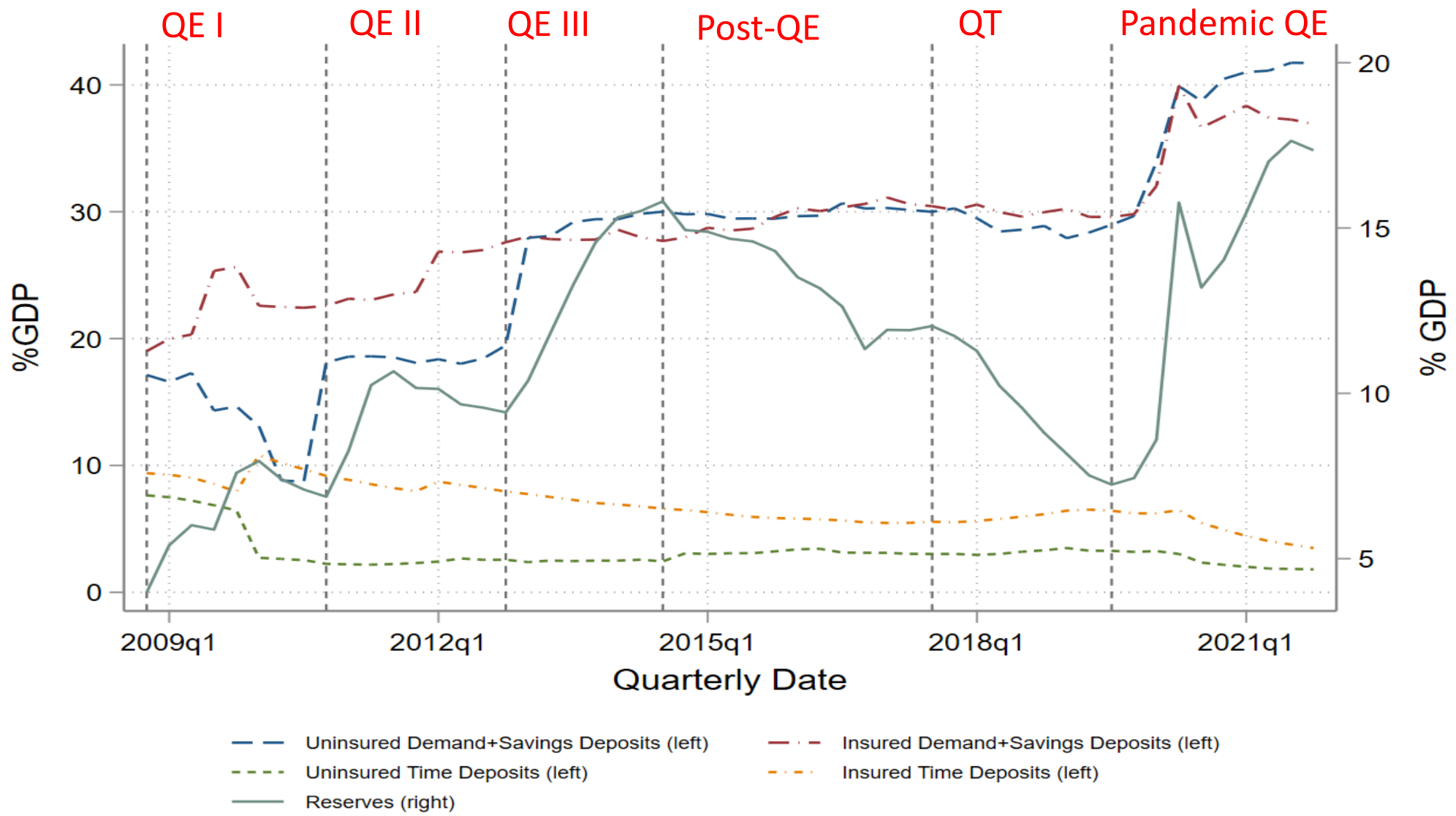
Demandable and Time Deposits (% of GDP)



Demandable and Time Deposits (% of GDP)



Uninsured/Insured Demandable/Time Deposits (% of GDP)



Empirical Tests

- Aggregate, time-series evidence
  - Reserves -> Quantities of demandable claims
  - Reserves -> Price of demandable claims (skipped in interest of time)
- Panel tests across banks
  - Reserves -> Quantities
    - Instrument for bank-level reserves
  - Reserves -> Price of liquidity: Term Spread in deposit rates
    - Instrument for bank-level reserves and deposits

Time-series analysis: Reserves -> Claims

$$\Delta Y_t = \alpha \Delta X_t + \beta X_{t-12} + \varepsilon_t$$

$\Delta Y_t = Y_t - \ Y_{t-12}$ is either the Δ Ln(Deposits) or Ln(Credit Lines) or
Δ Deposits or Credit Lines

$\Delta X_t = X_t - X_{t-12}$ is respectively either the Δ Ln(Reserves) or Δ Reserves.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Δ Ln(Deposits)	Δ Ln(Demand Deposits)	Δ Ln(Time Deposits)	Δ Ln(Credit Lines)	Δ Deposits	Δ Demand Deposits	Δ Time Deposits	Δ Credit Lines
Δ Ln(Reserves)	0.137***	0.180***	-0.242**	0.0802***				
	(0.0368)	(0.0541)	(0.114)	(0.0282)				
$Ln(Reserves)_{t-12}$	0.0503***	0.0136	-0.0251	0.0882***				
	(0.0140)	(0.0227)	(0.0702)	(0.0323)				
Δ Reserves					0.999***	1.358***	-0.224**	0.147***
					(0.242)	(0.314)	(0.0932)	(0.0392)
$Reserves_{t-12}$					0.329***	0.343***	0.0726	0.146***
					(0.0691)	(0.0838)	(0.0684)	(0.0399)
Constant	-0.327***	-0.0265	0.163	-0.616**	-88.97	-15.98	-220.0	-162.4*
	(0.106)	(0.172)	(0.533)	(0.249)	(169.3)	(164.0)	(150.2)	(91.28)
Obs	147	147	147	147	147	147	147	147
R-sq	0.592	0.589	0.296	0.232	0.663	0.673	0.334	0.416
Reg-Type	OLS	OLS	OLS	OLS	OLS	OLS	OLS	OLS
S.E.(# Lags)	Newey-West (12)	Newey-West (12)	Newey-West (12)	Newey-West (12)	Newey-West (12)	Newey-West (12)	Newey-West (12)	Newey-West (12)

Controlling for Household Financial Assets net of Deposits (Lopez-Salido and Vissing-Jorgensen, 2022)

	(1)	(2)	(3)	(4)
	ΔLn(Deposits)		ΔLn(Demand & Other Liquid Deposits)	
ΔLn(Reserves)	0.0877**	0.0865**	0.160***	0.161***
	(0.0383)	(0.0385)	(0.0394)	(0.0384)
ΔLn(Fin Assets - Deposits)	0.160		0.157	
	(0.116)		(0.147)	
ΔLn(Fin Assets – Insured Deposits)		0.159		0.125
		(0.110)		(0.148)
Constant	0.0459***	0.0457***	0.0670***	0.0688***
	(0.00870)	(0.00875)	(0.0106)	(0.0104)
Obs	146	146	146	146
R-Sq	0.457	0.462	0.597	0.593
Reg-Type	Newey-West	Newey-West	Newey-West	Newey-West
# Lags	12	12	12	12

From time-series to panel tests

- Time-series evidence suggests
  - Reserves affect claims on liquidity held by the banking system
    - Demandable deposits and credit lines rise
    - Time deposits shrink
  - Claims on liquidity have to be accounted for to price liquidity (skipped)
- Time-series tests lack power to analyze individual QE/QT periods
  - Can't rule out confounding effects due to interest rates, economic activity
- Hence, panel tests…

Challenges in panel tests

- Reserves are <u>exogenous for the banking system as a whole, but endogenous for each individual bank</u>

(1) Reserves may rise at a bank due to asset sales or equity issuance

(2) Reserves may correlate with *higher* time-deposits and *lower* demand deposits or credit-lines due to bank's risk-aversion or regulations (LCR)

- We instrument bank-level reserves to get at a "reserves beta"
  - Exogenous variation in reserves (aggregate change in reserves)
  - Non-transient bank-level variation (bank's share over the past year)

Instrument for Reserves

$$z_{it}^{R} = \ln\left(\frac{Aggregate\ Reserves_t}{Aggregate\ Reserves_{t-1}}\right) \times \frac{1}{4}\sum_{k=1}^{4} Bank\ i's\ share\ of\ aggregate\ reserves_{t-k}$$

Bank i's share of aggregate reserves in quarter t is calculated by dividing the bank-level reserves by aggregate central bank reserves.

Rationale:

- Average of lagged share reflects "location" of the bank with regard to picking up exogenous reserves
  - being a money-center bank,
  - having relationships with non-banks tendering assets to the Fed
- Assumption: Endogenous responses caused by shocks uncorrelated to "location"

Demand (& Savings) Deposits– IV 2nd Stage

	(1)	(2)	(3)	(4)
	ΔLn(Demand deposits)			
ΔLn(Reserves)	0.135***	0.122***	0.116***	0.525
	(0.0185)	(0.0305)	(0.0322)	(0.457)
Obs	115533	50921	43130	30770
Time-FE	Y	Y	Y	Y
Two-way Clustering	Y	Y	Y	Y
Controls	Y	Y	Y	Y
Reg Type	IV	IV	IV	IV
Period	Overall: 2001Q1 - 2021Q4	QE I-III + Pandemic QE: 2008Q4 - 2014Q3 & 2019Q4 - 2021Q4	QE I-III: 2008Q4 - 2014Q3	Post-QE III + QT2014Q4 - 2019Q3

Controls for time-varying bank characteristics: Size, profitability, primary dealer dummy, equity-assets ratio

Time Deposits – IV 2nd Stage

	(1)	(2)	(3)	(4)
	ΔLn(Time Deposits)			
ΔLn(Reserves)	-0.164***	-0.145***	-0.158***	0.954
	(0.0445)	(0.0441)	(0.0334)	(0.807)
Obs	114689	50555	42853	30551
Time-FE	Y	Y	Y	Y
Two-way Clustering	Y	Y	Y	Y
Controls	Y	Y	Y	Y
Reg Type	IV	IV	IV	IV
Period	Overall: 2001Q1 - 2021Q4	QE I-III + Pandemic QE: 2008Q4 - 2014Q3 & 2019Q4 - 2021Q4	QE I-III: 2008Q4 - 2014Q3	Post-QE III + QT2014Q4 - 2019Q3

Uninsured Demand Deposits– IV 2nd Stage

	(1)	(2)	(3)	(4)
	ΔLn(Uninsured Demand Deposits)			
ΔLn(Reserves)	0.0996***	0.105***	0.111***	-0.243
	(0.0213)	(0.0240)	(0.0268)	(0.430)
Obs	95114	38676	31051	29898
Time-FE	Y	Y	Y	Y
Two-way Clustering	Y	Y	Y	Y
Controls	Y	Y	Y	Y
Reg Type	IV	IV	IV	IV
Period	Overall: 2001Q1 - 2021Q4	QE I-III + Pandemic QE: 2008Q4 - 2014Q3 & 2019Q4 - 2021Q4	QE I-III: 2008Q4 - 2014Q3	Post-QE III + QT2014Q4 - 2019Q3

Uninsured Time Deposits– IV 2nd Stage

	(1)	(2)	(3)	(4)
	ΔLn(Uninsured Time Deposits)			
ΔLn(Reserves)	-0.179***	-0.181***	-0.190***	-0.0172
	(0.0512)	(0.0524)	(0.0363)	(0.569)
Obs	113664	49894	42273	30251
Time-FE	Y	Y	Y	Y
Two-way Clustering	Y	Y	Y	Y
Controls	Y	Y	Y	Y
Reg Type	IV	IV	IV	IV
Period	Overall: 2001Q1 - 2021Q4	QE I-III + Pandemic QE: 2008Q4 - 2014Q3 & 2019Q4 - 2021Q4	QE I-III: 2008Q4 - 2014Q3	Post-QE III + QT2014Q4 - 2019Q3

Reserves -> Lower deposit term spreads

	(1) 3 month CD Rate - Savings Rate	(2) 12 month CD Rate - Savings Rate	(3) 18 month CD Rate - Savings Rate	(4) 24 month CD Rate - Savings Rate
Ln(Reserves)	-0.134***	-0.0467	-0.209***	-0.108***
	(0.0327)	(0.0567)	(0.0341)	(0.0253)
Ln(Total Deposits)	0.141	0.306	0.882	0.352
	(0.525)	(0.481)	(0.550)	(0.509)
Obs	85319	91212	76421	89830
Bank & Time-FE	Y	Y	Y	Y
Two-way Clustering	Y	Y	Y	Y
Reg Type	IV	IV	IV	IV
Controls	Y	Y	Y	Y
Period	Overall: 2001Q1 - 2021Q4	Overall: 2001Q1 - 2021Q4	Overall: 2001Q1 - 2021Q4	Overall: 2001Q1 - 2021Q4

Bank preference to shorten the maturity of deposits in QE ; No reversal of this preference post-QE / QT

NOTE: Results robust to whether we include and instrument Total Deposits for exogenous variation

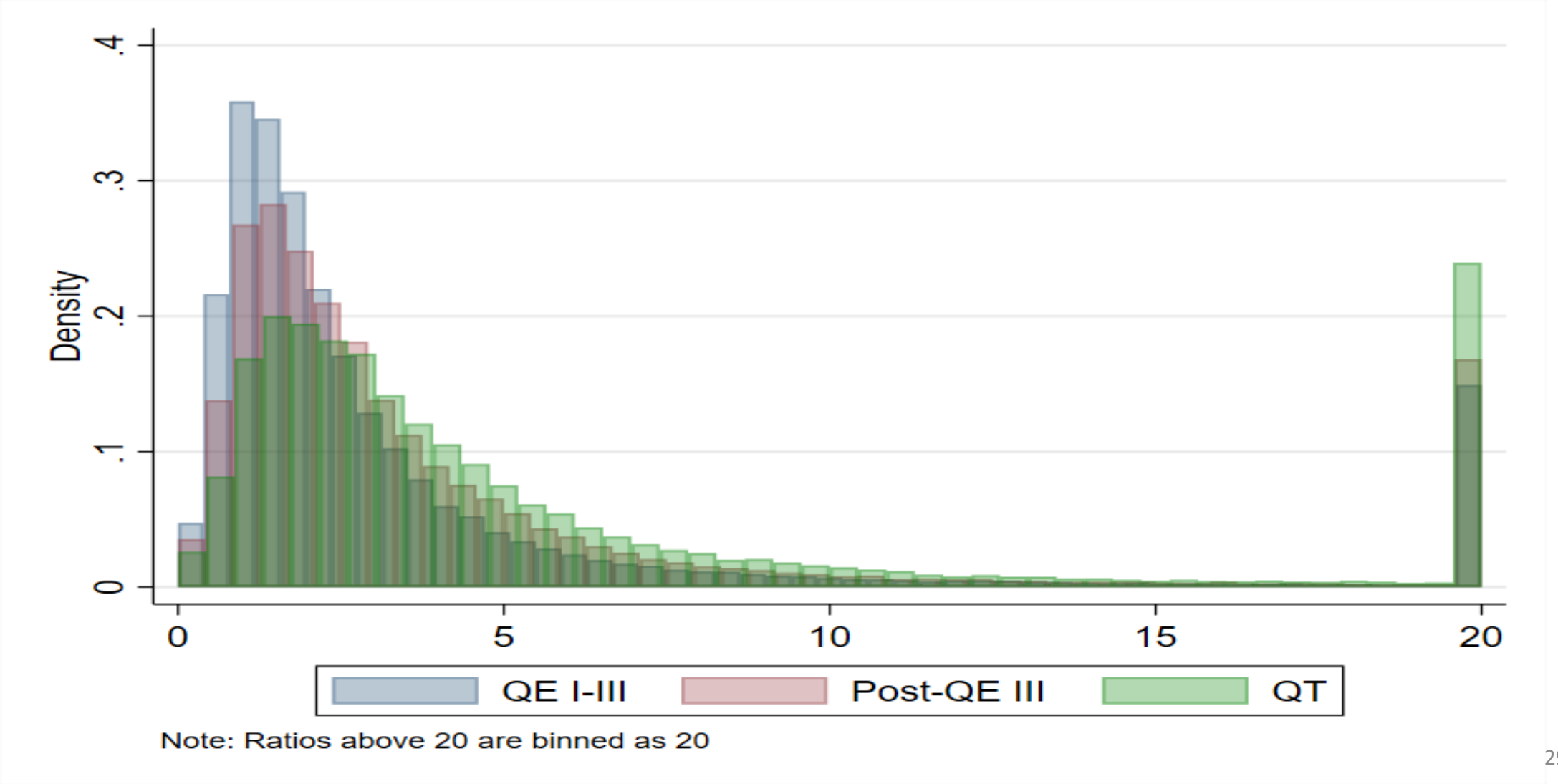
Additional Tests

- Is the shortening of maturities bank-driven?
  - Ability to affect deposit quantity by adjusting rates requires market power
  - Effects driven by banks with above-median HHI banks, limited effect for others
    - Banks with above median value of deposits-weighted county-level-deposit-HHI (full-sample)
- Which banks raise uninsured deposits and shrink maturity?
  - Results driven by below median (one-quarter-lagged) equity-to-assets banks
  - QE x Bank (under)capitalization –> Uninsured deposits and maturity shortening
- Do reserves-intensive banks also sell more credit lines?
  - Consistent with time-series tests, panel results hold for credit line originations

Further Inquiry and Insights

- Why do banks not shrink liquidity claims when reserves fall?
  - They instead substitute into eligible assets (Treasuries, MBS, Agency debt)
  - Skews liquidity risk distribution (dependence) and increases duration mismatch

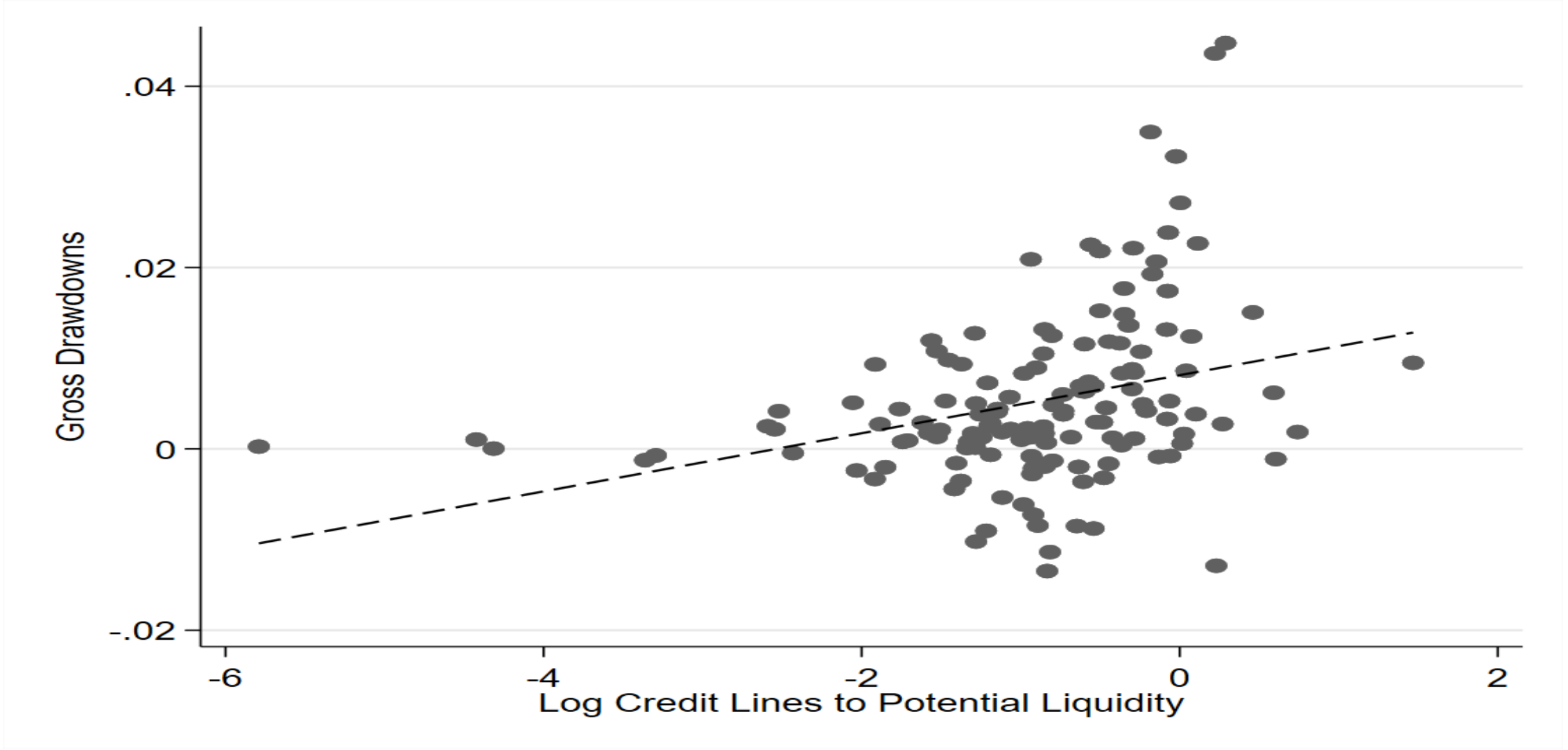
(Credit Lines + Demand and Savings Deposits) / (Reserves and Eligible Assets): Histogram by Period



Further Inquiry and Insights

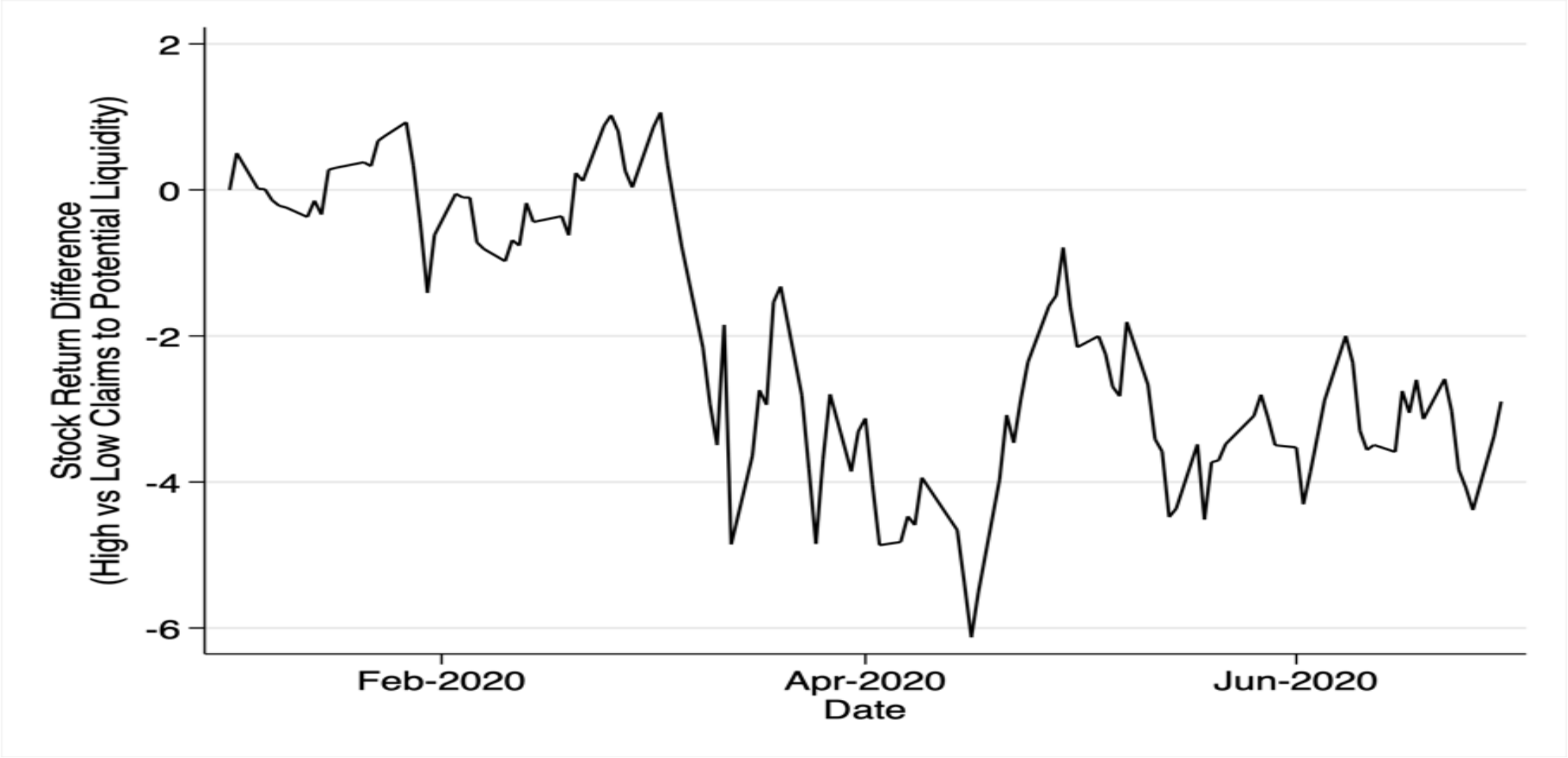
- Why do banks not shrink liquidity claims when reserves fall?
  - They instead substitute into eligible assets (Treasuries, MBS, Agency debt)
  - Skews liquidity risk distribution (dependence) and increases duration mismatch
- How large are the (private) gains from increasing liquidity dependence?
  - Pennies in front of a steamroller? Gains from Liquidity Claims < 3% of Net Income
- Has the financial fragility from QE followed by QT played out?
  - 2020: COVID shock - Dash for cash by corporate clients
  - 2023: SVB, Signature, First Republic Bank, … - Also a solvency-based depositor run

Demandable Claims and Fragility: Covid Shock



Panel B. Implications for gross credit line drawdowns of credit lines (Q1 2020)

Demandable Claims and Fragility: Covid Shock



Panel A. Implications for bank stock returns (1 March – 23 March 2020)

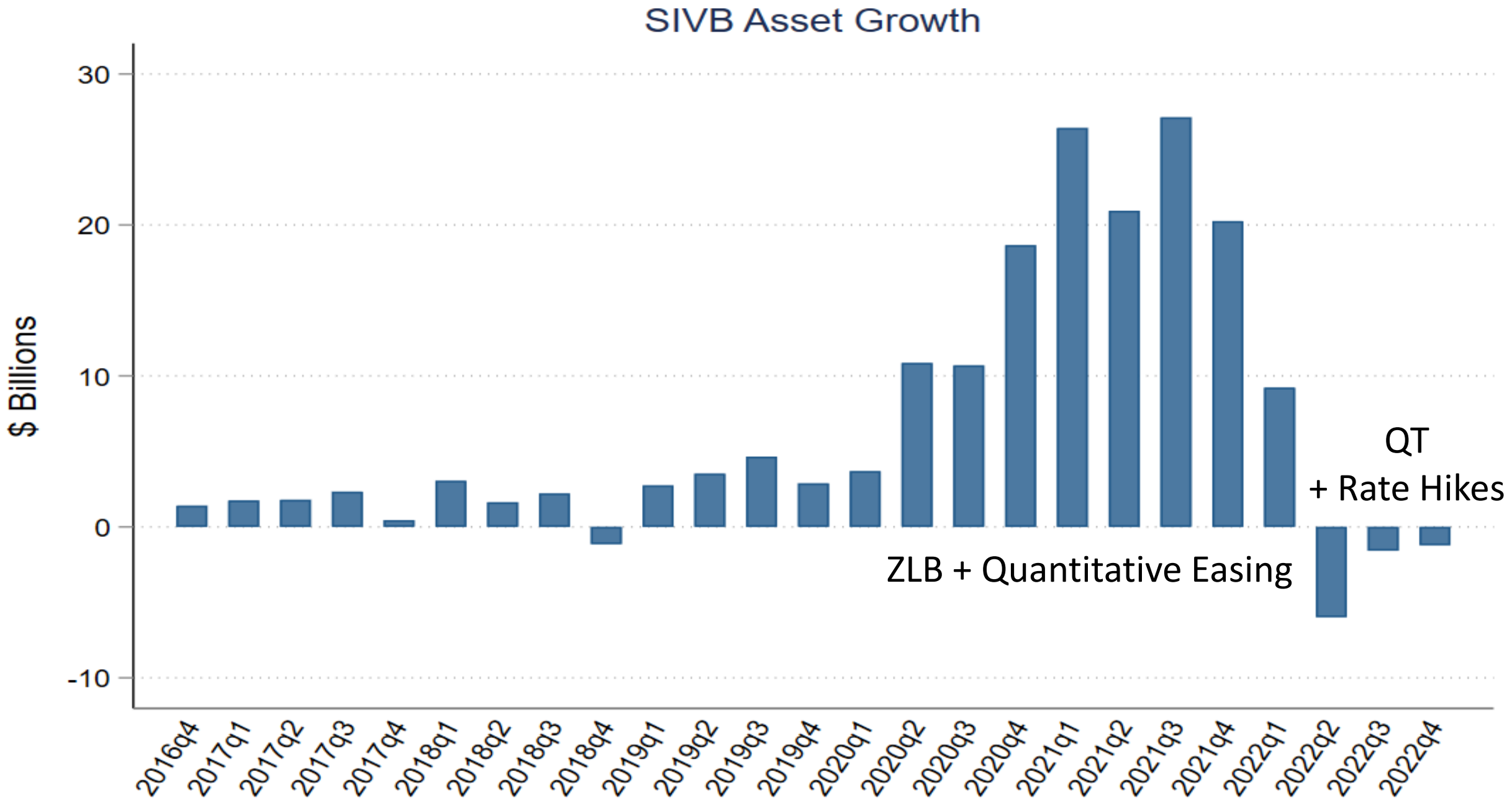
Demandable Claims and Fragility: Covid Shock

Stock Returns and Gross Credit Line Drawdowns

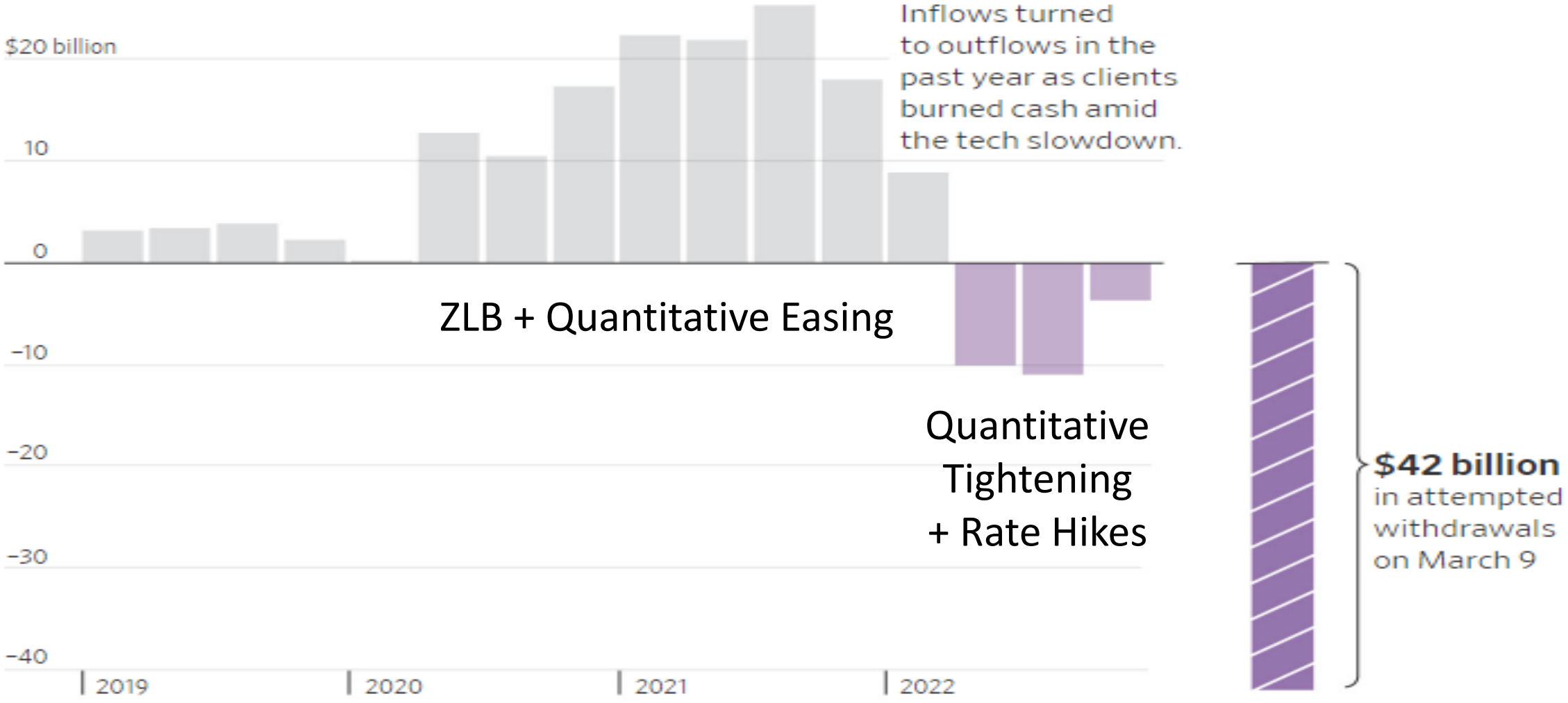
	(1) Excess Returns 1/1/2020 – 2/28/2020	(2) Excess Returns 3/1/2020 – 3/23/2020	(3) Excess Returns 3/1/2020 – 3/23/2020	(4) Excess Returns 3/1/2020 – 3/23/2020	(5) Gross CL Drawdowns Q1 2020	(6) Gross CL Drawdowns Q1 2020
Claims to Potential Liquidity	0.00132	-0.0159**				
	(0.210)	(0.024)				
Credit Lines to Potential Liquidity			-0.0960***		0.0049***	
			(0.000)		(0.002)	
Demandable Deposits to Potential Liquidity				-0.0165*		0.0003
				(0.053)		(0.403)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.307	0.443	0.463	0.435	0.426	0.375
Number obs.	143	143	138	143	138	143

COVID QE, recent QT and implications

- Solvency was not an issue at the time of COVID outbreak because of massive stimulus and low rates
- This time, QT is accompanied by sharp rate increases
- Could make a difference… Silicon Valley Bank

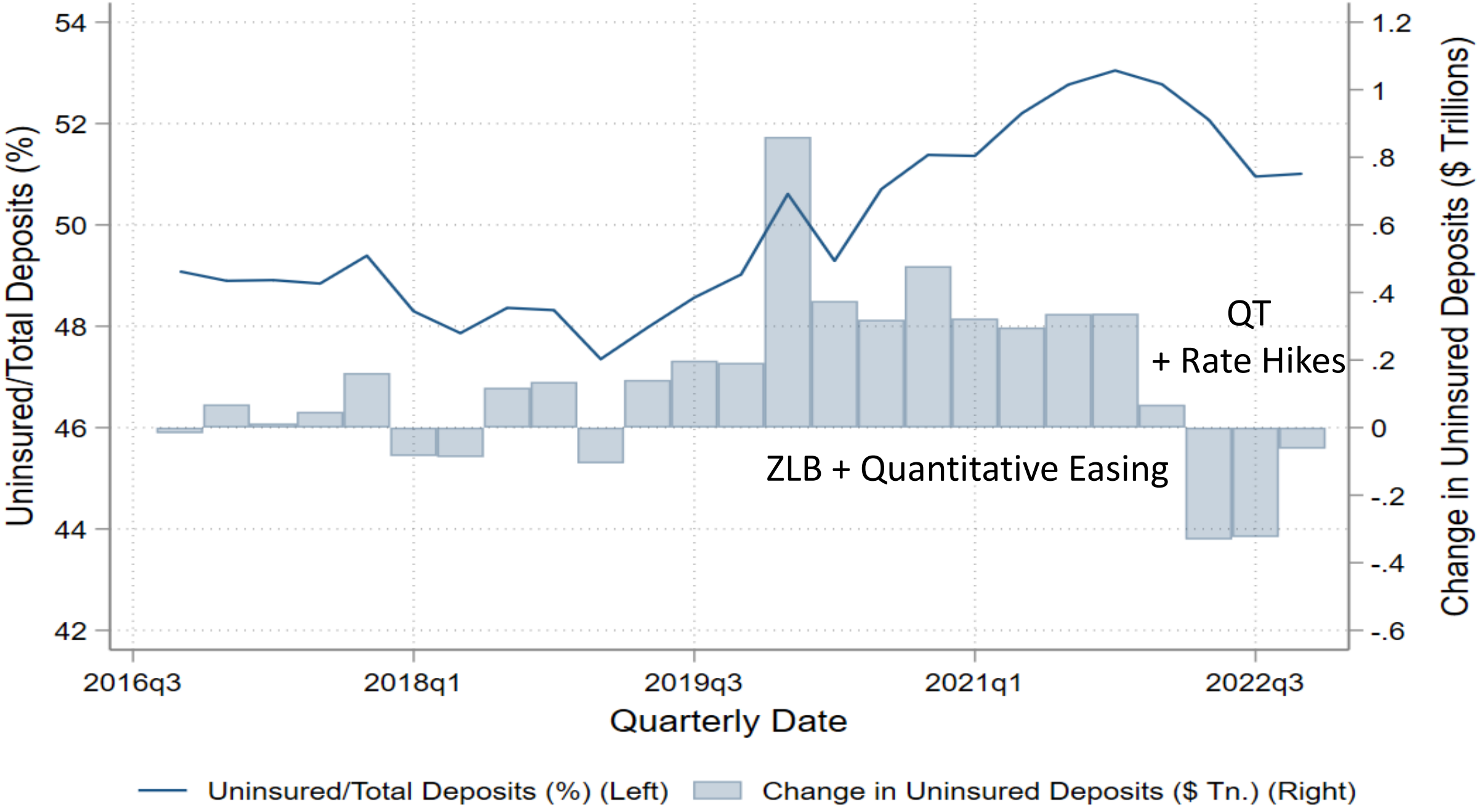

SIVB Asset Growth
$ Billions
30
20
10
0
-10
2016q4
2017q1
2017q2
2017q3
2017q4
2018q1
2018q2
2018q3
2018q4
2019q1
2019q2
2019q3
2019q4
2020q1
2020q2
2020q3
2020q4
2021q1
2021q2
2021q3
2021q4
2022q1
2022q2
2022q3
2022q4
QT
+ Rate Hikes
ZLB + Quantitative Easing

SIVB deposits, quarterly net change



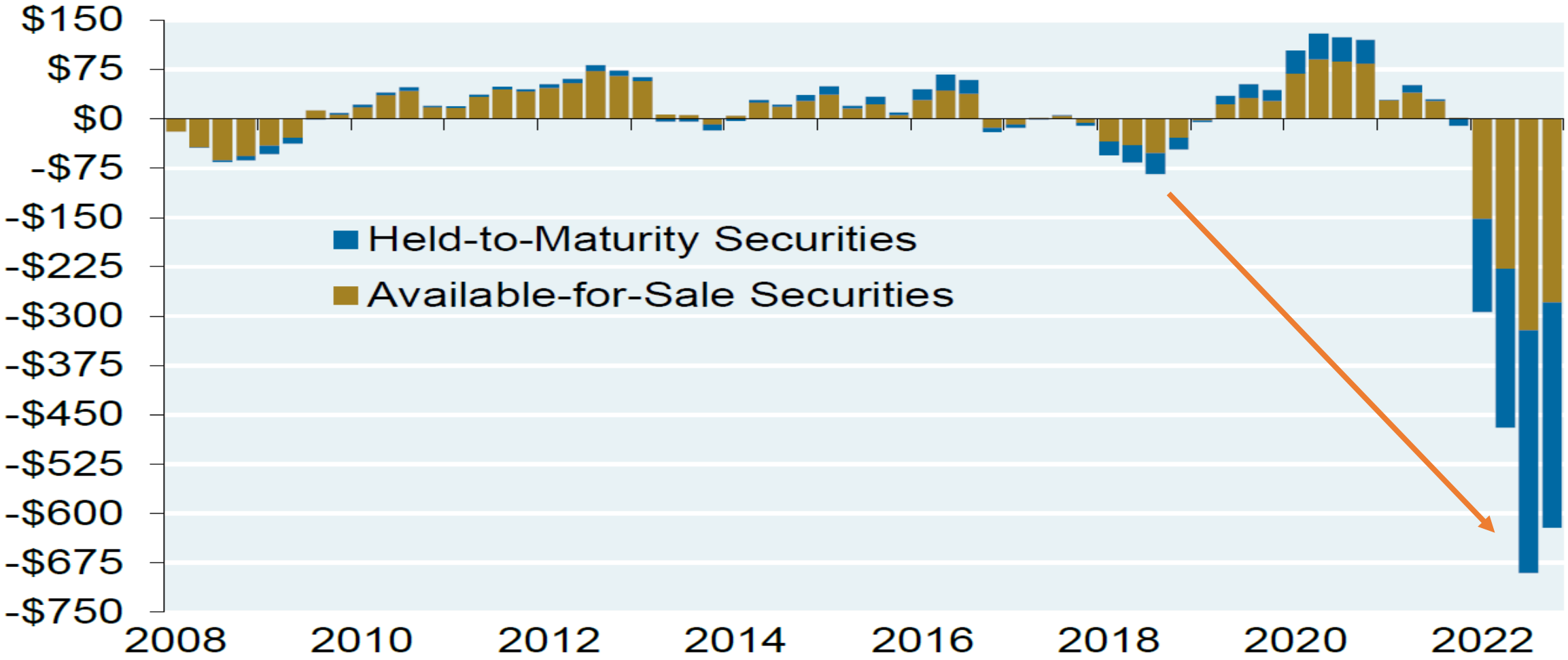
Sources: company filings (quarterly); California regulators (March 9)

Turning to the aggregate


Uninsured/Total Deposits (%)
54
52
50
48
46
44
42
Change in Uninsured Deposits ($ Trillions)
1.2
1
.8
.6
.4
.2
0
-.2
-.4
-.6
2016q3
2018q1
2019q3
2021q1
2022q3
Quarterly Date
QT
+ Rate Hikes
ZLB + Quantitative Easing
Uninsured/Total Deposits (%) (Left)
Change in Uninsured Deposits ($ Tn.) (Right)

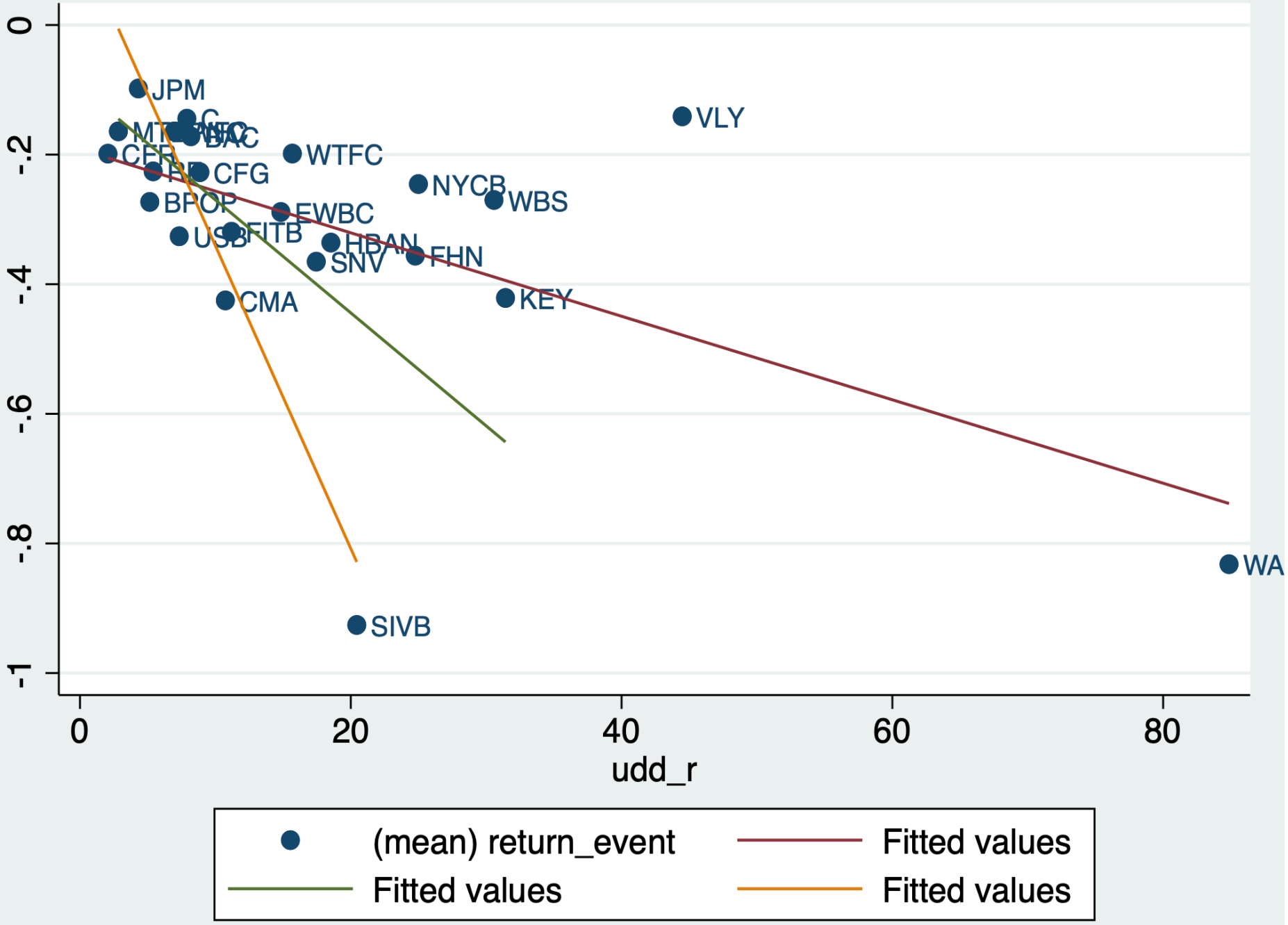
FDIC Q4 unrealized bank losses on investment securities

US$, billions



Source: FDIC. Q4 2022.

Total unrealized losses in this rate-hike cycle relative to the previous highlight saliently the “scale” of the bank balance sheets



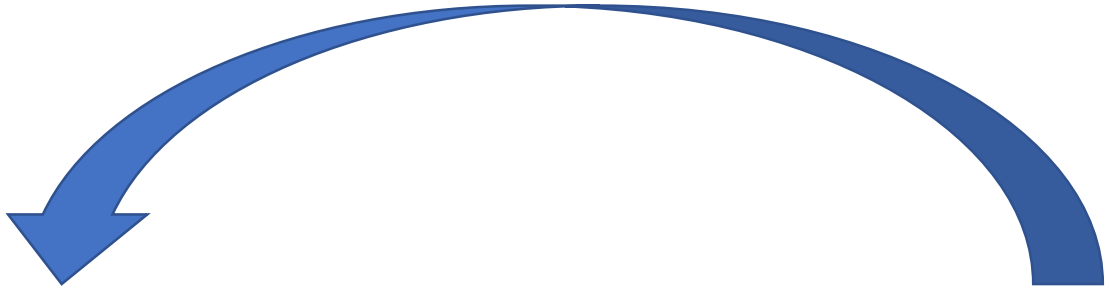
Stock Returns:
March 8-17, 2023

Vs

Uninsured Demand Deposits / Reserves

The steepest one (yellow) is the largest banks (> USD 200bn), the medium slope (green) for banks > USD 100bn and the one with the smallest slope (red) for > USD 50 bn

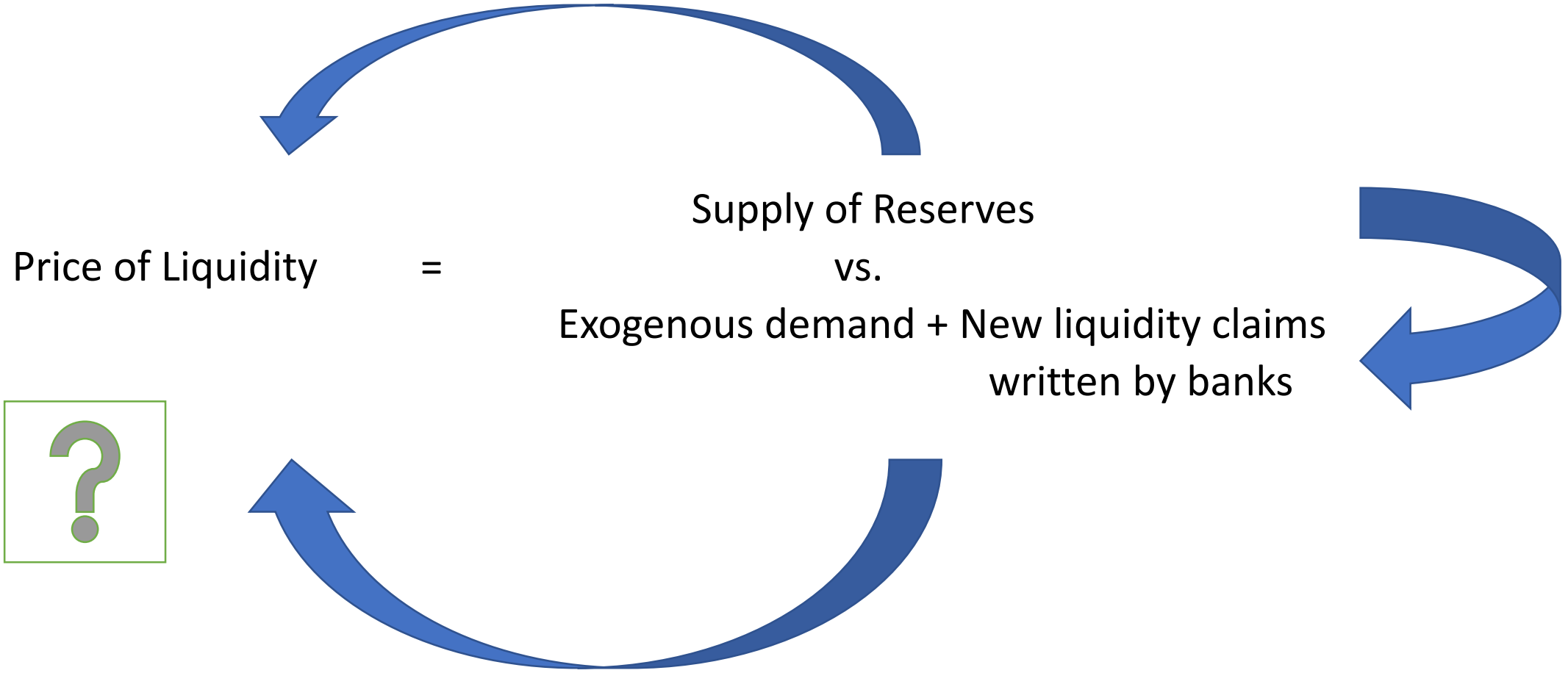
Traditional view: Exogenous demand for liquidity



Price of Liquidity = Supply of Reserves vs. Exogenous demand for liquidity

- As demand is exogenous, increasing supply of reserves is stabilizing

Dependence view: Liquidity demand affected by reserves



- Supply of reserves creates its own additional demand, new claims written by banks.
- Liquidity conditions and the effect of quantitative tightening depend on how these claims evolve.

Financial stability at conflict with monetary policy?

- Market underprices liquidity, enhancing need to intervene
- Accidents waiting to happen? Not just banks, but also in shadow banks?
  - BOE in 2022
- Severe conflict also in case of depositor runs at present
  - Fed in 2023

- Engage in QT while “feeling the stones” for financial fragility

- Revisit desirable scale, scope, duration of QE: “pushing on a string”?

Appendix

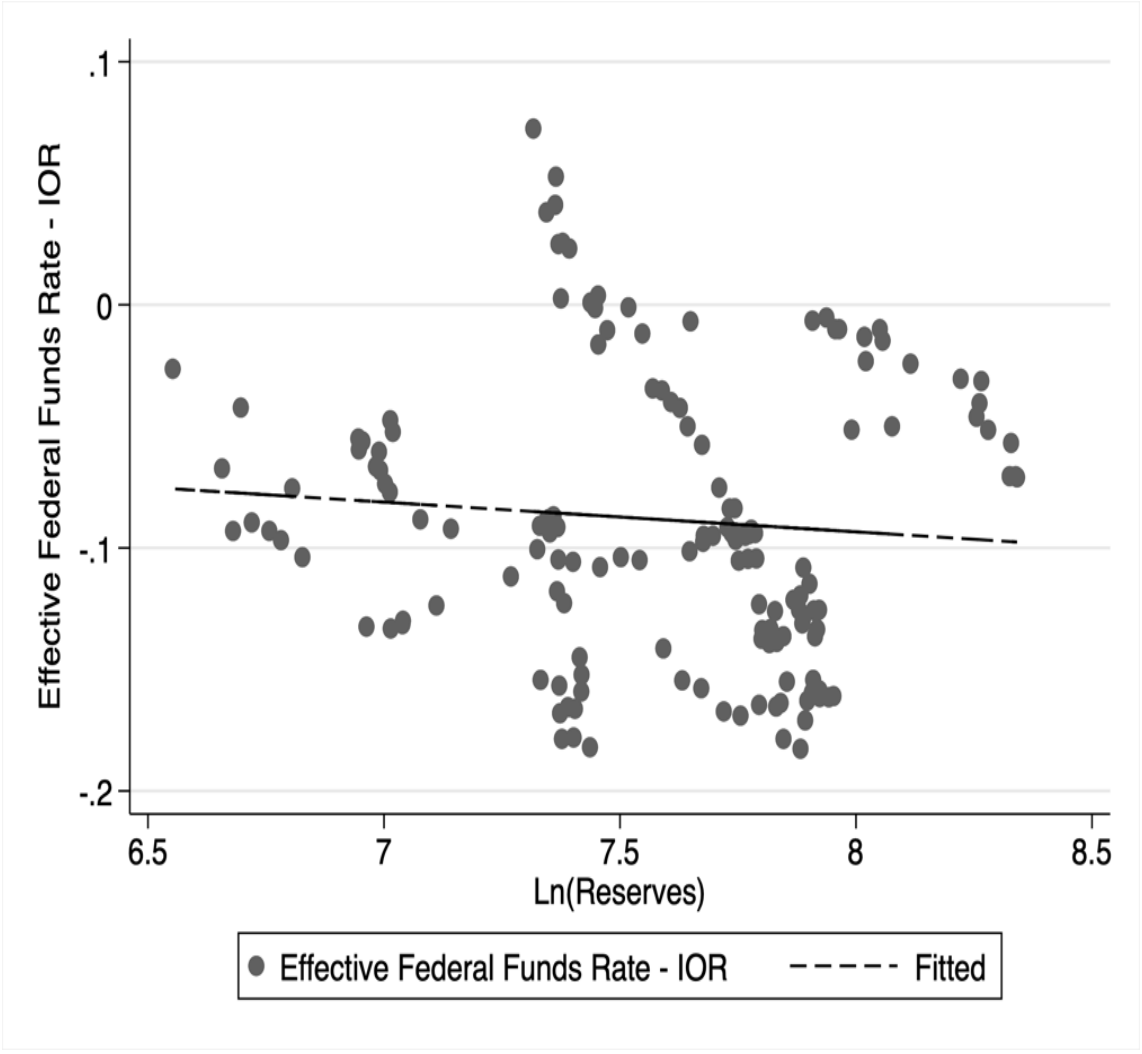
Data Sources: Period 2001Q1-2021Q4

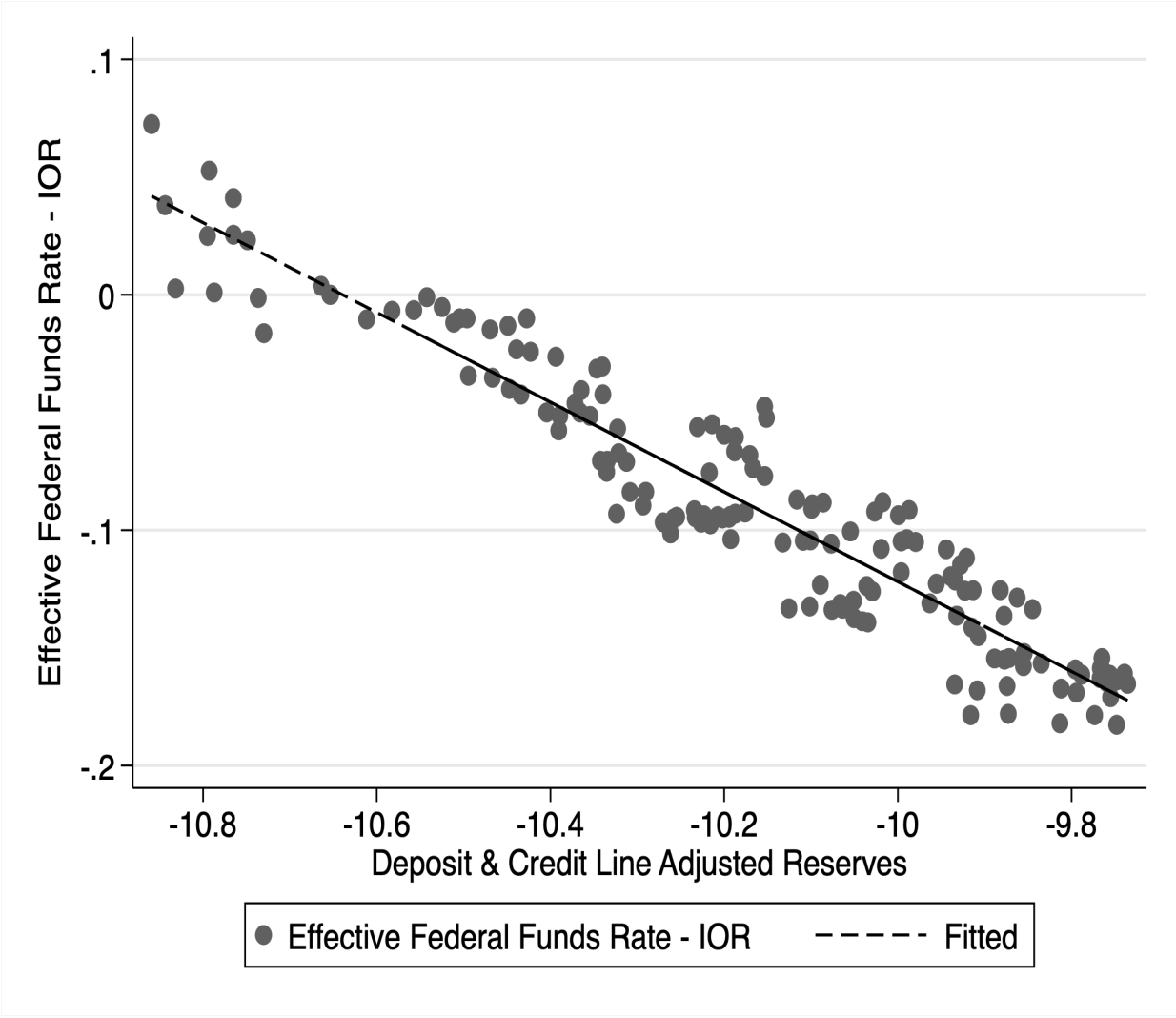
- Aggregate Reserves, Deposits, Credit Lines Outstanding, GDP data: FRED and Flow of Funds (Financial Accounts of the United States) Data

- Bank Balance Sheet Data: FDIC's Call Reports Data
- Bank-County Deposit Data: Branch Office Deposits in FDIC Summary of Deposits
- Bank-Deposit instrument Interest Rate Data: S&P Global's *RateWatch* database

- Credit Lines Originations and Pricing data – Dealscan *Refinitiv LoanConnector*
- Credit Default Swap data is from *Bloomberg* and Stock Returns are from *CRSP*

Reserves, Claims, and the Price of Liquidity





Note: inspired by Lopez-Salido and Vissing-Jorgensen (2022)

Time-series analysis: Reserves -> Price of liquidity

LS-VJ (2022) but in changes to address non-stationarity issues:

$$\Delta(EFFR - IOR)_t = \alpha\, \Delta Ln(Reserves)_t + \beta\, \Delta Ln(Deposits)_t + \gamma \Delta Ln(Credit\ Line)_t + \varepsilon_t$$

$\Delta X_t = X_t - X_{t-4}$ for regressions with quarterly variables and

$\Delta X_t = X_t - X_{t-12}$ for regressions with monthly variables

Results hold for US banks, controlling for non-US bank reserves, deposits

	(1) Δ(EFFR-IOR)	(2) Δ(EFFR-IOR)	(3) Δ(EFFR-IOR)	(4) Δ(EFFR-IOR)	(5) Δ(EFFR-IOR)	(6) Δ(EFFR-IOR)
ΔLn(Reserves)	-0.155***	-0.188***	-0.186***	-0.161***	-0.173***	-0.220***
	(0.0319)	(0.0368)	(0.0308)	(0.0290)	(0.0313)	(0.0213)
ΔLn(Total Deposits)		0.474**				
		(0.211)				
ΔLn(Demandable Deposits)			0.344***			0.376***
			(0.125)			(0.0961)
ΔLn(Time Deposits)			-0.00215			0.0460
			(0.0612)			(0.0610)
ΔLn(Credit Lines)				0.140**	0.183***	0.170***
				(0.0523)	(0.0496)	(0.0482)
ΔLn(Usage)					-0.0157***	-0.0123*
					(0.00518)	(0.00660)
Constant	0.00173**	-0.000692	-0.000857	0.00325	0.00318	-0.00385*
	(0.000751)	(0.00120)	(0.00130)	(0.00196)	(0.00200)	(0.00210)
Obs	154	154	154	51	51	51
R-sq	0.277	0.305	0.314	0.521	0.561	0.607
Reg-Type	OLS	OLS	OLS	OLS	OLS	OLS
Standard-Error	Newey-West	Newey-West	Newey-West	Newey-West	Newey-West	Newey-West
#Lags	12	12	12	4	4	4

	(1) ΔEFFR-IOR	(2) ΔEFFR-IOR	(3) ΔEFFR-IOR	(4) ΔEFFR-IOR	(5) ΔEFFR-IOR
ΔLn(Reserves)	-0.174***				
	(0.0327)				
ΔUS-Banks Ln(Reserves)		-0.133***		-0.0658***	-0.133***
		(0.0313)		(0.0223)	(0.0300)
ΔNon-US-Banks Ln(Reserves)			-0.116***	-0.113***	-0.118***
			(0.0303)	(0.0314)	(0.0314)
ΔUS-Banks Ln(Deposits)				-0.0484	
				(0.200)	
ΔNon-US-Banks Ln(Deposits)				-0.00621	-0.00000277
				(0.00770)	(0.00631)
ΔUS-Banks Ln(Demandable Deposits)					0.502***
					(0.184)
ΔUS-Banks Ln(Time Deposits)					0.110
					(0.0839)
Constant	0.0248***	0.0212***	0.0159*	0.0276*	-0.00935
	(0.00554)	(0.00664)	(0.00817)	(0.0157)	(0.0153)
Obs	48	48	48	46	46
R-Sq	0.690	0.498	0.474	0.754	0.780
Reg-Type	OLS	OLS	OLS	OLS	OLS
Data Frequency	Quarterly	Quarterly	Quarterly	Quarterly	Quarterly
Standard-Error	Newey-West	Newey-West	Newey-West	Newey-West	Newey-West
# Lags	4	4	4	4	4

Deposit Quantity (bank-level)

IV 1st Stage:

$$\Delta Ln\left(Reserves\right)_{it} = \gamma_1 Reserves\ Instrument_{it} + \gamma_2 Ln(Reserves_{it-5}) + \mu X_{it-1} + \delta_t + \mu_{it}$$

$where\ \Delta\left(Y\right)_{it} = Y_{it} - Y_{it-4}$, and δ_t represents (quarter) time-fixed effects

IV 2nd Stage:

$$\Delta Ln\left(Deposits\right)_{it} = \beta_1 Instr\ \Delta Ln\left(Reserves\right)_{it} + \beta_2 Ln\left(Reserves\right)_{it-5} + \mu X_{it-1} + \tau_t + \varepsilon_{it}$$

$where\ \Delta(Y)_{it} = Y_{it} - Y_{it-4}$, and τ_t represents (quarter) time-fixed effects and X_{it-1} represents bank-level controls: Ln(Assets), Equity/Assets Ratio, Net Income/Assets Ratio and Primary Dealer Indicator

First Stage - Deposit Quantities

First Stage: Change in Reserves by Period	(1)	(2)	(3)	(4)
	ΔLn(Reserves)	ΔLn(Reserves)	ΔLn(Reserves)	ΔLn(Reserves)
z_{it}^{R} (=Ln(Reserves$_t$/Reserves$_{t-1}$) × Lagged Share in Agg. Reserves over 4Q)	13.48***	12.54***	12.67***	25.87**
	(0.629)	(0.594)	(0.606)	(12.30)
Ln(Reserves)$_{t-5}$	-0.156***	-0.195***	-0.192***	-0.107***
	(0.00786)	(0.0122)	(0.0131)	(0.00846)
Constant	-0.793***	-0.896***	-1.012***	-0.501***
	(0.114)	(0.213)	(0.259)	(0.0912)
N	115839	51062	43236	30830
R-sq	0.126	0.160	0.161	0.0287
F-stat	10169107.2	578625.9	193052.1	28.30
Time-FE	Y	Y	Y	Y
Bank & Time Clustered FE	Y	Y	Y	Y
Period	Overall: 2001Q1 - 2021Q4	QE I-III + Pandemic QE: 2008Q4 - 2014Q3 & 2019Q4 - 2021Q4	QE I-III: 2008Q4 - 2014Q3	Post-QE III + QT2014Q4 - 2019Q3

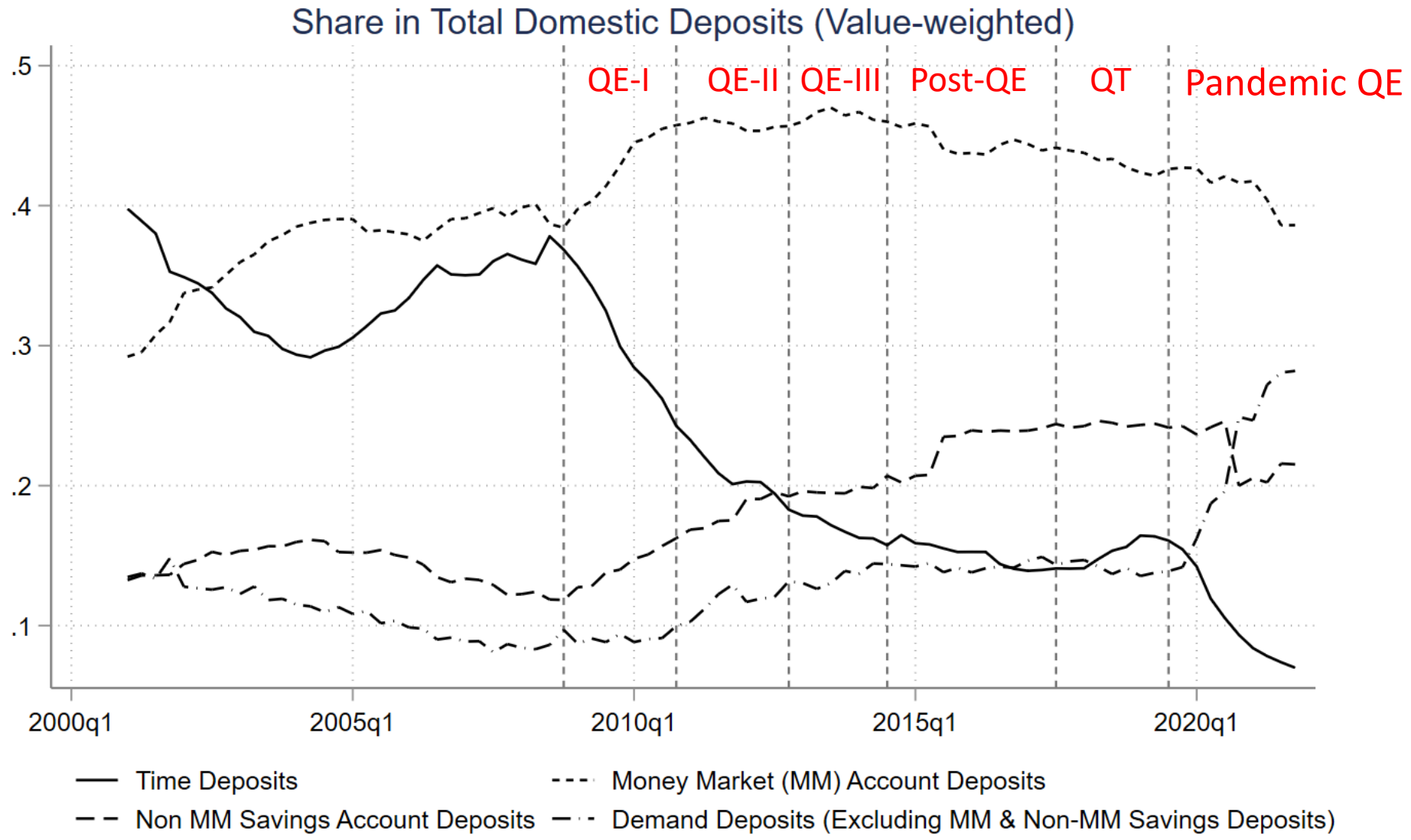
Demand & Savings Deposits– OLS

Panel B.1.1	(1) ΔLn(Demand + Savings Deposits)	(2) ΔLn(Demand + Savings Deposits)	(3) ΔLn(Demand + Savings Deposits)	(4) ΔLn(Demand + Savings Deposits)
ΔLn(Reserves)	0.0112***	0.0138***	0.0138***	0.0162***
	(0.00172)	(0.00258)	(0.00283)	(0.00122)
Newey-West s.e.	(0.00130)	(0.00206)	(0.00223)	(0.00102)
N	117076	50948	43149	32258
Time-FE	Y	Y	Y	Y
Bank & Time	Y	Y	Y	Y
Clustered SE				
Reg Type	OLS	OLS	OLS	OLS
Period	Overall: 2001Q1 - 2021Q4	QE I-III + Pandemic QE: 2008Q4 - 2014Q3 & 2019Q4 - 2021Q4	QE I-III: 2008Q4 - 2014Q3	Post-QE III + QT2014Q4 - 2019Q3

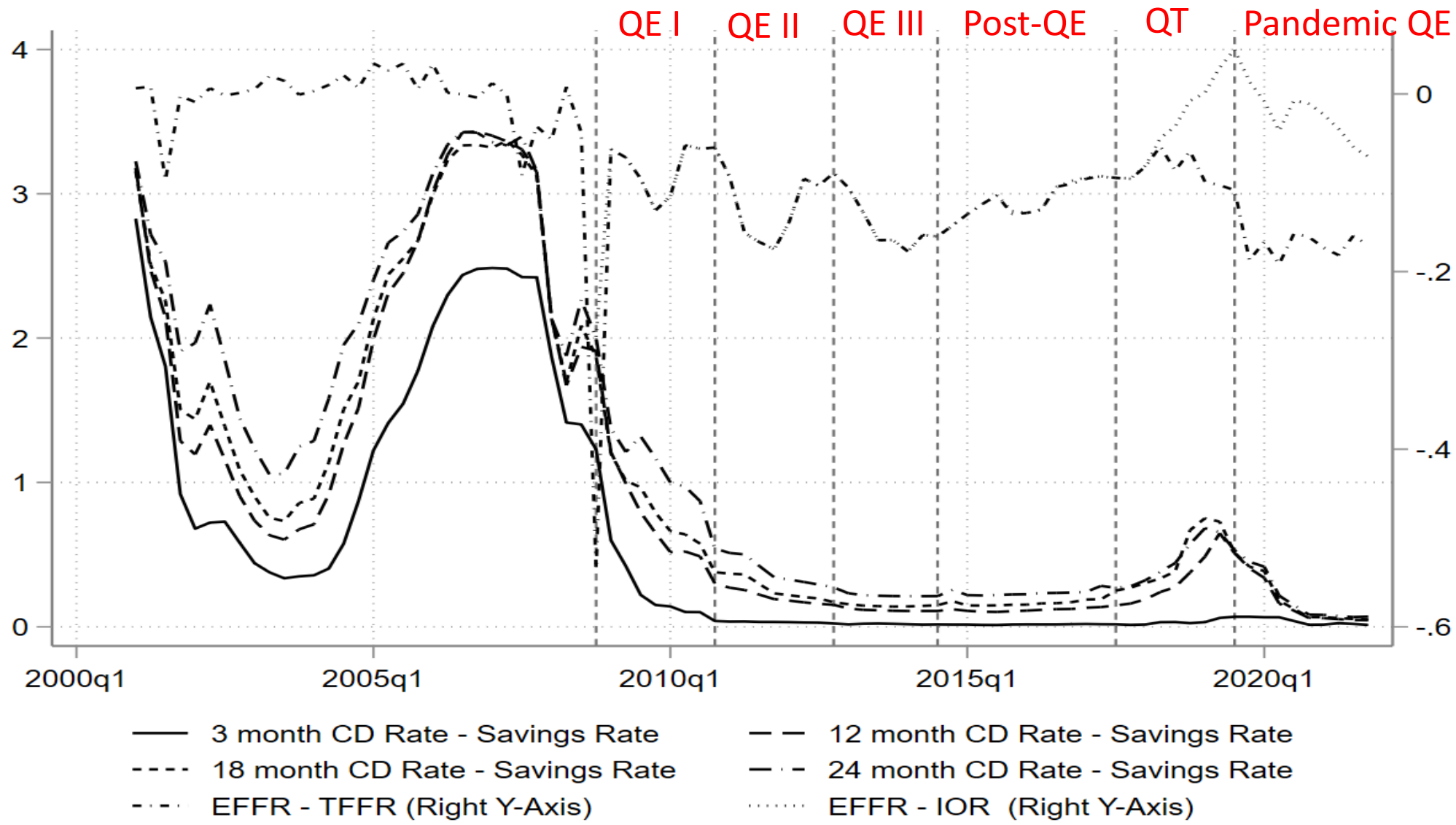
Time Deposits– OLS

Panel B.1.2	(1) ΔLn(Time Deposits)	(2) ΔLn(Time Deposits)	(3) ΔLn(Time Deposits)	(4) ΔLn(Time Deposits)
ΔLn(Reserves)	0.0134***	0.0133***	0.0139***	0.0185***
	(0.00129)	(0.00184)	(0.00198)	(0.00138)
Newey-West s.e.	(0.00104)	(0.00163)	(0.00176)	(0.00134)
N	116227	50579	42872	32037
Time-FE	Y	Y	Y	Y
Bank & Time	Y	Y	Y	Y
Clustered SE				
Reg Type	OLS	OLS	OLS	OLS
Period	Overall: 2001Q1 - 2021Q4	QE I-III + Pandemic QE: 2008Q4 - 2014Q3 & 2019Q4 - 2021Q4	QE I-III: 2008Q4 - 2014Q3	Post-QE III + QT2014Q4 - 2019Q3

Distribution of Deposit Types



Average Term Deposit Rate Spreads



Deposit Interest Rate Spread (bank-level)

IV 1st Stage:

$$Ln(Deposits)_{it} = \gamma_{11} Deposit\ Instrument_{it} + \gamma_{12} Reserves\ Instrument_{it} + \mu X_{it-1} + \rho_i + \delta_t + \mu_{it}$$
$$Ln(Reserves)_{it} = \gamma_{21} Deposit\ Instrument_{it} + \gamma_{22} Reserves\ Instrument_{it} + \mu X_{it-1} + \rho_i + \delta_t + \mu_{it}$$

where *i* represents bank, *t* represents quarterly data, X refers to bank-level control variables, ρ_i represents bank-fixed effects, and δ_t represents (quarter) time-fixed effects

IV 2nd Stage:

$$Deposit\ Rate\ Spread_{it} = \beta_1 Ln(Deposits)_{it} + \beta_2 Ln(Reserves)_{it} + \pi_i + \tau_t + \varepsilon_{it}$$

where *i* represents bank *i*, *t* represents the quarterly date, π_i represents bank-fixed effects and τ_t represents (quarter) time-fixed effects. *Deposit Rate Spread* is *3, 12, 18, 24 month Certificate of Deposit (CD) Rate – Savings Rate Spread*

Instrument for Deposits (Bartik-style)

$$z_{it}^{D} = ln\left(\sum_{c \in Ci,t} w_{ict} \frac{Dep_{c,t}}{Dep_{c,t-1}}\right) \text{ where } w_{ict} = \frac{Dep_{c,t-1}}{\sum_{c' \in C_{i,t}} Dep_{c',t-1}}$$

where w_{ict} is the bank-specific weight bank-specific weight accorded to county c the bank operates in time t, and $\frac{Dep_{c,t}}{Dep_{c,t-1}}$ is the growth rate in aggregate deposits in that county over the past period.

The bank-specific weight is determined as the level of aggregate deposits in that county at time t-1 divided by the sum of aggregate deposits over all the counties the bank has a presence in.

First Stage – Deposit Interest Spreads

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Ln(Total Deposits)				Ln(Reserves)			
z_{it}^{R}	-0.443	-0.550*	-0.505*	-0.794	10.85***	9.125***	8.283***	28.49***
	(0.382)	(0.283)	(0.279)	(1.204)	(1.513)	(1.424)	(1.359)	(7.038)
z_{it}^{D}	0.0193***	0.0134***	0.0159***	0.0118***	0.0601***	0.0119	0.0328	0.0476**
	(0.00312)	(0.00335)	(0.00368)	(0.00289)	(0.0205)	(0.0342)	(0.0348)	(0.0235)
Constant	0.429**	0.794***	1.375***	0.857	-1.340**	-0.732	2.874*	-2.949**
	(0.204)	(0.130)	(0.244)	(0.796)	(0.601)	(1.081)	(1.678)	(1.250)
N	118696	51738	43767	31984	116058	51104	43289	30720
R-sq	0.987	0.992	0.991	0.995	0.767	0.775	0.762	0.847
F-stat	829.6	1613.6	568.7	179.9	258.1	51.73	19.26	23.16
Bank & Time-FE	Y	Y	Y	Y	Y	Y	Y	Y
Two-way Clustering	Y	Y	Y	Y	Y	Y	Y	Y
Period	Overall: 2001Q1 - 2021Q4	QE I-III + Pandemic QE: 2008Q4 - 2014Q3 & 2019Q4 - 2021Q4	QE I-III: 2008Q4 - 2014Q3	Post-QE III + QT2014Q4 - 2019Q3	Overall: 2001Q1 - 2021Q4	QE I-III + Pandemic QE: 2008Q4 - 2014Q3 & 2019Q4 - 2021Q4	QE I-III: 2008Q4 - 2014Q3	Post-QE III + QT2014Q4 - 2019Q3

Deposit Concentration and Bank Behavior

3 month CD – Money Market Rate Spread for Above Median HHI banks

	(1)	(2)	(3)	(4)
	3 month CD – Money Market Rates			
Ln(Reserves)	-0.155***	-0.194***	-0.203***	0.256
	(0.0383)	(0.0558)	(0.0474)	(0.172)
Ln(Total Deposits)	0.372	0.652	0.827	-0.640
	(0.612)	(0.704)	(0.626)	(1.257)
Obs	41700	19429	17026	10856
Bank & Time-FE	Y	Y	Y	Y
Two-way Clustering	Y	Y	Y	Y
Controls	Y	Y	Y	Y
Reg Type	IV	IV	IV	IV
Period	Overall: 2001Q1 - 2021Q4	QE I-III + Pandemic QE: 2008Q4 - 2014Q3 & 2019Q4 - 2021Q4	QE I-III: 2008Q4 - 2014Q3	Post-QE III + QT2014Q4 - 2019Q3

Deposit Concentration and Bank Behavior

3 month CD – Money Market Rate Spread for Below Median HHI banks

	(1)	(2)	(3)	(4)
		3 month CD – Money Market Rates		
Ln(Reserves)	0.0339	0.0853***	0.0562	-1.042
	(0.0341)	(0.0307)	(0.0556)	(2.136)
Ln(Total Deposits)	-0.398	-1.553*	-0.957	3.925
	(0.797)	(0.807)	(0.847)	(6.671)
Obs	42306	19918	17552	10570
Bank & Time-FE	Y	Y	Y	Y
Two-way Clustering	Y	Y	Y	Y
Controls	Y	Y	Y	Y
Reg Type	IV	IV	IV	IV
Period	Overall: 2001Q1 - 2021Q4	QE I-III + Pandemic QE: 2008Q4 - 2014Q3 & 2019Q4 - 2021Q4	QE I-III: 2008Q4 - 2014Q3	Post-QE III + QT2014Q4 - 2019Q3

Deposit Concentration and Bank Behavior

Time Deposits for Above Median HHI banks

	(1)	(2)	(3)	(4)
		ΔLn(Time Deposits)		
ΔLn(Reserves)	-0.165***	-0.148***	-0.164***	0.557
	(0.0441)	(0.0438)	(0.0341)	(0.575)
Obs	54127	24147	20292	14945
Time-FE	Y	Y	Y	Y
Two-way Clustering	Y	Y	Y	Y
Controls	Y	Y	Y	Y
Reg Type	IV	IV	IV	IV
Period	Overall: 2001Q1 - 2021Q4	QE I-III + Pandemic QE: 2008Q4 - 2014Q3 & 2019Q4 - 2021Q4	QE I-III: 2008Q4 - 2014Q3	Post-QE III + QT2014Q4 - 2019Q3

Deposit Concentration and Bank Behavior

Time Deposits for Below Median HHI banks

	(1)	(2)	(3)	(4)
		ΔLn(Time Deposits)		
ΔLn(Reserves)	-0.0151	0.0312	0.00625	-1.619
	(0.0242)	(0.0333)	(0.0106)	(1.675)
Obs	60562	26408	22561	15606
Time-FE	Y	Y	Y	Y
Two-way Clustering	Y	Y	Y	Y
Controls	Y	Y	Y	Y
Reg Type	IV	IV	IV	IV
Period	Overall: 2001Q1 - 2021Q4	QE I-III + Pandemic QE: 2008Q4 - 2014Q3 & 2019Q4 - 2021Q4	QE I-III: 2008Q4 - 2014Q3	Post-QE III + QT2014Q4 - 2019Q3

Deposit Concentration and Bank Behavior

Demandable Deposits for Above Median HHI banks

	(1)	(2)	(3)	(4)
		ΔLn(Demandable Deposits)		
ΔLn(Reserves)	0.134***	0.113***	0.104**	0.258
	(0.0208)	(0.0352)	(0.0375)	(0.249)
Obs	54732	24427	20503	15105
Time-FE	Y	Y	Y	Y
Two-way Clustering	Y	Y	Y	Y
Controls	Y	Y	Y	Y
Reg Type	IV	IV	IV	IV
Period	Overall: 2001Q1 - 2021Q4	QE I-III + Pandemic QE: 2008Q4 - 2014Q3 & 2019Q4 - 2021Q4	QE I-III: 2008Q4 - 2014Q3	Post-QE III + QT2014Q4 - 2019Q3

Deposit Concentration and Bank Behavior

Demandable Deposits for Below Median HHI banks

	(1)	(2)	(3)	(4)
		ΔLn(Demandable Deposits)		
ΔLn(Reserves)	0.0544***	0.0525**	0.0550***	-0.321
	(0.0196)	(0.0206)	(0.0174)	(0.577)
Obs	60801	26494	22627	15665
Time-FE	Y	Y	Y	Y
Two-way Clustering	Y	Y	Y	Y
Controls	Y	Y	Y	Y
Reg Type	IV	IV	IV	IV
Period	Overall: 2001Q1 - 2021Q4	QE I-III + Pandemic QE: 2008Q4 - 2014Q3 & 2019Q4 - 2021Q4	QE I-III: 2008Q4 - 2014Q3	Post-QE III + QT2014Q4 - 2019Q3

Bank Capitalization and Bank Behavior

3 month CD – Money Market Rates for Above Median Equity/Asset Ratio Banks

	(1)	(2)	(3)	(4)
	3 month CD – Money Market Rates			
Ln(Reserves)	0.00360	0.0234	0.0322	2.560
	(0.0786)	(0.0666)	(0.0782)	(11.63)
Ln(Total Deposits)	-0.131	-0.0672	-0.236	-7.649
	(0.816)	(0.608)	(0.705)	(42.40)
Obs	34206	16666	14607	9237
Bank & Time-FE	Y	Y	Y	Y
Two-way Clustering	Y	Y	Y	Y
Controls	Y	Y	Y	Y
Reg Type	IV	IV	IV	IV
Period	Overall: 2001Q1 - 2021Q4	QE I-III + Pandemic QE: 2008Q4 - 2014Q3 & 2019Q4 - 2021Q4	QE I-III: 2008Q4 - 2014Q3	Post-QE III + QT2014Q4 - 2019Q3

Bank Capitalization and Bank Behavior

3 month CD – Money Market Rates for Below Median Equity/Asset Ratio Banks

	(1)	(2)	(3)	(4)
	3 month CD – Money Market Rates			
Ln(Reserves)	-0.123***	-0.140***	-0.0738***	0.105
	(0.0369)	(0.0342)	(0.0180)	(0.116)
Ln(Total Deposits)	0.0490	-0.0595	0.414	0.102
	(0.688)	(0.760)	(0.557)	(0.568)
Obs	49638	22509	19810	12053
Bank & Time-FE	Y	Y	Y	Y
Two-way Clustering	Y	Y	Y	Y
Controls	Y	Y	Y	Y
Reg Type	IV	IV	IV	IV
Period	Overall: 2001Q1 - 2021Q4	QE I-III + Pandemic QE: 2008Q4 - 2014Q3 & 2019Q4 - 2021Q4	QE I-III: 2008Q4 - 2014Q3	Post-QE III + QT2014Q4 - 2019Q3

Bank Capitalization and Bank Behavior

Demandable Deposits for Above Median Equity/Asset Ratio Banks

	(1)	(2)	(3)	(4)
		ΔLn(Demandable Deposits)		
Ln(Reserves)	-0.00639	-0.0761	-0.0895	-1.347
	(0.0398)	(0.111)	(0.118)	(3.161)
Obs	49251	22590	19136	14138
Time-FE	Y	Y	Y	Y
Two-way Clustering	Y	Y	Y	Y
Controls	Y	Y	Y	Y
Reg Type	IV	IV	IV	IV
Period	Overall: 2001Q1 - 2021Q4	QE I-III + Pandemic QE: 2008Q4 - 2014Q3 & 2019Q4 - 2021Q4	QE I-III: 2008Q4 - 2014Q3	Post-QE III + QT2014Q4 - 2019Q3

Bank Capitalization and Bank Behavior

Demandable Deposits for Below Median Equity/Asset Ratio Banks

	(1)	(2)	(3)	(4)
		ΔLn(Demandable Deposits)		
Ln(Reserves)	0.166***	0.165***	0.166***	0.390
	(0.0128)	(0.0123)	(0.0140)	(0.249)
Obs	66282	28331	23994	16632
Time-FE	Y	Y	Y	Y
Two-way Clustering	Y	Y	Y	Y
Controls	Y	Y	Y	Y
Reg Type	IV	IV	IV	IV
Period	Overall: 2001Q1 - 2021Q4	QE I-III + Pandemic QE: 2008Q4 - 2014Q3 & 2019Q4 - 2021Q4	QE I-III: 2008Q4 - 2014Q3	Post-QE III + QT2014Q4 - 2019Q3

Bank Capitalization and Bank Behavior

Time Deposits for Above Median Equity/Asset Ratio Banks

	(1)	(2)	(3)	(4)
		ΔLn(Time Deposits)		
Ln(Reserves)	-0.174	-0.124	-0.152	1.269
	(0.135)	(0.148)	(0.157)	(2.634)
Obs	48737	22389	18957	14023
Time-FE	Y	Y	Y	Y
Two-way Clustering	Y	Y	Y	Y
Controls	Y	Y	Y	Y
Reg Type	IV	IV	IV	IV
Period	Overall: 2001Q1 - 2021Q4	QE I-III + Pandemic QE: 2008Q4 - 2014Q3 & 2019Q4 - 2021Q4	QE I-III: 2008Q4 - 2014Q3	Post-QE III + QT2014Q4 - 2019Q3

Bank Capitalization and Bank Behavior

Time Deposits for Below Median Equity/Asset Ratio Banks

	(1)	(2)	(3)	(4)
		ΔLn(Time Deposits)		
Ln(Reserves)	-0.160***	-0.142***	-0.172***	1.722
	(0.0358)	(0.0336)	(0.0289)	(1.335)
Obs	65952	28166	23896	16528
Time-FE	Y	Y	Y	Y
Two-way Clustering	Y	Y	Y	Y
Controls	Y	Y	Y	Y
Reg Type	IV	IV	IV	IV
Period	Overall: 2001Q1 - 2021Q4	QE I-III + Pandemic QE: 2008Q4 - 2014Q3 & 2019Q4 - 2021Q4	QE I-III: 2008Q4 - 2014Q3	Post-QE III + QT2014Q4 - 2019Q3

Credit Lines Origination (bank-holding-co-level)

IV 1st Stage:

$$\Delta Ln\left(Reserves\right)_{it} = \gamma_1 Reserves\ Instrument_{it} + \gamma_2 Ln(Reserves_{it-5}) + \delta_t + \mu_{it}$$

$where\ \Delta\left(Y\right)_{it} = Y_{it} - Y_{it-4}$, and δ_t represents (quarter) time-fixed effects

IV 2nd Stage:

$$\Delta Ln\left(Credit\ Lines\right)_{it} = \beta_1 Instr\ \Delta Ln\left(Reserves\right)_{it} + \beta_2 Ln\left(Reserves\right)_{it-5} + \tau_t + \varepsilon_{it}$$

$where\ \Delta(Y)_{it} = Y_{it} - Y_{it-4}$, and τ_t represents (quarter) time-fixed effects

First Stage – Credit Lines Originations

	(1) ΔLn(Reserves)	(2) ΔLn(Reserves)	(3) ΔLn(Reserves)	(4) ΔLn(Reserves)
z_{it}^{R}	6.394***	6.343***	6.398***	21.53
	(0.858)	(0.903)	(1.016)	(25.59)
$\text{Ln(Reserves)}_{t-5}$	-0.195***	-0.245***	-0.242***	-0.122***
	(0.0254)	(0.0415)	(0.0470)	(0.0289)
Constant	-0.880	-1.417	-1.070	-1.459*
	(0.617)	(0.982)	(1.133)	(0.829)
Obs	2268	911	678	578
R-sq	0.263	0.344	0.347	0.117
Time-FE	Y	Y	Y	Y
Bank and Time Clustered SEs	Y	Y	Y	Y
F	27.16	33.06	27.16	6.826
Period	Overall: 2001Q1 - 2021Q4	QE I-III + Pandemic QE: 2008Q4 - 2014Q3 & 2019Q4 - 2021Q4	QE I-III: 2008Q4 - 2014Q3	Post-QE III + QT2014Q4 - 2019Q3

Credit Lines – IV 2nd Stage: IG Rated Firms

	(1) ΔLn(Credit Lines)	(2) ΔLn(Credit Lines)	(3) ΔLn(Credit Lines)	(4) ΔLn(Credit Lines)
ΔLn(Reserves)	0.233*** (0.0525)	0.197*** (0.0652)	0.192*** (0.0552)	-29.44 (618.8)
Obs	1718	649	486	430
Time-FE	Y	Y	Y	Y
Bank and Time Clustered Ses	Y	Y	Y	Y
Reg Type	IV	IV	IV	IV
Period	Overall: 2001Q1 - 2021Q4	QE I-III + Pandemic QE: 2008Q4 - 2014Q3 & 2019Q4 - 2021Q4	QE I-III: 2008Q4 - 2014Q3	Post-QE III + QT2014Q4 - 2019Q3

NOTE: Credit lines analysis is at bank-holding-company-level

Credit Lines – IV 2nd Stage: Non-IG Rated Firms

	(1) ΔLn(Credit Lines)	(2) ΔLn(Credit Lines)	(3) ΔLn(Credit Lines)	(4) ΔLn(Credit Lines)
ΔLn(Reserves)	0.250***	0.226**	0.237**	1.217
	(0.0916)	(0.0991)	(0.0979)	(2.155)
Obs	1898	731	562	492
Time-FE	Y	Y	Y	Y
Bank and Time Clustered Ses	Y	Y	Y	Y
Reg Type	IV	IV	IV	IV
Period	Overall: 2001Q1 - 2021Q4	QE I-III + Pandemic QE: 2008Q4 - 2014Q3 & 2019Q4 - 2021Q4	QE I-III: 2008Q4 - 2014Q3	Post-QE III + QT2014Q4 - 2019Q3

NOTE: Credit lines analysis is at bank-holding-company-level

Summary of Panel Test Results

- Mirror time-series quantity results with instrumented reserves

- Reserves → Demandable Deposits ↑ in QE, but no reversal of claims in post-QE / QT [especially driven by banks with above-median Credit Lines/Assets]

- Reserves → Credit lines to IG and Non-IG firms ↑ in QE, but no reversal in post-QE / QT

Summary of Panel Test Results

- Mirror time-series quantity results with instrumented reserves

- Reserves → Demandable Deposits ↑ in QE, but no reversal of claims in post-QE / QT

- Reserves → Credit lines to IG + Non-IG firms ↑ in QE, but no reversal in post-QE / QT

- Mirror time-series results on the price of liquidity (also instrument deposits)

- Reserves → Term spread of deposits ↓ [3m/18m/24m CD rate - Savings rate]

- Again, effects during QE, but no reversal in post-QE / QT

Pennies in front of a steamroller?

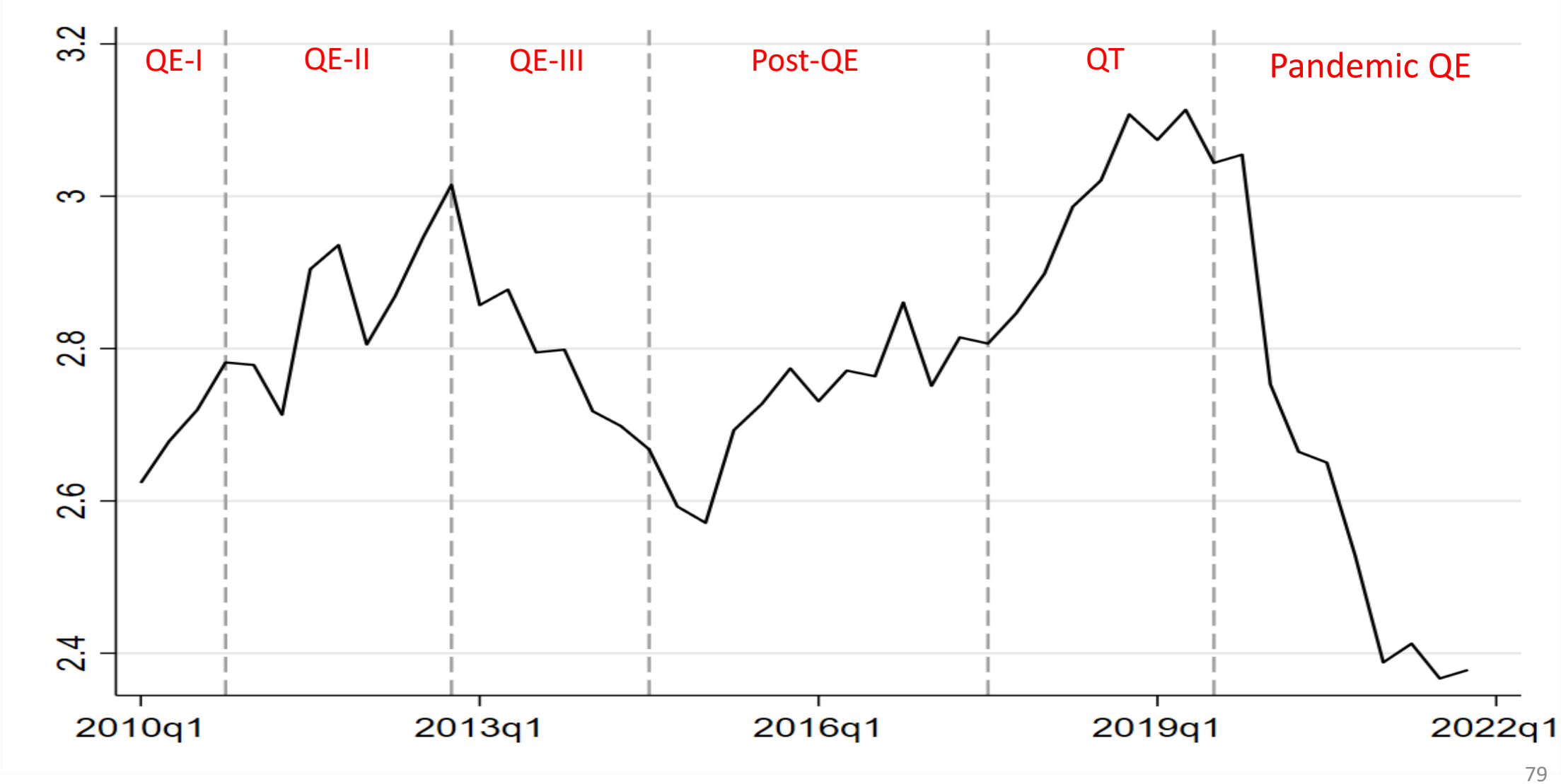
$$Gains\ from\ Claims_i = \frac{1}{4}\ [\Delta Reserves_{i,QE\rightarrow QT} \times IOR - \Delta Demandable\ Deposits_{i,QE\rightarrow QT} \times$$
$$Money\ Market\ Savings\ Rate - \Delta Time\ Deposits_{i,QE\rightarrow QT} \times$$
$$12\ month\ CD\ Rate_i + \frac{1}{(1 - Drawdown\ Rate)} \times$$
$$\Delta Unused\ Credit\ Lines_{i,QE\rightarrow QT} \times \{All\ in\ Spread\ Drawn_i \times$$
$$Drawdown\ Rate + All\ in\ Spread\ Undrawn_i \times$$
$$(1 - Drawdown\ Rate)\}] \qquad (13)$$

Gains from Claims/Net Income (%)	Mean	P10	P50	P90	N
BHC – Level	2.86	-1.77	2.81	6.92	23
Bank-Depository Level	12.7	-9.61	0.384	12	1328

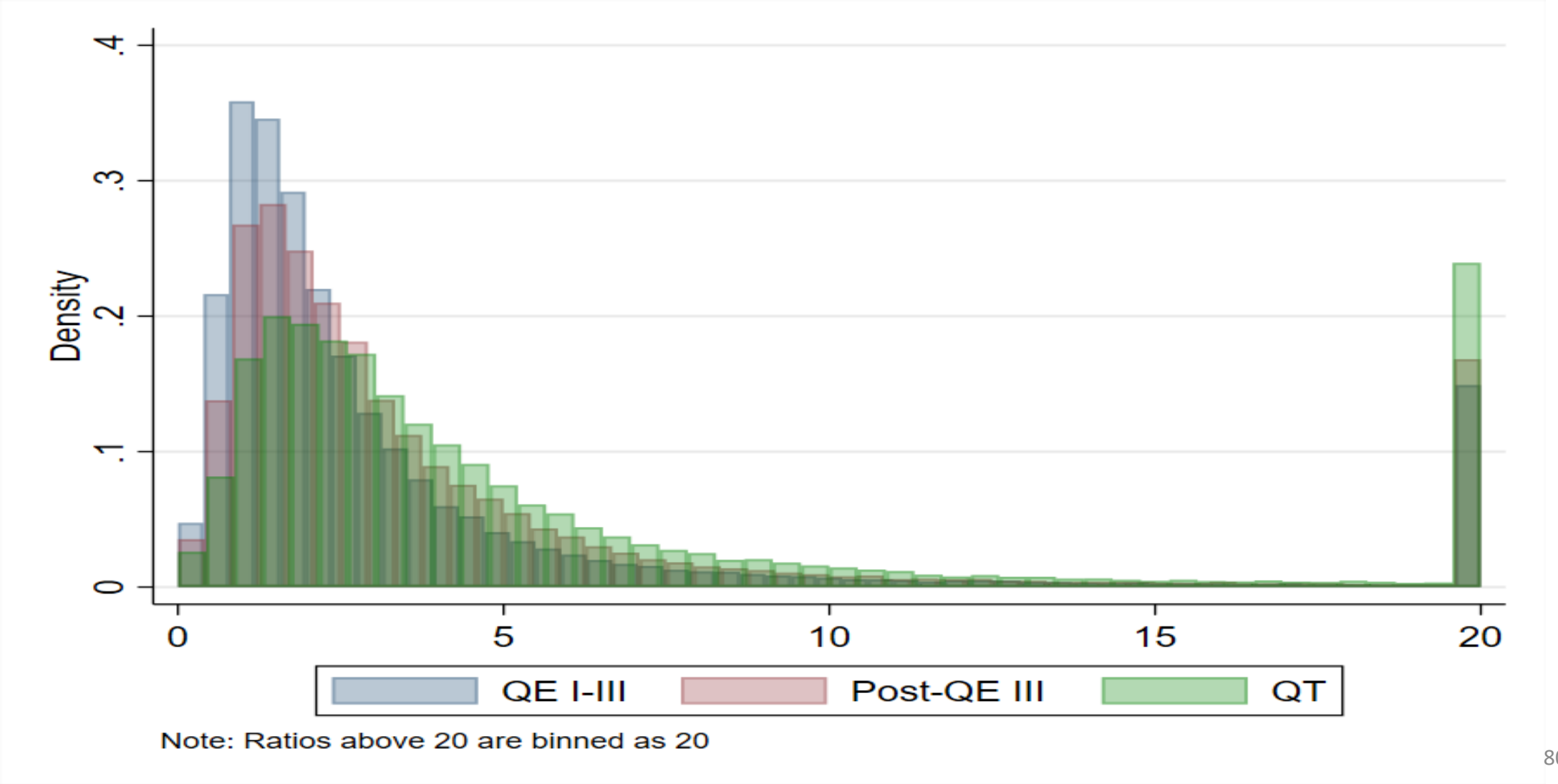
Why do banks not shrink liquidity claims?

- They substitute reserves with “eligible” assets
  - Can be “repo”ed for reserves with other banks
  - And with the Fed through the discount window and now the SRF
  - But… stigma? hoarding? repo market sensitive to small shocks to reserves?
  - Essentially, holding eligible assets leads to liquidity dependence

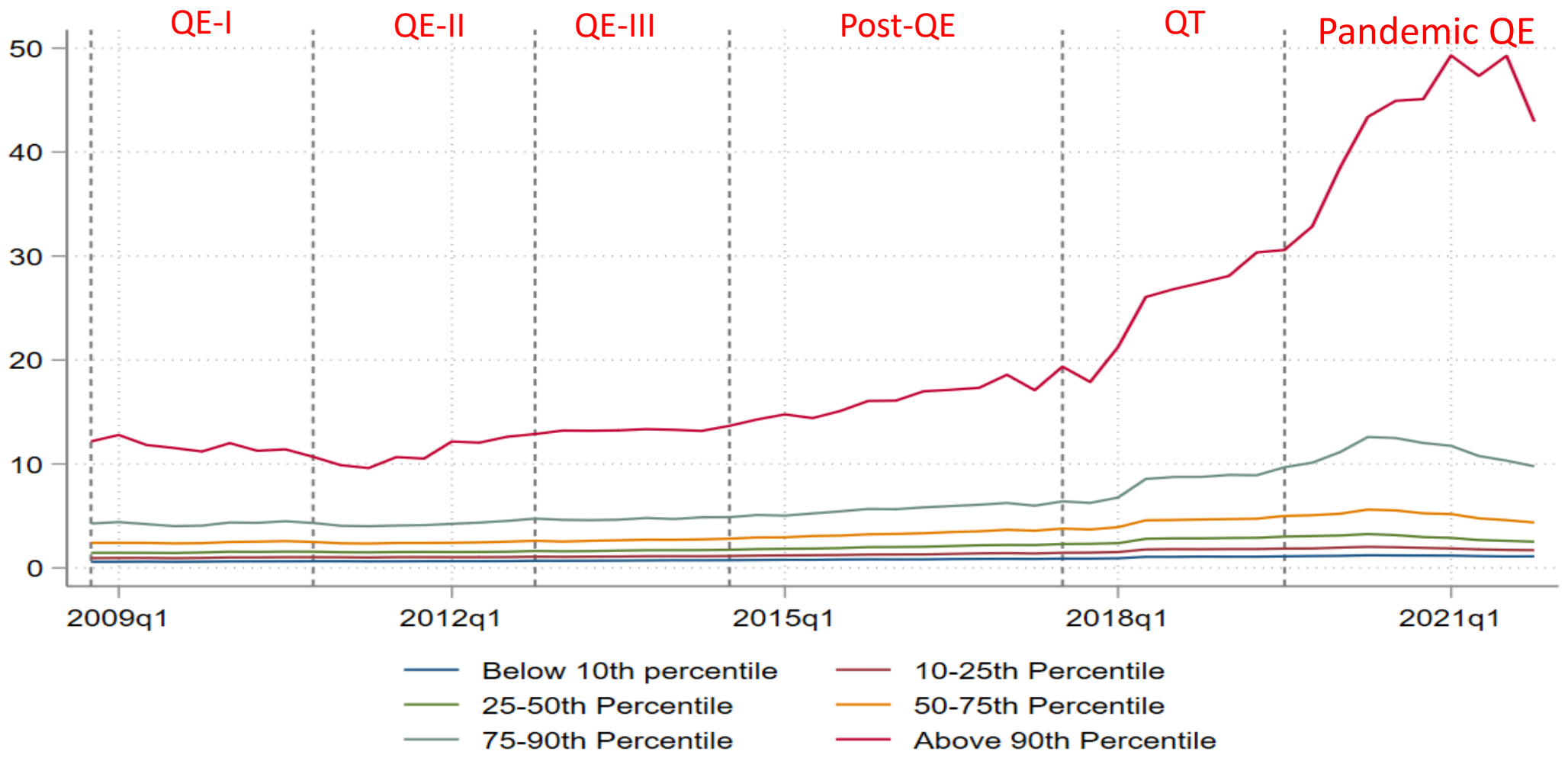
(Credit Lines + Demand and Savings Deposits) / (Reserves and Eligible Assets): Aggregate



(Credit Lines + Demand and Savings Deposits) / (Reserves and Eligible Assets): Histogram by Period



(Credit Lines + Demand and Savings Deposits) / (Reserves and Eligible Assets): Distribution over time



Each line represents within-bucket medians across time

Liquidity Exposure and Bank Capitalization

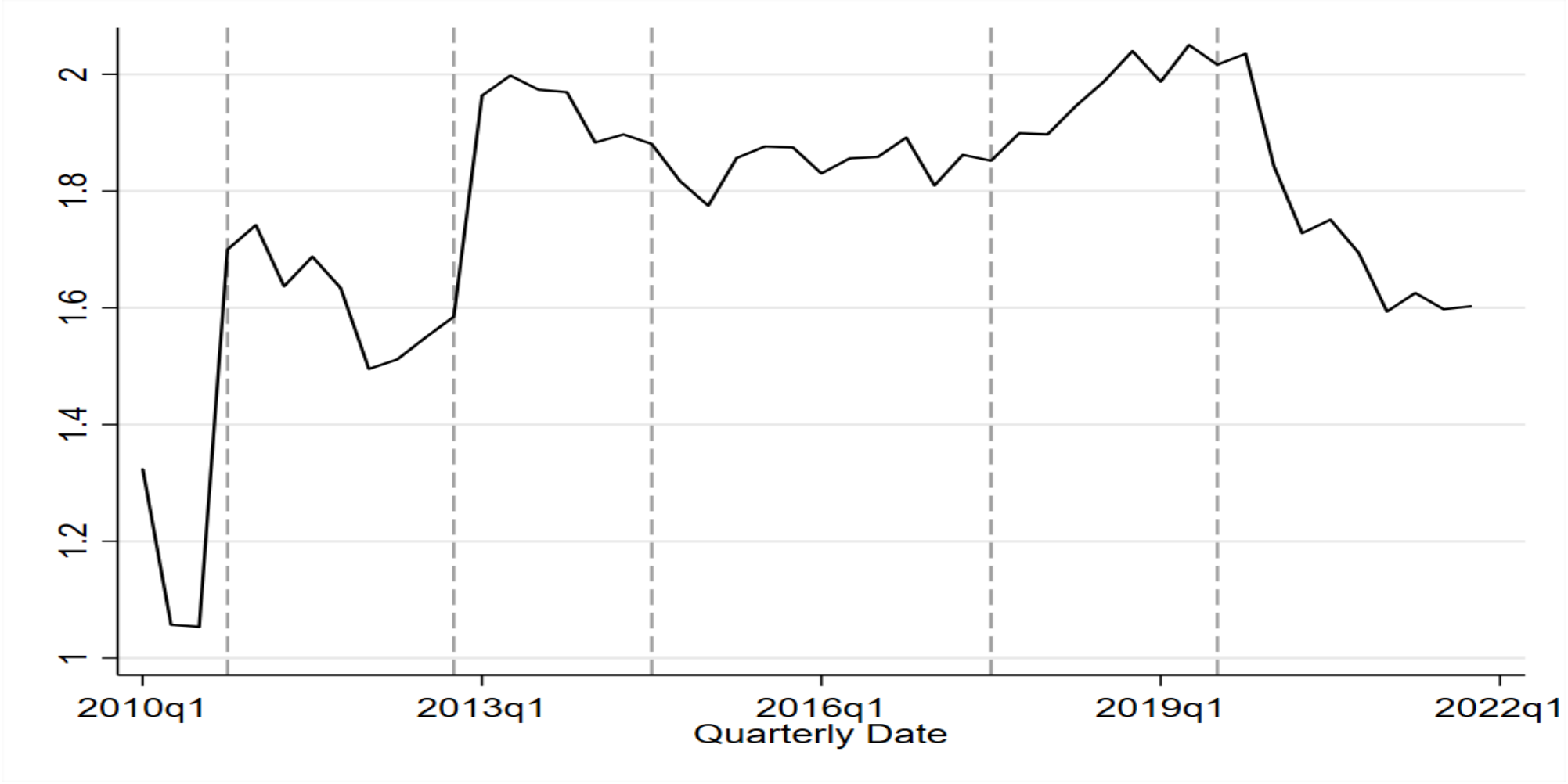
	(1)	(2)	(3)	(4)
	(Credit Lines + Demandable Deposits)/(Eligible Assets + Reserves)			
Equity/Assets$_{t-1}$	-12.89***	-9.777**	-2.046	-18.42***
	(3.857)	(4.258)	(3.770)	(5.057)
Obs	262638	156900	116592	105738
Time-FE	Y	Y	Y	Y
Two-way Clustering	Y	Y	Y	Y
Controls	Y	Y	Y	Y
Reg Type	OLS	OLS	OLS	OLS
Period	Overall: 2001Q1 - 2021Q4	QE I-III + Pandemic QE: 2008Q4 - 2014Q3 & 2019Q4 - 2021Q4	QE I-III: 2008Q4 - 2014Q3	Post-QE III + QT2014Q4 - 2019Q3

Other reasons…

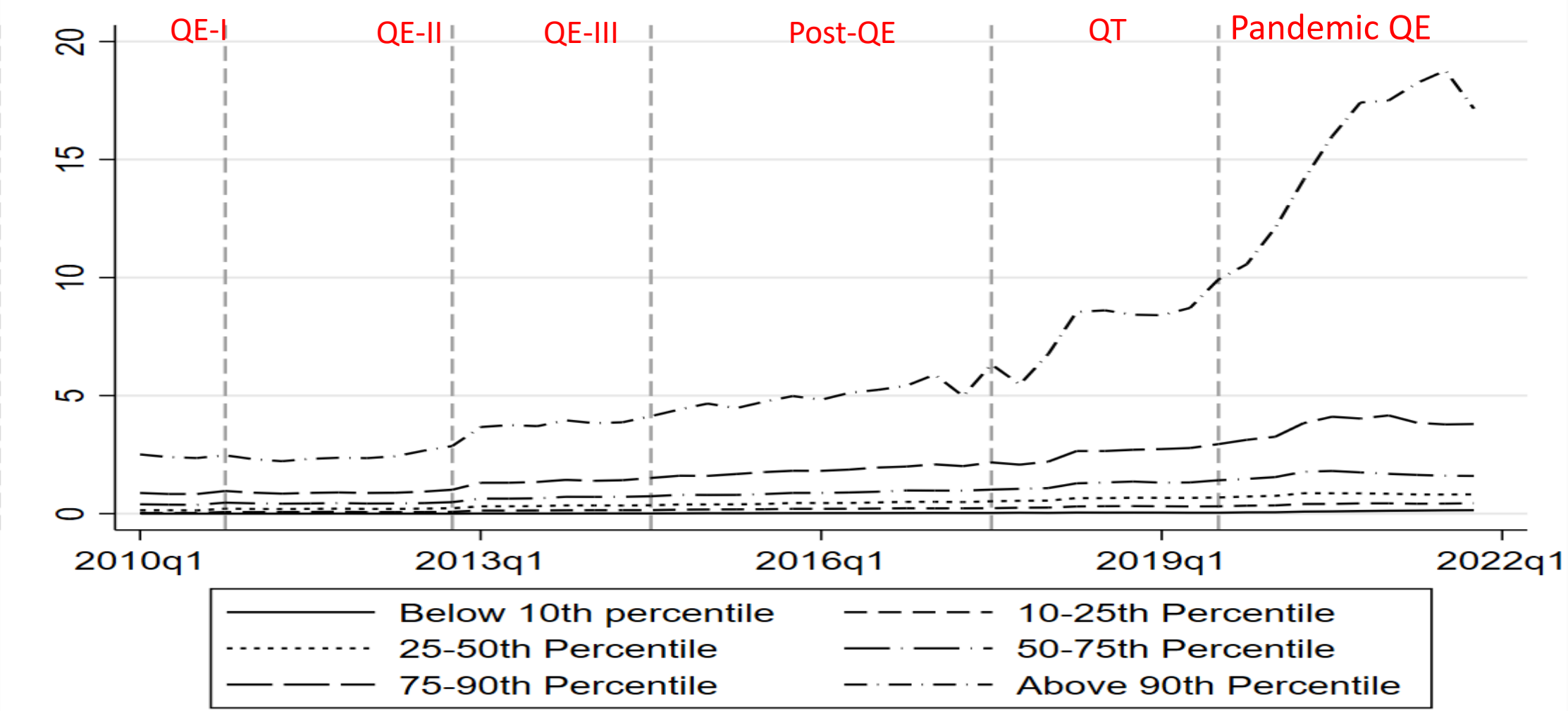
- Organizational constraints
  - Wholesale deposit desk may be hard to close.
  - How do you withdraw a line of credit from a relationship client?
  - Term loan, credit lines, uninsured deposits sold as a “bundle”

- Moral hazard
  - Fed will come in in times of need since stress will show up in Treasury repos.

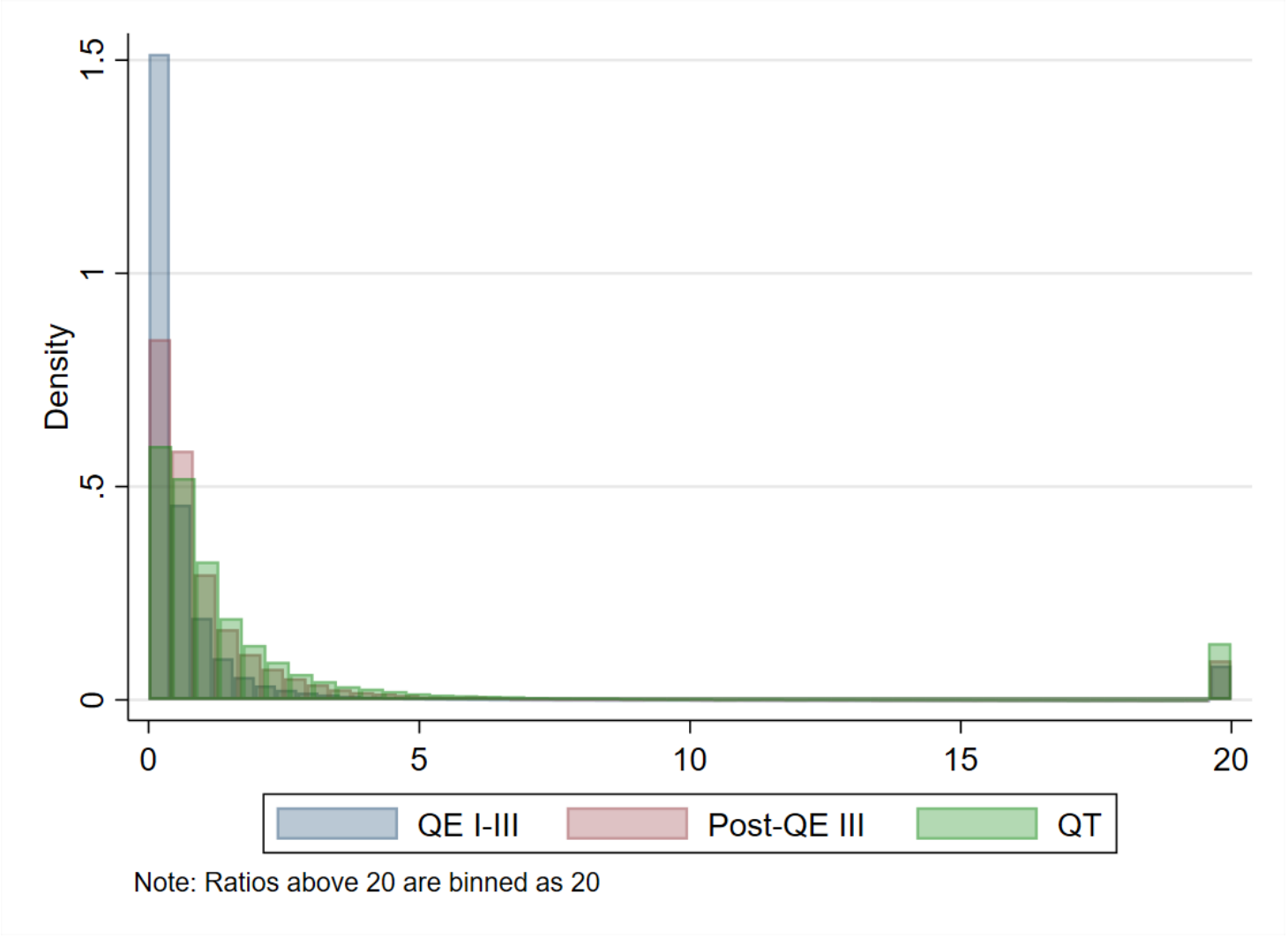
(Credit Lines + Uninsured Demandable Deposits)/(Reserves + Eligible Assets): Aggregate



(Credit Lines + Uninsured Demandable Deposits)/(Reserves and Eligible Assets): Distribution



(Credit Lines + Uninsured Demandable Deposits)/(Reserves + Eligible Assets): Histogram by Period



Liquidity Exposure and Bank Capitalization

Banks above 50 billion in Assets

	(1)	(2)	(3)	(4)
	(Credit Lines + Demandable Deposits)/(Eligible Assets + Reserves)			
Equity/Assets$_{t-1}$	14.01*	10.79	8.939	18.93**
	(7.025)	(7.704)	(8.915)	(6.846)
Obs	1815	1037	624	778
Time-FE	Y	Y	Y	Y
Two-way Clustering	Y	Y	Y	Y
Controls	Y	Y	Y	Y
Reg Type	OLS	OLS	OLS	OLS
Period	Overall: 2001Q1 - 2021Q4	QE I-III + Pandemic QE: 2008Q4 - 2014Q3 & 2019Q4 - 2021Q4	QE I-III: 2008Q4 - 2014Q3	Post-QE III + QT2014Q4 - 2019Q3

Liquidity Exposure and Bank Capitalization

Banks below 50 billion in Assets

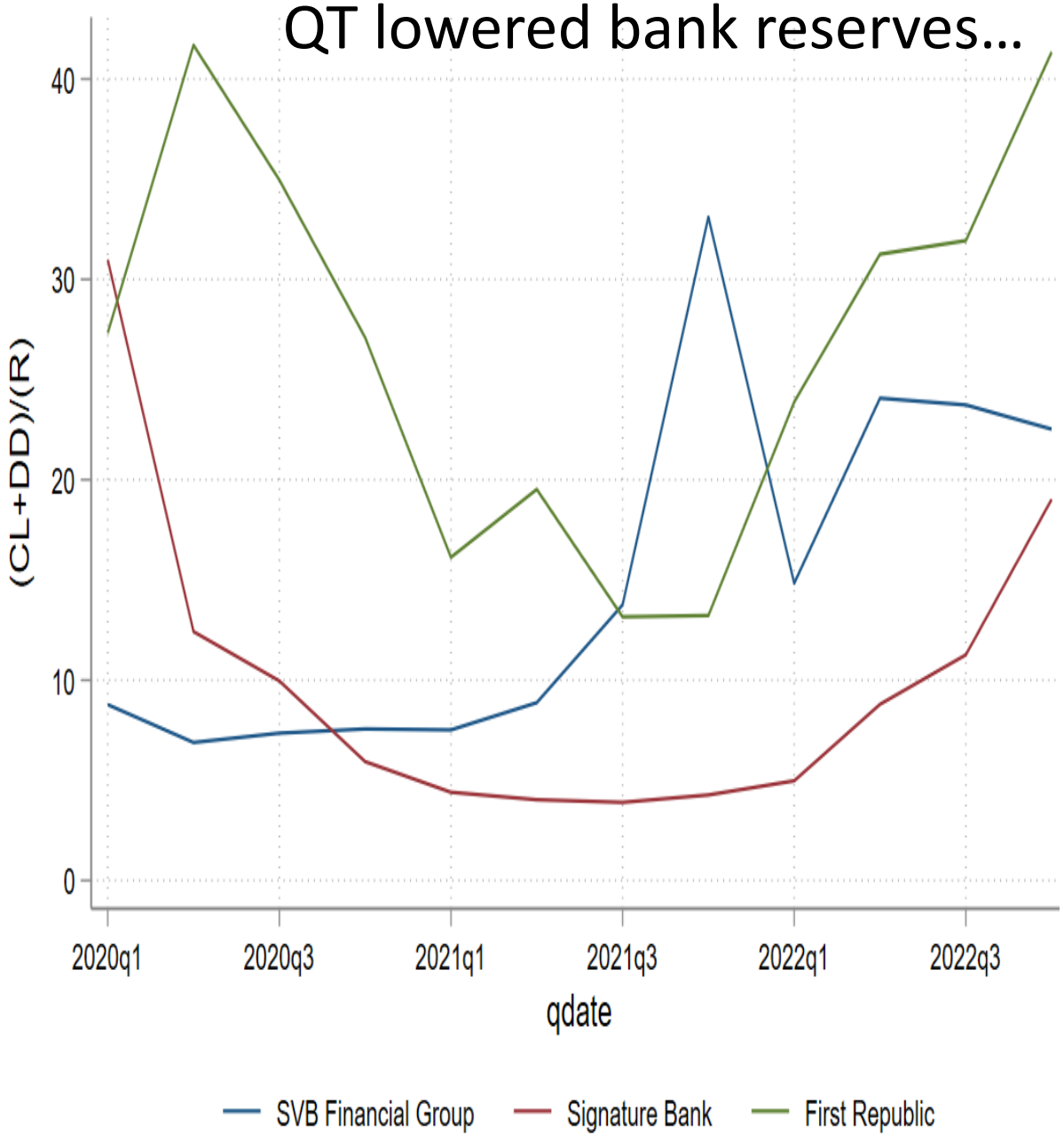
	(1)	(2)	(3)	(4)
	(Credit Lines + Demandable Deposits)/(Eligible Assets + Reserves)			
Equity/Assets$_{t-1}$	-13.34***	-10.22**	-2.710	-18.89***
	(3.860)	(4.237)	(3.801)	(5.091)
Obs	260823	155863	115968	104960
Time-FE	Y	Y	Y	Y
Two-way Clustering	Y	Y	Y	Y
Controls	Y	Y	Y	Y
Reg Type	OLS	OLS	OLS	OLS
Period	Overall: 2001Q1 - 2021Q4	QE I-III + Pandemic QE: 2008Q4 - 2014Q3 & 2019Q4 - 2021Q4	QE I-III: 2008Q4 - 2014Q3	Post-QE III + QT2014Q4 - 2019Q3

Demandable Claims and Fragility: Covid Shock

1-year CDS Premium Change

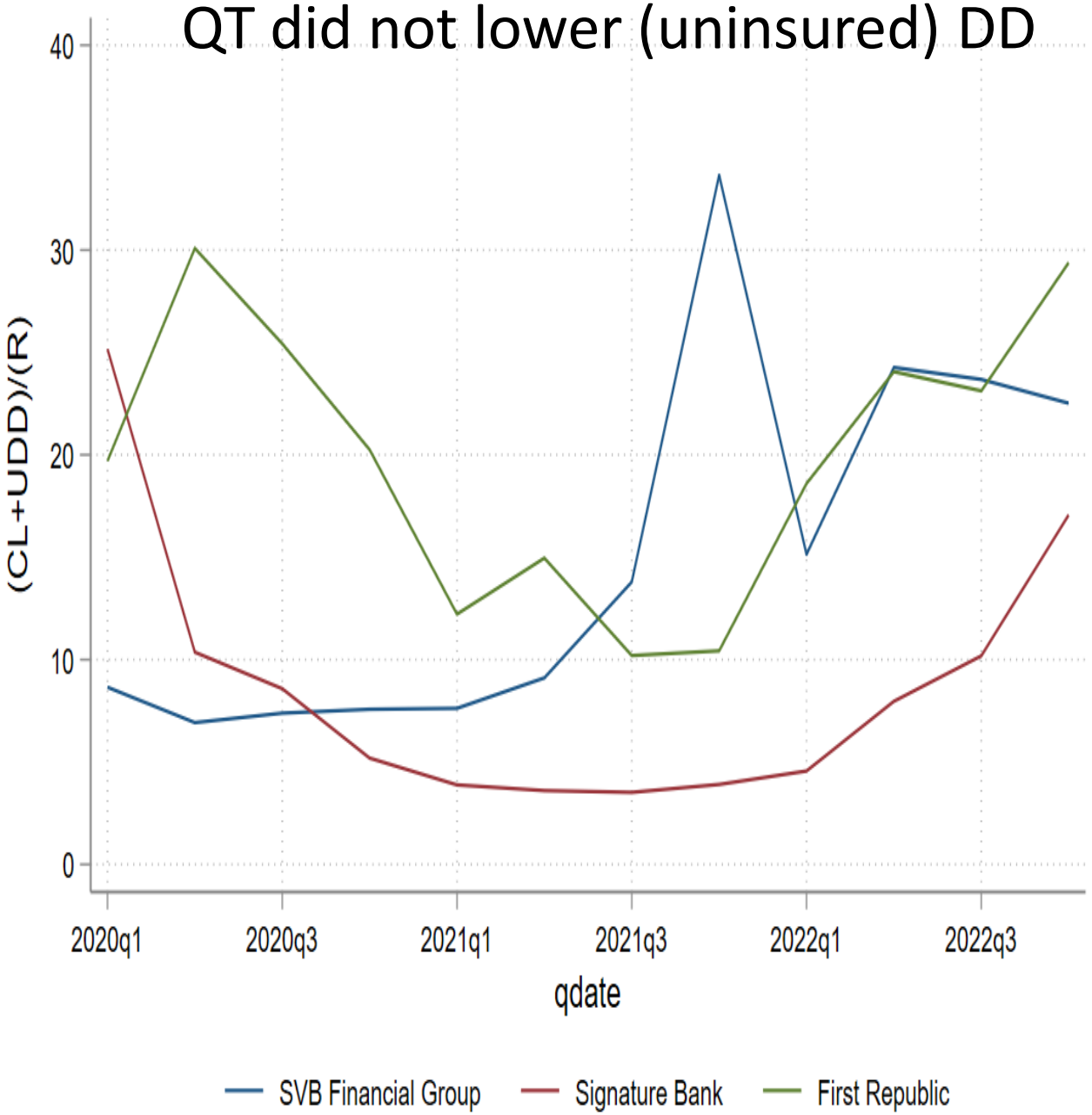
	(1) ΔLog(CDS)	(2) ΔLog(CDS)	(3) ΔLog(CDS)
Claims to Potential Liquidity	0.144*** (0.006)		
Credit Lines to Potential Liquidity		0.0685** (0.030)	
Demandable Deposits to Potential Liquidity			0.184*** (0.006)
Controls	Yes	Yes	Yes
Time FE	Yes	Yes	Yes
Standard errors			
Firm Cluster	(0.011)**	(0.008)***	(0.012)**
Time Cluster	(0.088)*	(0.087)*	(0.091)*
R-squared	0.543	0.575	0.543
Number obs.	277	244	277

QT lowered bank reserves…



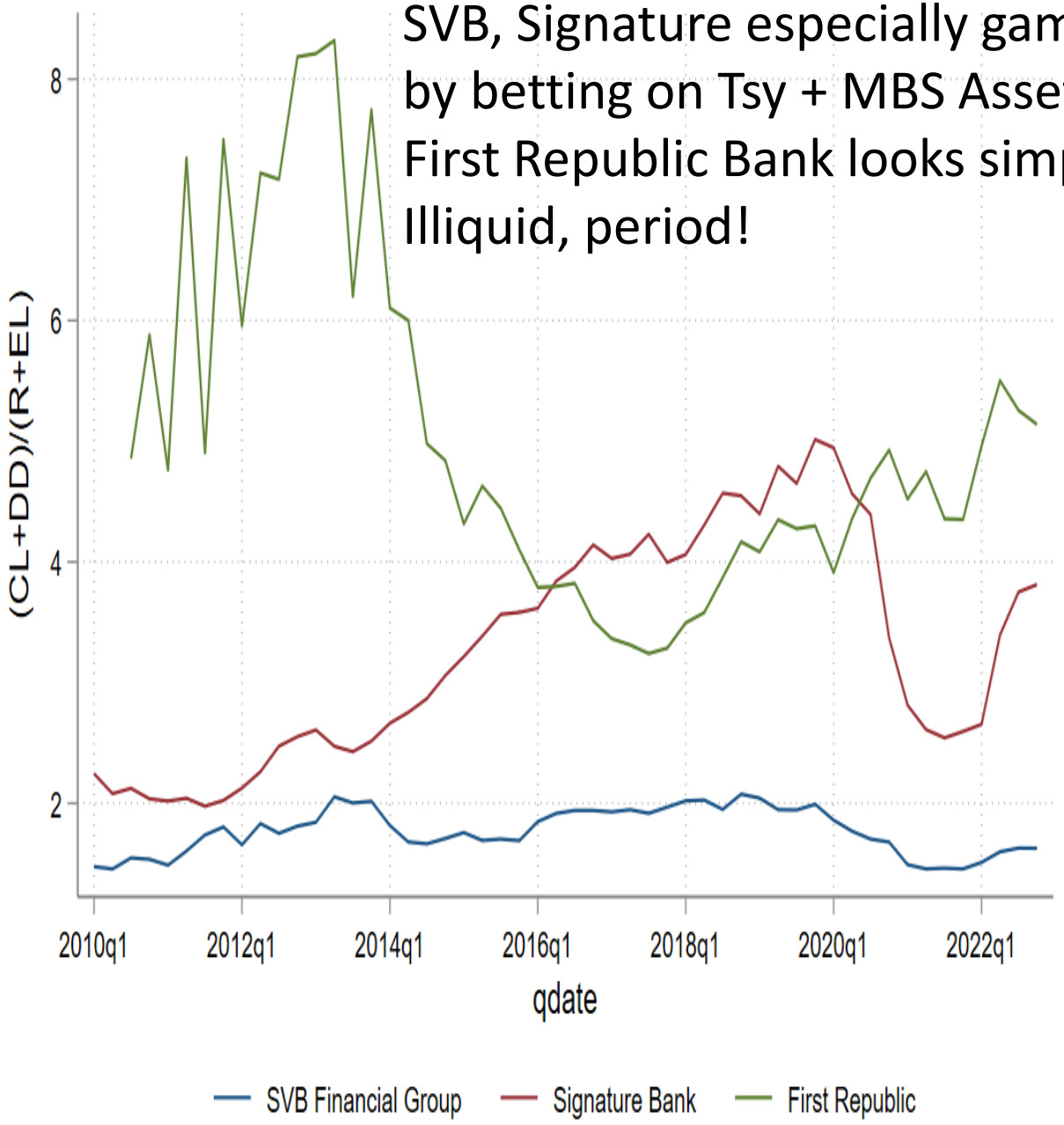
CL: Credit Lines, DD: Demandable Deposits, R: Reserves, EL: Eligible Assets, UDD: Uninsured Demandable Deposits

QT did not lower (uninsured) DD



CL: Credit Lines, DD: Demandable Deposits, R: Reserves, EL: Eligible Assets, UDD: Uninsured Demandable Deposits

SVB, Signature especially gambled by betting on Tsy + MBS Assets; First Republic Bank looks simply Illiquid, period!



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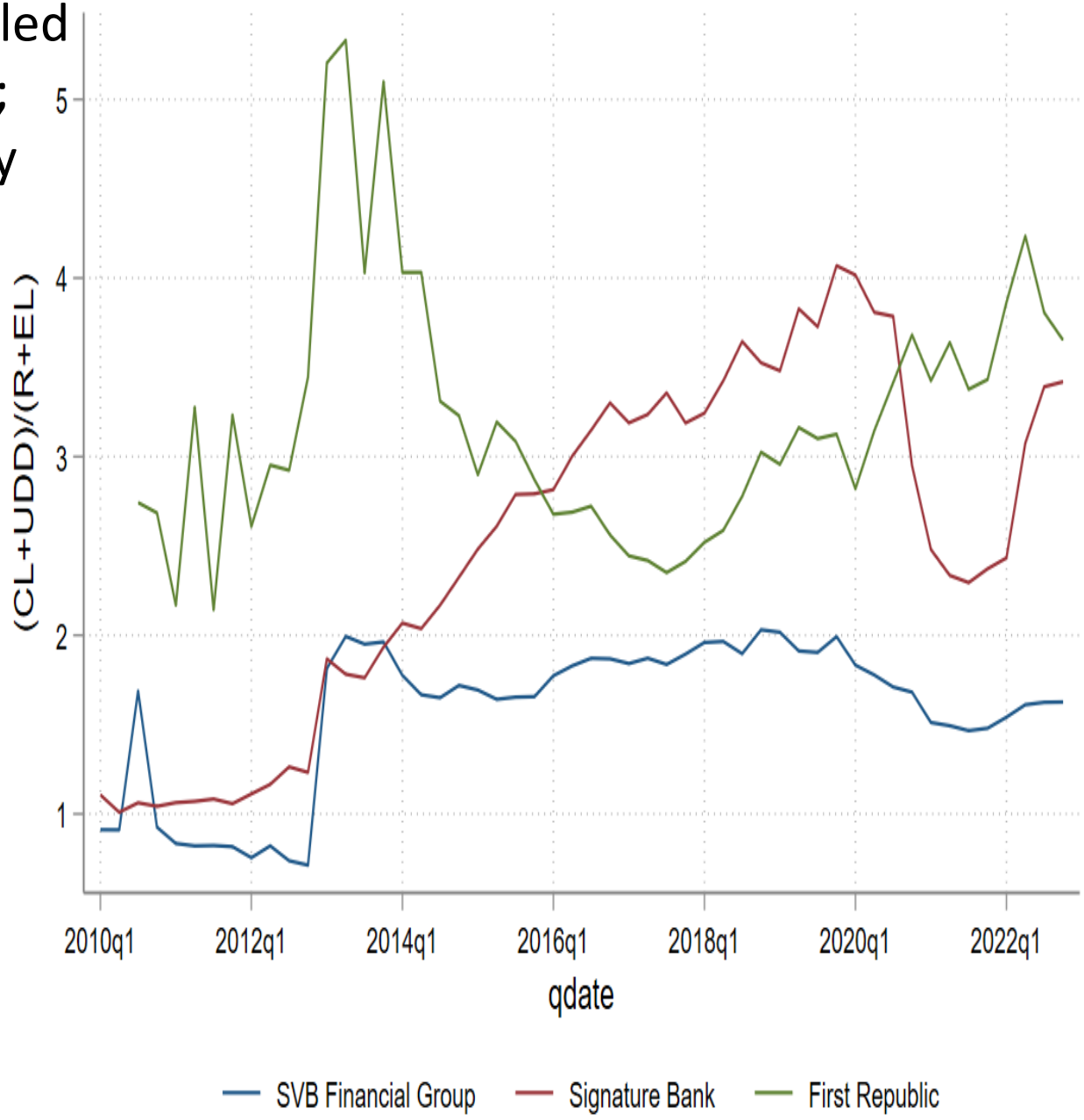

CL: Credit Lines, DD: Demandable Deposits, R: Reserves, EL: Eligible Assets, UDD: Uninsured Demandable Deposits

Policy Implications

- Demandable bank claims do not reverse in QT →
  - Financial stability objectives vs monetary policy objectives
- Monitor, understand, and manage bank-issued liquidity claims in QE/QT
  - Make reserves mobile by requiring LCR, Resolution Planning be met fortnightly?
    > Supervisory stigma with intra-day overdrafts (Nelson, 2019)
  - Countercyclical capital requirements (SLR policy of April 2020, 2021, e.g.)
- Access for non-banks?
  - Standing repo facility, subject to prudential requirements on “shadow banks”
- Engage in QT while “feeling the stones” for financial fragility
  - Revisit desirable scale, scope, duration of QE, when “pushing on a string”?