

Emergency Lending and Moral Hazard

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Motivation

- ① Since the GFC, central banks have deployed emergency facilities with increasing regularity
 - ▶ Clear benefits if short-circuit crisis dynamics
 - ▶ But we don't see counterfactuals. What is the bar for introducing these facilities?

- ② Emergency interventions come with certain costs/risks
 - ▶ Central bank independence, **moral hazard**
 - ▶ Operational risk, concerns about equity, legality

Moral hazard accompanies almost all gov't backstops and poses long-run stability risks

Research Question

Do emergency lending facilities result in measurable moral hazard?

① How to measure moral hazard?

- ▶ The manifestation of risk-shifting can take many forms

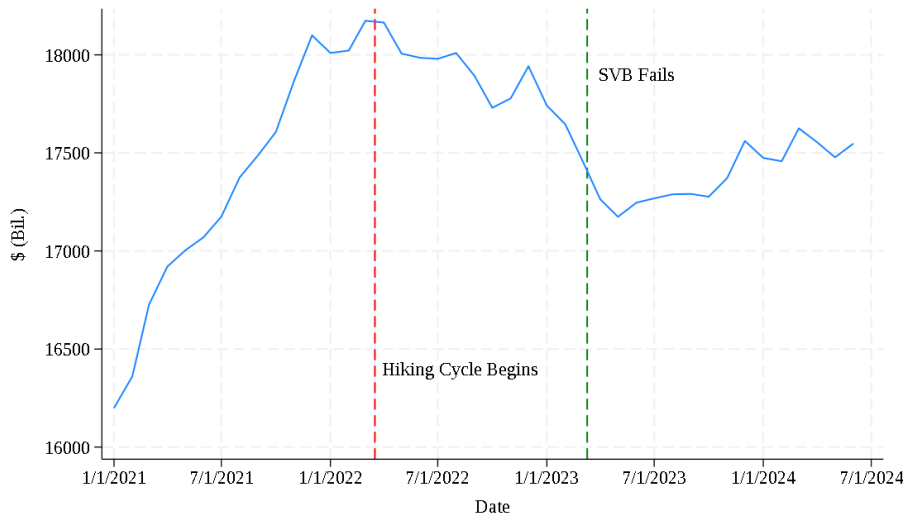
② How to overcome selection/endogeneity issues?

- ▶ Participation in emergency facilities is often a choice, potentially driven by a factor that also affects outcomes of interest

Background & Setting: 2023 U.S. Regional Banking Turmoil

- Fed rate-hiking cycle began March 2022 → deposits left the banking system
 - ① Deteriorating funding environment drove banks to other liabilities
 - ② Mark-to-market value of bank assets declined rapidly
- March 10, 2023: Silicon Valley Bank (SVB) placed into receivership
 - ▶ Investor flight following 8-K filing announcing capital raise after securities sales
 - ▶ Uninsured depositors fled, sparking contagion dynamics that affected other banks
 - ▶ Signature Bank failed the same weekend

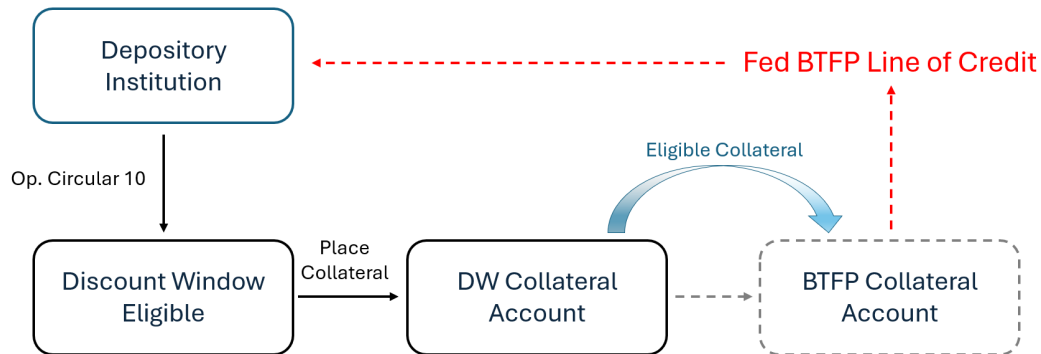
Deposit Outflows were a Feature of the pre- and post-SVB period



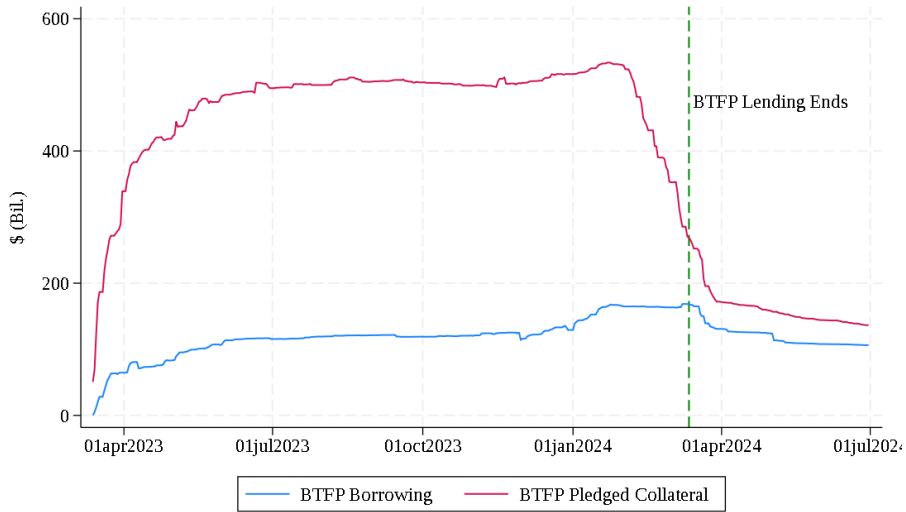
Background & Setting: Bank Term Funding Program (BTFP)

- To address the crisis, Fed created the BTFP to help banks meet funding needs
 - ▶ Fed would lend against the par value of eligible (U.S. gov/agency) securities
 - ▶ Other differences from discount window (DW): longer term (1 year), rate fixed at time of loan (OIS + 10bps)
- Banks had to meet varying administrative, operational, and legal hurdles to access
 - ▶ Requirements to access BTFP loans depended on DW status/positioning
 - ★ As simple as a phone call/online submission
 - ★ As complicated as board approval, legal agreements, collateral location & transfer

Background & Setting: Bank Term Funding Program (BTFP)



Collateral Placed at the BTFP Far Outstripped Borrowing



Background & Setting: Policymaker and Regulatory Response to the Crisis

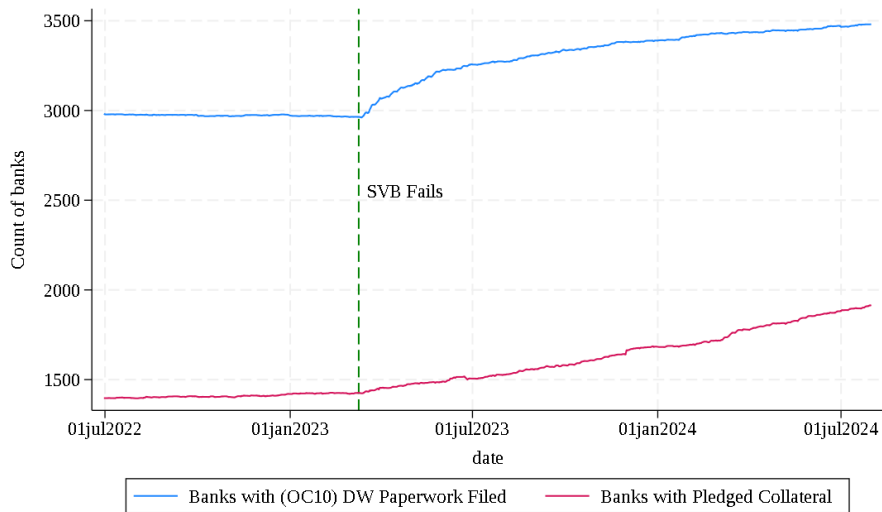
- Fed officials encouraged banks to proactively self-insure rather than expect gov't support

"Bank management must take ownership of their operational preparedness before a liquidity crisis occurs... Though we tailored a solution under these circumstances, banks would be very unwise to assume the Fed will be able to provide special, individualized attention and creative solutions in the event of another liquidity crisis." (Ostrander, 2023)

- Formal guidance via regulators' Statement on Funding and Liquidity Risk Management

- ① Maintain a broad range of funding sources.
- ② Regularly test any contingency borrowing lines and funding sources.
- ③ Incorporate the discount window as part of their contingency funding arrangements.
- ④ Establish and maintain operational readiness to borrow from the discount window by pre-pledging collateral and conducting small value borrowing tests.

Discount Window Preparedness pre- and post-SVB



Some Features of the Setting

- ① We know where to look for manifestation of moral hazard
- ② Identification: Variation in pre-BTFP eligible collateral availability

Research Design

Examine 2022Q4 → 2023Q4 changes in alternative/contingency funding sources

$$\Delta Y_b = \alpha + \beta \cdot \widehat{\text{BTFP Access}_b} + \varepsilon_b$$

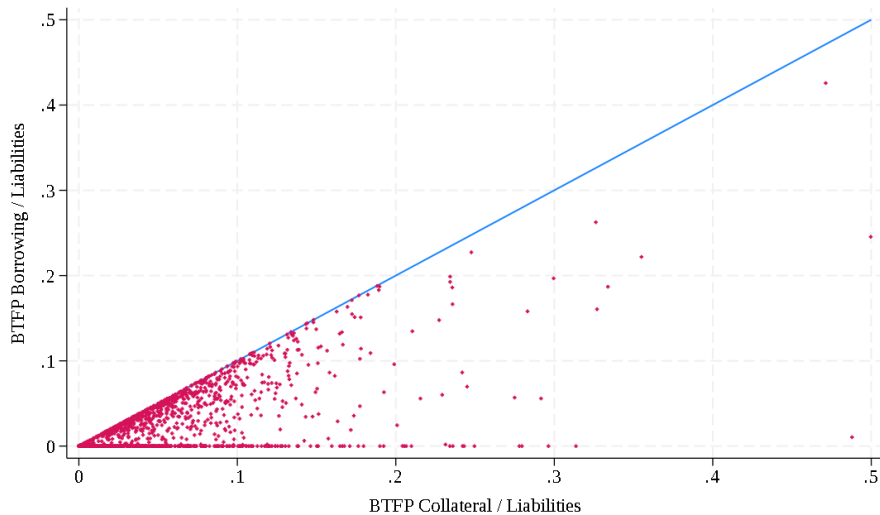
where

$$\text{BTFP Access}_b = \frac{\max(\text{BTFP Collateral}_{b,t} \mid t < 2023\text{Q4})}{\text{Liabilities}_{b,2022\text{Q4}}}.$$

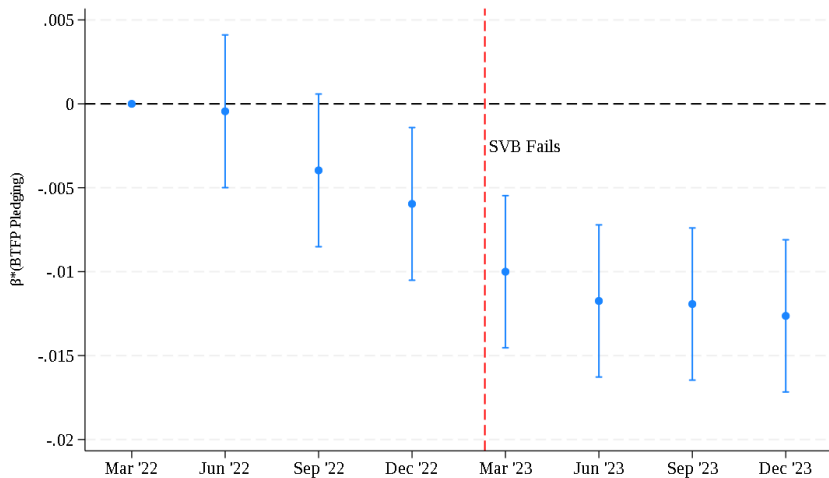
First stage:

$$\text{BTFP Access}_b = \alpha + \lambda \cdot \text{BTFP-Eligible Collateral}_b + \nu_b$$

Many Banks Placing Collateral Never Borrowed



Banks Using the BTFP Were not Random (Predicts Prior and Future Deposit Outflow) – cont'd



Research Design – cont'd

Examine 2022Q4 → 2023Q4 changes in alternative/contingency funding sources

$$\Delta Y_b = \alpha + \beta \cdot \widehat{\text{BTFP Access}_b} + \varepsilon_b$$

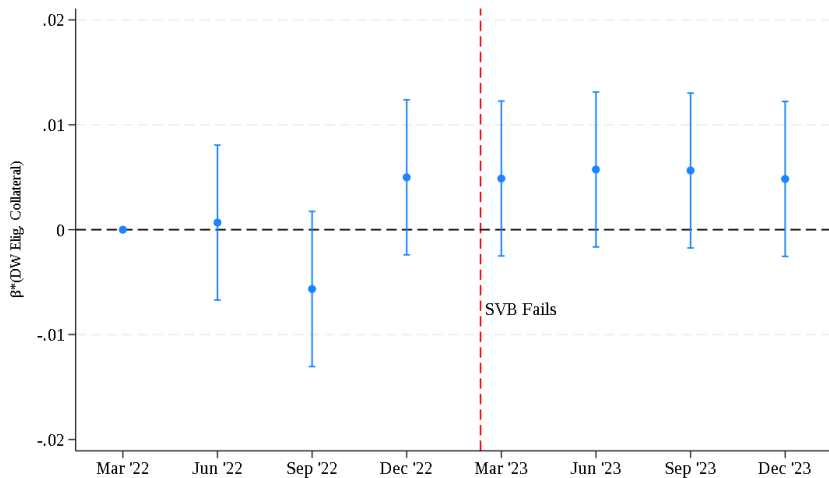
First stage:

$$\text{BTFP Access}_b = \alpha + \lambda \cdot \text{BTFP-Eligible Collateral}_b + \nu_b$$

Instrument:

$$\text{BTFP-Eligible Collateral}_b = \frac{\text{Gov./Agency Discount Window Collateral}_{b,2022Q4}}{\text{Liabilities}_{b,2022Q4}}$$

Banks' Pre-positioned DW Collateral Mix was Random (Doesn't Predict Prior and Future Deposit Outflow)



Results Outline

- ① Changes in alternative/contingency sources of private funding
- ② Changes in liquid asset buffers (and securities sales)
- ③ Differences in discount window borrowing preparation
- ④ Robustness/Placebo tests

More BTFP Access → Amass Less Alternative/Contingency Funding

Panel A: Discount Window Pledgers Sample

	Δ Time Deposits	Δ Wholesale Funding	Δ Brokered Deposits	Δ Reciprocal Deposits
Pledged BTFP Collateral	-0.54*** (0.14)	-0.48*** (0.14)	-0.48*** (0.11)	-0.21** (0.09)
N	1,396	1,396	1,396	1,396
First Stage F-stat	88.63	88.63	88.63	88.63

Panel B: Discount Window Eligible Sample

	Δ Time Deposits	Δ Wholesale Funding	Δ Brokered Deposits	Δ Reciprocal Deposits
Pledged BTFP Collateral	-0.50*** (0.13)	-0.41*** (0.12)	-0.40*** (0.09)	-0.11 (0.08)
N	2,892	2,892	2,892	2,892
First Stage F-stat	140.06	140.06	140.06	140.06

Panel C: BTFP Pledgers Sample

	Δ Time Deposits	Δ Wholesale Funding	Δ Brokered Deposits	Δ Reciprocal Deposits
Pledged BTFP Collateral	-0.84*** (0.12)	-0.59*** (0.11)	-0.63*** (0.09)	-0.05 (0.06)
N	1,290	1,290	1,290	1,290
First Stage F-stat	93.47	93.47	93.47	93.47

More BTFP Access → No Higher Liquid Asset Buffers + Security Sales!

Panel A: Discount Window Pledgers Sample

	Δ Cash & Securities	Δ Cash	Δ Securities	Σ Realized Gain/Loss
Pledged BTFP Collateral	-0.33* (0.18)	0.09 (0.11)	-0.42*** (0.12)	4.46 (2.80)
N	1,396	1,396	1,396	1,368
First Stage F-stat	88.63	88.63	88.63	89.75

Panel B: Discount Window Eligible Sample

	Δ Cash & Securities	Δ Cash	Δ Securities	Σ Realized Gain/Loss
Pledged BTFP Collateral	-0.22 (0.15)	0.13 (0.10)	-0.35*** (0.10)	4.22** (1.79)
N	2,892	2,892	2,892	2,830
First Stage F-stat	140.06	140.06	140.06	140.23

Panel C: BTFP Pledgers Sample

	Δ Cash & Securities	Δ Cash	Δ Securities	Σ Realized Gain/Loss
Pledged BTFP Collateral	-0.20* (0.11)	0.05 (0.08)	-0.25*** (0.08)	5.14** (2.53)
N	1,290	1,290	1,290	1,284
First Stage F-stat	93.47	93.47	93.47	94.29

More BTFP Access → Less Discount Window Testing & Pledging

Panel A: Discount Window Pledgers Sample

	P(DW Test post-BTFP) (%)		P(DW Test post-BTFP no prior) (%)		Δ DW Collateral		Δ Inelig. DW Collateral	
	(IV)	(RF)	(IV)	(RF)	(IV)	(RF)	(IV)	(RF)
Pledged BTFP Collateral	-2.86*** (0.93)	–	-1.50** (0.73)	–	-6.61*** (2.00)	–	-0.60 (1.30)	–
BTFP-Eligible DW Collateral	–	-1.19*** (0.26)	–	-0.62*** (0.15)	–	-2.75*** (0.43)	–	-0.40 (1.09)
N	1,396	1,396	1,396	1,396	1,391	1,391	1,047	1,047
First Stage F-stat	88.63	–	88.63	–	89.00	–	153.83	–

Panel C: BTFP Pledgers Sample

	P(DW Test post-BTFP) (%)		P(DW Test post-BTFP no prior) (%)		Δ DW Collateral		Δ Inelig. DW Collateral	
	(IV)	(RF)	(IV)	(RF)	(IV)	(RF)	(IV)	(RF)
Pledged BTFP Collateral	-1.24* (0.66)	–	-0.80 (0.54)	–	-12.27*** (1.96)	–	-4.02*** (1.61)	–
BTFP-Eligible DW Collateral	–	-0.60*** (0.19)	–	-0.34*** (0.13)	–	-7.62*** (1.92)	–	-2.78*** (1.01)
N	1,150	1,150	1,150	1,150	997	997	504	504
First Stage F-stat	94.77	–	94.77	–	97.10	–	100.93	–

Thanks!

Paper in One Slide

Research Question

- ▶ Does access to and use of emergency backstops foster moral hazard?

Setting & Data

- ▶ 2023 U.S. Regional Bank Crisis. Bank funding profile, discount window prep, BTFP usage.

Identification & Design

- ▶ Relate banks' BTFP pledge amount to funding diversity and contingency prep. Instrument for BTFP pledging w/eligible collateral at the discount window prior to the crisis.

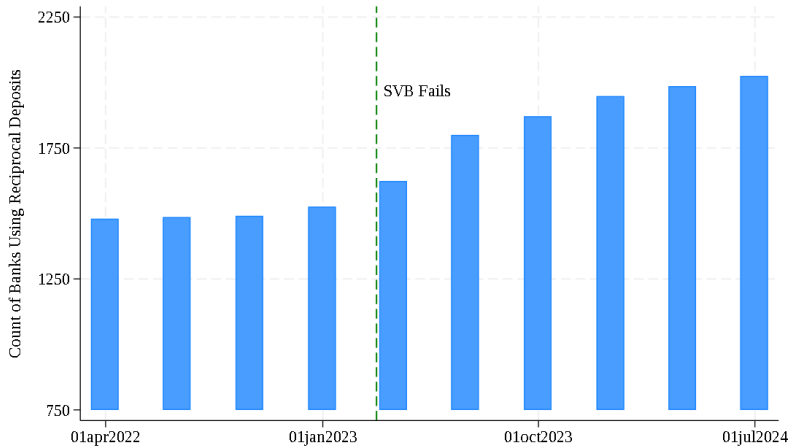
Results

- ▶ Banks with less access to the BTFP were more likely to heed regulatory guidance to diversify funding sources and prepare for emergency borrowing.

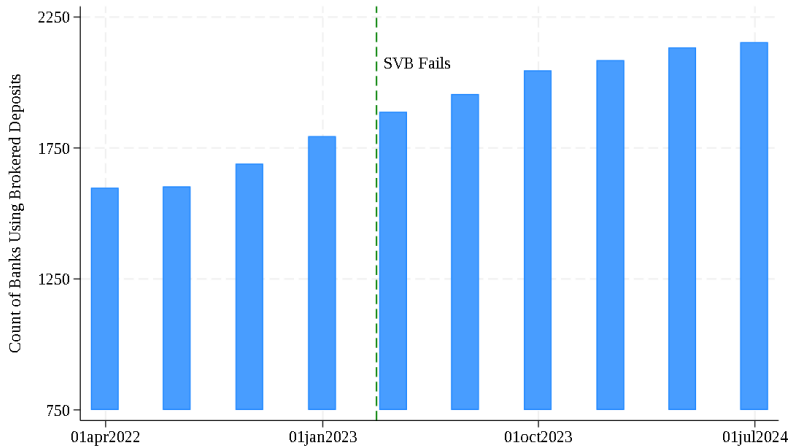
Policy Implications

- ▶ Emergency facilities have real costs, including adding stigma to standing facilities.
- ▶ Warrants a more systematic approach to sup & reg that integrates countercyclical capital and liquidity requirements with standing lending facilities and credible resolution regime.

Banks Increasingly Turned to Alternative Funding Sources post-SVB (Reciprocal Deposits)



Banks Increasingly Turned to Alternative Funding Sources post-SVB (Brokered Deposits)



Tables - Descriptive Statistics

	DW Pledgers (<i>N</i> =1,422)				DW Eligible (<i>N</i> =2,971)				BTTP Pledgers (<i>N</i> =1,299)			
	Mean	25th %ile	50th %ile	75th %ile	Mean	25th %ile	50th %ile	75th %ile	Mean	25th %ile	50th %ile	75th %ile
Assets (\$ mil)	12591.2	358.1	822.7	2406.7	6425.9	201.3	442.4	1174.3	13391.8	266.2	591.7	1670.1
Liabilities (\$ mil)	11359.2	324.8	743.3	2190.0	5799.1	181.8	402.2	1049.3	12037.6	242.2	538.9	1534.3
Uninsured Deposits (% of Assets)	28.3	18.1	28.0	37.7	27.4	17.2	27.2	37.2	29.3	19.6	29.0	38.5
Core Deposits (% of Assets)	77.7	72.8	80.1	86.0	79.1	74.6	81.6	86.7	80.2	75.4	81.9	87.1
Time Deposits (% of Assets)	16.2	7.9	13.2	21.1	17.1	9.2	14.5	22.3	15.5	8.4	13.6	20.0
Wholesale Funding (% of Assets)	7.8	0.7	5.0	11.2	6.4	0.0	3.5	9.4	6.7	0.6	4.4	10.2
Brokered Deposits (% of Assets)	3.4	0.0	0.0	3.9	2.6	0.0	0.0	2.6	2.4	0.0	0.0	2.6
Reciprocal Deposits (% of Assets)	2.2	0.0	0.0	2.5	1.9	0.0	0.0	1.5	2.1	0.0	0.0	2.1
Cash (% of Assets)	6.9	2.2	4.1	8.5	7.9	2.5	4.9	10.1	5.5	2.1	3.7	6.7
Securities (Amort. Cost, % of Assets)	25.1	12.9	22.3	35.6	25.8	12.8	23.5	36.4	30.4	17.8	28.0	40.5
DW Collateral (% of Liabs.)	8.7	0.8	3.0	10.6	4.2	0.0	0.0	2.8	5.7	0.0	0.6	5.2
DW Test post-BTTP (1/0)	0.2	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.2	0.0	0.0	0.0
DW Test post-BTTP No Prior Test (1/0)	0.1	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.1	0.0	0.0	0.0

BTFP Borrowers and Pledgers

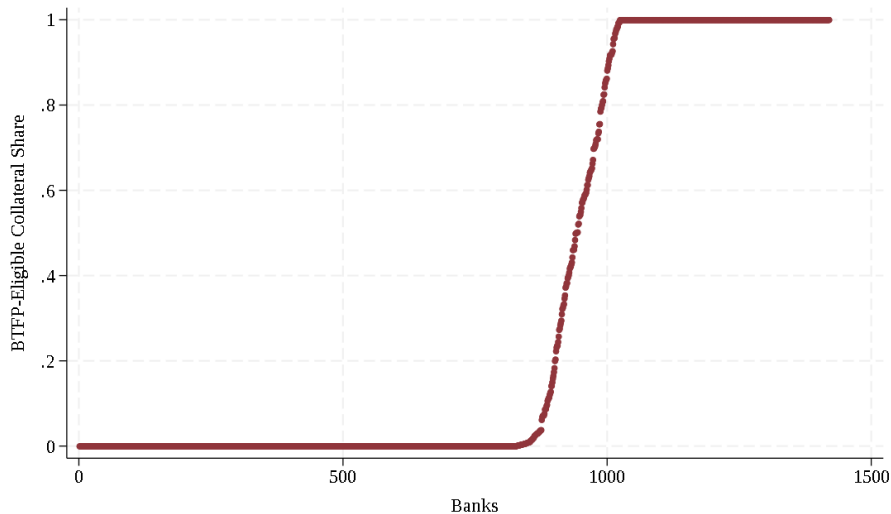
Panel B: BTFP Pledging and Borrowing Amounts (% of Liabilities)

	Mean	25th Percentile	50th Percentile	75th Percentile
$\frac{Q3\text{Max}\{BTFCollateral\}}{Liabilities_{2022}}$	6.2	2.3	4.8	8.5
$\frac{Q3\text{Max}\{BTFBorrowing\}}{Liabilities_{2022}}$	3.2	0.0	2.0	5.0
$\frac{Q3\text{Max}\{BTFBorrowing_{ Borr>0}\}}{Liabilities_{2022}}$	4.2	1.1	3.2	6.0

First Stage Regression Results

	2 nd Stage Endog. Regressor: $\frac{Q3Max\{BTFCollateral\}}{Liabilities_{2022}}$		
	DW Pledging Banks	DW Eligible Banks	BTFP Pledging Banks
$\frac{BTFP\text{-eligible DW Collateral}}{Liabilities}$	0.42*** 0.04	0.44*** 0.04	0.61*** 0.06
N	1,396	2,892	1,290
F-stat	88.63	140.06	93.47
R ²	0.06	0.05	0.07

Banks' Pre-positioned DW Collateral was not Exclusively BTFTP-Eligible



Longer Sample → Amass Less Alternative/Contingency Funding

Panel A: Discount Window Pledgers Sample

	Δ Time Deposits	Δ Wholesale Funding	Δ Brokered Deposits	Δ Reciprocal Deposits
Pledged BTFP Collateral	-0.71*** (0.20)	-0.45*** (0.17)	-0.53*** (0.14)	-0.26* (0.14)
N	1,362	1,362	1,362	1,362
First Stage F-stat	90.42	90.42	90.42	90.42

Panel B: Discount Window Eligible Sample

	Δ Time Deposits	Δ Wholesale Funding	Δ Brokered Deposits	Δ Reciprocal Deposits
Pledged BTFP Collateral	-0.73*** (0.20)	-0.37** (0.15)	-0.44*** (0.13)	-0.14 (0.12)
N	2,826	2,826	2,826	2,826
First Stage F-stat	144.68	144.68	144.68	144.68

Panel C: BTFP Pledgers Sample

	Δ Time Deposits	Δ Wholesale Funding	Δ Brokered Deposits	Δ Reciprocal Deposits
Pledged BTFP Collateral	-0.88*** (0.17)	-0.41*** (0.14)	-0.46*** (0.12)	-0.10 (0.09)
N	1,264	1,264	1,264	1,264
First Stage F-stat	95.29	95.29	95.29	95.29

Longer Sample → No Higher Liquid Asset Buffers + Security Sales!

Panel A: Discount Window Pledgers Sample

	Δ Cash & Securities	Δ Cash	Δ Securities	Σ Realized Gain/Loss
Pledged BTFP Collateral	-0.64** (0.31)	-0.08 (0.15)	-0.56** (0.23)	4.24 (2.90)
N	1,362	1,362	1,362	1,334
First Stage F-stat	90.42	90.42	90.42	91.57

Panel B: Discount Window Eligible Sample

	Δ Cash & Securities	Δ Cash	Δ Securities	Σ Realized Gain/Loss
Pledged BTFP Collateral	-0.47* (0.24)	-0.01 (0.14)	-0.46*** (0.17)	4.11** (1.86)
N	2,826	2,826	2,826	2,765
First Stage F-stat	144.68	144.68	144.68	144.94

Panel C: BTFP Pledgers Sample

	Δ Cash & Securities	Δ Cash	Δ Securities	Σ Realized Gain/Loss
Pledged BTFP Collateral	-0.45*** (0.15)	-0.26*** (0.10)	-0.20* (0.11)	4.98* (2.63)
N	1,264	1,264	1,264	1,258
First Stage F-stat	95.29	95.29	95.29	96.15

BTFP Access, Funding Diversification, and # Funding Sources

Panel A: HHI Changes (Dec '22 – Dec '23)

	<u>DW Pledgers</u>	<u>DW Eligible</u>	<u>BTFP Pledgers</u>
	<u>Δ HHI</u>	<u>Δ HHI</u>	<u>Δ HHI</u>
Pledged BTFP Collateral	0.53*** (0.18)	0.59*** (0.14)	0.35** (0.15)
N	1,378	2,848	1,280
Adj. R^2	0.01	0.01	0.00

Panel B: Fewer Private Funding Sources (Dec '22 – Dec '23)

	<u>DW Pledgers</u>	<u>DW Eligible</u>	<u>BTFP Pledgers</u>
	<u>Δ Funding Sources < 0</u>	<u>Δ Funding Sources < 0</u>	<u>Δ Funding Sources < 0</u>
Pledged BTFP Collateral	0.00* (0.00)	0.01*** (0.00)	0.01*** (0.00)
N	1,396	2,892	1,290
Adj. R^2	0.00	0.00	0.01

Instrument Exogeneity to Deposit Changes

Panel A: Discount Window Pledgers Sample

	Δ Uninsured Deps		Δ Core Deps	
	(OLS)	(IV)	(OLS)	(IV)
Pledged BTFP Collateral	-0.17*** (0.07)	0.03 (0.17)	-0.14*** (0.05)	-0.18 (0.21)
N	620	620	1,396	1,396
Adj. R^2	0.01	–	0.00	–
First Stage F-stat	–	122.24	–	88.63

Panel B: Discount Window Eligible Sample

	Δ Uninsured Deps		Δ Core Deps	
	(OLS)	(IV)	(OLS)	(IV)
Pledged BTFP Collateral	-0.21*** (0.07)	-0.07 (0.18)	-0.18*** (0.04)	-0.15 (0.20)
N	803	803	2,892	2,892
Adj. R^2	0.01	–	0.01	–
First Stage F-stat	–	142.74	–	140.06

Panel C: BTFP Pledgers Sample

	Δ Uninsured Deps		Δ Core Deps	
	(OLS)	(IV)	(OLS)	(IV)
Pledged BTFP Collateral	-0.15** (0.07)	-0.04 (0.18)	-0.18*** (0.04)	0.13 (0.15)
N	447	447	1,290	1,290
Adj. R^2	0.01	–	0.02	–
First Stage F-stat	–	92.96	–	93.47

Placebo Tests: Instrumenting with **Ineligible** Collateral at the DW

Panel A: Discount Window Pledgers Sample

	Δ Time Deposits	Δ Wholesale Funding	Δ Brokered Deposits	Δ Reciprocal Deposits
Pledged BTFP Collateral	0.96 (1.24)	-1.97 (1.53)	-1.62 (1.27)	-0.95 (0.92)
N	1,396	1,396	1,396	1,396
First Stage F-stat	1.89	1.89	1.89	1.89

Panel B: Discount Window Eligible Sample

	Δ Time Deposits	Δ Wholesale Funding	Δ Brokered Deposits	Δ Reciprocal Deposits
Pledged BTFP Collateral	-1.39 (1.41)	2.70 (2.39)	2.45 (2.04)	2.17 (1.75)
N	2,892	2,892	2,892	2,892
First Stage F-stat	1.78	1.78	1.78	1.78

Panel C: BTFP Pledgers Sample

	Δ Time Deposits	Δ Wholesale Funding	Δ Brokered Deposits	Δ Reciprocal Deposits
Pledged BTFP Collateral	8.53 (23.05)	-7.15 (18.40)	-3.67 (9.52)	-7.31 (19.17)
N	1,290	1,290	1,290	1,290
First Stage F-stat	0.15	0.15	0.15	0.15

Placebo Instrument: Liquidity Buffers

Panel A: Discount Window Pledgers Sample

	Δ Cash & Securities	Δ Cash	Δ Securities	Σ Realized Gain/Loss
Pledged BTFP Collateral	-1.41 (1.56)	0.01 (0.71)	-1.43 (1.22)	-18.46 (20.61)
N	1,396	1,396	1,396	1,368
First Stage F-stat	1.89	1.89	1.89	2.31

Panel B: Discount Window Eligible Sample

	Δ Cash & Securities	Δ Cash	Δ Securities	Σ Realized Gain/Loss
Pledged BTFP Collateral	2.85 (2.44)	0.63 (0.96)	2.23 (1.90)	33.07 (34.13)
N	2,892	2,892	2,892	2,830
First Stage F-stat	1.78	1.78	1.78	1.29

Panel C: BTFP Pledgers Sample

	Δ Cash & Securities	Δ Cash	Δ Securities	Σ Realized Gain/Loss
Pledged BTFP Collateral	-9.84 (26.05)	-5.27 (14.18)	-4.58 (12.01)	-169.32 (540.40)
N	1,290	1,290	1,290	1,284
First Stage F-stat	0.15	0.15	0.15	0.10

Placebo Instrument – Discount Window Preparation

Panel A: Discount Window Pledgers Sample

	P(DW Test post-BTFP) (%)	P(DW Test post-BTFP no prior) (%)	Δ DW Collateral	Δ Inelig. DW Collateral
Pledged BTFP Collateral	10.37 (9.92)	1.95 (5.08)	103.18 (72.74)	65.40 (57.64)
N	1,396	1,396	1,391	1,047
First Stage F-stat	1.89	1.89	1.85	1.35

Panel B: Discount Window Eligible Sample

	P(DW Test post-BTFP) (%)	P(DW Test post-BTFP no prior) (%)	Δ DW Collateral	Δ Inelig. DW Collateral
Pledged BTFP Collateral	17.10 (14.20)	9.65 (8.86)	109.38*** (39.28)	225.60 (326.35)
N	2,892	2,892	1,961	1,184
First Stage F-stat	1.78	1.78	7.25	0.48

Panel C: BTFP Pledgers Sample

	P(DW Test post-BTFP) (%)	P(DW Test post-BTFP no prior) (%)	Δ DW Collateral	Δ Inelig. DW Collateral
Pledged BTFP Collateral	-18.62 (42.80)	-9.02 (22.54)	727.84 (2379.99)	329.28 (1382.66)
N	1,150	1,150	997	504
First Stage F-stat	0.20	0.20	0.09	0.06