Blocking the Credit Chain: Cryptocurrencies, Deposits, and Bank Loan Growth

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10th Annual Bank Regulation Conference
Columbia University SIPA & Bank Policy Institute

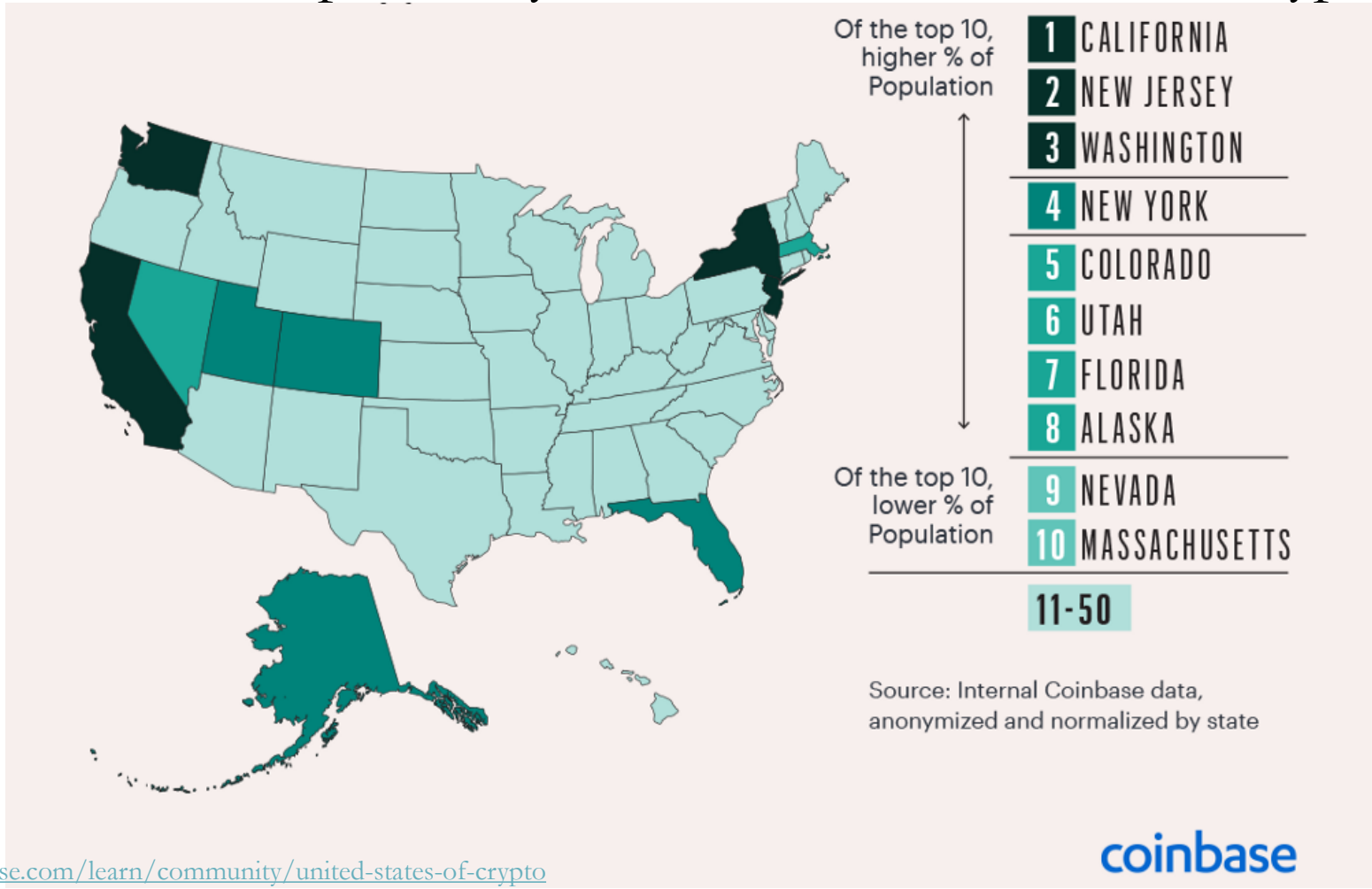
Motivation

- Between 2013 and 2025, the number of cryptocurrencies rose from <100 to >18,000 and their collective market capitalization grew from ~$10B to ~$4T

Source: https://coinmarketcap.com/charts/

Motivation

- National surveys from NORC/UChicago and Pew Research Center found 13%--16% of Americans had personally invested in, traded, or used a cryptocurrency



Source: https://www.coinbase.com/learn/community/united-states-of-crypto

Motivation

- Should banks participate in cryptocurrency markets? If so, how?
  - Custodian, exchange, coin issuer, broker, payment processor, participant, etc.
- Two banks among those with high exposure to the cryptocurrency industry — Silvergate Bank and Signature Bank — failed in early 2023

Silvergate

FINANCIAL TIMES

Crypto bank Silvergate to shut down in face of market turmoil

Shares plunge after lender whose fortunes tumbled since collapse of FTX announces liquidation

"In the past few years Silvergate had developed into the largest cryptocurrency bank in the US, **attracting as much as $14bn in customer deposits** and reaching a stock price of more than $200 in late 2021."

Signature | SIGNATURE BANK®

The New York Times

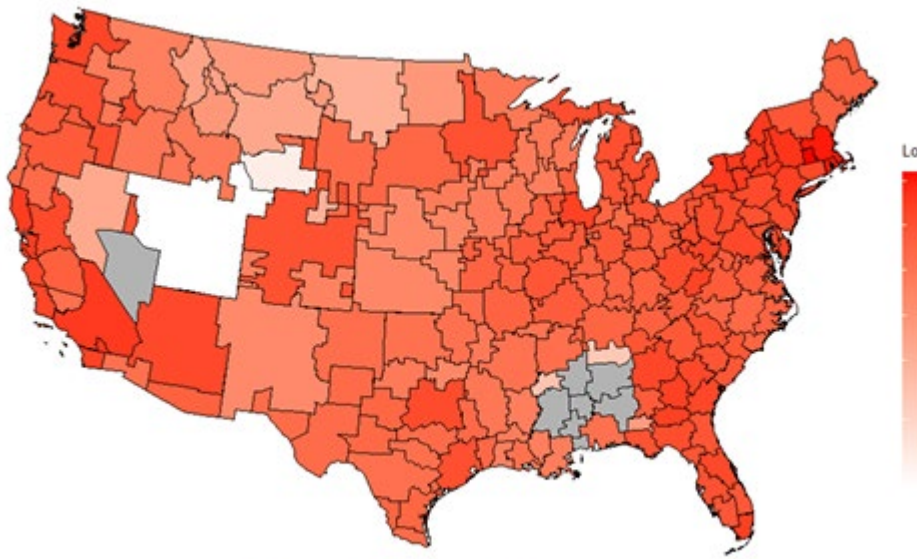
Risky Bet on Crypto and a Run on Deposits Tank Signature Bank

Regulators said keeping open the 24-year-old institution, which held deposits from law firms and real estate companies, could threaten the financial system's stability.

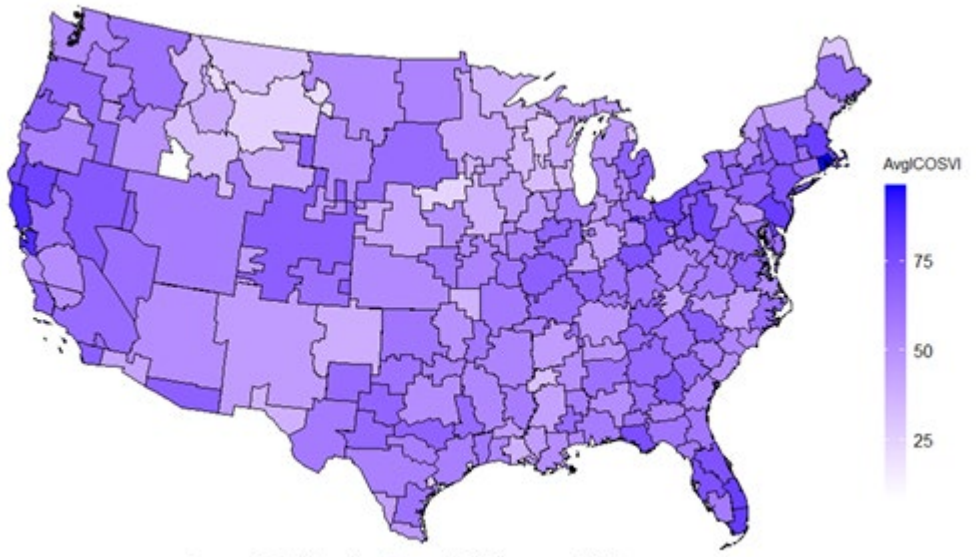
"The bank also said its **digital asset-related client deposits stood at $16.52 billion**. Signature was one of the few financial institutions that had opened its doors to taking deposits of crypto assets, a business it entered into in 2018."

Motivation

- Threats to financial stability could arise from the direct exposure to cryptocurrencies of banks or financial institutions
- But also through indirect exposure…
- Prior research has explored cryptocurrency demand at ICO stage and on-exchange
  - Lottery sales and attention paid to ICOs are geographically correlated – Chava et al. 25



Lottery Sales Per Capita across DMAs



Average ICO Attention (Google SVI) across DMAs

Source: Chava et al. 2025

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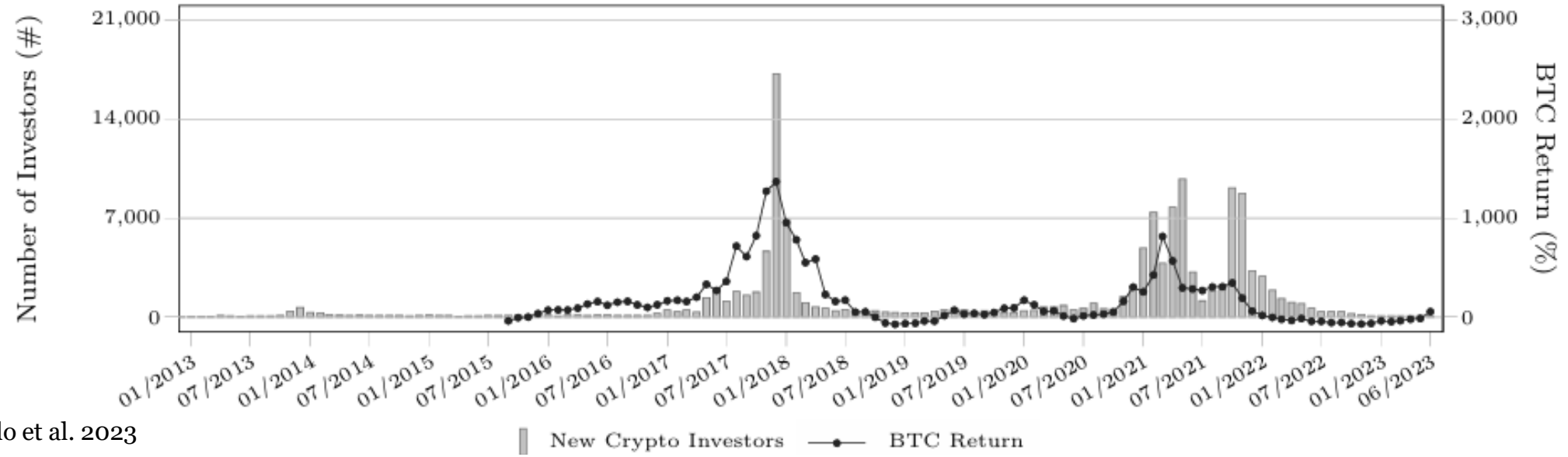
  - New cryptocurrency investors enter after strong crypto returns – Aiello et al. 23



Source: Aiello et al. 2023

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  - New cryptocurrency investors enter after strong crypto returns – Aiello et al. 23
  - Investors tend to be momentum traders in cryptocurrencies – Kogan et al. 23
- Portfolio rebalancing or consumption in response to crypto gains/losses could spillover to other markets, banks, and other financial institutions

→ **Does cryptocurrency participation affect traditional bank intermediation?**

This Paper

→ Cryptocurrency markets disrupt traditional bank intermediation:

- When crypto returns are high, banks with more exposure to crypto-investing households have more deposit outflows and lower loan growth

→ This disintermediation propagates to the real economy:

- When crypto returns are high, counties with more exposed banks experience less growth in establishments and employment, especially in bank-dependent sectors

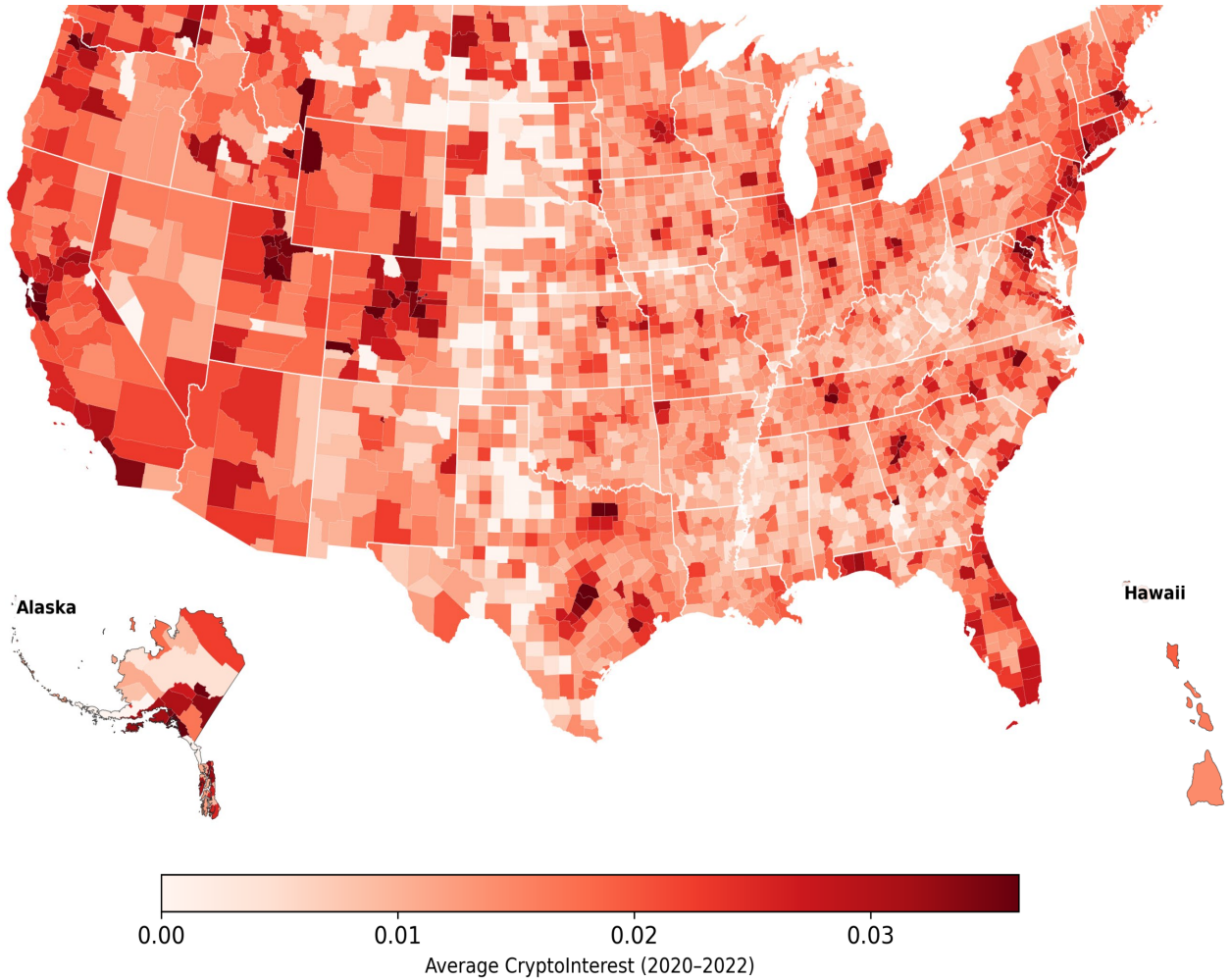
Crypto markets disintermediate traditional banks and affect the real economy

Data

- Sample period is 2020:Q1 to 2022:Q4
- Cryptocurrency Data
  - Trading data for all cryptocurrencies from Coinmarketcap.com.
  - Coins with market capitalization of less than $1M are removed.
- Bank Data
  - Call Reports, FDIC Summary of Deposits, Community Reinvestment Act
- Household cryptocurrency investment
  - IRS Virtual Currency Indicator (number of tax filings with gains or losses on virtual currency investment)
  - We calculate the percentage of a county's taxpayers with crypto investments
- Other Data
  - Compustat, BLS Quarterly Census of Employment and Wages

Household Crypto Investments

- The percentage of a taxpayers with crypto investments across counties in 2020:



Household Crypto Participation and Deposit Flows

- *CryptoInterest* defined as the share of household tax filings with virtual currency indicator (i.e., gain/loss on cryptocurrency investment):

$$CryptoInterest_{c,t} = \frac{\#Tax\ Filings\ with\ Crypto\ Investments_{c,t}}{\#Tax\ Filings_{c,t}}$$

- Are deposit flows more sensitive to cryptocurrency returns in counties with a larger share of crypto-investing households?

$$\log(\Delta Deposits_{b,c,t}) = \beta(CryptoInterest_{c,t} \times CryptoReturn_{t-1}) + X'_{b,c,t-1}\delta + \alpha_{b\times c} + \alpha_{b\times t} + \alpha_{s\times t} + \epsilon_{b,c,t}$$

- b indexes bank, c indexes county, s indexes state, t indexes year.

Crypto Exposure and Deposits Growth

	Log(ΔDeposits)			
CryptoInterest × CryptoReturn	-0.591***	-0.606***	-0.769***	-0.769***
	(3.68)	(3.79)	(3.74)	(3.75)
CryptoInterest	0.582	0.604	0.326	0.384
	(1.30)	(1.35)	(0.60)	(0.70)
Condition	Full Sample		CryptoInterest > 0	
Controls		×		×
Bank × County Fixed Effects	×	×	×	×
State × Year Fixed Effects	×	×	×	×
Bank × Year Fixed Effects	×	×	×	×
Adj. R^2	0.044	0.044	0.050	0.050
Obs.	36,792	36,792	35,590	35,590

- 1SD increase in CryptoReturn ~ about 1.4 p.p. lower deposit growth in counties with 1SD higher CryptoInterest, robust to excluding zero exposure counties
  - Consistent with Aiello et al. 23, which shows that high past crypto returns lead to increased household crypto investment (not bank deposits)

Bank Exposure to Household Crypto Investments

- Bank-level crypto exposure is defined as:

$$CryptoExposure_{b,t} = \sum_{c \in C_b} \frac{Deposits_{c,b}}{Deposits_b} \times CryptoInterest_{c,t}$$

- b indexes bank, c indexes county, t indexes year, C_b is the set of counties where bank b has at least one branch, and deposit shares are static and calculated using reports from 2019

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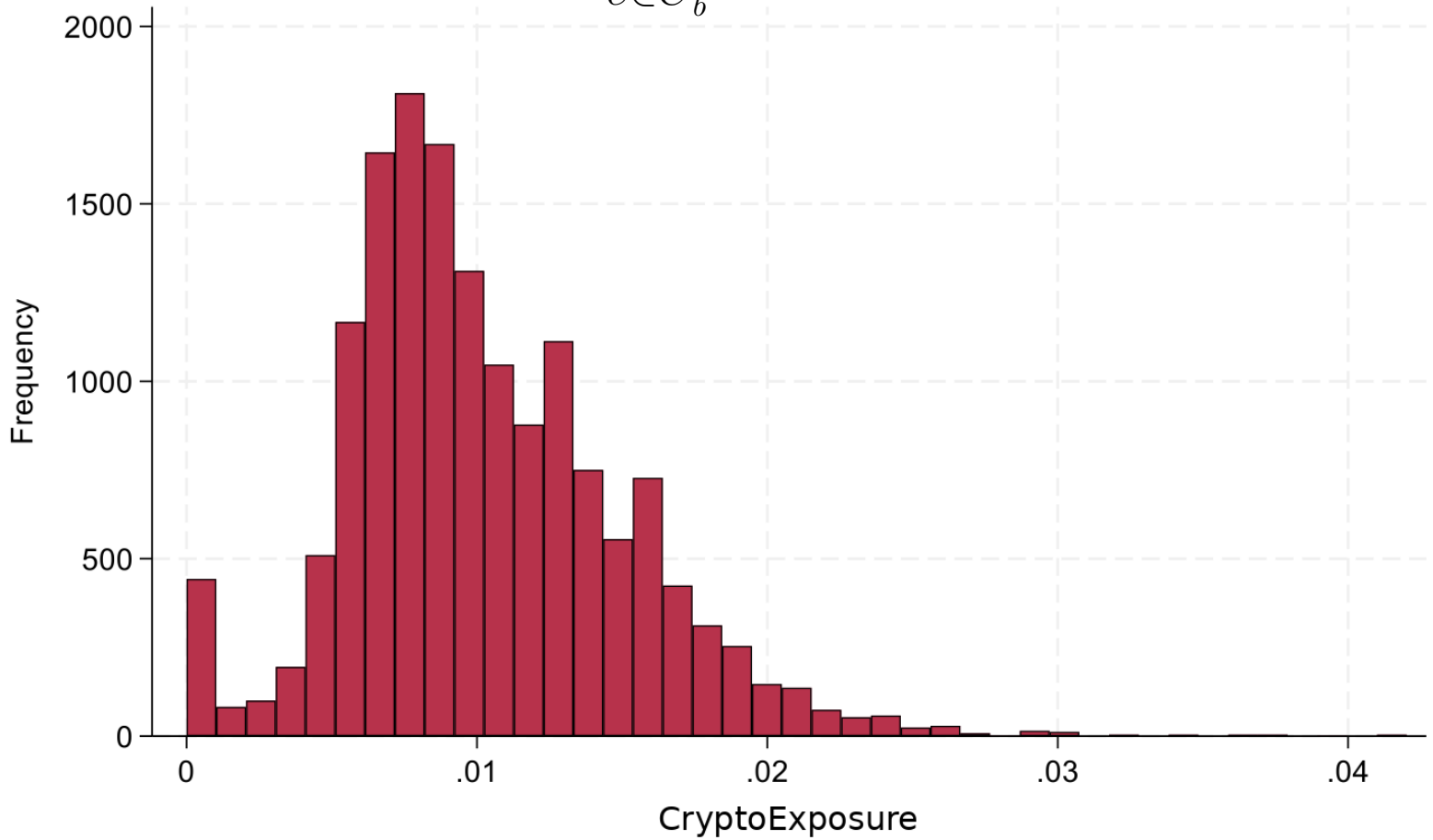

Crypto Exposure and Bank-Level Outcomes

- Estimate the difference in sensitivity to crypto returns conditional on bank exposure to crypto-investing households:

$$\log(\Delta DomesticDeposits_{b,t}) = \beta_1 (CryptoExposure_{b,t} \times CryptoReturn_{t-1}) + Z'_{b,t-1}\delta + \alpha_b + \alpha_t + \epsilon_{b,t}$$

- $CryptoExposure_b$ and $CryptoReturn_{t\text{-}1}$ are subsumed by bank and year-quarter fixed effects, respectively.
- Controls:
  - log(gross total assets), capital ratio, return-on-assets, ratio of non-performing loans to gross total assets, ratio of total loans to gross total assets, ratio of total expenses to gross total assets

Crypto Exposure and Bank-Level Outcomes

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- Hypotheses for *TotalDeposits*:
  - If households invest in cryptocurrencies after high crypto returns, we expect $\beta_1 < 0$ (*negative effect*) – Aiello et al. 23
  - If households with crypto investments consume more or rebalance portfolio away from crypto after high crypto returns, then we expect $\beta_1 > 0$ (*positive effect*)

Crypto Exposure and Bank-Level Outcomes

- Estimate the difference in sensitivity to crypto returns conditional on bank exposure to crypto-investing households:

$$\log(\Delta GrossLoans_{b,t}) = \beta_1 (CryptoExposure_{b,t} \times CryptoReturn_{t-1}) + Z'_{b,t-1}\delta + \alpha_b + \alpha_t + \epsilon_{b,t}$$

- We then consider *GrossLoans*:
  - If the impact on deposits is passed through to credit, we expect the interaction coefficient estimates that correspond in sign to the deposit specifications
- We also consider a two-stage least squares model of passthrough to estimate the elasticity of gross loan growth to crypto-driven deposit growth

Crypto Exposure and Deposits Growth

	Log(ΔTotalDeposits)			
CryptoExposure × CryptoReturn	-0.186***	-0.163***	-0.186***	-0.178***
	(5.18)	(4.51)	(5.17)	(5.38)
CryptoExposure	0.307***	0.108**	0.303***	0.280***
	(6.75)	(2.16)	(4.68)	(4.28)
Controls		×		×
Bank Fixed Effects			×	×
Year-quarter Fixed Effects	×	×	×	×
Adj. R^2	0.224	0.234	0.262	0.345
Obs.	46,149	46,149	46,049	46,049

- 1SD increase in crypto returns ~ 19 bps lower deposit growth for banks with 1SD higher exposure to crypto-investing households
  - 19 bps ~ 7% of average deposit growth in sample
  - Local deposit outflows are not diversified, instead lead to bank-level funding pressure

Deposit Type Heterogeneity

	Log(ΔTransaction)	Log(ΔTime)	Log(ΔSavings)
CryptoExposure × CryptoReturn	0.163	-0.421***	-0.391***
	(1.50)	(6.78)	(6.28)
CryptoExposure	0.286	-0.319***	0.286***
	(1.64)	(2.80)	(2.61)
Controls	×	×	×
Bank Fixed Effects	×	×	×
Year-quarter Fixed Effects	×	×	×
Adj. R^2	0.131	0.125	0.143
Obs.	45,934	46,049	46,049

- No effect for transaction deposits, all for time and savings deposits
  - Consistent with substitution to crypto from savings, not transaction services, again in line with Aiello et al. 23

Crypto Exposure and Loan Growth

	Log(ΔGrossLoans)			
CryptoExposure × CryptoReturn	-0.223***	-0.200***	-0.136***	-0.092***
	(6.24)	(5.58)	(4.00)	(2.82)
CryptoExposure	0.298***	0.109**	-0.439***	-0.317***
	(6.45)	(2.23)	(5.70)	(4.61)
Controls		×		×
Bank Fixed Effects			×	×
Year-quarter Fixed Effects	×	×	×	×
Adj. R^2	0.223	0.230	0.291	0.368
Obs.	46,149	46,149	46,049	46,049

- 1SD increase in crypto returns ~ 10 bps lower loan growth for banks with 1SD higher exposure to crypto-investing households
  - 10 bps ~ 5% of average loan growth in sample
  - Comparable in magnitude to deposit growth estimates, consistent with passthrough

Crypto Exposure and Loan Growth

	First Stage		Second Stage	
	Log(ΔTotalDeposits)		Log(ΔGrossLoans)	
CryptoExposure × CryptoReturn	-0.186***	-0.178***		
	(5.17)	(5.38)		
$\widehat{\Delta \text{TotalDeposits}}$			0.733***	0.518**
			(3.19)	(2.58)
Controls		×	×	×
Bank Fixed Effects	×	×	×	×
Year-quarter Fixed Effects	×	×	×	×
F-statistic	31.229	32.072		
Obs.	46,049	46,049	46,049	46,049

- Note the first stage estimates are the ΔTotalDeposits estimates from prior slides
- A 1% increase in crypto-driven deposit growth is associated with 0.5%–0.7% increase in gross loans growth
  - Similar magnitude to passthrough rates from local shale discoveries – Gilje et al. 16, Gilje 19

Robustness

- Controlling for exposure to other risky assets
  - Prior work documents deposit contractions following stock market booms – Lin 20
  - Construct stock (debt) market exposure measures based on county-level IRS reporting, following Lin (2020) – agg. dividend (interest) income divided by adj. gross income
  - Construct housing market exposure measures based on percentage of owner-occupied housing per American Community Survey (Census)
  - Interact with S&P500 stock and bond indexes, housing returns based on quarterly FHFA house price index data
- Alternative measures and specifications
  - Crypto booms vs. busts (weak evidence for stronger boom effects)
  - Branch-weighted CryptoExposure
  - Indicator for top tercile of CryptoExposure
  - Exclude banks with gross total assets <$100M or >$250B or with CryptoExposure = 0
  - Control for deposit concentration, ΔFF, and deposit channel of monetary policy

Crypto Exposure and Within-County Loan Growth

- Do bank-level loan growth effects extend to the county level? Are they robust to adjusting for local credit demand?

$$\log(\Delta SmallBusinessLoans_{b,c,t}) = \beta(CryptoExposure_{b,t} \times CryptoReturn_{t-1}) + Z'_{b,c,t-1} + \alpha_b + \alpha_{c\times t} + \epsilon_{b,c,t}$$

- Include Bank and County×Year fixed effects
  - **Note:** *CryptoReturn*$_{t-1}$ and county factors (e.g., *CryptoInterest*) subsumed by fixed effects

Crypto Exposure and Within-County Loan Growth

	Log(ΔSmallBusinessLoans)			
CryptoExposure × CryptoReturn	-4.057*	-6.350***		
	(1.91)	(2.83)		
1[HighExposure] × CryptoReturn			-0.048***	-0.056***
			(6.62)	(6.83)
Controls	×	×	×	×
Bank Fixed Effects	×	×	×	×
County × Year Fixed Effects	×	×	×	×
R^2	0.107	0.109	0.107	0.109
Obs.	196,623	196,623	196,623	196,623

- 1SD increase in crypto returns associated with ~5.3 p.p. lower small business loan growth for banks in top tercile of CryptoExposure distribution compared to other banks in the **same county** at the **same time**
  - Consistent in sign with bank-level loan growth estimates, and shows importance of adjusting for local credit demand

Crypto Exposure and County-Level Real Outcomes

$$HighExposureShare_{c,t} = \sum_{b \epsilon B_c} \left(\frac{Deposits_{b,c}}{Deposits_c} \right) \times 1[HighExposure_{b,t}]$$

$$\log(\Delta Y_{c,t}) =$$

$$\beta_1 \left(HighExposureShare_{c,t} \times CryptoReturn_{t-1} \right) + X'_{b,t-1} + \alpha_c + \alpha_{s \times t} + \epsilon_{c,s,t}$$

- Include County and State × Year fixed effects to adjust for state-level secular trends and conditions (e.g., bank/crypto regulation)
- Y represents our county-industry level dependent variables (establishments, employment)
  - Categorize industries by dependence on external financing – Rajan and Zingales 98, Lin 20

Crypto Exposure and County-Level Real Outcomes

	Log(ΔEmployment)		Log(ΔEstablishment)	
	(1)	(2)	(3)	(4)
HighExposureShare × CryptoReturn	-0.044***	-0.020**	-0.025***	-0.011**
	(5.43)	(2.17)	(4.67)	(1.98)
HighExposureShare × CryptoReturn × Dependent	-0.014**	-0.014**	-0.001	-0.001
	(2.31)	(2.30)	(0.35)	(0.35)
CryptoInterest × CryptoReturn		-1.545***		-0.875***
		(5.92)		(5.15)
Controls	×	×	×	×
County Fixed Effects	×	×	×	×
State × Year Fixed Effects	×	×	×	×
Adj. R^2	0.015	0.016	-0.003	-0.003
Obs.	71,756	71,756	71,849	71,849

- 1SD ↑ crypto returns ~ ↓ 0.7% employment growth, ↓ 0.4% establishment growth in counties with 1SD more high exposure banks
  - Employment effect ~70% larger in dependent sectors, consistent with bank lending channel
  - Robust to controlling for local share of crypto-investing households

Conclusion

- Banks are indirectly exposed to the cryptocurrency industry through market interactions with crypto-investing households
  1) Crypto-investing households withdraw deposits following high crypto returns
  2) Banks in areas with these households have lower deposit growth and cut loan growth
  3) Areas with more exposed banks, irrespective of households' crypto-investing, experience less growth, particularly in bank-dependent sectors.

→ **Crypto markets disintermediate traditional banks and affect the real economy**

Thank you!