The Effects of Cryptocurrency Wealth on Household Consumption and Investment

Darren Aiello
BYU

Scott R. Baker
Northwestern

Tetyana Balyuk
Emory

Marco Di Maggio
HBS

Mark Johnson
BYU

Jason Kotter
BYU

Emily Williams
HBS

March 4, 2023

Motivation

Crypto Market Cap

80%

of financial advisors support the creation of a spot Bitcoin ETF

Ray Dalio - Founder, Co-CIO, Bridgewater Associates

(total AUM: $138B)

"So [bitcoin] could serve as a diversifier to gold and other such storehold of wealth assets. The main thing is to have some of these type of assets (with limited supply, that are mobile, and that are storeholds of wealth)"

8 Dec 2020, source

Rick Rieder - CIO, BlackRock Global Fixed Income & Head of Global Allocation

(total AUM: $7.3T)

"Do I think [bitcoin] is a durable mechanism that will take the place of gold to a large extent? Yeah I do..."

20 Nov 2020, source

What is the role of Crypto in a household's portfolio?

This Paper

We use bank transaction data from millions of U.S. households to:

1. Characterize retail crypto traders
2. Explore the drivers of crypto adoption
3. Examine the effect of crypto wealth on consumption and investment
4. Document spillovers of crypto wealth to the local economy

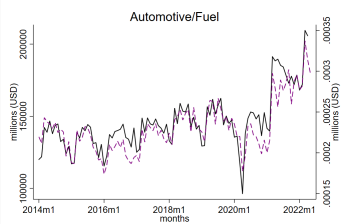
Key Results

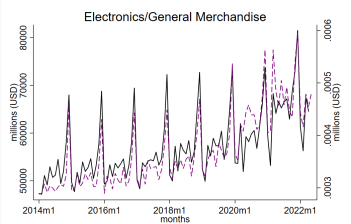
- Retail crypto investors hold crypto as one part of a broader portfolio
- Inflation expectations drive crypto investment
- Marginal propensity to consume (MPC) out of crypto wealth is big!
- Households use crypto wealth to purchase housing
- As a result, crypto wealth shocks spill over into local house prices

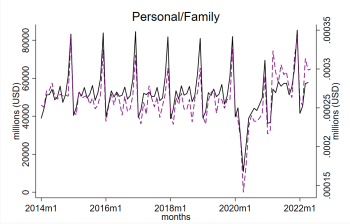
Data

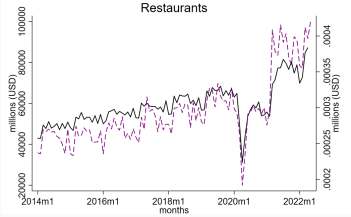
- Data provider is a large financial aggregation and analytics firm
- Provider contracts with banks/fintechs to aggregate transaction data
  - Avoids active selection of users into the data
- We see bank and credit card transactions for 60 million households/billions transactions
  - Good coverage from 2014–2022
- We observe transaction date/amount, category, merchant information

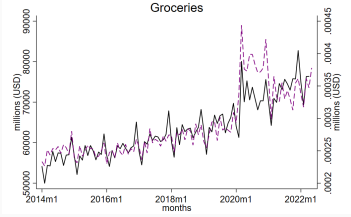
Trends in transaction data match Census surveys

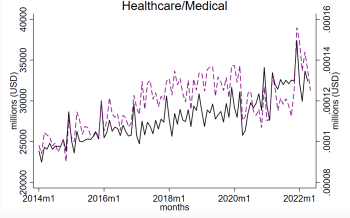












Solid is Census Retail Survey, Dashed is Transaction Data

We Measure Crypto Exposure Based on Deposits to Crypto Exchanges

mem_id	bank_id	amount	description	date	type
5.975e+23	5.578e+23	100	DEBIT CARD PURCHASE XXXXX4106 COINBASE SAN FRANCIS CA	2021-01-28	debit
1.161e+24	8.362e+23	50	COINBASE.COM XXXXXXXXXX **********9565~~XXXXX~~~~XXXXX~~0~~~~0065	2021-01-25	debit
1.161e+24	8.362e+23	100	COINBASE.COM XXXXXXXXXX **********9565~~XXXXX~~~~XXXXX~~0~~~~0065	2021-01-25	debit
1.161e+24	8.362e+23	1000	COINBASE.COM XXXXXXXXXX **********9565~~XXXXX~~~~XXXXX~~0~~~~0065	2021-01-25	debit
4.985e+23	9.281e+23	100	PRM*8700 BINANCE.US 702-XXXXXXX NV~~XXXXX~~XXXXXX******0161~~XXXXX~~0~~~~0079	2021-01-20	debit
4.985e+23	9.281e+23	100	PRM*8700 BINANCE.US 702-XXXXXXX NV~~XXXXX~~XXXXXX******0161~~XXXXX~~0~~~~0079	2021-01-25	debit
4.985e+23	9.281e+23	50	PRM*8700 BINANCE.US 702-XXXXXXX NV~~XXXXX~~XXXXXX******0161~~XXXXX~~0~~~~0079	2021-01-29	debit
3.092e+23	3.867e+23	1000	COINBASE.COM XXXXXXXXXX 55	2021-01-11	debit
3.092e+23	3.867e+23	.11	COINBASE.COM XXXXXXXXXX	2021-01-08	credit
1.132e+24	4.193e+23	5000	ACH ELECTRONIC DEBIT GEMINI TRUST CO ACH TXFER CXXXXXXX	2021-01-13	debit
4.672e+23	7.094e+23	1970.2	COINBASE.COM DES:XXXXXXXXX ID: INDN:XXXX X XXXXXXX CO ID:1455	2021-01-07	credit
5.975e+23	5.578e+23	181	DEBIT CARD PURCHASE XXXXX4106 COINBASE SAN FRANCIS CA	2021-01-25	debit
5.975e+23	5.578e+23	200	DEBIT CARD PURCHASE XXXXX4106 COINBASE SAN FRANCIS CA	2021-01-25	debit
5.224e+23	5.082e+23	230	XXXXXXXXX COINBASE.COM E50F XXXXXXX X XXXX ACH CREDIT	2021-01-11	credit
4.985e+23	9.281e+23	100	COINBASE SAN FRANCISCOCA~~XXXXX~~XXXXXX******0161~~XXXXX~~0~~~~0079	2021-01-11	debit
7.042e+23	9.848e+23	200	COINBASE INC. XXXXXXXXX **********WPDD~~XXXXX~~~~XXXXX~~0~~~~0065	2021-01-12	debit

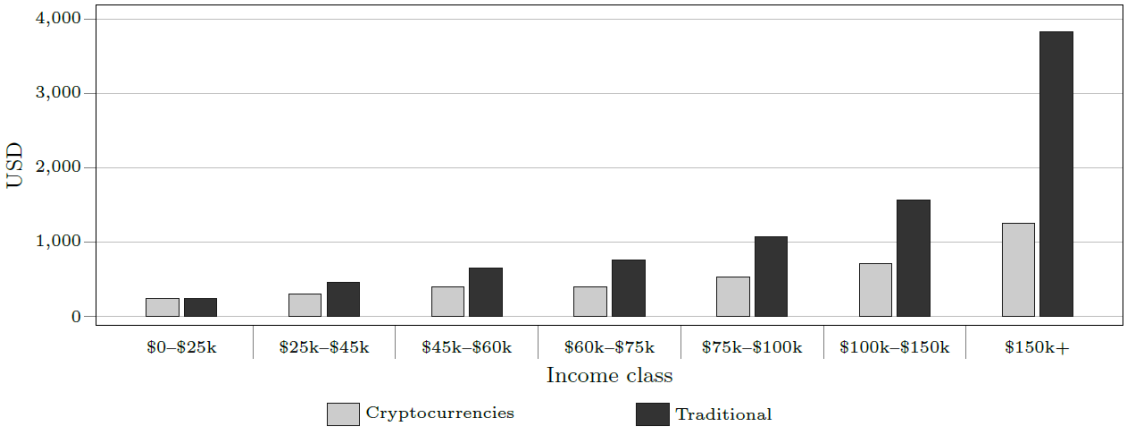
What does the typical Crypto user look like?

Monthly Income/Spending for Crypto vs Non-Crypto Users

Variable	Early Adopter	Late Adopter	Never Adopter
Total Income	8,747	8,135	7,212
	[9,630]	[8,981]	[7,910]
Total Spending	7,247	6,578	6,160
	[7,913]	[6,835]	[6,458]
Traditional Investment	321	257	120
	[2,578]	[2,223]	[1,635]
Crypto Investment	168	96	0
	[1,937]	[1,898]	[0]
Percent of Spending:			
Entertainment/Travel	8.1	7.8	6.3
	[12.9]	[25.1]	[118.4]
Restaurants	9.7	10.0	8.6
	[11.9]	[14.8]	[79.8]

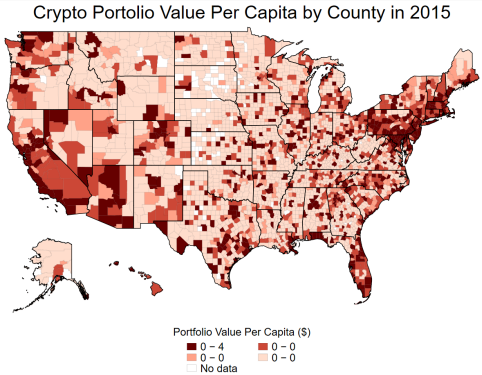
- Early Adopters invested before 2017 run-up
- Crypto Adopters have higher income and discretionary spending

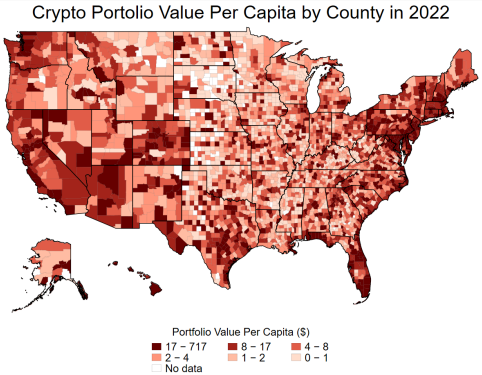
Median Annual Investment by Asset and Income Class



Crypto users also have substantial exposure to traditional investments.

Crypto Wealth is Geographically Concentrated

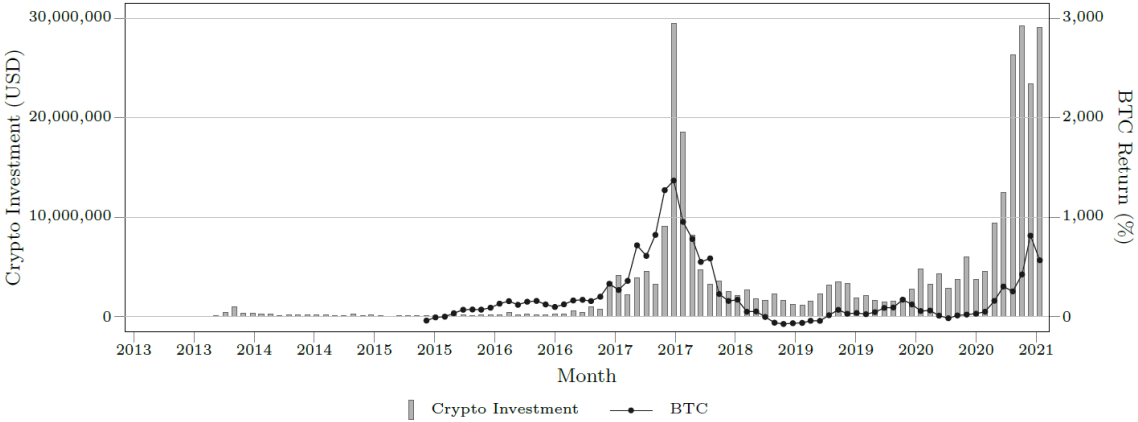




- Crypto wealth has spread to the interior U.S. over time

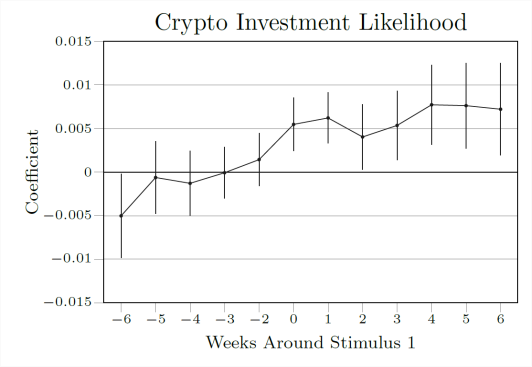
What drives crypto adoption?

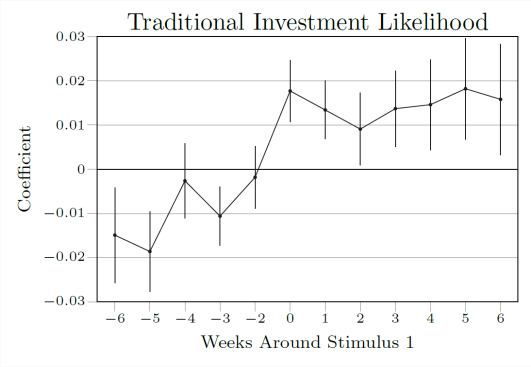
Monthly Crypto Investment and BTC Return



Large Returns lead to a surge in crypto investment

Investment Responses After COVID Stimulus Checks





- Some stimulus was spent on crypto investment
- But less than was spent on traditional investment (and magnitudes are small)

Inflation Expectations

- Unlike fiat currency, Bitcoin has a fixed supply

  $\rightarrow$ Proponents argue it is the "new gold"

- Perhaps retail investors buy crypto as an inflation hedge

Inflation Expectations Drive Retail Crypto Investment

	Log Crypto Debit			
	(1)	(2)	(3)	(4)
CPI-U Inflation	0.0271***	0.0272***	0.0268***	0.0272***
	(0.0035)	(0.0035)	(0.0036)	(0.0035)
12-Month E[pi]	0.0798***	0.0787***	0.0733***	0.0742***
	(0.0083)	(0.0083)	(0.0092)	(0.0083)
Constrained		-0.6755***		
		(0.1091)		
12-Month E[pi] × Constrained		0.2370***		
		(0.0395)		
Salary Income Variability			0.3246***	
			(0.1081)	
12-Month E[pi] × Salary Income Variability			-0.0805**	
			(0.0371)	
Sophisticated				6.962
				(5262.8)
12-Month E[pi] × Sophisticated				0.1230***
				(0.0155)
Observations	2,987,598	2,987,598	2,563,919	2,987,598
R^2	0.71347	0.71347	0.71324	0.71348

*Separate investor and state fixed effects included throughout.

- Both realized and expected inflation drive crypto deposits

Inflation Expectations Drive Retail Crypto Investment

	Log Crypto Debit			
	(1)	(2)	(3)	(4)
CPI-U Inflation	0.0271***	0.0272***	0.0268***	0.0272***
	(0.0035)	(0.0035)	(0.0036)	(0.0035)
12-Month E[pi]	0.0798***	0.0787***	0.0733***	0.0742***
	(0.0083)	(0.0083)	(0.0092)	(0.0083)
Constrained		-0.6755***		
		(0.1091)		
12-Month E[pi] × Constrained		0.2370***		
		(0.0395)		
Salary Income Variability			0.3246***	
			(0.1081)	
12-Month E[pi] × Salary Income Variability			-0.0805**	
			(0.0371)	
Sophisticated				6.962
				(5262.8)
12-Month E[pi] × Sophisticated				0.1230***
				(0.0155)
Observations	2,987,598	2,987,598	2,563,919	2,987,598
R^2	0.71347	0.71347	0.71324	0.71348

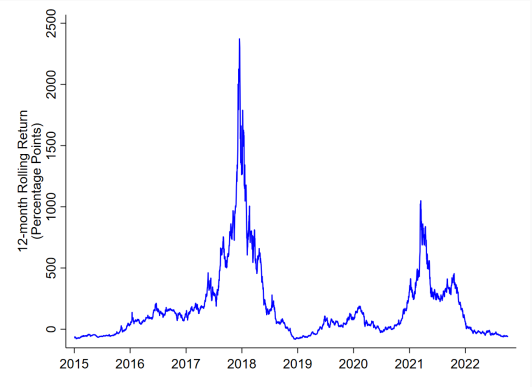
*Separate investor and state fixed effects included throughout.

- Both realized and expected inflation drive crypto deposits
- Expectations matter more for
  - Constrained households
  - Stable income
  - More Sophisticated

How do crypto gains affect household investment decisions?

Setting: 2017 BTC Run-up

- Massive Bitcoin returns during 2017
  - BTC crosses $10,000 for the first time
  - Peak year-over-year return of over 2,000%
  - Generated large crypto gains for early adopters
- Examine investment/spending 12-months post-peak as function of crypto gains
  - We include non-users as a control group



Some Households Chase Crypto Gains

	12-Month post-Peak Gross Crypto Deposits			
	(1)	(2)	(3)	(4)
12-Month Crypto Gains, December 2017	0.00629***	0.0516	0.0828***	0.0139**
	(12.44)	(0.37)	(5.24)	(2.05)
Average Monthly Income, prior 12-months	0.00181***	0.00732***	0.00637***	0.00566***
	(7.59)	(4.72)	(3.39)	(3.74)
Sample	All Gains	<80 ptile Gains	[80,99) ptile Gains	>99 ptile Gains
Observations	100,652	99,676	96,701	95,823
Adj. R^2	0.039	0.001	0.066	0.035

- Effect is concentrated in households that experience large, but not extreme, gains

Other Households Cash Out Some of Their Crypto Gains

	12-Month post-Peak Gross Crypto Withdrawals			
	(1)	(2)	(3)	(4)
12-Month Crypto Gains, December 2017	0.0316***	0.0701	0.0971***	-0.0103
	(7.79)	(0.55)	(3.02)	(-1.39)
Average Monthly Income, prior 12-months	0.0354**	0.00859	0.0461	0.616
	(2.49)	(0.56)	(0.29)	(0.30)
Sample	All Gains	<80 ptile Gains	[80,99) ptile Gains	>99 ptile Gains
Observations	4,878	3,902	927	49
Adj. R^2	0.107	-0.000	0.034	-0.035

- Cash-out magnitudes are larger than the crypto momentum magnitudes

Crypto Gains are Followed by Higher Traditional Investments

	12-Month post-Peak Investment Deposits			
	(1)	(2)	(3)	(4)
12-Month Crypto Gains, December 2017	0.0105**	-0.0101	0.0201***	0.00188
	(2.13)	(-0.06)	(2.83)	(0.53)
Investment Deposits 2017	0.720***	0.734***	0.722***	0.722***
	(77.17)	(29.34)	(29.12)	(28.17)
Average Monthly Income, prior 12-months	0.0995***	0.126***	0.126***	0.128***
	(14.76)	(9.49)	(9.40)	(9.41)
Sample	All Gains	<80 ptile Gains	[80,99) ptile Gains	>99 ptile Gains
Observations	100,652	99,676	96,701	95,823
Adj. R^2	0.398	0.426	0.418	0.417

- Combined with the withdrawals, behavior is consistent with portfolio re-balancing

How do crypto gains affect household consumption?

The MPC Out of Crypto Wealth is Large

	12-Month post-Peak Total Spending			
	(1)	(2)	(3)	(4)
12-Month Crypto Gains, December 2017	0.210***	0.200	0.268***	0.0404**
	(6.30)	(0.23)	(5.73)	(2.02)
Average Monthly Income, prior 12-months	5.791***	5.788***	5.795***	5.797***
	(107.01)	(106.54)	(105.07)	(104.69)
Sample	All Gains	<80 ptile Gains	[80,99) ptile Gains	>99 ptile Gains
Observations	100,652	99,676	96,701	95,823
Adj. R^2	0.168	0.167	0.168	0.168

- The MPC of \$0.21 is much higher than MPC out of equity wealth (\$0.03)
- Similar to MPC out of one-time income shocks

Heterogeneous Effects

- Early adopters might be "true believers" in crypto

  $\rightarrow$ less likely to consume gains

- Liquidity-constrained households should consume higher fraction of gains

Heterogeneous Effects

	12-Month post-Peak Total Spending		
	(1)	(2)	(3)
12-Month Crypto Gains, December 2017	0.200***	0.208***	0.172***
	(5.93)	(6.22)	(5.26)
Average Monthly Income, prior 12-months	5.788***	5.771***	5.825***
	(106.96)	(106.40)	(106.67)
	Level	Interaction				
Crypto Run-up Adopter	800.9	0.455**				
	(0.92)	(2.35)				
			Level	Interaction		
Low Available Balance			-11,868***	1.113***		
			(-14.52)	(9.48)		
					Level	Interaction
Overdraft in 2017					3,281***	0.350***
					(7.29)	(2.65)
Observations	100,652		100,652		100,652	
Adj. R^2	0.168		0.169		0.168	

- Late adopters and constrained households have higher MPCs
- Similar to estimates of MPC out of lottery winnings

What do households consume following crypto gains?

Broad Increases in Consumption Following Crypto Gains

12-Month Spending, post-Peak Category	Coefficient On 12-Month Crypto Gains, December 2017
Total	0.210***
	(6.30)
Auto	0.00215
	(1.50)
Cable/Telecom	-0.00318***
	(-3.39)
Cash/Check	0.129***
	(5.92)
Charity	0.000953
	(1.37)
Education	-0.000143
	(-0.21)
Entertainment /Travel	0.0214***
	(6.05)
General Merchandise	0.0136**
	(2.36)
Groceries	-0.0000657
	(-0.03)
Insurance	0.00201
	(1.32)
Medical	0.00252***
	(2.68)
Mortgage	0.0155**
	(2.37)
Rent	0.00360*
	(1.96)
Restaurants	0.00795***
	(3.57)
Utilities	0.00401***
	(2.95)

- Broad increase in consumption, including modest increase in housing

Broad Increases in Consumption Following Crypto Gains

12-Month Spending, post-Peak Category	Coefficient On 12-Month Crypto Gains, December 2017
Total	0.210***
	(6.30)
Auto	0.00215
	(1.50)
Cable/Telecom	-0.00318***
	(-3.39)
Cash/Check	0.129***
	(5.92)
Charity	0.000953
	(1.37)
Education	-0.000143
	(-0.21)
Entertainment /Travel	0.0214***
	(6.05)
General Merchandise	0.0136**
	(2.36)
Groceries	-0.0000657
	(-0.03)
Insurance	0.00201
	(1.32)
Medical	0.00252***
	(2.68)
Mortgage	0.0155**
	(2.37)
Rent	0.00360*
	(1.96)
Restaurants	0.00795***
	(3.57)
Utilities	0.00401***
	(2.95)

- Broad increase in consumption, including modest increase in housing
- But most of the increase is concentrated on discretionary spending

Withdrawal Event Study

Crypto Withdrawals and Expenditures

- Run-up results estimate MPC out of (mostly unrealized) crypto gains
- Consumption out of large realized gains might differ

- We explore this with an event study:
  - Compare spending in 12-months before and after large crypto withdrawal
  - Household FE to account for average spending patterns
  - Year-month FE to absorb macro effects

Large Crypto Withdrawals are Spent on Housing

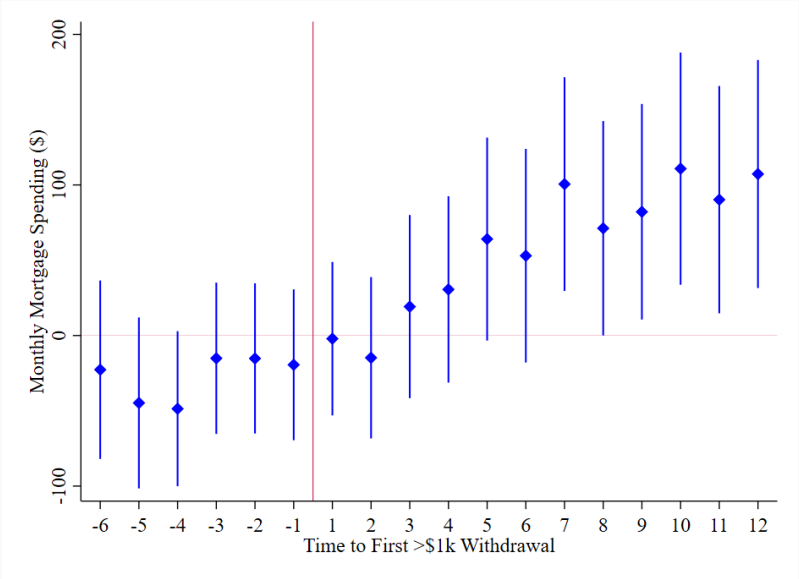
Annualized Monthly Spending Category	Coefficient On Post First Crytpo Withdrawal >$1,000
Total	1,451***
	(2.61)
Auto	5.737
	(0.12)
Cable/Telecom	8.918
	(0.37)
Cash/Check	696.0*
	(1.73)
Charity	4.087
	(0.32)
Education	-0.379
	(-0.02)
Entertainment	53.43
/Travel	(0.62)
General Merchandise	-55.83
	(-0.34)

Annualized Monthly Spending Category	Coefficient On Post First Crytpo Withdrawal >$1,000
Groceries	-177.2***
	(-3.26)
Insurance	80.42**
	(2.13)
Medical	10.65
	(0.45)
Mortgage	479.3***
	(3.03)
Rent	34.87
	(0.63)
Restaurants	19.24
	(0.31)
Utilities	86.73***
	(3.02)

*Separate account and month fixed effects included

- Large, significant increases in spending on mortgage, insurance, and utilities

Event Study Estimates of Effect of Crypto Withdrawals on Mortgage Spending



Crypto Withdrawals and Housing Consumption

- What does this higher housing spending mean?

- Large crypto withdrawals predict both:
  1. Transition into new homeownership
  2. Upgrading for existing homeowners

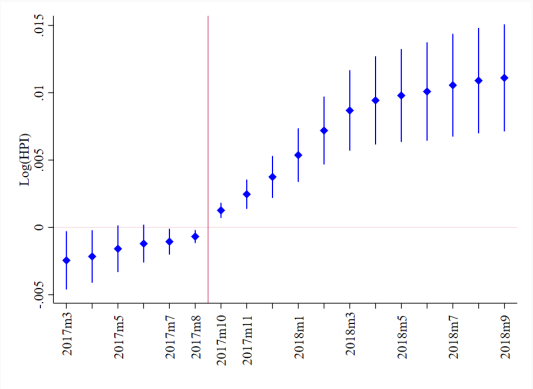
- This demand for houses, combined with geographic concentration of crypto wealth, suggests possible price pressure on local housing markets

Aggregate Effect of Crypto Wealth on Local Housing Markets

Bitcoin 2017 Runup Diff-In-Diff: Empirical Strategy

Idea: Counties that had early crypto exposure experienced a large crypto wealth shock during the 2017 BTC Runup

- Compare house prices in counties with high pre-runup exposure to counties with low pre-runup exposure
- Before and after large withdrawals that accompany the run-up



Bitcoin Run-Up Diff-In-Diff: County-Month Housing Prices

	County-Month Log Median Housing Price ($100k)	
	(1)	(2)
High Crypto Wealth County × Post Run-up	0.00106***	
	(5.27)	
Log County Crypto Wealth × Post Run-up		0.00337***
		(3.22)
County FE	X	X
Year-Month FE	X	X
Observations	33,645	33,645

House prices in high crypto exposure counties grow 10-80 bp faster over 2018 than low crypto exposure counties

- Or roughly $\frac{1}{4}$ of a s.d. in 2018 house price growth

Passive Gains Instrument: Empirical Strategy

- We extend the analysis to the entire sample using a 2SLS strategy
- Estimate the effect of 12-month county crypto gains on changes in future house prices
- Instrument for county-level crypto gains with:

$$\text{PassiveGains}_{c,t} = \frac{\text{CryptoWealth}_{c,t-12}}{Pop_{c,y-1}} \times \left[\frac{BTC_t}{BTC_{t-12}} - 1 \right]$$

Passive Gains Instrument: Empirical Strategy

- We extend the analysis to the entire sample using a 2SLS strategy
- Estimate the effect of 12-month county crypto gains on changes in future house prices
- Instrument for county-level crypto gains with:

$$\text{PassiveGains}_{c,t} = \frac{\text{CryptoWealth}_{c,t-12}}{Pop_{c,y-1}} \times \left[\frac{BTC_t}{BTC_{t-12}} - 1\right]$$

- Per capita crypto Wealth 12-months prior $\times$ Bitcoin Return over the year
  - Crypto gains that the county would have experienced if there were no deposits or withdrawals over the year

Exclusion Restriction

- Exclusion restriction: Passive Gains do not influence changes in house prices except through actual crypto gains

- Historical county crypto wealth less likely to be correlated with current price changes
  - Include county and year-month FE
  - Robust to fixing county crypto wealth 24 months in past
- Annual BTC return likely uncorrelated with most local economic factors
  - e.g., job growth, housing supply/demand
- However, might be correlated with equity returns
  - Robust to alternative instrument that uses BTC returns in excess of market returns

Effect of Crypto Gains on Housing Prices

	Change in House Price Index		Change in House Price Index	
	Next 6 Months	Next 12 Months	Next 6 Months	Next 12 Months
	(1)	(2)	(3)	(4)
Per Capita Crypto Gains, Prior 12-Months	354.0***	650.6***	366.5***	511.0***
	(4.13)	(3.90)	(3.99)	(3.09)
Instrumental Variable	Passive Gains		Excess Passive Gains	
Observations	197,481	182,384	197,481	182,384
Weak ID KP F Stat	23,367	5,459	10,049	5,771

*Separate county and month fixed effects as well as the prior 3-Month Change in House Price Index included throughout

- Implies \$1 crypto gains $\rightarrow$ county house prices increase by \$0.11
- About 7x individual-level mortgage spending effect

Conclusion

- For the typical retail crypto investor, crypto is one part of a larger investment portfolio
- Decision to invest in crypto appears to be motivated by salience of crypto returns and expectations of future inflation
- The MPC out of crypto wealth is significantly higher than equity wealth, suggesting investors treat crypto gains more like one-time exogenous income shocks
- Households use crypto gains to increase housing spending

Conclusion

- The spillover of crypto into other financial assets has so far been limited
  - e.g., SBF
- However, shocks to crypto wealth spill over into local house prices
- Consequently, distribution of crypto wealth can have a meaningful impact on the real economy

Thanks!

Additional feedback? Email me at jasonkotter@byu.edu