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Cryptocurrency bubbles, the wealth effect, and non-fungible token prices: Evidence from metaverse LAND

SEC Capital Market Symposium 2022

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HEARD ON THE STREET

Crypto Investors Are Wealthier. No One Knows How Much They're Spending.

It's time to start contemplating how vast wealth created in cryptocurrencies filters through the rest of the economy

By Telis Demos Follow
Feb. 18, 2022 5:30 am ET

While the SEC hasn't announced major actions against big crypto exchanges, the commission has threatened to sue companies offering crypto lending. WSJ's Dion Rabouin explains why this one part of the crypto market has drawn such a strong reaction. Photo: Mark Lennihan/Associated Press

A report by the Financial Stability Board (FSB) released in February 2022 explicitly outlined the **"wealth effect" as a vulnerability**, where

"changes in the value of crypto-assets might impact their investors, with **subsequent knock-on effects** in the financial system".

Source: https://www.wsj.com/articles/crypto-investors-are-wealthier-no-one-knows-how-much-theyre-spending-11645180214

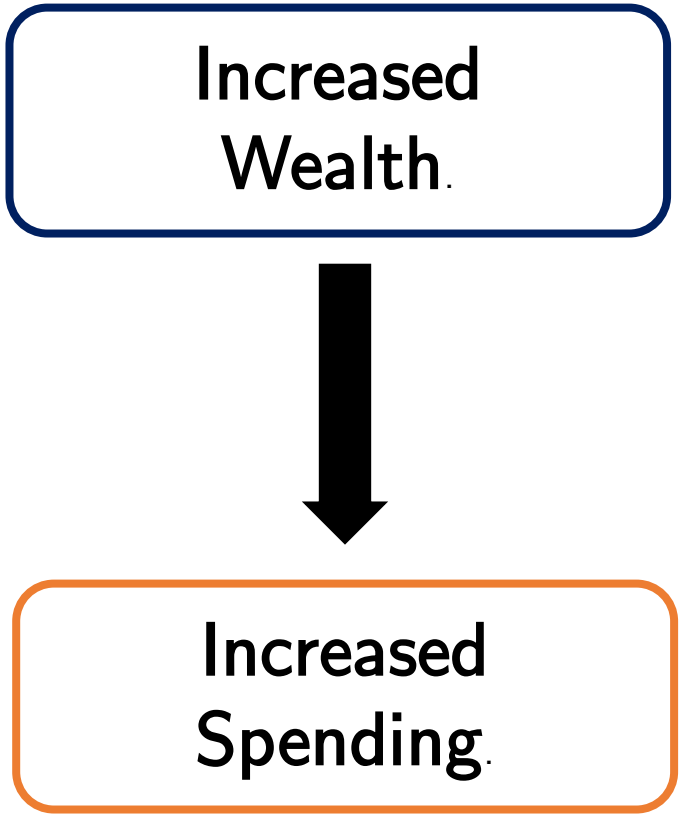
The Wealth Effect

when households become richer as a result of a rise in asset values, such as corporate stock prices or home values, they spend more and stimulate the broader economy. NBER THE DIGEST: NO. 8, AUGUST 2019

For example:

Equity: Chodorow-Reich et al. (AER, 2021)

Art: Goetzmann et al. (AER, 2011)
Pénasse and Renneboog (MS, 2022)



But wealth effect is closely related to bubbles.

Research question:
Does the wealth effect exist in digital assets space?

It is much harder to answer this question than it might seem!

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Challenges: the wealth effect of specific assets can be hard to detect when risk assets are comoving, and it is relatively harder to spend crypto wealth.

IMF BLOG

Fintech

Crypto Prices Move More in Sync With Stocks, Posing New Risks

There's a growing interconnectedness between virtual assets and financial markets.

Tobias Adrian, Tara Iyer, Mahvash S. Qureshi

January 11, 2022

Crypto assets such as Bitcoin have matured from an obscure asset class with few users to an integral part of the digital asset revolution, raising financial stability concerns.

Crypto assets are no longer on the fringe of the financial system.

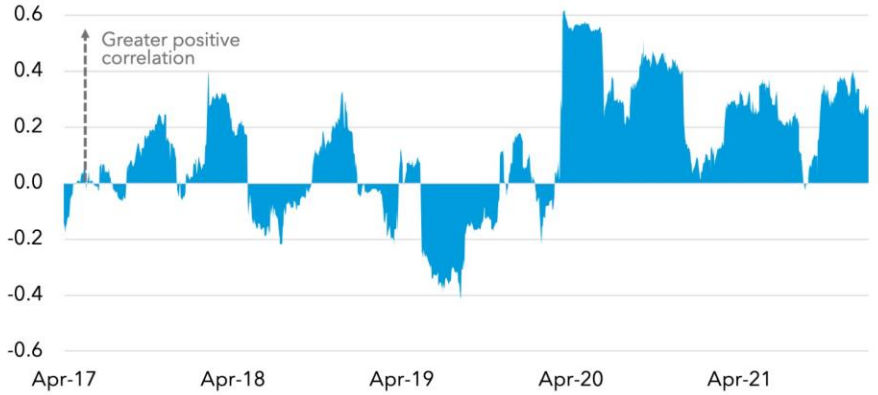
Source:
https://www.imf.org/en/Blogs/Articles/2022/01/11/crypto-prices-move-more-in-sync-with-stocks-posing-new-risks

Stronger correlation

Bitcoin and U.S. stocks have moved together more closely during the pandemic.

Bitcoin price and S&P 500 index

Correlation between Bitcoin returns and S&P 500 index



Source: CryptoCompare, Yahoo Finance, and authors' calculations.
Note: Bottom panel shows rolling 60-day correlation coefficient.

IMF

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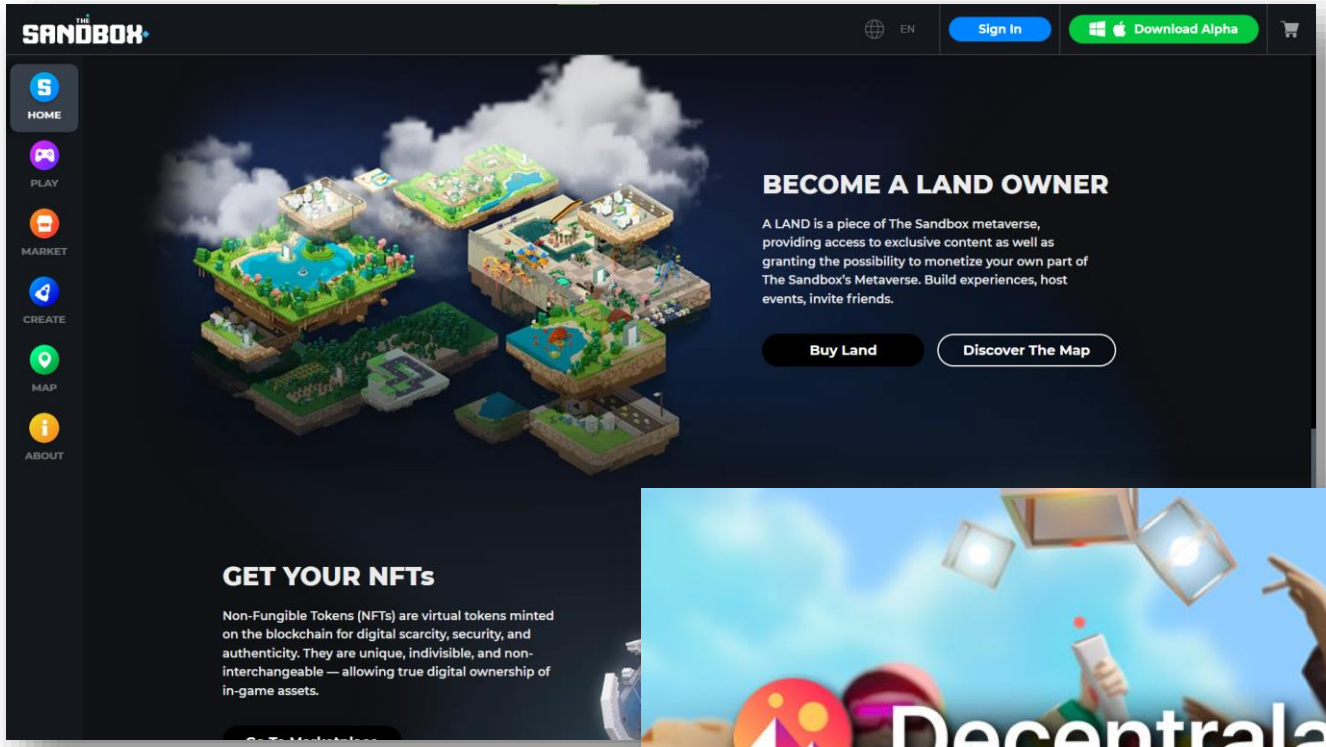
Blockchain-based metaverses offer a unique research setting for crypto wealth effect.



SAND → LAND
MANA → LAND

Advantage #1
Blockchain-based wealth is easier to spend on blockchain-based assets.

Advantage #2
Most blockchain-based metaverses issue their own cryptocurrency which can be used to purchase assets.

→ direct linkage between one crypto asset to another allows better identification.

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This paper follows a three-step approach

Step 1: identify phases where cryptocurrency prices are in a "bubble"

Phillips, Shi and Yu (2015) (PSY) bubble timestamping algorithm based on a series of augmented Dickey and Fuller (1979) (ADF) unit root test on a time series.

Step 2: construct metaverse real estate price indices

Hedonic pricing model (conditional average prices) commonly used in real estate (Fisher, Geltner and Webb, 1994; Hill, 2013). *Output: index with baseline date.* Also used by Nakavachara and Saengchote (2022) to analyze The Sandbox.

Step 3: detect lead-lag relationship between cryptocurrency and real estate

Granger (1969) causality test using vector autoregression (VAR) of lag p on first-differenced time series (price/index changes). Idea: lag = predictor of lead.

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Summary statistics of data used in step 1 and 2

Sample period: January 2021 to August 2022

Table 1: cryptocurrency prices

Daily data retrieved from CoinGecko data API.
MANA and SAND are cryptocurrencies of Decentraland and The Sandbox respectively.
High SD compared to mean.
High positive skewness.

	MANA	SAND	BTC	ETH
Mean	1.45	1.71	42,389	2,622
Min	0.08	0.04	19,047	730
Median	0.98	0.86	42,202	2,604
Max	5.20	7.51	67,617	4,815
Standard deviation	1.10	1.72	11,481	962
Skewness	1.04	1.28	-0.05	0.22
Kurtosis	3.19	3.70	2.36	2.16
% Bubble-stamped	5.6%	5.3%	0.0%	3.0%

Table 2: metaverse LAND prices

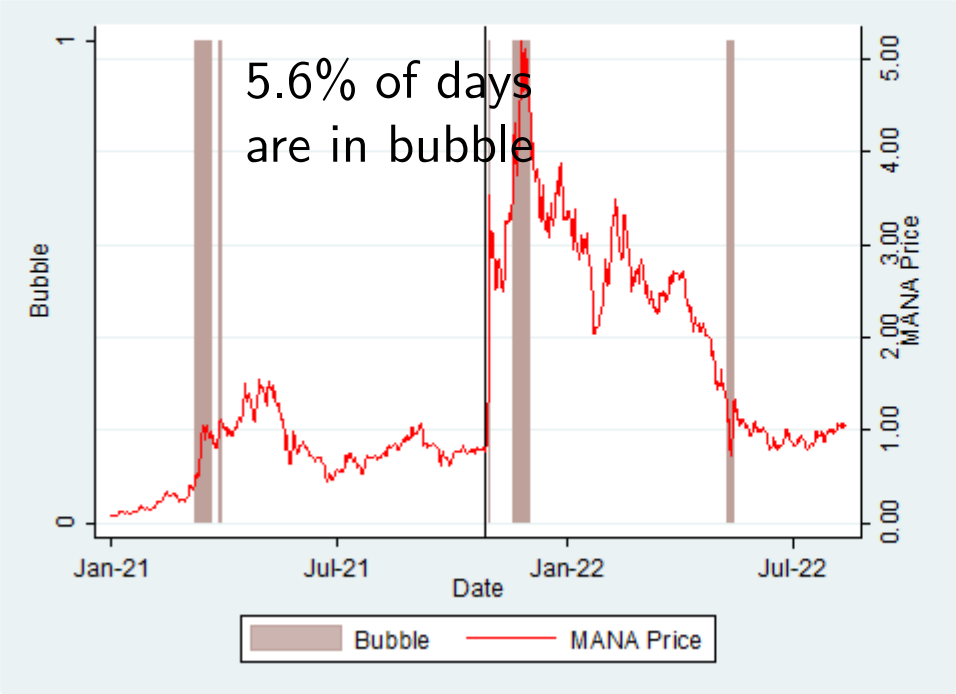
All transaction data retrieved from Ethereum blockchain with prices converted to dollar with CoinGecko data.

	Decentraland		The Sandbox	
Sample size	17,118		47,385	
Paid in wETH	7.30%		20.10%	
	USD price	Num plot	USD price	Num plot
Mean	7,790.67	1.06	9,140.90	1.64
Std Deviation	19,083.38	0.76	15,790.93	2.50
Skewness	15.70	18.77	5.92	5.51
Kurtosis	322.81	433.77	46.17	43.51
p5	450.71	1	139.03	1
p50	3,471.74	1	5,789.95	1
p95	20,779.96	1	21,021.45	9

Step 1: PSY bubble timestamping

Vertical line: October 28, 2021 -- Facebook announced name change to Meta.

Panel A: Decentraland's MANA



Panel B: The Sandbox's SAND

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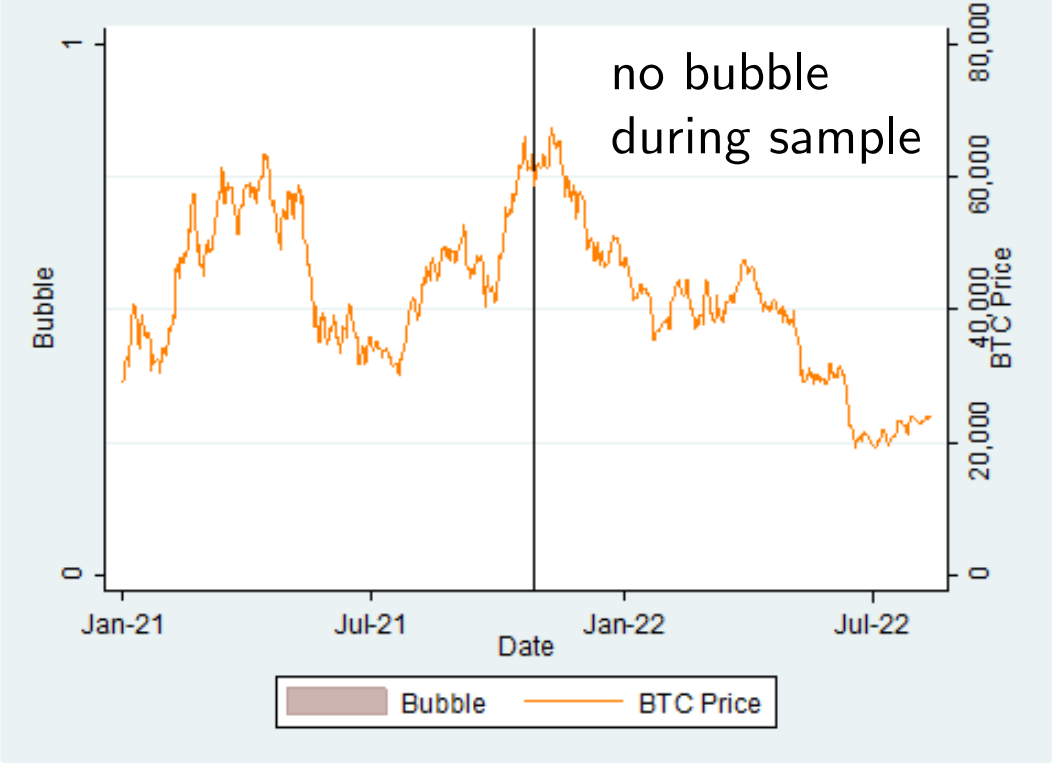
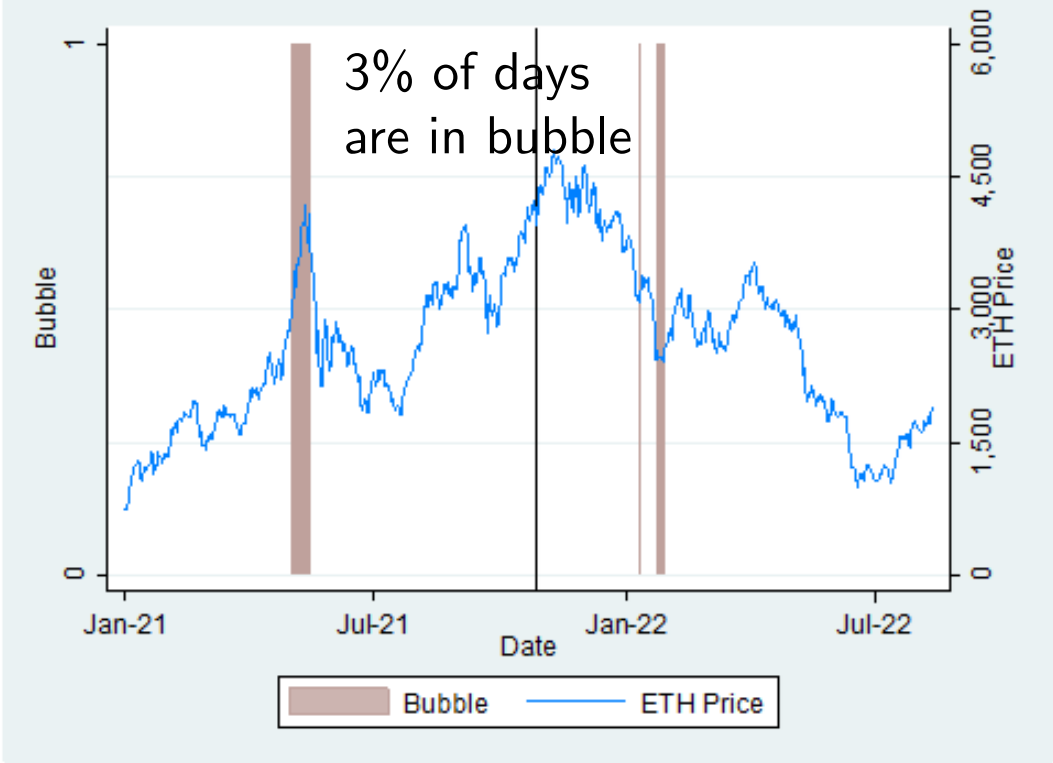
Cross checking bubble identification result: Fewer bubble days for Ether and no bubble days for Bitcoin.

Panel C: Bitcoin (BTC)



Panel D: Ether (ETH)



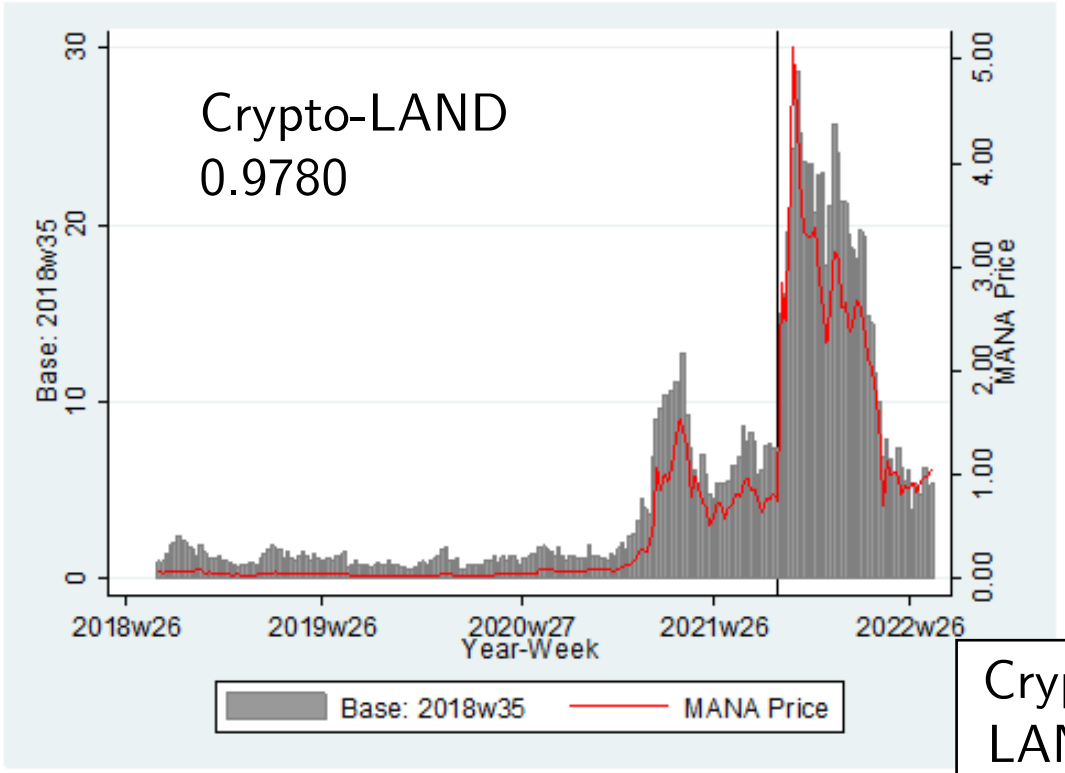
Step 2: Metaverse hedonic price indices (HPIs)

Panel B: Pairwise correlation

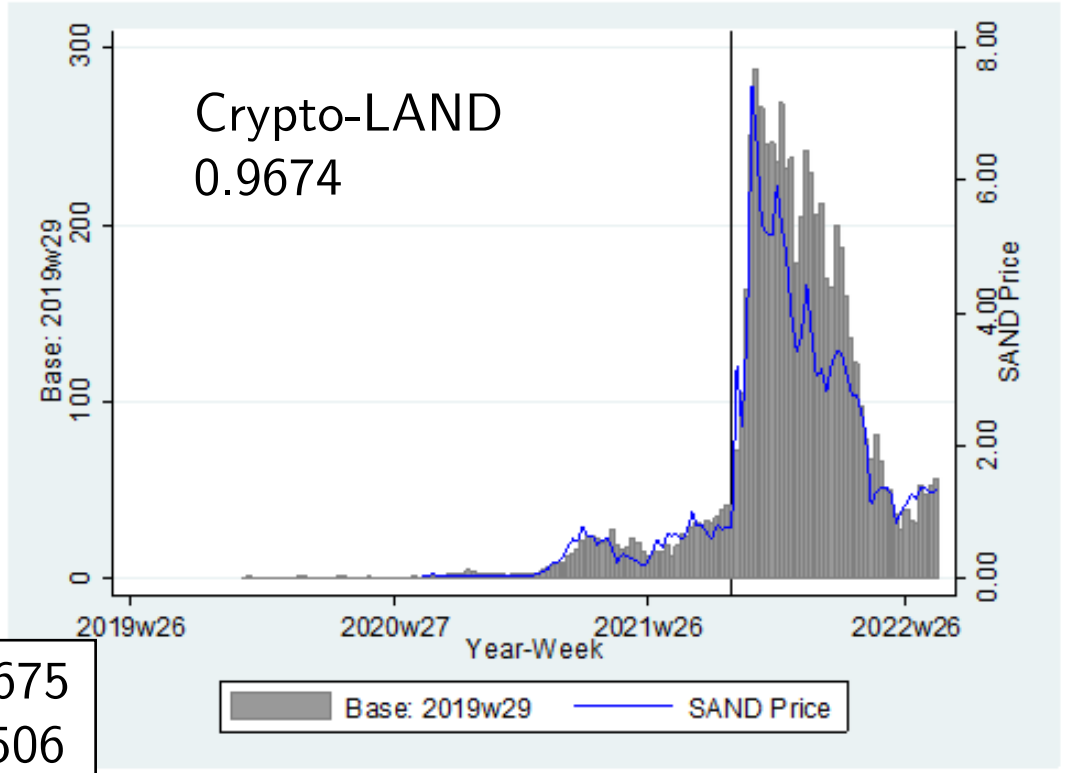
	DL HPI	MANA	SB HPI	SAND
Decentraland HPI	1.0000			
MANA	0.9780	1.0000		
The Sandbox HPI	0.9506	0.9463	1.0000	
SAND	0.9309	0.9675	0.9674	1.0000

All time series are highly correlated. (max = 1.00)

Panel A: Decentraland



Panel B: The Sandbox



Crypto: 0.9675
LAND: 0.9506

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Step 3: Granger causality test – KEY FINDING

Panel C: Granger causality test for Decentraland

Lag	BTC &	MANA → LAND		LAND → MANA	
(weeks)	ETH	F-stat	p-value	F-stat	p-value
1	Not inc.	15.96	0.000	2.25	0.135
2	Not inc.	12.86	0.000	0.96	0.384
3	Not inc.	8.54	0.000	1.61	0.187
1	Included	10.30	0.002	2.33	0.128
2	Included	10.17	0.000	0.73	0.485
3	Included	6.97	0.000	1.29	0.278

Panel D: Granger causality test for The Sandbox

Lag	BTC &	SAND → LAND		LAND → SAND	
(weeks)	ETH	F-stat	p-value	F-stat	p-value
1	Not inc.	5.36	0.019	0.17	0.680
2	Not inc.	5.32	0.007	1.89	0.156
3	Not inc.	3.41	0.021	0.72	0.543
1	Included	6.15	0.015	0.58	0.448
2	Included	5.42	0.006	1.87	0.160
3	Included	3.19	0.028	0.57	0.639

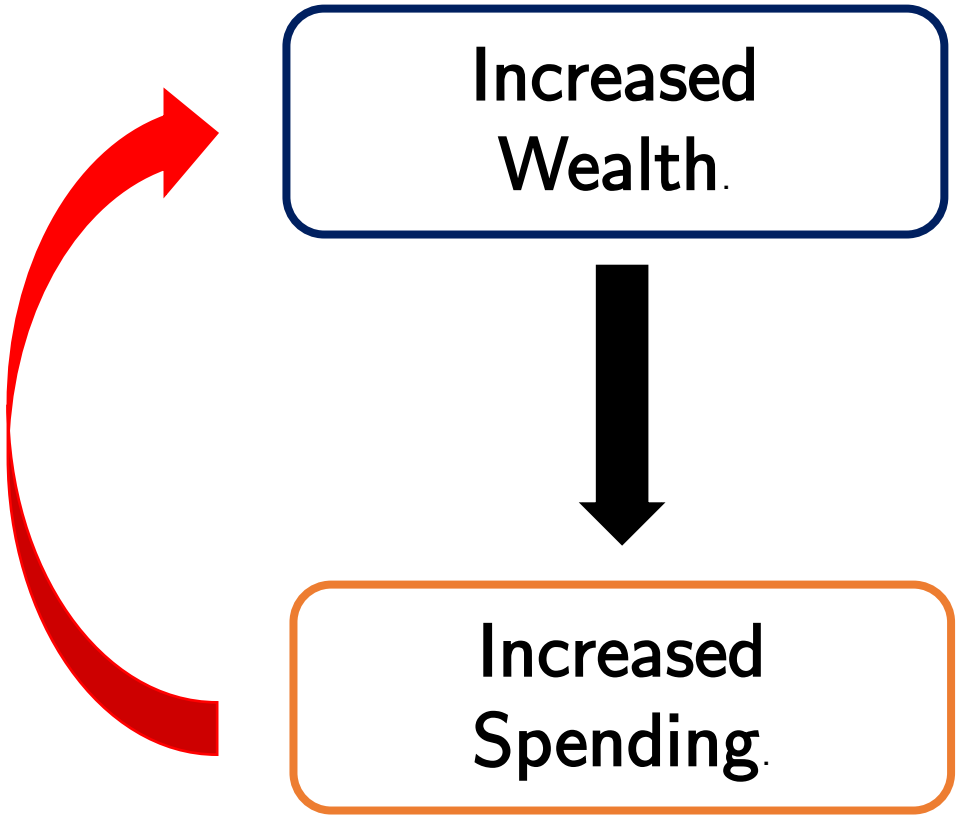
* low p-value means that lead-lag relationship is statistically significant.

Cryptocurrencies lead LANDs, thus **cryptocurrencies wealth effect spills over into real estate prices**, and not vice versa.

Appendix (BAYC Otherside)
The wealth effect works in BOTH directions.

So, why should we worry about wealth effect

#1: Is spending consumption or investment?



A. Consumption

Stronger for bottom 50% if wealth distribution (Di Maggio et al., JF 2020).

Can have multiplier effect, creating employment in non-tradeable industries and local economy (Chodorow-Reich et al., AER 2021).

B. Investment

Accumulation of investment assets can further increase in wealth effect.

Can lead to "double bubbles" (White, 2009).

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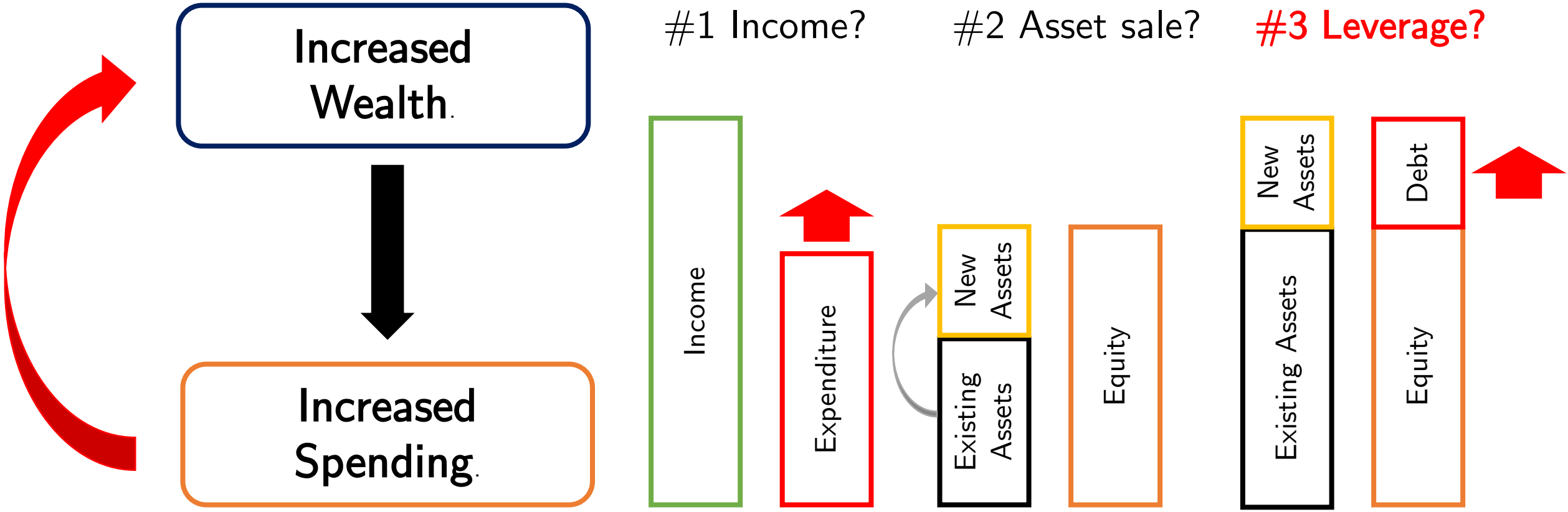
"[S]ubsequent knock-on effects in the financial system" – FSB (2022)

#2: Is this financed by income (lower savings rate), asset sale, or leverage?



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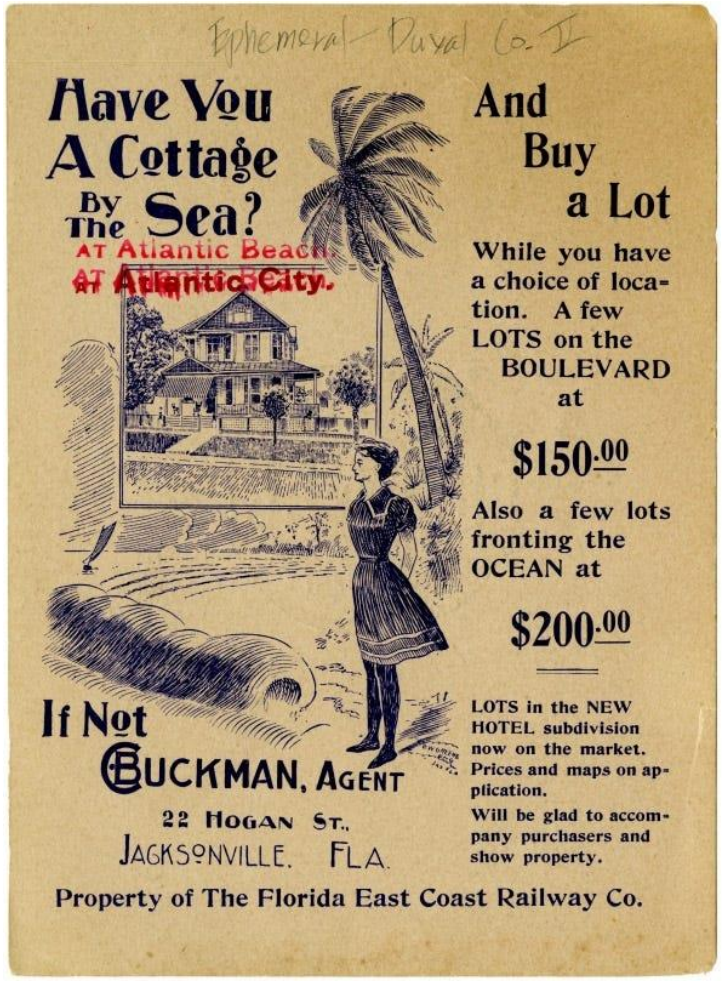
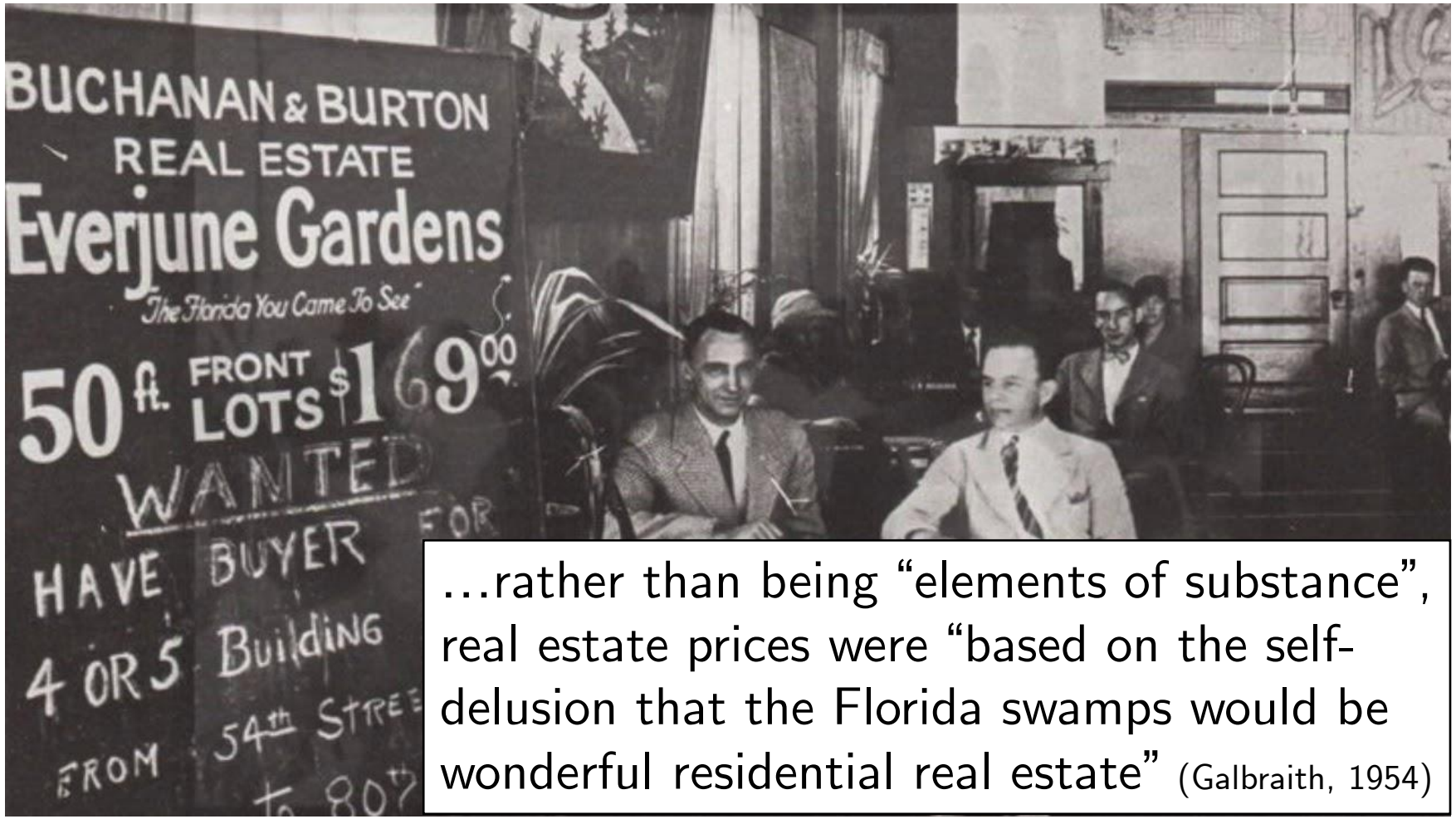
The real estate-stock market double bubbles of the 1920s was fueled by real estate collateralized loans and was said to contribute to the 1929 crash.





…rather than being "elements of substance", real estate prices were "based on the self-delusion that the Florida swamps would be wonderful residential real estate" (Galbraith, 1954)

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“Selling building lots in blue sky”

After the 1929 crash, a series of financial regulations in banking and capital markets reduce information asymmetry and conflicts of interests but make the system more “permissioned” and introduce costs on some more than others.

But imposing a cost on some to reduce aggregate costs to the system can improve trust and efficiency. When done right, they can improve the welfare of market participants.

In permissionless DeFi where identity is not required and financial history less informative, regulation is more challenging.