



# CHARTING DISRUPTION

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**GLOBAL X**

by Mirae Asset

OUTLOOK FOR  
2024 AND BEYOND

For more than a decade, our mission has been empowering investors with unexplored and intelligent solutions.



 Headquartered in New York, with Global X ETFs listed throughout Europe, Asia, Latin America, and Australia.



Global X ETFs is a fully-owned subsidiary of Mirae Asset Financial Group, a global industry leader with 55 offices and over 12,000 employees worldwide. Founded in 1997 as one of Asia's pioneering fund management companies, the Group now oversees **\$565bn in client assets** across a portfolio that includes real estate, insurance, private equity, and venture capital.<sup>2</sup>

**\$46bn** in AUM across more than 200 ETF strategies<sup>1</sup>

### Primary Listings by Office



**United States**

107 ETF Listings



**Europe**

34 UCITS ETF & 5 Crypto ETP Listings



**Australia**

35 ETF Listings



**Latin America**

32 ETF Listings in Brazil & Colombia



**Hong Kong**

27 ETF Listings



**Japan**

36 ETF Listings

<sup>1</sup>As of October 31, 2023 <sup>2</sup>As of June 30, 2023

## Charting Disruption 2024

Our future constantly develops and changes right in front of us. Yet much of the potential disruption seems unimaginable—until it happens.

Our flagship research project, Charting Disruption, aims to shed a quantifiable light on what the future may hold. It's where we explore the interplay between innovation and emerging technological as well as behavioral trends that can shape financial markets and their performance.

In charting potential disruption, we think it's helpful to zoom out to get a more complete view of where technology was and how far it's come. The advances in just the last 25 years alone prove momentous and the momentum of this trend of innovation continues.

It wasn't that long ago, for example, that people found it challenging to envision a world linked through smartphones and the internet. Before too long, most people won't be able to remember life without them.

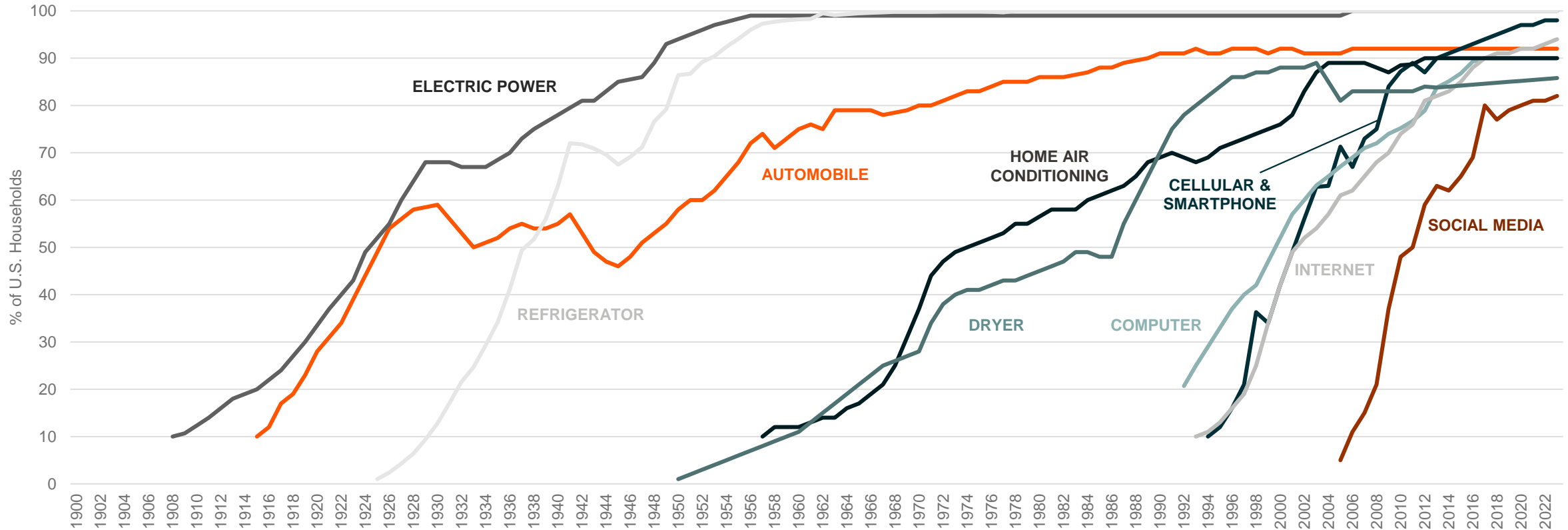
To explore the depth of changes like these, we partnered with handpicked experts in fields such as Artificial Intelligence, Digital Assets, CleanTech, Autonomous Vehicles, Genomics & Biotech, Battery Technology, and Food Innovation.

In what follows, we present unique forecasts, datasets, and analyses that reveal what we expect to disrupt our world in 2024 and beyond.

We hope you enjoy and gain a better understanding of what's possible.

## Zooming Out for a Comprehensive View of Disruption

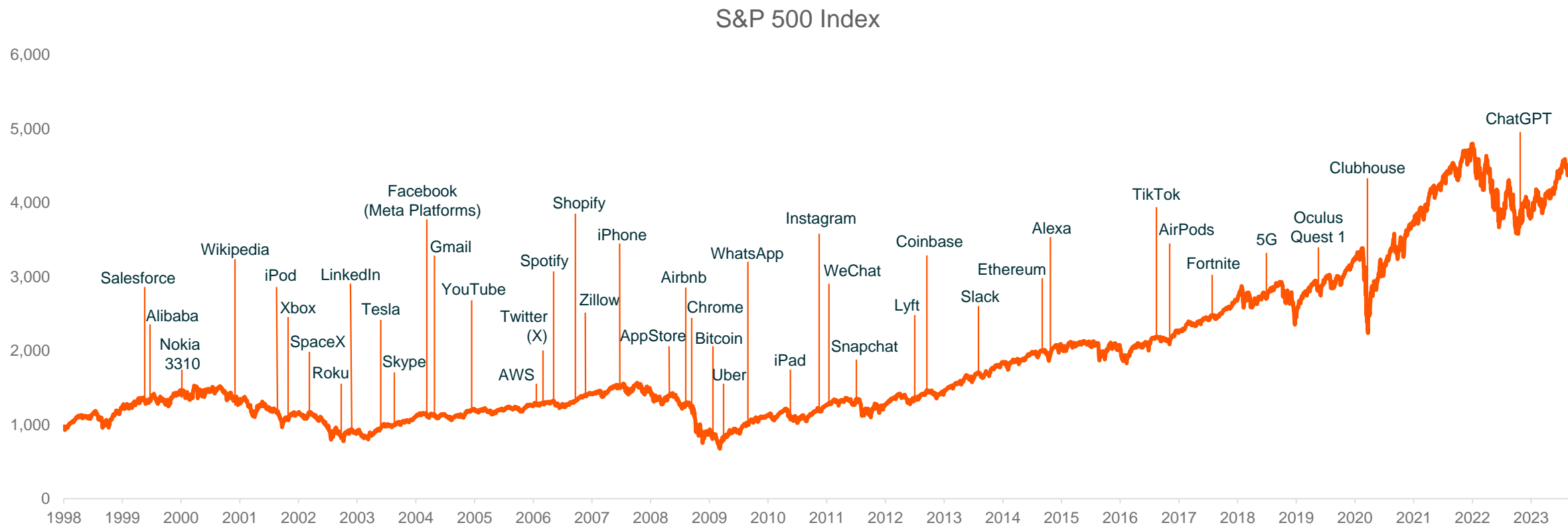
We may often underestimate how much the world can change within a lifetime. Recognizing past dramatic shifts can help us envision a vastly different world in the years or decades ahead.



Sources: Our World in Data. (2019, July 27). Share of United States Households Using Specific Technologies.

## Things That Didn't Exist 25 Years Ago

Throughout market cycles, innovation has not stopped. What's familiar to us today – social media, mobile payments, or e-commerce – was unimaginable to our ancestors a few generations ago.

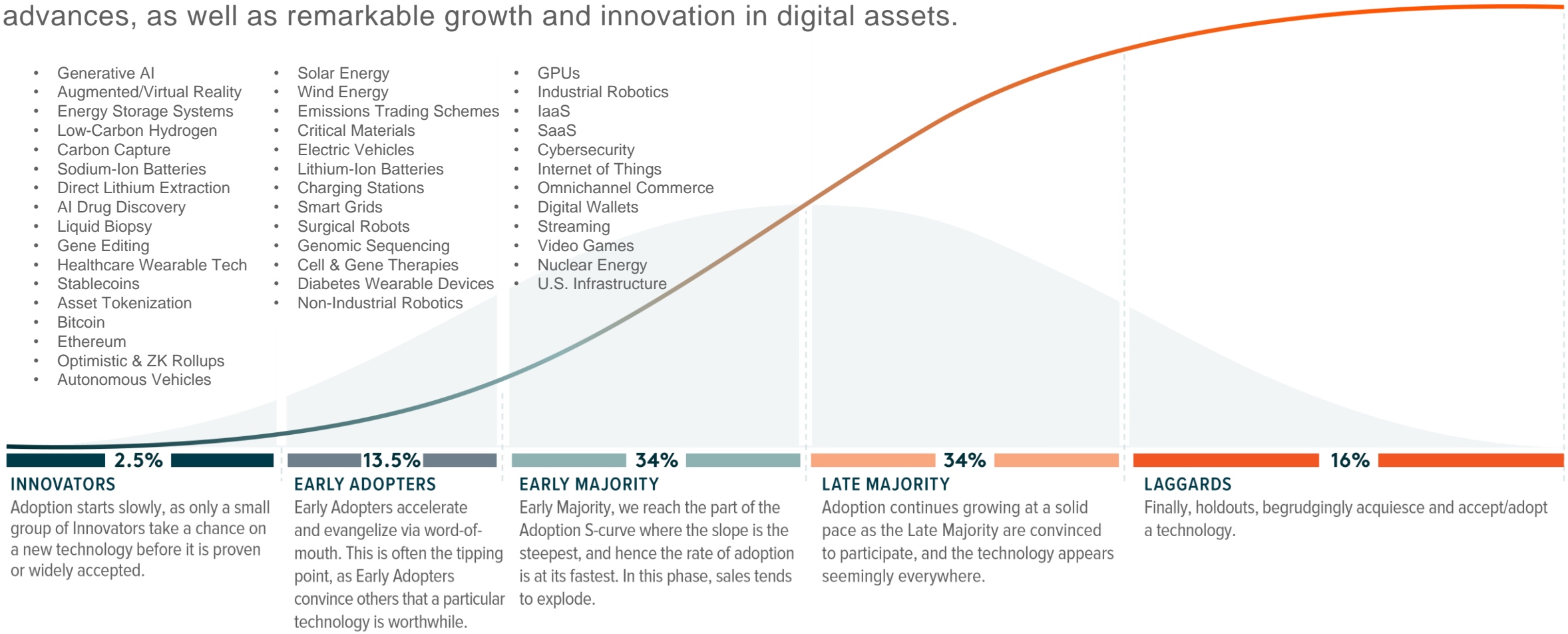


Source: Bloomberg, L.P. (n.d.). [S&P 500 Index] [Data set]. Retrieved on October 13, 2023 from Global X ETFs Bloomberg terminal.

# The Unimaginable Today Will Be Familiar Tomorrow

Anticipate a future marked by groundbreaking technologies, greener solutions to global issues, pioneering medical advances, as well as remarkable growth and innovation in digital assets.

- Generative AI
- Augmented/Virtual Reality
- Energy Storage Systems
- Low-Carbon Hydrogen
- Carbon Capture
- Sodium-Ion Batteries
- Direct Lithium Extraction
- AI Drug Discovery
- Liquid Biopsy
- Gene Editing
- Healthcare Wearable Tech
- Stablecoins
- Asset Tokenization
- Bitcoin
- Ethereum
- Optimistic & ZK Rollups
- Autonomous Vehicles
- Solar Energy
- Wind Energy
- Emissions Trading Schemes
- Critical Materials
- Electric Vehicles
- Lithium-Ion Batteries
- Charging Stations
- Smart Grids
- Surgical Robots
- Genomic Sequencing
- Cell & Gene Therapies
- Diabetes Wearable Devices
- Non-Industrial Robotics
- GPUs
- Industrial Robotics
- IaaS
- SaaS
- Cybersecurity
- Internet of Things
- Omnichannel Commerce
- Digital Wallets
- Streaming
- Video Games
- Nuclear Energy
- U.S. Infrastructure



## INNOVATORS

Adoption starts slowly, as only a small group of Innovators take a chance on a new technology before it is proven or widely accepted.

## EARLY ADOPTERS

Early Adopters accelerate and evangelize via word-of-mouth. This is often the tipping point, as Early Adopters convince others that a particular technology is worthwhile.

## EARLY MAJORITY

Early Majority, we reach the part of the Adoption S-curve where the slope is the steepest, and hence the rate of adoption is at its fastest. In this phase, sales tends to explode.

## LATE MAJORITY

Adoption continues growing at a solid pace as the Late Majority are convinced to participate, and the technology appears seemingly everywhere.

## LAGGARDS

Finally, holdouts, begrudgingly acquiesce and accept/adopt a technology.

## PHASES OF ADOPTION

*Displayed for illustrative purposes. Curve shape not indicative of mathematical transformation.*

# CHARTING DISRUPTION 2024

## Crypto & Blockchain Quests



## Crypto & Blockchain Quests

# Unlocking Digital Assets

### Alternative Currencies & Stores of Value

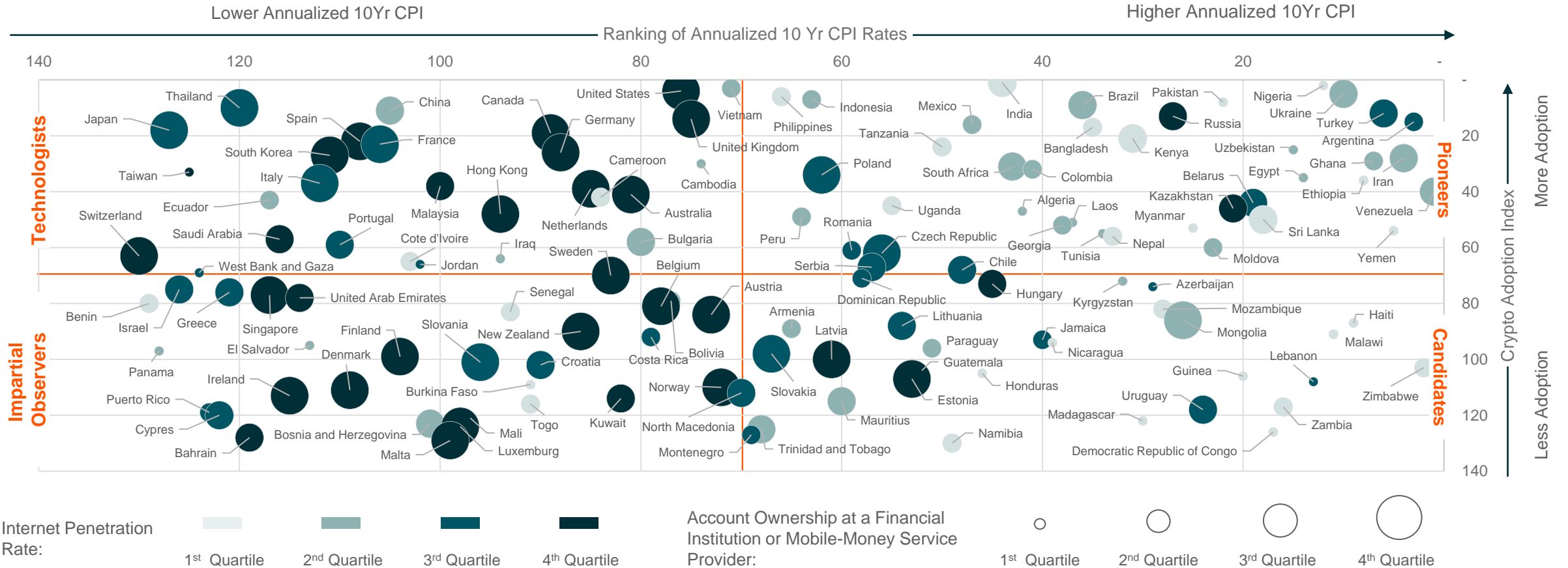
Digital assets, such as stablecoins and bitcoin, represent a transformative shift in the fabric of the global financial system, providing highly efficient means to transact and save, regardless of political and/or economic dynamics. Together, these assets have the potential to foster financial accessibility and inclusion for populations around the world.





# Multiple Catalysts Encourage Crypto Adoption

While crypto is being adopted in developed nations with a history of technological innovation, factors such as political and economic instability, systematic currency debasement, and conflict also seem to be powerful catalysts for adoption.

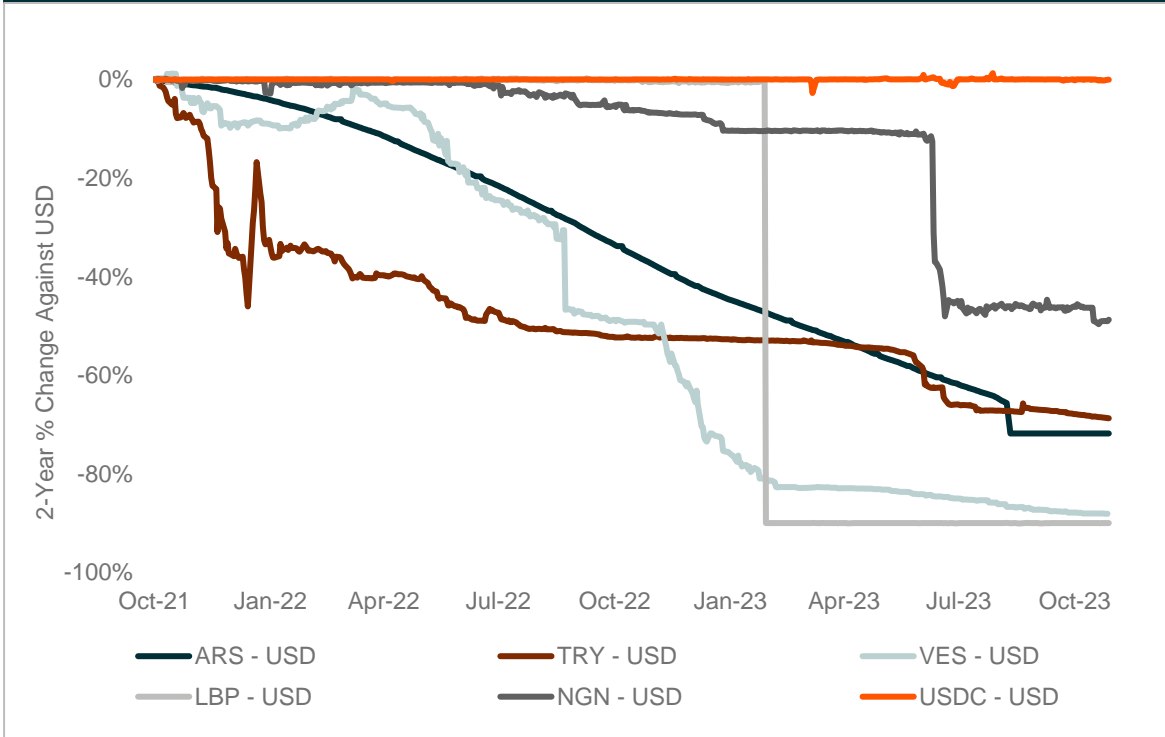


Sources: Chainalysis, 2023; International Monetary Fund, n.d.; The World Bank, n.d.a; The World Bank, n.d.b

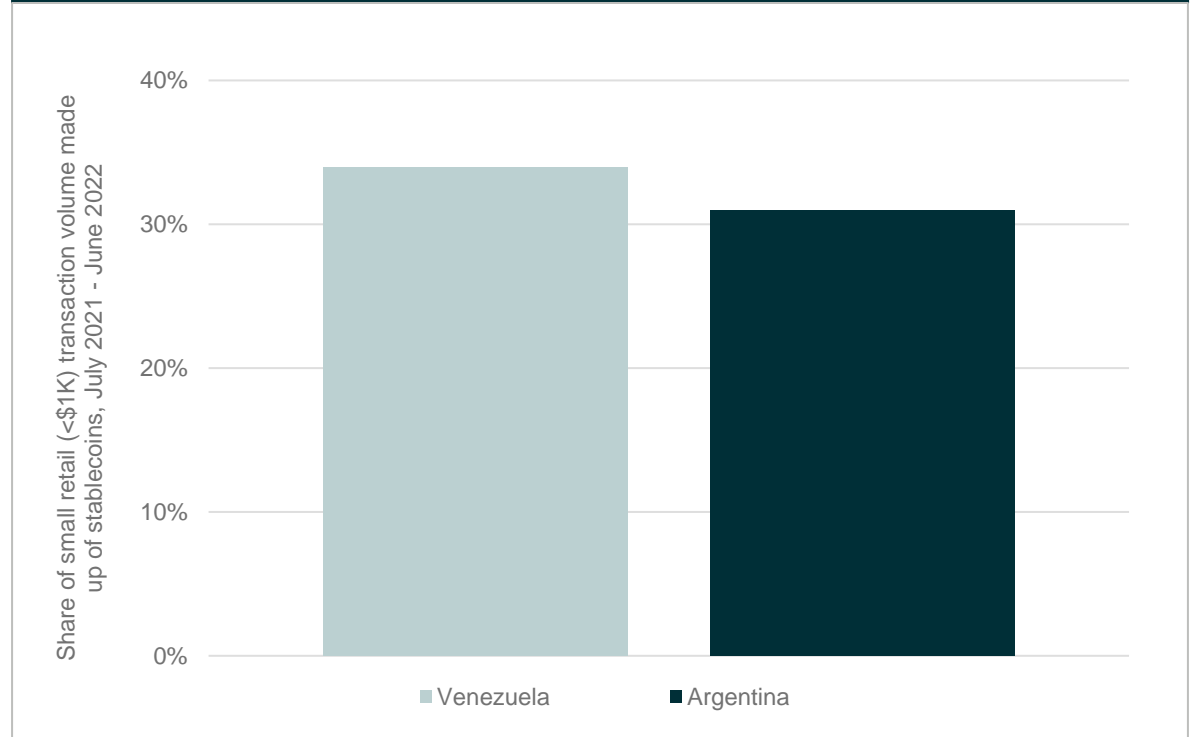
## Stablecoins Serve as a Reliable Medium of Exchange in Unstable Economies

Currency debasement and hyperinflation make everyday transactions a challenge. Stablecoins provide an alternative medium of exchange that people around the world can use to transact with greater confidence.

### Stablecoin & Hyperinflationary FX Rates Against USD



### Stablecoins Are Popular in Unstable Dollarized Economies

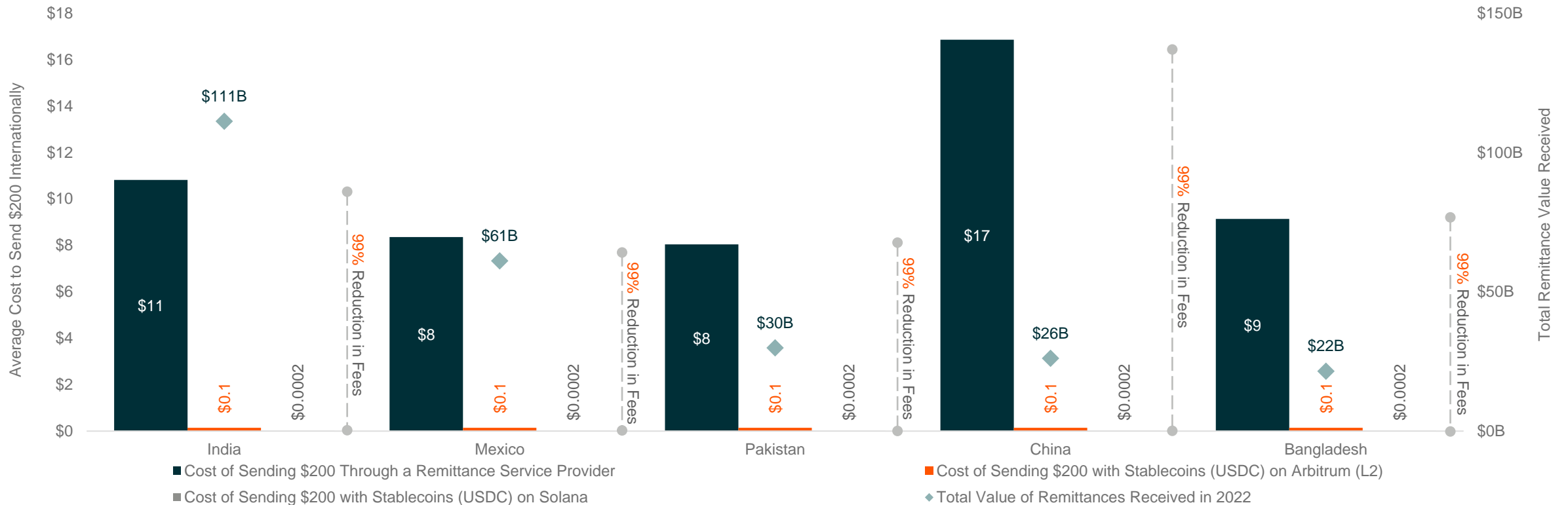


Note: USDC - USD = Circle's USD stablecoin rate, ARS - USD = Argentinian Peso rate, TRY - USD = Turkish Lira rate, VES - USD = Venezuelan Bolivar rate, and NGN - USD = Nigerian Naira rate.

Sources: Charts: Left: TradingView, n.d.; Bloomberg, n.d.; Right: Chainalysis, 2022

## Stablecoins Reduce the Cost of Global Remittance Payments by Orders of Magnitude

The price stability, cost effectiveness, and instant transfer capabilities of stablecoins are reducing remittance transaction costs and enabling frictionless cross-border money transfers.

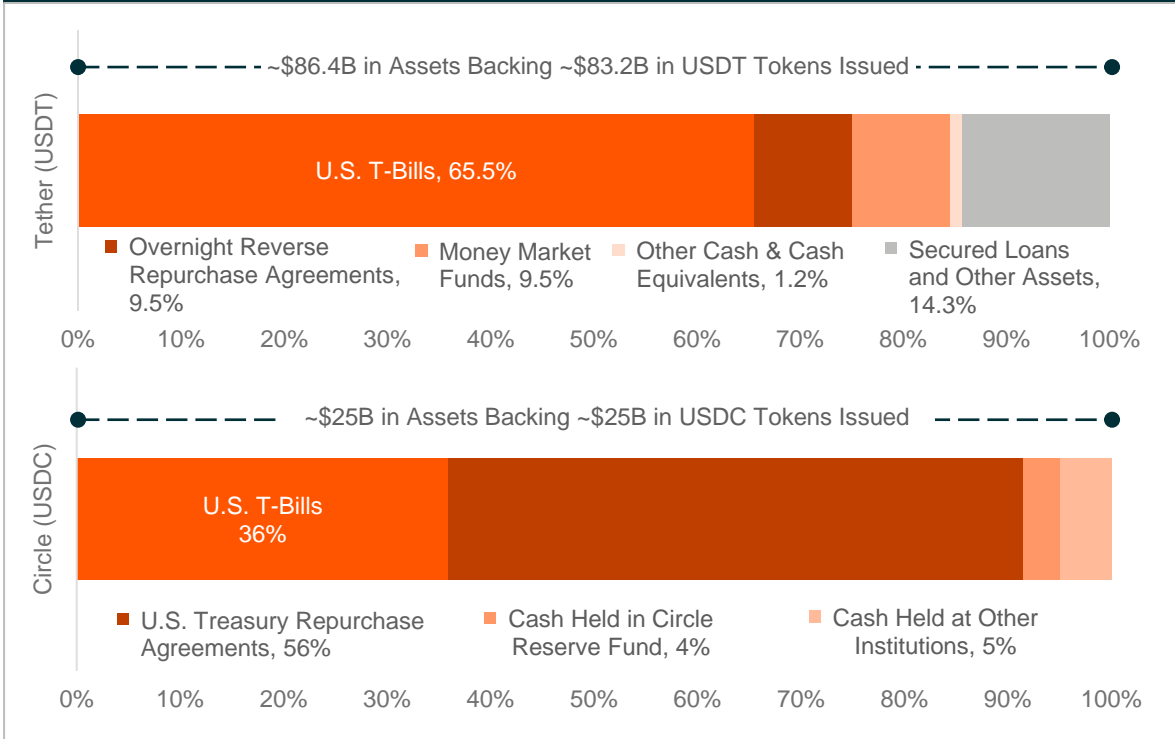


Sources: The World Bank, n.d.a; The World Bank, n.d.b; Arbiscan, n.d.; Solscan, n.d.

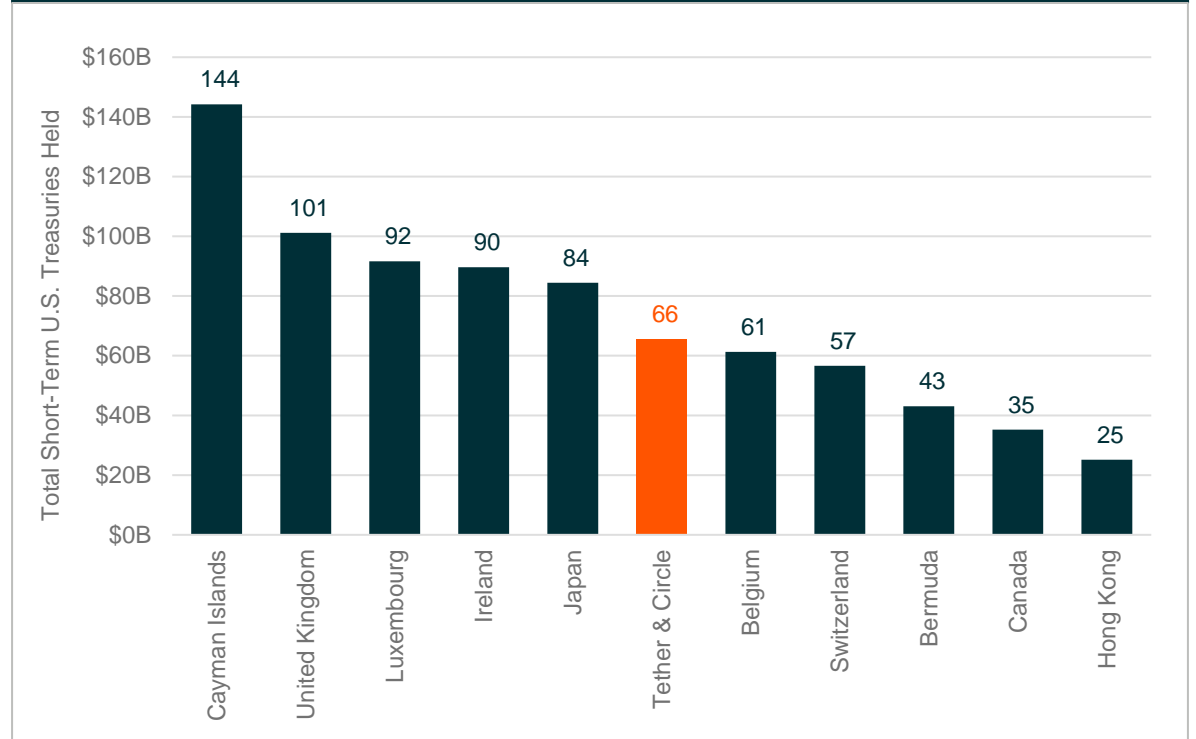
## Stablecoins Expand the Global Influence of the U.S. Dollar

The stablecoin market is largely denominated in USD. As global demand for stablecoins continues to grow, the stablecoin industry may soon become one of the largest buyers of U.S. government debt.

### Major Stablecoins Are Backed by over \$66B in U.S. T-Bills



### Stablecoin Issuers Hold as Many T-Bills as Top Foreign Buyers

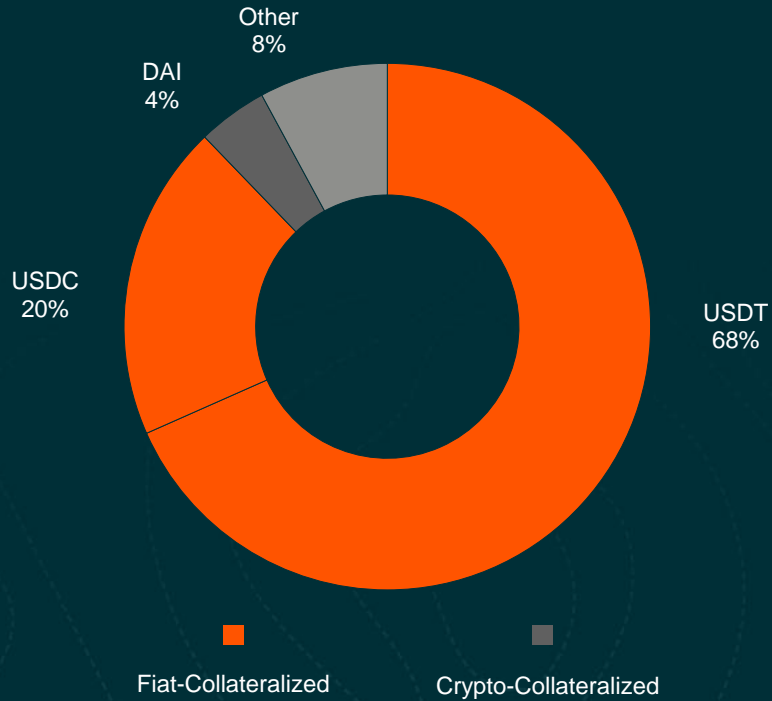


Sources: Charts: Left: Tether Holdings Limited, 2023; Circle Examination Report Audited by Deloitte, 2023; Right: U.S. Department of the Treasury, n.d.

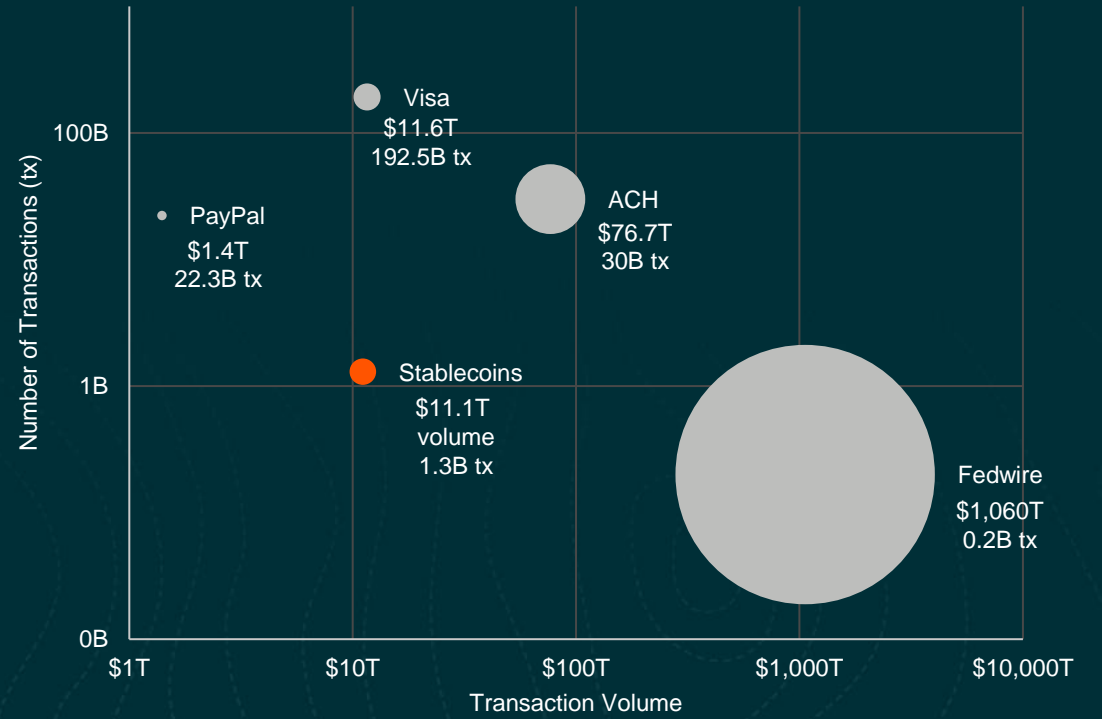
## Stablecoins Have Emerged as an Efficient Rail for Global Money Transmission

Already competitive with some of the world’s largest legacy payment systems, stablecoins are set to reshape global finance and cross-border payments by ushering in an era of enhanced financial efficiency and inclusivity.

**\$124B of Stablecoins Are in Circulation Today**



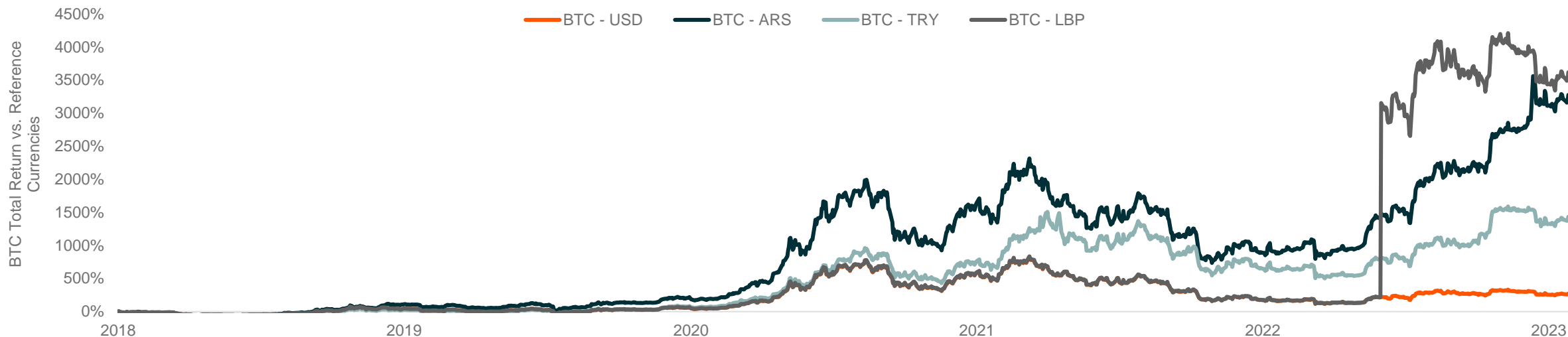
**Stablecoins Settled Over \$11T in 2022**



Sources: Charts: Left: DeFiLlama, n.d.; Right: Brevan Howard Digital, 2023

## Bitcoin Can Be a Long-Term Hedge Against Monetary Instability

Globally accessible, verifiably scarce, and censorship-resistant, bitcoin is a digital store of value that is location-agnostic to national borders and uncorrelated to domestic issues, making it a powerful wealth preservation tool.



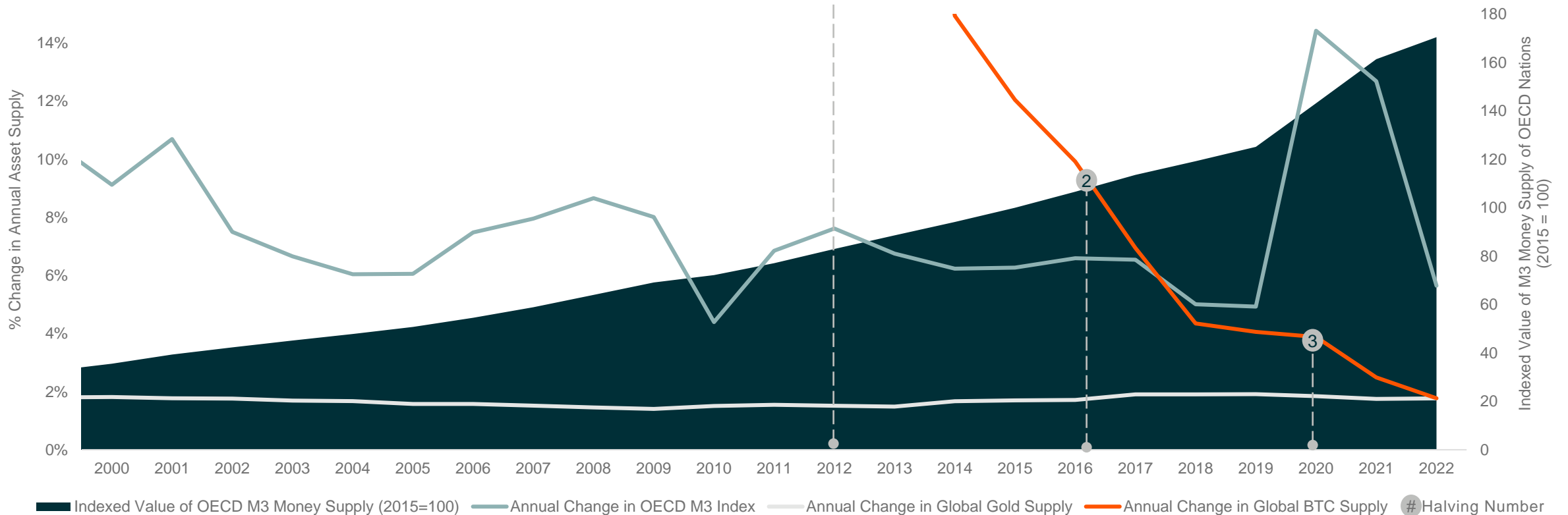
	Argentina	Turkey	Lebanon	United States
Annualized Change in Consumer Prices (September 2018–September 2023)	29.6%	34.0%	99.9%	3.7%
Total Change in Consumer Prices Since (September 2018–September 2023)	266.0%	332.6%	3093.0%	21.9%
BTC Performance (September 2018–September 2023)	3252.2%	1423.2%	3592.7%	268.6%

Notes: The Lebanese economic crisis caused an 80 - 90% devaluation of the Lebanese Pound (LBP) against the USD. Despite an official exchange rate pegged at 1,507.50 LBP - USD since 1997, at least three alternative LBP - USD exchange rates emerged to reflect true market value between 2018 and 2023. In February 2023, the official peg was changed to 15,000 LBP - USD. BTC = Bitcoin, ARS = Argentinian Peso, and TRY = Turkish Lira.

Sources: Bloomberg, n.d.; Bloomberg, n.d.; U.S. Bureau of Labor Statistics. (2023); U.S. Bureau of Labor Statistics. (2018)

## Bitcoin's Supply Constraints Provide Scarcity Assurances

Gold production is limited by mining resources. Bitcoin's supply schedule is defined by the protocol code and protected by consensus. Without these constraints supply can be highly variable, and debasement can accelerate.

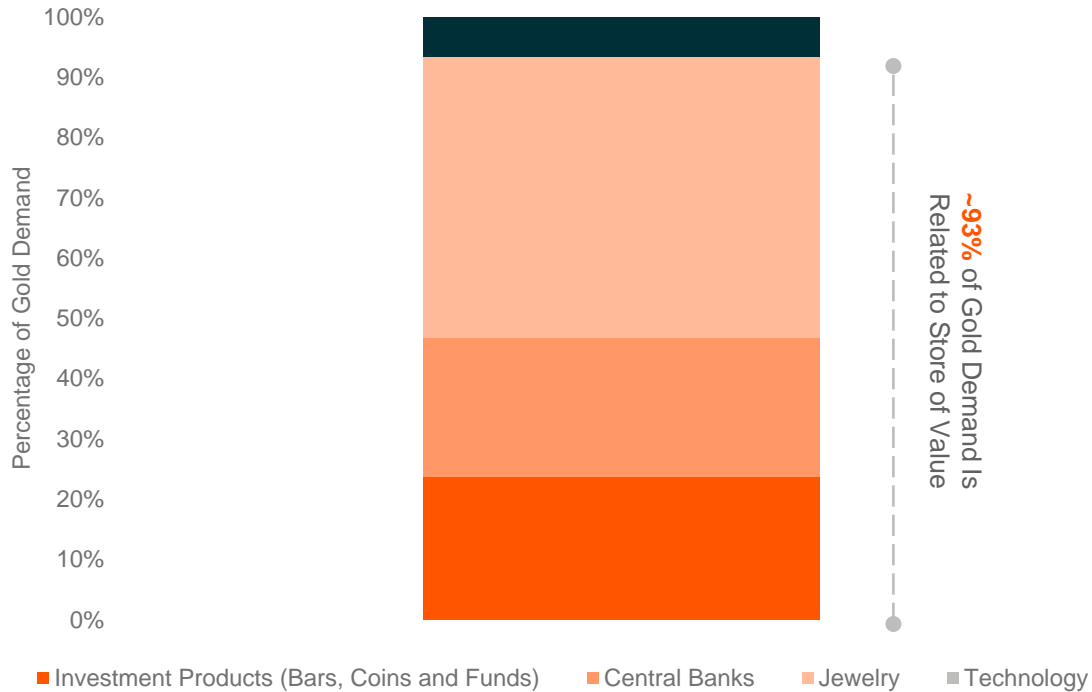


Sources: Organization for Economic Cooperation and Development, n.d.; Our World in Data, n.d.; World Gold Council, n.d.; Glassnode, n.d.

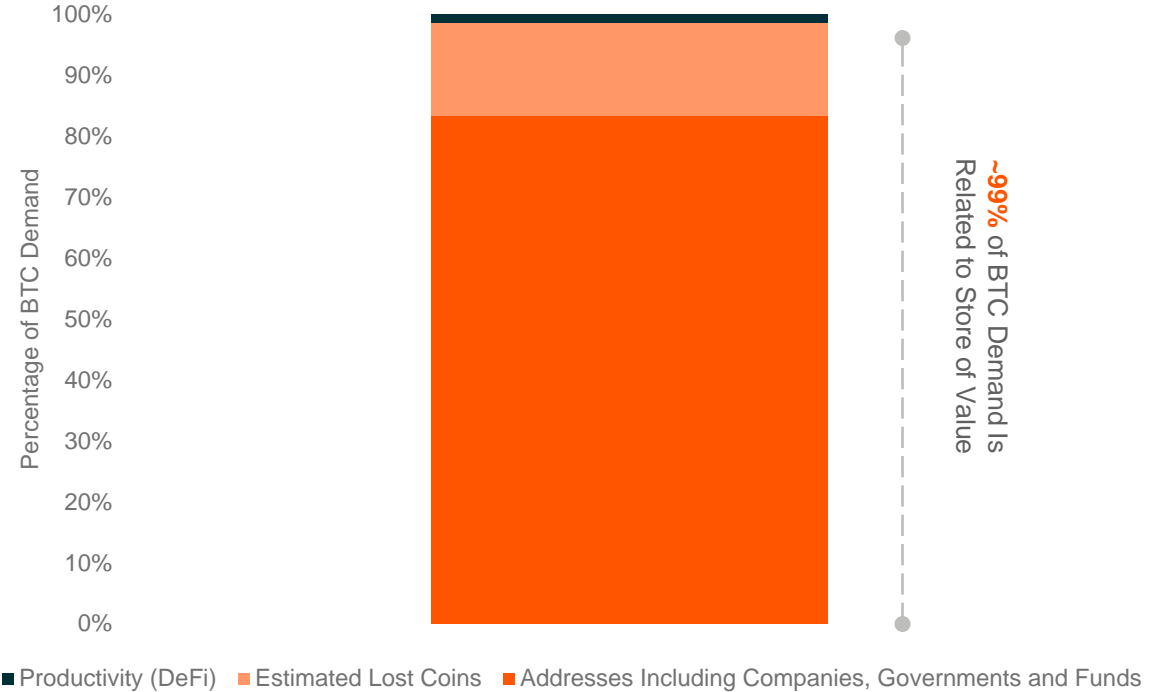
## Store of Value Is the Primary Demand Driver for Gold and Bitcoin

Gold’s long history as a store of value (SoV) stems from its scarcity, durability, and near-universal aesthetic appeal, underpinning its perceived value. Based on user data, bitcoin demonstrates similar attributes but in a digital format.

Demand Drivers for Gold



Demand Drivers for Bitcoin



Note: Gold demand values as of 2022

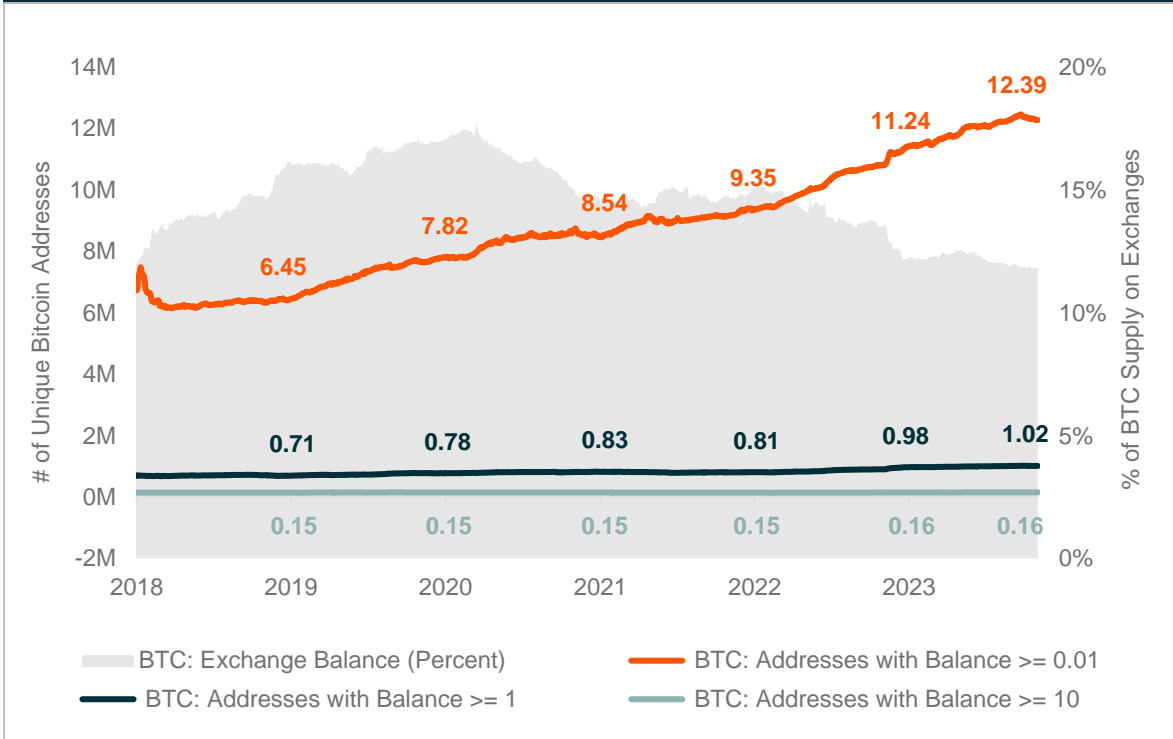
Sources: Charts: Left: World Gold Council, n.d.; Right: Glassnode, n.d.; Bitcoin treasuries.net, n.d.; The Wall Street Journal, 2018; Unchained, 2023



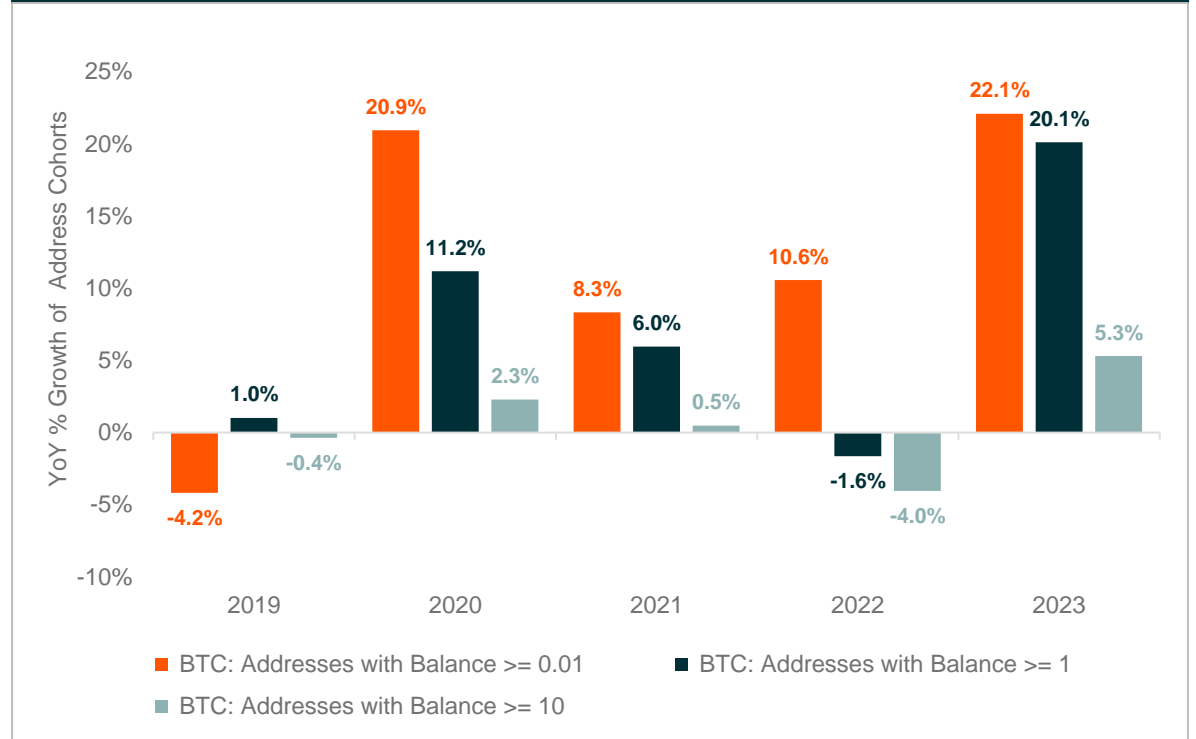
## Small and Self-Custodial Account Trends Suggest Growing Appeal of Bitcoin Values

Growth of self-custodial bitcoin wallets suggests that the network’s value proposition is gaining traction. Further, the growth of wallets with smaller balances may indicate increasing adoption among retail consumers.

### BTC Flows Off Exchanges Suggests Self-Custody Trend



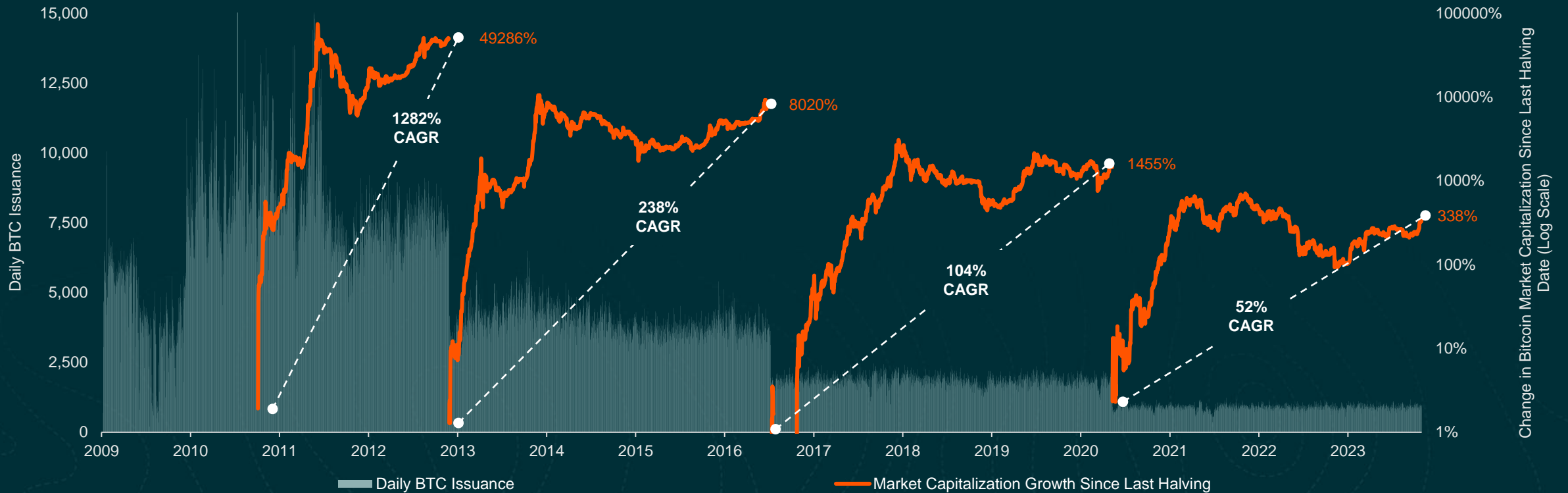
### Small Wallet Growth Shows Resilience of Retail Consumers



Sources: Charts: Glassnode, n.d.

## The Value of Bitcoin's Scarcity Increases with Each Halving

Every four years, the halving reduces bitcoin's issuance rate by 50%, enforcing its scarcity.<sup>1</sup> Though the timing of these events is predictable, the market only tends to find a new equilibrium market cap after the event occurs.

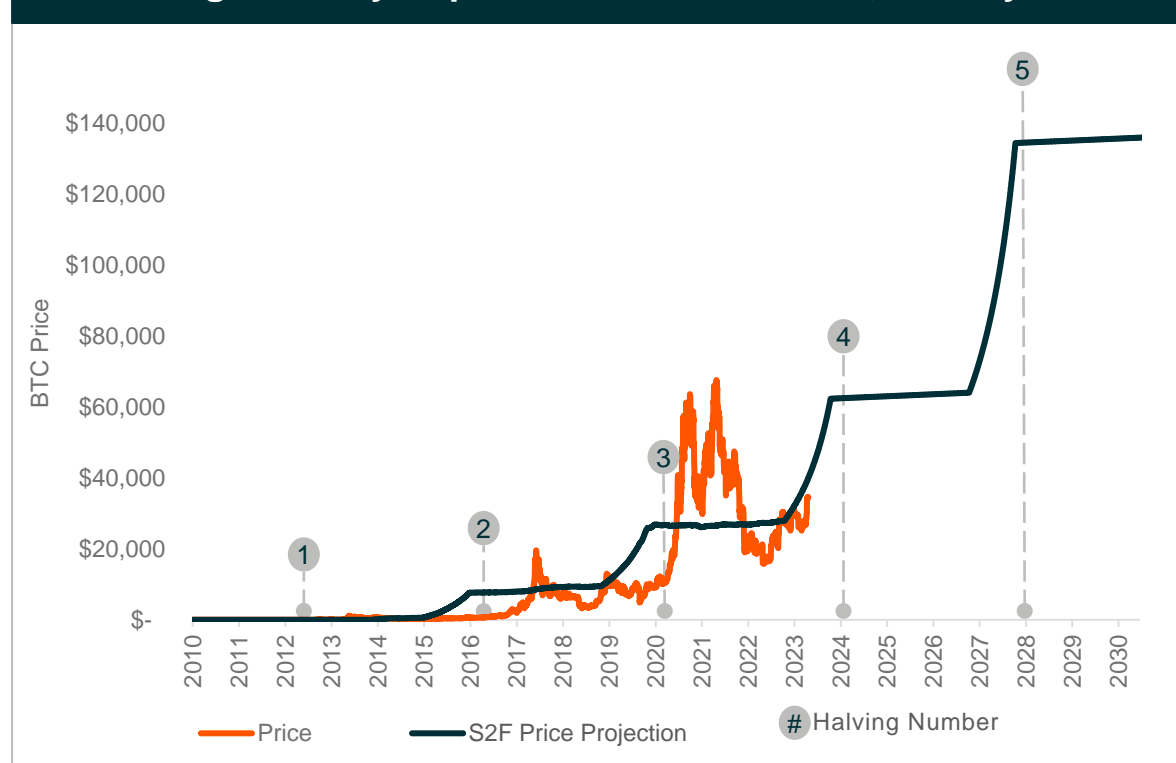


Sources: Text: 1. Conway, 2023; Chart: Glassnode, n.d.

## Valuing Bitcoin's Scarcity Using Stock-to-Flow

Stock-to-flow (S2F) models quantify the scarcity value of assets with a limited supply. They provide insights into how scarcity affects value and market dynamics by calculating the ratio of existing supply (stock) to annual production (flow).

### Increasing Scarcity Implies BTC Value of \$60,000+ by 2024



### Bitcoin S2F Model Outputs

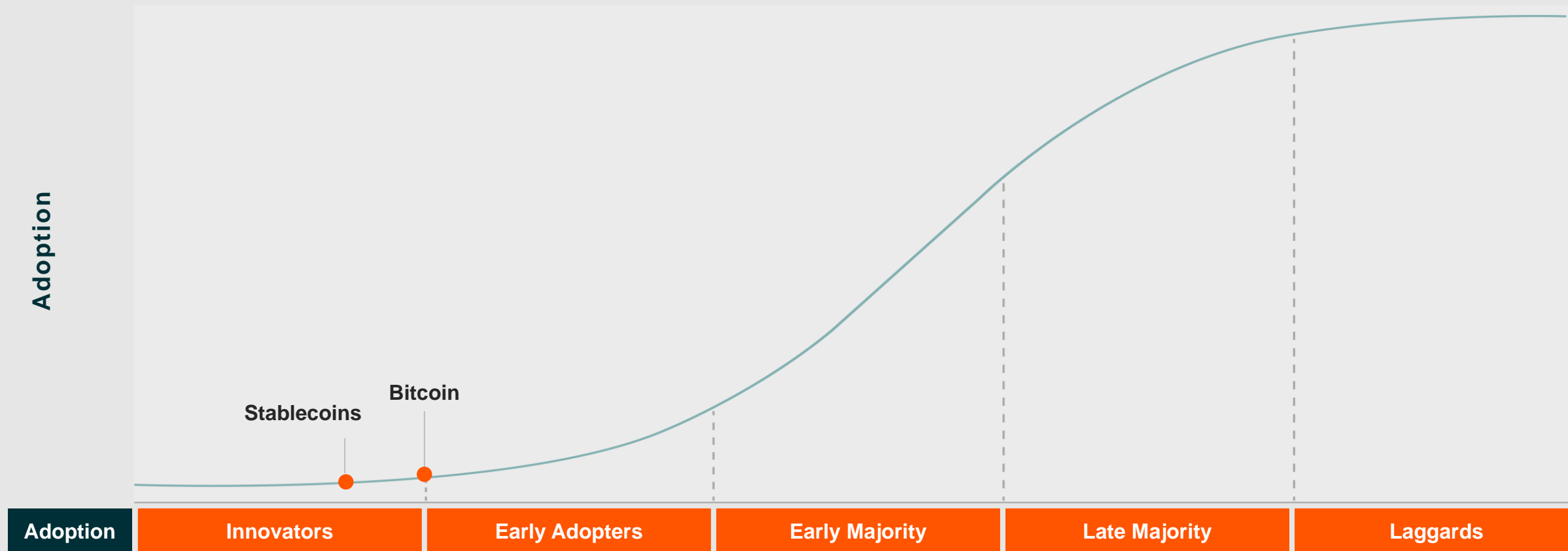
Halving #	BTC Issued Per Block (Pre/Post Halving)	Stock-to-Flow Ratio	Observed BTC Value	Implied Value of BTC Scarcity
1 (November 28, 2012)	50/25 BTC	6.8 Years	\$12	\$0
2 (July 9, 2016)	25/12.5 BTC	22.9 Years	\$677	\$7,655
3 (May 11, 2020)	12.5/6.25 BTC	54.1 Years	\$8,600	\$25,228
4 (Estimated April 2024)	6.25/3.125 BTC	119.5 Years	-	\$62,134
5 (Estimated April 2028)	3.125/1.5625 BTC	247.7 Years	-	\$134,382

Note: The stock-to-flow ratio signals the number of years it takes to replace existing supply at current annual production rates.

Sources: Charts: Glassnode, n.d.

## Unlocking Digital Assets: S-Shaped Curve of Adoption

Bitcoin occupies the transition between innovators and early adopters on the adoption curve, while stablecoins are firmly rooted among innovators. Both show strong progress in adoption.



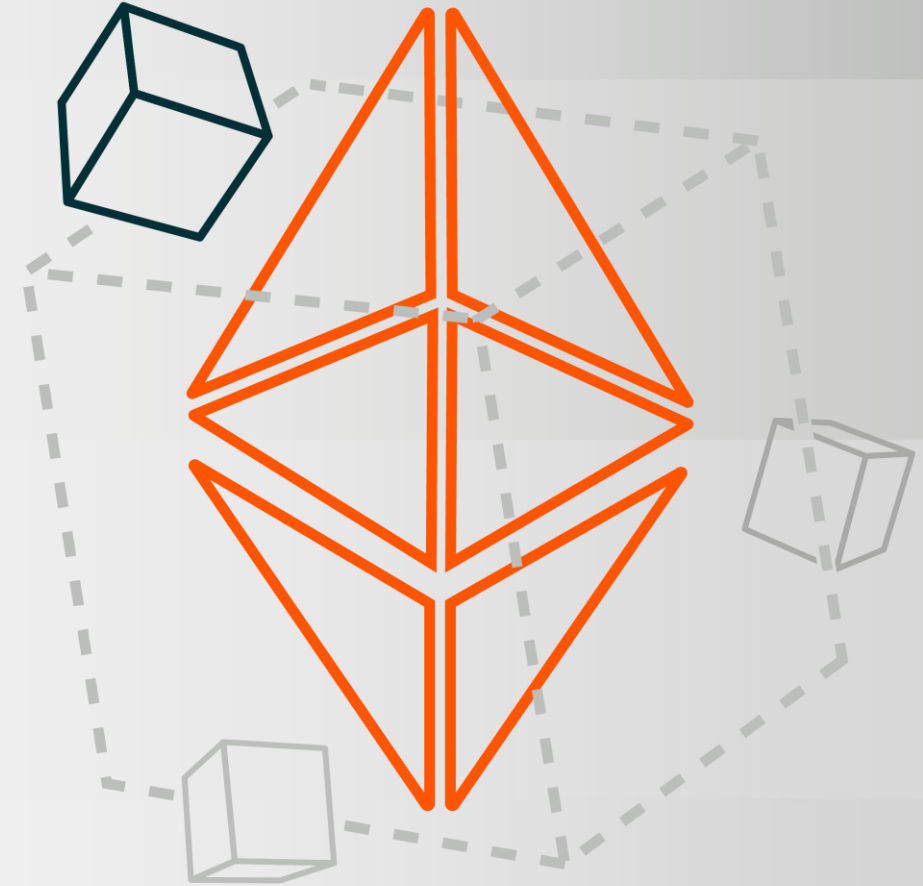
Note: For illustrative purposes only.

## Crypto & Blockchain Quests

# Ethereum's Blueprint

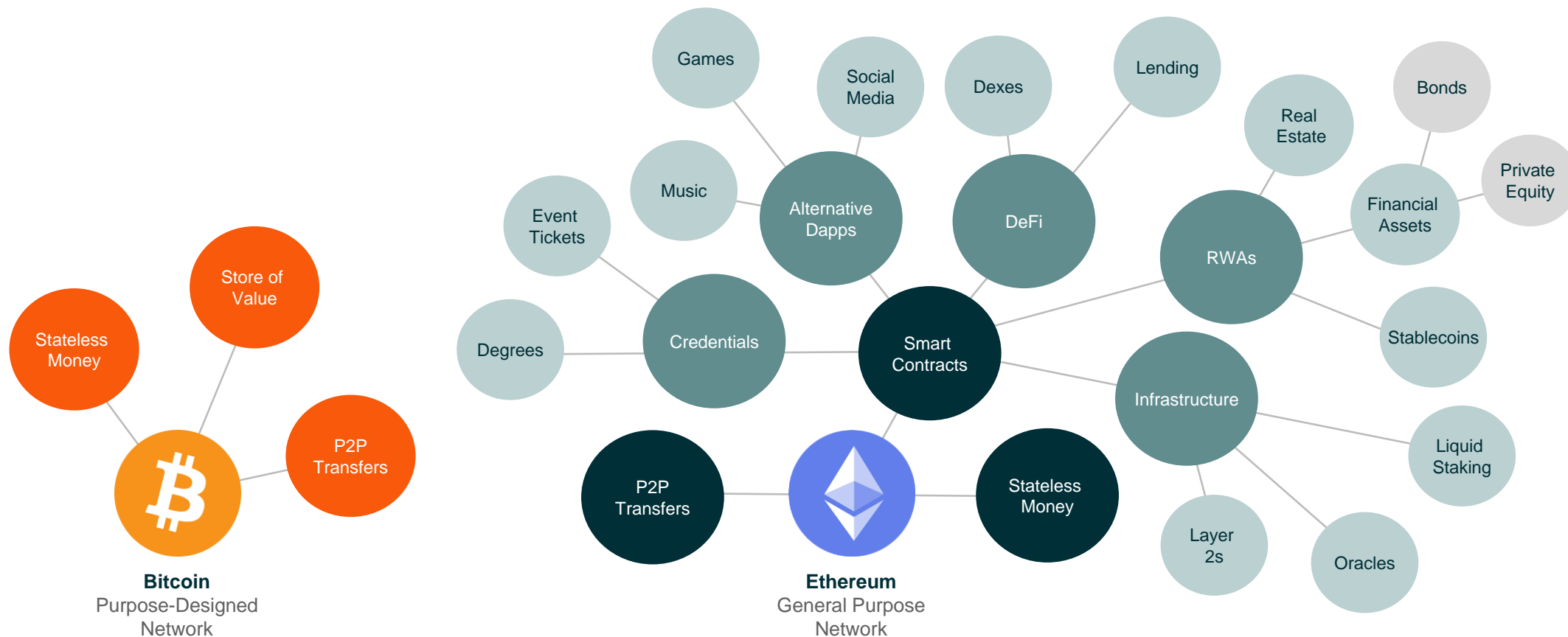
### Exploring Infrastructure Upgrades

Ethereum, the leading smart contract blockchain, underwent a significant upgrade last year, transforming its security model, reducing its carbon footprint, and reshaping network economics. While Ethereum presently supports various applications such as stablecoins, decentralized finance (DeFi), and asset tokenization, enhancing transaction capacity and reducing settlement costs are crucial for the success of additional use cases. The recent network upgrade lays the foundation for achieving these objectives, with recent advancements in scaling technology underscoring layer 2 rollups (L2s) as the preferred solution to build upon this foundation.



## Diverse Applications of Public Blockchain Networks

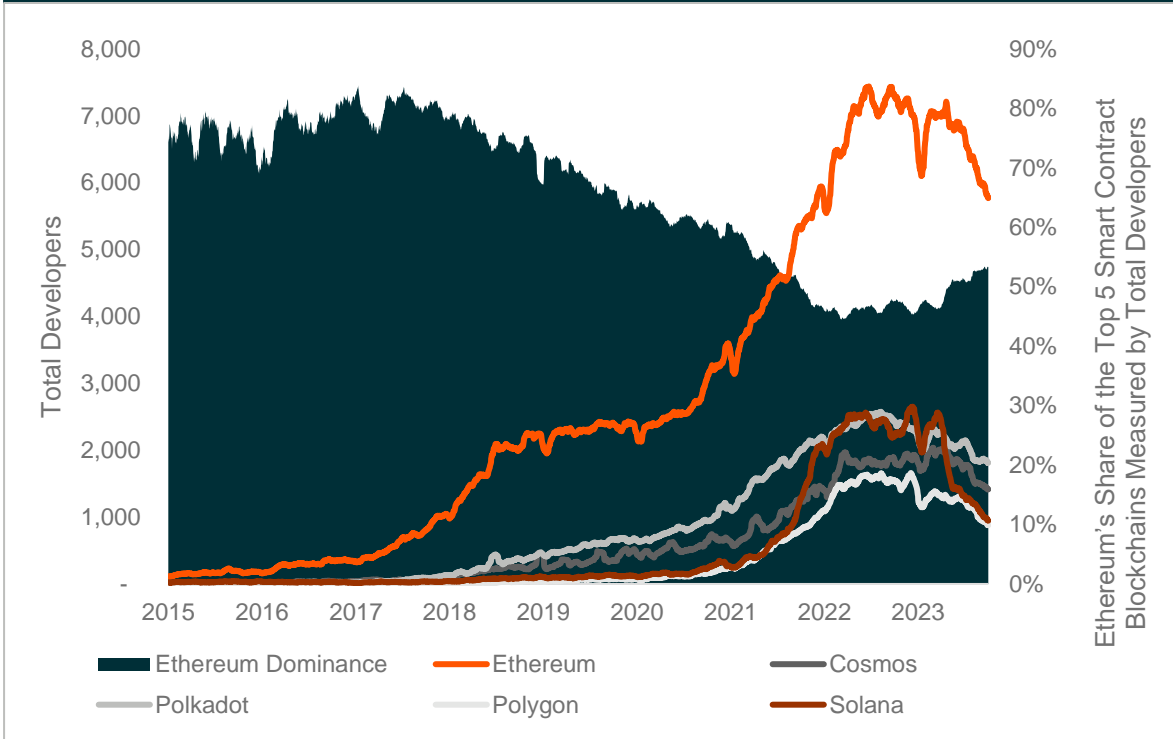
The blockchain landscape consists of both purpose-designed networks - such as Bitcoin, which secures the settlement of bitcoin (BTC) transfers - and flexible networks - like Ethereum, which can be a settlement layer for any arbitrary data.



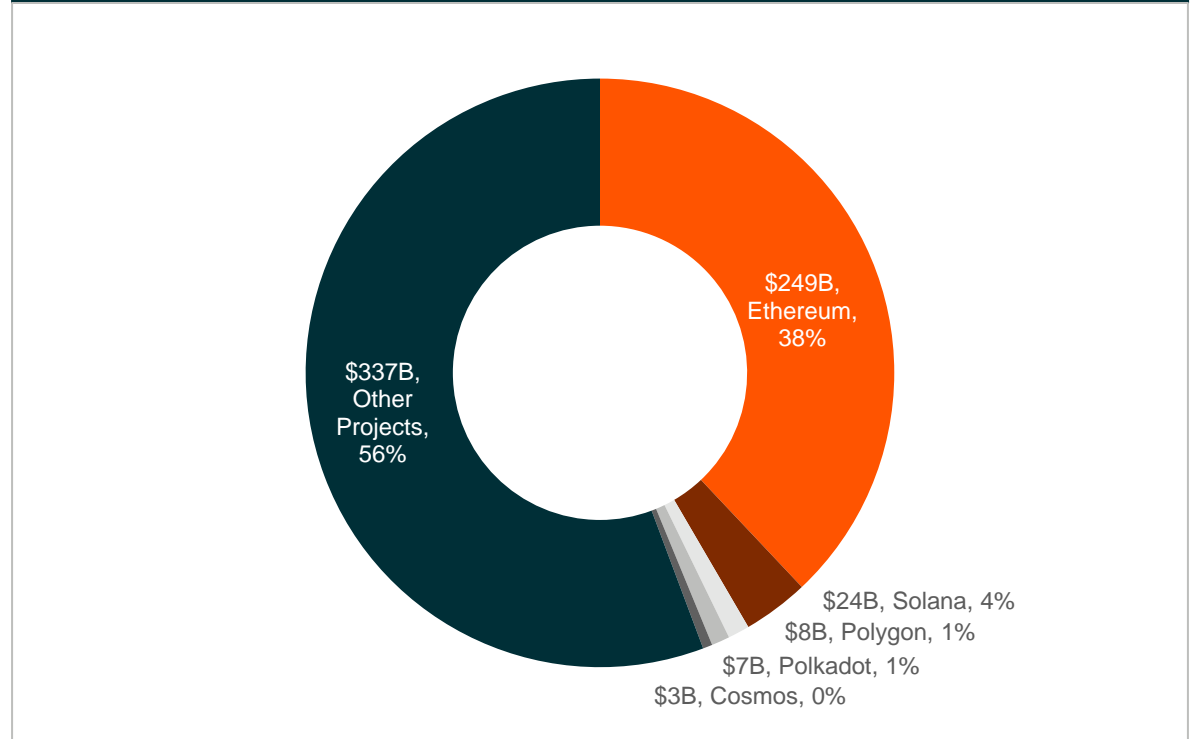
## Ethereum Is the Leading Smart Contract Blockchain Ecosystem

Ethereum is the largest smart contract network as measured by developer activity and market valuation. Its significance lies in its robust infrastructure and versatile capabilities, which make it a hub for blockchain-based innovations.

### Ethereum Commands the Largest Share of Developers



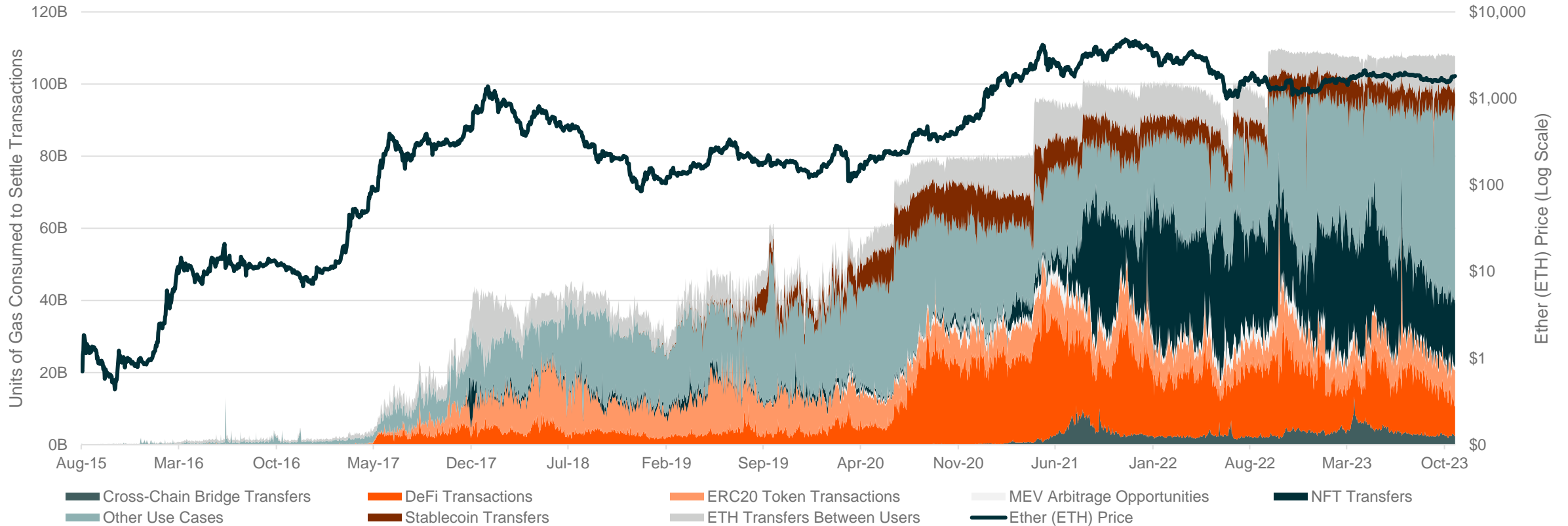
### Excluding Bitcoin, Ethereum Holds 38% of the \$658B Market



Sources: Charts: Left: Developer Report, n.d. ; Right: TradingView, n.d.

# Ethereum Infrastructure and Smart Contract Development Enable a Range of Applications

While decentralized finance (DeFi), P2P transfers, and tokenization are the largest demand drivers today, Ethereum's use cases are likely to continue to grow.



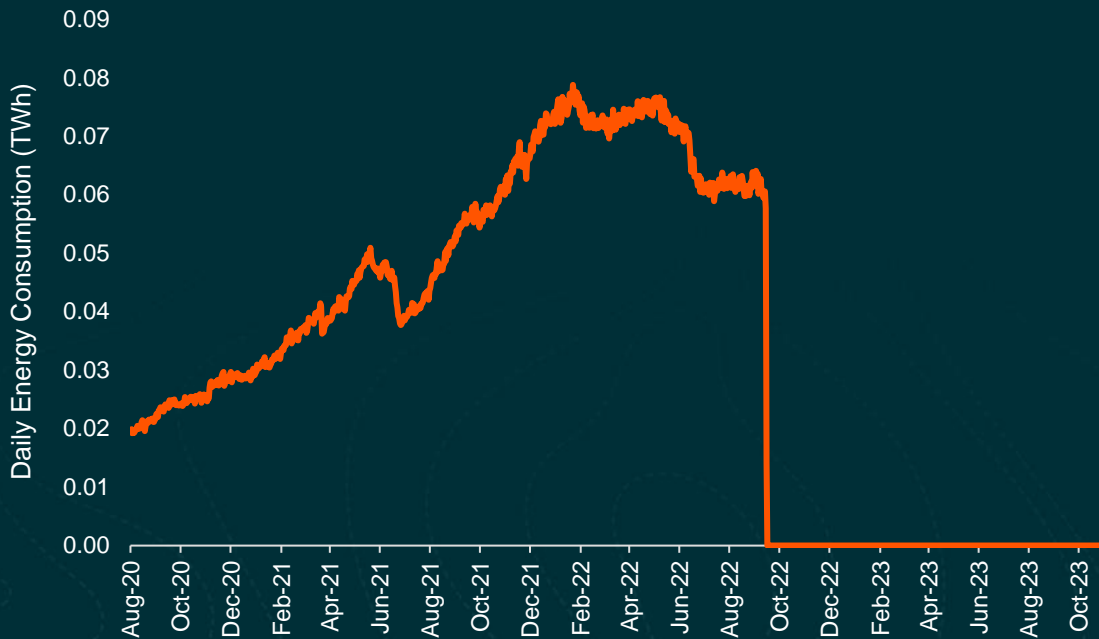
Sources: Glassnode, n.d.



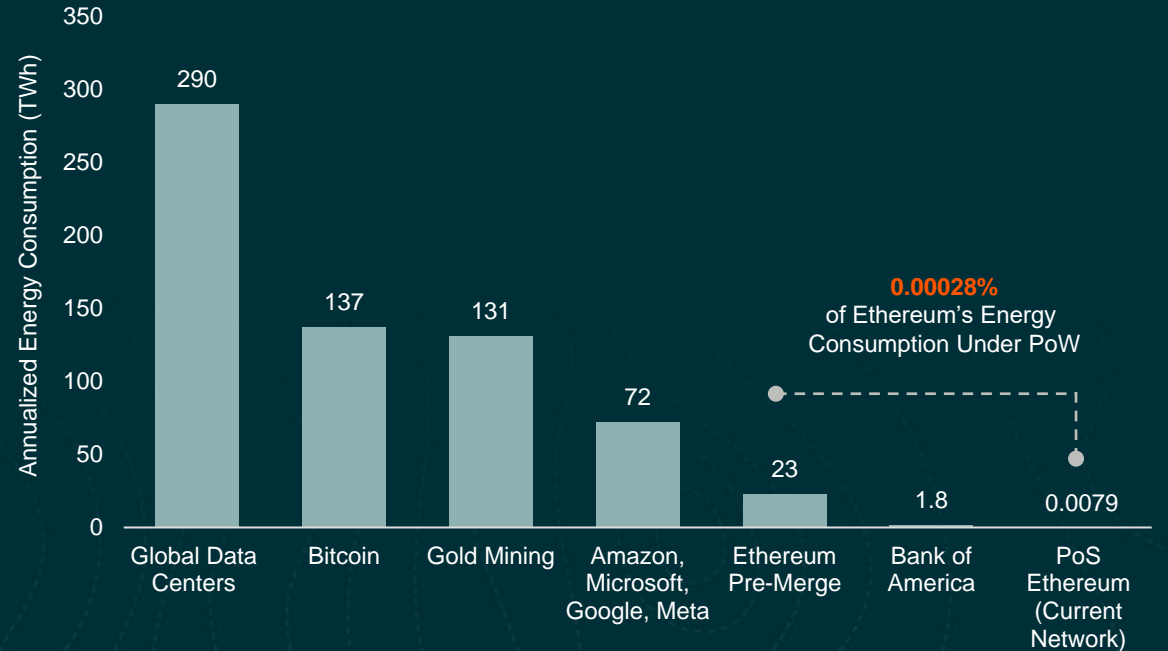
## The Merge Fundamentally Overhauled Ethereum's Energy Profile

At the precise moment Ethereum transitioned to Proof-of-Stake (PoS), the network's energy consumption was reduced by roughly 99.9%, making it one of the most eco-friendly global networks in a matter of minutes.<sup>1</sup>

### The Merge Reduced Ethereum's Electricity Use by 99%



### Contextualizing Ethereum's Energy Consumption

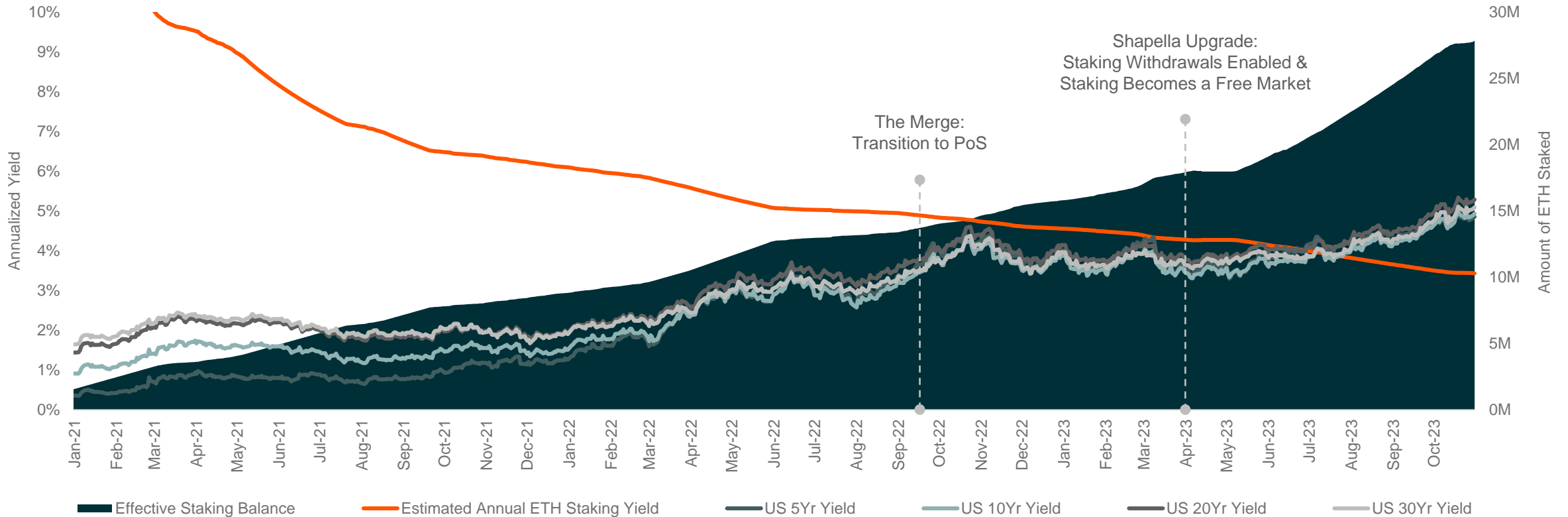


Note: Global Data Centers data represents midpoint of estimate of 240 – 340 TWh/year and excluded energy used for crypto mining.

Sources: Text: 1. Ethereum, 2023; Charts: Left: Crypto Carbon Ratings Institute, n.d.; Right: Crypto Carbon Ratings Institute, n.d.; Bank of America Corporation, 2023; International Energy Agency, n.d.; Cambridge Centre for Alternative Finance, n.d.

## Ethereum's New Security Model Gives Rise to the Internet Bond

Ethereum's shift to PoS changed how the network reaches consensus, replacing mining with staking. Under PoS, consensus is coordinated by users who collateralize ether (ETH), earning a dynamic ETH-denominated yield in return.

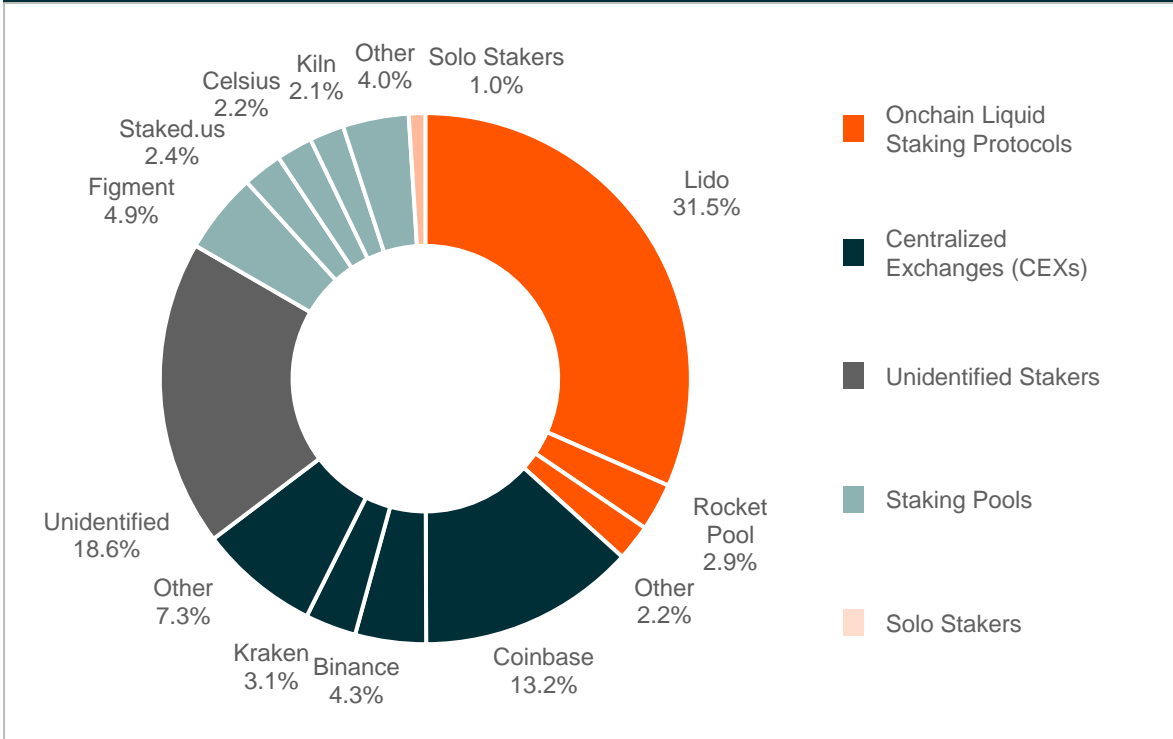


Sources: Bloomberg, n.d.; Glassnode, n.d.

# Ethereum Staking Has Become a Multi-Billion Dollar Security Barrier for an Ecosystem of Value

Ethereum's economic security is underpinned by capital commitments made by a decentralized network of participants. This community safeguards all the value settled on Ethereum.

## Distribution of \$42B of Staked ETH



## ETH Stakers Secure a \$350B+ Ecosystem

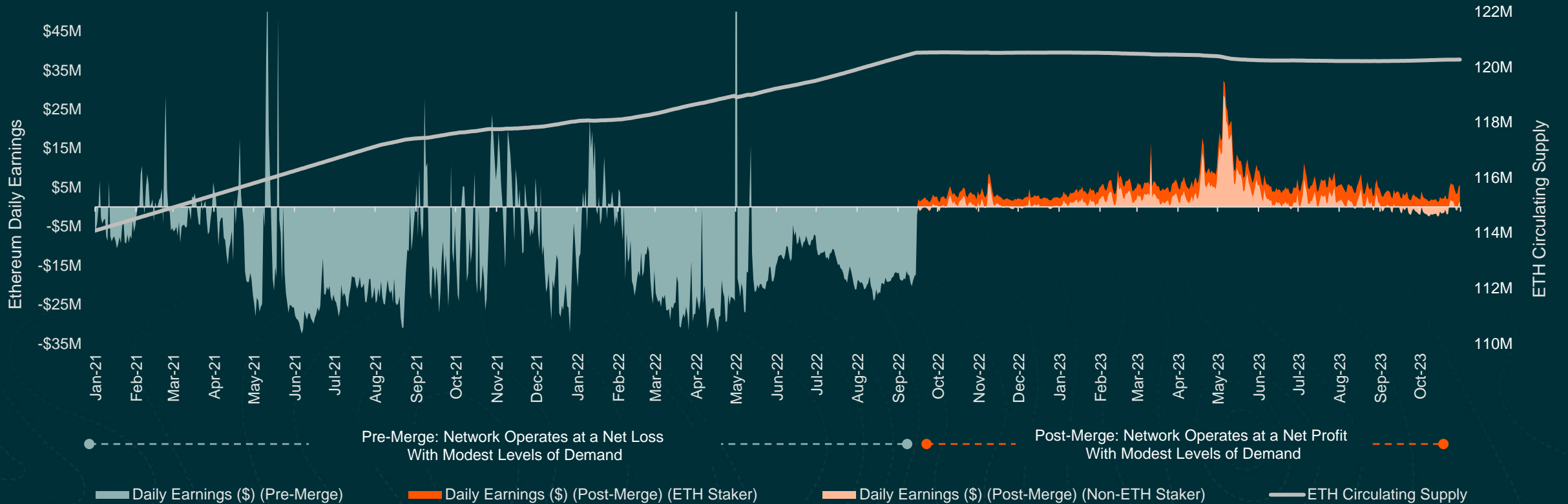
Native Currency	Stablecoins		Wrapped Tokens
ETH \$249B	USDT \$87B	USDC \$24B	DAI \$5.3B
			wBTC \$6B
DeFi		Storage	Liquid Staking
UNI \$3.1B	AAVE \$1.5B	FIL \$2.1B	AR \$0.5B
			stETH \$18.6B
Scaling Solutions		Oracles	Misc. Includ. NFTs and Games
ARB \$1.5B	OP \$1.5B	LINK \$8.6B	NFTs \$4B
			ILV \$0.5B

Note: Unidentified stakers could be composed of solo stakers. Solo stakers include known addresses from community members.

Sources: Charts: Left: Dune, n.d.; Right: Ultrasound Money, n.d.; TradingView, n.d.; CoinGecko, n.d.; Nftgo, n.d.

## A Reduction in Issuance Makes Ethereum a Sustainably Profitable Protocol

The shift to PoS increased Ethereum's profitability by eliminating the need to pay external actors (miners) for security. Instead, consensus rewards are now distributed to ETH holders who participate in staking.

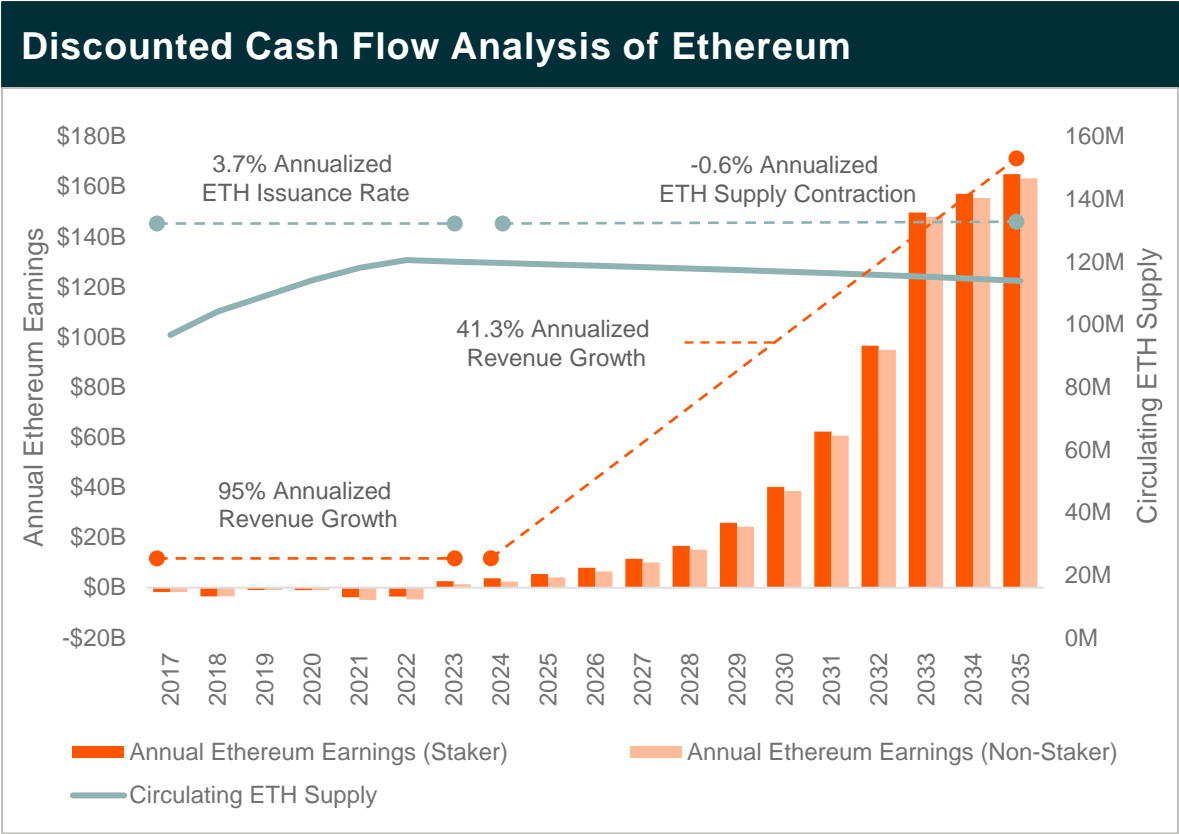


Note: While ownership of ETH is a prerequisite to participate in staking and earn staking yield, staking is an opt-in activity. As a result, the population of ETH holders is composed of both stakers and non-stakers. We have conducted an analysis of post-Merge network profitability from the standpoint of both these participant categories.

Sources: Glassnode, n.d.

# Fundamental Analysis Suggests Ethereum's Growth Potential Is Undervalued

Ethereum generates revenue from gas fees, which users pay to execute transactions and deploy smart contracts on the network. Ethereum's global reach and vast functionality create significant revenue growth potential.



### DCF Inputs & Growth Assumptions

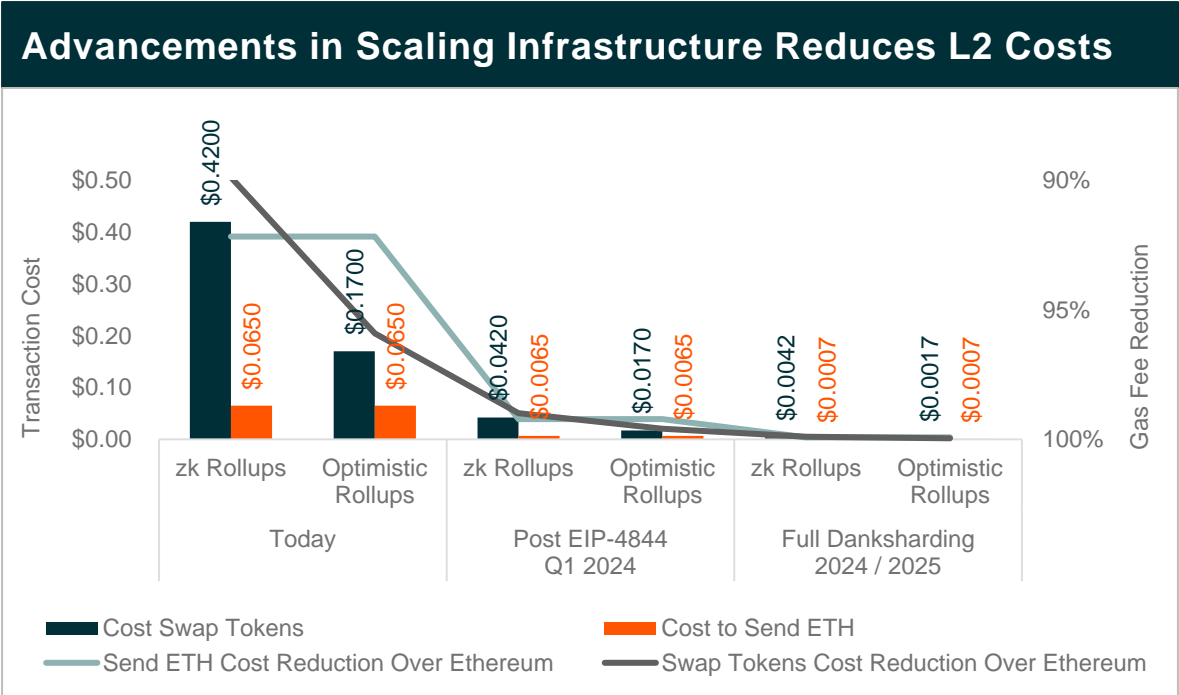
	Base Case	Bear Case	Bull Case	
Inputs	Initial Rev. Growth (2024 - 2028)	45%	15%	55%
	Mid-Term Rev. Growth (2029 - 2033)	55%	20%	70%
	Perpetual Rev. Growth (2034 - )	5%	2%	6%
	Equilibrium Staking Yield	2%	5%	1%
	Annual ETH Gas Fee Growth	3%	1%	4%
Outputs	Annual Earnings (Yr. 2035)	\$165B	\$13.6B	\$372.5B
	ETH Supply (Yr. 2035)	113.2M	113.9M	113.6M
	Staked ETH Fair Value	\$6,446	\$579	\$15,785

Note: The discounted cash flow (DCF) valuation of ETH is assessed from the standpoint of an ETH staker.

Sources: Charts: Glassnode, n.d.

# Scaling Throughput Is at the Forefront of Ethereum Innovation

Ethereum’s transactional capacity is intentionally limited to optimize for secure and decentralized data settlement. Layer 2 (L2) rollups allow Ethereum to exponentially scale transaction execution without sacrificing its core values.



### The Traits of the Main L2 Rollup Categories

Category	Optimistic Rollups	zk Rollups
Transaction Finality	Seven days due to the arbitration period required to audit fraud proofs	12 minutes due to the mathematical assurances of zero-knowledge proofs
Transaction Costs	Lower	Higher
Compatibility with Ethereum Virtual Machine (EVM)	Easier to program	Harder to program
Security	Strong due to the economic incentives of fraud proofs	Strong due to the cryptographic proofs generated

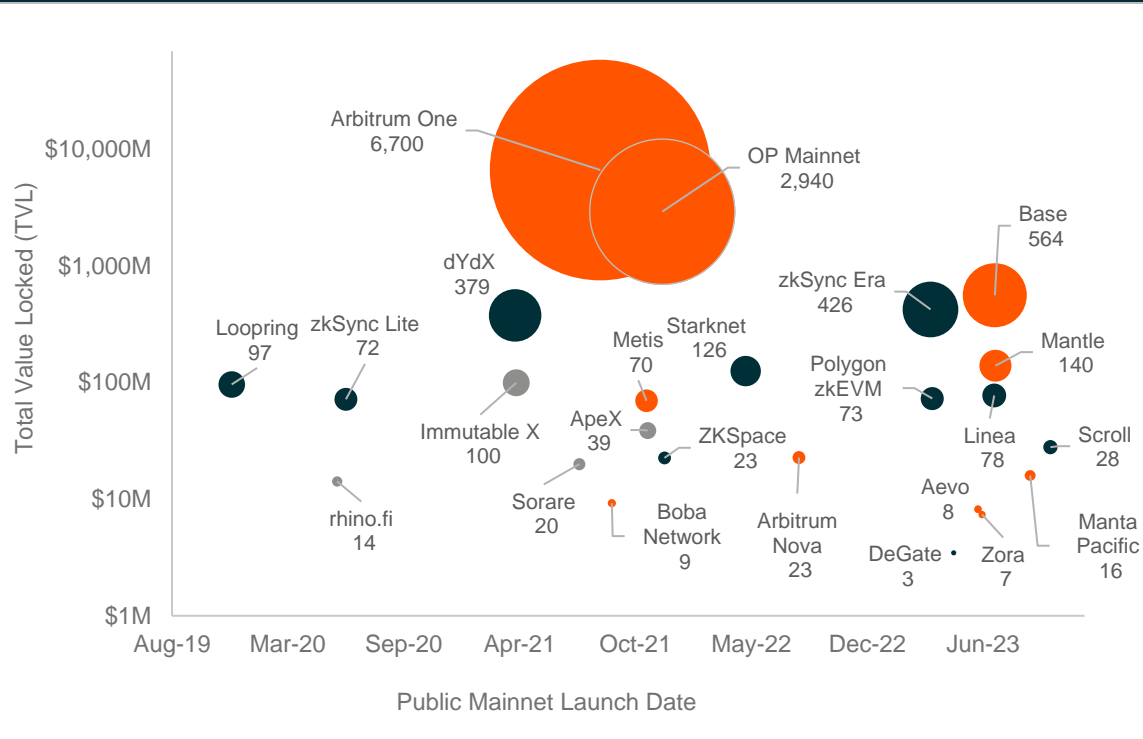
**What Are Layer 2 (L2) Rollups?** L2 rollups are a blockchain scaling solution that moves transactions off the main Ethereum blockchain (Layer 1) to improve speed and reduce fees. L2s batch multiple transactions into a single cryptographic proof and submit this aggregated data to Ethereum.

Sources: Charts: Left: L2fees.info, n.d.; EIP-4844, n.d.; Right: Blockchain Council, 2022

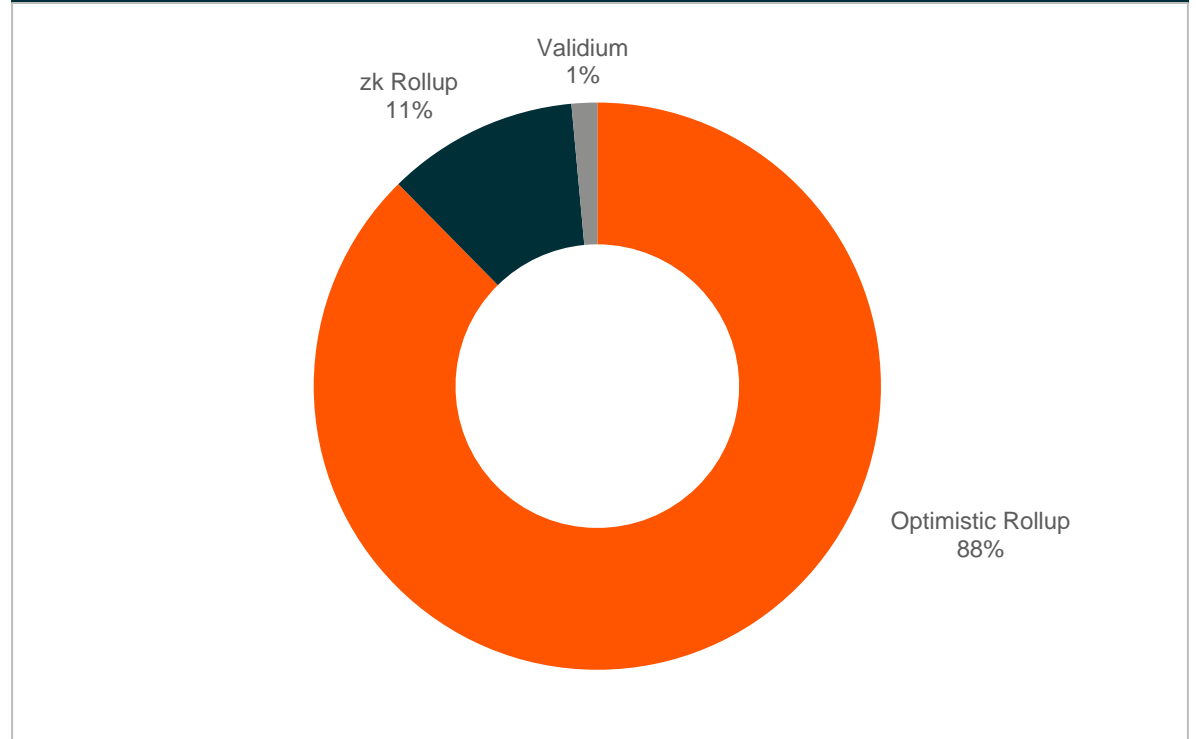
## The Race to Develop Cheap, Fast, and Secure L2 Execution Is Heating Up

Competition across the L2 ecosystem has accelerated substantially over the past two years. This competition is driving innovation, leading to diverse approaches to scaling, each tailored to different use cases.

### L2 Networks Have \$11.9B in Total Value Locked



### Optimistic Rollups Dominate, zk Rollups Gain Ground

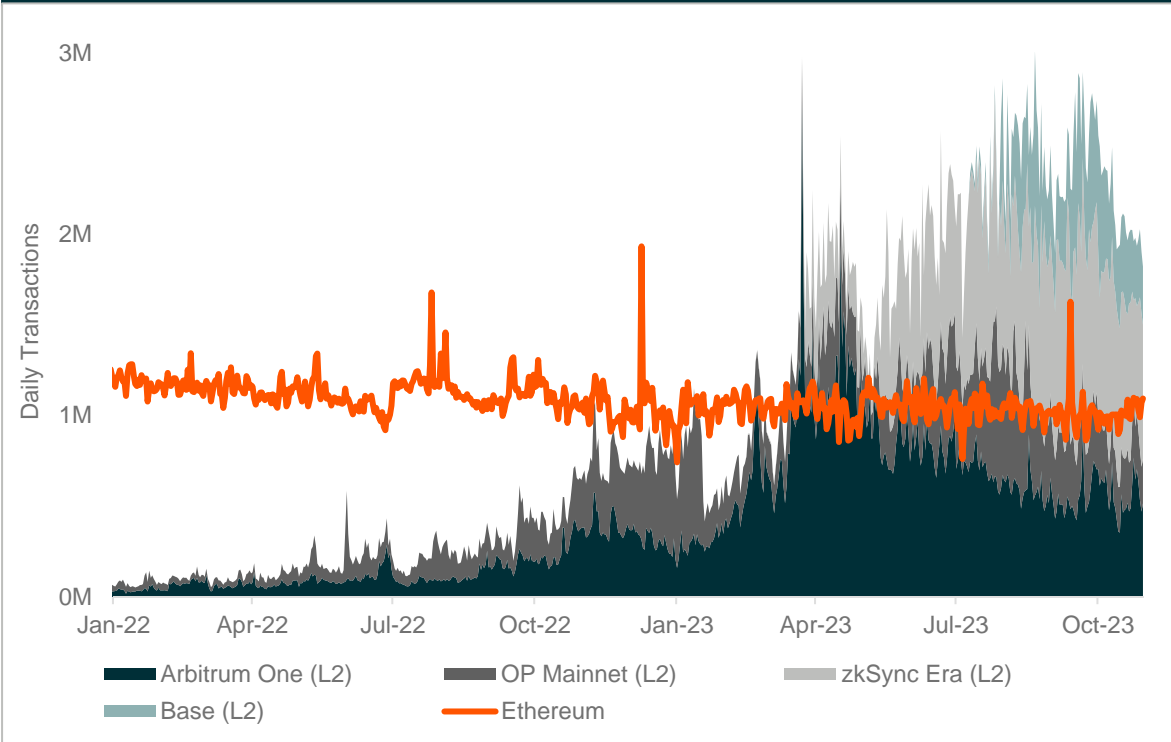


Sources: Charts: L2 Beat, n.d.

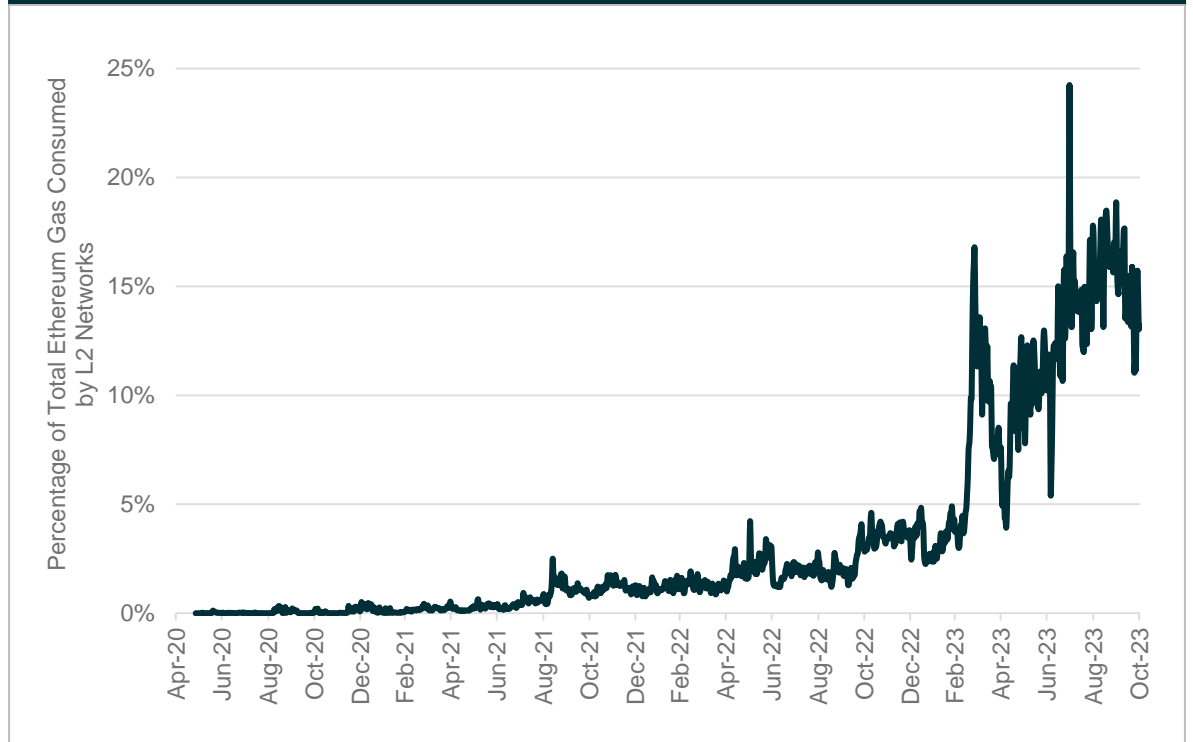
# Ethereum's Scaling Strategy Is Working as More Transactional Demand Migrates to L2 Networks

Ethereum L2s capture a growing portion of Ethereum's transaction demand, providing a boon to Ethereum's throughput. L2s have already expanded Ethereum's transactional bandwidth by more than double.

## L2s Now Execute More Transactions Than Ethereum



## L2s Utilize a Growing Share of Ethereum Compute



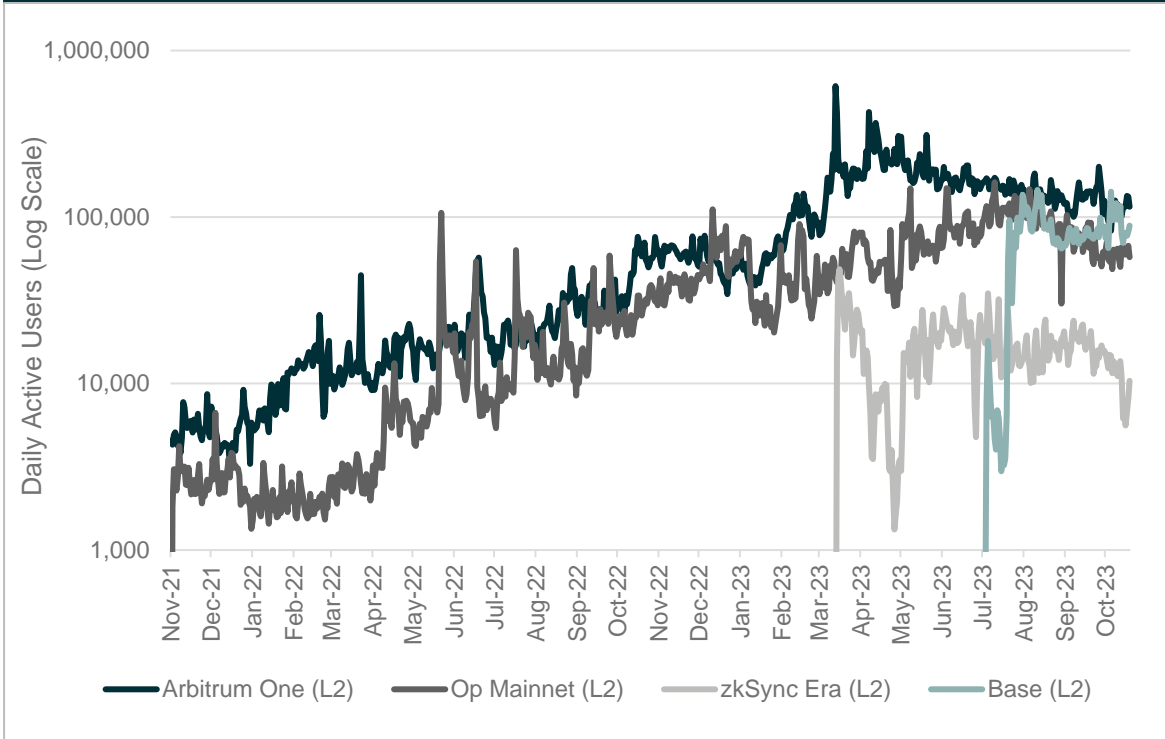
Sources: Charts: Left: Etherscan, n.d.b; Arbiscan, n.d.; Optimism, n.d.; Dune, n.d.b; Dune, n.d.c; Right: Etherscan, n.d.a; Dune, n.d.a



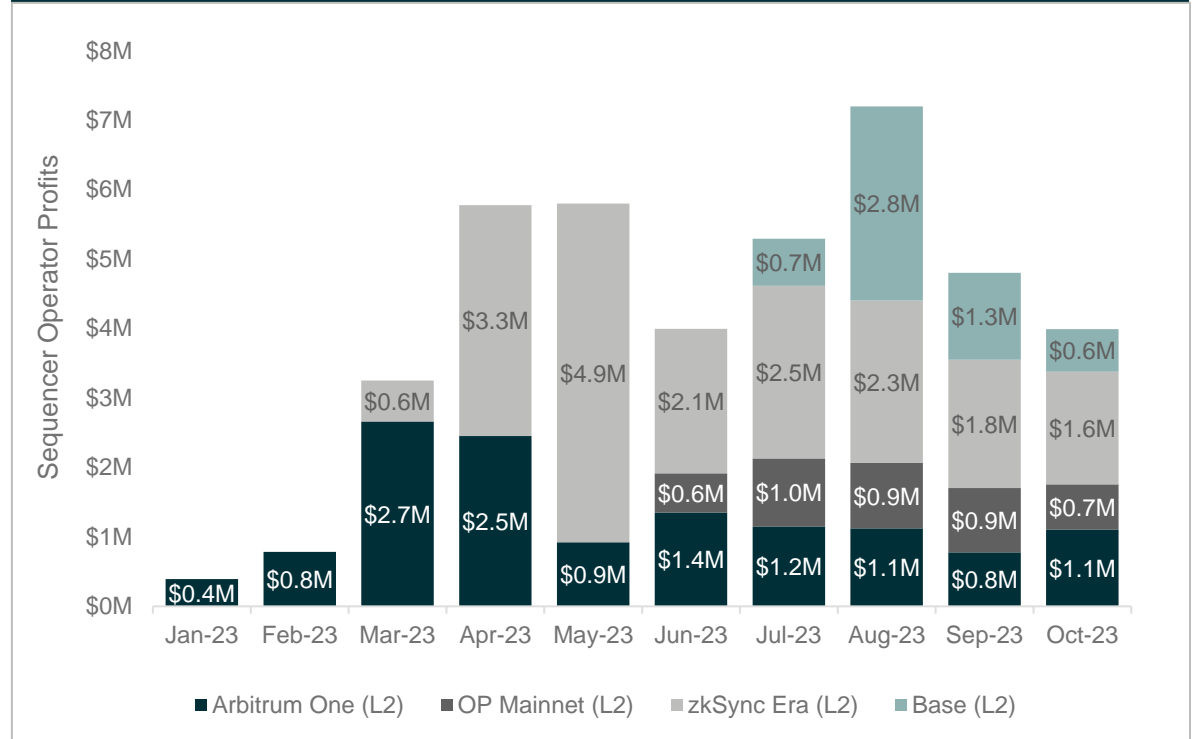
## Adoption of L2 Networks Is Driving Transactional Demand and Growing Profits

Accelerating adoption of L2 networks is driving an increased appetite to transact across the Ethereum ecosystem, leading to growing profitability of L2 operators.

### L2 User Onboarding Rates Are Accelerating



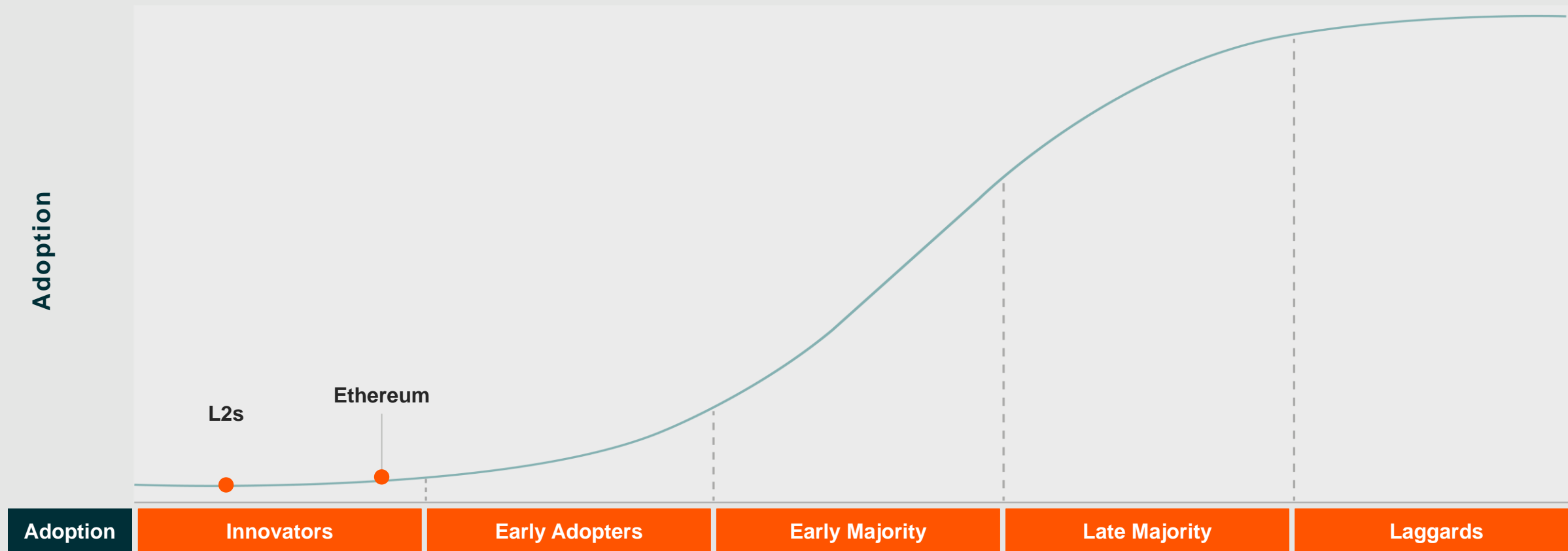
### Growing L2 Demand Drives Sequencer Profitability



Sources: Charts: Dune, n.d.a; Dune, n.d.b; Dune, n.d.c; Dune, n.d.d

## Ethereum's Blueprint: S-Shaped Curve of Adoption

Ethereum and L2s are currently in the Innovator's stage on the adoption curve, indicating that they are still in the early phases of widespread adoption and implementation.



Note: For illustrative purposes only.

## Crypto & Blockchain Quests

# Blockchain Trends

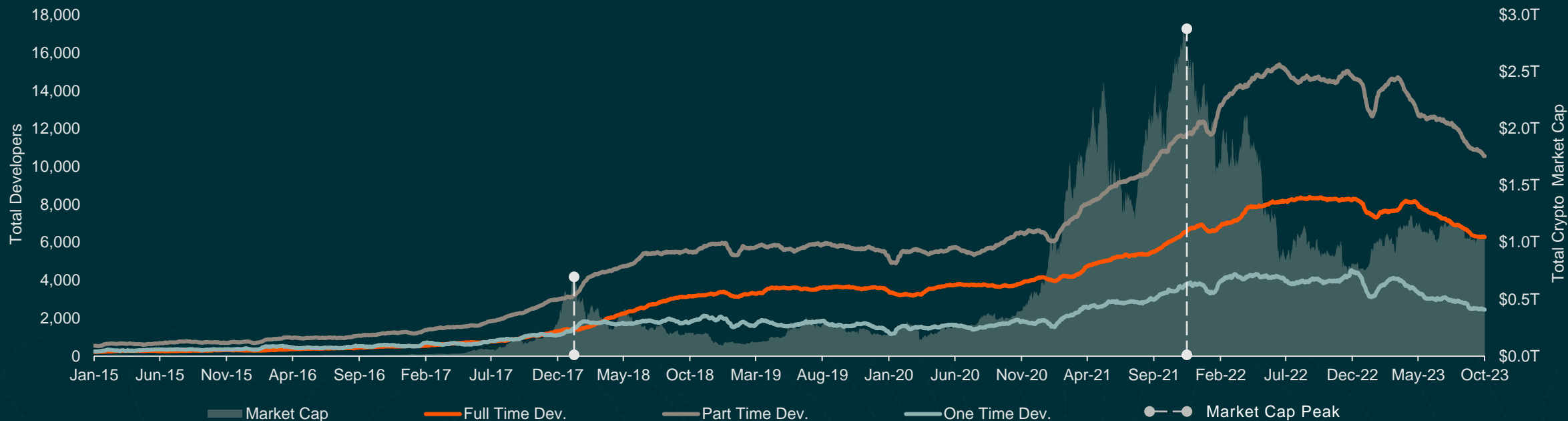
### Applications of the Technology

Blockchains are adapting to accommodate a variety of applications, fueled by growing developer engagement and infrastructure improvements that ensure cost-effective, fast, and secure computing. Decentralized finance (DeFi) applications are establishing credible alternatives for asset exchange, credit, and yield opportunities. The tokenization of real-world assets is opening the door to enhanced liquidity and capital efficiency while fundamentally transforming how ownership is represented. Beyond financial applications, consumer-oriented uses like onchain social networks, data storage, and map navigation infrastructure are broadening the scope of blockchain applications.



## Full Time Developer Activity Remains Unchanged Since the Peak of the Market in Q4 2021

Software developers are invaluable in driving innovation and long-term growth of crypto ecosystems. Code commitments from full-time developers have been resilient and steadily rising through market cycles.



Performance 12 Months Post-Market Cap Peak

January 6, 2018 – January 6, 2019

November 7, 2021 – November 7, 2022

Full Time Developer Growth

131%

28%

Market Cap Growth

-82%

-70%

Sources: Charts: Developer Report, n.d.; TradingView, n.d.

## Global Brands Are Progressing Beyond Blockchain Experimentation

Raghu Yarlagadda

Global brands are no longer just exploring blockchain technology. They are also leveraging it as a strategic tool to enhance business operations, build new revenue segments, and create innovative customer experiences.



### Supports Building on Ethereum

EY is pioneering an Ethereum-based carbon emission tracking platform and contributing to zero-knowledge tech to enable privacy-preserving features on public blockchain networks.



### Tests Tools to Simplify Crypto UX

Visa deploys its first paymaster smart contract on the Ethereum Goerli testnet, demonstrating its commitment to investing in account abstraction research.



### Unveils USD Stablecoin on Ethereum

PayPal is the first major U.S. financial institution to launch a dollar-backed stablecoin with the goal of streamlining digital payments.



### Generates \$185M in NFT Sales Since 2021<sup>1,2</sup>

Nike's NFTs can be used to unlock exclusive content and experiences, such as early access to new products and virtual events.



### Enables USDC Payments & Token-Gated Sites

Solana Pay integrates with Shopify to enable USDC payments. Also, Shopify is experimenting with token-gated websites.



### Launches Ethereum Layer 2 Network

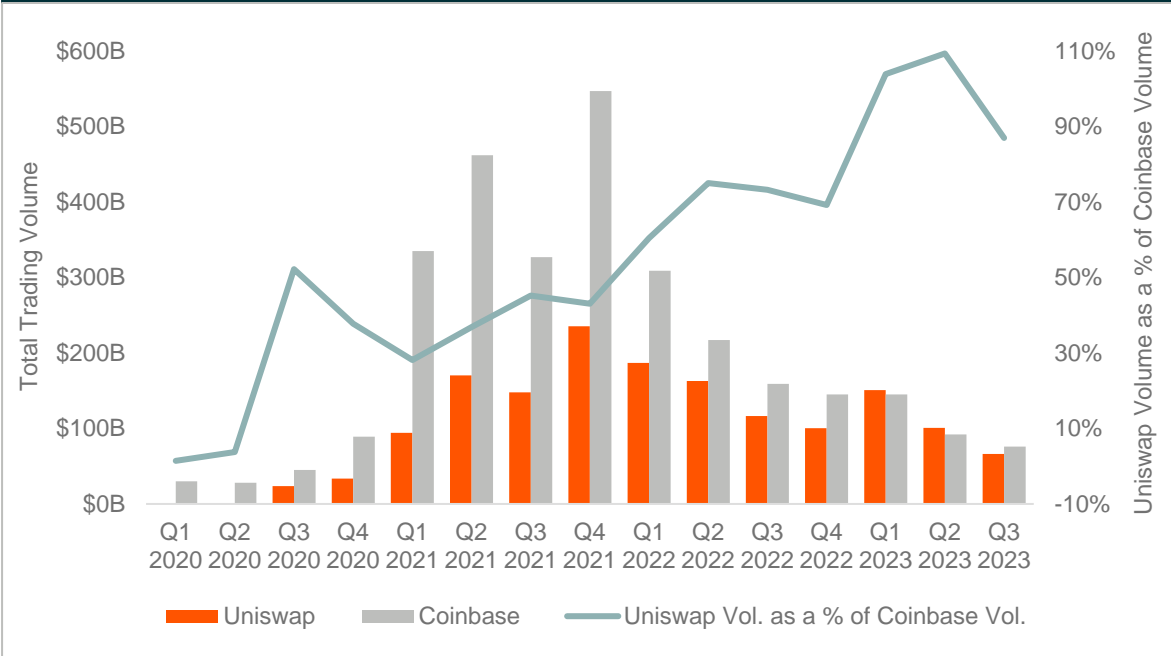
Coinbase's first-of-its-kind Ethereum layer 2 (L2) blockchain, Base, is designed to improve Ethereum's scalability and user experience.

Sources: Text: 1. Blockworks, 2022; 2. Dune, n.d.

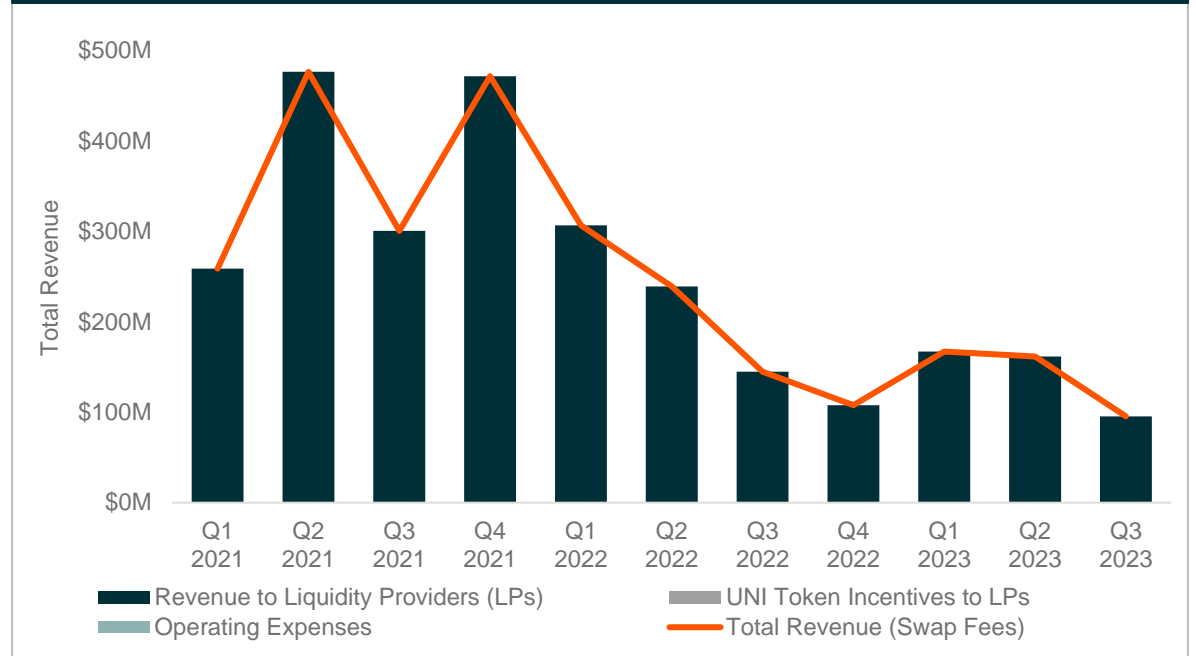
## Uniswap Emerges as a Legitimate Competitor to Centralized Exchanges

A decentralized application (dapp) on Ethereum, Uniswap is a leading global crypto exchange that facilitates hundreds of billions of dollars of trading volume every quarter, surpassing most centralized exchanges.

### Uniswap Achieves Similar Volumes to Coinbase



### Uniswap Trading Fees Accrue to Liquidity Providers



### Uniswap Facilitates Onchain Asset Exchange

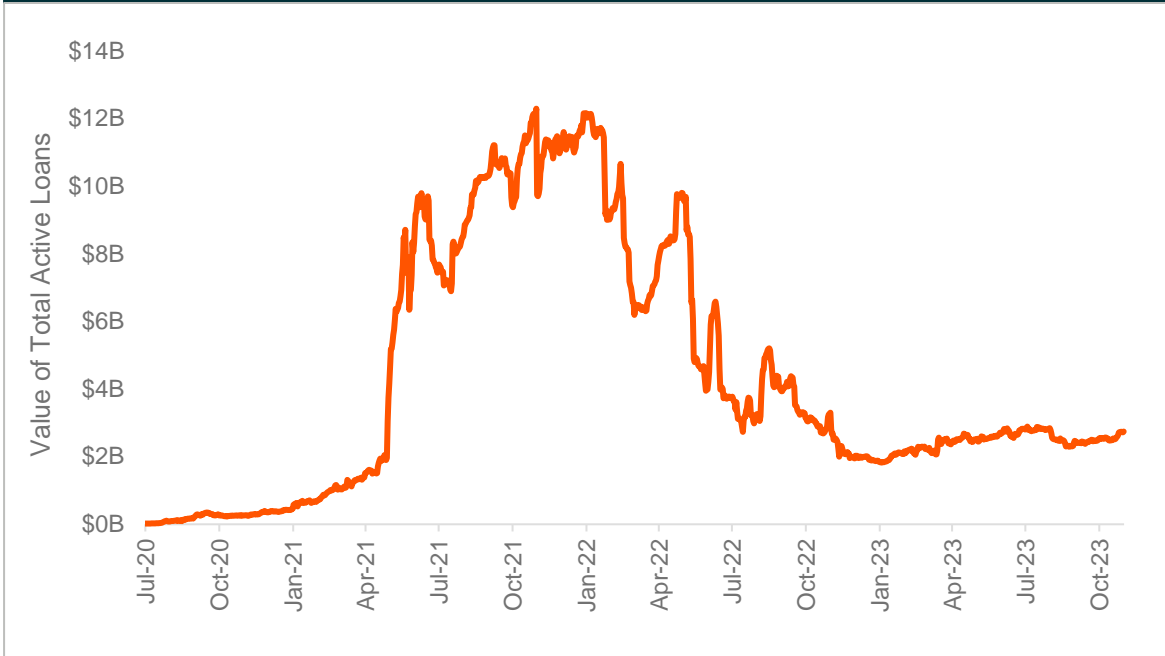
Uniswap is a premier decentralized exchange protocol. It employs liquidity pools and a constant product function to form an automated market maker (AMM) system that enables anyone to provide liquidity without intermediaries or a traditional order book.

Sources: Charts: Left: Coinbase, 2023; DefiLlama, n.d.; Right: Token Terminal, n.d.

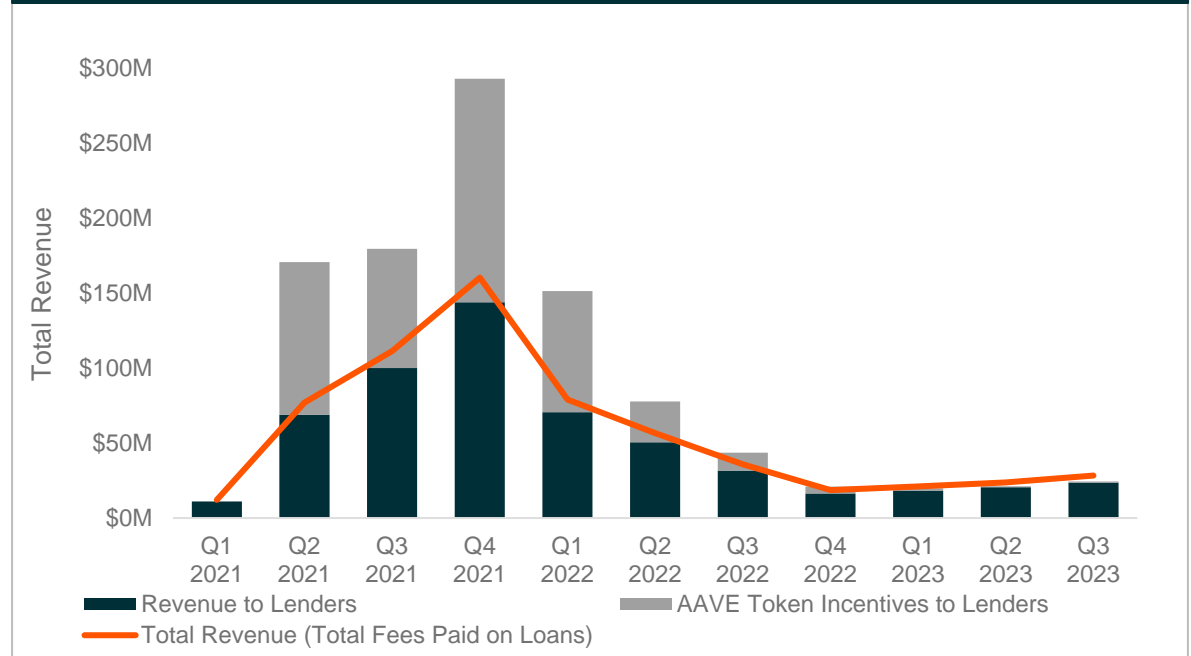
## Aave Is the Leader in Decentralized Borrowing

Even amid a contraction in lending activity during the crypto bear market, Aave continued to facilitate billions of dollars of loans, underscoring its resilience and the global appeal of permissionless borrowing.

### Aave Has Over \$2B in Active Loans



### Aave Gives Most of Borrower's Interest Payment to Lenders



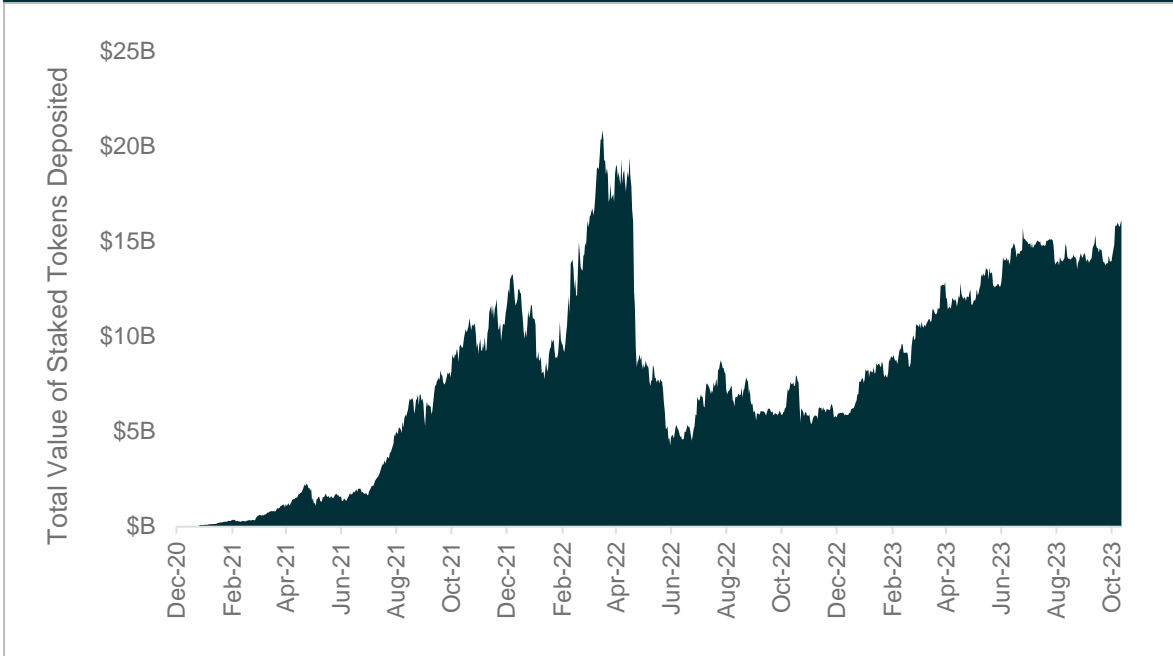
**Leader in Decentralized Lending & Borrowing** Aave links yield seekers with onchain liquidity providers, offering a cost-effective, globally accessible lending protocol. It minimizes credit risk by eliminating intermediaries, utilizing smart contracts, and over-collateralizing loans with digital assets.

Sources: Charts: Left: DefiLlama, n.d.; Right: Token Terminal, n.d.

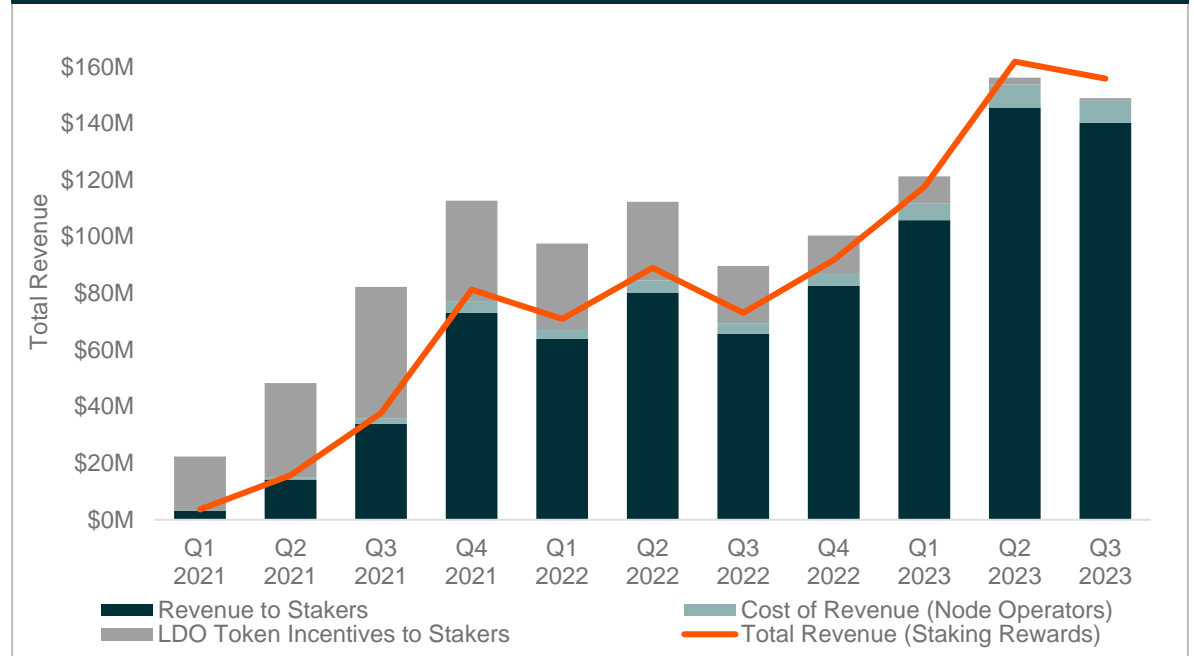
# Lido Is the Leading Liquid Staking Platform, Managing Over \$13 Billion of Staked ETH

Ethereum’s transition to PoS gave rise to staking-as-a-service. Lido, a DeFi protocol, highlights the growing demand for DeFi-native services over centralized solutions.

## Lido Now Manages Over 70% of Global Liquid Staking Value



## Lido Gets a Cut from Staking Rewards



### Lido Enables Liquidity for Staked Tokens

Lido users stake their assets on a Proof-of-Stake (PoS) blockchain and receive a tokenized receipt that represents their staked assets. This feature makes earning rewards easy because users avoid having to lock assets or manage hardware infrastructure.

Sources: Charts: Left: DefiLlama, n.d.; Right: Token Terminal, n.d.



# Content Ownership and Digital Identity Are in Their Early Days

Raghu Yarlagadda

Although many crypto use cases today are financial, non-financial applications are beginning to proliferate, highlighting the ubiquitous potential of this technology.



**121,000**

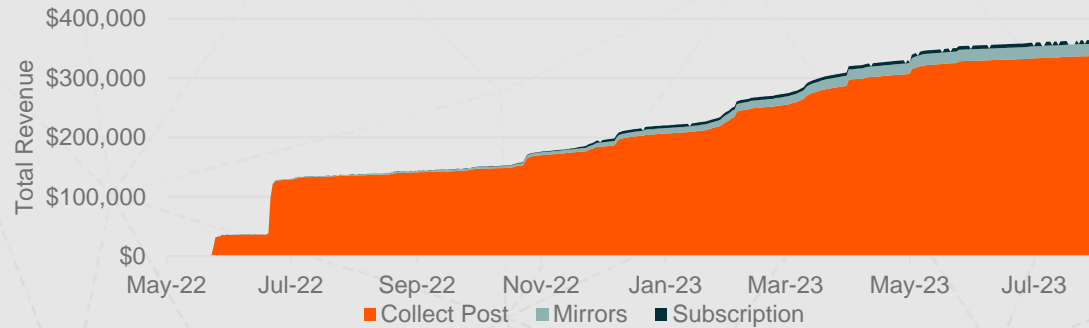
Unique Profile Owners on Lens (Closed Beta)<sup>1</sup>



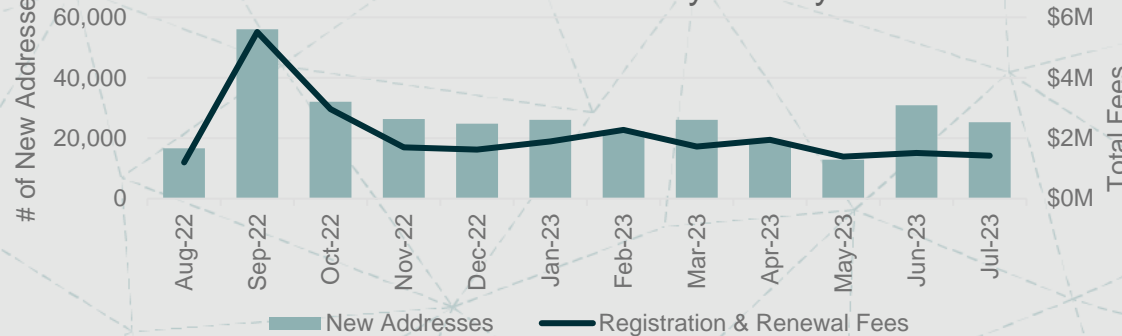
**2,586,281**

Number of Active ENS Names<sup>2</sup>

Lens (Closed Beta) Creator Revenue Breakdown



ENS Domains Monthly Activity



## A New Digital Social Paradigm

- Lens Protocol is a decentralized social graph that empowers users to have greater control over their personal data and social interactions.
- Lens' popular Collect feature allows creators to tokenize and monetize content. Collect introduces new avenues for creators to engage with their followers and for followers to directly support creators.

## Reducing Onchain Identity Complexity

- The Ethereum Naming Service (ENS) is a decentralized domain naming system that maps human-readable names (e.g., John.eth) to machine-readable identifiers such as a crypto wallet address. ENS is the crypto proxy for the Domain Naming Service (DNS) that associates human-readable names with IP addresses, simplifying internet navigation and accessibility.

Sources: Text: 1. Dune, n.d.a; 2. Dune, n.d.b; Charts: Dune, n.d.a; Dune, n.d.b; Token Terminal, n.d.

# Crowdsourcing Resources Using Blockchains Enables Novel Applications

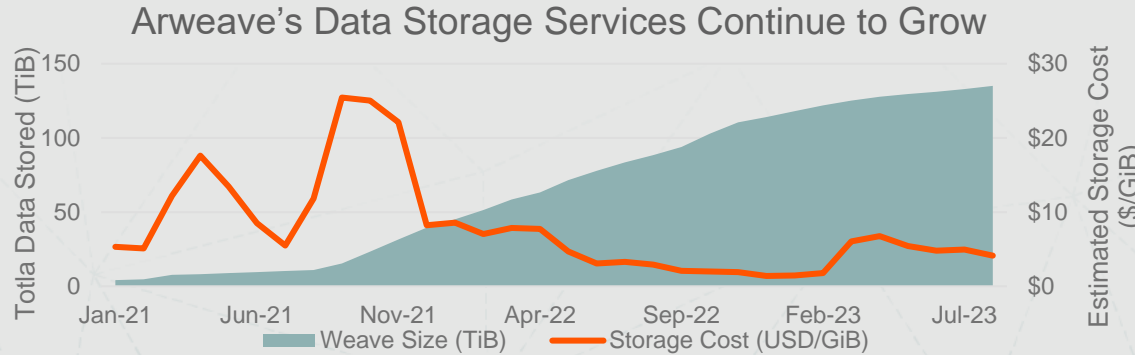
Raghu Yarlagadda

Protocols are exploring new ways to use the security properties of public, open-source blockchains to drive innovation across industries.



**120 TiB +**

Decentralized & Permanent Data Storage<sup>1</sup>



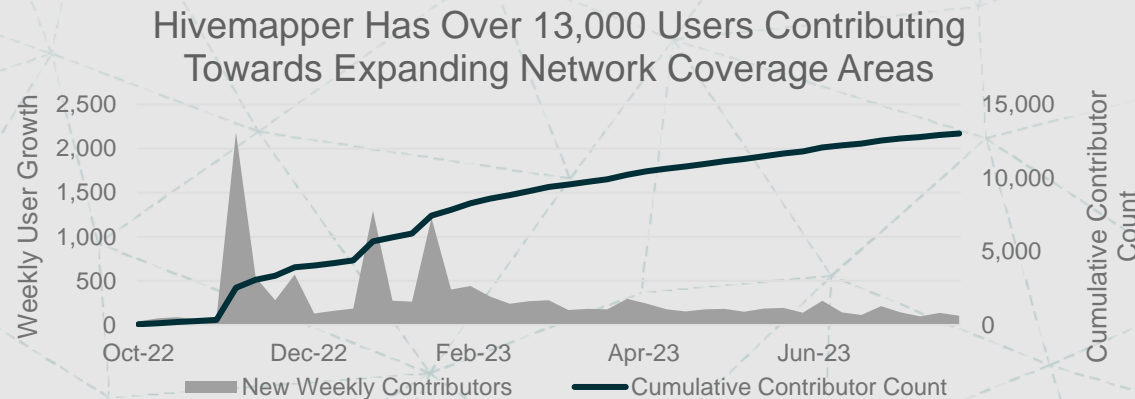
## Revolutionizing Data Storage Onchain

- Arweave is a blockchain-based data store platform that makes permanent and tamper-proof data storage possible for a single, one-time fee.
- Arweave relies on a decentralized network of miners to secure the protocol and ensure that data remain accessible and immutable over time. Arweave is an attractive option for archiving and securing information in a censorship-resistant manner.



**5,191,745**

Unique Kilometers of Roads Mapped Globally<sup>2</sup>



## Crypto-Incentivized AI-Powered Mapping

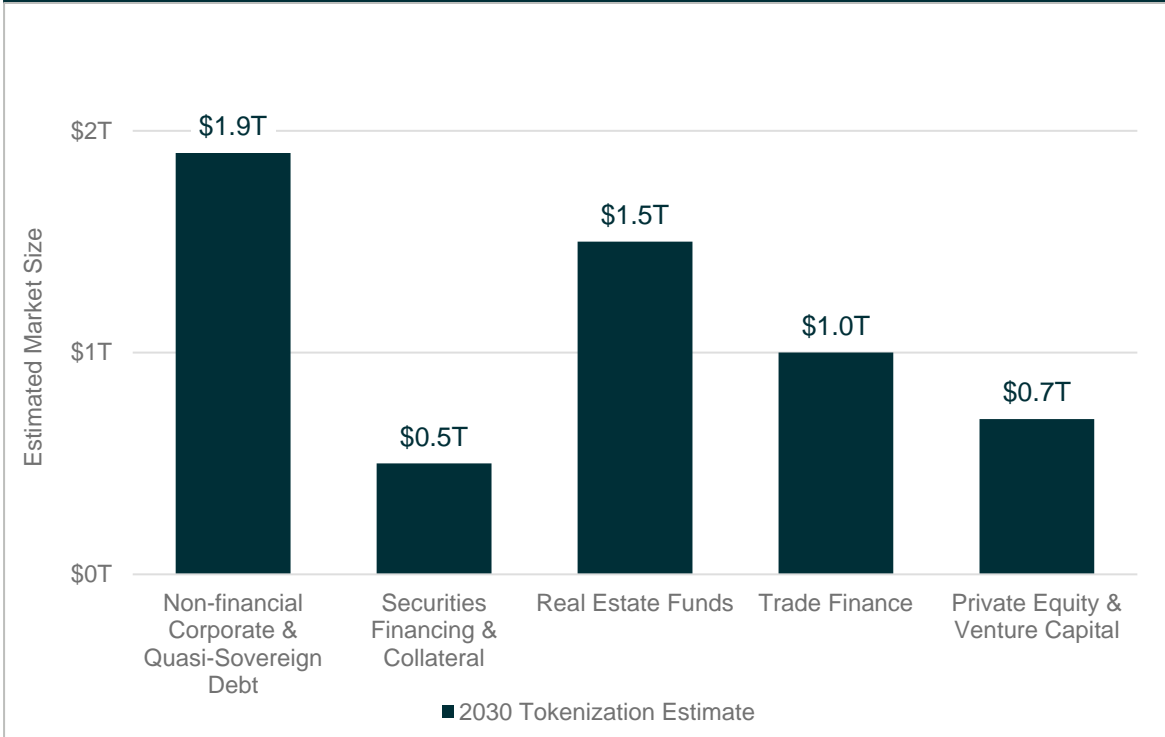
- Hivemapper is a decentralized mapping network built on the Solana blockchain that uses dashcam imaging and artificial intelligence to create frequently-updated 3D maps of the physical world.
- Hivemapper relies on a network of contributors to provide low-cost and frequently updated imaging. It can also set bounties for target regions, making it a constantly expanding resource.

Sources: Text: 1. ViewBlock, n.d.; 2. Hivemapper, n.d.; Charts: Dune, n.d.; ViewBlock, n.d.; CoinGecko, n.d.

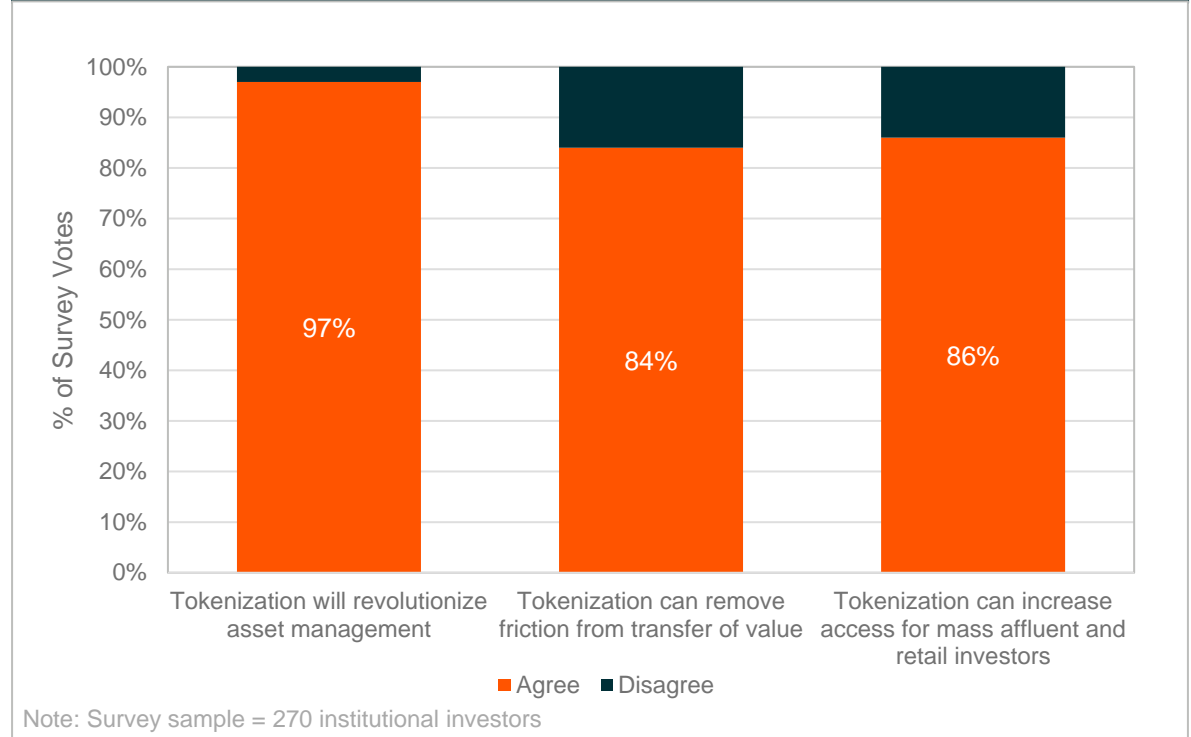
# Tokenization of Financial Assets Is Expected to Drive Millions of Users to Blockchain Ecosystems

Tokenization is likely to be a powerful catalyst for blockchain adoption, with the market for tokenized financial assets expected to grow from under \$1 billion today to \$4 trillion by 2030.<sup>1</sup>

## Tokenization Is Expected to Play a Role in Financial Markets



## Investors Acknowledge the Potential for Asset Tokenization

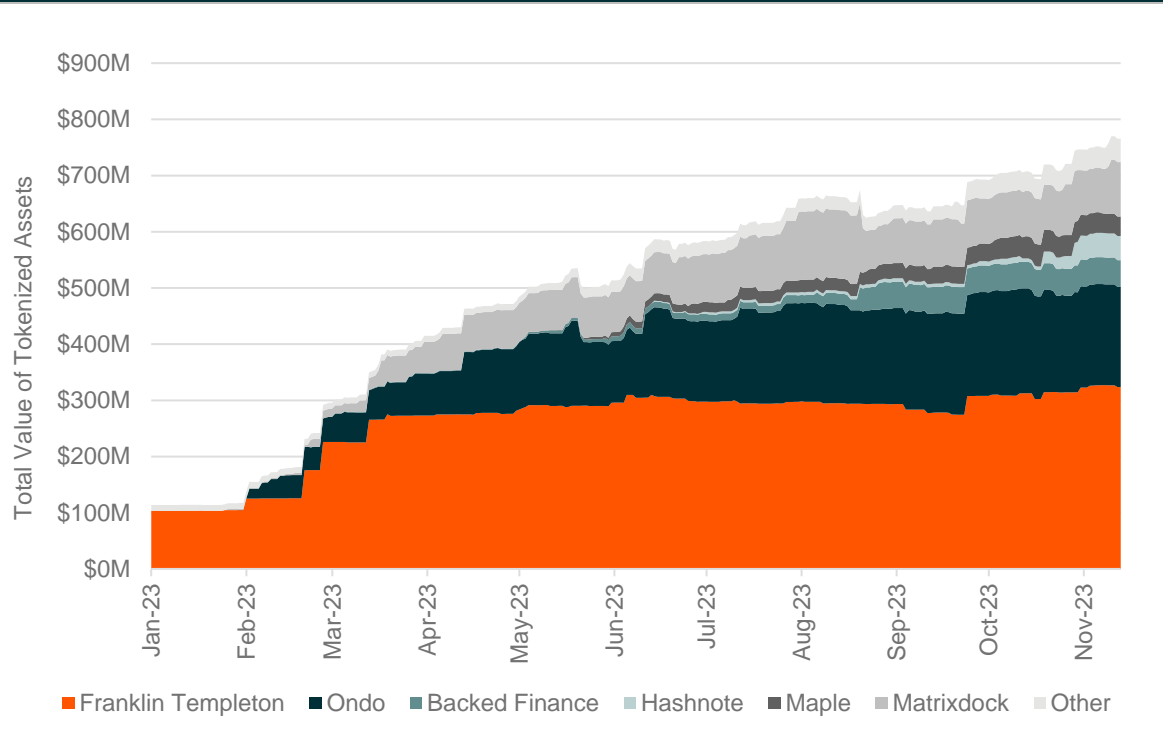


Sources: Text: 1. Citi, 2023; Charts: Left: Citi, 2023; Right: BNY Mellon, 2022

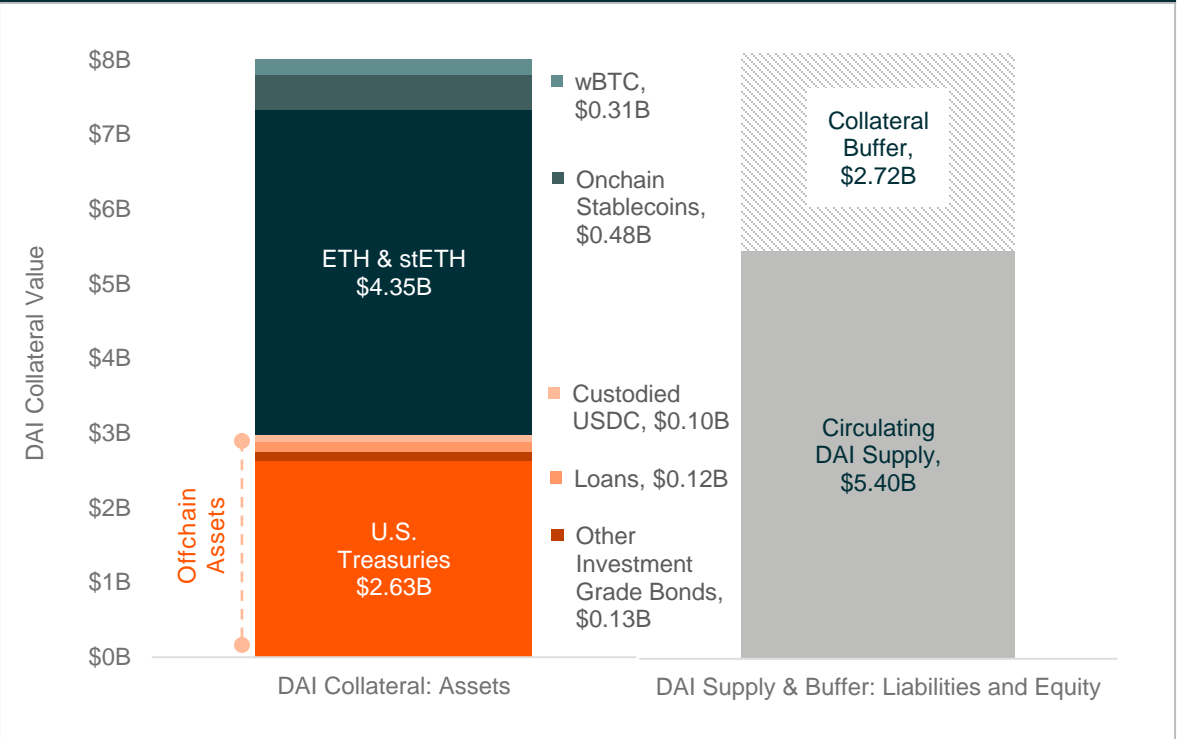
## Blockchain Applications Start to Intersect with Traditional Fixed Income Opportunities

Fixed income products are finding synergies with blockchain platforms, broadening market possibilities by providing onchain access to their current yield opportunities and bolstering the resilience of crypto-native stablecoins.

### Over \$700M Tokenized U.S. Treasuries Offering a ~5.2% YTM



### ~\$2.63B of U.S. Treasuries Back ~32% of DAI's Peg to USD



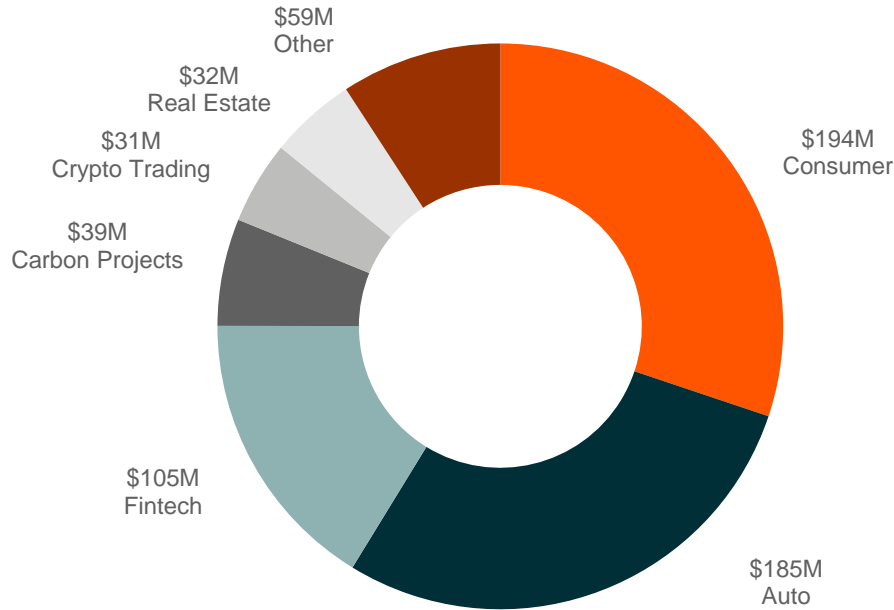
Note: Yield-to-maturity (YTM) is the total return anticipated on a bond if the bond is held to maturity. The average YTM refers to the weighted average of all tokenized treasury product tokens in circulation.

Sources: Charts: Left: RWA.xyz, n.d.; Right: Makerburn, n.d.

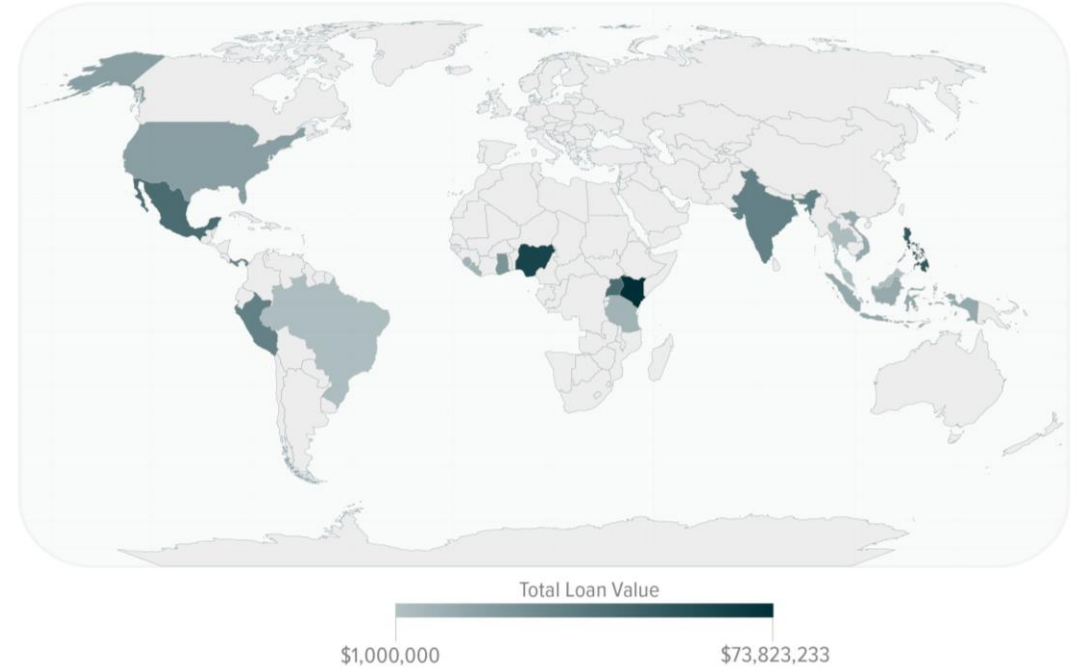
## Private Credit Is a Growing Segment of DeFi

Blockchains' ability to coordinate capital is boosting capital efficiency within private credit. The growth of this market broadens access to credit for businesses around the world and reduces the friction of investing in private credit.

### Active Onchain Private Credit Loans Exceed \$640M



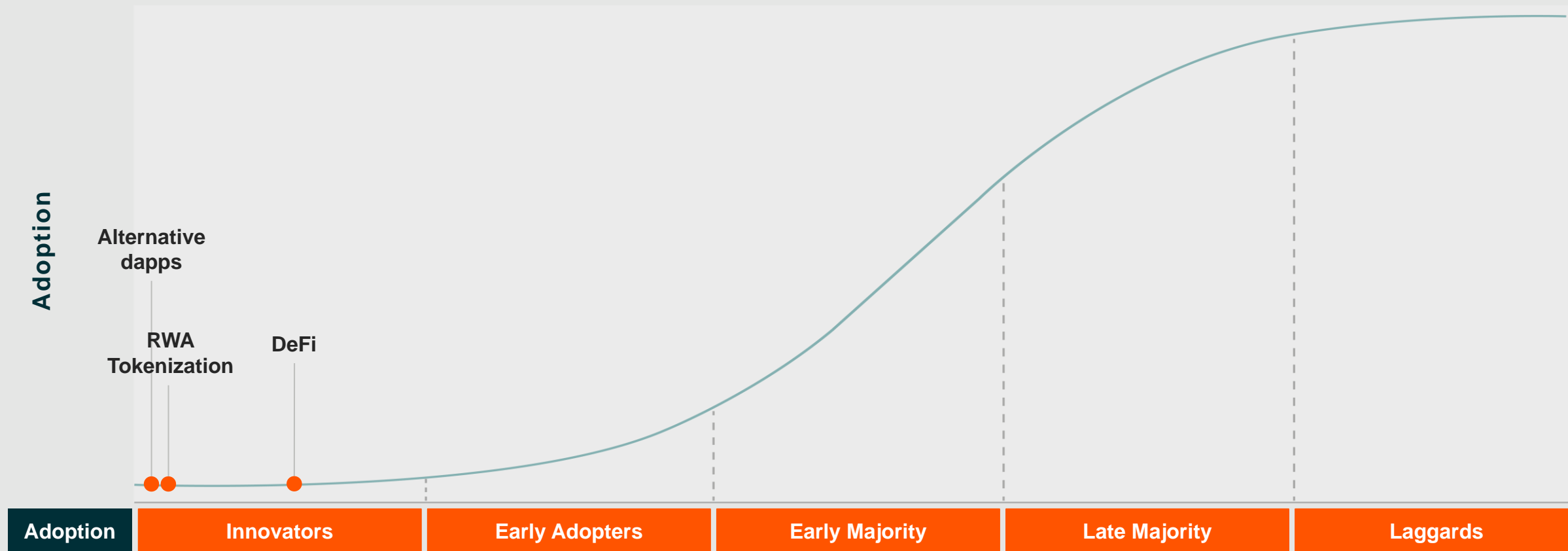
### Private Credit Loan Distribution by Borrower Location



Sources: Charts: RWA.xyz, n.d.

## Blockchain Trends: S-Shaped Curve of Adoption

DeFi, alternative dapps, and real-world asset tokenization are at the frontier of the adoption curve in the innovation stage, illustrating just how early they are in the process of gaining widespread acceptance.



Notes: For illustrative purposes only. RWA Tokenization excludes stablecoins.

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# Appendix: Unlocking Digital Assets

# Unlocking Digital Assets: Alternative Currencies & Stores of Value – Sources

## Multiple Catalysts Encourage Crypto Adoption

- Chainalysis. (2023, October 31). The Chainalysis 2023 Geography of Cryptocurrency Report.
- International Monetary Fund. (n.d.). Consumer Price Index (CPI). Accessed on November 1, 2023.
- The World Bank. (n.d.a). Account Ownership at a Financial Institution or with a Mobile-Money-Service Provider (% of Population Ages 15+). Accessed on November 1, 2023.
- The World Bank. (n.d.b). Individuals Using the Internet (% of Population). Accessed on November 1, 2023.

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- Bloomberg. (n.d.). ARSUSD (Argentinean Peso), TRYUSD (Turkish Lira), VESUSD (Venezuelan Bolivar), LBPUSD (Lebanese Pound), and NGNUSD (Nigerian Naira) USD Exchange rates. Accessed on November 1, 2023.
- Chainalysis. (2022, September 14). The Chainalysis 2022 Geography of Cryptocurrency Report.
- TradingView. (n.d). USDCUSD (Circle's USD Coin - Crypto). Accessed on November 1, 2023.

## Stablecoins Reduce the Cost of Global Remittance Payments by Orders of Magnitude

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## Stablecoins Have Emerged as an Efficient Rail for Global Money Transmission

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- DeFiLlama. (n.d.). Stablecoins. Accessed on November 1, 2023.

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- Bloomberg. (n.d.). BTCUSD Bloomberg Bitcoin Galaxy Index, ARSUSD, TRYUSD, and LBPUSD Exchange Rates Compared to BTC Between September 1, 2018, and September 30, 2023. Accessed on November 1, 2023.
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- Our World in Data. (n.d.). Gold Production, 1681 – 2015. Accessed on August 1, 2023.
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- Glassnode. (n.d.). Bitcoin: Issuance [BTC]. Accessed on August 1, 2023. (Percent). Accessed on August 1, 2023.

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- Glassnode. (n.d.). Bitcoin: Circulating Supply [BTC]. Data accessed on October 31, 2023
- The Wall Street Journal. (2018, July 5). A Fifth of All Bitcoin Is Missing. These Crypto Hunters Can Help.
- Unchained. (2023, January 17). Bitcoin Data Science (Pt. 2): The Geology of Lost Coins.
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# Unlocking Digital Assets: Alternative Currencies & Stores of Value – Sources

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- Glassnode. (n.d.). BTC: Addresses with Balance  $\geq 0.01$ , BTC: Addresses with Balance  $\geq 1$ , BTC: Addresses with Balance  $\geq 10$ , and BTC: Exchange Balance. Accessed on November 1, 2023.

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### Chart

- Glassnode. (n.d.). Bitcoin: Halving Event - Market Valuation Growth & Market Cap. Accessed on November 1, 2023.

## Valuing Bitcoin's Scarcity Using Stock-to-Flow

- Glassnode. (n.d.). Bitcoin: Circulating Supply [BTC], Bitcoin: Issuance [BTC], and Bitcoin: Price [USD]. Accessed on November 1, 2023.

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# Appendix: Ethereum's Blueprint

# Ethereum's Blueprint: Exploring Infrastructure Upgrades – Sources

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## Ethereum's New Security Model Gives Rise to the Internet Bond

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- Dune. (n.d.). Hilldobby ETH Stakers Dashboard. Accessed on November 9, 2023.
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- Glassnode. (n.d.). Ethereum: Total Transaction Fees [ETH], Ethereum: Burn Rate (Base Fee) [ETH], Ethereum: Tips (Priority Fee) [ETH], Ethereum: Issuance [ETH], Ethereum: Mean Transaction Gas Limit, Ethereum: Number of Active Addresses, Ethereum: Price [USD], Ethereum: Market Cap [USD], and Ethereum: Circulating Supply [ETH]. Accessed on August 1, 2023.

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- EIP-4844. (n.d.). Proto-Danksharding. Accessed on November 1, 2023.
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- L2 Beat. (n.d.). Value Locked (Sum of All Funds Locked on Ethereum Converted to USD). Accessed on August 14, 2023.

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## **Ethereum's Scaling Strategy Is Working as More Transactional Demand Migrates to L2 Networks (continued)**

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# Appendix: Blockchain Trends

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## Lido Is the Leading Liquid Staking Platform, Managing Over \$13 Billion of Staked ETH

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### Charts

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## Tokenization of Financial Assets Is Expected to Drive Millions of Users to Blockchain Ecosystems

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## Blockchain Trends: Applications of the Technology – Sources

### Tokenization of Financial Assets Is Expected to Drive Millions of Users to Blockchain Ecosystems (continued)

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