Bitcoin Policy Institute

July 5, 2022

International Trade Administration
U.S. Department of Commerce
1401 Constitution Ave, NW Washington, DC 20330

Re: Request for Comment on Developing a Framework on Competitiveness of Digital Asset Technologies *(RIN: 0625-XC04)*

The internet is changing society's relationship with money as profoundly as it has with information. To ensure sound policy, the U.S. needs rigorous research that moves past hype and cynicism alike. The Bitcoin Policy Institute is a non-partisan, non-profit research center working to study the policy and societal implications of emerging monetary networks. Our researchers include economists, lawyers, climate scientists, philosophers, and technologists with decades of combined experience studying bitcoin and digital assets. We are pleased to submit the following report[1] to the ITA.

After a brief primer on the essential and uniquely valuable features of bitcoin, we explore implications for US interests in (1) Financial Inclusion and Consumer Welfare, (2) Competitiveness, (3) National Security, and (4) Mining and Energy. We conclude with broad policy principles and recommendations.

[1] Significant portions of this report borrow from an upcoming BPI paper, "Neutral Money", which explains in more depth bitcoin's unique place among digital assets, and our whitepaper "Bitcoin and U.S. National Security".

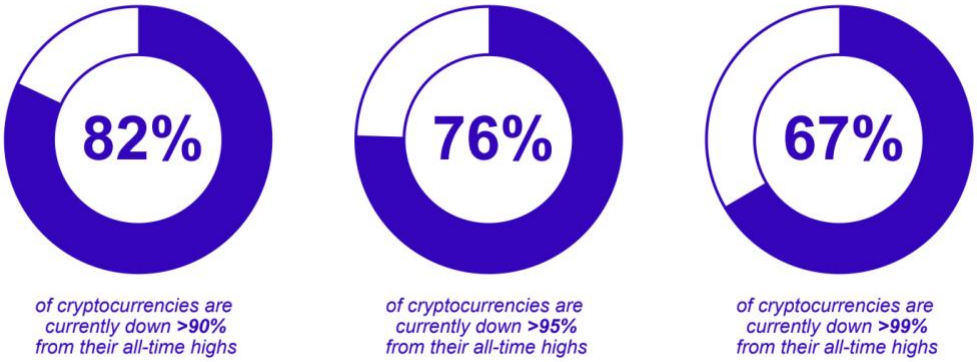
Introduction

The internet has enabled a dynamic payments ecosystem, where public and private monies interoperate and offer consumers safety and innovation, respectively. In a single morning, we may buy coffee with a credit card and breakfast with cash before tapping our phone to ride the subway or pay a friend with Cash App. Between the growth of fintech and the proliferation of cryptocurrencies, Americans now have access to diverse protocols for transferring value. These protocols come with tradeoffs, including transaction and settlement speed, cost, interoperability, coverage, accessibility, privacy, volatility, monetary policy, transparency in monetary policy governance, user rights, counterparty risk, and security.

At the time of writing, the cryptocurrency market has crashed roughly 70% from its peak total capitalization of $2.95 trillion. This has happened before. After reaching $15 billion dollars in 2013, the total market capitalization of cryptocurrencies declined 77%. From there, the market rose by roughly 24,600% to $830 billion in 2017 before falling 87%. Now, the cryptocurrency market sits just above its 2017 highs at $860 billion. Amidst this decline and further risks from contagion in the

markets, some onlookers are once again declaring the "death of crypto." This prediction is unlikely to be true. We very rarely, if ever, un-invent technology.

Since the advent of bitcoin in 2009, debates over blockchains and cryptocurrencies have abounded from online forums and Silicon Valley to Wall Street and Washington D.C. Today, there are 13,000-19,000 cryptocurrencies which vary in form, function, purpose, and regulatory status. The majority become worthless after a few years. Analyzing data from May 2013 to July 2022, we find that 67% of cryptocurrencies have lost more than 99% of their maximum value. It is worth noting that this analysis studied 12,614 coins and excluded the 4,391 tokens that have never exceeded a value of $0.01, making our estimates quite conservative.



Despite these findings, the still-nascent industry has driven genuine innovation in the fields of cryptography and computer science. This report focuses primarily on bitcoin, the oldest and largest digital asset. While a comprehensive framework on digital assets will require thorough examination of the industry overall, we believe that bitcoin warrants particular consideration given its size and relevance, level of decentralization, immutability, function as digital property, and unique utility as a value transfer protocol.

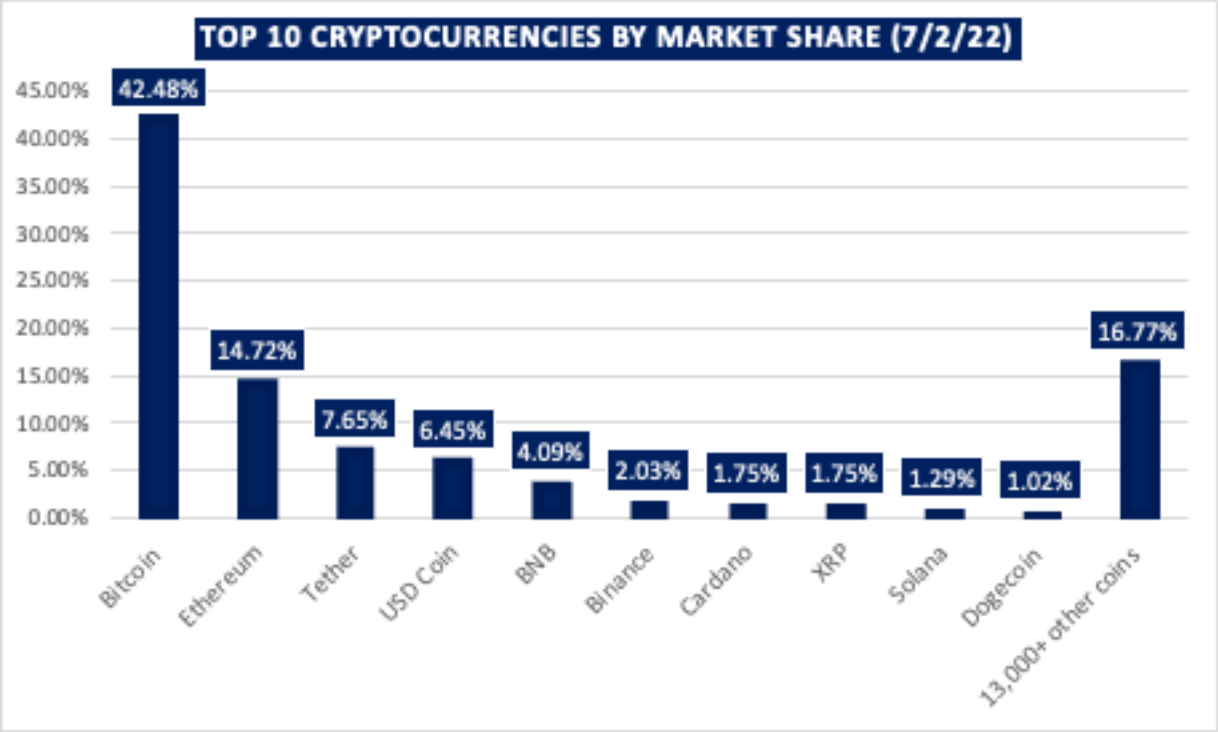
What is Bitcoin?

Bitcoin offers payments that achieve nearly instant final settlement, anywhere in the world. It does this without the need for centralized intermediaries to oversee, settle, and clear transactions. Transactions are conducted using the network's native asset, which is also called bitcoin. Software automates the network's monetary policy, ensuring a fixed rate of issuance and supply cap.

The protocol applies a mechanism of distributed consensus secured by Proof of Work (PoW). "Miners" are special purpose computers that run the bitcoin software and compete to publish the next valid block of transactions onto the ledger by making a large number of computationally intensive guesses, or "hashes." When a miner successfully produces a valid block they earn that block's transaction fees, as well as a predefined amount of bitcoin. Every two weeks, the software automatically adjusts the difficulty of the competition based on the total computational intensity of miners in order to keep the rate of new blocks at roughly ten minutes. Essentially, it is as if a gold mine made it harder to dig the more people tried to dig, adjusting this difficulty to ensure the amount of newly mined gold stayed constant. These dynamics make Bitcoin mining close to a perfectly competitive market and drive miners to seek the most energy efficient and cheapest (often wasted or non-marketable) forms of power.

What Sets Bitcoin Apart?

Size and Relevance



Source: CoinMarketCap, July 2 2022, https://coinmarketcap.com/charts/

Currently, Bitcoin accounts for nearly 43% of the total value of all cryptocurrencies. Within the broader market, Bitcoin is treated as the foundational asset, used as the most demanded form of collateral, and the measure by which other tokens reference their relative increase or decrease in value.

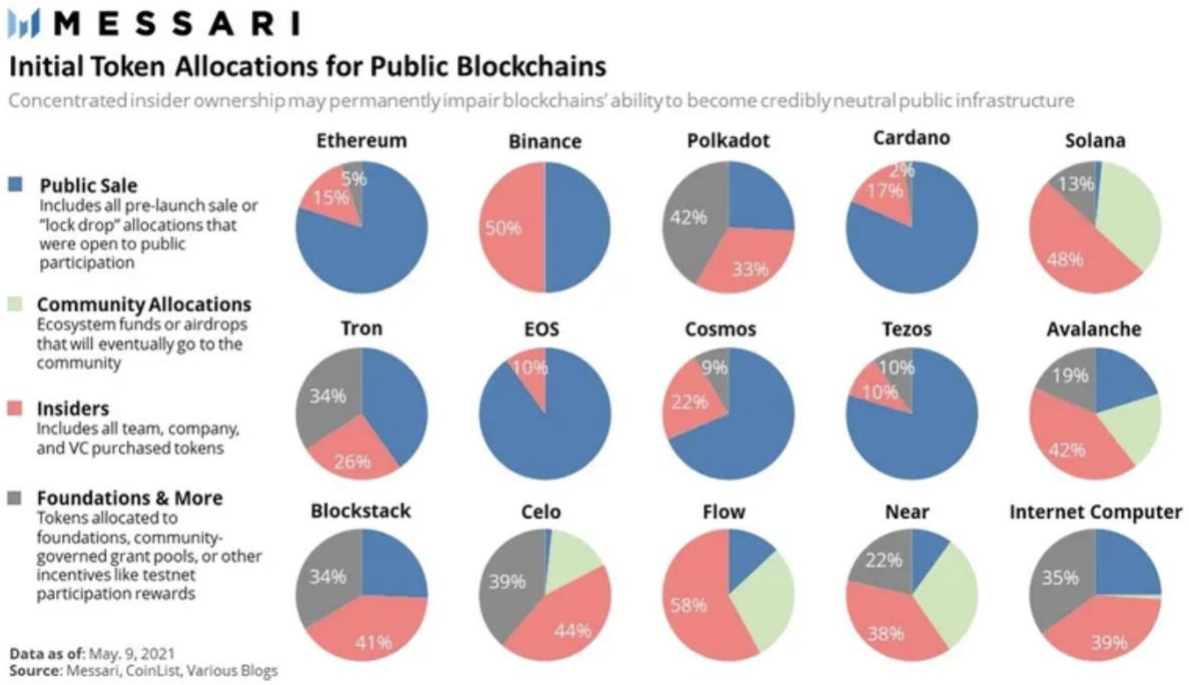
Bitcoin is traded 24/7 against almost every currency in the world on dozens of exchanges, and is by far the most liquid cryptocurrency market.

Level of Decentralization

The Bitcoin network has no central authority or central servers. The ledger is public and distributed, audited by tens of thousands of nodes running an independent version of the Bitcoin Core software. These nodes mostly use cheap, off-the-shelf hardware and ensure new blocks of transactions follow the rules of the protocol. Bitcoin makes it easy for normal users to run their own node by keeping the block time at 10 minutes and the block size small, sacrificing speed for decentralization. Shorter block times or larger blocks in other blockchains make it cost-prohibitive for users to run nodes and leave networks more vulnerable to single points of failure like internet outages.

Launching a new cryptocurrency almost always involves a group of founders, developers, and venture capital funders. In many cases, these entities set aside a significant share of a token's total supply for themselves before selling the rest on the open market. This presents some cause for concern, especially with blockchains that rely on Proof of Stake. In Proof of Work, the right to publish a new block is awarded by lottery. Proof of Stake systems award this right to individuals in proportion to how much of the native asset they have already "staked". The more you stake, the more of the native asset you earn for staking. Wealth compounds, as does the power to control which transactions appear in the ledger. So whereas the amount of bitcoin one owns provides no direct influence over the network, Proof of Stake systems afford their wealthiest users the greatest control. A report by the Bank of International Settlements corroborates:

> Certain features of DeFi blockchains favour the concentration of decision power in the hands of large coin-holders. Transaction validators need to receive compensation that is sufficient to incentivise them to participate without committing fraud. Blockchains based on Proof of Stake, which are expected to improve scalability, allow validators to stake more of their coins so that they have a higher chance of "winning" the next block and receiving compensation. Since the associated operational costs are mostly fixed, this setup naturally leads to concentration (Auer et al (2021)). Many blockchains also allocate a substantial part of their initial coins to insiders, exacerbating concentration issues.



Source: Messari Research https://messari.io/article/power-and-wealth-in-cryptoeconomies

While there is nothing inherently problematic with this dynamic, opacity in the financing arrangements behind crypto tokens presents serious cause for concern and likely stems in part from regulatory uncertainty. Chris Burniske, a prominent crypto venture capitalist, had this to say in a recent reflection on the industry:

> While "fair distribution" is a normative judgment, it flows from what we see as a consensus belief within crypto: creating level playing-fields where everyone has a chance at financial sovereignty. If a small group of insiders regularly take [about] half of the fully-diluted upside (which is common), we're seriously kneecapping the redistributive effects of this technology in order to make a handful of people obscenely rich... Under the veil of this opacity the same norms and structures that have imbalanced past wealth and power distributions are at play. If we don't openly address what's going on at the inception of cryptonetworks, then we are bound to repeat the same past societal mistakes.

By contrast, the pseudonymous Bitcoin creator Satoshi Nakamoto did not freely create money for himself or a group of insiders. All bitcoins have been acquired through mining—a global market available to anyone since its inception. Bitcoin does not have a CEO, a company, or any entity that controls the network. Despite competition from thousands of cryptocurrencies, the market reflects an

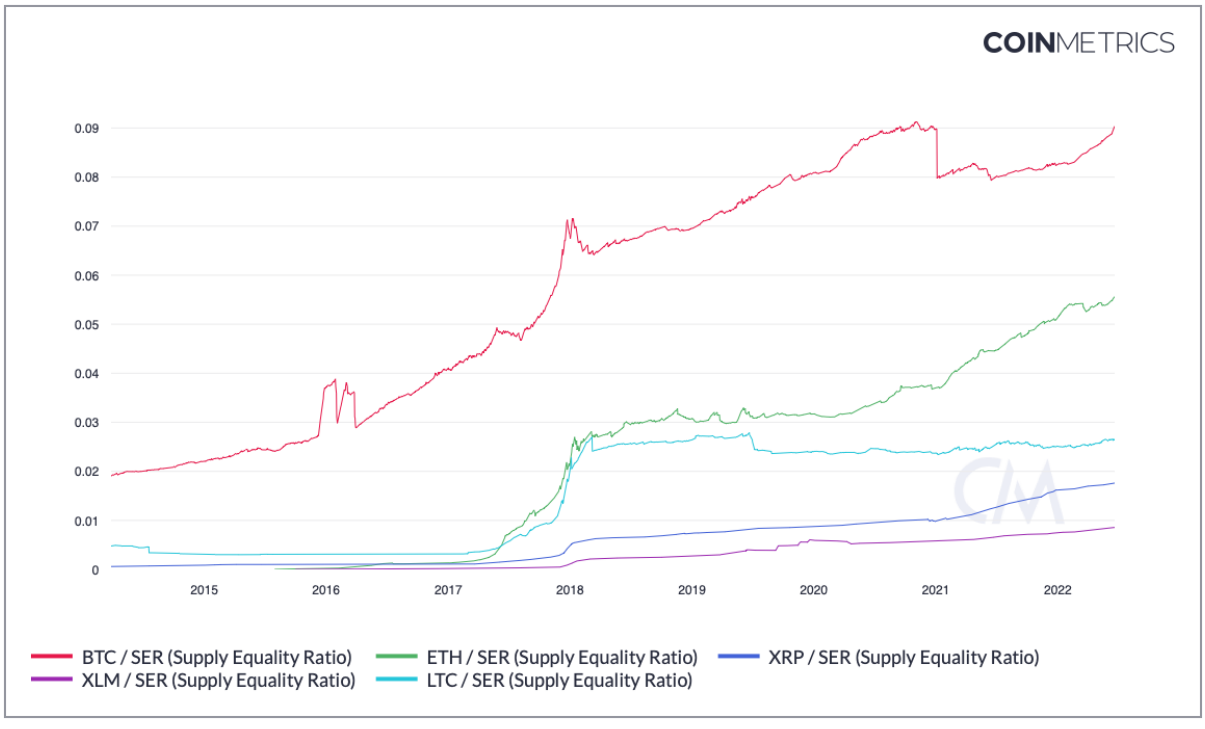
overwhelming demand for bitcoin and Proof of Work, revealing a preference by consumers for a neutral cryptocurrency with a fair initial distribution.

Maximizing for decentralization isn't always the goal of a digital asset; there are blockchains beyond Bitcoin that are useful. However, the aforementioned dynamics do raise questions about the application of existing securities law and ethical questions about insider dealings and user rights. While Proof of Stake (PoS) systems underpin many blockchain utilities, they programmatically lock in wealth inequality and are more vulnerable to attacks and internet disruptions, making PoS less desirable for a protocol aiming to be used widely as money.

Some have argued that bitcoin ownership is highly concentrated. But unlike many PoS systems, where wealth concentrates, bitcoin's ownership has become more widely distributed for the entirety of its existence. Two metrics, in particular, illustrate this trend.

Supply Equality Ratio

> *"This ratio compares the poorest accounts (the sum held by all accounts with a balance less than 0.00001% of the supply) on the bitcoin network against the richest accounts (the sum held by all the top 1% addresses).*



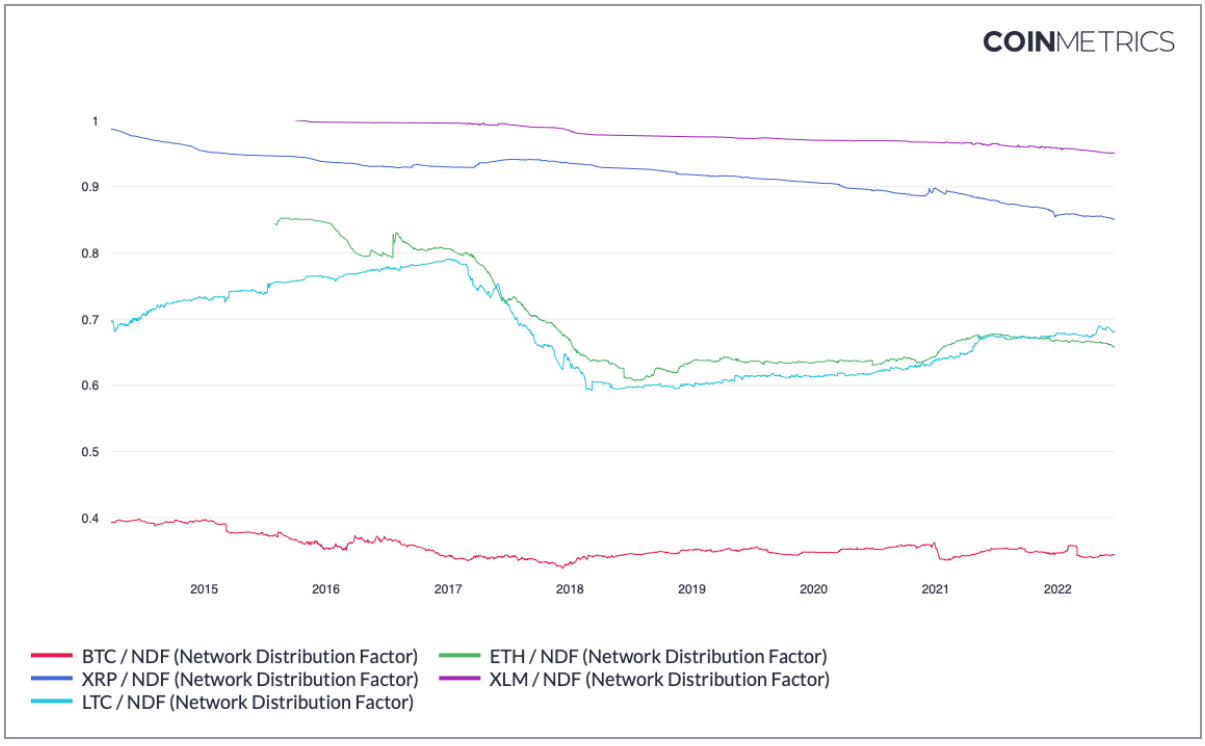
Source: CoinMetrics,https://coinmetrics.io/bitcoin-an-unprecedented-experiment-in-fair distribution/

Coinmetrics explains:

> A high SER signifies high distribution of supply. As hypothesized, bitcoin has the highest SER out of the assets evaluated, followed by Ether and Litecoin. This is remarkable, since bitcoin is also the primary crypto asset being custodied by large financial institutions; a trend that increases SER's denominator and puts overall downward pressure on the ratio. The sustained increase in bitcoin's SER shows that, in spite of large institutions entering the space, bitcoin is still very much a grassroots movement.

Network Distribution Factor

> *"This ratio encompasses a broader economic group, perhaps equivalent to a combination of the middle and lower classes. It is calculated by assessing the aggregate supply in addresses holding more than 0.01% of a cryptoasset's supply and dividing that figure by the total supply."*



Source: CoinMetrics https://coinmetrics.io/bitcoin-an-unprecedented-experiment-in-fair-distribution/

Immutability

Bitcoin transactions are effectively irreversible. Bitcoin's consensus rules (about who has which amounts of bitcoin) have changed around twenty times. And they occur less frequently as bitcoin has matured—only one such change has occurred in the last five years. The software is open-source and available for public scrutiny. Proposed changes undergo rigorous testing. Bitcoin's software has a stellar history, especially when compared to the hacks, exploits, outages, and unfulfilled promises of many cryptocurrency protocols.

Bitcoin As a Value Transfer Protocol

Limitations

It is often said that Bitcoin is slow and expensive. In a sense, this is true. Bitcoin's ledger updates, on average, every ten minutes. And each transaction includes a fee to whichever miner produces the block that includes it. But each block is small — due to bitcoin's consensus rules, the maximum block size is somewhere between 2 and 4 megabytes. At today's average transaction size of around 650 bytes, users shouldn't expect to squeeze much more than around 2000-3000 transactions in a typical block. With blocks every ten minutes, this averages to about 3-5 transactions per second. There is, accordingly, a fee market: transaction fees are bids for space in the ledger. The more data a transaction involves, the more space on the ledger it'll take and the higher the fee. When the network buzzes with activity, users bid over one another---no matter how big or small a payment one seeks. Small value payments become uneconomical. So bitcoin's blockchain lacks the transaction throughput of a global payments network. However, as explained above, these tradeoffs afford bitcoin greater decentralization.

Opportunities

Visa processes an average of about 1,400 transactions per second, at a cost most are willing to pay. However, Visa isn't a final settlement layer. They can and do reverse transactions. Visa transactions settle after several days instead through banks and, ultimately, master accounts with the Federal Reserve. Bitcoin is more akin to paying for something with a gold coin. In a single transfer, a payment is settled without counterparty risk, transfer of liability, or intermediaries. Bitcoin has matured into a "Layer 1" protocol for final settlement and is more akin to FedWire and ACH than the Visa network. "Layer 2" protocols that interoperate with Bitcoin, like the Lightning Network, are better comparisons to Visa.

Bitcoin's Lightning Network allows for transactions that boast nearly instant settlement at a miniscule cost with a theoretical throughput that far exceeds Visa's own. Over time, bitcoin will likely process and settle a relatively small number of transactions where each transaction involves a large amount of value. In just the last two years, lightning has become a substantial component of the broader Bitcoin ecosystem with capacity in bitcoin terms increasing 300%.

This peer-to-peer network is providing the rails for novel financial solutions like immediate, low cost, global remittances (e.g., using Strike), streaming payments (e.g., using Breeze), social media tipping (e.g., integrated on Twitter), and many other emerging applications. There is a reason why Visa and Mastercard are looking to, somewhat belatedly, interoperate with Bitcoin, as protocols like the Lightning network threaten to dramatically undercut the interchange and processing fees (~1-3%) they impose on global merchants.

In this sense, the Bitcoin protocol is serving as a foundational network protocol for a decentralized value transfer system in much the same way as TCP/IP serves as the foundational network protocol for the decentralized information transfer system we call the Internet, with higher-level, integrated, and cross-compatible protocols built at the application layer on top for specific purposes (e.g., HTTP, DNS, etc.). The Bitcoin and Lightning network protocols can thus be seamlessly integrated into a wide array of software and hardware platforms, enabling "Layer 3" applications like social media anti-spam (posting Bitcoin as surety), E-commerce (global frictionless payments), decentralized identity (DiD), monetized internet-of-things (IoT) devices, among others. There is strong reason to suspect that most of the major U.S. internet companies (and others to come) will be forced by competitive pressures to connect their technology into this interoperable open-source protocol and develop innovative and differentiated products and services.

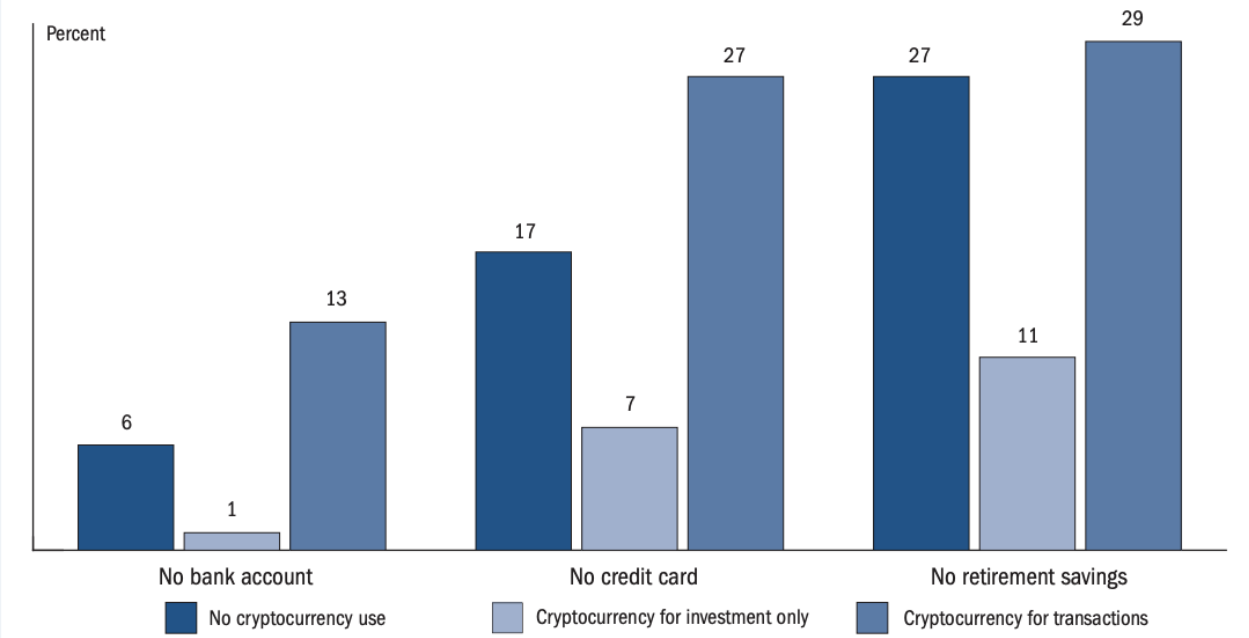
Financial Inclusion and Consumer Welfare

Research from the Federal Reserve estimates that 19% of Americans are either unbanked or underbanked, with rates higher "among adults with lower income, adults with less education, and Black and Hispanic adults." In 2009, 12.7% of unbanked Americans cited "minimum balance requirements too high" as a reason for not having a bank account. Ten years later, nearly half of unbanked consumers identified this as a reason for being unbanked, with 29% of households citing it as the main reason. More than a third of unbanked respondents cite high bank fees as a reason for not having a bank account, with 7.3% listing fees as the main reason. Roughly a third of unbanked Americans cite not trusting banks as their reason for not having an account, the second-most cited explanation. As a result, unbanked Americans are pushed toward more costly methods of conducting

financial transactions. In 2018 alone, unbanked Americans "spent $189 billion in fees and interest on financial products."

According to a study conducted by the Federal Reserve in 2021, 12% of Americans invested in or used cryptocurrencies in the prior year. Of those who used cryptocurrencies for transaction purposes, 13% lack a bank account (compared with 6% of adults who did not use cryptocurrency) and nearly 60% had an income of less than $50,000. A recent survey found that 30% of Black Americans and 27% of Hispanic investors own crypto, compared with just 17% of Whites.

Figure A. Share without a bank account, credit card, or retirement savings (by cryptocurrency use)



Note: Among all adults. Key identifies bars in order from left to right.

Source: Federal Reserve https://www.federalreserve.gov/publications/files/2021-report-economic-well-being-us-households-202205.pdf

Most digital payments require a plethora of intermediaries to clear and settle payments and combat fraud. As a result, consumers pay between 1.5% and 3.5% in credit card interchange and processing fees. By contrast, cryptocurrencies like bitcoin offer markedly lower fees by removing the need for centralized intermediaries. We expect that continued innovation of and expanded access to emerging payment protocols like the Lightning Network will not only lower transaction costs for underbanked Americans but will also exert competitive pressures on traditional financial institutions to lower fees as well.

Competitiveness

While the bitcoin protocol is 13 years old, the digital asset industry is relatively new. The average founding date for U.S. cryptocurrency companies is March 2017, and the most significant investment occurred over the past two years. This industry is subject to the wild volatility associated with the cryptocurrency market and is prone to periodic booms and busts. However, the structural uptrend is clear, with the number of Bitcoin addresses holding at least one BTC reaching an all-time high of 848K in June of 2022, even as the larger market underwent a dramatic correction.

While the industry and overall market will continue to be volatile, there are some measures the U.S. government can use to assess its global competitiveness. We present some of those below, as well as a summary of the key advantages and disadvantages facing U.S. Bitcoin competitiveness.

Measuring Competitiveness

The Federal Reserve found that in 2021, 12 percent of adults held or used cryptocurrencies in the prior year. Those 30 million Americans include many who were likely experimenting, making small transactions, and exploring how this new technology works. A smaller, but increasing, fraction, were holding Bitcoin as a long-term investment.

Chainalysis reported that at the end of Q2 2021, global adoption of cryptocurrency grew by over 2300% since Q3 2019 and over 881% in the last year. They found that "the reasons for this increased adoption differ around the world: in emerging markets, many turn to cryptocurrency to preserve their savings in the face of currency devaluation, send and receive remittances, and carry out business transactions; in North America, Western Europe, and Eastern Asia, by contrast, adoption over the last year has been driven largely by institutional investment."

The same study found that North America is the second-largest cryptocurrency economy in the world, having received over $750 billion in cryptocurrency between July 2020 and June 2021, accounting for 18.4% of global activity in that period. Globally, the U.S. ranks 8th in Chainalysis' Global Crypto Adoption Index, "largely due to its high ranks in total cryptocurrency value received and value received in retail-sized transactions in proportion to internet-using population and purchasing power, ranking fourth and third in each category respectively." They find that "more Americans are devoting a higher share of their purchasing power to cryptocurrency than in nearly every other country."

Country	Index score	Overall index ranking	Ranking for individual weighted metrics feeding into Global Crypto Adoption Index		
			On-chain value received	On-chain retail value received	P2P exchange trade volume
Vietnam	1.00	1	4	2	3
India	0.37	2	2	3	72
Pakistan	0.36	3	11	12	8
Ukraine	0.29	4	6	5	40
Kenya	0.28	5	41	28	1
Nigeria	0.26	6	15	10	18
Venezuela	0.25	7	29	22	6
United States	0.22	8	3	4	109
Togo	0.19	9	47	42	2
Argentina	0.19	10	14	17	33
Colombia	0.19	11	27	23	12
Thailand	0.17	12	7	11	76
China	0.16	13	1	1	155
Brazil	0.16	14	5	7	113
Philippines	0.16	15	10	9	80
South Africa	0.14	16	18	16	62
Ghana	0.14	17	32	37	10
Russian Federation	0.14	18	8	6	122
Tanzania	0.13	19	60	45	4
Afghanistan	0.13	20	53	38	7

Source: Chainalysis 2021 https://go.chainalysis.com/rs/503-FAP-074/images/Geography-of-Cryptocurrency-2021.pdf

Roughly one quarter of bitcoin's estimated 150 million users reside in the United States. As a result, in 2021, the U.S. accrued the most ($47B) of the total realized gains ($162B) from cryptocurrency.

A large portion of bitcoin-focused businesses are located in the US., especially mining-related firms. America's competitiveness in bitcoin mining increased dramatically following China's ban on the activity. A large share of Chinese miners relocated to US states with cheap energy, like Georgia, Texas, and Wyoming. In January of 2020, the US accounted for just 3.44% of the bitcoin "hashrate"—a measure of the total computational power underpinning the network. By January of 2022, the United States was home to 37.84% of the bitcoin network hashrate—roughly a 1000% gain.

Advantages for American Competitiveness

The same open, innovative, and informed regulatory environment that led to the flourishing of the early internet in the United States has also provided fertile ground for Bitcoin adoption and innovation. The U.S has particular advantages in fostering and competing for Bitcoin innovators, businesses, and users relative to the rest of the world.

In particular, we have a thriving ecosystem of venture capital markets and technology incubators that help early-stage firms bootstrap high-risk, high-reward businesses. Many Bitcoin startups have benefited from this funding network, with over 1,600 cryptocurrency businesses raising over $30B to date. The U.S. also maintains a strong culture of open-source software development, including the foundational protocols of the internet itself. Bitcoin, as an open-source software project, is a direct inheritor of this legacy.

The Bitcoin protocol fastens together key constituent technologies (namely public-private key cryptography, distributed systems, and peer-to-peer communications) that were actively fostered or even developed by the U.S. government (for vastly different applications). In addition, some of the biggest brands in the industry are based in the U.S. and our deep and liquid capital markets provide the go-to venue for firms to list their equity on our public exchanges.

Our open culture, deep capital markets, historical legacy, and economic dynamism have attracted world-leading technical talent to our country. While Bitcoin is a global, borderless system, these specific attributes have generated a fly-wheel of innovation that helped Bitcoin mature and grow.

The next several years will also see an explosion in applications that interoperate with the Lightning Network and bring the value transfer properties of Bitcoin to a broad swath of merchants, retailers, E-commerce, social media platforms, media firms, individual businesses, software developers, hardware manufacturers, and countless other businesses (some of which may not exist yet). Even in the early days of this adoption, it's likely that many innovations will provide the basis for long-term, durable solutions that are used for years to come. Those who build on this open standard and adapt their

economic systems to its principles are positioned to disproportionately influence and benefit from its wider adoption.

Further, the United States' commitment to the rule of law has drawn Bitcoin mining companies to relocate from less favorable jurisdictions. The United States now has a plurality of global hashpower. Several of the largest Bitcoin miners are now publicly listed in the United States and the intense competition in this industry is driving rapid innovation in hardware, business operations, financing models, scale of deployments, and improved economics for renewables.

Despite popular narratives that the growth of bitcoin necessarily comes at the cost of the US dollar, the Bitcoin network is an incredibly powerful tool to spread access to dollars around the world to economies that are currently starved for access (e.g., the function of Strike in Argentina and El Salvador). The uneasiness in foreign countries around their own monetary policies (which tend to be less disciplined than America's) creates an urgent need, and thus a great opportunity to exploit Bitcoin's blockchain as a tool of soft/economic diplomacy that is accretive both to the value of the dollar (because of reduced friction and increased demand) and of bitcoin the asset.

To the extent that U.S. competitiveness stands to gain from domestic technology innovation, appreciation in our equity markets, and as an attractive destination for global talent, Bitcoin gives the U.S. a clear advantage over other economic blocs and adversary nations that reject or stifle its adoption, especially as they pursue techno-authoritarian governance and monetary systems designed to facilitate social control rather than individual freedom.

Challenges for American Competitiveness

Because of the global and digital nature of bitcoin, companies have significant flexibility in determining where to locate and are especially sensitive to regulatory dynamics. Policy hurdles and uncertainties threaten American competitiveness.

Regulations that create expensive and difficult obstacles for Bitcoin industry participants create massive headwinds for innovators and builders in this burgeoning industry. For example, New York State's Bitlicense and restrictions on Proof of Work computing centers, as well as onerous Money Services Business (MSB) and Money Transmitter License (MTL) regulations tell prospective investors and entrepreneurs to take their business elsewhere. On the contrary, those states that offer regulatory certainty are attracting Bitcoin industry participants, setting up a healthy competitive dynamic that brings capital investment, talent, and cultural energy to forward-thinking local jurisdictions.

While a small fraction of the overall adult population holds cryptocurrency, almost one third of young people (aged 18 to 29) do so. It is likely that this experience will have structural effects on the U.S.'s Bitcoin competitiveness as this generation forms households, grows their net worth, and makes career and investment decisions. It is entirely plausible to expect a majority of the Millennial generation (now the largest) to have some holdings in Bitcoin by the end of the decade, and as a result form a powerful political and economic force driving U.S. Bitcoin competitiveness. Policies that fail to anticipate this change or actively stymie its nascent potential may see the U.S. lose its current position of Bitcoin leadership.

National Security

It is important for policymakers to understand how new security concerns may arise from increased adoption of digital assets, including risks related to cybersecurity, ransomware, sanctions enforcement, illicit finance, and data privacy. However, these concerns must be balanced by considerations of how the U.S. may leverage open digital asset networks to counter the closed systems of our adversaries, especially as geopolitical and economic tensions rise.

Given the rapid development of these networks, it is critical to take a long-term view, and consider a range of scenarios. In particular, there are potentially significant implications to U.S. leadership of the global economic system if these technologies continued to grow apace. If we cede leadership and Bitcoin flourishes outside our country, others may gain relative to ourselves. If we recognize the power of this open system and its alignment with our open society, we may find Bitcoin to be a powerful force to advance U.S. values and our security interests in an increasingly fraught and multi-polar world. U.S. national security rests in part on domestic technology innovation and leadership, where bitcoin gives us a clear advantage.

The U.S. government has a clear national security interest in countering criminal groups and malign actors that engage in destructive ransomware attacks and illicit finance activities. The proliferation of anonymity-enhanced cryptocurrencies, offshore exchanges to facilitate money laundering, and dark web markets for illicit trade are a source of concern.

In this regard, it is important to recognize that Bitcoin is not entirely anonymous, but pseudonymous. The real identity of Bitcoin ownership can be linked to coins purchased on regulated exchanges that follow standard Know-your customer (KYC) and Anti-money laundering (AML) procedures.

In fact, Bitcoin's very transparency gives legitimate law enforcement authorities powerful tools to track and trace illicit activity, seizing ill-gotten gains by criminal groups and ransomware operations. For example, the largest U.S. exchange, Coinbase, provides detailed analytics services to U.S. agencies like the IRS, DEA, and the Intelligence Community that enable highly effective law enforcement and intelligence activities. These analytics providers have shown that just 0.15% of all cryptocurrency activity in 2020 was related to crime.

While transparent, a core value proposition of Bitcoin is its resistance to censorship. This makes it very difficult (if not practically impossible) to stop a bitcoin-to-bitcoin transaction. It is this feature that makes it attractive to political dissidents, human rights activists, and other marginalized groups under threat from state oppression. As a morally neutral tool for peer-to-peer transactions, one must consider the full range of actors and motivations for using Bitcoin. Just as the internet (and privacy preserving technologies like the TOR network) have been used for nefarious purposes, it's fair to say the net effect has been to increase human liberty, freedom of expression, and liberal values. There is a reason China blocks much of the outside internet as well as Bitcoin. Open, freedom-promoting networks are the enemy of closed, authoritarian systems.

One more speculative national security benefit of Bitcoin is how organic increasing demand for Bitcoin and USD-based stablecoins in developing countries may help counter China's geopolitical ambitions for the digital yuan and the Belt and Road Initiative. Our closest allies have raised the red flag. GCHQ chief Sir Jeremy Fleming warned that China's digital currency efforts will give them the ability to "exercise control" and "surveil transactions," and that China is "investing very heavily, overtly and covertly" to exercise influence on "the rules of the road" for the emerging digital global infrastructure. MI6 head Richard Moore recently opined that China's "technologies of control and surveillance are increasingly being exported to other governments... expanding the web of authoritarian control around the planet."

There is a reason China has been among the most Bitcoin-hostile governments in the world, banning Bitcoin mining and making all cryptocurrency transactions illegal. Bitcoin is a clear and present threat to China's strategic ambitions for its digital currency, the e-RMB, as well as its efforts to enforce capital controls. The latter in particular has been a worry for the PBoC, with some stablecoins being a popular vehicle for mainland Chinese to bypass annual limits on overseas capital transfer. These moves on Bitcoin coincided with a crackdown on other mechanisms for capital flight like gambling in Macau and the Hong Kong banking sector. At the same time, China has slowed purchases of U.S. Treasury securities, redeploying their dollar reserves into western real estate and equity markets, giving them financial power to exert political influence over US corporations.

The existence of Bitcoin is a severe complication for China's CBDC ambitions, presenting an attractive store of wealth and effective cross-border payment system to those BRI nations that China seeks to entangle with the e-RMB. Meanwhile, global demand for bitcoin and dollar-pegged stablecoins has exploded, especially by citizens of emerging markets facing currency distress. The e-RMB will be an attractive tool for certain states that trade directly with China. We should encourage Bitcoin's adoption in these nations as an open-source and freedom-promoting alternative that comes with on-ramps and transaction rails that facilitate dollar-exchange and associated dollar-demand as well.

To address these challenges, the United States can take special advantage of the dollar-based stablecoin ecosystem that has emerged to facilitate cryptocurrency trading, especially offshore. The top two largest dollar-pegged stablecoins hold a market cap exceeding $150 billion. One can argue that these private stablecoins are winning the fight the U.S. should be fighting against the e-RMB, with market-driven transaction volume in just these two dollar-stablecoins vastly outpacing that of the PBoC's DCEP efforts to-date.

The world wants dollars, not renminbi. But when it comes to serving the demand for digital currency, China has a determined strategy. Thus far, the U.S. has been able to free-ride on private innovation, but continued success in this regard is not guaranteed. No less an authority than the former Vice Chair for Supervision at the Federal Reserve Randal K. Quarles noted in a recent speech, that "a global U.S. dollar stablecoin network could encourage use of the dollar by making cross-border payments faster and cheaper, and it potentially could be deployed much faster and with fewer downsides than a CBDC." Given that the global economy suffers from a somewhat chronic "eurodollar" shortage, stablecoins provide another rail to satisfy demand for dollar liquidity.

As the industry becomes increasingly regulated and transparent, the combination of bitcoin and stablecoins can serve as an effective tool to support the dominance of the dollar at the digital front line competing against China's e-RMB. The growth of these stablecoins promises to bolster demand for U.S. Treasuries if appropriately regulated, helping the Federal Reserve keep interest rates low in the face of inflation. In this way, bitcoin can serve a neutral reserve asset that helps reinforce, not undermine, the dollar system.

Mining and Energy

The relationship between bitcoin mining's energy usage and its environmental impacts are complex and underexplored. For a comprehensive assessment of bitcoin mining's environmental impact, our report to the Office of Science and Technology policy is linked here.

Assessing Mining Trends

Projecting the future of digital assets mining in the U.S. requires multiple predictions: (1) the total size of the digital assets market; (2) the relative proportion of digital assets using Proof of Work relative to digital assets using other consensus mechanisms like Proof of Stake; and (3) the proportion of mining that happens in the U.S. Each of these is uncertain and subject to a number of influences. However, we believe the digital assets mining sector in the U.S. is potentially very sizable.

Size of Proof of Work Market

Currently, Proof of Work constitutes nearly two thirds of the entire digital assets market, and secures over $500 billion in value. The entire sector is volatile, and that number may diminish, but it may also increase rapidly, as it has in the past. Bitcoin is the largest digital asset and any long-term estimate must include its decreasing schedule of issuance. Every four years, the subsidy to miners—issuance of new bitcoin—drops in half. So, setting aside transaction fees, which are currently 1% of miner revenue, bitcoin mining revenues will shrink unless price doubles every four years. Whether or not the fee market will increase over time remains the subject of speculation.

Proof of Work's Market Share

The proportion of value in digital assets using Proof of Work may shift over time. For instance, Ethereum, which is currently 15% of value in digital assets, has announced they are shifting their consensus mechanism from Proof of Work to Proof of Stake, although that promise has been delayed for years. There has also been a movement to "change the code" of bitcoin itself in much the same way, although we cannot imagine this movement ending in anything more than a new, failed fork of bitcoin where just a tiny fraction of users choose to run the altered software.

Rather, we believe Proof of Work will retain a substantial share of all digital asset value over time. Proof of Work uses physics to settle on the authoritative version of the blockchain by deferring to the chain that verifiably demonstrates the most physical work in its construction. Other consensus mechanisms, such as Proof of Stake, ultimately rely on a social agreement between large holders of the asset, rather than a verifiable link to the physical world. The question of Proof of Work's share of the

digital asset space is thus a question of how much demand exists for a physical, rather than a social, method of reaching consensus about an authoritative ledger. We project that demand for a physically-linked ledger, secured by Proof of Work, will remain strong.

US Share of Mining

Until recently, a majority of bitcoin mining was located in China. China had a number of advantages. They were home to the leading manufacturers of specialized mining equipment, had vast amounts of curtailed hydroelectricity, subsidized coal-fired electrical generation, and a thriving domestic market for bitcoin as a speculative vehicle, a store of value, and a means of subverting China's strict capital controls. That all changed in the spring of 2021 when China banned mining and trading in bitcoin, causing miners to move their operations worldwide. In that migration, the U.S. benefited, growing its share of mining from roughly 16% to its present share of 38%. Features that drew miners to the U.S. included the world's deepest capital markets, regulatory transparency, rule of law, and abundant energy and energy infrastructure. Those advantages are robust, and with fair and transparent regulation, should continue.

In sum, we believe Proof of Work mining will continue to be valued by the marketplace, and in particular, the mining industry will continue to expand in the U.S. within a predictable and fair regulatory framework.

Potential Environmental Benefits from Mining

We have argued, elsewhere and at length, that bitcoin could prove instrumental in accelerating renewable energy production, stabilizing our new, greener grid, and curbing methane emissions, while providing creative alternatives to fossil-fuel-powered heating systems.

Accelerating Renewables

While it is tempting to think of bitcoin miners as merely *users* of electrical power, it is more accurate to view them as *revenue sources* for power producers when other grid-connected buyers for renewable-generated electricity do not exist. In our RFI response we explain how this revenue from bitcoin mining helps to address the chief problems facing renewable power developers: uncertainty of financing and interconnection wait queues. Bitcoin mining provides renewable energy producers with a guaranteed buyer, prior to full interconnection with grid demand; miners are also a buyer of last resort when the grid is not in need of power, even after connection. This promise of revenue allows renewable energy producers to secure financing and proceed with construction, accelerating the pace of renewable energy adoption.

Grid Stabilization

As renewable penetration increases, grids will become more and more difficult to balance, since neither the sun nor the wind is adjustable to electrical demand. The standard way to address this problem is to overbuild renewable production and pair that excess with a large component of flexible load. Bitcoin mining is one such portable, scalable, and highly flexible load. Mining allows grid operators to balance weather-dependent renewable sources like wind turbines and solar farms with independently-shifting grid demand from consumers by shutting down miners, remotely, in as little as five seconds as needed. Highly flexible data centers like bitcoin mining can thus, even while adding load to the system, lead to net decarbonization by participating in such demand response programs.

Methane Conversion

Bitcoin mining can monetize the capture and conversion of highly-potent methane from oil wells, farms, or landfills. The IPCC's recent 2021 report noted that about 0.3 degrees C of the currently 1.1-degree C global warming was attributable to methane gas. Methane gas, while having a shorter lifetime than carbon dioxide, is a much more potent greenhouse gas. The UN reports that when measured over a 20-year period, methane has 84-86 times more global warming potential than carbon dioxide. And currently, there is enough methane gas flared, inefficiently, into the atmosphere, to power over 7 bitcoin networks. Because mining operations are scalable and portable, they can seek out methane, wherever it is escaping or being inefficiently flared, and in a highly-controlled manner, combust it efficiently while generating electricity.

Mining's Present and the Future

It is important to separate out, in any analysis, bitcoin's past, present, and future, as a consumer of energy. Already, the bitcoin mining industry is among the greenest in existence, using 58.4% sustainably-produced electricity, thereby subsidizing a great deal of sustainable power infrastructure. But the mining network is immature, and it has not achieved the role in the energy transition that we think it will ultimately serve.

Most mining operations quickly scaled up during a 20-fold spike in bitcoin prices, during a shortage of mining equipment and power infrastructure, which made mining with nearly any energy source profitable. Thus, it is dangerous to generalize about bitcoin's energy future given this single aberrant moment in time. As bottlenecks ease and the market matures, mining will become more and more sensitive to the price of electricity, its most costly input. As mining becomes more price sensitive, it will become ever more difficult to mine with anything but the cheapest energy, which will be

renewable energy—already the least expensive—and eventually, only wasted and stranded energy that can find no other buyers.

Bitcoin is also a relatively new and ill-understood technology. While some miners are themselves renewable energy producers, most are using existing renewable power or buying renewable energy credits. Little financing of new renewables is based on future mining rewards at present. We suspect that with maturity—just as batteries were once experimental and only installed at already-existing renewable energy production facilities, and eventually became folded into financing strategies for new facilities—bitcoin mining too will find its place as a bankable offtaker of power as well as being incorporated into existing systems. Duke Energy, for instance, the second largest electrical utility in the country, is currently studying bitcoin mining to determine whether incorporating mining, with demand response agreements, at key locations in its grid, could help it meet its climate goals. Policymakers should pay attention to increasing research into synergies between mining, grids, and renewables.

Principles for Mining Policy

Mining Bans Are Likely to Backfire or Fail

Proof of Work has faced increased scrutiny. EU officials have debated a ban of the activity on several occasions. The case study of China's ban on Proof of Work is instructive. When China banned bitcoin mining, the total amount of energy devoted to mining worldwide briefly dipped, then recovered and bested its earlier highs. China's ban had no effect because the global daily reward to miners remained the same. The amount of new bitcoin issued daily is fixed by the protocol itself (currently 900 bitcoin per day) and is unaffected by any government's action. If the U.S. were to ban mining, or otherwise make mining unattractive, the hashrate would flee to the next-most-appealing region. It is difficult to know whether a given state's ban on mining would have any effect on the net emissions of the network. If that region has an average carbon intensity higher than the US's, the U.S. regulation would actually increase global bitcoin-related CO_2 emissions. In short, it is quite possible that a given state's ban on mining would increase rather than decrease the net emissions of the network.

Carrots vs Sticks

The very same feature that makes bitcoin resistant to a ban—its algorithmically-fixed supply—allows regulators to lower the global bitcoin-related CO_2 emissions by offering incentives to mine in low-carbon ways that match their climate goals. Since only 900 new bitcoin are issued daily—the more bitcoin mined in low-carbon ways using wind, solar, hydro, or nuclear power—the fewer remain to be

mined in high-carbon ways by miners in West Virginia, Iran, Kazakhstan, or Nigeria using fossil fuels to generate their electricity.

The regulation of mining, in other words, cannot change the global reward that inspires miners to plug in their machines and use energy. It can only change where those machines are plugged in. Thus, policy "carrots"— such as Wyoming and North Dakota's tax breaks for mining with natural gas that would otherwise be flared—are far more effective than policy "sticks" which cannot begin to police mining worldwide.

Industry-neutrality

Like any industry providing a good, valued by human beings, bitcoin mining will have an environmental impact. In its maturity, and under certain market conditions, we believe bitcoin mining could actually be a net environmental positive. But we categorically reject the notion that one industry should be singled out for special treatment concerning its energy use.

Externalities due to the carbon-intensive production of electricity should be addressed at the source—their generation—or taxing all consumers of that energy, rather than by targeting one specific use of those electrons. We find it a dangerous precedent to deem some uses of electrons worthwhile and others mere waste. Each individual actor in a free market makes this kind of judgment, by purchasing the electricity or purchasing goods made thereby. And regulators should not supplant those judgments of free citizens with their own, particularly when it comes to a nascent and ill-understood technology. Our preference, therefore, is for electrical generation regulations to be use-neutral.

We ourselves consider bitcoin's energy use to be highly worthwhile, as it secures a global monetary network valued by hundreds of millions of people. While there are highly visible exceptions in the present, we believe bitcoin mining is moving towards sustainable energy for purely economic reasons, without the need of any special regulation. As stated above, mining's status as a single global market, and a nearly perfect market with exceptionally low barriers to entry, means that it will only be profitable on the cheapest electrical energy, which is already renewable or waste methane. But we do not hinge the viability or value of bitcoin on this claim. Rather, bitcoin's value is shown by the conviction of its users. Its externalities, whatever they are, are shared with other electricity consumers, and should be treated just the same.

Policy Considerations

Background

Throughout its history, the United States has proven its ability to adapt and rise to meet new challenges on the world stage, guided by our Constitutional principles of individual liberty and justice, and buoyed by our strong economy and the natural resources and human capital at our disposal. As a result, in times of technological change, other nations around the world look to the U.S. for leadership and guidance on how to navigate the novel and complex global issues that inevitably arise as a result of the proliferation of new technologies. Bitcoin, and the rise of borderless digital assets, is merely the latest technological paradigm shift, analogous to the widespread adoption of the internet, that poses important policy questions that will need to be answered by every state on the planet. It is therefore imperative that the United States approach any policy framework for Bitcoin and digital assets with care, and with an eye towards fostering the principles of freedom and self-determination that we seek to uphold.

We have, before us, the opportunity to lean into this new era of money and finance and claim a first-mover advantage that will allow the United States to leave its mark on the world's first stateless digitally-native monetary network. We can embrace Bitcoin and other digital assets as a beacon of freedom for underbanked and underserved individuals at home and abroad, and leverage the Bitcoin network as a tool for economic fairness and financial inclusion in a world that is otherwise trending in the direction of financial repression and economic protectionism. Or we could fall into the trap, as other nations will inevitably do, of reacting to novelty with suspicion or outright hostility, driving the fruits of innovation elsewhere, perhaps to jurisdictions whose values do not match our own. BPI corrals cross-disciplinary expertise in an effort to guide U.S. policymakers on issues surrounding digital assets and cryptocurrency.

Towards that end, we propose a few key principles for U.S. policy. These are not radical proposals, but ones that issue from basic considerations of fairness, harm reduction, and cautious optimism about the future and the potential of the bitcoin network as a force for good in the world. Policymakers must craft a flexible framework that guards against risk and mitigates negative externalities, while simultaneously allowing a nascent technology to grow to its full potential, guided by the principles that Americans hold dearest.

If we apply these principles to our policy framework for Bitcoin and digital assets, the U.S. will find itself exceptionally well-positioned to take unique advantage of economic and political opportunities

presented by Bitcoin which, properly recognized, may help promote a more resilient and secure future for America and allies of liberty around the world.

Principles for a Framework to Maintain U.S. Competitiveness with Bitcoin

1. **Avoid picking winners and losers.**
    - We need a framework for securities law for digital assets and yield products that is clear, fair, and actually enforced.
    - Bitcoin the asset/commodity should be treated like any other commodity with a free spot market, a well-regulated derivatives market, and safe financial infrastructure that includes a spot ETF.
    - The government should not pass laws trying to regulate the workings of the Bitcoin protocol (e.g., Proof of Stake, OFAC-compliant blocks, etc.).
2. **Employ a light touch with regulation and avoid doing harm to the nascent industry.**
    - We should have reasonable money transmission laws that allow us to combat cybercrime and money laundering without creating and overly-burdensome barrier to entry for companies working to innovate in payment technologies.
    - We should have a federal framework for licensure that supersedes overly punitive state frameworks like New York's BitLicense and makes clear that players like lightning routing nodes are not regulated as MSBs.
    - A de minimis capital gains tax exemption will help bitcoin become more spendable in the US economy and avoid accounting nightmares.
3. **A legislative framework should help shape the Bitcoin industry worldwide in a way that fits US policy and moral interests.**
    - Policymakers would be wise to protect private and sovereign bitcoin usage (i.e. self-custody) for wealth preservation as a human right, and promote it as a tool to push back against authoritarian governments around the world.
    - The United States should study the use of the Lightning network as a means of spreading the dollar abroad.

America has been the world leader in technology in part due to its commitment to allowing market competition to drive innovation. With respect to not picking winners and losers, BPI concurs with the findings of Coin Center, an established think tank that focuses on policies regarding cryptocurrencies. Their work points to a quote from SEC Commissioner Hester Pierce that bears repeating. She stated, "On a beach, you have a lifeguard, but she is not sitting next to the sand castle builders." Coin Center stated at the time, that, "...In general, we believe regulators should avoid making legally binding

pronouncements that dictate specifics about how consumer or financial technologies should be built." We agree.

Former Chairman of the CFTC Chris Giancarlo stated in 2018 that "...the internet flourished because the government did not step in too heavily, and applied a 'do no harm' approach... When it comes to fraud and manipulation, we need to be strong. When it comes to policy making, I think we need to be slow and deliberate and well informed." In a separate Coin Center report, an explanation of how lawmakers can protect consumers without harming the innovation of digital currencies also focuses on the 'do no harm' approach.

We concur with Coin Center's analysis that states should apply a light touch to regulation of money transmitter laws. Formally re-defining "money" within a statute to include digital or virtual currencies would not be sufficient to guarantee efficient regulation of these new technologies. One must also define what it means to "transmit" a virtual currency or be a "regulated virtual currency transmitter."

Coin Center explains, "Traditional money transmission occurs when an intermediary reassigns credits or debits among its customers or partner institutions. These institutions have free reign to assign and reassign credit to different accounts, subject to applicable legal restrictions, as long as they remain solvent at the end of the day." They further that, "...bitcoins, for example, can only be transmitted by the holders of unique cryptographic keys. Therefore, only a business that holds these keys could ever have the ability to transmit bitcoin. A transmittal instrument for a virtual currency is not, then, a promise to pay; it is the ability to pay—i.e. cash on hand—as measured by possession or knowledge of cryptographic keys sufficient to execute or prevent a transaction. Just as we would only wish to require licensure from businesses that take it upon themselves to "transmit money" we should only require licensure from VCBs that take it upon themselves to assume control over keys related to customer bitcoin balances."

Therefore, money transmitter laws should apply only to those responsible for such "transmission" in this context. Specifically, a light touch regulation to allow innovation means avoiding the treatment of bitcoin miners, validators, and computer programmers as having any responsibility for applicability of money transmission laws. A slow and deliberate approach that includes all relevant stakeholders—not just those with CEOs and lobbying firms—to inform policy is the best way to proceed.