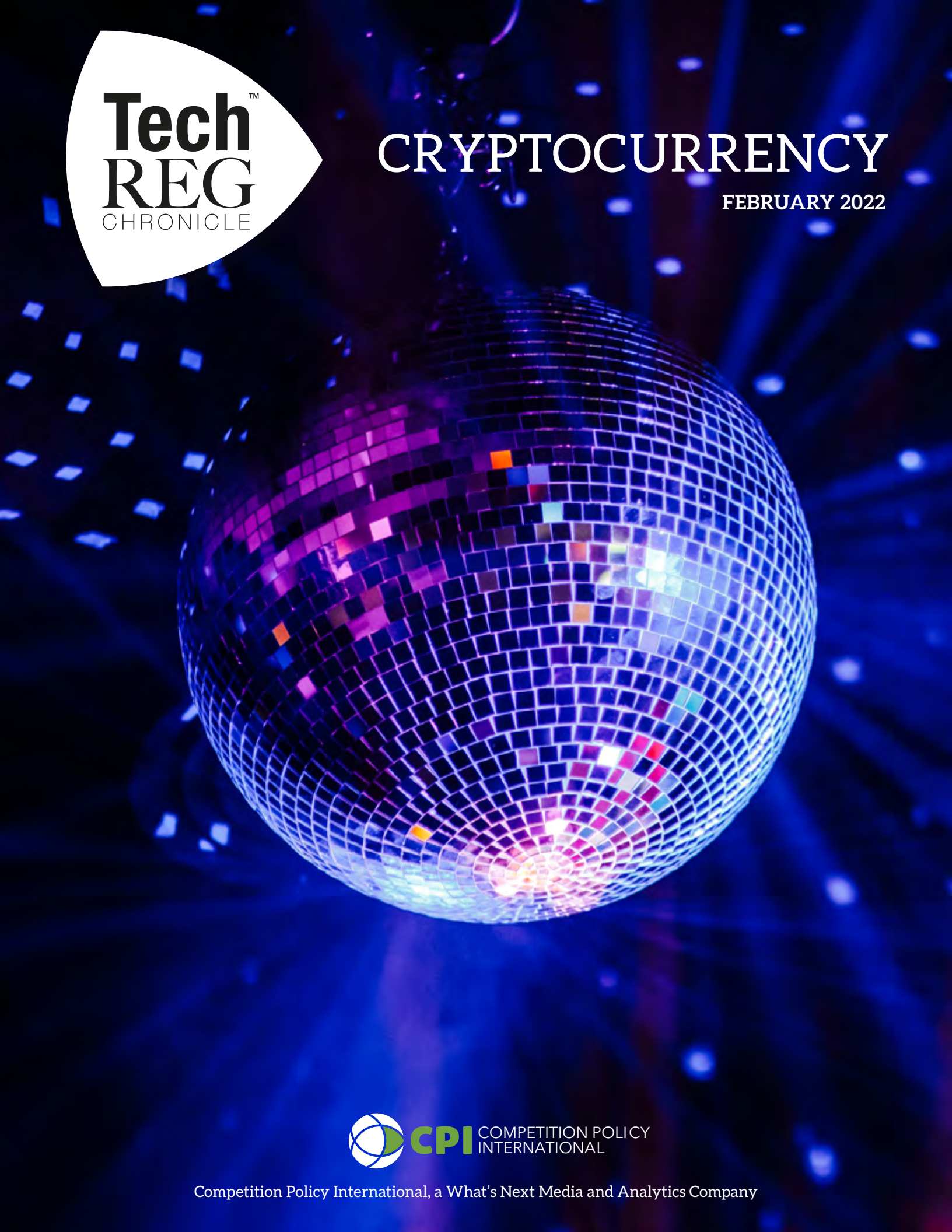

Tech REG CHRONICLE

CRYPTOCURRENCY

FEBRUARY 2022

CPI COMPETITION POLICY INTERNATIONAL

Competition Policy International, a What's Next Media and Analytics Company

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CPI COMPETITION POLICY INTERNATIONAL

CRYPTO CURRENCY

FEBRUARY 2022

LETTER FROM THE EDITOR

Dear Readers,

Ever since the anonymous and pseudonymous Satoshi Nakamoto published a seminal white paper on October 31, 2008, the world has been in thrall to the potential of cryptocurrencies.

In essence, a cryptocurrency is a digital currency in which transactions are verified, and records are maintained by a decentralized system using cryptography, rather than by a centralized authority (such as a Central Bank like the Federal Reserve system in the U.S., the Bank of England, or the European Central Bank).

Almost by definition, cryptocurrencies raise potential benefits and risks. They represent a break from the traditional model of so-called "fiat currency," which gives government bodies inherent regulatory power. Their use offers potential for criminals to escape the oversight of the government, but they also present potential benefits for individuals who wish to gain greater autonomy over their finances.

Maintaining a balance between these risks and benefits is the dilemma that faces regulators at present. The implications range from the need to prevent tax fraud, to the need to control illicit transactions (involving e.g. narcotics or other items).

The articles in this edition address these (and other) issues raised by cryptocurrencies, and explore potential issues that may present themselves in the near future.

As always, many thanks to our great panel of authors.

Sincerely,
CPI Team

WHAT'S NEXT

For March 2022, we will feature a TechREG Chronicle focused on issues related to **Artificial Intelligence**.

ANNOUNCEMENTS

CPI TechREG CHRONICLES April & May 2022

For April 2022, we will feature a TechREG Chronicle focused on issues related to **Privacy**. And in May we will cover **Fintech Regulations**.

Contributions to the TechREG Chronicle are about 2,500 – 4,000 words long. They should be lightly cited and not be written as long law-review articles with many in-depth footnotes. As with all CPI publications, articles for the CPI TechREG Chronicle should be written clearly and with the reader always in mind.

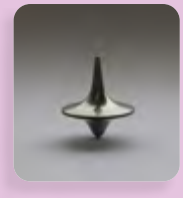
Interested authors should send their contributions to Sam Sadden (ssadden@competitionpolicyinternational.com) with the subject line "TechREG Chronicle," a short bio and picture(s) of the author(s).

The CPI Editorial Team will evaluate all submissions and will publish the best papers. Authors can submit papers in any topic related to competition and regulation, however, priority will be given to articles addressing the abovementioned topics. Co-authors are always welcome.

SUMMARIES

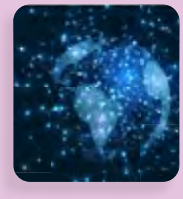
Crypto Needs Common Sense Financial Regulation – Suggestions for 2022
By Sean Stein Smith

While the blockchain and cryptoasset sector has continued to grow, mature, and expand at a rapid rate, the regulatory outlook has simply not kept pace. In almost every market where cryptoassets have become more mainstream there are substantial questions regarding how these assets should be taxed, valued, and treated from a financial reporting standpoint. Written with both policymakers and practitioners in mind, this research seeks to both identify the open questions with regards to cryptoasset integration as well as propose potential solutions to these issues. In addition, this piece provides action steps and processes for policymakers - regardless of geographic location - to develop a commonsense regulatory framework for cryptoassets moving forward.



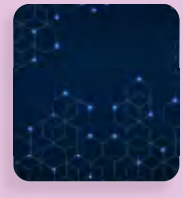
Can Crypto Fix Itself in Time?
By David S. Evans

Payment methods have a high degree of inertia making change slow and challenging for new alternatives. So it is not surprising that crypto currencies based on public blockchains are not broadly used 13 years after Bitcoin launched. The future of the largest public blockchains is limited, however, because they cannot, as is now widely acknowledged, provide stable currencies or operate efficient payment systems and other transactional services at scale. Their ability to correct these problems is impeded by the fact that they serve several masters—decentralization of authority in particular—and are not as nimble at making hard pivots as traditional startups given their consensus-based governance. Established public blockchains may solve these problems but that will take time; new faster public blockchains are entering but must attract capital and labor, which takes time too. Meanwhile payments and financial services are not standing still. Real-time payment methods, mobile money platforms, non-crypto FinTechs, and private permissioned blockchains are developing innovative payment and financial services. In the end it is race, probably over a decade or more, to see who prevails in this competition. Could crypto fix itself in time to win this race? That is possible but far from sure. For those concerned about systemic risks, the public blockchains, and their applications, given the plausible pace of adoption, are less alarming than they may appear from the current hype and valuations. There may be sound reasons to consider regulations but there is no reason to panic. The same is true for businesses concerned about missing out on an opportunity. There is likely time to evaluate the best technologies and business models for innovations in payments and financial services.



The Global Challenge of Digital Asset Regulation
By Bianca Kremer & Kevin Werbach

Digital assets add complexity to an already complex global financial system. Jurisdictions around the world are adopting measures to respond to ongoing developments. As activity grows, bespoke legal regimes are either in place, in development, or under discussion around the world. Regulatory interest now extends beyond token offerings and exchanges to include stablecoins, decentralized finance ("DeFi"), non-fungible tokens ("NFTs") and decentralized autonomous organizations ("DAOs"). In this article, we take a bird's eye view of the global state of digital asset regulation. While some countries have adopted a hostile posture, most regulators are attempting to balance concerns about potential harms against potential benefits. Despite concerns about uncertainty and fragmentation, the regulatory environment is gradually adapting to the novel challenges of digital assets and blockchain-based financial services.



Cryptocurrency Regulation and an Economic Classification of Tokens
By Lin William Cong & Claire Wilson

We discuss some of the core regulatory issues concerning crypto-tokens and digital currencies. While regulation can potentially address the needs of market participants and enhance market confidence, current approaches are either excessive or too light. As a start, we need to categorize different types of tokens, consider what protections are needed, and then model regulation around them. In particular, we highlight why token classification matters for regulation and present a classification framework based on the economic functions of tokens.

Defining Relevant Markets in the Crypto Economy

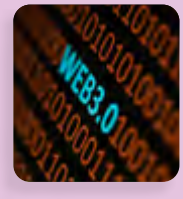
By Florian Deuflhard & C.-Philipp Heller

The regulation of cryptocurrencies and the application of antitrust law to cryptocurrencies is still in its infancy. As the definition of relevant markets may play a role both in antitrust law and other areas of the law, we discuss how existing methods to delineate relevant markets may be adapted to cryptocurrency market, in relation to consensus mechanisms, crypto exchanges, and transactional money.

Crypto Love is a Battlefield

By Richard B. Levin, Craig Nazzaro, Brian Russ & Kevin Tran

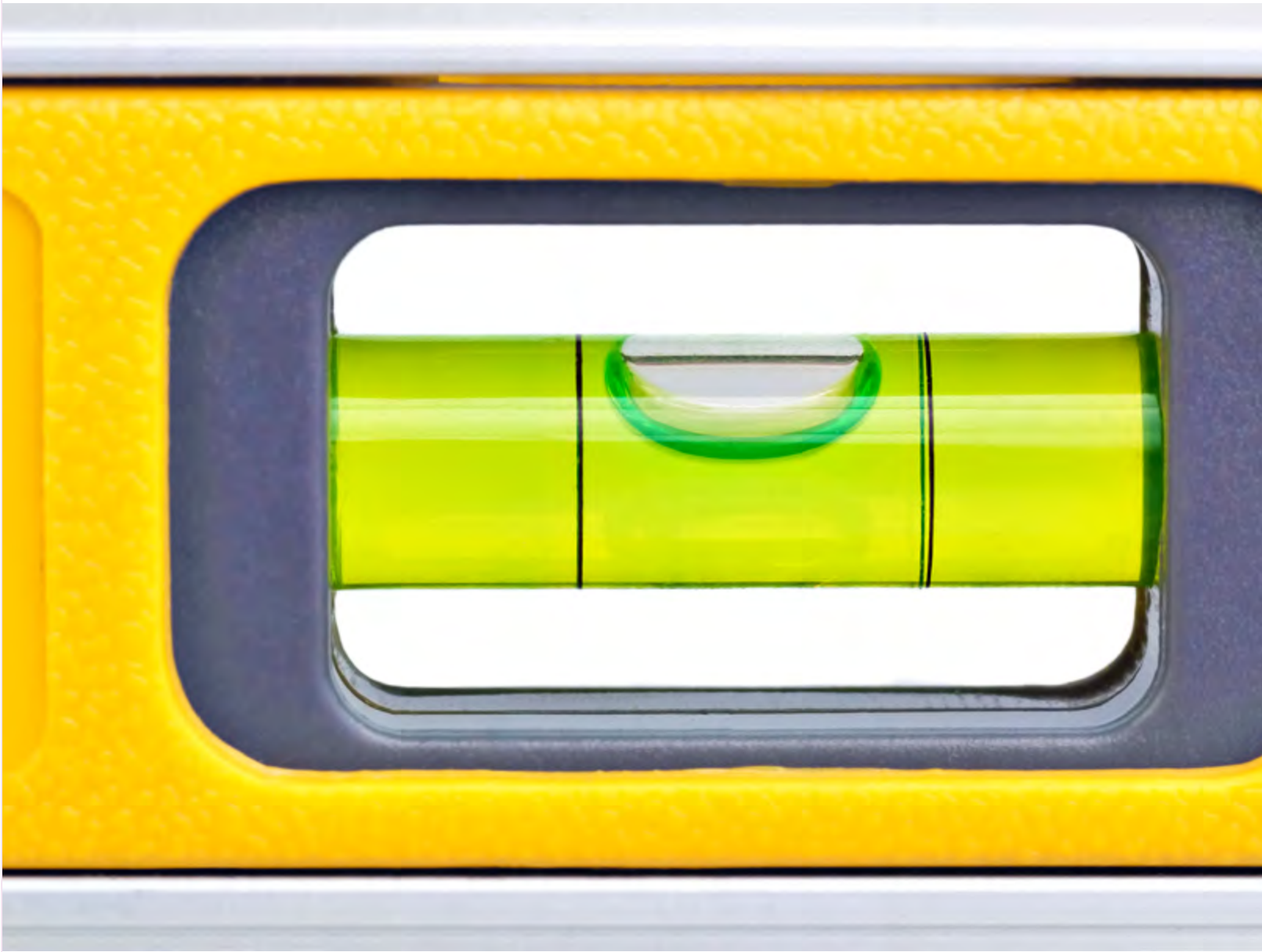
The battle over blockchain technology and digital assets bears a striking resemblance to the debate over the potential of the internet in the mid-1990s. Where critics see a passing fad with little actual utility or a lawless industry rife with fraud, many others believe a financial system supported by blockchain technology and digital assets, including virtual currencies such as Bitcoin, has significant potential has the potential to democratize and transform the very nature of the financial services industry and change how consumers, businesses and even governments interact with the financial system. Innovation in the financial services sector sparked by blockchain and digital assets, however, have caused U.S. federal and state regulators to devote more resources to better understanding this technology and the potential impact a digitized financial system could have on consumer protection, the "traditional" finance industry, and the overall safety and soundness of the financial system. As a result, regulators are taking steps to develop the tools and regulatory infrastructure to better ensure that innovation is being done responsibly.



Can WEB3 Bring Back Competition to Digital Platforms?

By Christian Catalini & Scott Duke Kominers

Like the early Internet, blockchain and Web3 applications promise a new wave of decentralization and competition – yet at the same time, it is unclear which of the dynamics that drove concentration in online platforms and services will remain in force under the Web3 paradigm. In this piece, we highlight three fundamental costs that Web3 technology can potentially reduce: the *cost of verification,* the *cost of interoperability and portability*, and the *cost of composability*. We then explore how reducing these costs may influence the design of digital ecosystems, as well as the resulting market structure and competition.



CRYPTO NEEDS COMMON SENSE FINANCIAL REGULATION – SUGGESTIONS FOR 2022

BY
SEAN STEIN SMITH

Professor, City University of New York – Lehman College.

01 INTRODUCTION

As 2022 gets underway, and the true implications of the rapid proliferation of cryptoassets the world over in 2021 becomes more understood, the following implication should be clear. Regulation, and regulatory frameworks, must evolve to keep pace with the rapid changes that have emerged in the various aspects of the crypto ecosystem. This does not mean, nor recommend, that regulatory frameworks should be constructed hastily, nor should they be implemented with an eye toward squashing or limiting innovation. Innovation and competition, in whatever industry is being analyzed at the moment, invariably leads to better results for the individuals and institutions involved in this sector.

Attempts to artificially limit or curtail the proliferation and development of blockchain based products and services are already being observed as stop-gap solutions – which will be discussed in more detail further along in this piece. Instead of seeking to control a global and decentralized industry, appropriate and reasonable regulation will seek to foster a business landscape with novel solutions that can be tested, developed, and improved in an iterative feedback loop.

Generally speaking, the less regulation and direct oversight that regulators and policymakers have and exercise over a specific industry, the healthier and more competitive that industry ends up becoming. This is not to say that regulations are not necessary. Quite to the contrary, reasonable, flexible, yet robust rulemaking is imperative to the healthy maturation of any economic sector. Free market competition and the diversity of ideas, products, and services that such competition creates have

led to improvements and higher quality experiences in virtually every asset category.

On the other hand, there have been multiple examples – as would occur in any industry or economic sector that has grown from nothing to over $3 trillion in just over a decade – of fraud, scams, and other unethical activities. That is to say that while the best approach to regulation and oversight is, and will continue to be, a relatively lighter and more accommodative touch this is not the universal answer. Rather, on the other hand, it is reasonable to expect, and would be naïve to think otherwise, that increased regulation and scrutiny is coming to this space.

The critical factor will be how well this regulation allows continued innovation and creativity while also protecting the investors and organizations involved. In other words, the balance between regulation and innovation must be integrated into every policy decision regarding blockchain and cryptoassets.

02
PURPOSE OF REGULATION

Prior to diving into specific examples or recommendations for how blockchain and crypto regulation should be developed it is worth briefly revisiting what the primary drivers and intents of regulation usually are. Firstly, there are legal requirements and obligations that all organizations must be able to comply within every jurisdiction, especially since cryptoassets represent a truly decentralized and distributed industry. Whether these be reporting, accounting, tax, or other disclosure obligations connected to environmental, social, or governance issues the importance is the same. Legal compliance is the core many regulations. Secondly, consumer protection and the enforcement of investor rights is a common theme underlying many regulatory measures.

For example, the Consumer Financial Protection Bureau ("CFPB") in the United States has enforcement and compliance powers directly connected to enforcing the rights of individual consumers in various aspects of financial transactions. Investor protection is also at the center of the mandate of the Securities and Exchange Commission ("SEC"), arguably the most powerful financial markets regulator in the world. One final aspect of regulation and regulatory measures is connected to what types of actions or enterprises will be actively encouraged or discouraged.

For example, certain and tax and regulatory positions – accelerated depreciation or favorability deductibility of interest expense – have been overtly developed to encourage certain types of behaviors over others. This is mirrored in the current treatment of cryptoassets in the United States (and other jurisdictions), where every transaction or exchange involving cryptoassets – except direct purchases of crypto with fiat currencies. This taxation treatment limits the utilization of crypto as a medium of exchange, and instead continues to push crypto toward treatment as an investable asset.

All of that said, it is also worth noting that the somewhat benevolent nature of regulation can oftentimes be overshadowed by the politics of the moment in certain jurisdictions. No country or region is exempt from this influence, but this political influence and impact can also be harnessed in a positive manner. Let us now look at some high-level examples of regulatory efforts that have sought to either actively encourage the usage of cryptoassets or drive the sector to the fringe thanks to ill-conceived and poorly executed initiatives.

03
EXAMPLES GOOD AND BAD

Regulation, as noted above, is a multi-faceted and complicated endeavor that is difficult to get right even under the best of circumstances. Given that blockchain and cryptoassets still represent relatively new technologies that remain only tangentially understood by the mainstream marketplace the risk of inappropriate regulation remains high. Mainland China has seemingly tried to lead the way in term of developing and enforcing onerous regulatory and compliance-based standards. Examples of these efforts include, but are not limited to, the following. Several efforts, including the shutting off of electricity to crypto miners, have been implemented in an attempt to forcibly close down the bitcoin (and other) crypto mining industry in the nation. In addition, several efforts, and pronouncements from the People's Bank of China ("PBoC") have banned the holding or trading of bitcoin and other cryptoassets since 2017. In addition to these headline efforts, Chinese nationals – even those located overseas – are effectively legally banned from owning any cryptoassets.

Interestingly, the efforts and initiatives to ban or limit other crypto have seemed to coincide with the development and subsequent implementation or the E-CNY or crypto-yuan. This central bank digital currency ("CBDC") is directly issued and managed by the PBoC. This CBDC was used by over 140 million people in the country during 2021, and while usage has remained primarily domestic to date, the PBoC

is actively and persistently seeking to have other countries and organizations utilize this cryptoasset.

Several other nations have completely banned cryptoassets, while many other have made operating private cryptoassets a complicated and onerous basis. This often coincides with government pronouncements or developments of a nationally issued cryptoasset, indicating a robust understanding of the opportunities provided by this technology. At the same time, many of these same nations have implemented various levels of bans and restrictions on both blockchain trading and mining, as well as limiting the ability of individuals and organizations to own or trade individual cryptoassets.

Ultimately, these efforts will most likely be uncovered to be either 1) short-sighted attempts to prevent disruption or innovation by incumbent financial institutions, or 2) present a back-door opportunity for central governments or other such institutions to develop and implement their own centralized alternatives in the meantime. Regulation over a fast moving and still-evolving economic sector is bound to be complicated, but should not be heavy-handed nor targeted specifically toward private market options.

On other hand, however, there are several notable examples in the United States – not at the federal by rather the state and local levels – where creative and forward-thinking leaders have fostered adoption of, and investment in, blockchain and cryptoassets. Notably these efforts and initiatives have focused not only on the financial sector, but have also integrated various legal, payment, and compliance aspects into these conversations. Such an approach reflects the reality that blockchain and cryptoassets are not solely concentrated around financial services or any one other specific area.

> ***Interestingly, the efforts and initiatives to ban or limit other crypto have seemed to coincide with the development and subsequent implementation or the E-CNY or crypto-yuan***

Wyoming is perhaps the most noteworthy example of a state that has wholeheartedly embraced blockchain and cryptoasset innovation. Beginning with efforts in 2017, the state eventually wrote and passed over a dozen blockchain specific laws that firmly integrated the technology and cryptoasset class into the business landscape and economic outlook of the state. Specifics of these laws include the development of a new banking institution designed specifically to conduct transactions in cryptoassets, the ability of firms to use blockchain as a definitive corporate proof of ownership and record keeping for stock and other financial instruments, and the authorizations of decentralized autonomous organizations "DAOs") to operate freely within the state. It is true that the DAO cannot operate in a truly decentralized manner, and must have an individual identified and registered as the representative of the firm for business filing purposes, this does represent a tremendous step forward.

More recently, specifically in 2021, a recent development around the intersection of public sector interest and investment in cryptoassets intersected with continuing private sector innovation; the CityCoin initiative.

04
CITYCOINS

The development and implementation of the CityCoin initiative at several major metropolitan centers in the United States, notably Miami, Austin, and New York City, also serves as a potential example and framework for other areas and jurisdictions to emulate moving forward. Prior to discussing the benefits and positives of such a framework it seems appropriate to examine just what this concept is, what it potentially represents, and what some of the challenges of this concept might end up being.

On the surface the idea of the CityCoin project is to attempt to link together the financial rewards and benefits of cryptoassets – notably the ability to mine or mint new cryptoassets, and the projected ability to benefit from both increases in price as well as the income able to be derived from these endeavors. Drilling down a little deeper the project itself does not involve bitcoin or any of the other cryptoassets that tend to make headlines and draw attention. Rather, the primary coins used – to date – in these initiatives are the STX tokens native to the Stacks blockchain. Stacks is not a corporation per se, but instead of a community of developers and individuals who have agreed to collaborate on the CityCoin initiative with metropolitan areas.

How this process works, without getting lost in the technical weeds of any other specific project is that the protocol running on the Stack blockchain – bitcoin adjacent but not the bitcoin blockchain – mines the STX tokens. After this mining process is complete a preset percentage, currently approximately 30% is held in reserve for the city in question. Once the vesting period, or whatever predetermined period, has passed the city then has access to these funds and can do with them what they wish. Options include immediately liquidating these STX tokens for cash, converting the STX tokens into other cryptoassets, or reinvest the

token into some alternative project such as a decentralized finance ("DeFi") initiative.

05 ACTION STEPS FOR A FRAMEWORK

Implementing a comprehensive regulatory and tax framework for cryptoassets is never going to be a simple or straightforward, and proceeding otherwise is simply setting up the project for failure before it even starts. Cryptoassets, by their very nature, represent unique and decentralized financial instruments that do not always comply with well-established norms or standards in the financial marketplace. In other words, attempting to fit the round peg of cryptoassets into the square hole of traditional financial instruments is simply not going to work, and just result in frustration on all sides. Rather, and an approach that seems to be taking hold in some corners of the regulatory world, is that innovative and creative solutions to these regulatory issues and open items should be presented. Clearly every jurisdiction is going to operate differently, and every cryptoasset should be treated as the differentiated asset that it is, but there are several common themes that can should be incorporated into how these frameworks are developed and put into place. Without seeking to present an all-inclusive listing, these factors should instead be viewed as a starting foundational point for future conversation.

Firstly, any well thought out regulatory framework needs to be the result of a collaborative effort between the public sector and private sectors. CityCoins, referenced above, seems to be a good example of such a collaborative effort. Wyoming is also an example as to how legislatures can coordinate efforts with other policymakers and learn from private sector participants. It is important to note that collaboration is a buzzword and term that is often overused and not terribly well understood. For any frameworks or policies to 1) be developed in the first place, 2) operate and have the intended effect, and 3) be able to survive and maintain effectiveness into the future, regulation needs to be treated as an iterative process. Especially since the blockchain and cryptoasset sector is still emerging and fast-moving, the need for flexibility and iterative improvements are critical for policy success.

Secondly, and an approach that can borrow from existing regulatory experiments is the idea of a sandbox; a selected and separate area within which organizations can develop and implement new types of operations without necessarily having to be in full compliance with regulatory obligations. Sandboxes have been used to great effect across a number of emerging technologies and applications, and there is no reason why blockchain and cryptoassets should be treated any differently. For example, regulators could seek to implement crypto payment options for certain local organizations, waive local and state taxes on cryptoasset transactions, or introduce other incentives to assist businesses seeking to start accepting payments denominated in cryptoassets.

Thirdly, how will this regulatory structure evolve – and have the capacity to evolve over time. It is no secret that cryptoassets represent one of the most dynamic and quickest moving economic sectors in the global economy today. In 2020 and 2021 alone the innovations of decentralized finance, non-fungible tokens, and central bank digital currencies all moved from conceptual or fringe ideas to topics that have rapidly moved into the mainstream financial market conversation. Given this accelerated pace of change, which shows no sign of dissipating or slowing down in any way, it seems logical to expect any rules or plans for regulation instituted at this time to invariably require updates along the way.

Now, let's pivot to specific considerations for policymakers seeking to further integrate blockchain and cryptoassets into municipal and other operations. Clearly, every cryptoasset will need to be assessed on its individual merits, but these are general considerations that should form the basis for future conversations and debates.

What cryptoassets will be integrated into the plan in the first place? The sheer array of cryptoassets that have been developed just in the last several years is astounding to think about, so this is an important aspect of any broader regulatory conversation. CityCoins provides an interesting template and example that others could potentially follow, but is just one option that should be assessed.

Sandboxes have been used to great effect across a number of emerging technologies and applications, and there is no reason why blockchain and cryptoassets should be treated any differently

Decentralized finance applications – from staking to yield mining to providing liquidity for liquidity pools – also seem to hold significant promise. Regardless of the item selected there are a few additional items that need to be designed and implemented as a part of this process.

1) How will taxpayers and residents of the city, state, or nation be able to access the cryptoassets in question? Or, conversely, is there going to be any restriction as to who can participate in these transactions? In other words, will a cryptoasset in question actually be limited to a certain set

of individuals, or will anyone be able to participate in these transactions.

2) Is there a process in place to deal with volatility, especially for cryptoassets that achieve increasingly mainstream adoption and utilization? Stablecoins and other cryptoassets might not possess the high levels of volatility commonly associated with bitcoin, but the risk and potential for volatility still certainly exist. Especially since the entire conversation around crypto policy and policy frameworks are still relatively new, it seems prudent to establish such a plan.

3) Will cryptoassets be exempt for local and other types of taxation? The tax issues that complicate the cryptoasset conversation will not be solved or addressed in any one policy proposal or framework, but there is one simple tactic that can be implemented. Building on the sandbox idea mentioned previously, eliminating, or reducing certain local or transactional (such as VAT) is a method that can be implemented to reduce the friction associated with using cryptoassets for transactional purposes.

An additional facet that should be implemented into the policy conversation is whether the jurisdiction in question will tolerate an array of cryptoassets. For example, and illustrative of the array of options that currently exist – how will the tax and other regulatory issues impact the future development of blockchain and cryptoasset development?

06
TAX AND GLOBAL IMPLICATIONS

One aspect of regulation that should be assessed and needs to be incorporated into any regulatory framework of action plan is the impact of tax treatment and the global impact of tax regimes on the development of cryptoassets. Taxes are almost always a complicated and multifaceted issue, and cryptoassets are not exempt from these issues. Rather, and illustrated by the current treatment of cryptoassets, the differences in tax policies can have a significant influence over the specific sector develops and evolves moving forward. It is important to link back to both earlier points raised in this piece as well as the underlying idea of cryptoassets in the first place.

Cryptoassets were, and by many still are, intended to be used as a transactional medium of exchange for both domestic and international transactions. Taxation, and specifically taxing cryptoassets at every point in time that a transaction occurs, will ultimately undermine this use case, and make it more difficult to have this concept manifest into reality. The discussion around tax policy and regulation is fay beyond the scope of this – or any other singular article – but is something that needs to be factored into the broader policy conversation. Stated simply, if cryptoassets are going to emerge as a transactional tool, tax treatment and regulation will need to become more nuanced to keep pace with the development of the marketplace.

07
CONCLUSIONS

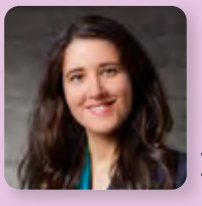
Regulation and policy decision making are invariably going to be an ongoing and complicated topic as adoption and integration of blockchain and cryptoassets continue to become an increasingly mainstream financial tool. Effective policy and rule-making processes will need to reflect the fast changing and evolving nature of the blockchain and cryptoasset sector; new iterations of applications continue to be introduced and implemented on an almost continuous basis.

With these new applications, however, will invariably come an array of regulatory, reporting, and financial reporting challenges that will need to be effectively addressed. Regulation and policy frameworks will also need to, on top of the specific policy actions taken, need to factor into the competitive implications of how policy decisions and actions impact the broader ecosystem at large. Blockchain and cryptoassets represent an innovative and dynamic technological sector, and have already created multiple advancements in terms of technical development and financial wealth creation.

Successfully shepherding this fast-growing space to a more mature position in the marketplace, and doing so in a manner that is dynamic and inclusive, is a responsibility that policymakers should be taken seriously. A complicated task to be sure, but a challenge that must be proactively addressed in a proactive way, utilizing best practices that already exist as well as thinking of new ways to effectively lead this space forward.

An additional facet that should be implemented into the policy conversation is whether the jurisdiction in question will tolerate an array of cryptoassets

THE GLOBAL CHALLENGE OF DIGITAL ASSET REGULATION



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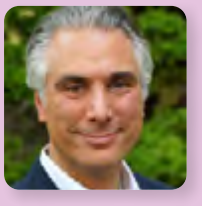
BIANCA KREMER



&
KEVIN WERBACH

Research Fellow, Wharton Blockchain and Digital Asset Project, and First Pacific Company Professor and Chair, Department of Legal Studies & Business Ethics, The Wharton School, University of Pennsylvania, respectively.

01

INTRODUCTION

The financial system has become increasingly global and intertwined over the past century. While this has produced tremendous benefits, it also raises the stakes on the risk side of the equation. Higher volumes, greater velocity, and increasing sophistication of financial engineering open opportunities for unintentional crashes as well as intentional manipulation. And failure in one market can ultimately have cascading effects into others. More digital and global money also raises the stakes around illicit financial activity, such as money laundering and terrorist financing. For these and other reasons, as global finance has evolved, so has global financial regulation.

The development of digital asset markets, in particular the rise of decentralized finance ("DeFi") can be viewed as a new and significant

stage in this process. Over 100 million people worldwide now hold cryptocurrencies.[2] In addition to pure digital asset exchanges such as Coinbase, traditional financial platforms such as PayPal and Square are embracing cryptocurrency transactions. Funds locked into DeFi protocols grew from US$1 billion in early 2020 to US$250 billion in late 2021.[3] And traditional financial institutions are becoming increasingly active players in digital asset markets.

Contrary to popular discourse, blockchain-based finance is neither a regulatory "Wild West" where anything goes, nor a world that has successfully replaced the need for law with immutable code. The market failures, information asymmetries, and abuses that give rise to the need for traditional financial regulation do not all disappear in DeFi and other digital asset markets; in some cases, they are magnified. Effectively addressing these regulatory challenges, however, is difficult. Part of the difficulty lies in the complex convergence of systems involved: the blockchain technology itself and its derivative applications, the global financial system, and the many regulatory agencies that have varying interests and mandates. In addition, digital assets and blockchains are inherently global, while regulation operates, in the first instance, at the national or sub-national level.[4]

Contrary to popular discourse, blockchain-based finance is neither a regulatory "Wild West" where anything goes, nor a world that has successfully replaced the need for law with immutable code

There is a long way to go to address these challenges. However, there is reason for optimism. The dramatic increase in adoption and sophistication of digital asset markets since 2017 has occurred against a backdrop of extensive regulatory activity around the world. With a few important exceptions, governments have not attempted to shut down cryptocurrencies, but to ensure they are appropriately regulated to address significant public policy concerns. Regulation has not prevented the flowering of innovative activity. Furthermore, there is growing coordination and harmonization among jurisdictions, suggesting that the global nature of digital assets need not stand in the way of appropriate regulatory accommodations.[5]

02
THE STATE OF DIGITAL ASSET REGULATION

Blockchain-based innovations may represent a paradigm shift in the very nature of financial services, facilitating transactions without the need for intermediaries, allowing for more user control through self-custody, and automating activity through smart contracts. Digital assets represent a new asset class that simply did not exist before. While they promise tremendous benefits, they also pose risks, some of which are novel.

The traditional financial system ("TradFi") is subject to a variety of laws, regulations, and "soft law" constraints within and across jurisdictions. Major goals of financial regulation are to: (i) combat financial crime and terrorist financing, (ii) protect consumers to investors, (iii) ensure market integrity and efficiency, (iv) maintain financial stability by avoiding systemic risk and ensure a stable monetary system; (v) enable innovation and promote capital formation; and (vi) ensure tax compliance. Digital assets raise questions in virtually all of these categories.

Countries all over the world are designing frameworks or are at least planning to address the unique challenges that blockchains and digital assets pose for financial regulation. Regulatory activity increased as a response to the initial coin offering ("ICO") boom in 2017; following Facebook's

2 See Paul Vigna, Bitcoin's 'One Percent' Controls Lion's Share of the Cryptocurrency's Wealth, (Wall Street Journal, Dec. 20, 2021), https://www.wsj.com/articles/bitcoins-one-percent-controls-lions-share-of-the-cryptocurrencys-wealth-11639996204.

3 See https://defillama.com/. Google trends show that the interest for DeFi had its onset with the start of the Covid-19 pandemic in the Western world. See https://trends.google.com/trends/explore?cat=7&date=all&q=defi.

4 Supra-national regulators such as the European Commission or World Trade Organization gain explicit mandates through voluntary accession of sovereign states.

5 See Kevin Werbach, Regulating Cryptocurrency Markets: First, Do Something (Medium, 2021), https://kwerb.medium.com/regulating-cryptocurrency-markets-first-do-something-cc84a3424fa4.

2019 proposal for a global stablecoin, originally called Libra; and in 2021, with increased institutional adoption.[6]

The spectrum of initial regulatory approaches across countries is quite broad, from adopting bitcoin as legal tender in the case of El Salvador, to outright banning certain cryptocurrency activity, such as in China, India, and Nigeria.[7] However, most of the major financial and digital asset activity hubs have taken a broadly similar approach: (i) identifying where cryptocurrency and DeFi activity fits with existing regulatory obligations, in order to achieve major public policy goals; and (ii) where gaps or conflicts are evident, developing new regulatory frameworks appropriate to the unique attributes of digital asset markets.

In the United States, digital assets have received regulatory attention both at a federal and state level by various agencies, such as the Securities and Exchange Commission ("SEC"), the Financial Crimes Enforcement Network ("FinCEN"), the Office of the Comptroller of the Currency ("OCC"), the Internal Revenue Service ("IRS"), the Commodity Futures Trading Commission ("CFTC"), the Federal Deposit Insurance Corporation ("FDIC"), the Office of Foreign Asset Control ("OFAC"), and the Consumer Financial Protection Bureau ("CFPB"). At a state level, approaches to digital assets encompass the whole spectrum from crypto-favorable, such as in Wyoming, to more restrictive, such as in Maryland.[8] This has produced a fragmented regulatory landscape, but also one experimenting with a large number of possible approaches.

Digital assets can serve many functions. Because the U.S. financial regulatory structure is divided among specialized agencies and offices, digital assets are classified in a variety of ways. FinCEN, which focuses on financial crime, designated virtual currencies as "money" and in 2020 suggested that large virtual currency transactions needed to adhere to Know Your Customer ("KYC") requirements and had to be reported.[9] The IRS treats digital assets as property for income tax purposes.[10] The Commodity Futures Trading Commission ("CFTC") has found digital assets to be commodities when traded,[11] and the Securities and Exchange Commission ("SEC") has suggested that most digital assets fall under securities law.

> ***"The traditional financial system ("TradFi") is subject to a variety of laws, regulations, and "soft law" constraints within and across jurisdictions***

The SEC brought more than seventy cryptocurrency-related enforcement actions since 2013, mostly involving claims of fraud and unregistered securities issuances. SEC Chair Gary Gensler has urged Congress to clarify the SEC's regulatory power over digital assets and exchanges.[12] However, Gensler has also stated that "[c]ertain rules related to crypto assets are well-settled. The test to determine whether a crypto asset is a security is clear."[13] This view is not widely shared in the digital asset community. Resolution of pending litigation between the SEC and Ripple, which the SEC claims engaged in unregistered securities trading through the XRP token, may provide greater clarity. Moreover, Congress appears highly interested in passing legislation to address the securities classification of digital assets, or to provide a more comprehensive framework. Several hearings were held in late 2021, and several serious legislative

6 Coinbase's successful initial public offering in 2021 was a watershed moment for institutional acceptance of digital asset markets. See Landon Manning, Coinbase IPO Exceeds All Expectations, Showing More Promise For Bitcoin, (Nasdaq, Apr. 19, 2021), https://www.nasdaq.com/articles/coinbase-ipo-exceeds-all-expectations-showing-more-promise-for-bitcoin-2021-04-19.

7 In the case of Nigeria, that attitude, however, backfired, and instead of preventing Nigerians from engaging with cryptocurrencies the adoption has increased. See Chijioke Ohuocha & Libby George, Crypto trading thrives in Nigeria despite official disapproval (Reuters, Oct. 12, 2021), https://www.reuters.com/business/crypto-trading-thrives-nigeria-despite-official-disapproval-2021-10-12/.

8 See Joe Dewey, Blockchain and Cryptocurrency Laws and Regulations 2022 - USA, https://www.globallegalinsights.com/practice-areas/blockchain-laws-and-regulations/usa.

9 See Requirements for Certain Transactions Involving Convertible Virtual Currency or Digital Assets, 85 FR 83840 (Dec. 23, 2020), https://www.govinfo.gov/app/details/FR-2020-12-23/2020-28437/summary.

10 See IRS Notice 2014-21, 2014-16 I.R.B. 938, Guidance for Individuals and Businesses on the Tax Treatment of Transactions Using Virtual Currencies, https://www.irs.gov/pub/irs-drop/n-14-21.pdf. See also IRS, Frequently Asked Questions on Virtual Currency Transactions, https://www.irs.gov/individuals/international-taxpayers/frequently-asked-questions-on-virtual-currency-transactions.

11 See CFTC Release Number 7820-18, Federal Court Finds that Virtual Currencies Are Commodities (Oct. 3, 2018), https://www.cftc.gov/PressRoom/PressReleases/7820-18. See also CFTC, Digital Assets, https://www.cftc.gov/digitalassets/index.htm.

12 See Testimony of Gary Gensler (Chairman, SEC) before the Subcomm. on Fin. Serv. And General Govt. of the H. Appropriations Comm., 117th Cong. (May 26, 2021), https://www.sec.gov/news/testimony/gensler-2021-05-26.

13 See SEC Chair Gary Gensler, Remarks Before the Aspen Security Forum, (Aug. 3, 2021), https://www.sec.gov/news/public-statement/gensler-aspen-security-forum-2021-08-03.

proposals are being developed. There is active dialogue underway between policymakers and major digital asset firms or investors.

There are now a number of collaborative efforts across federal agencies. For example, the President's Working Group on Financial Markets ("PWG") together with FDIC and the OCC earlier in November 2021, released a report on stablecoins,[14] alerting to the risks associated with this type of digital asset and calling on the U.S. Congress to pass legislation.[15] An Executive Order on cryptocurrencies, which would encourage further coordination, is reportedly under discussion in the White House.[16]

> ***There is active dialogue underway between policymakers and major digital asset firms or investors***

In Europe, the regulation of digital assets is similarly moving from initial fragmentation toward a coordinated approach. Almost all European Union Member States have significantly increased their regulatory activity since 2018, applying both tax and AML/CFT laws to crypto assets.[17] According to Article 47 (1) of the 5th Anti Money Laundering Directive, Member States must ensure that exchange service providers between virtual currencies and fiat currencies, and custodian wallet providers are registered.[18] In a new proposal for a 6th Anti-Money Laundering Directive, the goal is to harmonize AML/CFT across the European Union further and establish a new EU anti-money laundering authority.[19]

The European Securities and Markets Authority ("ESMA") is the EU securities markets regulator and has issued warnings regarding ICOs in 2017,[20] it published advices on ICOs and crypto assets in 2019,[21] and in 2021 warned about the risks linked to still largely unregulated crypto assets.[22] In 2019 the European Banking Authority ("EBA") published a report on crypto assets, in which it recommends the European Commission to take further measures.[23] In September 2020, the European Commission thus presented a comprehensive legislative proposal for a regulation on Markets in Crypto Assets ("MiCA")[24] as part of its Digital Finance Strategy. The ambition is to harmonize this area across all Member States. The Digital Finance Strategy not only includes the MiCA regulation but also a new proposal for a Pilot Regime for Market

14 See U.S. Department of the Treasury Press Release, President's Working Group on Financial Markets Releases Report and Recommendations on Stablecoins (Nov. 1, 2021), https://home.treasury.gov/news/press-releases/jy0454.

15 See PWG, FDIC, & OCC, Report on Stablecoins, (Nov. 1, 2021), https://home.treasury.gov/system/files/136/StableCoinReport_Nov1_508.pdf.

16 See Jennifer Epstein & Benjamin Bain, White House Weighs Wide-Ranging Push for Crypto Oversight, (Bloomberg, Oct. 8, 2021), https://www.bloomberg.com/news/articles/2021-10-08/white-house-weighs-wide-ranging-push-for-crypto-oversight.

17 With the exception of Bulgaria. See US Law Library of Congress, Regulation of Cryptocurrency Around the World: November 2021, Update, https://tile.loc.gov/storage-services/service/ll/llglrd/2021687419/2021687419.pdf.

18 See the 5th AML/CFT Directive (EU) 2018/843 of the European Parliament and of the Council of 30 May 2018 amending Directive (EU) 2015/849 on the prevention of the use of the financial system for the purposes of money laundering or terrorist financing, and amending Directives 2009/138/EC and 2013/36/EU, https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32018L0843&from=EN.

19 See European Commission COM(2021) 420 final, Proposal for a regulation of the European Parliament and of the Council on the prevention of the use of the financial system for the purposes of money laundering or terrorist financing, https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52021PC0420.

20 See ESMA, Warnings and Publications for Investors - ESMA highlights ICO risks for investors and firms, (Nov. 13, 2017), https://www.esma.europa.eu/press-news/esma-news/esma-highlights-ico-risks-investors-and-firms.

21 See ESMA, Advice Initial Coin Offerings and Crypto-Assets, (Jan. 9, 2019), https://www.esma.europa.eu/sites/default/files/library/esma50-157-1391_crypto_advice.pdf.

22 See ESMA Press Release, ESMA sees high risk for investors in non-regulated crypto assets, (Mar. 17, 2021), https://www.esma.europa.eu/press-news/esma-news/esma-sees-high-risk-investors-in-non-regulated-crypto-assets.

23 See EBA, Report on crypto assets with advice for the European Commission, (Jan. 9, 2019) https://www.eba.europa.eu/sites/default/documents/files/documents/10180/2545547/67493daa-85a8-4429-aa91-e9a5ed880684/EBA%20Report%20on%20crypto%20assets.pdf.

24 See European Commission COM(2020) 593 final, Proposal for a Regulation of the European Parliament and of the Council on Markets in Crypto-assets, and amending Directive (EU) 2019/1937, https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52020PC0593.

Infrastructures Based on Distributed Ledger Technology ("PilotR").[25]

MiCA creates a bespoke regime for markets in crypto assets, tackling issuers of crypto assets as well as crypto asset service providers ("CASPs"), such as wallet providers and exchanges. A distinction is made between three-subcategories of crypto-assets, the two latter categories essentially being sub-categories of stablecoins. MiCA defines these categories as (i) utility tokens which have no financial purpose, (ii) asset-referenced tokens, which maintain stability by referencing one or several legal tender currencies, commodities, or crypto assets, and (iii) crypto-assets that are intended as means of payment and stabilize their value by referencing one fiat currency. MiCA wants to enhance transparency for crypto asset holders by requiring ESMA to establish a register of service providers and considers crypto asset services as financial services. The European Union is a supranational body with law-making power in its Member States. MiCA as a regulation (as opposed to a directive),[26] once adopted, will become applicable throughout the European Union, taking precedence over any national rules. Thus, by implementing a harmonious regime, which becomes directly applicable in all Member States, fragmentation can be avoided.

Outside the European Union, small jurisdictions such as Switzerland and Liechtenstein are known for their crypto-friendly stance. Switzerland has been fast to act and seize the opportunity to attract crypto business with its regulators' clear guidance and the amendment of existing laws, amending several civil, financial market, and securities laws, introducing electronic registers, and DLT Licenses.[27] A neighboring country, Liechtenstein, has passed a completely new law for digital assets and introduced a container model in 2020, paving the way for any right or asset to be tokenized.[28]

In other parts of the world, such as in Asia, the regulatory environment is maturing as well. Many jurisdictions, including Japan, South Korea, Singapore, and Hong Kong, have implemented cryptocurrency license requirements. While in Singapore, crypto companies and exchanges are regulated and can apply for licenses,[29] Hong Kong has proposed restrictions on crypto-asset trading.[30]

Even more drastic restrictions on digital asset providers and users seem to be more commonplace elsewhere in Asia and in parts of Africa. On 24 September 2021, for example, in its most aggressive crackdown yet, several Chinese authorities in conjunction issued a blanket ban on all crypto-related transactions and activities, including mining.[31] While crypto is prohibited, the adoption of the digital yuan is further encouraged.[32] Blockchains are not simply disregarded; instead, they form part of China's DLT infrastructure strategy.[33]

"MiCA creates a bespoke regime for markets in crypto assets, tackling issuers of crypto assets as well as crypto asset service providers ("CASPs"), such as wallet providers and exchanges

25 See Dirk A. Zetzsche & Jannik Woxholth, The DLT Sandbox Under the EU Pilot Regulation, (Oxford Business Law Blog, May 14, 2021), https://www.law.ox.ac.uk/business-law-blog/blog/2021/05/dlt-sandbox-under-eu-pilot-regulation.

26 See European Union, Types of legislation, https://europa.eu/european-union/law/legal-acts_en.

27 See Federal Council Press Release, Federal Council brings DLT Act fully into force and issues ordinance, (Jun. 18, 2021), https://www.sif.admin.ch/sif/en/home/documentation/press-releases/medienmitteilungen.msg-id-84035.html.

28 See Government of the Principality of Liechtenstein Press Release, Liechtenstein Parliament approves Blockchain Act unanimously, (Oct. 3, 2019), https://www.regierung.li/en/press-releases/222958/?typ=content&nid=11164. See The Token and Trusted Technology Service Provider Act (TVTG), https://www.gesetze.li/konso/2019301000.

29 See Monetary Authority of Singapore (MAS) Payment Services Act (PSA), https://www.mas.gov.sg/regulation/acts/payment-services-act. See the 2021 amendments of the PSA, https://sso.agc.gov.sg/Acts-Supp/1-2021/Published/20210301?DocDate=20210301.

30 See Mercedes Ruehl & Leo Lewis, Stakes Rise for Singapore's Big Crypto Bet, (Financial Times, Sept. 30, 2021), https://www.ft.com/content/1f948b38-2061-416d-951d-69415b879c17.

31 See Alun John, Samuel Shen & Tom Wilson, China's top regulators ban crypto trading and mining, sending bitcoin tumbling (Reuters, Sept. 24, 2021), https://www.reuters.com/world/china/china-central-bank-vows-crackdown-cryptocurrency-trading-2021-09-24/.

32 See Jamie Crawley, China's CBDC has been used for $9.7B of Transactions (CoinDesk, Nov. 3, 2021), https://www.coindesk.com/business/2021/11/03/chinas-cbdc-has-been-used-for-97b-of-transactions/.

33 See Jane Wu, Blockchain as an Infrastructure: A Deep Dive Into China's DLT Strategy, (Cointelegraph, Jun. 23, 2020), https://cointelegraph.com/news/blockchain-as-an-infrastructure-a-deep-dive-into-chinas-dlt-strategy.

03
LOOKING TO THE FUTURE

As major jurisdictions refine their approach to digital assets, several international standard-setting bodies are working to harmonize regulation globally. Although their guidelines and recommendations are soft law, they play a key role in shaping the regulatory blockchain landscape. Among these are the Financial Action Task Force ("FATF"), the International Organization of Securities Commission ("IOSCO"), the Financial Stability Board ("FSB"), the Basel Committee on Banking Supervision ("BCBS"), and the Organization for Economic Cooperation and Development ("OECD"). In October 2021, for example, FATF updated its guidance for virtual asset service providers ("VASP").[34] In November 2021, the IOSCO in its report sets out recommendations on sustainability-related practices, policies, procedures, and disclosures in asset management.[35]

There will inevitably remain differences among regulatory approaches around the world, opportunities for arbitrage, and jurisdictions that fail to meet global standards for regulatory protections. However, global financial regulation need not be perfect to be reasonably effective. So-called traditional finance is already highly digital and highly mobile. Ultimately, financial activity depends on trust.[36] Regulation can serve as a trust-building and -enhancing exercise, which leads activity to migrate to jurisdictions with strong protections against illicit activity, market manipulation, and fraud.

Minimizing risk and protecting users, while still realizing the benefits from new financial technologies, is a balancing act. Regulation must protect important public interests without unnecessarily stifling innovation. It is not an inconsequential undertaking; its effects will be felt both directly by those subject to the rules, and indirectly by investors and other market actors. Moreover, firms will change their behavior strategically in anticipation of, or in response to, regulatory mandates, which will produce second-order consequences. That is why continued research, education, and fruitful discussions between industry and regulators are imperative. Only in achieving a good balance between regulation and innovation, while continuously monitoring and evaluating the path chosen, and adapting it when and if necessary, can jurisdictions remain competitive and collaborative in the global economy.

To achieve these goals, regulators must continue to follow a deliberate process:

(i) Assess whether existing rules, such as the classification of regulated securities transactions, can effectively encompass digital assets. Doing so may require formal clarification of how general terms will be applied in this context, and/or prioritization of enforcement against actors in clear violation of regulatory mandates.

(ii) Consider proportionality and use tools such as sandboxes and safe harbors to address unintended consequences of applying requirements to nascent firms and activities.[37]

(iii) Consider whether the technologies of digital assets and blockchains either eliminate the need for traditional requirements or make application of those requirements more problematic. Where possible, identify the solution that meets the policy goal in the manner most appropriate for the technical and market context.

(iv) Where needed, adopt new specialized rules for digital assets.

(v) Coordinate both informally and formally with other regulatory agencies and jurisdictions.

"There will inevitably remain differences among regulatory approaches around the world, opportunities for arbitrage, and jurisdictions that fail to meet global standards for regulatory protections

34 See FATF's Updated Guidance for a Risk-Based Approach to Virtual Assets and Virtual Asset Service Providers, https://www.fatf-gafi.org/publications/fatfrecommendations/documents/guidance-rba-virtual-assets-2021.html.

35 See The Board of the IOSCO, Recommendations on Sustainability-Related Practices, Policies, Procedures and Disclosure in Asset Management Final Report FR08/21 (Nov., 2021), https://www.iosco.org/library/pubdocs/pdf/IOSCOPD688.pdf.

36 See Kevin Werbach, Regulating Cryptocurrency Markets: First, Do Something (Medium, May 15, 2021), https://kwerb.medium.com/regulating-cryptocurrency-markets-first-do-something-cc84a3424fa4. See also Kevin Werbach, The Blockchain and the New Architecture of Trust (MIT Press, 2018).

37 See, e.g., World Economic Forum and Wharton Blockchain and Digital Asset Project, Decentralized Finance: (DeFi) Policy-Maker Toolkit (Jun. 8, 2021), https://www.weforum.org/whitepapers/decentralized-finance-defi-policy-maker-toolkit.

To stay relevant, regulatory practices themselves should also be brought into the new digital era. Novel methods of so-called “RegTech” that harness the power of blockchains could further be explored and used. In cases such as money laundering, for example, flagging of suspicious wallets and transactions if any risks have been identified could happen automatically. Ongoing conversations between regulators and industry participants will be important for shaping such tools. The digital asset space is not only a challenge: it also represents an opportunity for governments if they seize this moment proactively to modernize and streamline regulatory processes.

To stay relevant, regulatory practices themselves should also be brought into the new digital era. Novel methods of so-called “RegTech” that harness the power of blockchains could further be explored and used

CAN CRYPTO FIX ITSELF IN TIME?

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01 INTRODUCTION

This paper provides a pragmatic assessment of the future of crypto. As used here, crypto refers to public blockchains that rely on a cryptocurrency and the applications that use these blockchains to provide services to end users. Ether is an example of a public blockchain; it uses the ether cryptocurrency; and it supports applications such as Aave for lending and borrowing. Some blockchains, such as Onyx, which is owned by JPMorgan Chase, are private in that they are closed except to those who have permissions to use them. Private blockchains are one of the potential competitors to public ones.

The paper considers the timeframe over which disruptive innovation could take place and substantial uncertainties about outcomes could be resolved. That is important for decisionmakers — including businesses and regulators — who must decide how quickly to react to possible threats and opportunities posed by crypto.

The analysis is informed by the economics and experience of payment methods which is where we begin. Payments are one of the major applications for public blockchains and one that is necessary for supporting many proposed applications. The conclusions apply more broadly to other financial and transactional services.

02

CHANGE TAKE PLACE SLOWLY IN PAYMENTS AND IT IS TOUGH FOR NEW SOLUTIONS TO GET CRITICAL MASS

Payment methods are two-sided. Senders and receivers of funds use the platforms to transact. There are strong indirect network effects. Senders value platforms that enable them to reach more receivers, and receivers value platforms that enable them to reach more senders. Inertia makes it hard to get participants, who use one method, to use another. People and businesses are accustomed to a method and collectively need a reason to change. They have made sunk cost investments in assets, such as software, and the time they have spent learning a method. They would have to incur those costs again. That makes indirect network effects sticky for incumbent methods and hard to overcome for new ones. These features help explain why changes takes place slowly in payments and why entirely new methods, such as public blockchains, have trouble securing widespread adoption.

A. Change Takes Place Very Slowly in Payments

Change doesn't literally occur at a glacial pace for payments, but from the perspective of the human lifespan it can seem that way.[2] New high-level payment methods displace old ones very slowly, so much so that old payment methods remain in use for hundreds of years. Physical money started displacing barter about three millennia ago; paper checks did the same for physical money about 800 years ago, and digital methods started pushing both aside about 150 years ago.[3] Within these high-level methods, new variants displace older ones but also slowly and often incompletely. Money went from coins to paper, but there are still coins.

The digital revolution has not upended these historical trends even though it has increased the pace quite a bit. Consider everyday transactions between consumers and merchants. General purpose payment cards came into use in the early 1950s. By the early 1970s, private computer networks processed credit and debit transactions for consumers and merchants. The speed of these networks has increased dramatically over time to the point where a transaction takes place in a few seconds when a consumer waves a contactless card at a terminal or presses buy on an app or a website.

Yet cash persists in highly developed countries with all the necessary infrastructure for electronic payments. The European Central Bank did a survey of consumer payments covering 19 EU countries (accounting for 85 percent of EU GDP) in late 2019 and early 2020.[4] It found that 73 percent of all transactions at the point of sale or between people were made with cash, which accounted for 48 percent of the value of these transactions. The percent of payments made with cash, cards, or e-money in the EU-5 (France, Germany, Italy, Spain, Netherlands) declined from 57 percent in 2014 to 44 percent in 2020 based on the ECB's Payments and Settlements Systems Statistics.[5] Cash use is much lower in the U.S. but still significant. A 2020 Federal Reserve Survey found that cash accounted for 19 percent of consumer transactions and 6 percent of the value of these transactions. Cash has, as oft-noted, largely disappeared in Sweden but most countries have a long ways to go for that to happen.

Payment methods are two-sided. Senders and receivers of funds use the platforms to transact. There are strong indirect network effects

2 David S. Evans & Richard Schmalensee, *Paying with Plastic: The Digital Revolution in Buying and Borrowing*, (Cambridge, Mass: MIT Press, 2004), Chapter 2.

3 The first two are well known. Western Union started an electronic payment system based on its telegraph network in 1871 which competed with the then popular methods of sending cash by stagecoach and paper checks through a correspondent banking network.

4 European Central Bank, "Study on the payment attitudes of consumers in the euro area (SPACE)," December 2020.

5 These calculations infer cash use from data on ATM and OTC withdrawals.

B. New Payment Methods Struggle to Gain Adoption

Given that even fundamental innovations in payment methods erode incumbent methods slowly, it should come as no surprise that lesser innovations struggle to gain traction at all. They must overcome a high degree of inertia for existing methods to get the critical mass necessary for survival much less growth. That has happened when there is a powerful reason for people to try something new. M-PESA, the mobile money scheme in Kenya, grew very rapidly. It served at least initially as a complement to cash: people could use cash to buy mobile money at physical (cash-in/cash-out) locations and send it to people who could redeem mobile money for cash at those locations. It mainly displaced physical methods for transporting cash with digital ones and took off during a period when civil war made transport unsafe and risky.[6]

Apple Pay shows the challenge. Launched in 2014, Apple Pay made it very convenient for a consumer to register their card on their iPhone and then simply wave the phone at a contactless terminal to pay. It is very slick. Nevertheless, roughly 95 percent of iPhone users, who have Apple Pay installed, and are paying at a terminal where they could use it, do not.[7] That has been the case, approximately, every year from 2014-2021. Other mobile payment solutions have been even less successful in the U.S. Even when people do use their mobile phone to pay, they are generally using a debit or credit card as the source of funds.

These methods are not being held back by sunk cost investments by consumers or merchants. People already have iPhones and merchants already have contactless terminals. The problem appears to be that it is easy for consumers to just wave or dip a card at a terminal, just like they have always done, and they do not see any reason to depart from that ingrained and efficient behavior. New payment methods that require senders and receivers of funds to make new investments of time or money face far greater obstacles.

These points concerning the inertia of payment systems apply to financial services more generally. Banks, businesses, and consumers have all made investments. They have embedded costs and learnings which make rapid change difficult for any of them. Getting all parties to move to new solutions is a challenge. This inertia certainly does not preclude innovative solutions from getting widespread adoption. But doing so is difficult and takes time in the best of circumstances.

03

LIKE ANY NEW TECHNOLOGIES CRYPTO HAS FLAWS BUT HAS LESS FLEXIBILITY FOR FIXING FUNDAMENTAL PROBLEMS

It should come as no surprise then that crypto has gotten little traction as a general-purpose payment method thirteen years after its launch and after various well publicized claims that it was about to go mainstream. It took five years before a major retailer, overstock.com which was led by a bitcoin evangelist, to accept bitcoin; three years later bitcoin accounted for 0.2 percent of payment volume there.[8] Today, it is not possible to pay directly with crypto at most online sites or physical locations.

> ***These methods are not being held back by sunk cost investments by consumers or merchants. People already have iPhones and merchants already have contactless terminals***

Following the run-up in crypto asset values, and wealth accumulation, and massive publicity, including by celebrities, more businesses have announced they would accept crypto. Some digital wallets, such as PayPal, support crypto, but it appears that this mainly provides a convenient way for buying and selling the asset for investment and spec-

6 For discussion of the adoption M-PESA and Apple Pay see David S. Evans & Richard Schmalensee, *Matchmakers: The New Economics of Multisided Platforms* (Cambridge, MA: Harvard Business Review Press, 2016).

7 Based on surveys conducted by and reported periodically by PYMNTS.com.

8 Ellen Rosen, "From Furniture to Cryptocurrency—Overstock Is on a Journey," New York Times, June 27, 2018.

ulation.[9] El Salvador, population 6.5 million, made bitcoin legal tender alongside the U.S. dollar. Most people in that country do not want to hold, or use bitcoin, and now incur substantial transaction fees converting bitcoins to dollars.[10]

Given the glacial change in payment methods thirteen years is a blink of the eye. There is no reason to discount crypto's future, as a payment method, based on its limited success so far. Debit cards were available in the U.S., for example, by the early 1970s, but had scant adoption until the mid-1990s.

In their current form, though, the leading public blockchains have fundamental problems — they cannot be currencies because they do not have any mechanisms to make them stable, and they cannot be general-purpose payment systems because they cannot process large numbers of transactions efficiently. These are not the best of circumstances. The question is whether one or more could solve the instability and scalability problems, and gain enough traction, before they are crowded out by other sticky efficient alternatives.

The following discussion focuses on Bitcoin but applies more broadly.

> ***In their current form, though, the leading public blockchains have fundamental problems***

A. Bitcoin Has No Mechanism to Ensure Price Stability Which Is a Necessary Condition for Being a Currency

A putative currency must be reasonably stable. If it is subject to rapid depreciation people do not want to receive it for payments, and if subject to rapid appreciation people do not want to spend it and thereby lose their gain.[11] Bitcoin does not have any mechanism for ensuring a stable currency. It has a hardwired, algorithmically driven, supply curve that reaches an asymptote of 21 million bitcoins. It cannot adjust supply to ensure either that the currency is relatively stable over short periods of time or that it inflates or deflates at a predictable rate.

In fact, the price of bitcoin has been highly unstable. The Table shows the coefficient of variation of bitcoin relative to stable currencies (the euro and dollar) and unstable ones (the Nigerian naira and the Argentinian peso) over the last 10 years.[12] Between 2012 and 2021 the average annual coefficient of variation for bitcoin has been 16.4 times higher than the dollar and 5.0 times higher than the peso. The coefficient of variation over the entire time period is 23.4 times higher than the dollar and 1.8 times higher than the peso. Over the first six-month period during which bitcoin has been legal tender in El Salvador (September 7, 2021-February 7, 2022) its coefficient of variation has been 10.6 times higher than the dollar, with a daily peak of $69,000 and a trough of $32,917.[13]

These same points apply to the other public blockchains. They do not have mechanisms to ensure reasonable price stability and in fact they have been extremely volatile. Stablecoins — which have a fixed exchange rate with a basket of one or more fiat currencies — are a possible remedy for some blockchains such as Ethereum. Stablecoins, however, have alarmed financial regulators and their future is uncertain.[14]

9 There are solutions, such as by Visa, which enable a crypto holder to buy a fiat-denominated good by converting crypto to the fiat currency and then paying the merchant in the fiat currency. In principle doing is no different than buying goods with appreciations on an investment in a fiat currency, stock, or commodity. The increase in the value of crypto assets has resulted in a demand to evade taxes on capital gains by using the appreciated currencies to buy goods. The effectiveness of this approach depends on the extent to which tax authorities monitors and receive reports on this activity. More online merchants are taking payment from native crypto wallets such as those offered by BitPay.

10 Anthony Faiola, "Nayib Buklele trades bitcoin naked. El Salvador is paying the price, Washington Post, January 26, 2022. https://www.washingtonpost.com/world/2022/01/26/el-salvador-bitcoin-dip-crypto-crash/.

11 For an earlier discussion and some data, see David S. Evans, "Economic Aspects of Bitcoin and Other Decentralized Public-Ledger Currency Platforms," April 15, 2014. University of Chicago Coase-Sandor Institute for Law & Economics Research Paper No. 685, Available at SSRN https://ssrn.com/abstract=2424516 or http://dx.doi.org/10.2139/ssrn.2424516.

12 In each case the price is measured relative to a base currency (the U.S. dollar relative to the euro, for example, which is shown as USD/EUR in the table.

13 The IMF has urged El Salvador to drop bitcoin as legal tender because it leads to financial instability. Ephrat Livni, "The I.M.F. urges El Salvador to end its embrace of crypto as Bitcoin tumbles," New York Times, January 26, 2022. https://www.nytimes.com/2022/01/26/business/bitcoin-el-salvador.html.

14 President's Working Group on Financial Markets, the Federal Deposit Insurance Corporation, and the Offce of the Comptroller of the Currency, "Report on STABLECOINS," November 2021. Available at https://home.treasury.gov/system/files/136/StableCoinReport_Nov1_508.pdf.

Table: Variability of Exchange Rates for Bitcoin and Other Currencies, 2012-2021

Year	Coefficient of Variation for Selected Currency Exchange Rates (Currency/Comparison)				
	USD/EUR	EUR/USD	NGN/USD	ARS/USD	BTC/USD
2012	0.03	0.03	0.01	0.04	0.39
2013	0.02	0.02	0.01	0.08	1.30
2014	0.04	0.04	0.04	0.05	0.28
2015	0.03	0.03	0.02	0.09	0.22
2016	0.02	0.02	0.22	0.04	0.25
2017	0.05	0.05	0.07	0.06	1.00
2018	0.03	0.03	0.00	0.27	0.32
2019	0.01	0.01	0.02	0.17	0.35
2020	0.04	0.04	0.03	0.10	0.39
2021	0.02	0.02	0.04	0.05	0.21
Average	**0.03**	**0.03**	**0.05**	**0.09**	**0.47**

Note: Data on euro, dollars, peso, and naira from ofx.com and for bitcoin from es.investing.com.

B. Bitcoin Cannot be a Fast-Scalable Payment System by Design

Successful payment methods must be scalable, so that senders and receivers can transact with a large number of potential counterparties, and they must be efficient so that transactions can be processed quickly, giving certainty about transactions for senders and receivers of transactions. Buyers and sellers can consummate payment card transactions almost instantaneously.[15] Visa processed an average of 564 million transactions a day — 6,532 a second — in almost real time between July 1, 2020 and June 30, 2021.[16] Its current network is capable of handling 65,000 transactions a second.[17]

To create a decentralized payment system, Bitcoin adopted design features that limited its speed, throughput, and scale.[18] Miners are rewarded based on "proof of work" which essentially means investing a great deal of computational power in solving math problems. The algorithm adjusts the difficulty of these problems so that it takes about 10 minutes to validate a block of transactions. That, together with a limit on the block size, prevents Bitcoin from processing more than 7 transactions per second. The capacity constraint can result in lengthy delays and high fees for processing transaction when volumes are high. A transaction cannot be processed until it gets included in a new block leading to senders and receivers experiencing delays of longer than 10 minutes. To get included in earlier blocks, senders can pay offer to pay higher transaction fees which then bids up the cost of transactions.

Developers of public blockchains, and others, have recognized that blockchains cannot scale efficiently given these features. Many have pursued new solutions based on choosing an entity to validate a block, and add it to the chain, through a lottery in which the odds of winning are based on the ownership of the associated crypto currency. That replaces "proof of work" (for "miners") with "proof of stake" (for "validators"). Together with other innovations in network design these solutions can increase transaction speed and network capacity dramatically.

> ***"To create a decentralized payment system, Bitcoin adopted design features that limited its speed, throughput, and scale***

They are works in progress though. In 2017, Ethereum announced plans to develop a new version of its blockchain that would make it more scalable and concluded early on that would require moving to proof of stake. After several delays its leadership expects to move to proof-of-stake in 2022 and over the coming years roll out other scalability-

15 The consumer's card payment is authorized almost instantaneously, and with enough certainty, that the consumer and merchant can consummate transactions almost instantaneously. The innovation of payment cards was disassociating the timing of funds transfers from the transaction. The consumer and merchant can complete a transaction even though, unlike cash, the merchant does not get their money right away and the consumer does not have to pay right away. Bitcoin was designed to be more like cash although its design prevents the instantaneous movement of funds which occurs with cash or real-time payment systems discussed below.

16 Based on 206 billion transactions over this period. See https://usa.visa.com/dam/VCOM/global/about-visa/documents/aboutvisafactsheet.pdf.

17 Daren Fonda, "Solana Could be the Visa of Crypto Networks. Not So Fast, Says Visa," Barron's, January 13, 2022. https://www.barrons.com/articles/solana-could-be-the-visa-of-crypto-networks-not-so-fast-says-visa-51642091862.

18 For a succinct discussion see, Eswar S. Presad, *The Future of Money: How the Digital Revolution is Transforming Currencies and Finance* (Cambridge, MA: Harvard University Press, 2021), pp. 132-133.

related innovations.[19] The new improvements sound good in theory but time will tell whether they work in practice.[20] Their success is important because Ethereum, which has focused on providing a platform for smart contracts, is the main public blockchain being used for decentralized finance ("DeFi") applications.

To be clear the innovations required for scalability do not just involve technical ones such as rewriting code. They involve devising new methods for compensating key participants who operate the network. As the founder of Solana, one of the new fast networks put it, "The hard part is finding the humans that want to run the network…. The challenge for us is not the technology challenge but the social challenge…[21] Incentive schemes are hardwired into the public blockchain, and fundamental problems cannot be fixed quickly just by changing code.[22]

C. Public Blockchains Face Two Major Constraints on Optimizing Their Networks for Payments and Financial Services

All new technologies have problems. There is nothing unusual about the fact that public blockchains were born imperfect and that work has to be done to stand them up for mass use. But two features of public blockchains impede this process compared to traditional startups with centralized control.

The first is that the sponsors of public blockchains have multiple objectives. An overriding goal of the leading public blockchains is to provide decentralized networks with no central authority and no intermediaries. That is based on a belief that this will lead to a better world. As a result, the public blockchains face tradeoffs between developing solutions that increase the performance of the network for commercial functions and ones that limit the possible role of central authorities. Pursuing these multiple objectives can result in a suboptimal network for users who only care about one objective — say those who are only interested in a low-cost fast payment method regardless of the centralization of authority.

"All new technologies have problems. There is nothing unusual about the fact that public blockchains were born imperfect and that work has to be done to stand them up for mass use

The second is that public blockchains have adopted governance models that make it difficult to pursue fundamental changes quickly. The governance models are varied but basically consensus driven. Reaching consensus over controversial changes takes time, may not be achieved, and may result in a hard fork to the blockchain, thereby destabilizing the original chain, and its applications. This governance model is very different from what has worked well for most startups in which the founders, and investors, can make quick pivots as they learn more.

Securing consensus is also complicated by the fact that there are competing objectives which those with voting power weight differently.[23] In 2017, for example, efforts to increase Bitcoin's capacity ultimately resulted in a standoff between a group that was going to pursue a hard fork that would have doubled capacity and others who opposed the change. According to the Wall Street Journal, the proponents were mainly businesses that wanted to scale the network while "many who opposed the move view bitcoin more as a store of value, akin to digital gold, and are less concerned with its use as a payments platform."[24] The efforts ultimately resulted in a hard fork of Bitcoin and then a hard fork of that hard fork.

As of early 2022, the well-established public blockchains do not have stable cryptocurrencies and cannot process transactions efficiently at large scales. They cannot support large-scale payments or other transactional services. That situation could change but it would take time to improve technologies and business models. New, more efficient, public blockchains need time to build their networks, including drawing capital and labor resources into them. The

19 See interview with Ethereum's founder at https://www.youtube.com/watch?v=b1m_PTVxD-s&t=1049s.

20 See, for example, Saleh F. 2021. Blockchain Without Waste: Proof-of-Stake. Review of Financial Studies. 34:1156.

21 Tim Copeland, "Solana Labs CEO: 'Part of our culture is to eat glass," The Block, November 8, 2021. https://www.theblockcrypto.com/post/123515/solana-labs-ceo-part-of-our-culture-is-to-eat-glass.

22 For a balanced and insightful discussion of the opportunities and challenges of cryptocurrencies see Halaburda, Hanna, Sarvary, Miklos & Haeringer, Guillaume, Beyond Bitcoin: The Economics of Digital Currencies and Blockchain Technologies (Chapter 5: The Rich Land of Crypto) (May 28, 2021). Beyond Bitcoin: The Economics of Digital Currencies and Blockchain Technologies, 2nd ed, forthcoming, Available at SSRN https://ssrn.com/abstract=3135057. (The other chapters are also available on SSRN).

23 Consensus-based governance models have worked well in some settings, including standards development organizations, natural resource cooperatives, and open source software, but those cases do not involve building and operating anything as complicated as a scalable public blockchain.

24 Paul Vigna, "Bitcoin Dodges Split That Threatened Its Surging Price," Wall Street Journal, November 8, 2017.

results, which depend on getting both the technologies and incentives right, are uncertain.

03

PAYMENTS INNOVATION MAY SOLVE MANY FRICTIONS BEFORE CRYPTO BECOMES A FEASIBLE ALTERNATIVE FOR USERS

The future of crypto ultimately comes down to races between public blockchains that have bet on the virtues of decentralized networks and other business models that have more flexibility in their choices of technologies and control. The winners of these races are not necessarily the best technologies in some technical or ideological sense. They are the ones that secure indirect network effects as a result of being good enough to gain widespread adoption and become sticky as a result of end users making sunk cost investments. Public blockchains face substantial dynamic competition to innovate payments and financial services.

> ***The future of crypto ultimately comes down to races between public blockchains that have bet on the virtues of decentralized networks and other business models that have more flexibility in their choices of technologies and control.***

As of 2021, about 56 countries had developed real-time payment ("RTP") rails that can move money between accounts in real time.[25] In the U.S., which is one of the later adopters, The Clearing House launched its RTP network in 2017. Many banks have invested in integrating into RTP, while banks and FinTechs are creating new payments services products using instant payments. The Federal Reserve Board will launch its FedNow RTP network in 2023. Businesses and consumers in these countries will have access to fast efficient payment rails. Countries are working towards making these RTP networks interoperable — including significant efforts in the European Union with SEPA Instant Credit Transfer — thereby facilitating the rapid movement of funds cross-border. The RTP rails will support more payments services over time.

In 2019, there were 290 mobile money schemes operating in 95 countries, with 372 million active accounts.[26] They were initially used to enable people to move cash digitally but have evolved towards operating "payments as a platform" where they support a diverse array of financial services for consumers and businesses, particularly in lesser developed countries with weak banking systems. The Indian government helped spark the adoption of mobile money in that country by adopting the Unified Payments Interface ("UPI") in 2016. UPI supported 4.6 billion transactions in January 2022.[27] More than third of the transactions come from Google Pay.

There has been rapid entry of FinTech companies globally. There were an estimated 26,346 in November 2021.[28] In the EU, UK, and some other countries, open banking regulations, requiring banks to provide APIs to access customer accounts, have spurred their formation. Between 2018 and the first half of 2021, European FinTech companies raised €33.4 billion.[29] Many are using non-crypto payment methods to innovate payments and banking.

Central Banks, including the Federal Reserve and the European Central Bank, are investigating launching their own digital currencies ("CBDCs") sparked in large part by threats they see coming from stablecoins and cryptocurrencies to their ability to guide monetary policy and threats to financial stability. China launched the digital yuan and India's finance minister says the country will the roll out a digital rupee in

25 McKinsey & Company, "Global payments 2021: Transformation amid turbulent undercurrents, October 7, 2021. https://www.mckinsey.com/industries/financial-services/our-insights/global-payments-2021-transformation-amid-turbulent-undercurrents.

26 GSMA, "State of the Industry Report on Mobile Money," 2019. https://www.gsma.com/sotir/wp-content/uploads/2020/03/GSMA-State-of-the-Industry-Report-on-Mobile-Money-2019-Full-Report.pdf.

27 https://www.npci.org.in/what-we-do/upi/product-statistics.

28 https://www.statista.com/statistics/893954/number-fintech-startups-by-region/.

29 Isabel Woodford, "2021 has (already!) been a record year for European fintech investment," Sifted, June 16, 2021, https://sifted.eu/articles/european-fintech-record-2021/.

2022. These digital currencies provide another potentially efficient platform for supporting innovation in payments and financial services. A recent research study on CBDCs at MIT developed centralized software that processed 1.7 million transactions per second and scaled linearly with the number of servers.[30]

Finally, established businesses and startups have developed solutions that rely on private blockchains. As they are centrally owned and controlled, they can decide on the degree of decentralization, if any, they want and can customize the blockchain technology to their particular objectives. JPMC's Onyx/Liink platform for messaging between banks, which facilitates cross-border transactions, relies on a private blockchain the bank developed. These centralized private blockchains provide solutions that compete with ones that decentralized public blockchains could provide.

04

POSSIBLE TIME PATHS AND OUTCOMES FOR CRYPTO

All these solutions, including public blockchains, face obstacles in disrupting payments and financial services, given the inertia of current systems. This dynamic competition will take place over many years based on historical experience. The results are uncertain, but here are some possible paths, under alternative assumptions.

Fast: It is possible that innovative public blockchains could arise soon that are highly scalable and efficient, as technical and business matters, and that secure enough investment from miners, validators, and others. Killer apps could also emerge that quickly garner indirect network effects. These public blockchains could figure out how to provide a currency with stable value or regulators could end up allowing stablecoins. One of more of these public blockchains, and their applications, could leapfrog alternative methods in the next couple of years.

Slow: Instead, competitive public blockchains could arise, but much more slowly. Then for public blockchains to dominate payments and financial services they would have to either win the race against alternatives, which are also seeking to solve friction in payments and financial services. Or they would have to offer a compelling proposition that could overcome the inertia binding users to whatever methods become the *status quo*.

> ***All these solutions, including public blockchains, face obstacles in disrupting payments and financial services, given the inertia of current systems***

The fast and slow outcomes both assume that regulations do not severely constrain public blockchains and their applications. Some crypto advocates provoke regulators by emphasizing their desire to bypass governmental oversight.

Niche: A third alternative, which is similar to how open source software has evolved, is that public blockchain solutions get traction in narrow areas. Compelling solutions could become popular in areas where transaction volumes are not so large that they do not result in congestion or high fees, or where the benefits are so large that they counter the inefficiencies in the technologies and business models. Collectively, these niche areas could amount to a big market for crypto. These narrow solutions, however, are the ones where nimbler private blockchains pose the greatest competitive threat.

If public blockchains did become successful in these niche areas, however, it is also possible that over the longer term they could expand from these beachheads and evolve into widely used methods for payments and financial services.

Fade: Finally, public blockchains could largely fade away over a long period of time. The speculative bubble around crypto, if there is one, bursts, leading them to shrivel as miners (or validators) exit. Perhaps for the reasons explained above, investors heavily discount the likelihood of success and funds dry up for crypto startups. Crypto innovations, of which there are many, get absorbed into other technologies, as we are seeing with the private blockchain ventures.

The "fast" time-path appears the least likely. The public blockchains probably cannot move that rapidly and, even if they could, they would not be able to displace existing solutions quickly.

Given the plausible pace of adoption, for those concerned about systemic risks, the public blockchains, and

30 Massachusetts Institute of Technology, "MIT experts test technical research for a hypothetical central bank digital currency," February 2, 2022. https://news.mit.edu/2022/digital-currency-fed-boston-0203.

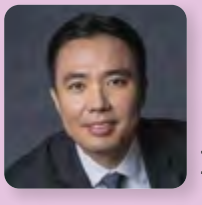
their applications, are less alarming than they may appear from the current hype and valuations. There may be sound reasons to consider regulations but there is no reason to panic based on crypto quickly sweeping over payments and financial services.[31] The same is true for businesses concerned about missing out on an opportunity. There is likely time to evaluate the best technologies and business models for innovations in payments and financial services.

It may take years, if not decades, to know what new payment methods, and financial services innovations, emerge from this latest round of innovation, and their impact on existing ones. For payments, that is really not that much time at all.

> ***The "fast" time-path appears the least likely. The public blockchains probably cannot move that rapidly and, even if they could, they would not be able to displace existing solutions quickly***

31 The President's Working Group report on the regulation of stablecoins, cited above, expressed concern that the "broader use of stablecoins as a means of payment could occur rapidly due to network effects or relationships between stablecoins and existing user bases or platforms." There is urgency in dealing with consumer protection issues related to investing in crypto but that is not the subject of this paper.

CRYPTOCURRENCY REGULATION AND AN ECONOMIC CLASSIFICATION OF TOKENS



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01 INTRODUCTION

Cryptocurrencies compete with traditional fiat currencies, disrupt existing financial systems, and create challenges for regulatory agencies. With illegal activities, as well as pseudonymous networks (allowing for discrete, anonymous transactions), governments are wary of allowing wide adoption and usage. Careful and comprehensive regulations can address the needs of market participants and boost market confidence.

Excessive regulation may kill innovation. As crypto continues to grow in popularity internationally, strong regulation is becoming necessary. With China, India, and South Korea already severely limiting their countries' interactions with private crypto, many fear this wave of crackdowns might spread to the rest

of the world.[2] Yet, the laissez-faire approaches in many countries may be too light. As a starting point, we need to categorize different types of tokens, consider what protections are needed, and then model regulation around them. This paper offers a first step in that direction.

Due to the diverse and innovative nature of cryptocurrencies and blockchain technology, U.S. regulators face an incongruous definition of what a cryptocurrency is, and therefore, what jurisdiction and regulations cryptocurrency must adhere to. Certain digital assets and cryptocurrencies are considered to be securities (depending on the circumstances, perhaps limited to their initial distribution) and others may be commodities, creating some ambiguity around how digital assets should be categorized. The goal of this article is to outline current arguments for reform and relevant definitions, certain of the implications of being classified as either a security or a commodity, and how this regulation may affect different parties such as issuers, exchanges, and investors. Importantly, we discuss a new classification framework based on economic functionality that would facilitate easy regulation going forward.

02
CRYPTOCURRENCY AS A SECURITY

"Security" is defined in Section 2(a)(1) of the Securities Act of 1933 and Section 3(a)(10) of the Securities Exchange Act of 1934. Both definitions (which largely, but not entirely, track each other) identify certain specific instruments as "securities" (such as common stock and notes) and also include broader provisions that potentially extend the federal securities laws to new instruments that are not specifically identified. Among them, "investment contracts" are included within the definition of "security." Whether or not an instrument is an "investment contract" has been subject to interpretation by the courts and the SEC, resulting in a range of tests that delimit the boundaries of that term. The most well-known is the Howey Test, which sets out four basic criteria to determine if an instrument is a security subject to SEC regulation.[3] At its basic, the Howey Test looks to whether (1) there is an investment of money (or other consideration) (2) in a common enterprise (3) in which an investor is led to expect profits (or other value) (4) which are derived principally from the efforts of one or more third parties.[4] Some cryptocurrencies have been treated as securities under the Howey Test, while others have managed to evade SEC recognition.

The first instance of the Howey Test being applied to a digital asset came from the cease-and-desist proceedings to halt Munchee Inc.'s sale of tokens. In that order, the distribution of Decentralized Autonomous Organization (or "DAO") tokens was declared to be an unregistered securities offering despite their utility design features.[5]

Recent SEC actions have potentially expanded the scope of the federal securities laws. For example, in August 2021, the SEC settled charges against Blockchain Credit Partners for using decentralized finance technology to sell over $30 million of securities in an unregistered offering and misleading investors about the company's operations and profitability. The company sold two types of digital tokens: mTokens that could be purchased using specified digital assets and that paid 6.25% interest, and DMG "governance tokens" that purportedly gave holders certain voting rights, a share of excess profits, and the ability to profit from DMG governance token resales in the secondary market. The SEC explained that labeling the tokens as decentralized or a governance token did not prevent the SEC from concluding that the tokens were securities.[6] Likewise, in August 2021, the SEC found that a crypto exchange had facilitated the buying and selling of digital assets, including investment contracts. According to the SEC's order, the trading platform met the criteria of a securities "exchange," which required that it register as such with the SEC, which it had failed to do.[7]

2 Dan Milmo & Dan Milmo Global technology editor, *India to ban private cryptocurrencies and launch official digital currency*, The Guardian, November 24, 2021, https://www.theguardian.com/world/2021/nov/24/india-to-ban-private-cryptocurrencies-and-launch-official-digital-currency (last visited Dec 30, 2021).

3 David Concannon, Yvette Valdez & Stephen Wink, *Not in Kansas anymore: The current state of consumer token regulation in the United States, in* Blockchain & Cryptocurrency Regulation 2022 68–92, 68–69 (Fourth Edition ed. 2021), https://www.lw.com/thoughtLeadership/gli2021-blockchain-crypto-not-in-kansas-anymore- (last visited Dec 30, 2021).

4 *Id*. at 68.

5 *Id.* at 69.

6 Jamie Boucher et al., *Cryptocurrency Regulation and Enforcement at the US Federal and State Levels*, Skadden, https://www.skadden.com/insights/publications/2021/09/quarterly-insights/cryptocurrency-regulation-and-enforcement-at-the-us-federal-and-state-levels (last visited Dec. 30, 2021).

7 *Id.*

Based on SEC regulatory actions, no-action letters, and policy guidelines, whether or not a digital asset satisfies the third and fourth prongs of the Howey Test – namely, whether an investor was led to expect profits (or other value) derived principally from the efforts of others – is likely to be significant in determining whether the instrument is a security.[8] Several academic studies provide a more detailed discourse on how conceptually to distinguish between entrepreneurial and managerial efforts pre-launch and post-launch for purposes of categorizing tokens.[9] [10]

A. How Does the Label affect the Ecosystem?

Due to the nature of cryptocurrencies, with many trying to become daily use tokens and others trying to become more mainstream, being labeled as a security comes with its own challenges. As seen from the efforts of Coin Center's numerous statements and Andreessen Horowitz's presentations to Washington, many crypto investors and firms are fighting to be treated as commodities.[11] Issues that arise if a cryptocurrency is federally regulated as a security can be addressed in four main categories: initial coin offerings, reporting, stablecoins, and taxation.

B. Initial Coin Offerings

For many early-stage cryptocurrencies, it can be hard to distribute and sell tokens to raise the initial capital required to continue and build. The original method was through gifting or mining; however, more recent token distribution methods include selling tokens to those intending to speculate on future value rather than direct participation in the network.[12] The more risky distribution methods include presale or pre-mining in which hardcoded tokens are sold to consumers at a promised value before the tokens are produced, with the proceeds used to then fund the mining efforts.[13] This can take the form of certain utility tokens, which may be labeled as commodities once they are traded, but may be regulated as securities as part of their initial distribution to the public.[14] Because these distribution methods implicate the third and fourth prongs of the Howey Test, the SEC has found a majority of these presale tokens/ICOs to involve the distribution of securities. Consequently, many early networks are starting to iterate and find different ways of distribution that fall outside the Howey Test.

"Due to the nature of cryptocurrencies, with many trying to become daily use tokens and others trying to become more mainstream, being labeled as a security comes with its own challenges

C. Registration of Exchanges

The requirement for exchanges to register poses another major issue for the crypto market. Exchanges, being arguably the most profitable players in the ecosystem, have been accused of wash trading, front running, and/or freezing customer balances.[15] With less than 1% of transactions occurring on regulated exchanges in 2019, there is a need for clear regulation on who needs to register and what benefits that may serve.[16] By being forced to register with

8 See Concannon, Valdez & Wink, *supra* note 3, at 69.

9 Lin William Cong & Yizhou Xiao, *Categories and Functions of Crypto-Tokens* 12 (2020), https://papers.ssrn.com/abstract=3814499 (last visited Jan. 2, 2022)

10 Lin William Cong, Ye Li & Neng Wang, *Token-based Platform Finance* (2021), https://papers.ssrn.com/abstract=3472481 (last visited Jan. 3, 2022).

11 Joe Light, *Crypto Firms Brace for Regulation by Writing Own Rules*, Bloomberg (2021), https://www.bloomberg.com/news/articles/2021-10-13/crypto-firms-brace-for-regulation-by-writing-their-own (last visited Dec. 30, 2021).

12 Peter Van Valkenburgh, *Framework for Securities Regulation of Cryptocurrencies*, Coin Center (2018), https://www.coincenter.org/framework-for-securities-regulation-of-cryptocurrencies/ (last visited Dec. 30, 2021).

13 *Id.*

14 Amit Singh, *SEC Chair Gives Example of Token That Isn't a Security*, startupblog (2018), http://www.new.startupblog.com/sec-chair-defends-agency-action-on-icos/ (last visited Dec. 30, 2021).

15 Mark Austen, *ASIFMA Best Practices Digital AssetExchanges* (2018), https://www.lw.com/thoughtLeadership/ASIFMA-best-practices-digital-asset-exchanges (last visited Jan 24, 2022).

16 Lin William Cong et al., *Crypto Wash Trading* 2 (2021), https://papers.ssrn.com/abstract=3530220 (last visited Dec. 31, 2021).

the SEC, the exchanges would be required to record their trades and adopt safety systems to make their order books audit-compliant.[17] As shown in a study on crypto-wash trading, regulated exchanges that considerably commit towards compliance and license acquisition do little wash trading showing the impact that regulation has and how it may serve the overall market.[18]

> *The requirement for exchanges to register poses another major issue for the crypto market*

Crypto exchanges may also be subject to Know Your Customer (KYC) and AML regulations.[19] Entities subject to KYC requires must know detailed information about their clients' risk tolerances, respective investment knowledge, and financial positions. For exchanges, this would be quite hard given that many are decentralized exchanges or systems built with anonymity in mind, so they don't have the current systems and information required to be KYC and AML compliant.[20] One study found that half of all crypto exchanges possessed weak or non-existent KYC processes.[21] Consequently, if they become subject to KYC or similar requirements, many exchanges would need to completely rework their transaction process either through implementing a strategy, like anonymous identity verification modules, another form of transaction identification, or to avoid U.S. regulations, choosing to move abroad or restricting access to non-US consumers.[22]

D. Stablecoins

Stablecoins pose another challenge for regulators. Stablecoins are tokens that tie their value to an existing fiat currency and are backed by a large reserve of low-risk assets.[23] Due to the growth in the market as well as its favorability with bad actors, the U.S. President's Working Group on Financial Markets ("PWG"), the U.S. Federal Deposit Insurance Corporation ("FDIC"), and the Office of the Comptroller of the Currency ("OCC") released the so-called PWG Report calling for urgent legislative action to limit stablecoins and address the risks they pose to the broader financial system.[24] With cases such as Tether-- the largest stable coin -- misrepresenting the nature of its reserves, market manipulation by stablecoin issuers, as well as the PWG Report calling for urgent legislative action, the case for a stablecoin crackdown seems imminent. [25]

While this will only impact a minor part of the overall cryptocurrency sector, stablecoins present a unique perspective since, due to their limited risk, they are much easier to adopt and regulate than other cryptocurrencies.[26] As regulations are imposed on stablecoins, it is likely there will be a secondary impact on the general crypto market.

E. Taxation

The final issue is taxation. Beginning in 2019, the IRS asked for the first time explicitly if taxpayers had transacted in crypto; unfortunately, it was asked on a form that not many people complete, leading to many taxpayers unintention-

17 Rakesh Sharma, *How SEC Regs Will Change Cryptocurrency Markets*, Investopedia (2021), https://www.investopedia.com/news/how-sec-regs-will-change-cryptocurrency-markets/ (last visited Dec 30, 2021).

18 See Cong et al., *supra* note 19, at 5.

19 What Is KYC? Know Your Customer for Crypto Traders, Gemini, https://www.gemini.com/cryptopedia/kyc-meaning-know-your-customer, https://www.gemini.com/cryptopedia/kyc-meaning-know-your-customer (last visited Jan 24, 2022).

20 Rachid Ajaja, *KYC is essential, especially within crypto*, TechRadar (2021), https://www.techradar.com/news/kyc-is-essential-especially-within-crypto (last visited Dec. 30, 2021).

21 *Id.*

22 *Id.*

23 Sharma, *supra* note 17.

24 Kathryn Wellman & Neil Bloomfield, *President's working group report calls for stablecoin regulation*, Reuters (2021), https://www.reuters.com/legal/transactional/presidents-working-group-report-calls-stablecoin-regulation-2021-12-02/ (last visited Dec. 30, 2021).

25 Sharma, *supra* note 17.

26 The Importance of Stablecoins and Their Future - Zipmex, , Zipmex (2021), https://zipmex.com/learn/the-importance-of-stablecoins-and-their-future/#header-c2 (last visited Dec 30, 2021).

ally misstating their taxes.[27] In 2020, to help remedy this issue, the wording of the question was made more clear and moved to the 1040; however, since the IRS treats virtual currencies similar to property, taxpayers must calculate crypto gains and losses which can be challenging.[28] In order to help make this calculation easier, some exchanges have started delivering 1099-Ks similar to the 1099-Bs often associated with a brokerage firm.[29] These forms, however, are only given to those who meet a certain level of transactions either through dollar amount or a minimum transaction number; likewise, they don't include the original cost at which the asset was purchased, which means it may still be a challenge to calculate taxable gain.[30] With these challenges in mind, the U.S. Treasury Department's "Greenbook" calls for more comprehensive reporting requirements for crypto.[31] This includes proposals to require businesses to report certain transactions to the IRS and, specifically, for crypto asset exchanges, custodians to report data on user accounts that conduct at least $600 USD in gross inflows or outflows in a given year.[32]

One of the fears of treating crypto as a security is that taxation policies may lead to members of the crypto community being unable to use crypto for daily transactions (one proposal was to have a *de minimis* exemption). Under current tax rules, persons who both mine and sell tokens can be taxed twice (first as income tax when the tokens are created and capital gains tax upon sale), potentially deterring the creation of new tokens.[33]

03
CRYPTOCURRENCY AS A COMMODITY

As defined, commodities refer to "all services, rights, and interests […] in which contracts for future delivery are presently or in the future dealt in."[34] On that basis, the U.S. Commodity Futures Trading Commission (the "CFTC") has taken the view that certain tokens such as Bitcoin and Ether are commodities,[35] which may be subject to CFTC enforcement in the event of fraud.[36] Cong, Li, and Wang in "Tokenomics: Dynamic Adoption and Valuation" first recognize theoretically that tokens exhibit features of commodities, which is empirically corroborated in Cong, Karolyi, Tang, and Zhao in "Value Premium, Network Adoption, and the Factor Pricing of Crypto Assets."[37]

Since 2015, the CFTC has been active in bringing enforcement actions on virtual currency enterprises when they have strayed from the rules.[38] Using the inverse of the Howey Test and the SEC's analysis of what constitutes a security, to be treated as a commodity cryptocurrencies must have a decentralized network such that no active participant can directly affect and influence the value of the tokens.[39] The use

27 MacKenzie Sigalos, *How the IRS is trying to nail crypto tax dodgers*, CNBC (2021), https://www.cnbc.com/2021/07/14/irs-new-rules-on-bitcoin-ethereum-dogecoin-trading.html (last visited Dec 30, 2021).

28 Nelson Hsieh, *New Crypto Tax Reporting Requirements in the 2021 Infrastructure Bill*, Volt Equity (2021), https://www.voltequity.com/post/new-crypto-tax-reporting-requirements-in-the-2021-infrastructure-bill (last visited Dec 30, 2021).cryptocurrency exchanges have not been required to report any information about gains or losses to the IRS, or to their customers. Section 80603 of the Infrastructure Investment and Jobs Act (H.R. 3684

29 Sigalos, *supra* note 27.

30 *Id.*

31 *Id.*

32 *Id.*

33 Jerry Brito & Peter Van Valkenburgh, *The ideal regulatory environment for Bitcoin*, Coin Center (2020), https://www.coincenter.org/the-ideal-regulatory-environment-for-bitcoin/ (last visited Dec 30, 2021).

34 What is a Commodity, Willkie Compliance, https://complianceconcourse.willkie.com/resources/cftc-overview-what-is-a-commodity (last visited Jan 24, 2022).

35 *Id.*

36 Concannon, Valdez, and Wink, *supra* note 3.

37 Lin William Cong, Ye Li, and Neng Wang "Tokenomics: Dynamic Adoption and Valuation" (2019) *Review of Financial Studies*, Forthcoming; Lin William Cong, Andrew Karolyi, Ke Tang, and Weiyi Zhao "Value Premium, Network Adoption, and the Factor Pricing of Crypto Assets" (2021), *Working Paper.*

38 Concannon, Valdez, and Wink, *supra* note 3.

39 *Id.*

of token sale proceeds (where the money goes and who it goes to), network governance (is there a centralized force), and the existence of a robust, diverse token economy are measured to determine if a network is sufficiently decentralized.[40]

If a token and network manage to qualify as a commodity, it will be subject to the less-intrusive regulation applicable to the commodity markets. Within this space, the CFTC focuses on abuses rather than the pervasive securities regulations seen with the SEC. This stance towards digital assets in particular derives from the CFTC's desire for innovation and development, encouraging communication between innovators and regulators to help maintain their "do no harm" mentality.[41] The CFTC has thus tried to prosecute cases of "fraud, abuse, manipulation, or false solicitations in markets."[42] The majority of enforcement actions have mostly fallen into one or more of these five categories: fraudulent schemes, failure to register with the CFTC, illegal off-exchange transactions, price manipulation, and gatekeepers' violations.[43] CFTC prosecution for fraud provides some comfort for consumers in this marketplace.

04

A CLASSIFICATION FRAMEWORK BASED ON THE ECONOMIC FUNCTIONALITY OF TOKENS

As presented by Cong & Xiao (2021), a useful classification entails four main types of tokens based on their economic functionality: General Payment Tokens, Platform Tokens, product tokens, and cash-flow-based tokens.[44] Within this, the SEC classifies some tokens as securities, and others as not (most notably, utility tokens), which results in some instruments being subject to greater regulation. While the decision between a token being a security token versus a utility token can be quite nuanced and involve more information than just the token's function, a good estimate as to how the token will be treated comes down to its economic functionality.

Beginning with General Payment Tokens, as suggested by the name, these tokens serve as substitutes for fiat money and other liquid assets.[45] Many of these general payment tokens are considered utility tokens by regulatory agencies due to their economic functionality.[46] This stands to reason as currencies and other liquid assets themselves hold value in the way a utility token can.

The next category of token, Platform Tokens, are distinguished due to their purpose of being local means of payment on given platforms. Due to their wide appearance in ICOs, these tokens are generally also thought of as utility tokens, providing a service value for a token.[47] A way to justify the claim of Platform Tokens being a form of utility tokens is to think about how these tokens act on their platform as a form of payment. The functionality of a token does not really change between a General Payment Token and a Platform Token just the scope on which it is usable, thereby allowing for a similar utility token labeling. That said, concentrated entrepreneurial effort, especially post-launching the platforms, could cause the tokens to be labeled as securities under the Howey Test. The SEC lawsuits against the Kik/KIN foundation and Telegram/TON foundation are cases in point.

While product tokens are not too common, they act similarly to a corporate coupon or discount voucher, providing a predetermined quantity of products and services for a token.[48] As there is a good or service being exchanged for a token, these tokens fit very well with the current uses ascribed to utility tokens. A popular example of this style of token has been Non-Fungible Tokens or NFTs which allow ownership over digital collectibles. While it is unclear whether most

40 *Id.*

41 Abe Chernin, Nicole Moran & Simona Mola, *The CFTC's Approach to Virtual Currencies*, The National Law Review (2020), https://www.natlawreview.com/article/cftc-s-approach-to-virtual-currencies (last visited Dec 30, 2021).

42 *Id.*

43 *Id.*

44 Cong & Xiao, *supra* note 9 at 5.

45 *Id*. at 5

46 What is a Commodity, *supra* note 34.

47 Cong and Xiao, *supra* note 9 at 5.

48 Cong and Xiao, *supra* note 9. at 5

NFTs are currently considered securities, if these were to potentially fractionalize and create shares of a digital good, this would warrant SEC oversight.[49] This shows how close this utility vs security distinction truly is and how easily this style of token (and really any of the types of tokens listed above) can switch between the two classes.

The last type of token explored is cash-flow-based tokens. These tokens are generally what is thought of when discussing security tokens as they grant the holder certain rights to future cash flows from a business.[50] As this clearly passes the Howey Test and acts as essentially tokenized security contracts, they will always be regulated as such.[51]

Between all four types of tokens, based on economic functionality alone, many tokens would be categorized as utility tokens. While this remains true, the ways in which the cryptocurrency grew as well as the decentralization and internal regulation of the network influence the SEC's decision greatly. With the unique features each type of token holds, as well as the diverse approaches to the initialization and use of these tokens, the act of categorization still remains rather unsolidified resulting in the need for holistic approaches to all prongs of the Howey Test.

As cryptocurrency grows and matures in regulation, it will be interesting to observe the possibility of conversion of a single currency from a security to a commodity and vice versa as the token continues to be offered and regulated based on its current position. With the possibility of a digital asset changing its status from an investment contract to a decentralized commodity, it will be important to understand how the two regulations interact and watch how the different digital assets and markets respond to the changes. The varying approaches to cryptocurrency and their lack of geographic boundaries makes it difficult to predict how the global market may change over time; however, the U.S. seems to be moving in a direction that will promote stronger regulation regardless of how the cryptocurrencies are classified be it as securities or commodities.

> ***"While product tokens are not too common, they act similarly to a corporate coupon or discount voucher, providing a pre-determined quantity of products and services for a token***

05
CONCLUSION & FINAL REMARKS

The legislation of cryptocurrencies and virtual currencies in general have been overseen by many different regulatory agencies including federal and state banking authorities, and the IRS, SEC, and CFTC, with each serving its own purpose for different currencies given different categorizations and labels.[52] While the United States seems to be promoting the "do no harm" mentality with a keen interest in innovation, other countries have taken alternative approaches to regulating cryptocurrencies. That said, the White House has decided to step in to coordinate various regulatory agencies in a push for crypto oversight.[53]

49 David Morris, *Are NFTs Securities?*, Yahoo (2021), https://www.yahoo.com/now/nfts-securities-164816137.html (last visited Jan 2, 2022).

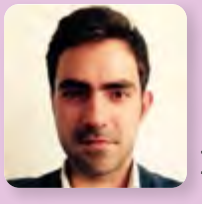
50 Cong & Xiao, *supra* note 9 at 6.

51 *Id*. at 7

52 U.S. Commodity Futures Trading Commission, *CFTC Backgrounder on Oversight of and Approach to Virtual Currency Futures Markets* (2018), https://www.cftc.gov/sites/default/files/idc/groups/public/%40customerprotection/documents/file/backgrounder_virtualcurrency01.pdf.

53 Jennifer Epstein, Jenny Leonard & Allyson Versprille, *White House Is Set to Put Itself at Center of U.S. Crypto Policy* Bloomberg (2022) Jan 22. Read more at https://www.bloombergquint.com/business/white-house-is-set-to-put-itself-at-center-of-u-s-crypto-policy.

DEFINING RELEVANT MARKETS IN THE CRYPTO ECONOMY



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NERA Economic Consulting, Berlin, Germany. All remaining errors are our own. The opinions expressed herein do not necessarily reflect those of our employer. Besides both authors holding small portfolios with long positions in various cryptocurrencies, there are no conflicts of interest to declare.

01 INTRODUCTION

Since the creation of Bitcoin as the first cryptocurrency during the global financial crisis in 2009, an entire ecosystem has emerged.[2] Consequently, cryptocurrencies and other applications based on blockchain technology have received increasing attention from regulators. While issues of taxation and securities law have come under intense regulatory scrutiny, cryptocurrencies and related markets increasingly raise concerns from an antitrust and

2 See Nakamoto (2008). Nakamoto, S. (2008). Bitcoin: A Peer-to-Peer Electronic Cash System. Retrieved from https://bitcoin.org/bitcoin.pdf. For an overview on Bitcoin, see Böhme *et al.* (2015) and Huberman *et al.* (2021). Böhme, R., Christin, N., Edelman, B., & Moore, T. (2015). Bitcoin: Economics, Technology, and Governance. *Journal of Economic Perspectives, 29*(2), 213-238; Huberman, G., Leshno, J. D., & Moallemi, C. (2021). Monopoly without a Monopolist: An Economic Analysis of the Bitcoin Payment System. *Review of Economic Studies, 88*(6), 3011-3040.

competition law perspective.[3] In the European Union, there are also plans to create an entirely new regulatory framework for cryptocurrencies.[4]

> ***Since the creation of Bitcoin as the first cryptocurrency during the global financial crisis in 2009, an entire ecosystem has emerged***

An important dimension in the assessment of potential violations of antitrust and competition law and in the application of sector-specific regulation is the need to define the relevant market(s) in which firms compete.[5] This allows the calculation of meaningful market shares as well as an assessment of market power and relevant competitive forces.[6] For traditional markets, established methods to delineate relevant markets exist. Do these transfer to new forms of digital money and asset classes with specific features both from an economic and network security perspective or is an entirely new approach needed?

Economists typically define relevant markets using the hypothetical monopolist test ("HMT").[7] This identifies the relevant market as the smallest market worth monopolizing. A hypothetical monopolist on the relevant market would not be constrained in its price-setting by outside substitutes to a substantial degree. If some candidate market is not worth monopolizing, then the candidate market is typically expanded, and the process is repeated.[8]

To implement the HMT for traditional markets, it is tested whether a small, but significant non-transitory increase in the price relative to the competitive level on a candidate market would be profitable for a hypothetical monopolist (the "SSNIP" test). We will show that the HMT and the SSNIP test may - after some modifications - also be applied to delineate relevant markets for cryptocurrencies and related markets.[9]

This article is organized as follows. In Section II, we apply existing tools for market definition to cryptocurrency mining (Section II.A) and validation (Section II.B). In Section III, we turn to the relevant markets for cryptocurrency exchanges. In Section IV, we discuss stablecoins and where they fit into relevant markets for money. In Section V, we conclude.

3 For some early analyses of cryptocurrencies and blockchain from an antitrust perspective, see Schrepel (2019a; 2019b; 2020a; 2020b), Schrepel and Buterin (2020), Deuflhard & Heller (2021) as well as Schrepel (2021). -143. Schrepel, T. (2019a). Collusion by Blockchain and Smart Contracts. *Harvard Journal of Law and Technology, 33*(1), 117-166; Schrepel, T. (2019b). Is Blockchain the Death of Antitrust Law? The Blockchain Antitrust Paradox. *Georgetown Law Technology Review, 3*(2), 281-338; Schrepel, T. (2020a). Libra: A Concentrate of 'Blockchain Antitrust'. *Michigan Law Review Online, 118*, 160-169; Schrepel, T. (2020b). The Theory of Granularity: A Path for Antitrust in Blockchain Ecosystems. *SSRN Working Paper*. Retrieved from https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3519032; Schrepel, T., & Buterin, V. (2020). Blockchain Code as Antitrust. *Berkeley Technology Law Journal.*; Deuflhard, F., & Heller, C.-P. (2021). Antitrust Economics of Cryptocurrency Mining. *SSRN Working Paper.* doi:http://dx.doi.org/10.2139/ssrn.3917012; Schrepel, T. (2021). *Blockchain + Antitrust: The Decentralization Formula.* Cheltenham, UK, and Northampton, MA, USA: Edward Elgar

4 See Proposal for a Regulation of the European Parliament and of the Council on Markets in Crypto-assets, and amending Directive (EU) 2019/1937.

5 For example, European fixed broadband regulation requires the delineation of relevant markets. See European Commission (2014). European Commission. (2014). *Commission Recommendation of 9 October 2014 on relevant product and service markets within the electronic communications sector susceptible to ex ante regulation in accordance with Directive 2002/21/EC of the European Parliament and of the Council.* Brussels: European Commission.

6 For an attempt to calculate market shares in the crypto economy, see Konstantinos & Carter (2020). Konstantinos, S., & Carter, N. (2020). The Size of the Crypto Economy: Calculating Market Shares of Cryptoassets, Exchanges and Mining Pools. *Journal of Competition Law & Economics, 16*(4), 511–551.

7 See Motta (2004), Chapter 3; Davis & Garcés (2010), Chapter 4. Motta, M. (2004). *Competition Policy.* Cambridge: Cambridge University Press; Davis, P., & Garcés, E. (2010). *Quantitative Techniques for Competition and Antitrust Analysis.* Princeton and Oxford: Princeton University Press.

8 A candidate market should probably include at least one of the products that are of interest to the analyst.

9 While Bitcoin and many other cryptocurrencies may have features of two-sided markets, this will not be the focus of our discussion. For an introduction to the literature on two-sided markets, see Rochet & Tirole (2006) and Rysman (2009): Rochet, J.-C., & Tirole, J. (2006). Two-Sided Markets: A Progress Report. *RAND Journal of Economics, 37*(3), 645-667; Rysman, M. (2009). The Economics of Two-Sided Markets. *Journal of Economic Perspectives, 23*(3), 125. For a discussion of market definition in two-sided markets, see Filistrucchi, Geradin, van Damme & Affeldt (2014). Filistrucchi, L., Geradin, D., van Damme, E., & Affeldt, P. (2014). Market Definition in Two-Sided Markets: Theory and Practice. *Journal of Competition Law and Economics, 10*(2), 293.

02
MARKETS FOR BLOCK VALIDATION

We now discuss in detail how the relevant markets are defined for proof of work ("PoW") and proof of stake ("PoS") consensus mechanism.[10] The markets for the two consensus mechanisms are likely separate. While PoS uses mainly holdings of cryptocurrency as an input, PoW relies on more specialized mining equipment and electricity.

A. Proof of Work

PoW is the consensus algorithm of the two of the most well-known cryptocurrencies, Bitcoin and Ethereum.[11] Under PoW, so-called miners, akin to miners for historic metal-based currencies, invest computing power to guess the solution of a cryptographic puzzle which wins the right to add a new block of transactions to the blockchain.[12]

Cryptocurrency miners do not set prices, although they respond to the expected and pre-determined mining reward. Directly applying the SSNIP test is thus not practical, since even a monopolistic cryptocurrency miner would not set the price of the mining reward. It is therefore necessary to modify the standard HMT/SSNIP test to consider how much computing power a miner allocates to a cryptocurrency's proof of work as measured by the hashrate.[13] For a hypothetical monopolist that is the only miner for one (or more) cryptocurrencies, one would then ask whether a reduction in the computing power by 5 to 10 percent is profitable.[14] If it is, then the initial cryptocurrency (or more) is the relevant market. If not, then additional cryptocurrencies need to be included in the relevant market.

"Cryptocurrency miners do not set prices, although they respond to the expected and predetermined mining reward. Directly applying the SSNIP test is thus not practical, since even a monopolistic cryptocurrency miner would not set the price of the mining reward

When applying the HMT, it is typically necessary to consider a price increase relative to a competitive benchmark case. To apply the HMT for cryptocurrency mining, one correspondingly needs a benchmark hashrate for the cryptocurrency (or cryptocurrencies) under consideration. Assuming that the observed cryptocurrency mining markets are competitive, one may thus assume that the observed hashrate corresponds to the competitive level. Applying the HMT then implies asking whether a reduction in this observed hashrate by 5 to 10 percent would be profitable to a hypothetical monopolist.

Given that the hypothetical monopolist is the only miner of the cryptocurrency, reducing the hashrate reduces its cost for energy, which increases its profit. The reduction in hashrate would, however, make it more profitable for miners of other cryptocurrencies to switch their hashrate to the hypothetical monopolist's cryptocurrency. The outsiders have a greater incentive to do so because the monopolist's hashrate is reduced by 5-10 percent, which increases the outsiders' probability of successfully mining blocks of the cryptocurrency.

Whether this will also be profitable for the outside miners will then depend on how similar the proof of work puzzles used by the relevant cryptocurrencies are. If both use the same cryptographic hash function, it appears that miners with similar mining equipment for one cryptocurrency could easily switch to another cryptocurrency. Even if the cryptocurrencies do not use the same PoW puzzle, they might be similar enough that switching is still profitable for outsiders.

10 A consensus mechanism describes the process, in which validators or nodes (e.g., miners) jointly agree on the (ideally truthful) addition of new entries (e.g., transactions) to the existing blockchain.

11 At the time of this writing, the plans to switch Ethereum to a PoS consensus mechanism have not yet been implemented.

12 For a mathematical characterization of PoW, see Leshno & Strack (2020). Leshno, J. D., & Strack, P. (2020). Bitcoin: An Axiomatic Approach and an Impossibility Theorem. *AER: Insights, 2*(3), 269-286.

13 The hashrate measures the number of calculations or hashes executed by a network participant per second.

14 This crucially depends on entry of miners switching from other cryptocurrencies to the candidate market due to the increased attractiveness of mining in the latter. For more details on the use of the HMT to delineate relevant markets for cryptocurrency mining, see Deuflhard & Heller (2021).

The relevant market will not only depend on the hash puzzle used by cryptocurrencies, but also on the available mining technologies. For Bitcoin, several phases of primary mining technologies can be identified.[15] In the beginning, bitcoins were be mined by practically anyone with a personal computer. As the price of Bitcoin rose, graphic cards became more suitable for solving mining puzzles and increasingly sophisticated sets of graphics cards were built to mine bitcoin. Today mining of many cryptocurrencies is done mainly with application-specific integrated circuits ("ASICs"). These specifically designed computer chips deliver optimal performance for solving cryptographic hash puzzles that make other methods uneconomical.[16]

The prices of the relevant cryptocurrencies are another aspect that will matter for assessing whether outsiders will switch after the hypothetical hashrate reduction of the hypothetical monopolist. The higher the price and the block reward of the cryptocurrency in the candidate market, the more likely other miners will switch to mining it after a hashrate reduction. The higher the prices of other cryptocurrencies, the less likely other miners will switch.

"The relevant market will not only depend on the hash puzzle used by cryptocurrencies, but also on the available mining technologies

B. Proof of Stake

PoS is an alternative consensus mechanism used by blockchain networks to achieve distributed consensus. Instead of miners investing energy to validate transactions, users lock up or "stake" part of their cryptocurrency holdings to become a validator in the network. They thereby risk losing part of their own cryptocurrency holdings, in the case of untruthful reporting, in exchange for a chance of getting to validate a new transaction and earning a reward.

The likelihood of earning a reward depends on the amount of crypto currency holdings and the length of time this amount is put at risk. Thus, more invested participants are more likely to earn a reward than relatively less invested participants. Participating validators are rewarded according to their relative staking amount. Becoming a validator typically requires a certain minimum stake in the underlying crypto currency.

Consensus is reached by other validators attesting whether the respective block has been validated accurately, thus ensuring the truthfulness of all validated blocks. In case validators report untruthfully, they can lose some of their stake as a result, a process called "slashing."[17] This constitutes an important pillar to incentivize staking parties to accurately validate transactions although no prior investment has been made as in the case of PoW.[18]

In the case of PoS, the HMT/SSNIP methodology needs to be adjusted again, since validators do not set the staking rewards themselves, but instead decide on how much of their crypto currency holdings to stake. For a hypothetical monopolist holding the entire stake of a crypto currency, one would then ask whether a reduction in the overall stake by 5 to 10 percent is profitable. If that is the case, the relevant cryptocurrency market has been found, if not other cryptocurrencies need to be included. Assuming as before that the cryptocurrency staking market is competitive, we can apply the potential 5 to 10 percent reduction directly to the overall observed staked crypto currency.

Given that the hypothetical monopolist is the only staking party for the cryptocurrency, reducing the staked amount reduces the opportunity costs of staking (e.g. using the staked amount of the crypto currency for transactions). The reduction in the overall amount of staked cryptocurrency would make it more profitable for outsiders to stake in that crypto currency. In contrast to PoW, this now potentially in-

15 For an overview of the different mining technologies that were used over time, see Narayanan, Bonneau, Felten, Miller & Goldfeder (2016). Narayanan, A., Bonneau, J., Felten, E., Miller, A., & Goldfeder, S. (2016). *Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction.* Princeton and Oxford: Princeton University Press. For a general, but dated overview of semiconductors, see Turley (2002). Turley, J. (2002). *The Essential Guide to Semiconductors.* Pearson.

16 Several cryptocurrencies using PoW, such as Ethereum and Litecoin, were designed to be resistant to ASICs by not using Bitcoin's PoW hash puzzle, thereby making switching more costly.

17 This mimics the PoW system, in which miners lose their invested computing power in case of inaccurate reporting of a transaction.

18 On the one hand, PoW offers some advantages compared to the PoW such as better energy efficiency, lower barriers to entry, and reduced hardware requirements. On the other hand, critics have described it as less secure than comparable PoW mechanisms. See for example Schwarz-Schilling et al. (2021). Schwarz-Schilling, C., Neu, J., Monnot, B., Asgaonkar, A., Tas, E. N., & Tse, D. (2021). Three Attacks on Proof-of-Stake Ethereum. arXiv.

cludes not only staking parties in other cryptocurrencies but also users holding the same cryptocurrency but using it for, e.g. transactions.

These outsiders now have a greater incentive to stake since a higher reward can be achieved with the same amount staked when entering the candidate market compared to the benchmark scenario. Whether this will also be profitable for the outside miners will then depend on how transferable the different technologies are between different crypto currencies staked or the different use cases. Depending on the nature of the PoS mechanism, different PoS blockchains might, for example, have substantially different technical requirements in terms of CPU.[19]

03
CRYPTO EXCHANGES

During the early phase of the development of Bitcoin, when mining on standard PCs was still viable, consumers could obtain Bitcoin by being active as a miner. Since the mining of the more popular cryptocurrencies now requires specialized mining equipment, obtaining them this way is no longer feasible. To obtain additional units of a cryptocurrency using PoS in any case requires the validators to already possess some of the cryptocurrency.

Nowadays, specialized cryptocurrency exchanges allow consumers to trade cryptocurrencies amongst each other or against fiat currencies. While crypto exchanges typically offer consumers to transfer the cryptocurrency to the consumer's own separate wallet, many consumers are happy to have the crypto exchange act as a custodian for their crypto holdings.[20]

Cryptocurrency exchanges can be categorized in three types. The first and most basic type allows the trading of a cryptocurrency, such as Bitcoin or Ether, for fiat currency, such as U.S. dollars or the Euro. A second type of exchanges offer to trade different pairs of cryptocurrencies since for some cryptocurrencies there are limits on the number of exchanges offering to trade them against fiat currencies. Often this involves the use of a stablecoin, such as Tether's USDT in place of a fiat currency.[21] While both types of these crypto exchanges are thus making transactions on the blockchains of various cryptocurrencies (on behalf of customers), they compete in the traditional world.

> ***During the early phase of the development of Bitcoin, when mining on standard PCs was still viable, consumers could obtain Bitcoin by being active as a miner***

Third, there are Decentralized Exchanges ("DEx").[22] These exchanges operate as smart contracts on top of an existing blockchain, such as Ethereum.[23] As running a DEx essentially only requires the code for a related smart contract as well as the provision of some liquidity, which may also be provided by disparate holders of the relevant pairs of cryptocurrencies, entry into the DEx market is fairly easy.[24] A DEx is fully decentralized and allow consumers full control over their funds.

19 For example, to be a Solana validator, an Ethereum competitor using PoS, "[…] you need a computer with 12 CPU cores, 128 gigabytes of RAM, and 300Mbit/second upload speed (1 Gbit/second recommended)." This basically implies you need to be a datacenter operator to run a Solana validator. See https://docs.solana.com/de/running-validator/validator-reqs, last accessed January 4, 2022.

20 This may be due to steep learning costs involved in setting up one's own crypto wallet. A crypto wallet allows users to store cryptocurrency directly without using an exchange. It is well-documented that even in traditional financial markets, differences in financial literacy can affect consumers' market behavior and outcomes. See Deuflhard, Georgarakos & Inderst (2019). Deuflhard, F., Georgarakos, D., & Inderst, R. (2019). Financial literacy and savings account returns. *Journal of the European Economic Association, 17*(1), 131-164.

21 Stablecoins are cryptocurrencies pegged to a cryptocurrency, fiat money, or to exchange-traded commodities. We define stablecoins more precisely in Section IV.

22 Decentralized exchanges are also referred to as automated market makers. A market maker is someone who provides liquidity to market participants wishing to buy or sell a security or currency by either directly quoting bid and ask prices for the security/currency or submitting limit orders on an exchange's market.

23 A smart contract is a computer program that is automatically executed on a blockchain.

24 As a result, even large DEx', such as Uniswap (V3) and PancakeSwap (V2), have only a small share of the transaction volume. See https://coinmarketcap.com/rankings/exchanges/dex/, last accessed January 3, 2022.

So far, we are not aware of any antitrust authority having defined the relevant market(s) for crypto exchanges. We will nevertheless attempt to provide initial thoughts on what will likely be key issues to consider in defining relevant market(s). Before doing so, we note however that there may also be complementarities among the various crypto exchanges. Instead of exchanging a fiat currency for a cryptocurrency directly, the same consumer might first exchange the fiat currency for yet another cryptocurrency, only for her to later exchange that other cryptocurrency for the initially desired cryptocurrency. As such, a crypto exchange that offers fiat-to-crypto trades would be complementary to a crypto exchange that only offered crypto-to-crypto trades.

When defining relevant markets for crypto exchanges, one natural question to ask is whether separate markets should be defined for separate pairs of fiat and cryptocurrencies. Should there be, for example, separate markets for exchanging U.S. dollars into Bitcoin and Euros into Ethereum, or should these markets be aggregated into one? While we do not wish and indeed cannot provide a definite answer to this question, especially since the rapid developments in this industry likely will require adjustments to the definition of the relevant market, we provide some first rough indications on how this question might be addressed.

As usual, the basis for discussing the definition of the relevant market is the hypothetical monopolist test. Would a monopoly provider of trading a given fiat currency and cryptocurrency be able to profitably raise its transaction fee by 5-10 percent above the competitive benchmark level?[25]

When defining relevant markets for crypto exchanges, one natural question to ask is whether separate markets should be defined for separate pairs of fiat and cryptocurrencies

To fix ideas, we consider the market for buying Ether using U.S. dollars ("USD"). From the point of view of a consumer, trading different pairs is not a substitute since the consumer may not have the relevant fiat currency or have no desire to purchase another cryptocurrency. It may, however, be possible for the consumer to replicate as USD-ETH transaction by first using U.S. dollars to buy a different cryptocurrency, for example a stablecoin such as USDT, and then engaging in a second transaction with the target cryptocurrency, namely Ether. Depending on the fees charged for these other transactions and depending on how many consumers have access to this type of arbitrage trade, the hypothetical monopolist may see a decline in its transaction volume following its hypothetical price increase making it unprofitable.

Another possibility is that the hypothetical monopolist's price increase might induce other crypto exchanges offering trades in different currency pairs to enter the market for trading USD-ETH. Whether this will be profitable for the other crypto exchanges will depend on how similar the target cryptocurrency is to those cryptocurrencies already being offered. As most crypto exchanges do in fact offer trading in multiple fiat and cryptocurrency pairs, such countervailing entry may need to be considered when defining the relevant market.

04
STABLECOINS AND MONEY

In economics, money typically has three functions: medium of exchange, store of value and unit of account.[26] Cryptocurrencies compete among each other and with traditional money as a medium of exchange and as a store of value used by consumers. While the earliest cryptocurrency Bitcoin was initially intended to have both functions, the large volatility of its price relative to the U.S. dollar has limited its appeal for the use as a medium of exchange in mainstream transactions. As a result of the large volatility of most cryptocurrencies relative to the U.S. dollar, the cryptocurrency community has attempted to create so-called stablecoins. These are explicitly intended to simply be digital versions of existing fiat currencies backed by some form of collateral.

Stablecoins should allow consumers a relatively fast transaction throughput and lower fees for small and large payments on a national and international level compared to the traditional financial system without the volatility of traditional cryptocurrencies. Consumers can then send and receive stablecoin payments between themselves with no central-

25 Since the fees for trading currencies is often expressed in percentages of the transaction amount, it may be necessary to adapt the benchmark for what constitutes a SSNIP.

26 For a modern discussion of money's role as a medium of exchange, see Kiyotaki & Wright (1989; 1993). Kiyotaki, N., & Wright, R. (1989). On Money as a Medium of Exchange. *Journal of Political Economy, 97*(4), 927-954. Kiyotaki, N., & Wright, R. (1993). A Search-Theoretic Approach to Monetary Economics. *American Economic Review, 83*(1), 63-77.

ized third-party. We distinguish three types of stablecoins depending on the type of collateral used.

First, fiat-backed stablecoins are issued by a centralized entity that collects a specific amount of fiat currency or a fiat currency portfolio, most commonly the U.S. Dollar, and then issues a redeemable stablecoin token backed 1-for-1 by the collected fiat currency.[27] Thus, in principle, every digital U.S. Dollar entering the crypto economy should be accompanied by one physical U.S. Dollar serving as collateral. Fiat collateralization typically happens off the blockchain, thus relying significantly on trust in the centralized entity. One problem is that these stable coins are often relatively centralized since the emitting party holds the fiat currency backing the stablecoin. Moreover, stablecoin accounts can be frozen by the centralized emitting party.[28]

Second, cryptocurrency-backed stablecoins are conceptually similar but are backed by a cryptocurrency or a cryptocurrency portfolio instead of fiat money. One major difference, however, is that the collateralization typically happens in a more decentralized way on the blockchain using smart contracts. Additional features may be implemented into the smart contract to promote price stability, which may, however, introduce additional technical risks that may be exploited.

Last, algorithmic stablecoins are not backed by any collateral. Similar to traditional monetary supply steered by central banks, the underlying protocol works as the central bank by adjusting the supply in reaction to deflationary or inflationary tendencies. The specific rules for such actions are typically defined within a smart contract. One advantage compared to more centralized models is that algorithmic stablecoins rely on transparent and auditable code which can enhance trust in the stablecoin itself.

While still in exploration phase, related central bank digital currencies ("CBDCs") are digital counterparts of fiat currency issued by central banks with similar features as stable coins. Since those are issued by the same authority determining the monetary policy of traditional fiat money, CBDCs are not strictly speaking stablecoins. They are, however, different from traditional central bank money in that CBDCs combine two formerly distinct features of banking, namely the banknote in the form of a token and a bank account in the form of ledger entries in accounts.

This could allow central banks to participate more directly in the creation of money which so far is largely left to private institutions.[29]

Although we are not aware of competition authorities examining the issue of the relevant market for money, central banks use a variety of definitions of money. The European Central Bank, for example, defines the monetary aggregate M1 to be the sum of currency in circulation and overnight deposits.[30] The larger aggregate M2 includes M1, but adds deposits with an agreed maturity of up to two years and deposits redeemable at notice of up to three months.

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What makes these monetary aggregates problematic is that the simple addition of the constituent quantities implicitly takes the various types of deposits to be perfect substitutes from the perspective of consumers. This is unlikely to be correct. While cash may be convenient for paying smaller sums at the point of sale, bank transfers from a customer's bank account may be more convenient for larger purchases. To better consider the imperfect substitutability of monetary assets, the use of Divisia indices has been proposed. These differ from simple sum monetary aggregates in that they take account of differences in the

27 The claim of 1-for-1 backing by fiat currency has often been controversial. For example, Tether, issuer of the one of the largest stablecoins, was fined for claiming it had a 1-for-1 backing of its stablecoin, although this was not the case. See https://www.bloomberg.com/news/articles/2021-10-15/tether-bitfinex-to-pay-fines-totaling-42-5-million-cftc-says, last accessed January 4, 2022.

28 For example, the most popular stablecoin to date has frozen over 500 addresses. Source: Bitquery, last accessed November 8, 2021.

29 See Bank for International Settlements (2018). Bank for International Settlements. (2018). Central bank digital currencies. *Working paper.*

30 See https://www.ecb.europa.eu/stats/money_credit_banking/monetary_aggregates/html/index.en.html, last accessed January 3, 2022.

monetary assets' relative prices in a way that is consistent with economic theory.[31]

To calculate an appropriate Divisia monetary aggregate it is also necessary to first determine the type of monetary assets to be included in the aggregation procedure. While Divisia monetary indices can be computed analogously to simple sum monetary aggregates, such as M1 and M2, the selection of monetary assets into these aggregates is based primarily on a consideration of the ease of converting the asset into funds that may be used for transaction. While there is therefore some flavor of the arguments behind the HMT in the construction of these monetary aggregates based on closeness of substitution, there may be other considerations, such as the ease of using different types of monetary assets for different types of transactions. For example, using cash and debit cards will typically be the preferred payment method at the point-of-sale, whereas bank transfers are likely more common for paying for larger durable consumer goods.

Introducing stablecoins into the appropriate definition of monetary aggregates raises further questions. While in principle stablecoins are easily and quickly convertible into other monetary assets, their use by businesses for accepting payments still remains limited, compared to alternative such as cash and debit cards. Including them in narrow definitions of money, such as M1, would therefore appear to be premature.

> ***To calculate an appropriate Divisia monetary aggregate it is also necessary to first determine the type of monetary assets to be included in the aggregation procedure***

For fully fiat-backed stablecoins it may also be argued that these should not change the overall monetary aggregate. While the stablecoins themselves may, provided they are sufficiently substitutable with other types of money, count as an increase in the money supply, the simultaneous "locking up" of the currency backing the stablecoin would serve to reduce the overall money supply. For stablecoins that are only fractionally backed by fiat money, the stablecoin may contribute towards an increase of the money supply, akin to how fractional reserve banking serves to increase the money supply. In that sense fractionally fiat-backed stablecoins may share some similarities to deposit-taking financial institutions and may be vulnerable to something akin to bank runs.

This might justify regulating fractionally backed stablecoins through measures such as an insurance fund, akin to the U.S. Federal Deposit Insurance Corporation ("FDIC)."

As the value of all stablecoins referencing a particular fiat currency should, in principle, correspond 1-to-1 to the value of the underlying fiat currency, applying a SSNIP test to delineate markets may again not be straightforward. This would, of course, also be the case when applying the SSNIP test to more traditional monetary assets.

As the literature on Divisia monetary indices makes clear, different monetary assets are associated with different relative prices.[32] The price of a monetary asset in that literature refers to the difference between a benchmark rate of return and the rate of return offered by the monetary assets. The rate of return for a monetary asset may also include fees and other costs imposed on users when holding it. For stablecoins these costs may be the fees charged by crypto exchanges for buying and selling the stablecoin.

Once it is understood that the relative rate of return on stablecoins (and other monetary assets) is the relevant price variable – rather than the exchange rate between stablecoins and the reference currency – applying the SSNIP test should again be feasible conceptually. Of course, obtaining the necessary data may still be a challenge, so that approximate approaches may have to be relied upon.

05
CONCLUSIONS

We discuss how to adjust the well-known hypothetical monopolist test ("HMT") used to define relevant markets

31 For an overview, see Barnett, Fisher & Serletis (1992). Barnett, W. A., Fisher, D., & Serletis, A. (1992). Consumer Theory and the Demand for Money. *Journal of Economic Literature*, 2086-2119. For recent evidence on the benefits of Divisia monetary aggregates, see Belongia & Ireland (2019). Belongia, M. T., & Ireland, P. N. (2019). The demand for Divisia Money: Theory and evidence. *Journal of Macroeconomics, 61*, 103-128.

32 See Barnett, Fisher & Serletis (1992). Barnett, W. A., Fisher, D., & Serletis, A. (1992). Consumer Theory and the Demand for Money. *Journal of Economic Literature*, 2086-2119.

relating to cryptocurrencies. The adjusted tools may be helpful to determine relevant markets for blockchain consensus mechanisms, crypto exchanges as well as stablecoins and other monetary assets. Based on the definition of relevant markets, appropriate regulations may then be considered.

> *As the literature on Divisia monetary indices makes clear, different monetary assets are associated with different relative prices*


WEB3.0

CAN WEB3 BRING BACK COMPETITION TO DIGITAL PLATFORMS?

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01 INTRODUCTION

The Internet played a major role in decentralizing access to information and services, bringing competition and innovation back to many concentrated industries. At the same time, because of network effects and economies of scale, verticals such as communications, retail, media, and music have seen the emergence of Internet players with substantial market power. Like the early Internet, blockchain and Web3 applications promise a new wave of decentralization and competition – yet at the same time, it is unclear which of the dynamics that drove online concentration in the first place will remain in force under the Web3 paradigm.

In this article, we highlight three fundamental costs that Web3 technology can potentially reduce: the *cost of verification*, the *cost of interoperability and portability*, and the *cost of composability*. We then explore how reducing these costs may influence the design of digital ecosystems, as well as the resulting market structure and competition.

02
THE WEB3 PARADIGM

The key economic feature of blockchain technology is the ability to design digital platforms without assigning control – and market power – to a centralized intermediary.[2] Whether it's for sending value across the globe without relying on a bank or for matching the buy- and sell-sides of a digital exchange, blockchain-based protocols allow parties to coordinate with each other without having to write bilateral contracts or rely on third-party facilitation.

Web3 uses blockchain-based tokens to define new forms of digital ownership, record transfers of ownership, and create incentives for participants to perform actions that contribute to the growth and health of a digital ecosystem. This is fundamentally different from the structure of "Web 2" ecosystems (like on Twitter, Facebook, and Amazon Web Services), where the platform architect predominantly retains control of and ownership over key digital assets (e.g. users' posts, the social graph, and so forth), as well as the rules of participation and exchange, and the monetization models available to application developers.

On a Web 2 platform, creators, aggregators, and participants are not completely free to compete or invent – but instead often have to follow strict guidelines shaped by the platform architect.[3] This can be particularly problematic when the platform architect also competes with some of its market participants directly.[4] And because the platform itself owns key data assets and transaction infrastructure, users may have little recourse or ability to transition to other platforms – even when they are highly dissatisfied.

Web3 platforms, by contrast, are built as open protocols that anyone can interface with through a public blockchain. The underlying data and infrastructure are typically accessible to anyone and can be used, remixed, aggregated, or repurposed with substantially fewer restrictions. The open source community, through code, defines the rules of engagement – and, unlike with traditional APIs, nobody has unilateral control over which features are available to participants.

Openness also means that entities who want to build novel business models on top of Web3 tokens have more transparency and certainty about the rules of engagement, and are less at risk of hold-up by the platform architect. Once a feature is part of a Web3 protocol, everyone has access to it on the same terms, and changes require governance actions by the community of holders. While this process will be substantially slower than the decision-making process of a Web 2 company, it also ensures that a broader set of stakeholders and shareholders are represented.

> ***"Web3 uses blockchain-based tokens to define new forms of digital ownership, record transfers of ownership, and create incentives for participants to perform actions that contribute to the growth and health of a digital ecosystem***

Take the music industry as an example. Because replicating digital music is frictionless, in the early days of the Internet, artists and labels struggled to stop the uncompensated sharing of their intellectual property. Furthermore, by decoupling music from a physical artifact such as a CD or cassette, digitization made it impossible to own music in a form that was substantially different from the illegal copies – thus devaluing legal music ownership. The lower resulting price for music tracks, combined with economies of scale in the process of acquiring licensing rights, tipped the music

2 See C. Catalini & J. S. Gans, "Some simple economics of the blockchain," *Communications of the ACM*, 2020.

3 E.g. the Apple Store Review Guidelines (available online at https://developer.apple.com/app-store/review/guidelines/; accessed January 20, 2022).

4 Amazon, for example, has replicated and scaled production of some of its third-party sellers' most successful products (see, e.g. K. Canales & D. Reuter, "Amazon systematically used third-party sellers' data to copy products and promote them to shoppers, despite saying otherwise, according to a new report," *Business Insider*, 2021) and influences consumer search through algorithmic recommendations, which often preference Amazon's in-house products (see, e.g. K. H. Lee & L. Musolff, "Entry Into Two-Sided Markets Shaped By Platform-Guided Search," Working Paper, 2021 – although as they note, the consumer welfare implications of this behavior are unclear, and may be positive at least in the short run).

distribution market in favor of large players such as iTunes.[5] Two decades later, music streaming is highly concentrated, and companies such as Apple have been able to profoundly shape dimensions of the digital music market – ranging from pricing, to format,[6] to visibility of and terms with individual artists.

Web3 brings back, although in a novel form, the concept of ownership for digital artifacts such as songs. Now ownership of a song can be codified in the form of a token, and the token can become the basic economic building block for the funding, creation, and commercialization of music on an open online ecosystem. Early supporters of an artist can buy tokens encoding the artist's songs; this both supports the artist directly *and* helps other participants and aggregators discover the artist by observing the transactions. Tokens can be imbued with add-on features, such as early access to exclusive content or concerts. And the tokens can also be configured to accrue royalties automatically as the artist's music is played through streaming. While some of the same functionality has been implemented before on centralized crowdfunding platforms, in a Web3 ecosystem, these sorts of transactions can take place without relying on a centralized intermediary.

The tokens, in combination with smart contracts and the rules of the protocol, can perform all these operations programmatically. Furthermore, a variety of economic exchanges can be built on top of the tokens in a modular fashion. For example, when a song is remixed or used in a movie, the token associated with the new artifact could automatically share royalties with the piece it is "licensing." And the ecosystem could provide tokens as rewards for different types of measurable contributions, including reviews and referrals to new listeners.

03

THREE KEY COSTS AFFECTED BY WEB3

Like any new technology, the impact of Web3 will be shaped by the dimensions along which it changes the transaction costs of launching and operating businesses. As we highlight, there are three cost categories Web3 will particularly affect.

> ***The tokens, in combination with smart contracts and the rules of the protocol, can perform all these operations programmatically***

The cost of verification: Web3 relies on distributed public ledgers, making the underlying information available to all participants and robust to error or misrepresentation. Web3 thus lowers the cost of verifying that a specific digital asset exists and following that asset's transaction history. Furthermore, Web3 allows anyone to independently verify the current or past state of a digital asset or participant without relying on a third party.

This is what allows for digital ownership to emerge: while a token in and of itself does not guarantee any offline rights, the ability to reach consensus among ecosystem participants about ownership status and related benefits makes it possible to define new types of digital property rights – and again, these rights are established without need for a third party. For example, anyone who holds a Bored Ape Yacht Club token can use that token to unlock access to exclusive discussion groups, events, and merchandise through the Bored Ape Yacht Club's website.[7] Similarly, anyone owning a song token could be allowed to stream it at any point in time on any device. Nobody has to "verify" the token holder's rights – they are embedded in the digital asset itself.

Moreover, the ability to audit digital information cheaply makes it possible to establish better reputation systems, build trust among otherwise disconnected parties, and write self-enforcing contracts. For example, a third-party investor in an artist would not need to worry about the enforcement of a royalty contract because that contract would be embedded into the publicly accessible source code. A low cost of verification can also help establish derivative reputation systems – for example, in order to assess an individual's talent in scouting new artists, one could check how often that individual bought tokens of artists who later turned out to be major successes.[8]

All of this means that Web3 stands to reduce our reliance on centralized platforms and intermediaries with established reputations and/or institutional backing.

5 See, e.g. the discussion of the rise of iTunes in D. Arditi, "iTunes: Breaking Barriers and Building Walls," *Popular Music and Society*, 2014.

6 For example, iTunes drove the unbundling of albums into individual songs (see, e.g. S. Knopper, "iTunes' 10th Anniversary: How Steve Jobs Turned the Industry Upside Down," *Rolling Stone*, 2013).

7 See the discussion in S. Kaczynski & S. D. Kominers, "How NFTs Create Value," *Harvard Business Review*, 2021.

8 See, e.g. the discussion in S. Kominers & J. Esber, "Decentralized Identity: Your Reputation Travels With You," *Future*, 2021.

That said, blockchain technology on its own can only reduce verification costs for information that is already digital. At the interface between the offline and online worlds, new types of intermediaries will have to ensure that the information recorded on a distributed ledger is accurate, and, when needed, that it maps to additional legal rights such as copyright. In the absence of these intermediaries, last mile frictions are likely to severely limit where Web3 platforms can add value, and may skew the evolution of Web3 in favor of sectors of the economy and transactions that do not necessarily need a link with the offline world (e.g. digital media, gaming, and art).

The cost of interoperability and portability: Because Web3 applications are built on top of open protocol standards, they are compatible with each other by design. Unlike APIs which are created, maintained, and controlled by a third party, Web3 protocols allow anyone to read and write to the distributed ledger. The resulting interoperability can be especially beneficial for competition, as users of a nascent application with a small user base can immediately interact with those of an already established player. New entrants can even go further than that and build on top of existing applications in a modular fashion, or create incentives for the installed user base of an incumbent to switch over.[9]

> *That said, blockchain technology on its own can only reduce verification costs for information that is already digital*

Portability is guaranteed because at any point in time, ownership is established at the level of the individual token and resides with its owner, rather than with an aggregator or other third party. This is different from Web 2 platforms, where users may create content, contribute to the discovery of the social graph, and drive engagement, yet typically do not own or control the underlying information or value generated.

Because of portability, users of a Web3 application have a substantial degree of control: they can use Web3 assets they already own in new ways without having to ask for permission. Together with interoperability, this facilitates the use of assets across potentially competing applications. For example, someone who has acquired a piece of digital art could use it to decorate a digital space in the metaverse, place it as collateral for a loan in a decentralized finance ("DeFi") application, and trade it on any digital asset marketplace. There is no need for the metaverse application, for example, to integrate directly with the marketplace application; all of these applications can interact with the asset through the underlying blockchain infrastructure, with the owner's permission. While some forms of interoperability will still need additional, shared standards – for example, to ensure that the same type of digital object can be used in two different games in the same way – this represents a significant reduction in the cost of interoperability.

Portability fundamentally changes how network effects operate on Web3 platforms, as the benefits of network effects accrue at the level of the token, not the platform itself. Owning a digital token becomes more valuable when more people want to own or interact with similar tokens. While that represents a fairly traditional type of network effect, because it is attached to the token – not the platform – it can be easily transferred elsewhere. Similarly, as new applications are developed, causing a token to appreciate in value, the owner of the token and not a centralized intermediary stands to benefit directly from the expanded functionality.

From a competition perspective, this means that entry barriers are lower, as entrants with a better value proposition can entice users to port their assets and associated value over.[10] Dynamically, this may mean that Web3 platforms, in the absence of other mechanisms, may face lower investment incentives due to the weaker appropriability regime.

These are not new issues in open-source development, but the presence of a public ledger, tokens, and related monetization strategies make some of these challenges more salient, as imitators can not only borrow code but also fork the history of transactions. In a Web3 world, an imitator can be immediately backwards-compatible with the project it is drawing inspiration from. This keeps incumbents in check, and may force them to focus more on choices that benefit the broader ecosystem rather than extracting rents from the platform they have created.

Interestingly, Web3 and blockchain technology seem to have the broader potential to rebalance the role of network effects in digital platforms. While in Web 2 most of the benefits of network effects have accrued to the platform architects, and participants only have very costly and hard-to-

9 NFT marketplace LooksRare, for example, recently bootstrapped its initial liquidity by using blockchain transaction records to identify the most active users of the dominant NFT marketplace, OpenSea, and offering all of those users tokens (loosely representing a form of equity in LooksRare's platform) in exchange for listing NFTs on LooksRare (see O. Hernández, "New NFT marketplace LooksRare allows traders to earn rewards," *Cointelegraph*, 2022).

10 When the DeFi protocol and codebase of Uniswap was imitated and tweaked by the SushiSwap team, for example, Uniswap lost some liquidity and attention to the new competitor (see, e.g. M. Young, "How SushiSwap Positioned Itself as a Formidable Uniswap Rival," *BeInCrypto*, 2021).

coordinate ways to express their voices or exit, in Web3 portability and interoperability ensure that the frictions to challenging the teams behind any specific protocol are technically much lower.

The cost of composability: A third fundamental cost affected by Web3 is the cost of composing applications or transactions together across platforms. Because Web3 protocols rely on a combination of tokens and smart contracts, they are inherently modular. A token used in one application can later be ported seamlessly into another without asking for permission from the platform architect. Similarly, smart contracts can be combined with each other to build more complex products and services. While this also introduces new forms of systemic risk – as one piece of code may rely on the proper execution of third-party code, or on the stable functioning of a related ecosystem – it also accelerates experimentation in the space, as developers can reuse what others have created and build incrementally from what is already available on a particular network.

> ***These are not new issues in open-source development, but the presence of a public ledger, tokens, and related monetization strategies make some of these challenges more salient, as imitators can not only borrow code but also fork the history of transactions***

As a result, we should expect new types of contractual arrangements to emerge that take advantage of composition across platforms – such as, for example, allowing a token representing ownership of a song to accrue royalties irrespective of the way the song is distributed (e.g. streaming, inclusion in a movie soundtrack, or sampling in a remix). Similarly, composability will make it easier for different revenue models to co-exist – such as ad-based and subscription models for the same content.

Composability also dramatically simplifies building aggregators and marketplace platforms, as anyone can access the underlying blockchain and offer a particular "view" on the associated content. While search costs may still end up driving some concentration, the drop in the cost of composability should still lead consumers to have a wider variety of channels for accessing content. For example, on a Web 2 social media platform, the only way for consumers to experience content is through the choices of the platform architect. In Web3, instead, consumers should be able to choose the way they experience content by selecting across platforms that present that content in different formats. And if no available platform presents the preferred content frame, a consumer can in principle design such a frame themself by reading from the blockchain directly.

04
WHAT THIS MEANS FOR MARKET STRUCTURE

By lowering the three costs just described, Web3 has the potential to significantly improve digital platform competition. Lowering the costs of verification and composability makes it easier to stand up new platforms or classes of transactions; moreover, interoperability means that users of these new services can immediately interact with the assets and user bases of established platforms. Enhanced portability, meanwhile, makes it easier for participants to exit an app and move their business, transaction histories, and other data elsewhere. Because Web3 applications and aggregators always face the dual threats of new platform entry and user exit,[11] they should have less latitude to take extractive actions even once they establish themselves in the space; this is sometimes summarized by a change from "don't be evil" to "can't be evil."[12]

Going back to our music example, in theory, because Web3 protocols reduce the role of intermediaries such as streaming platforms and labels, artists and the communities that support them should be able to retain more of the value they create. Distribution is also different: while in the previous paradigm the platform controls not only access to content but also what is surfaced by algorithms or editors, Web3 digital content can be distributed across multiple types of interfaces at the same time. Anyone can build an aggregator because the "licensing contract" is embedded into the protocol and effectively permissionless – unless the artists create restrictions to the contrary, anyone willing to pay the right level of royalties has immediate access to the song.

Similarly, once a consumer owns a digital asset in a Web3 ecosystem, they are freely able to interact with it and consume it through different service providers. This is different from the way consumers experience digital goods today, under which when a consumer buys a song or an e-book, they're really just licensing access through a specific provider, rather than taking ownership of a copy. Whereas li-

11 See, e.g. D. Finlay, "What Moxie Missed on Web3 Wallets," *Medium*, 2022.

12 See M. Ali, "Can't be evil," *Medium*, 2017.

cense-based ownership in Web 2 prevents consumers from switching platforms – because if they did, they would lose access – Web3 promises a more platform-agnostic consumption experience in the future.

> *Similarly, once a consumer owns a digital asset in a Web3 ecosystem, they are freely able to interact with it and consume it through different service providers*

Yet as in Web 2, aggregators and platforms that own the interface with the consumer may still retain substantial market power. For example, users can technically hold cryptocurrency such as Bitcoin or Ether in a self-custodial wallet, and thus avoid the need to rely on any intermediary when transacting – yet for convenience and security reasons, most cryptocurrency users today choose to hold and manage their crypto tokens through centralized intermediaries such as custodial wallets or exchanges. As a result, we have seen the emergence of new types of intermediaries with substantial influence over Web3 ecosystems.

Whether these new intermediaries have less market power than the ones they are replacing is an open question. In the business of digital asset custody, economies of scale in security, brand, and ease of use may well give a small number of players an advantage. And indeed, the mere presence of an open protocol does not guarantee a competitive outcome. While email, for example, is built on top of open protocols like SMTP and IMAP, the vast majority of consumers rely on a small number of email systems like on Gmail because of their functionality and ease of use.

Convenience and well-designed user interfaces can easily drive concentration in digital platforms. Moreover, these same dimensions can provide enough utility to consumers for them to accept compromises on other dimensions such as privacy.[13] Web3 is no different. Because of its intuitive interface and overall brand awareness, OpenSea has quickly become the largest non-fungible token ("NFT") marketplace – and this has allowed the platform to add proprietary extensions to NFT auctions and transactions. While the NFT market is fundamentally open, in the absence of more open solutions at the last mile between consumers and the blockchain, aggregators can still try to maintain a privileged position and have some degree of power to shape interactions and transactions.[14]

At the same time, Web3 applications have the potential to be different in the long run. OpenSea already faces multiple competitors that have used blockchain records of NFT transactions to identify top OpenSea customers and recruit them to trade on their platforms instead.[15] And there are active efforts underway to build trustless applications that reduce the reliance on platform aggregators such as OpenSea entirely.[16] Rather than relying on proprietary APIs to read and write on a blockchain and visualize outcomes to a user, trustless applications connect an end user directly to the blockchain, modularizing the different layers between the ledger and what a user may experience on their device.

A challenge for the development of trustless applications is that consumers may not care about decentralization enough, and so questions about what market structure will arise inevitably become questions about what levels of decentralization vs. openness the market will demand across different industry verticals.

05
CODA

By reducing the costs of verification, interoperability and portability, and composability, Web3 is poised to help address many of the challenges that regulators, policymakers, and academics have surfaced with respect to competition and consumer welfare in Web 2. Over time, Web3 may even enable some of these more open digital ecosystems to compete head-to-head with entrenched digital incumbents.

But the outcome is far from predetermined. While Web3 applications that emerge on the margins around transactions that Web 2 cannot support are likely to reflect more competitive digital ecosystems, the outlook for application categories that already exist in Web 2 is less clear-cut. Web 2 incumbents will still be able to leverage their installed user bases, data, and technical abilities to deliver a far superior

13 See, e.g. S. Athey, C. Catalini, & C. Tucker, "The Digital Privacy Paradox: Small Money, Small Costs, Small Talk," NBER Working Paper No. 23488, 2017.

14 See, e.g. the discussion in B. Thompson, "OpenSea, Web3, and Aggregation Theory," *Stratechery*, 2022

15 Again, consider for example the case of LooksRare, discussed in footnote 9.

16 See, e.g. V. Buterin, "The word 'server' imo is not very useful in the blockchain context," *Reddit*, 2022.

user experience – which means that whenever convenience and usability matters, Web3 applications will start at a massive disadvantage.

While the history of technology is filled with examples of established companies entirely missing a new wave towards a model that is different from the one they thrived on (e.g. from a more centralized one to a more decentralized one or vice versa), for Web3 to reach its potential, we will need regulation and infrastructure that supports greater interoperability overall – and especially portability of digital assets, data, and services into Web3 applications and frames.

> *By reducing the costs of verification, interoperability and portability, and composability, Web3 is poised to help address many of the challenges that regulators, policymakers, and academics have surfaced with respect to competition and consumer welfare in Web 2*

CRYPTO LOVE IS A BATTLEFIELD

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01 INTRODUCTION

"We are young, heartache to heartache we stand, no promises, no demands, love is a battlefield." (Benatar, P. 1983)

While many academics, lawmakers, regulators, bankers, technologists, and entrepreneurs profess to love blockchain technology, at times the relationship with blockchain looks like a battlefield. The "tug-of-war that is likely to evolve between … traditional methods of payment and blockchain-driven payment systems."[2] The battle over blockchain technology and digital assets bears a striking resemblance to the debate over the potential of the internet in the mid-1990s.

If you believe certain critics of digital assets and blockchain technology, you might view this battleground as a bleak dystopian sci-

2 Goldman Sachs, "*Digital Assets: Beauty Is Not in the Eye of the Beholder*," (June 2021).

ence fiction world of lawlessness, fraud, and get-rich-quick schemes. Supporters of blockchain technology and digital assets believe otherwise. One apparent supporter of blockchain technology is former Chair of the Federal Reserve System and current Treasury Secretary, Janet Yellen, who has noted:

> *It makes sense for central banks to be looking at [central bank digital currencies]* … We do have a problem with financial inclusion. Too many Americans really don't have access to easy payment systems and to banking accounts, and I think this is something that a digital dollar – a central bank digital currency – could help with. I think it could result in faster, safer and cheaper payments.[3]

Supporters of blockchain technology and digital assets agree with Secretary Yellen and believe the technology has the potential to democratize finance and promote financial inclusion. They believe the technology has the potential to transform the very nature of the financial services industry. The ability to represent assets on a digital system and execute transactions using distributed ledger technologies has the potential to fundamentally change how consumers and businesses interact with money, trade on markets, and manage wealth and assets.

The digitization of assets is powered by distributed ledger technology or blockchain technology. Existing assets such as securities, real estate, or commodities can be recorded on a blockchain to enable the settlement of transactions directly against fiat currencies and other digital assets or to power alternative payment systems. In doing so, digital assets have lowered transaction costs by removing the need for centralized intermediaries, improving transaction transparency, reducing counterparty risk, and speeding up settlement of transactions.

Supporters of blockchain technology and digital assets agree with Secretary Yellen and believe the technology has the potential to democratize finance and promote financial inclusion

Proponents of a financial system supported by digital assets, including virtual currencies such as Bitcoin, recognize the significant potential of blockchain technology to promote financial inclusion by creating more liquid markets, enabling larger segments of the population to execute transactions, and offering the means to store value without the need of an intermediary or central authority. To meet the growing interest and use of digital assets, industries have emerged to create alternative electronic payment rails to facilitate the movement of digital assets and the settlement of transactions involving such assets, to establish digital asset exchanges that mirror traditional equity exchanges, and to develop new technologies that rely on digital assets. These innovations have caused U.S. federal and state regulators to devote resources to better understanding this technology and the potential impact a digitized financial system could have on consumer protection and the safety and soundness of the financial system, generally.

The past year has been pivotal with respect to the evolving legal treatment of digital assets and virtual currencies in the United States. This article provides an overview of key U.S. regulatory developments that will have a significant impact on how blockchain technology and digital assets will affect the U.S. financial system.

02 BACKGROUND

Despite the miscomprehension of critics of blockchain technology, digital assets and blockchain technology are not the same. Blockchain technology refers to a distributed ledger technology that distributes a list of all transactions across an entirely digital, peer-to-peer network. The idea of blockchain was introduced in 2008 as the technology powering Bitcoin — the most widely known open-source, digital asset. Today, various blockchains — for example, the Bitcoin, Ethereum, Corda, Hyperledger, Algorand, and Solana blockchains — are used to support all digital assets and provide an authoritative record of transactions.[4]

A. Blockchain Technology

A blockchain is a database structure that can only be updated by appending a new set (or "block") of valid transac-

3 .Sorkin, A. "*Reading Between the Lines: A Conversation with Janet Yellen*," (NY Times Dealbook, Feb. 23, 2021).

4 Levin, R. "*Blockchain & Cryptocurrency Laws and Regulation 2020*," (Global Legal Insights, 2020).

tions to the log of previous transactions (the "chain").[5] As noted by Goldman Sachs in a note to clients:

> In its most basic form, the blockchain records ownership of Bitcoin and transactions involving the crypto currency across a wide network of computers, as opposed to a centralized ledger. Transactions are signed off by the parties involved using the software, checked by the network or the "crowd," then added to the blockchain — a long string of code that records all activity. Encryption in the software ensures these "blocks" cannot be tampered with or altered. And the decentralized nature means the "crowd" police the whole system. The software cuts out the need for a "trusted middleman" to sit in between parties in a transaction, such as a bank or clearinghouse. This makes transactions quicker, cheaper, and easier when compared to the current systems banks use.[6]

Many firms in the financial services industry believe blockchain technology can be adapted for use in traditional financial services transactions in a way that "has the potential to redefine transactions and the back office of a multitude of different industries. From banking and payments to ... trade settlement ... a distributed shared ledger has the potential to make interactions quicker, less-expensive and safer."[7] For example, the adoption of blockchain technology among competing financial institutions would enable these same institutions to share a common digital representation of asset holdings and monitor the execution, clearing, and settlement of transactions outside of legacy, proprietary databases and, more importantly, without the need for a central database management system. Instead, blockchain technology would enable users, including financial institutions, to become peers in a shared database that users can rely on to record transfers of assets and to perform additional related activities involving multiple parties, such as trading, clearance, and settlement.

"Many firms in the financial services industry believe blockchain technology can be adapted for use in traditional financial services transactions in a way that "has the potential to redefine transactions and the back office of a multitude of different industries

B. Digital Currencies

Digital currencies, or "virtual currencies," refer to monetary units of exchange stored or represented in a digital or other electronic format that operate like currency but does not have all the attributes of "real" currency, including legal tender status.[8] Digital currencies can be created by an individual, corporation, organization, or can arise from use and acceptance by people as currency.[9] Traditional currencies are generally either backed by the faith and credit of the national governments that recognize the currency (the fiat system) or by real assets or hard commodities, such as gold, silver, or minerals (the commodity system). Generally, U.S. regulators consider the acceptance and transmission of digital currencies as being subject to Bank Secrecy Act and Anti-Money Laundering regulations, among others, regardless of whether the digital currency is represented by a physical or digital token, whether the ledger is centralized or distributed, or the type of technology is utilized for the transmission of value.[10]

C. Digital Assets

The U.S. Securities and Exchange Commission ("SEC") has defined digital assets as "an asset that is issued and transferred using distributed ledger or blockchain technology."[11] Digital assets include, but are not limited to, digital currencies, coins, tokens, stablecoins, and non-fungible tokens

5 Pinna, A. & W. Ruttenberg. "*Distributed Ledger Technologies in Securities Post-Trading*," (European Central Bank, April 2016).

6 Goldman Sachs. "*What if I Told You…*," (Dec. 2, 2015).

7 *Id.*

8 FinCEN Guidance. FIN-2019-G0001: "*Application of FinCEN's Regulations to Certain Business Models Involving Convertible Virtual Currencies,*" (U.S. Department of the Treasury, May 9, 2019) ("FinCEN 2019 Guidance").

9 Turpin, J., *Bitcoin: the economic case for a global, virtual currency operating in an unexplored legal framework.* Ind. J. Global Legal Stud. 21 (1), 335–368 (2014).

10 FinCEN 2019 Guidance.

11 *Statement on Digital Asset Securities Issuance and Trading,* Division of Corporation Finance, Division of Investment Management, and Division of Trading and Markets, SEC (Nov. 16, 2018).

("NFTs"). A digital asset may in certain instances be deemed a security under the federal securities laws. While not defined in the securities laws, the SEC often refers to digital assets that are securities as "digital asset securities."[12]

D. Wallets and Keys

Digital assets are stored by associating them with addresses called "wallets," which can be stored on web servers' local hardware such as personal computers, jump drives, and mobile devices, or on paper printouts. A digital asset wallet takes the form of a cryptographic public key, which is a string of numbers and letters. Each public key has a matching "private key," known only to the user. Control of the private key is what assures one control of the digital assets at any address, so collections of private keys must be protected by passwords or other means of securing them. To the extent entities are hosting digital wallets, specifically "hot" wallets that exist online in the entities' cloud platform, concerns exist as to whether the entity would be operating as a money transmitter and, therefore, require licensure to support its custodial digital wallet.

03
DIGITAL ASSETS AND THE BANKING SYSTEM

Financial regulators in the United States have long focused on ensuring the safety and soundness of financial institutions holding customer funds and securities. As consumers and investors alike have become increasingly interested in digital assets, U.S. regulators have faced the challenge of attempting to protect customer funds and securities using laws written in the 1930s, 1940s, and 1970s. Meanwhile, traditional financial institutions, such as banks, are scrambling to understand the risks and benefits of developing and implementing a new technology infrastructure that can safely incorporate the custody (and related acceptance, remittance, transfers, and lending) of digital assets onto the institution's balance sheet while maintaining compliance with existing regulations.

A. OCC Regulation of Digital Assets

In July 2020, the Office of the Comptroller of the Currency ("OCC") issued an interpretive letter asserting national banks were permitted to provide cryptocurrency custody services on behalf of customers.[13] The OCC's letter discussed the custody services provided by banks and concluded banks may provide "cryptocurrency custody services, including holding the unique cryptographic keys that permit the control and transfer of the customer's cryptocurrency, is a modern form of these traditional bank activities."[14] The OCC also affirmed the agency's belief in its own power to "authorize national banks to perform, provide or deliver through electronic means and facilities any activities that they are otherwise authorized to perform.[15]

In September 2020, the OCC reaffirmed its support of financial technology entities, particularly those entities conducting activities considered "core" activities of banking such as deposit-taking, lending and custody services, by confirming that national banks and federal savings associations are permitted to take and hold fiat currency deposits to back stablecoins associated with hosted digital wallets.[16] In this letter, the OCC recognized that "some stablecoin issuers may desire to place the cash reserves backing their issued stablecoin with a national bank."[17] Given the OCC's prior guidance affirming the ability of national banks to "provide permissible banking services to any lawful business they choose," the OCC concluded that not only are national banks permitted to receive deposits associated with a stablecoin issuance but also may engage in any activity incidental to receiving deposits from stablecoin issuers.[18]

12 *Id.*

13 Office of the Comptroller of the Currency. Interpretive Letter #1170: Authority of a National Bank to Provide Cryptocurrency Custody Services for Customers. United States Department of the Treasury, Washington, D.C. (July 22, 2020)..

14 *Id.*

15 *Id.*

16 OCC (2020). Interpretive Letter #1172: OCC Chief Counsel's Interpretation on National Bank and Federal Savings Association Authority to Hold Stablecoin Reserves. United States Department of the Treasury, Washington, D.C..

17 *Id.*

18 OCC Interpretive Letters #1170 and #1172.

Although the OCC appeared to support nationally-chartered banks providing core banking services involving digital currencies, the proliferation of digital assets and increasing interest in these assets across regulated financial institutions has caused the OCC to slow its adoption among banks. In November 2021, the OCC issued guidance clarifying banks' authority to engage in certain digital currencies.[19] In this letter, the OCC imposed stricter guardrails for banks intending to provide the digital currency services described in OCC Interpretive Letters 1170, 1172, and 1174 (e.g. providing custody services, taking stablecoin-backing fiat deposits, and facilitating payment transactions on blockchain). Specifically, the OCC noted that banks needed to demonstrate, to the satisfaction of its supervisory office, that it had the necessary controls, policies and procedures in place to ensure these digital currency-related activities could be conducted in a safe and sound manner. To that end, the OCC requires nationally chartered banks to seek a "non-objection" letter from the OCC prior to providing any such services.[20]

B. Federal Reserve Board

The OCC's support of banks providing core banking services to businesses issuing or heavily involved in cryptocurrencies has not been mirrored by the other U.S. federal bank regulators — the Federal Reserve Board (the "Fed") and the Federal Deposit Insurance Corporation ("FDIC"). In May 2021, the Fed issued proposed guidelines for evaluating account and services requests (i.e. guidelines for granting "master account" access).[21] The "master account" is both a record of financial transactions that reflects the financial rights and obligations of an account holder and of the Reserve Bank with respect to each other, and the place where opening and closing balances are determined.[22] For each institution, all credits and debits resulting from the use of Fed services at any Fed office are booked to this single master account at one Reserve Bank.[23] The proposed guidelines intend to standardize criteria across the Fed System for granting access to a master account. Among the proposed changes, the authors believe that potential revisions to the scope of eligible entities that are permitted to apply for and obtain master account access are a direct reaction to the increasing number of "non-traditional" entities seeking master account access.

C. Basel Committee

At the international level, the Basel Committee on Banking Supervision published a consultative paper inviting comment on the prudential treatment of digital asset exposures.[24] The consultative paper proposed a significantly higher risk weight for such exposures, likely leading many banks to suspect that banking regulators remain highly skeptical of digital assets being brought onto the balance sheet of a bank. As a result, banks have been slow to incorporate the provision of custody services for cryptocurrencies and other digital assets into their business model because of the lack of clarity on the permissibility of custody of digital assets across all of the federal bank regulators.

04
DIGITAL ASSETS AND ANTI-MONEY LAUNDERING

In January 2021, Congress passed the National Defense Authorization Act ("NDAA") and, as part of the NDAA legislation, the Anti-Money Laundering Act of 2020 ("AMLA"). The AMLA represents the most comprehensive overhaul of anti-money laundering ("AML") laws in the United States since the passage of the USA PATRIOT Act in 2001. Among its many provisions broadening the scope of the U.S. AML regulatory regime, the AMLA specifically amended the Bank Secrecy Act of 1970 ("BSA") to expand the scope of businesses considered to be engaged in the transmission of money.

While previously "money services businesses" referred only to those businesses that transferred "funds," money services businesses now explicitly include all businesses that transfer "currency, funds or value that substitutes for currency." In addition, the AMLA grants the Treasury Secre-

19 OCC. Interpretive Letter #1179: Chief Counsel's Interpretation Clarifying: (1) Authority of a Bank to Engage in Certain Cryptocurrency Activities; and (2) Authority of the OCC to Charter a National Trust Bank. United States Department of the Treasury, Washington, D.C. (Nov. 18, 2021).

20 OCC Interpretive Letter #1179, 2021.

21 Proposed Guidelines for Evaluating Account and Services Requests.

22 Federal Reserve, Reserve Maintenance Manual.

23 *Id.*

24 Basel Committee on Banking Supervision. "*Consultative Document: Prudential Treatment of Cryptoasset Exposures*," (June 2021).

tary authority to define "value that substitutes for currency" through future regulations. Although the AMLA essentially codified prior guidance from FinCEN regarding the treatment of "convertible virtual currencies," this expanded definition is particularly important for businesses involved in digital currencies, virtual currencies in internet gaming applications, electronic gift cards and other non-traditional cash substitutes.[25]

In December 2020, FinCEN issued a notice of proposed rulemaking ("NPR") requesting comments on proposed requirements for certain transactions involving convertible virtual currencies.[26] As set forth in the NPR, banks and money services businesses would be required to submit reports, maintain certain records, and verify the identity of customers to the extent transactions involving convertible virtual currencies exceed prescribed thresholds. The proposed reporting requirements effectively enable the government to better surveil transactions involving convertible virtual currencies as well as impose additional AML requirements on such businesses.

05
DIGITAL ASSETS AND THE SEC

2017 marked the start of a frenzy of digital asset offerings commonly known as initial coin offerings ("ICOs"). The ICO craze has been met with a flurry of enforcement actions by the SEC. Unlike initial public offerings, ICOs were marketed without registrations with the SEC or exemptions from registration. ICOs were viewed as similar to crowdfunding efforts using virtual currencies.[27]

The explosion of ICOs prompted several responses from the SEC, including an investigation conducted by the SEC regarding whether the DAO, a decentralized autonomous organization created by Slock.it UG ("Slock.it"), a German corporation, and Slock.it's co-founders, violated U.S. securities laws with their ICO. The ensuing investigation and report (the "DAO Report") found that Slock.it engaged in the sale of an unregistered security. The SEC used the DAO Report as an opportunity to remind the public that "All securities offered and sold in the United States must be registered with the [SEC] or must qualify for an exemption from the registration requirements. In addition, any entity or person engaging in the activities of an exchange must register as a national securities exchange or operate pursuant to an exemption from such registration." 2017 ended with a statement from then SEC Chairman, Jay Clayton, that cautioned potential investors in these ICOs that none of the ICOs were registered with or approved by the SEC.[28] The impact of the SEC statements served as a chilling effect on ICOs.

New SEC Chairman, Gary Gensler, has stated that he believes "a lot of crypto tokens—I won't call them cryptocurrencies for this moment—are indeed securities."[29] Speaking during his confirmation hearing before the Senate Banking Committee, Chairman Gensler noted that "Bitcoin and other cryptocurrencies brought new thinking to payments but raised new issues of investor protection we still need to attend to." As demonstrated by the blockchain course he taught at the Massachusetts Institute of Technology, Chairman Gensler is very familiar with blockchain technology and digital assets.[30] However, supporters of certain digital assets should continue to exercise caution because Chairman Gensler has stated that certain digital assets including Ethereum, and Ripple are securities.[31] Chairman, Gensler is expected to promote blockchain technology while ensuring investor protections. While the SEC has not adopted rules specifically tailored to digital assets that are securities, Chairman Gensler has noted that it is important for the SEC to provide that guidance and clarity. Furthermore, in previous statements has suggested he believes there is a strong case that all digital assets and currencies, other than bitcoin, created and issued by companies have likely violated securities laws.

25 FinCEN Guidance, 2019.

26 FinCEN. Notice of Proposed Rulemaking. "*Requirements for Certain Transactions Involving Convertible Virtual Currency or Digital Assets*," (Dec. 23, 2020).

27 Kauflin, J. "*Where Did the Money Go? Inside the Big Crypto ICOs of 2017*," (*Forbes* 2018).

28 Clayton, J. "*Statement on Cryptocurrencies and Initial Coin Offerings*," (SEC Public Statement, Dec. 11, 2017).

29 Pound, J. "*SEC Chairman Gary Gensler says More Investor Protections are Needed for Bitcoin and Crypto Markets*," (CNBC, May 7, 2021).

30 Gensler, G. 2018.

31 *See* Popper, N. "*A Former Top Wall Street Regulator Turns to the Blockchain*," New York Times (Apr. 22, 2018).

06
STABLECOINS

A joint report published by the President's Working Group on Financial Markets, the FDIC, and the OCC (collectively, the "PWG") in November 2021 provided key insight into the potential direction federal regulators intend to head regarding the regulation of stablecoins. Stablecoins are digital assets designed to maintain a stable value relative to a national currency, such as the U.S. dollar, or other reference asset.[32] Stablecoins primarily are used in the United States to facilitate trading, lending, or borrowing of other digital assets, predominantly on or through digital asset trading platforms.[33] Although the PWG recognized the benefits of stablecoins as a means of payment, it nevertheless identified a variety of risks associated with stablecoins, including concerns related to (1) market integrity, (2) investor protection, and (3) illicit financial activities that potentially introduce key gaps in prudential authority over stablecoins and how they are used to facilitate transactions in the United States and globally.[34]

The PWG offered several recommendations to address these risks and concerns: (1) passage of legislation that would require stablecoin issuers to be insured depository institutions; (2) subjecting custodial wallet providers to be subject to appropriate federal supervision and risk-management standards; and (3) imposing activity restrictions on stablecoin issuers, such as limiting their affiliation with certain commercial entities. The implication behind each of these recommendations is that stablecoin issuers could be treated as a bank and, therefore, be subject to the panoply of prudential regulation, supervision, and examination by the federal banking agencies.

In December 2021, the Senate Banking Committee held a full committee hearing on the potential risks stablecoins pose to the financial system. The authors believe that Congress continues to evaluate the PWG Report and are engaging in internal discussions to determine whether legislation regarding digital assets broadly and/or stablecoins specifically would be appropriate. It is worth noting that the SEC, which did not participate in the PWG Report, issued a statement on the same day the PWG Report was released, stating that the SEC, along with the CFTC, would "deploy the full protections of the federal securities laws and the Commodity Exchange Act to [digital assets], where applicable,"[35] which suggests that, to a certain degree, the SEC already believes that it has the necessary regulatory tools to regulate the digital asset industry.

07
NON-FUNGIBLE TOKENS

NFTs are quickly gaining notoriety as a popular means of buying and selling digital collectibles representing tangible and intangible assets across multiple industries, including art, sports, music, fashion, and gaming. NFTs, however, are not like digital currencies such as bitcoin and Ethereum, which function as the native assets of their respective blockchains. Instead, NFTs are created as part of a platform built on an existing blockchain (like the Ethereum blockchain) and are not fungible like other digital currencies, meaning NFTs cannot be traded or exchanged for one another without inherent diminution in value (i.e. one dollar is always worth one dollar and one Bitcoin is always equal to another Bitcoin).[36] Instead, NFTs are individually unique and use blockchain technology to establish authenticity, ownership, and transferability of a unique asset. An NFT is created from digital objects that represent both tangible and intangible property, including, but not limited to: (1) artwork, (2) videos, (3) collectibles and antiques, (4) video game avatars; and (5) music. The National Basketball Association created NBA Top Shot, a market for selling highlight videos of basketball in the form of NFT.

The subject of many headlines in 2021 and 2022 references the emergence of "the metaverse." While there is no formal or concrete definition for this term currently, it is generally understood to be one of many building blocks (along with, and co-dependent on, cryptocurrencies, blockchain technology, NFTs, and the expanded use of automation and artificial intelligence) to be employed in the broader development of communications and the next iteration of the internet many know today. This "new" iteration of the internet is colloquially referred to as "Web 3.0." Use cases and embodiments of the metaverse are being developed at a rapid

32 President's Working Group on Financial Markets. "*Report on Stablecoins*," (Nov. 2021).

33 *Id.*

34 *Id.*

35 Gensler, G. "*SEC Statement on President's Working Group on Stablecoins*," (Nov. 1, 2021).

36 Conti R. & J. Schmidt. "What is an NFT? Non-Fungible Tokens Explained," (Forbes, May 2021).

pace, but one common idea of the metaverse encompasses the use of virtual reality, augmented reality, and using current or yet-to-be created technologies. The metaverse also encompasses the idea of a digital economy where participants can buy, sell, trade, consume, and display virtual goods (perhaps with connections to tangible and real property) in a virtual world. The definition of metaverse and what all it encompasses is not yet settled, but one central component seems to be its adoption of NFTs and digital assets into its operation. While there are likely some benefits to this new means of communication, as with any new technology, there will likely be some uses which land its developers, promoters, and issuers in hot water with regulators and plaintiff's attorneys, particularly as it relates to consumer protection laws as its use gains broader traction.

The SEC evaluates digital assets in the same manner as traditional assets to determine whether they are securities. Unlike initial coin offerings, which are a type of digital asset that has drawn a considerable level of attention from the SEC staff, NFTs have not been the subject of interpretative guidance or rulemaking by the SEC. Furthermore, the SEC has not initiated an enforcement action against the creator of an NFT or the operator of a platform that facilitates the offer and sale of NFTs. On May 12, 2021, a plaintiff sued Dapper Labs, Inc., the creator of popular NFT platform NBA Top Shot, alleging that Dapper Labs sold unregistered securities (in the form of NFTs that capture video highlights, or "Moments") through its platform. The litigation remains pending in New York state courts.[37]

Even if an NFT is not deemed a security, NFTs could be considered a "commodity" under U.S. laws. The trading of commodities is regulated by the Commodity Futures Trading Commission ("CFTC"). A commodity is defined broadly as all goods and articles, and all services, rights and interests in which contracts for future delivery are presently or in the future dealt in.[38] The CFTC notes that the definition of "commodity" is not limited to tangible commodities and has taken the position in enforcement actions that bitcoin and other virtual currencies encompassed in the [commodity] definition and properly defined as a commodity (i.e. not a security) and, as a result, subject to the anti-fraud and anti-manipulation jurisdiction of the CFTC.[39] Furthermore, the inclusion of futures contracts and other derivatives using Bitcoin and Ether as the reference assets are now traded on CFTC-registered trading venues such as the Chicago Mercantile Exchange, which further reinforces that digital assets like Bitcoin and Ether are commodities under U.S. law.

Whether an NFT could be subject to CFTC oversight as a commodity or derivative, particularly a futures contract, is murkier. Generally, a futures contract is an agreement to purchase or sell a commodity for delivery in the future (a) at a price that is determined at initiation of the contract; (b) that obligates each party to the contract to fulfill the contract at the specified price; (c) that is used to assume or shift price risk; and (d) that may be satisfied by delivery or offset.[40] Notwithstanding the foregoing, the CFTC and SEC issued a joint final rule in August 2012 providing for, among other items, a "forward contract exclusion" that excludes certain forward contracts from the definition of "swap" where the "sale or transaction involves a non-financial commodity or security for deferred shipment or delivery, so long as the transaction is to be physically settled."[41] Given that NFTs often represent a digitized tangible asset that grants the NFT holder ownership rights over the underlying asset, the issue of "physical delivery" could render the NFT a forward, future, or swap even if the underlying asset is not.

08

STATE REGULATION OF VIRTUAL CURRENCIES

To date, several U.S. states have issued guidance or passed legislation related to virtual currencies, however, the legal treatment of virtual currency varies by state. The states of New York and Louisiana now have a statutory requirement that requires companies engaged in virtual currency business activities to obtain a license separate from state money transmitter license. In August 2020, Louisiana adopted similar legislation, the Virtual Currency Business Act, which requires virtual currency businesses to obtain a license for conducting business in Louisiana or otherwise seek an exemption from registration. California has proposed legislation to exempt certain digital assets from being considered securities. The states of Washington and North Carolina have passed legislation that formally clarifies the respective states' jurisdiction over virtual currency under each state's money transmission laws. Other states have taken a different approach. The state of New Hampshire passed a law that explicitly excludes businesses using transactions in

37 *Jeeun Friel v. Dapper Labs, Inc.* (N.Y. Sup. Ct. 2021).

38 17 C.F.R. §1.3.

39 *In the Matter of: Coinflip, Inc., d/b/a Derivabit, and Francisco Riordan*, CFTC Docket No. 15-29.

40 CFTC Glossary.

41 7 U.S.C. §1a(47)(B)(ii).

virtual currency from the state's money transmitter license. In addition, states such as Kansas, Tennessee, and Illinois have issued guidance that virtual currency transactions that do not implicate fiat currency (e.g. an exchange) are not subject to licensure.

09
CENTRAL BANK DIGITAL CURRENCIES

Central bank digital currencies ("CBDCs") are a digital representation of a central bank-issued money denominated in the national unit of the respective country and, most important, a CBDC is legal tender representing a liability of a country's central bank. From the end user's perspective, a CBDC is riskless unlike other digital currencies (like Bitcoin) or other digital assets (like a stablecoin or utility token) because a CBDC is a direct claim on the central bank just like fiat currency. As a result, the introduction of CBDCs by a central bank could "ensure that, as economies go digital, the general public would retain access to the safest form of money—a claim on a central bank."[42]

Interest in CBDCs has increased globally in response to changes in payment services, financial activity involving digital assets and technological innovation, as well as the disruption brought on by the covid-19 pandemic. A recent survey of more than 60 central banks conducted by the Bank of International Settlements found that 86 per cent of the respondents, including the United States, were exploring CBDCs.[43] Twenty countries have introduced pilot programs for a national CBDC, with the Bahamian central bank launching the first nationwide CBDC, the digital Sand Dollar, on October 20 2020.[44] China launched trials of a digitized yuan in April 2020 and, in January 2022, released its digital yuan wallet on online stores (e.g. Apple's App Store and Google Android app stores) in China. In addition, the Bank of Japan launched a one-year trial of the digital yen on April 5, 2021.[45]

The United States has taken a measured approach to the issuance of a U.S. CBDC. Federal Reserve Governor Lael Brainard has noted "the Federal Reserve is active in conducting research and experimentation related to distributed ledger technologies and the potential use cases for digital currencies."[46] Governor Brainard further mentioned that the Federal Reserve Bank of Boston was collaborating with MIT to "build and test a hypothetical digital currency oriented to central bank uses."[47] The United States, however, has not indicated that a pilot of a U.S. CBDC is on the horizon despite the push forward by other central banks of developed countries to pilot and "go-live" with a CBDC.

On January 20, 2022, the Fed released a discussion paper examining the pros and cons of a potential U.S. CBDC.[48] In the discussion paper, the Fed acknowledges that any U.S. CBDC should seek to accomplish multiple goals, including (1) ensuring the benefits to households, business and the overall economy outweigh the costs; (2) complementing, rather than replacing, current forms of money and methods for providing financial services; (3) protecting consumer privacy; and (4) protecting against criminal activity.[49] To that end, the Fed is soliciting comments on over 20 questions posed in the paper to further develop the United States' position on a U.S. CBDC. Of greatest concern in the Fed's CBDC paper is the following:

> The Federal Reserve is exploring the implications of, and options for, issuing a CBDC. For the purpose of this paper, *a CBDC is defined as a digital liability of the Federal Reserve that is widely available to the general public.* While Americans have long held money predominantly in digital form — for example in bank accounts recorded as computer entries on commercial bank ledgers — *a CBDC would differ from existing digital money available to the general public because a CBDC would be*

42 Bank of International Settlements, 2021.

43 Codruta B. & A. Wherli, Bank for International Settlements, "*BIS Papers No. 114—Ready, steady, go? – Results of the third BIS survey on central bank digital currency*" (January 2021).

44 Bharathan, V. "*Central Bank Digital Currency: The First Nationwide CBDC in the World has been Launched by the Bahamas*," (Forbes, Oct. 21, 2020).

45 Novak. M. "*Japan's Central Bank Launches One-Year Test of Digital Currency*," (Gizmodo, Apr. 6, 2021).

46 Brainard, L. "*An Update on Digital Currencies*," (Aug. 13, 2020).

47 *Id.*

48 Federal Reserve. "*Money and Payments: The U.S. Dollar in the Age of Digital Transformation*," (Jan. 2022).

49 *Id.*

> *a liability of the Federal Reserve, not of a commercial bank.*[50]

The Fed appears to be exploring a retail central bank digital currency model that would disintermediate traditional commercial banks and potentially transform the Fed into an institution similar to postal banks in other countries. Such an approach was proposed by the failed nominee for Comptroller of the Currency, Saule Omarova, and was the subject of substantial criticism in Congress and the financial services industry. The Fed acknowledged that a narrower-purpose CBDC could be developed, "such as one designed primarily for large-value institutional payments and not widely available to the public."[51]

10 CONCLUSION

While critics of digital assets and blockchain technology believe these innovations represent the end of the world, supporters of the technology see a path forward. Regulators including Treasury Secretary Yellen, Chairman Gensler, and Comptroller Hsu have recognized there are issues to be resolved before blockchain technology will reach its full potential and before banks get into digital currencies. As noted by Secretary Yellen:

> What would be the impact on the banking system? Would it cause a huge movement of deposits out of banks and into the Fed? Would the Fed deal with retail customers or try to do this at a wholesale level? Are there financial stability concerns? How would we manage money laundering and illicit finance issues? *There's a lot to consider here, but it's absolutely worth looking at*.[52]

The authors believe the statements by Secretary Yellen about the possible benefits of CBDCs in promoting financial inclusion, Chairman Gensler's high degree of understanding of blockchain technology and digital assets, and Comptroller Hsu's stated desire to work in concert with other regulators on an approach to the regulation of the technology are extremely promising. As purportedly noted by Winston Churchill, "You can always count on the Americans to do the right thing, after they have exhausted all the other possibilities." The battle over the regulation of blockchain technology and digital assets is not at the end of the world.

While critics of digital assets and blockchain technology believe these innovations represent the end of the world, supporters of the technology see a path forward

50 *Id.*

51 *Id.*

52 Sorkin, A. 2021.


CBDC
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CRYPTO
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No Smoking
No Smoking!
HODL

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