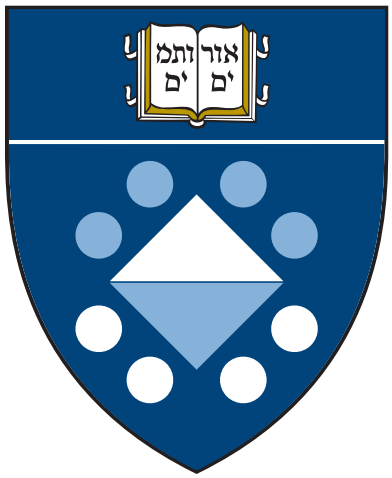

Yale University

Thurman Arnold Project

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Paper 12

Move Fast and Tie Things: The Anticompetitive Dangers of Big Tech-run Blockchain

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I. Introduction: Tying Arrangements with Blockchain[1]

United States courts and regulators have long considered the anticompetitive risks raised by tying arrangements—when a seller makes the purchase of one product (tying good) conditional on the purchase of another product (tied good). Firms can use tying arrangements to foreclose demand and reduce competition in the market for the tied or tying products. By doing so, firms can insulate an inferior product from competitive pressures, create barriers to entry of new competitors in the tied and tying markets, facilitate price discrimination, and impair consumer choice.[2]

This paper looks at the ways Big Tech firms[3] can use tying arrangements relating to their blockchain products to gain advantages in at least two ways. First, a firm can use its blockchain products to coerce companies that utilize blockchain technology to build their entire network on services provided by that single firm. This article addresses three examples of this kind of arrangement: (1) Amazon's managed blockchain services; (2) Google's network operation contracts; and (3) Google's leverage of governing power to tie its products to software updates, which may develop in the near future. Second, a firm can use its control of "metaverse" app stores or their equivalents to coerce app developers and other companies into relying on the firm's own blockchain-related products. Metaverses are platforms, so the network effects and competitive dynamics that appear on phone operating systems and app stores also apply to metaverse ecosystems. This paper discusses potential development scenarios of Meta and Microsoft's metaverse platforms and app stores to illustrate this class of tying arrangements. This paper also briefly explores how leading firms can use their control of metaverses to charge higher fees to developers and consumers. It illustrates how the popular blockchain-game Axie Infinity establishes a template that firms could take to the extreme to leverage coercive power over metaverse contributors and users. Lastly, readers can reference the glossary for blockchain terminology used in this paper.

This paper uses the terms "tying" and "ties" in an expanded sense, referring to when a seller requires the purchase or *use* of one product, service or platform based on the purchase or *use* of another product, service or platform. I mean specifically to encompass scenarios where no purchase is technically made, like when a service provider forces companies to use one service to access another product. This expanded usage means some of the case studies will not perfectly correspond to the legal criteria for "tying arrangements" used by U.S. courts, but they entail the same aforementioned concerns.

It is not the purpose of this paper to declare all these potential tying arrangements as illegal under the current antitrust legal doctrines. Some of the practices described are already taking place, while others are merely possibilities. In addition, some instances of potential

[1] This paper does not mean to suggest or imply that every tie or bundle will violate antitrust law but rather discusses ties and bundles that raise the sort of concerns that antitrust is meant to address. More information about the products and markets must be known to evaluate the legality of these arrangements.
[2] Jefferson Parish Hospital Dist. No. 2 v. Hyde, 466 U.S. at 14 (1984).
[3] In this paper "Big Tech" will refer to Amazon, Google, Meta, and Microsoft.

competitive harm are hypothetical or nascent, whereas others are progressing or more developed. It is too soon to make any definitive determinations. Despite these uncertainties, the growing adoption of blockchain and metaverse technologies by new firms and consumers is likely to realize the competitive threats outlined in this paper sooner rather than later.[4] For this reason, this paper is intended as an early survey of potential tying arrangements by Big Tech firms that can pose anticompetitive threats in the future. As such, it serves as a cautionary note for regulators.

II. The Use of Blockchain to Gain Advantage in Adjacent Markets

A blockchain is a shared electronic database distributed among a network of users. Blockchains often contain computer programs called smart contracts that automatically execute transactions when certain conditions are met. Smart contracts exist throughout a blockchain network and facilitate transactions involving money, goods, or property directly between users. Smart contracts eliminate the need for intermediaries such as banks or clearing houses to settle and finalize transactions. All transaction data is distributed to special computers in the network known as validator nodes, which approve and publish transactions on the blockchain. Blockchains can feature many additional software components including cryptocurrencies, which act as a network's digital currency; decentralized applications (dApps), which are blockchain-based versions of apps; and oracles, which connect blockchains to outside data.[5]

There are two main types of blockchains. A public blockchain has no restrictions. It permits anyone to join the network, make or validate transactions, and view the blockchain's history. No single entity officially controls the network. In contrast, a private (or permissioned) blockchain is restricted to certain users. One or multiple authorized entities dictate who can join the network and their possible roles.[6] There are tradeoffs between the two types of systems. Private blockchains are faster and more efficient than their public counterparts because they have fewer nodes and data. Public blockchains, on the other hand, are more secure because their greater number of validators limits the power of any malicious users.

A. Amazon's Use of Its Managed Blockchain Service to Coerce Companies into Using Its Cloud and Key Management Services

As Amazon transformed into the leading consumer goods marketplace over the past decade, it experienced equally astounding growth in enterprise applications and services. One vital component of this success has been Amazon Web Services (AWS). AWS enabled businesses to reduce their online data storage costs by handling all hardware equipment and offering adjustable, rather than fixed, storage plans.[7] Amazon's cloud computing subsidiary has since

[4] For the wide range of business use cases, see Linda Pawczuk & Wendy Henry, *Blockchain Goes Bold,* WALL ST. J.: CIO J. (Feb. 1, 2022), https://deloitte.wsj.com/articles/blockchain-goes-bold-01643741756.
[5] Oracles allow smart contracts to execute based on real-world inputs.
[6] These requirements can be simple, like verifying identity or possessing an account (e.g. Facebook).
[7] Daisuke Wakabayashi, *Prime Leverage: How Amazon Wields Power in the Technology World*, N.Y. TIMES (Dec. 15, 2019) https://www.nytimes.com/2019/12/15/technology/amazon-aws-cloud-competition.html.

expanded its offerings to include networking, remote computing, email, mobile development, and security. AWS' cloud market share stands at 33 percent as of 2022.[8]

Amazon Managed Blockchain (AMB) marks Amazon's entrance into blockchain through selling blockchain infrastructure as a service. AMB offers businesses a fully managed service through which they can join or create private blockchain networks using the popular open-source blockchain project Hyperledger Fabric.[9] Private networks are frequently used by consortia and other business networks because of their faster transaction speeds and transaction privacy.[10] By using AMB to host their networks, trade consortiums and entire supply chains can transact, record updates, and process trade-related paperwork electronically on a single shared ledger. Additionally, the "managed" nature of service eliminates the need for companies to closely monitor technical details related to hardware, software, and security. Businesses simply need to configure network participants, data visibility, and roles according to their preferences. However, the "managed" nature also ensures that Amazon retains a high degree of involvement. Amazon provides all hardware equipment, secures network certificates using its AWS Key Management Service (KMS) and automatically adjusts nodes according to their performance.[11] While estimates of its market share are unavailable, in an industry where there are few established competitors AMB is one of the preeminent firms in managed blockchain services.[12]

Amazon's use of AMB coerces companies to build their entire business on Amazon's integrated web. This arrangement meets some characteristics of anticompetitive tying: AMB requires that companies using the managed service have AWS accounts and use AWS cloud storage for all network data.[13] Additionally, all users are charged for AWS KMS—regardless if they use it or not—pushing users to cede key management to AWS.[14] Amazon therefore uses its leverage as one of the leading managed blockchain service providers to force companies to use its cloud products and pressure them into using its key management services.

Additionally, Amazon's tie of AWS cloud services to AMB becomes more concerning when factoring in network effects. In the case of Hyperledger Fabric on AMB, no user can create a Hyperledger Fabric node on another cloud provider and join an AMB managed Fabric network.[15] Thus, if the founding member of a consortium decides to launch a Hyperledger Fabric blockchain network on AMB, then all other members of the consortium using another cloud provider must switch their infrastructure to Amazon to participate in the Hyperledger

[8] Felix Richter, *Amazon Leads $180-Billion Cloud Market*, STATISTA (Feb. 8, 2022), https://www.statista.com/chart/18819/worldwide-market-share-of-leading-cloud-infrastructure-service-providers/
[9] *Amazon Managed Blockchain*, AWS, https://aws.amazon.com/managed-blockchain/ (last visited May 23, 2022).
[10] Companies would otherwise need to put their data directly on-chain on a layer 1 public blockchain.
[11] Richter, *supra* note 8.
[12] As a proxy, over 25 percent of all nodes on the second largest blockchain Ethereum use AWS for storage.
[13] AWS cloud usage requirement confirmed via contacting principal AWS product manager.
[14] In addition to already paying the fee for AWS KMS, companies using customer managed keys incur a charge for each API call, and AWS KMS quotas apply to these KMS keys. *See* https://docs.aws.amazon.com/managed-blockchain/latest/hyperledger-fabric-dev/managed-blockchain-encryption-at-rest.html
[15] Confirmed by principal AWS product manager.

network on AMB. While the system is supposed to be decentralized, yielding each participant autonomy, in practice whoever conducts the mundane activity of establishing the first node can have a profound impact. AMB networks therefore have strong direct network effects: the decision of one or a few key members to begin using AMB can influence the entire network to switch over. This outcome can hold significant long-term consequences. There are high costs to transitioning between cloud providers, and Amazon has previously used long-term contracts, volume minimums, and egress fees (for cloud provider transitions) to bind firms and impose even higher costs of exit.[16]

By contrast, other blockchain solutions provide users with choice over ecosystem components. For example, Chainstack, a managed blockchain services provider, enables cross-cloud deployment and external key management.[17] This means members in the same consortium can use multiple different cloud hosting providers and manage their own keys at no additional charge. This counter-example illustrates that Amazon's use of AMB serves anticompetitive ends. Clearly integrating managed blockchain with cloud storage and key management services is not necessary.[18] AMB forces companies on Hyperledger to use AWS services when Amazon could instead, like Chainstack, permit the use of other service providers.

Ultimately, the tying of Amazon Managed Blockchain to AWS allows Amazon to leverage its market power in managed blockchain into cloud services and key management and deepen industry dependence on its infrastructure.

B. Google's Use of Blockchain "Validator Nodes" and Potential Use of Governing Power to Gain Advantage in the Markets for Cloud and Data Analytics Services

Google also uses blockchain services to coerce companies into building their entire business on an integrated infrastructure, except that the tying service it uses is different. Whereas Amazon ties cloud products to its managed blockchain service, Google ties cloud storage and an array of other analytics offerings to its blockchain validator node services. In 2020, Theta Labs—a video streaming service built on blockchain—and Google agreed on a contract that provided for three principal things.[19] The first was for Google to operate an external validator node, validating transactions taking place on the Theta network. The second was for Google to serve as the Theta network's preferred cloud and storage provider, meaning that users who want to join the Theta network would do so by deploying a node through Google Cloud Marketplace. The third was for

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[16] MAJORITY STAFF, H. COMM. ON THE JUDICIARY, 116TH CONG., INVESTIGATION OF COMPETITION IN DIGITAL MARKETS: REPORT AND RECOMMENDATIONS 320 – 21 (Comm. Print 2020), https://judiciary.house.gov/uploadedfiles/competition_in_digital_markets.pdf?utm_campaign=4493-519.

[17] *Supported Cloud Providers*, CHAINSTACK DOCS https://docs.chainstack.com/platform/supported-cloud-hosting-providers (last visited May 23, 2022).

[18] Amazon's tie of AMB to AWS also nudges firms towards Amazon's data analytics tools and AWS Marketplace products. These auxiliary services might help companies, but they too are not necessary for blockchain networks.

[19] Theta Labs, *Theta Labs announces Google Cloud as Enterprise Validator Node and Launch Partner for Theta Mainnet 2.0*, MEDIUM (May 27, 2020), https://medium.com/theta-network/theta-labs-announces-google-cloud-as-enterprise-validator-and-launch-partner-for-theta-mainnet-2-0-8f765096f2a9.

the THETA.tv video platform, a streaming site on the Theta network, to be built on Google Cloud infrastructure. By adding the second and third conditions, Google tied its cloud products to its validation service to gain an advantage in the former market.[20] Within a year of its initial contract, Theta Labs also began using Google's data and analytics services, including BigQuery, Dataflow, Pub/Sub and Firestore.[21] The outcome illustrates how ties of cloud services to blockchain products can develop into devotion to a single provider's infrastructure. Google's desire to become "the cloud provider of choice for DLT networks and decentralized applications," combined with the increasing popularity of blockchain, suggests that the use of validator contracts to gain advantages in other markets warrants continued attention.[22]

In addition to tying cloud products to validator node services, Google may also choose to tie its future products to software updates through its participation in the governance of blockchain networks. Blockchain governance is the process of coordinating decisions on the direction of a blockchain project. The scope of governance decisions can range from features such as software updates and consensus mechanisms to validator rewards, and the size of governing entities can vary.

Blockchains distribute governance power in two main ways.[23] First, the development team can appoint entities, oftentimes companies, to a governance council. Second, the development team can implement on-chain governance, where votes are derived from holdings of the project's native cryptocurrency or governance token.

In the first case, if Google were appointed to a governance council it could leverage the dependence of fellow governing members—either on Google Cloud or any of its other services—to skew votes for software update proposals to its advantage. It may even offer other governing members favorable partnerships with other Google products in exchange for votes supporting proposals implementing or requiring the use of Google products.[24] Meanwhile, opaque voting procedures for proposals or for veto rules (if either exists at all) increase the possibility that Google can unilaterally tie its products to software upgrades. A serious conflict of interest develops when governance participants' technical infrastructure depends directly on one of their peers. By acquiring governing ability, Google subsequently gains both the incentive and the ability to exclude rivals.

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[20] This "tie" is presumed based on the absence of these products from Google's other partnerships (see Hedera Hashgraph and Dapper Labs) when they could have implemented similar terms. Details on Google's negotiations with Theta are unavailable, but it seems that Google conditioned the partnership on the basis of these additional cloud products. None of these additional services is necessary for Google to be a validator node.

[21] Google Cloud Content Team, *A (Visual) Space Odyssey: How Theta Labs Reached the Outer Limits of Video Streaming,* GOOGLE CLOUD: BLOG (Mar. 15, 2021), https://cloud.google.com/blog/products/data-analytics/how-theta-labs-reached-the-outer-limits-of-video-streaming

[22] Allen Day, *Working with Hedera Hashgraph to Support the Next Generation of Distributed Ledger Technology*, GOOGLE CLOUD: BLOG (Feb. 11, 2020), https://cloud.google.com/blog/topics/public-datasets/working-with-hedera-hashgraph-to-support-the-next-generation-of-distributed-ledger-technology.

[23] This applies for blockchains that support some form of decentralization. In some cases, the core developers may keep all the governing power, although this would dampen the network's appeal.

[24] For more on collusion on blockchains see THIBAULT SCHREPEL, BLOCKCHAIN+ANTITRUST (2021).

In the second case of on-chain governance based on token holdings, Google could single-handedly tie its services without needing to convince other members. A governance token is a digital token that gives holder voting rights on blockchain protocol decisions. Nothing prevents Google from buying up a majority or even all of a blockchain network's governance-related tokens. It could then suggest and pass proposals implementing new Google products to the blockchain network. Decentralized finance ("DeFi") projects serve as an illuminating example. In contrast to most base layer blockchain protocols, DeFi projects generally do have some form of decentralized governance—and yet even these projects are typically dominated by a handful of major players. For instance, the DeFi lending protocol Compound launched its native governance token, COMP, in June 2020. As part of the release, it allocated 2.4 million tokens to early investors of Compound Labs.[25] While Compound's intent was decentralized governance, currently three venture capital firms control one-third of Compound's entire voting weight. Further, a select group of key individuals, blockchain services firms, and Compound employees at one point submitted over eighty percent of the total proposals on compound.[26] Google can acquire and extend similar levels of influence across numerous blockchain networks to advantage its cloud or blockchain-connected products.

The levers available to Amazon and to Google illustrate potential means by which Big Tech firms can force companies relying on blockchain technology to build their entire business via the infrastructure of a single Big Tech provider. In these contexts, cloud solutions can be tied to managed blockchain services while data analytics and software products are tied to blockchain networks through blockchain network contracts. Meanwhile, the nature of governance in blockchain projects presents an opportunity for Big Tech firms to influence voting decisions, exclude rivals, and tie cloud solutions and additional products to network software decisions.

III. The Use of Metaverse App Stores to Coerce App Developers and Disadvantage Competitors

The "metaverse" is an expansive three-dimensional virtual space in which users partake in experiences and interact with each other via digital avatars. It makes use of virtual reality (VR), which creates artificial simulated environments, and augmented reality (AR), which overlays real-world environments with digital information. The metaverse also features non-fungible tokens (NFTs), tradeable digital assets linked to blockchains. NFTs are uniquely identifiable and typically represent digital files like photos or videos, property rights to virtual land, or claims to physical goods. VR and AR applications are increasingly incorporating NFTs in metaverse

[25] Bradley Keoun & Omkar Godbole, *First Mover: Compound Has Been a DeFi Darling. Its New Token Is Priced Accordingly*, COINDESK (Sep. 14, 2021), https://www.coindesk.com/markets/2020/06/17/first-mover-compound-has-been-a-defi-darling-its-new-token-is-priced-accordingly/.

[26] *See Governance Overview*, COMPOUND, https://compound.finance/governance (data retrieved Sep. 21, 2021).

events, social interactions, games, and more.[27] In this system, metaverse app stores are crucial intermediaries that stand at the gates to new experiences and services.

Unlike managed blockchain and network operation, the potential harms posed by app store management should be more familiar to regulators because of their similarities to existing systems. While the metaverse is rapidly evolving, a metaverse application typically requires a platform, applications, hardware, and potentially other elements. Metaverses are thus platform businesses with strong network effects. Big Tech firms can use their control of metaverse app stores to coerce app developers into relying on that firm's own products, or to privilege the firm's applications above those of competing developers. These techniques are similar to those used by Apple and Google in the past with the App Store and Play Store.[28]

A. Meta's Potential use of the Meta Quest Store to Inhibit Blockchain Wallet Competitors and Advantage Its Blockchain and Social Media Products

Meta can potentially use a blockchain wallet, digital currency, or enforcement policies to force metaverse app developers and users to use its blockchain products. Meta has led Big Tech firms in virtual reality development through its Oculus and Meta Quest headsets, as well as the Meta Quest Store, which features over 1,000 virtual-reality based apps. Notably, among the Quest Store's most popular offerings are Meta's own apps: Horizon Worlds, a social platform for hang outs, gaming, and world-building; Horizon venues, an app for hosting live concerts and events; and Horizon Workrooms, a space for remote workrooms and collaboration.

Concerns regarding blockchain wallet competition first arose during the launch of Meta's digital stablecoin Diem (formerly known as Libra), and these concerns still apply to the metaverse.[29] Blockchain wallets (or "crypto wallets") are electronic applications that store blockchain-based assets. They are like normal wallets except they store cryptocurrencies and NFTs instead of credit cards and tickets. Meta could expand its newly renamed Meta Pay to include cryptocurrencies, preinstall a blockchain wallet on its messaging platforms, or tie its wallet to use of the Meta Quest Store, limiting the functionality of competing wallet providers.[30] Doing so would enable Meta to gain an advantage among wallet developers in the market for digital asset storage. In addition, Meta could bolster its blockchain products through selective enforcement of app store policies against app developers that aid their competitors. Past investigations revealed that Facebook selectively enforced its platform policies based on whether it perceived other companies as competitive threats.[31] In the event that Meta launches its own token—thru Zuck Bucks, for example—it could penalize third party developers who refuse to

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[27] Oleg Fonarov, *What Is the Role of NFTs in the Metaverse?*, FORBES (Mar. 11, 2022), https://www.forbes.com/sites/forbestechcouncil/2022/03/11/what-is-the-role-of-nfts-in-the-metaverse/?sh=42cdd4ac6bb8.

[28] MAJORITY STAFF, *supra* note 16, at 218, 242.

[29] *See generally*, *Examining Facebook's Proposed Cryptocurrency and its Impact on Consumers, Investors, and the American Financial System*: *Hearing Before the Comm. on Fin. Servs.*, 116th Cong. (2019).

[30] Meta renamed Facebook Pay to Meta Pay. *See* Stephane Kasriel, *Where the Metaverse Can Take FinTech*, MEDIUM (May 11, 2022), https://medium.com/@skasriel/where-the-metaverse-can-take-fintech-a936e6bd6987

[31] *See* MAJORITY STAFF, *supra* note 16.

build in token functionality into their apps or build their apps on external blockchain-based digital tokens or cryptocurrencies.[32] Apps that promote non-Meta social media accounts may suffer similar consequences.

B. Microsoft's Potential Use of Office Applications to Force Integration of Metaverse and Existing Enterprise Services

As with Meta, Microsoft can also tie its metaverse and blockchain products to its existing services. To date, Microsoft has focused on business use cases for virtual reality and metaverse gaming. The first category includes products like the HoloLens holographic headset and Microsoft Mesh for Teams, the latter of which allows collaborators to combine Mesh's holographic experiences with the features of Microsoft Teams.[33] One potential scenario could see Microsoft Azure cloud services tied to products like Microsoft Mesh; alternatively, existing Office applications might automatically be linked to their metaverse counterparts. Metaverse gaming, meanwhile, has similar potential to increase Microsoft's advantages in both existing and new blockchain products. Microsoft stated that its $68.7 billion acquisition of Activision Blizzard "will accelerate the growth in Microsoft's gaming business across mobile, PC, console and cloud and will provide building blocks for the metaverse."[34] As the parent company of Xbox, Microsoft could tie its metaverse gaming apps to its Xbox subscription and cloud storage, or mandate the use of a Microsoft blockchain wallet for storing any NFTs. It could also leverage strong network effects from Minecraft, which it owns, to migrate users to its new metaverse platforms and blockchain products.

All of the scenarios described warrant a close look given the abilities and incentives of Big Tech firms to extend their market power either into, or through, these new markets. The ultimate concern is the tying of metaverse-related apps to existing products, or vice versa.

IV. The Control of Governance to Charge High Fees in the Metaverse

Lastly, Big Tech firms can use their control of metaverse ecosystems to develop rules and structures that enable them to extract high transaction and platform fees from developers and consumers. The potential factors contributing to this coercive power include digital token requirements, expansive powers concerning the regulation of blockchain-based digital assets, and metaverse platform fees. These actions are parallel to building requirements into mobile phone operating systems—for example, consider Apple's thirty percent fee charged to App Store developers or if Google hypothetically tied its Google Wallet to the Android operating system. In this section, the popular blockchain game Axie Infinity will highlight how blockchain governance

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[32] Hannah Murphy, *Facebook Owner Meta Targets Finance with 'Zuck Bucks' and Creator Coins*, FIN. TIMES (Apr. 6, 2022), https://www.ft.com/content/50fbe9ba-32c8-4caf-a34e-234031019371 (describing how Meta is targeting finance in the metaverse).

[33] John Roach, *Mesh for Microsoft Teams Aims to Make Collaboration in the 'Metaverse' Personal and Fun*, MICROSOFT (Nov. 2, 2021), https://news.microsoft.com/innovation-stories/mesh-for-microsoft-teams/.

[34] *Microsoft to Acquire Activision Blizzard to Bring the Joy and Community of Gaming to Everyone, Across Every Device*, MICROSOFT (Jan. 18, 2022), https://news.microsoft.com/2022/01/18/microsoft-to-acquire-activision-blizzard-to-bring-the-joy-and-community-of-gaming-to-everyone-across-every-device/.

can give firms coercive power over certain ecosystem features such as fees. The article then turns to how Big Tech firms can adapt and modify features of blockchain to charge higher fees and essentially tax users in blockchain and metaverse ecosystems.

Axie Infinity is a blockchain-based game developed by Sky Mavis where players collect and trade digital pet NFTs called 'Axies' which are used to battle with other users. Despite frequent claims of decentralization, many blockchain-based games such as Axie Infinity are highly centralized and controlled. Axie Infinity's marketplace uses the Ronin blockchain network, but Sky Mavis unilaterally controls marketplace rules and fees. The game developers, in fact, unilaterally adjust game features, algorithms, and rewards once a month.[35] Additionally, Axie Infinity's broad and sweeping terms of service give Sky Mavis enormous powers. The rights Sky Mavis reserves for itself include: ownership of all intellectual property; the ability to ban the use of smart contracts "as part of any effort to compete with us"; imposition of regional access controls to the game; and the power to ban users for "any reason or for no reason."[36] Plans for decentralized governance are vague at this stage and bear little binding power given Sky Mavis's extensive powers. Overall, the main difference between Axie Infinity and conventional games is the implementation of NFTs yielding digital ownership rights, an in-game marketplace involving real financial value, and monetizable gameplay. Unique from non-blockchain games, the use of cryptocurrencies at all levels of gameplay creates the possibility for a myriad of fees.

A Big Tech firm or leading game developer can concentrate power in the hands of its developers to a greater extent than Sky Mavis, subsequently using this influence to extract high fees from third-party app developers and users. Meta's Horizon Worlds VR platform is one case where a firm has complete control over the system and is making use of its power. Meta will reportedly take upwards of 47.5 percent from developers on each transaction made on Horizon Worlds, a rate that stands above even Apple's 30 percent fee to developers for in-app purchases via the App Store.[37] The fees may not end here, as Meta's plans for new digital tokens or payments may introduce more transaction fees in its ecosystem.[38]

Additionally, even if Big Tech firms ease developer control by offering a governance token, they can still severely restrict the scope of voting rights. As previously mentioned, Microsoft is making a strong push into metaverse and blockchain gaming. Microsoft could limit the rights conferred by governance tokens, for example, only to decisions related to gameplay (and not transaction fees). Moreover, if Microsoft enables NFTs or game modes by third-party developers, it will likely choose to take a percentage of all NFTs sold or even establish itself as the body that decides which NFTs are permitted in the ecosystem. This leverage would enable

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[35] Adjustments take place during Axie Infinity's off-season periods, which follow a month-long season of gameplay. For an example of adjustments, see Axie Infinity, *Axie Arena Season 18!*, LUNACIAN (Aug. 9, 2021), https://axie.substack.com/p/-axie-arena-season-18?s=r.

[36] *See Terms of Use*, AXIE INFINITY, https://axieinfinity.com/terms/ (last updated Feb. 15, 2022).

[37] Sam Shead, *Meta Plans to Take a Nearly 50% Cut on Virtual Asset Sales in Its Metaverse*, *CNBC* (APR. 13, 2022), https://www.cnbc.com/2022/04/13/meta-plans-to-take-a-nearly-50percent-cut-on-nft-sales-in-its-metaverse.html.

[38] *See* Murphy, *supra* note 32.

Microsoft to take a high portion of in-app purchase revenue from developers.

In sum, blockchain ecosystems or metaverse where developers maintain a high degree of control—and whose closed non-interoperable nature prevents users from transferring their assets—pose significant threats to consumers and developers alike. As industry leaders like Epic Games and Meta invest billions into metaverse projects, everything from the scope of governance to the control maintained by developers can extract rents through potentially exorbitant transaction fees. The boons of the metaverse may not be so cheap after all.

V. Conclusion

Over eighty percent of companies worldwide have some blockchain initiatives underway,[39] and estimates place the total available market of the metaverse at $8 trillion.[40] As a growing number of companies and consumers adopt blockchain products and engage with the metaverse, the significance of tying arrangements involving blockchain products by Big Tech firms will only grow. In a few years it may become easier to perform traditional antitrust analysis of the practices described herein to determine if they are illegal. Until then, regulators should maintain a close eye on Big Tech's involvement in blockchain and metaverse development, specifically looking at tying arrangements, validator node partnerships, digital currency and blockchain wallet requirements, and blockchain governance. Despite that digital technology markets tend towards consolidation and even tipping, regulators – fearful lest they stifle competition – have exercised what many would describe as undue caution in recent decades and have intervened in digital markets hardly at all. The emergence of blockchain-reliant products and services may offer the opportunity to discard that approach and adopt a new one — one in which it is the *regulators* who "move fast and break things" — ensuring that markets remain competitive, to the benefit of consumers and other businesses.

[39] *PwC 2018 Blockchain Survey*, PWC (2018), https://www.pwc.com/ng/en/press-room/pwc-2018-blockchain-survey.html.
[40] *Metaverse: More Evolutionary than Revolutionary*?, MORGANSTANLEY (Feb. 23, 2022), https://www.morganstanley.com/ideas/metaverse-investing.

Glossary

Blockchain
A distributed, immutable ledger that records data of some kind, especially those of transactions and ownership of assets. Blockchains frequently contain other features like smart contracts and decentralized applications.

Blockchain governance
The processes of managing and implementing changes regarding the functioning of blockchains. It involves the coordination of stakeholders and entails decisions on many topics including the role of stakeholders, network protocols, and software updates.

Blockchain wallet
An application that stores virtual versions of cards, NFTs, digital tokens, and more.

Cloud computing
The delivery of internet technical (IT) services over the internet, especially data storage.

Decentralized Finance (DeFi)
The use of peer-to-peer financial services built on blockchain technology. DeFi products generally involve a cryptocurrency and enable users to lend, earn interest, borrow, etc.

Governance token
Digital tokens created by developers to represent voting power on blockchain networks.

Metaverse
An expansive three-dimensional virtual space where users partake in experiences and interact with each other, facilitated by virtual reality and augmented reality technologies,

Non-fungible token (NFT)
A digital asset stored on blockchain with unique identification. They can represent real-life assets such as art, collectibles, or real estate.

Public blockchain
Distributed ledger where anyone can join and participate.

Permissioned blockchain
Distributed ledger that is not publicly assessable and can only be assessed by specific user.

Smart contract
Computer code that automatically that automatically carries out the terms of agreements between parties.

Staking
A method of earning rewards for holding cryptocurrencies through the validation of blockchain transactions.

Validator node
A device on a blockchain network that communicates with other validator nodes to validate blockchain transaction.