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# The exchange theory of web3 governance

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## Abstract

Blockchains have enabled innovation in distributed economic institutions, such as money (e.g., cryptocurrencies) and markets (e.g., decentralised exchanges), but also innovations in distributed governance, such as decentralised autonomous organisations. These innovations have generated academic interest in studying web3 governance, but as yet there is no general theory of web3 governance. In this paper, we draw on the contrast between a 'romantic view' of governance (characterised by consensus through community voting) and the 'exchange view' of governance from public choice theory (characterised by an entrepreneurial process of bargaining and exchange of voters under uncertainty). Our analysis is the first to argue that the latter 'exchange view' of governance is best to understand the dynamics of governance innovation in web3, providing the foundations for a new general theory of governance in this frontier field. We apply the 'exchange view' of governance to three case studies (Curve, Lido and Metagov), exploring how these projects enable pseudonymous, composable and permissionless governance processes to reveal value. Our approach helps illuminate how this emergent polycentric governance process can generate robustness in decentralised systems.

## 1 | TOWARDS AN ECONOMIC THEORY OF BLOCKCHAIN GOVERNANCE

Blockchains are an institutional technology at the base of the web3 stack of a digital economy (Berg et al., 2019a; Davidson et al., 2018). But blockchains—and specifically smart contracts, digital identity and protocols with governance tokens—also facilitate new innovations in governance (see Allen et al., 2019; Alston et al., 2022). Governance in web3 incorporates both governance by blockchains (i.e., applying blockchain as a governance technology) and governance of blockchains (e.g., the processes by which blockchains update their code) (see Alston, 2020; de Filippi & Loveluck, 2016; de Filippi & Wright, 2018; Lee et al., 2020; Werbach, 2018; Wright, 2021). Both governance by blockchains and governance of blockchains are still poorly understood and mostly an experimental science (de Filippi et al., 2022; Weyl et al., 2022). One of the reasons for this lack of understanding is that we do not yet have a full theoretical toolkit. We lack a toolkit because of the novelty of the technology and its applications and because blockchains produce complex, emergent, polycentric and competitive orderings (Alston et al., 2022). Often, the most effective way to analyse these technologies is to build them and empirically observe what happens.

Economics can contribute to this endeavour of understanding web3 governance. But it matters which lens of economics. Our argument is that the exchange paradigm of economics is more effective to understand blockchain governance than the value paradigm. One challenge is how to think clearly about the dynamics of web3 systems. Is the starting point to examine them as being externally driven (value paradigm) or emerging from within an evolving complex system (exchange paradigm)? In the exchange view of governance that we adopt in this article, entrepreneurial action in pursuit of value creation sets up an emergent process of permissionless discovery and coordination over voting rights, which drives institutional innovation and governance evolution. The exchange view of governance helps us to better understand how web3, as a new governance technology, creates value through a process of bargaining and exchange of rights.

In this article, we offer the first attempt at setting out an economic theory of blockchain governance in the exchange paradigm, emphasising the role of entrepreneurship and innovation. We proceed as follows. Section 2 discusses Buchanan's distinction between the romantic view of politics and the exchange view of politics as a foundation for thinking about blockchain governance. Section 3 unpacks blockchains and defines 'governance'. Section 4 argues that governance is a process of iteration and evolution—and web3 opens up new possibilities in this regard. Section 5 illustrates our contention with three case studies: Curve (and the so-called 'Curve Wars'), Lido (a staking protocol) and the Metagovernance Project. Each of these case studies demonstrates ways that the exchange paradigm of governance (cf. the value paradigm) can provide insights into web3 governance dynamics. Section 6 discusses the implications in relation to the robustness of governance in web3, focusing on governance polycentricity. Section 7 concludes.

## 2 | BLOCKCHAINS WITHOUT ROMANCE

James Buchanan famously explained public choice theory—the research programme on the economics of politics that he founded with Gordon Tullock (see Buchanan, 2003; Buchanan & Tullock, 1962; Mueller, 2003)—as 'politics without romance'. The aim of the public choice research programme was to bring economic incentives (including the rational actor model, methodological individualism, economic and legal institutions) to the forefront of analysis of politics. Public choice theory was intended as a corrective against the naive or 'political romantic' model then popular in both political theory and economic policymaking. In this 'political romantic' model, political actors were assumed to operate entirely in the public interest (rather than pursuing their own private interests), and governments (unlike markets) were omniscient, benevolent and costless. Buchanan had dubbed the prevailing theoretical welfare economics 'romantic' because it presumed if markets failed to meet idealised standards and that politicised corrections would always succeed in bringing about the perfectly efficient outcome. The asymmetry between markets and

politics (both in motivations and efficiency) suggests that this was in fact an (idealised) economic model of political intervention, not an economics of politics itself.

The economic view of politics—public choice economics—is focused on the economic incentives in collective decision-making, through the lens of contracting and exchange (i.e., politics as exchange; Buchanan, 1987). For public choice theorists, the relevant difference between markets and politics is not motivational (i.e., private vs. public interest) but the structure under which individuals seek to secure their interests. Politics is explained as an alternative to markets, with participants sometimes choosing to engage in the complex, collective exchange of politics over private markets. They do so because, for some goods, political provision is more efficient than market provision. Subsequent contributions to public choice theory have incorporated rational ignorance (Congleton, 2001; Somin, 1998; Somin, 2016), irrationality (Caplan, 2001a, 2001b, 2007) and expressivity (Brennan & Hamlin, 1998; Brennan & Lomasky, 1993) as other 'unromantic' explanations of political behaviour.

In economics, there is a useful distinction between the value paradigm and the exchange paradigm (Buchanan, 1969; Kohn, 2004). In the value paradigm (i.e., the Hicks–Samuelson framework), economics is a science of choice or of trading equilibrium with given resources, preferences and technologies. In the exchange paradigm—what Boettke (2012) calls 'mainline economics'—economics is a science of entrepreneurial action, knowledge, uncertainty and coordinating institutions of exchange (see also Loasby, 1999). The 'romantic' model of politics is within the value paradigm of economics, since it assumes that market failures can be corrected by identifying and enacting welfare maximising policy interventions and that citizens, policymakers and bureaucrats alike act in the public interest during this political process. Public choice 'politics without romance' is built upon the exchange paradigm in that it views politics as a forum for the discovery of efficient policy (or otherwise) through a process of bargaining between varyingly publicly and privately interested individuals and groups.

Our argument is that an economic theory of blockchain governance should begin in the exchange paradigm. This is a non-trivial observation because the default view of governance in blockchain is the mostly implicit value paradigm and somewhat tacit political model.[1] The 'romantic' view of blockchain governance first notices the salience of communities and public voting (e.g., in decentralised autonomous organisation [DAO] governance; Hassan & de Filippi, 2021), which leads it to interpret and understand governance problems through the lens of modern collective action institutions. These are, for instance, the institutions of political democracy and consensus decision-making in civil society, such as national elections or local town-hall meetings. These ideas have been closely examined and found broadly prospective, such as in governing blockchain dispute resolution (e.g., see Allen, Lane, & Poblet, 2020; Howell & Potgieter, 2021). Moreover, some DAO governance analyses (e.g., Bodon et al., 2019; Buterin, 2022; Buterin et al., 2019; Howell & Potgieter, 2021; Murtazashvili et al., 2022; Rozas et al., 2021) draw heavily on Ostrom's (1990) 'governing the commons' model of rules, as well as the broader IAD framework (Ostrom, 2005, 2010).

The political model clearly dominates thinking and discussion in analysis of blockchain governance, both on the side of governance of blockchain and governance by blockchains (Werbach, 2018). The prevailing mindset of blockchain scholars and practitioners mirrors that of mid-20th century social scientists and policymakers prior to public choice: governance amounts to decision-making about correcting market failures, usually by financing public goods for the ecosystem. For instance, this is the standard rationale for blockchain foundations as grant-giving organisations (i.e., to fund research and development) (see Allen, Berg, Davidson, MacDonald, & Potts, 2021). It is less explicitly appreciated that this understanding of blockchain governance sits squarely within the value paradigm in economics because it supposes that the real underlying governance problem maps to a rational choice problem under allocative scarcity constraints (i.e., budget line, preferences, uniqueness and aggregation principle). It is an example of theoretical welfare economics applied to blockchains instead of polities.

Further, participants in the governance process are thought to temporarily suspend their economic interests by earnestly submitting and selecting policy proposals 'for the good of the blockchain'. There is a seeming double

[1]Davidson and Potts (2022) argue that blockchain governance is closer to corporate governance rather than political governance.

standard here: community decision-making is extolled for decentralising power away from privately interested founders and core developers (as alike democratic transition from dictators and oligarchs), yet political actors from the community are supposed to be publically interested. This only serves to obscure the underlying structure of complex exchanges at play, which can be revealed by applying the public choice lens. Thus, we examine the theory of blockchain governance as exchange—or what we call 'blockchains without romance'.

The elements of a public choice theory of blockchains can be found in Allen et al. (2018), Berg et al. (2018), Cowen (2019), and Allen, Berg, et al. (2020), while a constitutional political economy approach can be found in Berg et al. (2018), Rajagopalan (2018) and Berg, Berg, and Novak (2020). Frolov (2021) and Alston et al. (2022) explain why blockchain governance is especially difficult due to institutional complexity and the emergent polycentric and competitive orderings it generates. In this article, we focus on the exchange theory of blockchain governance to better understand entrepreneurship and innovation and how different institutional mechanisms affect outcomes (i.e., comparative institutional economics or institutional cryptoeconomics; Berg et al., 2019a, 2019b). The exchange view we adopt in this article, building on the field of institutional cryptoeconomics, makes clear that web3 governance processes are about innovation and discovery too. These governance processes can facilitate the entrepreneurial discovery of opportunities to create private and public value, through innovation in ways of coordinating, both cooperative and competitive, using the new tools of governance that enable pseudonymous, composable and permissionless governance actions.

## 3 | BLOCKCHAINS AND GOVERNANCE

Blockchains are a form of distributed ledger technology—a shared ledger or record held over a distributed peer-to-peer network, coordinated through consensus algorithms. Blockchains are best understood as an institutional technology (Davidson et al., 2018). They enable innovation in the private order provision of digital infrastructure for business and market administration, including payments, identity, savings and finance, contracting and many other aspects of trusted secure record keeping and updating among economic agents seeking to cooperate for mutual benefit.

Blockchain technology—particularly through smart contract based governance tokens and DAOs—also enables innovation in distributed governance (Allen et al., 2019). Yet governance of and by blockchains remains at best partially understood. This lack of understanding is partly because of the ways that blockchain systems are emergent, complex, polycentric orderings (Alston et al., 2022). They are systems made of institutional technologies that are also continuously evolving. Taken together, this means that strategic behaviour on these systems is to be expected in part, as best response to non-cooperative games inherent in governance (Alston, 2022), and also due to expected further evolutionary dynamics in the rules of those games themselves (Voigt, 1997; Voigt, 2011). Blockchain governance games are therefore a potentially significant theatre of entrepreneurial action.

Blockchains are systems of rules generated (and then evolved) through consensus and agreement. Blockchain romanticism is tied in with the underlying ethos of web3 governance, including ideals of democracy, community ownership, self-ownership and decentralisation (see Nabben, 2023). Web3 communities have adapted tools for operational protocol or DAO decisions and applied them also to constitutional-level decisions about the rules of governance. When those rules are to be changed (i.e., through constitutional developments or exit and forking), there is a tendency towards Ostrom-style town halls and other community-level mechanisms for consensus decision-making. The characteristic feature of these institutions is that they are implicitly centralised in terms of communication (i.e., a common channel) with low cost, high trust communication and clear rules (Ostrom, 1990).

This is the 'romantic view' of web3 governance in practice: a preference for participatory community decision-making but with communications and enforcement, including sanctioning and conflict resolution, often residing centrally. Community decisions signal the popular will much like voting outcomes in ideal democratic theory. Outcomes are deemed legitimate due to their participatory character and therefore in the greater blockchain (public) interest. A

public choice approach would instead point to the structure of implicit exchanges underlying web3 governance decisions (e.g., differential impacts of revenue raising and treasury spending) and suggest individuals (citizens) choose web3 communities (states) that are overall net beneficial to their private interest (i.e., once decisions are implemented).[2]

Similarly for constitution-level changes to the rules of web3 governance, which again are typically run by participatory community decision-making through a central, permissioned channel (e.g., like constitution referenda). Additionally, there is the readily apparent threat of exit via forking—another mechanism for constitution-level governance change[3]—that is decentralised and permissionless. Forking is typically portrayed as a last resort once deliberation and mediation efforts (again playing out publicly in common channels) have been exhausted, which, while true enough, fails to recognise the calculus of consent motivating exit. As we will see in the case studies below, the composable and permissionless properties of new web3 governance mechanisms offer participants more options for political exchange.

Blockchain protocols need governance processes for decision-making. Some view governance as ideally minimised in blockchains (e.g., the bitcoin blockchain), due to the need and desire to minimise attack surfaces and ensure that 'code is law' to the greatest possible extent (de Filippi & Wright, 2018). But as blockchains have evolved, governance design (or governance surfaces) are a feature of blockchains (Zargham & Nabben, 2022). Governance is necessary because of contractual incompleteness (in social and smart contracts) and the need to deal with problems and newly arising issues such as bugs or code upgrades (Allen, Lane, & Poblet, 2020; Davidson & Potts, 2022).

There is an important distinction between governance of blockchains and governance by blockchains (Werbach, 2018). Governance of blockchains is usually the concern of blockchain foundations and committees with the power to push code commits. Governance by blockchains is when a community is governed by smart contracts (as in a DAO). Davidson and Potts (2022) identify another key distinction between corporate governance and political governance. Corporate governance is about limiting agency problems (i.e., how weak outsiders, usually suppliers of finance, control strong insiders, usually managers). Political governance is about collective decision-making and collective action in representation (i.e., ensuring that minorities and majorities do not tyrannise or exploit each other). Davidson and Potts (2022) argue that corporate governance is a more appropriate framework for understanding blockchain governance.

But governance, as a form of institutional coordination, also creates value—not only as a forum of decision-making (e.g., for provision of collective goods or regulations) but also by expanding the possibility space for new exchanges through political entrepreneurship (Koppl et al., 2015; Novak, 2020). Evolution of governance institutions creates lasting value in the same way that other technological innovations do. That is why entrepreneurial action (in governance institutions) to discover and put to use innovations in governance is a form of value creation through innovation in platforms and protocols. In the following section, we outline this relationship between governance innovation and value creation.

## 4 | EXCHANGE, GOVERNANCE AND INNOVATION

In the political romantic view, governance is the set of procedures and constraints that structure, or govern, collective decision-making of a community. Once these constitutional rules have been established, the scope of governance diminishes to operational decision-making by the community for the community. In the Ostrom (1990) version

[2]Also described in constitutional economics, a related research programme that focuses on explaining choices of alternative sets of legal, institutional and constitutional rules, rather than political choices within those rules sets (Brennan & Buchanan, 1985; Buchanan, 1987, 1990, 1991; Voigt, 1997, 2011).
[3]MacDonald (2019) argues that migration of economic activity to blockchains stimulates constitutional change akin to secession, which he calls 'cryptosecession'. Markey-Towler (2020) applies this idea to institutional competition between blockchains and national innovation systems. Berg and Berg (2020) compare blockchain forking to instances of institutional forking of political systems.

of private order governance, these institutional rules are developed by the community itself. In this way, a community creates its own rules and then applies and enforces those rules across all members of the relevant communities. In the theory of corporate governance, the purpose of governance is to protect (weak) outsiders from (powerful) insiders (i.e., governance is a control mechanism).[4] In both models, private orderings emerge from choices and actions within governance institutions.

Governance can also be a mechanism for entrepreneurial discovery of new ways to create value through institutional innovations that enable more complex forms of coordination and exchange. This is a relatively rare phenomena in most types of economy, including industrial economies in which much governance is supplied centrally through general codes of corporate regulation and national level legislation, including over property rights, legal systems and political processes. Governance is not typically a site of entrepreneurship and innovation, and where it does exist it is often expected to be destructive (Baumol, 1990), or a process of rent seeking (Tullock, 1967).

The suite of new web3 platforms, digital assets and governance tools have rapidly decreased the costs of governance experimentation (see case studies below). These capabilities have made web3 a site for entrepreneurship and discovery of value in governance. In web3, governance is a discovery process—a process of coordination and competition under inevitable uncertainty. The new governance tools in web3 protocols bring into view the ways that collective choice infrastructure reveals and coordinates knowledge. These opportunities include coalition formation and vote delegation, buying and selling—just as in markets—while simultaneously protecting against opportunistic behaviour. This is the exchange vision of web3 governance.

The exchange theory of web3 governance is therefore apt to draw on insights from economics about the efficiency and efficacy of political markets.[5] Vote trading (logrolling), vote buying (bribing) and other forms of strategic voting are normally condemned by the public and most social scientists for undermining the democratic political process. By contrast, public choice economists have found them to be efficient (Pareto improving) and therefore 'socially desirable' under certain conditions. The logic is that these types of voting mechanisms elicit a finer expression of individual preferences—for example, by allowing voters to express their varying intensities of concern over issues and to compensate each other for forgoing voting rights.[6]

Significant innovations in the design of voting mechanisms have recently been proposed and introduced in web3, enabled by lower cost secure digital voting rights. For instance, quadratic vote buying (paying the quadratic of the number of votes) has gained some attention in blockchain governance circles to improve voting efficiency while preventing dominant positions (plutocrats) from controlling decision-making (Buterin et al., 2019; Lalley & Weyl, 2018; Weyl, 2017). Commitment or bond voting (weighting votes by a nominated period that they will be locked from future votes if successful) is another recent proposal for signalling intensity of preferences and long-term commitment to blockchain governance decisions, while achieving resistance to plutocracy formation and Sybil attacks (Berg, Davidson, & Potts, 2020; Mohan et al., 2022).

The standard economic model of private order governance (e.g., Buchanan & Tullock, 1962; North, 1990; Ostrom, 1990; Williamson, 1985) is a game-theoretic analytic universe of two-phase governance. In the first phase, the rules of the game are determined. This first phase includes writing constitutions,[7] enacting legislation and town-hall meetings. In the second phase, the game is played (strategically). From the player perspective, governance rules

[4]The theory of corporate governance was developed by Oliver Williamson, whom Ostrom shared the 2009 Nobel Prize with for work on the economic theory of governance (see Earl & Potts, 2011).

[5]Whether those applying the 'politics-as-market' metaphor (e.g., in voting, Peltzman, 1990; in political influence, Becker, 1983); comparing politics to markets (e.g., Buchanan, 1954; Stigler, 1971); or modelling exchange in real and hypothetical political markets (e.g., in vote trading, Riker & Brams, 1973; Schwartz, 1975; Tullock, 1970; in vote buying, Buchanan & Lee, 1986; Buchanan & Tullock, 1962; Tullock, 1959).

[6]'Permitting those citizens who feel strongly about an issue to compensate in some way those whose opinion is only feebly held can result in a great increase in the well-being of both groups, and the prohibition of such transactions will serve to prevent movement towards the conceptual social optimality surface, under almost any definition of this term'. (Buchanan & Tullock, 1962, p. 133)

[7]'The "constitutional way of thinking" shifts attention to the framework rules of political order—the rules that secure consensus among members of the body politic. It is at this level that individuals calculate their terms of exchange with the state or with political authority. They may well calculate that they are better off for their membership in the constitutional order, even while assessing the impact of ordinary political actions to be contrary to their interests'. (Buchanan, 2003, p. 15)

are mostly ex ante. Web3 governance opens new possibilities for ex post iteration and evolution of governance rules through an entrepreneurial process of Popperian conjecture and refutation (Loasby, 1999).

This is sometimes called a 'design space' (or 'phase space' or 'possibility space'; Koppl et al., 2015), but our point here is to focus instead on how governance solutions and opportunities are collectively discovered through entrepreneurial processes and systems adaptation in something like an innovation commons (Potts, 2019). Evidence of this process is the prevalence of public, open experimentation and failure. Indeed, we are already seeing many web3 governance failures (Feichtinger et al., 2023), such as poor engagement in community voting, the emergence of voting blocs or concentrations (i.e., 'governance whales') and as DAOs over-reach in their capacity to make efficient decisions (and thus re-centralisation). But these failures are the outcomes of experiments and from which agents learn and adapt. And the more powerful the tools to do so, the larger the consequence of ex post adaptation and institutional evolution.

Two main features of web3 infrastructure are leading to a rapid adaptation in governance processes: pseudonymity and composability. These are particularly prominent in decentralised finance (defi), where there is often direct economic value attached to governance rights. Much of web3 operates on pseudonymity, with a lack of connection between the identity of an address and a human. While there are privacy benefits of this pseudonymity, it also generates new governance challenges, including the potential of 'Sybil' attacks, where users hold multiple accounts. Governance token rights are increasingly composable across protocols, aided by token standards. The impact of this composability is for governance rights to be traded and bundled in new, and sometimes unexpected, ways (see case studies). This composability is being expanded through a diverse range of bridges: infrastructures that seek to enable tokens within one blockchain ecosystem (e.g., Ethereum) to operate on a different blockchain (e.g., Cosmos). Bridges consequently allow governance tools on one blockchain to interact with governance systems on another blockchain. Bridging infrastructure creates new possibilities for exchange and potentially new sources of value.

## 5 | CASE STUDIES IN ENTREPRENEURSHIP AND INNOVATION IN WEB3 GOVERNANCE

We have demonstrated above that the exchange view of governance provides a potentially fruitful lens for analysing web3 governance. In this section, we apply this lens to a series of case studies. Our approach is to analyse three case studies (Curve Finance, Lido and the Metagovernance Project) as illustrations of an exchange view of web3 governance. Throughout these case studies, we emphasise instances of market-like behaviour in governance systems. We demonstrate how these three web3 governance cases reveal processes of bargaining, exchange and discovery of value, compared to a romantic vision that focuses on how processes such as public discourse remedy failures.

### 5.1 | The Curve Wars

The Curve Wars are a competitive value-extracting and value-revelation process between governance layers on top of the defi protocol, Curve Finance. The Curve Wars are the clearest example of an exchange view of web3 governance, revealing the economic value of governance voting rights, and how projects layer and extract value from other protocols through a discovery process.

Curve Finance is a type of defi protocol known as an automated market maker (or AMM) that uses smart contracts to facilitate buy and sell orders on a decentralised exchange (or DEX), which is a peer-to-peer marketplace of cryptocurrency liquidity pools (Curve Finance, 2023). At its peak in January 2022, the Curve AMM liquidity pools had over USD $24 billion of total value locked, and today hold TVL of USD $5 billion (representing 10 blockchains and 28 tokens) (DeFi Llama, 2023). Curve's many deep liquidity pools help users trade while avoiding price slippage. By facilitating users to swap cryptocurrencies in pools involving multiple tokens across multiple blockchains, Curve

(and other AMMs) also enhances composability—the ability to combine existing components (tokens, smart contracts and protocols) and reassemble them.

Composability and the permissionless nature of defi protocols have led to defi being described as 'money legos' that can be stacked together like a lego set. Furthermore, when combined with DAO tooling 'governance legos' (mostly voting protocols), powerful and often unintended institutional innovations can be unlocked. It was this governance composability that set off the Curve Wars, a process in which new types of governance were created and stacked together to successively control each other—ultimately in order to control decision-making over the value created by Curve Finance (Eliason, 2022).

Curve Finance was created in January 2020. In August 2020, Curve launched Curve DAO for decentralised decision-making over the parameters of the defi protocol and associated financial products and incentives. In doing so, Curve introduced CRV, a governance token for Curve DAO (and by extension for all of Curve Finance). Decisions made in Curve DAO are applied to the operations of Curve Finance through automatic execution of a nexus of smart contracts linking its DAO to its defi products. CRV is primarily used to incentivise liquidity into the protocol. The token can be used for voting, staking and boosting rewards,[8] but to access these functionalities, token holders must lock their CRV so that it can be used to back Curve's defi products. This locking mechanism also aligns incentives of CRV holders with longer term prospects of the protocol. In return, users receive vote-escrowed CRV (veCRV). The longer that CRV is locked (between 1 week and 4 years), the more veCRV is generated and the more voting power and rewards go to the holder (as such, veCRV is in effect the protocol's governance token).

The 'vote escrow token' and DAO governance innovation of Curve introduced a new means of value creation to their ecosystem by instantiating a new form of property rights or 'governance rights'. As an AMM, Curve's ultimate source of value is the product-market fit of its liquidity pools, both in terms of the combination of cryptocurrencies in a pool and its associated fees and rewards. Curve DAO governance meant that stakeholders had input into those decisions that affected product-market fit, by purchasing CRV, locking and holding veCRV tokens and participating in voting. This innovation facilitated an exchange of governance rights (vis-à-vis a core team or board of directors) and created space for value creation through potentially better decisions.

Curve Finance quickly became a dominant DEX and important source of liquidity for many cryptocurrency and defi projects. It attracted many stakeholders from across the cryptoeconomy, including project foundations who wanted to support their own liquidity and financial entrepreneurs who simply wanted to earn liquidity provider rewards. This increased demand for veCRV because it could, for instance, be used to vote to boost LP rewards, which would raise revenue for liquidity providers and incentivise more locking of value into a preferred pool (hence more liquidity for the defi tokens in it).

The composable and permissionless properties of web3 infrastructure, however, opened further possibilities for governance innovation. While CRV are transferable tokens, veCRV is non-transferable and hence illiquid—so the locking of CRV for veCRV significantly reduces the circulating supply of CRV. From this sprung the layering of vote coordination infrastructure, in what has been termed the 'Curve Wars'. Many different platforms—including Convex, Votium, REDACTED, Bribe.crv and Llama Airforce Union—competed for veCRV voting tokens, and the rewards and liquidity that flowed from them (Eliason, 2022). We have seen layers upon layers, each with different coordination strategies (Allen, 2022).

These competitive dynamics are still ongoing, with projects endeavouring to build their own governance tools to coordinate purchase of nested tokens and control voting on other protocols they have successively integrated with, ultimately to control Curve Finance decision-making. This process has been termed 'metagovernance'—holding one DAO or protocol's token to influence decisions in another—somewhat resembling the practice of investment stewardship in traditional finance (0xkydo.eth, 2022; Eze, 2022; Giove, 2022).

The Curve Wars demonstrate how web3 enables a process of exchange and coordination of voting property rights. From the exchange paradigm of web3 governance, the Curve token escrow model, together with the various

[8]Voting: participation in official DAO votes. Staking: receiving a share of AMM trading fees. Boosting: up to 2.5X more rewards for liquidity provision.

layers of voting infrastructure that have emerged on top (e.g., Convex), enables a discovery process of the value of voting rights over the underlying Curve Finance liquidity pools. Rather than relying on a romantic vision of governance at the underlying protocol level, by providing liquid markets for voting rights, the Curve wars have injected more local knowledge into the collective governance process.

## 5.2 | Lido

Lido is a liquid staking protocol for Ethereum (Lido, 2020; Scharnowski & Jahanshahloo, 2022). Lido's governance dynamics led to it holding significant amounts of Ethereum (ETH) tokens. This case study demonstrates how applications based on top of protocols can have unintended governance impacts on external protocols, even though the formal institutions of the underlying protocol have not changed. Similarly to the Curve Wars case study above, Lido demonstrates how web3 tokens enable a core element of the exchange view of governance—a process of entrepreneurial governance innovation that was not designed at the base protocol level.

Lido emerged because of the transition of Ethereum from a proof-of-work to proof-of-stake consensus mechanism. Under the new Ethereum proof-of-stake model, users wanting to stake their tokens to provide security to the network and earn a staking reward need a minimum of 32 ETH. Furthermore, once ETH has been staked, they are subject to a withdrawal period. Ethereum is undergoing the transition to proof of stake, and withdrawals have only recently become available. Lido allows ETH holders to delegate any amount of ETH to stakers, who stake the ETH on their behalf. In return, they are provided with a token (stETH), which represents their share of the ETH staked through Lido, that can be immediately exchanged in liquid markets.

The significance of Lido for Ethereum governance comes from the Lido's size relative to individual stakers, institutional staking providers and other liquid staking protocols. At time of writing Lido currently has approximately 30% share of all ETH staked on Ethereum's Beacon chain. Lido is governed as a DAO with holders of a governance token (LDO) able to vote on decisions within the DAO. The Ethereum network, by contrast, has no formally specified governance mechanism and is not formally structured as a DAO. Governance in Ethereum is controlled by a complex mix of stakeholders with heterogeneous bargaining power over the network (Allen & Berg, 2020). Those stakeholders include miners, ETH holders, quasi-formal leadership bodies such as the Ethereum Foundation and even large fiat-backed stablecoin providers (Qureshi & Lee, 2019). As the dominant liquid staking provider, the Lido DAO has become a significant stakeholder in Ethereum governance. Thus, even as the Ethereum network itself is not a DAO, to the extent that Lido dominants Ethereum staking, then the Lido DAO plays a role as a de facto DAO for Ethereum itself (for an alternative view, see Core Lido & Hasu, 2022). Several potential scenarios have been hypothesised, whereby this might harm the economic security of the Ethereum blockchain itself (Kozin, 2022; Shapovalov, 2022) and lead to the cartelisation of staking and governance power on the network.

The role Lido plays in Ethereum has been widely debated within and outside the Lido DAO. Partly to reduce the impact that the DAO has on Ethereum itself, Lido has tried to implement a 'governance minimization' (BlockScience, 2022) approach, which seeks to reduce the amount of decision-making subject to voting and maximise automated processes through smart contracts (for a discussion, see Ehrsam & Robinson, 2020). The DAO has additionally debated placing a maximum limit on the share of ETH staked (Shapovalov, 2022), which when LDO token holders were polled in July 2022 received a 99.81% vote against. An alternative model for limiting the DAO's influence over Ethereum has been to adopt a 'dual governance' model, where LDO token holders would share voting power with holders of stETH (Kozin, 2022). Proponents of this approach argue that it would better reflect the interest that stETH holders have in Lido governance because of the influence Lido has over Ethereum itself.

The emergence of Lido was possible due to the permissionless and composable nature of web3 protocols. Lido was effectively able to make Ethereum's staked tokens liquid and tradable through issuing stETH. This complex interaction between Ethereum and an external protocol, Lido, enables new processes of coordination and exchange of digital assets. This layering of governance infrastructure without permission from the underlying protocol is only

visible through the exchange paradigm of governance, where entrepreneurs are seeking to extract value from governance rights.

## 5.3 | The Metagovernance Project

The Metagovernance Project (Metagov, 2023c) is an interdisciplinary research collective (law, political science, economics, communications theory, sociology, anthropology, systems science and game theory) formed in 2019 to build 'standards and infrastructure for digital self-governance'. While our previous two case studies focused on specific protocols and innovations in governance, the Metagovernance Project represents a higher level coordination mechanism within web3 governance. The existence of Metagov as an organisation to lower the transaction costs of political bargaining and exchange is only visible through the exchange paradigm of governance.

Metagov's motivation is that a 'new generation of online communities is changing the rules of online governance. In these worlds, users have the right to self-governance—the right to come together and organize their own social and political institutions' (Metagov, 2023c). Drawing inspiration from Lessig (1999), Metagov noted that 'the right to self-governance is not a natural right; it is enabled and circumscribed by the architecture of the platform on which people interact' (Metagov, 2023c). That is, developers need access to governance tools to be able to facilitate self-governance.

Metagov's activities are organised through a range of project-based working groups. One project is 'Metagov Gateway'—an open-source API gateway connecting decision-making tools to teams to embed into their communication platforms (such as Slack, Discord, Discourse and Github) incorporating 'PolicyKit'—developed in partnership with researchers at the University of Washington and Stanford (Metagov, 2023b). PolicyKit allows 'online community members to concisely author a wide range of governance procedures and automatically carry out those procedures on their home platforms' (Zhang et al., 2020). Similarly, the 'Community Rule' project—developed in partnership with researchers at the University of Colorado Boulder—is a toolkit that provides communities with guidance on describing and forming governance rules of practice (Schneider & Hornbein, 2023). While there is no single type of governance practice, 'Community Rule' provides eight templates (e.g., benevolent dictator, consensus and do-ocracy) and working examples that can be used by communities as a starting point for discussion. As open-source libraries, PolicyKit and Community Rule significantly lower the transaction costs of community governance compared with if each community had to 'make or buy' its own governance policies and rules. Communities can modify the policy scripts to suit their own requirements.[9] Through the exchange paradigm of governance, these templates and toolkits facilitate the coordination of governance rights in web3 projects.

Another Metagov project is 'MetagovDAO' whose purpose is to fund qualitative 'governance research in participatory, digital communities' relevant to Metagov and providing up to $10,000 in funding support to proposals (Metagov, 2023a). Development grants are common in the web3 ecosystem and MetagovDAO itself received an initial grant from Gitcoin (Gitcoin, 2022). Consistent with the exchange view of governance, the research support—including opportunities for dissemination through seminars and other channels—does not rely on romantic notions of voluntary contributions in the public good but instead aligns the economic incentives of industry and academic contributors with the broader Metagov community. The result is that Metagov can continue to push the boundaries of innovation in governance, such as recent endeavours to form Validator political parties (Rennie, 2022).

In a romantic view of governance, it is unclear why an organisation such as Metagov would emerge and what its role would be in governance. By contrast, through the exchange paradigm, Metagov's role is to lower the costs of innovating on web3 governance. Through toolkits, gateways and grants, Metagov facilitates more efficient exchange and bargaining of governance rights in the projects it supports. Importantly, that coordination includes governance rights across different web3 ecosystems, demonstrating the potential coordination from better defined voting rights.

[9]For recent theoretical work on web3 toolkits, see Allen and Potts (2023).

Metagov is ultimately a recognition that developing systems of governance, including the property rights of those governance processes, is costly.

## 6 | ROBUST GOVERNANCE INNOVATION

While our case studies demonstrate significant governance innovation on web3 networks, there is widespread governance scepticism in parts of the web3 industry, particularly among the venture capital community (e.g., Ehrsam & Robinson, 2020). Through the exchange paradigm of governance, however, governance innovation can be a major source of value creation. Innovations in governance structures enable people to make new types of mutually beneficial exchanges as part of a governance system. But it is also an evolutionary process of knowledge discovery and creation, acting under differential selection pressure in an open system.

Blockchains add a further layer of governance, but because it is a relatively open and flexible design space, it can adapt to, and develop within, other governance systems. In this way, blockchains are a new institutional technology that enables innovation in governance, but crucially with innovation within nested arrangements of other governance systems. This suggests that blockchains will generally push in the direction of increasing polycentricity of governance. That is, blockchains will increasingly exhibit features of polycentricity in the sense that they have 'many centres of decision making that are formally independent of each other' (see Ostrom et al., 1961, pp. 831–832) because of the lowered costs of nested arrangements. This polycentricity of blockchains may have implications for the characteristics and robustness of web3 institutional systems, and the ways that governance processes operate within them (see McGinnis, 1999, 2000).

Another impact of layering of governance systems is on the centralisation or decentralisation of decision-making. There is of course legitimate concern with the various ways governance can concentrate in blockchains, due to inequalities or dominating coalitions (e.g., premines, mining pools and whales) or weak incentives to vote, indifference or complexity. However, the growth of governance through innovation generally adds new centres of governance into an already complex and nested structure. This pushes in the direction of further polycentricity and robustness (Aligica & Tarko, 2012; Boettke & Leeson, 2004; Leeson & Subrick, 2006; Pennington, 2011; Pennington, 2013) and entangled political economy (Koppl & Horwitz, 2014; Novak, 2018; Wagner, 2014).

Governance innovations, as in the case studies above, are often viewed as potential attack vectors. The larger governance space does generate more potential attack vectors and as yet undiscovered strategies (both to attack and defend). More complex governance systems are also vulnerable due to the need for careful engineering and systems testing. Due to the cost or need for speed-to-market, that testing may occur in production. Because the romantic view does not place value on the discovery and learning that comes from these new strategies (and therefore the potentially valuable outcomes), these governance innovations are viewed largely as an attack vector. This is the 'Nirvana fallacy' (Demsetz, 1967) applied to blockchain governance. The exchange paradigm, by contrast, emphasises the potential value generation and discovery that comes from re-organisation and revelation of voting property rights.

Technologies that facilitate more pseudonymous interaction reduce social distance between potentially interacting agents and thereby create more favourable conditions for beneficial self-enforcing exchange (Leeson, 2008). Blockchains achieve this both by abstracting away socially heterogeneous identifiers and maintaining reputational signals through shared records of past interactions. Moreover, pseudonymous interactions in increasingly permissionless blockchain ecosystems (in large part due to more composable governance rights) are valuable precisely because an increased complexity of governance space also increases the opportunities for exchange (in the Adam Smith sense). While this is perhaps a surprising conclusion from the romantic perspective—from which such factors would be predicted to lead to chaos—its value is clearer from the exchange perspective.

The exchange vision of economics enables us to clearly see the value of robust polycentric increases in governance complexity that blockchain technologies can bring. This emphasises that economic evolution with new

institutional technologies such as blockchain will be messy on an entrepreneurial front but also on a governance front. We can expect a Schumpeterian process of creative destruction to also work through the innovations of new market tools and protocols (such as played out in the case studies detailed above).

This same argument also implies limits to ex ante design of governance or the risks in locking governance down completely behind a hard constitution. Instead, key events in the evolution of governance in defi, such as the emergence of Convex as a platform to enable the realisation of economic rights in CRV tokens, imply a Demsetz (1967) style perspective on governance property rights. These new property rights emerged from an innovation in governance rights and the market uptake of that new institutional technology.

## 7 | CONCLUSION

Governance in web3 is still a nascent field, as much an experimental art as a theoretical science. This article was motivated by a lack of theoretical toolkit to guide our understanding of governance in web3. This article has sought to contribute to that toolkit by distinguishing between two paradigms of governance: (1) the romantic vision of web3 governance through consensus and collective action and (2) the exchange vision of governance as an emergent process of permissionless discovery and coordination over voting rights. We argued that the exchange view is particularly useful for understanding innovation in web3 governance. In this view, governance is part of a discovery process of rules for coordination and competition under uncertainty, in order to create value.

After distinguishing between these two paradigms of governance, we examined three web3 case studies that each demonstrate potential benefits of applying the exchange view. The Curve Wars is the most explicit example of bargaining and exchange through layering of governance tokens, including the direct development of mechanisms such as bribery and aggregation markets. Lido reveals how external protocols can permissionlessly develop complex distributions of governance and ownership rights over underlying protocols (in that case, Ethereum). The Metagovernance Project plays an important role in coordinating and lowering the costs of exchanges of a range of web3 projects, demonstrating that bargaining and exchange of voting rights is costly.

Our case studies have revealed that an exchange view of web3 governance can be a source of entrepreneurial value creation. This insight has two implications. First, it cautions against attempts to romantically or naively overly optimise governance rules because of the discovery and knowledge problems inherent in governance. That is, it cautions against a preference for designed simplistic governance systems over more complex emergent governance systems. Those complex emergent systems can also exhibit more polycentric and robust characteristics. Second, it reveals the potential costs of minimising governance innovation (e.g., through locking down or restricting the potential for the exchange of web3 tokens at different layers). Ultimately, composable and stackable governance rights lead to both greater governance innovation and simultaneously a loss of governance control for underlying protocols.

Our approach to web3 governance in this paper builds on the new field of institutional cryptoeconomics (e.g., Berg et al., 2019a; Davidson et al., 2018) by integrating well-established insights from public choice economics. This provides the foundation for a new research programme that takes an exchange-based view of web3 governance. This research programme could examine how different governance designs lead to the emergence of unintended governance structures. Further research is needed on the scope of governance surfaces across different stacks of web3 protocols and applications. Together with further empirical research of web3 governance events, there is scope for additional research through governance experiments and simulations. We also anticipate research into the implications of these insights into the frontiers of web3 governance, as they apply to more traditional governance processes (e.g., politics, corporations and non-government organisations).

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Data sharing is not applicable to this article as no new data were created or analyzed in this study.

## REFERENCES

0xkydo.eth. (2022). Metagovernance in crypto. Retrieved December 1, 2022, from https://kydo.substack.com/p/metagovernance-in-crypto?s=r

Aligica, P., & Tarko, V. (2012). Polycentricity: From Polanyi to Ostrom, and beyond. *Governance*, *25*(2), 237–262. https://doi.org/10.1111/j.1468-0491.2011.01550.x

Allen, D. W. E. (2022). *Permissionless governance layering*. Substack. 5 August. https://darcyallen.substack.com/p/permissionless-governance-layering

Allen, D. W. E., & Berg, C. (2020). Blockchain governance: What we can learn from the economics of corporate governance. *The Journal of the British Blockchain Association*, *3*(1), 1–10. https://doi.org/10.31585/jbba-3-1-(8)2020

Allen, D. W. E., Berg, C., Davidson, S., MacDonald, T., & Potts, J. (2021). An economic theory of blockchain foundations. *SSRN*, 3842281. https://doi.org/10.2139/ssrn.3842281

Allen, D. W. E., Berg, C., Davidson, S., Novak, M., & Potts, J. (2021). Blockchain and investment: An Austrian approach. *The Review of Austrian Economics*, *34*(1), 149–162. https://doi.org/10.1007/s11138-020-00504-x

Allen, D.W.E., Berg, C., & Lane, A.M. (2019). *Cryptodemocracy: How blockchain can radically expand democratic choice*. In Polycentricity: Studies in Institutional Diversity and Voluntary Governance. Lexington Books.

Allen, D. W. E., Berg, C., Lane, A., & Potts, J. (2020). Cryptodemocracy and its institutional possibilities. *The Review of Austrian Economics*, *33*(3), 363–374. https://doi.org/10.1007/s11138-018-0423-6

Allen, D. W. E., Berg, C., & Novak, M. (2018). Blockchain: An entangled political economy approach. *Journal of Public Finance and Public Choice*, *33*(2), 105–125. https://doi.org/10.1332/251569118X15282111163993

Allen, D. W. E., Lane, A., & Poblet, M. (2020). The governance of blockchain dispute resolution. *Harvard Negotiation Law Review*, *25*(1), 75–101.

Allen, D. W. E, & Potts, J. (2023). Web3 toolkits: A user innovation theory of crypto development. *Journal of Open Innovation: Technology, Market, and Complexity*, *9*(2), 100050. https://doi.org/10.1016/j.joitmc.2023.100050

Alston, E. (2020). Constitutions and blockchains: Competitive governance of fundamental rule sets. *Case Western Journal of Law, Technology and the Internet*, *11*(5), 133–171.

Alston, E. (2022). Governance as conflict: Constitution of shared values defining future margins of disagreement. *MIT Computational Law Report*. https://law.mit.edu/pub/governanceasconflict

Alston, E., Law, W., Murtazashvili, I., & Weiss, M. (2022). Blockchain networks as constitutional and competitive polycentric orders. *Journal of Institutional Economics*, *18*(5), 707–723. https://doi.org/10.1017/S174413742100093X

Baumol, W. (1990). Entrepreneurship: Productive, unproductive and destructive. *Journal of Political Economy*, *98*(5), 893–921. https://doi.org/10.1086/261712

Becker, G. (1983). A theory of competition among pressure groups for political influence. *Quarterly Journal of Economics*, *98*(3), 371–400. https://doi.org/10.2307/1886017

Berg, A., & Berg, C. (2020). Exit, voice, and forking. *Cosmos + Taxis*, *8*(8+9), 76–89.

Berg, A., Berg, C., & Novak, M. (2018). Crypto public choice. *SSRN*, 3236025. https://doi.org/10.2139/ssrn.3236025

Berg, A., Berg, C., & Novak, M. (2020). Blockchains and constitutional catallaxy. *Constitutional Political Economy*, *31*(2), 188–204. https://doi.org/10.1007/s10602-020-09303-9

Berg, C., Davidson, S., & Potts, J. (2018). Blockchains as constitutional orders. In R. Wagner (Ed.), *James M. Buchanan* (pp. 383–397). Palgrave Macmillan. https://doi.org/10.1007/978-3-030-03080-3_18

Berg, C., Davidson, S., & Potts, J. (2019a). *Understanding the blockchain economy: An introduction to institutional cryptoeconomics*. Edward Elgar. https://doi.org/10.4337/9781788975001

Berg, C., Davidson, S., & Potts, J. (2019b). Capitalism after Satoshi: blockchains, dehierarchicalisation, innovation policy, and the regulatory state. *Journal of Entrepreneurship and Public Policy*, *9*(2), 152–164. https://doi.org/10.1108/JEPP-03-2019-0012

Berg, C., Davidson, S., & Potts, J. (2020). Commitment voting: A mechanism for intensity of preference revelation and long-term commitment in blockchain governance. *SSRN*, 3742435. https://doi.org/10.2139/ssrn.3742435

BlockScience. (2022). DAO vulnerabilities: A map of Lido governance risks & opportunities. Retrieved December 1, 2022, from https://medium.com/block-science/dao-vulnerabilities-a-map-of-lido-governance-risks-opportunities-92bc6384ff68

Bodon, H., Bustamante, P., Gomez, M., Krishnamurthy, P., Madison, M., Murtazashvili, I., Murtazashvili, J., Mylovanov, T., & Weiss, M. (2019). Ostrom amongst the machines: Blockchain as a knowledge commons. *Cosmos + Taxis*, *10*(3+4), 1–15. https://doi.org/10.2139/ssrn.3462648

Boettke, P. (2012). *Living economics: Yesterday, today, and tomorrow*. Independent Institute.

Boettke, P., & Leeson, P. (2004). Liberalism, socialism, and robust political economy. *Journal of Markets and Morality*, *7*(1), 99–111.
Brennan, G., & Buchanan, J. (1985). *The reason of rules: Constitutional political economy*. Cambridge University Press.
Brennan, G., & Hamlin, A. (1998). Expressive voting and electoral equilibrium. *Public Choice*, *95*(1–2), 149–175. https://doi.org/10.1023/A:1004936203144
Brennan, G., & Lomasky, L. (1993). *Democracy and decision: The pure theory of electoral preference*. Cambridge University Press. https://doi.org/10.1017/CBO9781139173544
Buchanan, J. (1954). Individual choice in voting and the market. *Journal of Political Economy*, *62*(4), 334–343. https://doi.org/10.1086/257538
Buchanan, J. (1969). Is economics the science of choice? In E. Streissler (Ed.), *Roads to freedom: Essays in honour of Friedrich A. von Hayek* (pp. 47–64). Routledge.
Buchanan, J. (1987). The constitution of economic policy. *The American Economic Review*, *77*(3), 243–250. http://www.jstor.org/stable/1804093. https://doi.org/10.1126/science.236.4807.1433
Buchanan, J. (1990). The domain of constitutional economics. *Constitutional Political Economy*, *1*(1), 1–18. https://doi.org/10.1007/BF02393031
Buchanan, J. (1991). Constitutional economics. In J. Eatwell, M. Milgate, & P. Newman (Eds.), *The world of economics*. Palgrave Macmillan. https://doi.org/10.1007/978-1-349-21315-3_18
Buchanan, J. (2003). Public choice: Politics without romance. *Policy*, *19*(3), 13–19.
Buchanan, J., & Lee, D. (1986). Vote buying in a stylized setting. *Public Choice*, *49*(1), 3–15. https://doi.org/10.1007/BF00163527
Buchanan, J., & Tullock, G. (1962). *The calculus of consent: Logical foundations of constitutional democracy*. University of Michigan Press.
Buterin, V. (2022). DAOs are not corporations: Where decentralization in autonomous organizations matters. Retrieved December 1, 2022, from https://vitalik.ca/general/2022/09/20/daos.html
Buterin, V., Hitzig, Z., & Weyl, G. (2019). A flexible design for funding public goods. *Management Science*, *65*(11), 5171–5187. https://doi.org/10.1287/mnsc.2019.3337
Caplan, B. (2001a). Rational ignorance versus rational irrationality. *Kyklos*, *54*(1), 3–26. https://doi.org/10.1111/1467-6435.00138
Caplan, B. (2001b). Rational irrationality and the microfoundations of political failure. *Public Choice*, *107*(3–4), 311–331. https://doi.org/10.1023/A:1010311704540
Caplan, B. (2007). *The myth of the rational voter: Why democracies choose bad policies*. Princeton University Press.
Coe Lido & Hasu. (2022). The next chapter for Lido. Retrieved December 1, 2022, from https://blog.lido.fi/the-next-chapter-for-lido/
Congleton, R. (2001). Rational ignorance, rational voter expectations, and public policy: A discrete informational Foundation for Fiscal Illusion. *Public Choice*, *107*(1), 35–64. https://doi.org/10.1023/A:1010337412291
Cowen, N. (2019). Markets for Rules: The promise and peril of blockchain distributed governance. *Journal of Entrepreneurship and Public Policy*, *9*(2), 213–226. https://doi.org/10.1108/JEPP-03-2019-0013
Curve Finance. (2023). Curve finance. Retrieved January 10, 2023, from https://curve.fi/
Davidson, S., de Filippi, P., & Potts, J. (2018). Blockchains and the economic institutions of capitalism. *Journal of Institutional Economics*, *14*(4), 639–658. https://doi.org/10.1017/S1744137417000200
Davidson, S., & Potts, J. (2022). Corporate governance in a crypto-world. *SSRN*, 4099906. https://doi.org/10.2139/ssrn.4099906
de Filippi, P., & Loveluck, B. (2016). The invisible politics of bitcoin: Governance crisis of a decentralized infrastructure. *Internet Policy Review*, *5*(4), 1–28. https://doi.org/10.14763/2016.3.427
de Filippi, P., Mannan, M., & Reijers, W. (2022). The Alegality of blockchain technology. *Policy and Society*, *41*(3), 358–372. https://doi.org/10.1093/polsoc/puac006
de Filippi, P., & Wright, A. (2018). *Blockchain and the law: The rule of code*. Harvard University Press.
DeFi Llama. (2023). *Curve*. Retrieved January 10, 2023, from https://defillama.com/protocol/curve
Demsetz, A. (1967). Toward a theory of property rights. *The American Economic Review*, *57*(2), 347–359. https://www.jstor.org/stable/1821637
Earl, P., & Potts, J. (2011). A Nobel prize for governance and institutions: Oliver Williamson and Elinor Ostrom. *Review of Political Economy*, *23*(1), 1–24. https://doi.org/10.1080/09538259.2011.526291
Ehrsam, F., & Robinson, D. (2020). Governance minimization. Retrieved December 1, 2022, from https://www.paradigm.xyz/2020/10/870
Eliason, N. (2022). Field guide to the curve wars: DeFi's fight for liquidity. Retrieved December 1, 2022, from https://every.to/almanack/curve-wars
Eze, K. (2022). Early 2022 survey of metagovernance. Retrieved December 1, 2022, from https://indexcoop.com/blog/early-2022-survey-of-metagovernance

Feichtinger, R., Fritsch, R., Vonlanthen, Y., & Wattenhofer, R. (2023). The hidden shortcomings of (D) AOs—an empirical study of on-chain governance. *arXiv*. preprint arXiv:2302.12125.

Frolov, D. (2021). Blockchain and institutional complexity: An extended institutional approach. *Journal of Institutional Economics*, *17*(1), 21–36. https://doi.org/10.1017/S1744137420000272

Giove, B. (2022). Ultimate guide to metagovernance. Retrieved December 1, 2022, from https://newsletter.banklesshq.com/p/ultimate-guide-to-metagovernance?s=r

Gitcoin. (2022). MetagovDAO—DAO governance research group (academic + industry practitioners). Retrieved December 1, 2022, from https://gitcoin.co/grants/2900/metagov-dao-governance-research-group

Hassan, S., & de Filippi, P. (2021). Decentralized autonomous organization. *Internet Policy Review*, *10*(2), 1–10. https://doi.org/10.14763/2021.2.1556

Howell, B., & Potgieter, P. (2021). Uncertainty and dispute resolution for blockchain and smart contract institutions. *Journal of Institutional Economics*, *17*(4), 545–559. https://doi.org/10.1017/S1744137421000138

Kohn, M. (2004). Value and exchange. *Cato Journal*, *24*(2), 303–339.

Koppl, R., & Horwitz, S. (Eds.). (2014). *Entangled political economy*. Emerald Group Publishing. https://doi.org/10.1108/S1529-213420140000018001

Koppl, R., Kauffman, S., Felin, T., & Longo, G. (2015). Economics for a creative world. *Journal of Institutional Economics*, *11*(1), 1–31. https://doi.org/10.1017/S1744137414000150

Kozin, S. (2022). *LDO+stETH dual governance*. Lido Governance Fourm. Retrieved December 1, 2022, from https://research.lido.fi/t/ldo-steth-dual-governance/2382

Lalley, S., & Weyl, G. (2018). Quadratic voting: How mechanism design can radicalize democracy. *AEA Papers and Proceedings*, *108*, 33–37. https://doi.org/10.1257/pandp.20181002

Lee, B., Moroz, D., & Parkes, D. (2020). The political economy of blockchain governance. *SSRN*, 3537314. https://doi.org/10.2139/ssrn.3537314

Leeson, P. (2008). Social distance and self-enforcing exchange. *The Journal of Legal Studies*, *37*(1), 161–188. https://doi.org/10.1086/588262

Leeson, P., & Subrick, J. (2006). Robust political economy. *The Review of Austrian Economics*, *19*(2–3), 107–111. https://doi.org/10.1007/s11138-006-7342-7

Lessig, L. (1999). *Code: And other laws of cyberspace*. Basic Books.

Lido. (2020). Lido: Ethereum liquid staking. Retrieved December 1, 2022, from https://lido.fi/static/Lido:Ethereum-Liquid-Staking.pdf

Loasby, B. (1999). *Knowledge, institutions and evolution in economics*. Routledge.

MacDonald, T. (2019). *The political economy of non-territorial exit: Cryptosecession*. Edward Elgar Publishing. https://doi.org/10.4337/9781788979382

Markey-Towler, B. (2020). Blockchains and institutional competition in innovation systems. *Journal of Entrepreneurship and Public Policy*, *9*(2), 185–193. https://doi.org/10.1108/JEPP-03-2019-0015

McGinnis, M. (Ed.). (1999). *Polycentric governance and development: Readings from the workshop in political theory and policy analysis*. University of Michigan Press. https://doi.org/10.3998/mpub.16052

McGinnis, M. (Ed.). (2000). *Polycentric games and institutions: Readings from the workshop in political theory and policy analysis*. University of Michigan Press. https://doi.org/10.3998/mpub.10728

Metagov. (2023a). MetagovDAO. Retrieved January 10, 2023, from https://metagov.org/metagovdao-call-for-proposals-research-community/

Metagov. (2023b). Metagov gateway. Retrieved January 10, 2023, from https://gateway.metagov.org/

Metagov. (2023c). Metagovernance project. Retrieved January 10, 2023, from https://metagov.org/

Mohan, V., Khezr, P., & Berg, C. (2022). Voting with time commitment for decentralized governance: Bond voting as a Sybil-resistant mechanism. *SSRN*, 4259599. https://doi.org/10.2139/ssrn.4259599

Mueller, D. (2003). *Public choice III*. Cambridge University Press. https://doi.org/10.1017/CBO9780511813771

Murtazashvili, I., Murtazashvili, J., Weiss, M., & Madison, M. (2022). Blockchain networks as knowledge commons. *International Journal of the Commons*, *16*(1), 108–119. https://doi.org/10.5334/ijc.1146

Nabben, K. (2023). Web3 as 'self-infrastructuring': The challenge is how. *Big Data & Society*, *10*(1), 1–56, 20539517231159002. https://doi.org/10.1177/20539517231159002

North, D. (1990). *Institutions, institutional change, and economic performance*. Cambridge University Press. https://doi.org/10.1017/CBO9780511808678

Novak, M. (2018). *Inequality: An entangled political economy approach*. Palgrave. https://doi.org/10.1007/978-3-319-89417-1

Novak, M. (2020). Crypto-friendliness: Understanding blockchain public policy. *Journal of Entrepreneurship and Public Policy*, *9*(2), 165–184. https://doi.org/10.1108/JEPP-03-2019-0014

Ostrom, E. (1990). *Governing the commons: The evolution of institutions for collective action*. Cambridge University Press.

Ostrom, E. (2005). *Understanding institutional diversity*. Princeton University Press.
Ostrom, E. (2010). Beyond markets and states: Polycentric governance of complex economic systems. *The American Economic Review*, *100*(3), 641–672. http://www.jstor.org/stable/27871226, https://doi.org/10.1257/aer.100.3.641
Ostrom, V., Tiebout, C., & Warren, R. (1961). The organization of government in metropolitan areas: A theoretical inquiry. *American Political Science Review*, *55*(4), 831–842. https://doi.org/10.2307/1952530
Peltzman, S. (1990). How efficient is the voting market? *Journal of Law and Economics*, *33*(1), 27–63. https://doi.org/10.1086/467199
Pennington, M. (2011). *Robust political economy: Classical liberalism and the future of public policy*. Edward Elgar.
Pennington, M. (2013). Elinor Ostrom and the robust political economy of common-pool resources. *Journal of Institutional Economics*, *9*(4), 449–468. https://doi.org/10.1017/S1744137413000258
Potts, J. (2019). *Innovation commons: The origin of economic growth*. Oxford University Press. https://doi.org/10.1093/oso/9780190937492.001.0001
Qureshi, H., & Lee, L. (2019). Ethereum is now unforkable. Thanks to DeFi. Retrieved December 1, 2022, from https://haseebq.com/ethereum-is-now-unforkable-thanks-to-defi/
Rajagopalan, S. (2018). Blockchain and Buchanan: Code as constitution. In R. Wagner (Ed.), *James M. Buchanan* (pp. 359–381). Palgrave Macmillan. https://doi.org/10.1007/978-3-030-03080-3_17
Rennie, E. (2022). How to start a crypto political party. *Medium*. Retrieved December 1, 2022, from https://ellierennie.medium.com/how-to-start-a-crypto-political-party-a6324cb53f35
Riker, W., & Brams, S. (1973). The paradox of vote trading. *American Political Science Review*, *67*(4), 1235–1247. https://doi.org/10.2307/1956545
Rozas, D., Tenorio-Fornés, A., Díaz-Molina, S., & Hassan, S. (2021). When Ostrom meets blockchain: Exploring the potentials of blockchain for commons governance. *SAGE Open*, *11*(1), 1–14. https://doi.org/10.1177/21582440211002526
Scharnowski, S., & Jahanshahloo, S. (2022). Liquid staking: Basis determinants and price discovery. *SSRN*, 4180341. https://doi.org/10.2139/ssrn.4180341
Schneider, N., & Hornbein, D. (2023). Retrieved January 10, 2023, from https://communityrule.info/
Schwartz, T. (1975). Vote trading and Pareto efficiency. *Public Choice*, *24*(1), 101–109. https://doi.org/10.1007/BF01718419
Shapovalov, V. (2022). Should Lido on Ethereum be limited to some fixed % of stake? Retrieved December 1, 2022, from https://research.lido.fi/t/should-lido-on-ethereum-be-limited-to-some-fixed-of-stake/2225
Somin, I. (1998). Voter ignorance and the democratic ideal. *Critical Review*, *12*(4), 413–458. https://doi.org/10.1080/08913819808443511
Somin, I. (2016). *Democracy and political ignorance: Why smaller government is smarter*. Stanford University Press.
Stigler, G. (1971). Economic competition and political competition. *Public Choice*, *13*(1), 91–106. https://doi.org/10.1007/BF01718854
Tullock, G. (1959). Problems of majority voting. *Journal of Political Economy*, *67*(6), 571–579. https://doi.org/10.1086/258244
Tullock, G. (1967). The welfare costs of tariffs, monopolies, and theft. *Economic Inquiry*, *5*(3), 224–232. https://doi.org/10.1111/j.1465-7295.1967.tb01923.x
Tullock, G. (1970). A simple algebraic logrolling model. *The American Economic Review*, *60*(3), 419–426. https://www.jstor.org/stable/1817991
Voigt, S. (1997). Positive constitutional economics: A survey. *Public Choice*, *90*(1–4), 11–53. https://doi.org/10.1023/A:1004913203197
Voigt, S. (2011). Positive constitutional economics II: A survey of recent developments. *Public Choice*, *146*(1–2), 205–256. https://doi.org/10.1007/s11127-010-9638-1
Wagner, R. (2014). Entangled political economy: A keynote address. *Advances in Austrian Economics*, *18*(1), 15–36. https://doi.org/10.1108/S1529-213420140000018000
Werbach, K. (2018). *The blockchain and the new architecture of trust*. Princeton University Press. https://doi.org/10.7551/mitpress/11449.001.0001
Weyl, E. (2017). The robustness of quadratic voting. *Public Choice*, *172*(1–2), 75–107. https://doi.org/10.1007/s11127-017-0405-4
Weyl, G., Ohlhaver, P., & Buterin, V. (2022). Decentralized society: Finding web3's soul. *SSRN*, 4105763. https://doi.org/10.2139/ssrn.4105763
Williamson, O. (1985). *The economic institutions of capitalism*. Free Press.
Wright, A. (2021). The rise of decentralized autonomous organizations: Opportunities and challenges. *Stanford Journal of Blockchain Law & Policy*, *4*(2), 152–176. https://stanford-jblp.pubpub.org/pub/rise-of-daos
Zargham, M., & Nabben, K. (2022). Aligning 'decentralized autonomous organization' to precedents in cybernetics. *SSRN*, 4077358. https://doi.org/10.2139/ssrn.4077358

Zhang, A., Hugh, G., & Bernstein, M. (2020). PolicyKit: Building governance in online communities. *arXiv*, 2008.04236. https://doi.org/10.48550/arXiv.2008.04236

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