

# Cryptoeconomics as a Limitation on Governance

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DRAFT v.20210828

Governance practices in distributed-ledger systems have grown increasingly diverse and diffuse, while retaining a commitment to cryptoeconomics—the use of economic incentives to guide user behavior, in tandem with cryptographic technology. In the space of a few years, cryptoeconomics has introduced advances in techniques for self-governance. But reliance on cryptoeconomics also introduces limitations on governance possibilities. Drawing on earlier critiques of how economic logics can erode democracy, this paper identifies specific limitations that cryptoeconomic governance faces. It contends that, to overcome these limitations, designers should envelop cryptoeconomics within a logic of politics capable of seeing beyond economic metrics for human flourishing and the common good.

*This paper has benefitted from generous feedback from readers including Eric Alston, Eva Beylin, Paul D’Aoust, Alexander Lange, Mario Laul, Harry McLaverty, Auryn Macmillan, Kelsie Nabben, Brandon Ramirez, Lane Rettig, Julia Rosenberg, Sacha Saint-Leger, Jeremy Sklaroff, Michael Zargham, and particularly the editors and fellow contributors to this special issue.*

## Introduction

“The root problem with conventional currency is all the trust that’s required to make it work,” wrote pseudonymous Bitcoin inventor Satoshi Nakamoto in an early forum post announcing the invention—meaning, by “trust,” faith in banks, governments, and other sorts of “third party middleman” (Nakamoto, 2009). In their place, Nakamoto offered a system of cryptography and economic incentives that would make digital money “secure” and “effortless.” After a little more than a decade, Nakamoto’s creation has swelled the

lexicon of human self-governance to elevate such once obscure or nonexistent terms as proof-of-work, proof-of-stake, off-chain, on-chain, self-sovereignty, holographic consensus, smart contracts, bonding curves, optimistic consensus, Sybil resistance, quadratic voting, governance tokens, and more. Billions of dollars' worth of digital assets now rests on such jargon and the innovations they represent. For the observer of institutional designs, a Cambrian explosion appears to be underway among the organisms emanating from Nakamoto's singular mutation.

And what became of trust? De Filippi et al. (2020) conclude that while the distributed-ledger technology underlying Bitcoin and its progeny has not fully escaped trust, it has produced a new kind of "confidence machine." The partial shift from trust to confidence transfers governance burdens from people to technical systems, inviting that renaissance in designs for systems of governance.

For all the achievements of the renaissance underway, I propose to interrogate the inverse of its possibilities: What limitations does the confidence machine introduce? What governance options fall away when institutions seek to diminish the space of trust? What does the machine fail to measure? These questions are especially urgent to the extent that distributed ledger technology represents a kind of prefigurative politics (Leach, 2013), as many practitioners seek to replace the institutional infrastructure of political and economic life (Dicker, 2021; Faustino, 2019; Swartz, 2017). If blockchains and their ilk are the germ of a future society, or at least some important subset of it, what kind of society will they germinate?

I refer to the logic that undergirds Bitcoin, derivative blockchains, and other distributed-ledger technologies with a colloquialism among practitioners, *cryptoeconomics*. The industry publication *CoinDesk* defines this "crucial concept" as "an area of applied cryptography that takes economic incentives and economic theory into account"—neither abstract cryptography nor economics but a practical fusion of the two (Stark, 2017). The term is widely associated with Ethereum founder Vitalik Buterin (Voshmgir & Zargham, 2020), according to whom "cryptoeconomics is fundamentally about the use of economic incentives together with cryptography to design and secure different kinds of systems and applications" (Buterin, 2018). For example, Bitcoin's cryptographic math ensures an artificial scarcity of units on its ledger; the perceived value of those tokens, in turn, motivates users to expend computing energy to perform the expensive cryptographic math known as "proof of work." The math secures the economy, which in turn motivates

people to use the math.

For Buterin (2018), this has everything to do with trust: the goal is “to reduce social trust assumptions by creating systems where we introduce explicit economic incentives for good behavior and economic penalties for bad behavior.” Traditional preconditions of trust such as personal familiarity (Luhmann, 2000) and credentialed expertise (Giddens, 1991) fall into obsolescence under the cryptoeconomic gale. In ways hard to fathom a few years ago, digital artifacts such as incomprehensible ledger addresses and scarce representations of non-scarce digital artworks have achieved legitimacy to the point that people regard them as valuable (Buterin, 2021b). Cryptoeconomics is producing the demise of bureaucracy, in one form, and its apotheosis in another (Laul, 2021). Culture and ideology play roles in the successes of this technology, but cryptoeconomics above all summons it into being, as their glue and its users’ favorite topic of conversation.

The *economics* in *cryptoeconomics* raises a particular set of anxieties. Critics have long warned against the expansion of economic logics, crowding out space for vigorous politics in public life. From the Zapatista insurgents of southern Mexico (Hayden, 2002) to political theorists like William Davies (2014) and Wendy Brown (2015), the “neoliberal” aspiration for economics to guide all aspects of society represents a threat to democratic governance and human personhood itself. Here is Brown:

neoliberalism transmogrifies every human domain and endeavor, along with humans themselves, according to a specific image of the economic. All conduct is economic conduct; all spheres of existence are framed and measured by economic terms and metrics, even when those spheres are not directly monetized. In neoliberal reason and in domains governed by it, we are only and everywhere *homo oeconomicus* (p. 10)

For Brown and other critics of neoliberalism, the ascent of the economic means the decline of the political—the space for collective determinations of the common good and the means of getting there. Brown continues:

as an economic framing and economic ends replace political ones, a range of concerns become subsumed to the project of capital enhancement, recede altogether, or are radically transformed as they are “economized.” These include justice (and its subelements, such as liberty, equality, fairness), individual and popular sovereignty, and the rule of law. They also include the knowledge

and the cultural orientation relevant to even the most modest practices of democratic citizenship. (p. 22)

The things not visible to the market, that is, become unthinkable and impossible. If the market cannot see a changing climate, there is no motivation to act on it. If the market does not recoil at the plight of homelessness, neither can we, if we learn to be what the market sees in us.

Worries about the corrosive possibilities of economics on politics preceded the terminology of neoliberalism. Hannah Arendt (1958/1998) observed how ancient Greek democratic thought regarded economics as a private matter, segregated from the political sphere. Athens’s sexist, slaver economy enabled citizens to enter politics as relative equals, whose “prepolitical” basic needs were already met, whose democracy could stand aloof from self-interest and corruption. To be free, and a trustworthy citizen, meant being free from susceptibility to economics and its means of instilling confidence. Political bonds are bonds of trust.

Arendt’s formulation of a politics wholly distinct from economy provides a useful foil for our purposes here; let my references to *politics* refer to some approximation of Arendt’s usage. Political institutions are domains for *homo sapiens* before *homo economicus*. Even if politics cannot—and arguably should not—fully depart from economic life, what distinguishes politics is its capacity to notice and address less-economic considerations. While a country’s taxation policy utilizes economic nudges, for instance, lawmakers must generally rationalize it according to conceptions of the common good, rather than optimizing for financial metrics. And while politics is hardly immune from self-interest (Alston, 2020), incentives such as politicians’ self-preservation can introduce imperatives that economics alone would not.

Are concerns about corrosion by economics, such as those of Arendt and Brown, pertinent to cryptoeconomics? David Golumbia (2016) has argued forcefully that it is, recognizing the affinities that many blockchain designers and their systems have with Austrian School economists such as Friedrich Hayek, a godfather of neoliberalism. I come to these matters with comparatively more admiration for what cryptoeconomics has accomplished, more attraction to its opening of possibilities. And yet we must take stock of how worlds made of incentives elevate certain parts of us and suppress others, make some possibilities seem plausible and others not. It is difficult to imagine a vital political act like solidarity, with the fellow-feeling and sacrifice it implies, taking form in cryptoeconomics; as with a gift (Mauss, 1925/2006), the presence of game-theoretic calculation would seem to undermine the

power of prosocial acts. Flurries of tweets to “HODL!”—crypto-jargon for a call to “hold” tokens, in hopes of summoning the next bull market—are a pale substitute for solidarity; the closest cognate in the idiom of cryptoeconomics is “coordination.” Following (and often quoting) Hayek, designers of these systems seem to assume economics as a sufficient basis for organizing much of society, as opposed to the account of Karl Polanyi (1944/2014), which regards markets as downstream from politics.

Meanwhile, a growing body of analysis interprets cryptoeconomics and its associated technologies as engines of commoning, in the spirit of Elinor Ostrom (Cila et al., 2020; Fritsch et al., 2021; Reijers et al., 2016; Rozas et al., 2021, 2018). There is much to commend this approach, as participant-governed blockchains do seem to resemble common-pool resources. Yet there are respects in which cryptoeconomics also resembles an opposite of the commons: the enclosure, in which what was once held in common become subdivided into ownable, tradeable assets (Federici, 2004). Under cryptoeconomics, things previously difficult or impossible to buy or sell, from cryptographic computing power to real estate in digital games, have become the basis of markets. Notably, cryptoeconomic markets depend on some sort of artificial scarcity, such as Nakamoto’s limit on supply at 21 million bitcoins. More invasive forms of enclosure and scarcity could follow. In the past, major advances in commodification produced markets for enslaving human beings and conquering the once-common lands of indigenous peoples. Such comparisons might seem alarmist if cryptoeconomic enthusiasts were not setting their world-transforming sights so high.

I offer an analysis informed by snowball-sampled, unstructured interviews with participants in thirteen governance-related cryptoeconomic projects;<sup>1</sup> quotations from them are used with subsequent permission. I also took part in participant observation with several “decentralized autonomous organizations” (DAOs)<sup>2</sup> during the rise and fall of the 2020–2021 bull market, which saw historic highs in the value of leading cryptocurrencies. Drawing on these encounters, in what follows, I survey the emerging promise that cryptoeconomics presents, followed by an analysis of what appear to be its emerging

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<sup>1</sup>Automata (Tony Jin), Aragon (Alex Clay, Isabella de Brito, Lucas Vento), Ethereum Foundation (Vitalik Buterin), Gitcoin (Kevin Owocki), Gnosis (Auryn MacMillan), The Graph (Jeremy Sklaroff, Eva Beylin, Brandon Ramirez), Holochain (Paul D’Aoust), Kleros (Clément Lesaege), Optimism (Jinglan Wang), Orca Protocol (Maria P. Gomez Gelvez, Julia Rosenberg), Placeholder.vc (Mario Laul), Radicle (Abbey Titcomb), Spacemesh (Lane Rettig).

<sup>2</sup>1Hive, Gitcoin, and Kleros.

limitations. Finally, I outline suppositions about how cryptoeconomics might mature by incorporating logics of politics in which economics serves as a means more than an end, where the range of motion available in governance is as wide as possible. I hope that these observations can inform both future practice and empirical research; if cryptoeconomics is running up against its limits, future scholarship and entrepreneurship alike should take care not to be constrained by it.

I land on an argument that is both normative and predictive, though perhaps anticlimactic for a technology that inspires such utopian aspirations: rediscovering older habits of political life. This entails enveloping economics within rules set by institutions not primarily economic in nature, which are capable of articulating, instantiating, and evolving shared understandings of the common good. The argument entails that it is not enough to produce confidence machines without undertaking the forever uncertain work of cultivating trust.

## **The cryptoeconomic explosion**

This article joins an expanding literature on cryptoeconomic governance. The literature largely agrees that cryptoeconomics introduces novel governance instruments with consequences still uncertain enough that they merit further study. Cryptoeconomics has been notable, for instance, in achieving more rapid growth and adoption than other recent efforts to organize complementary and alternative currencies (Meyer & Hudon, 2019); distributed ledgers have meanwhile amassed significant value outside the control of corporations or governments, making the question of how to govern them urgent and yet beyond the reach of prevailing regimes. Although it is far from clear what role cryptoeconomic systems will play in the economy and society of the future, the actually existing experiments contain innovations in governance that attract persistent interest (e.g., Wharton Cryptogovernance Workshop, n.d.; El Faqir et al., 2020; Wright & Law, 2021).

Some of these innovations include, at least potentially:

- Dynamic decision-making processes that evaluate preferences in nearly real time (Beck et al., 2018; Reijers et al., 2018)
- Voting systems unavailable in conventional politics or business (Karjalainen, 2020)
- Mechanisms for incentive alignment among diverse participants (Beck et al., 2018; Karjalainen, 2020)

- Algorithmic dispute resolution (Barnett & Treleaven, 2018)
- Permissionless participation (Beck et al., 2018)
- Widely shared accountability and distribution of benefits (Beck et al., 2018; Fritsch, 2019)
- Self-enforcing security and censorship resistance (De Filippi et al., 2020)
- Sovereignty from external control or regulation (De Filippi & Wright, 2018; Duffy, 2017; Manski & Manski, 2018)
- Transparency of on-chain activity (Cila et al., 2020)
- Competitive markets for governance (Alston, 2019)

To illustrate at least some of these innovations, I will briefly recount three recent examples of cryptoeconomic governance in practice.

### Kleros case 532

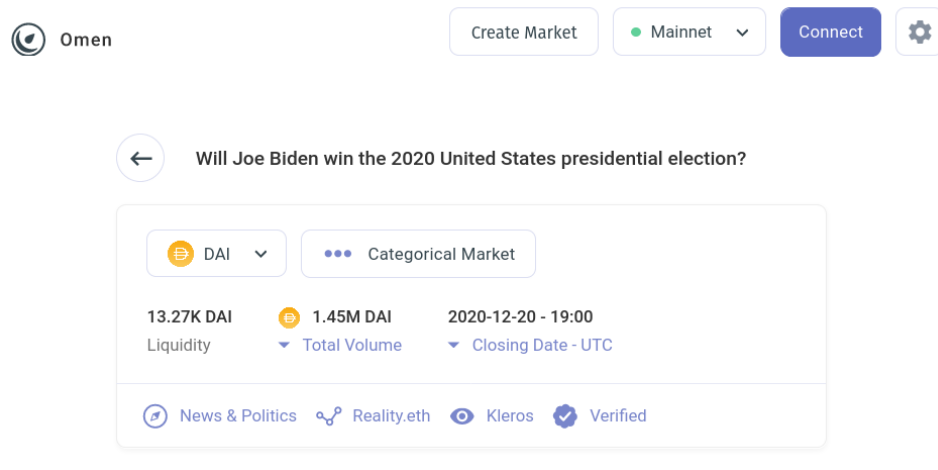


Figure 1: Omen prediction market.

The name *Kleros* comes from the Greek word for randomness, referencing the Athenian democracy’s use of lotteries to choose government officials. It is a cryptoeconomic court built on the Ethereum protocol. Case 532 posed the question “Will Joe Biden win the 2020 United States presidential election?” The case originated from Omen, an Ethereum prediction market, where that question amassed \$1.45 million in trading volume.<sup>3</sup> The arbiter of the answer was to be reality.eth, a cryptoeconomic “oracle”—referencing another, more

<sup>3</sup>See the Omen market and related information at <https://is.gd/uj4FDj>.

mystical feature of ancient Greek politics—that crowdsources verification of real world events. The oracle failed to reach a determination, so the case went to its predefined arbitrator, Kleros. There, the matter was settled in favor of President-Elect Biden on December 20, 2020—two weeks before a mob attacked the US Capitol seeking to overturn the election—by a jury whose members had to stake tokens in order to participate. The jurors stood to earn rewards by correctly choosing the answer that they expected other jurors to independently select. This process implements the “Schelling point” concept in game theory (Aouidef et al., 2021; Dylag & Smith, 2021).

Such a jury does not deliberate, does not seek a common good together; its members unite through self-interest. Before coming to the jury, the factual basis of the case was supposed to come not from official organs or respected news organizations but from anonymous users similarly disciplined by reward-seeking. The prediction market itself was premised on the supposition that people make better forecasts when they stand to gain or lose the equivalent of money in the process. The politics of the presidential election in question, here, had been thoroughly transmuted into a cluster of economies.

### **The Graph: GIP-0002**

The Graph is a protocol that facilitates data queries on decentralized networks. It is a piece of cryptoeconomic infrastructure that many other projects rely on, and its GRT utility tokens represented a market capitalization peak of \$2,878,164,921 in February 2021. Graph Improvement Proposal GIP-0002 sought a technical change in the protocol to “separate destination address for Indexer indexing rewards.”<sup>4</sup> A specific implementation of the proposal resided on Radicle, a decentralized code-hosting platform. Discussion occurred on a Discourse-based forum, where it garnered nearly two hundred comments. Following the process outlined earlier in GIP-0001, a poll took place on Snapshot, a platform that allows users to vote with their token holdings; between March 9 and March 16, 2021, 99.72 percent of the GRT tokens that voted did so in favor of the change. That poll was not in itself binding. On March 23, a forum post announced that the Graph Council, a group of network participants that controls changes to the protocol, would delay the implementation due to concerns raised since the poll. Not until March 29 was the proposal actually added to the protocol, to be followed by proposals that could address concerns that arose in the process.

Rather than relying on direct token voting, as other protocols have done,

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<sup>4</sup>See <https://is.gd/IP56vd> for relevant information.



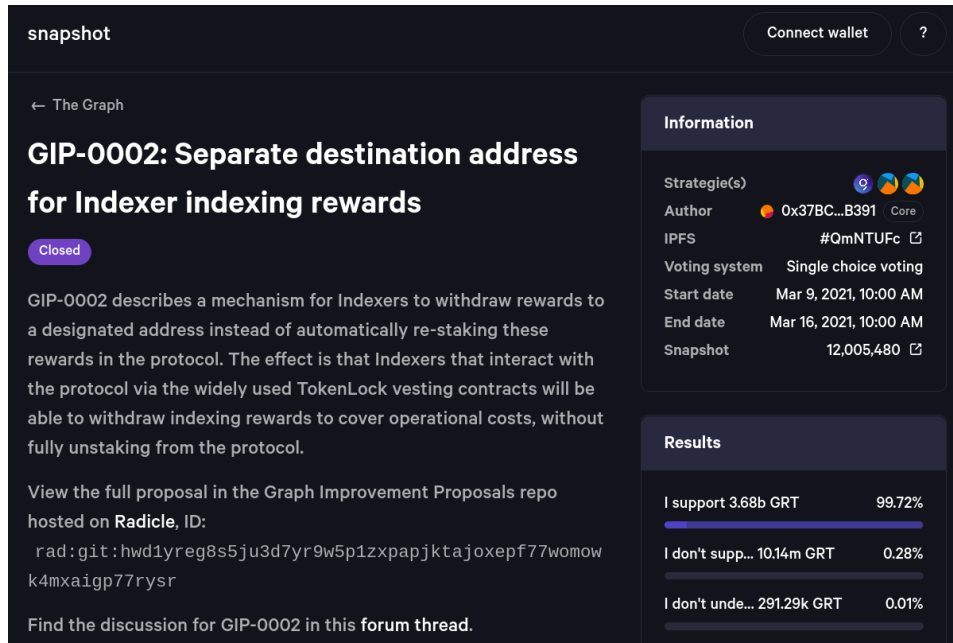


Figure 2: Proposal on Snapshot.

The Graph uses a board-like mediating layer, the Graph Council, on which the protocol’s major stakeholder groups have representatives. In this case, the proposal had the potential to favor one group of stakeholders over others, and passing a decision through the Council requires multiple stakeholder groups to agree. At the same time, the Snapshot vote put pressure on the Council to implement the will of token-holders.

### 1Hive on-boarding

I asked several of my informants to recommend a vibrant DAO to join, and 1Hive was at the top of several lists. “Honey is money, for everybody,” the website said.<sup>5</sup> 1Hive is a “community,” backed by no company or other legal entity, that has its own token (Honey), exchange (Honeyswap), financial products (Honeycomb), constitution (Community Covenant), and dispute-resolution system (Celeste). The Honey token had a peak market capitalization of \$29,135,127 in March 2021. Decisions occur through “conviction voting,” which weighs power to participants who indicate a consistent

<sup>5</sup>See [about.1hive.org](https://about.1hive.org).

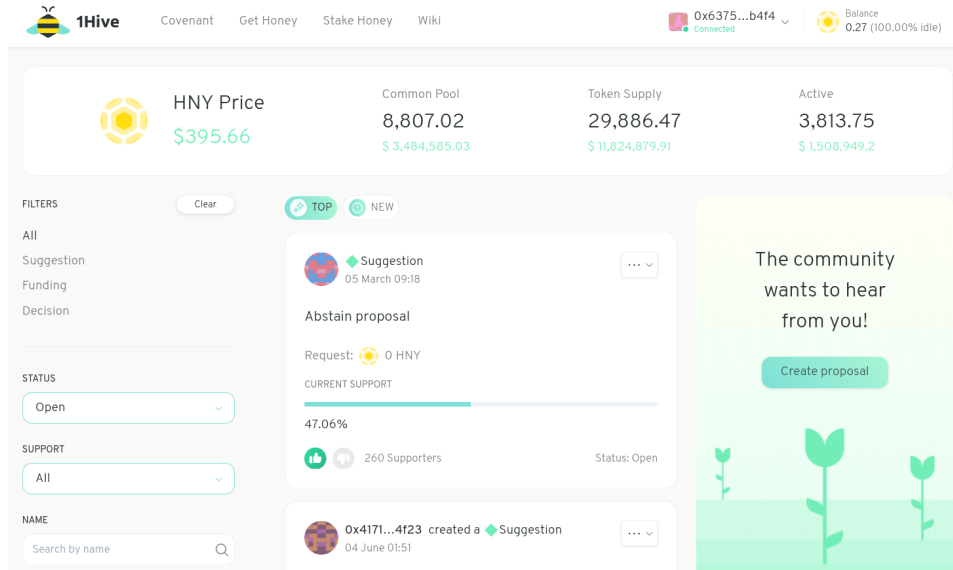


Figure 3: The 1Hive landing page, a listing of proposals under consideration.

preference by staking tokens over time (Emmett, 2019). Community members communicate on a Discourse forum, Discord chat, and Telegram chat, each of which requires a separate account. A system called Pollen distributes rewards of Honey based on a user's participation on the 1Hive Discourse, Discord, and GitHub spaces. As I tried to navigate the terminology and ascertain the point of it all, I came across a 3,180-word post on the forum, "Everything about 1Hive in one place," detailing the steps necessary to get all of one's accounts and wallets and tokens in order enough to participate (Eth\_man, 2020). I felt bewildered and was able to accomplish only some of them.

The point, as far as I could tell, was as dual. On the one hand, it was "money," under the aegis of a cartoon bee. A community currency flows through 1Hive's platforms to encourage pro-social behavior. And yet the Community Covenant puts the goal in less financial terms: "1Hive is a community of activists seeking to build a future that is more free, fair, open, and humane." The cryptoeconomic juries of Celeste serve to enforce the qualitative values of the Covenant (sacha, 2021). According to a slogan that appears repeatedly in 1Hive discussions, "Come for the honey, stay for the bees." That is, although economics figures prominently as one first encounters and explores 1Hive, participants understand the community's primary value as interpersonal, social, and non-economic. Anecdotally, the

community appears to be indeed vibrant; in its meme-drenched Discord, I made a new friend in my first few minutes online.

## Observations

During the cryptocurrency boom cycle of 2017, governance was often treated like a problem to be solved by a uniform and scalable solution. Projects such as Aragon, Colony, and DAOStack set out to become the operating systems for governing diverse kinds of networks, thanks to airtight cryptoeconomics and a user-friendly platform (El Faqir et al., 2020). By the time of the 2020–2021 boom, cryptoeconomic governance had become more a reality than just an intention. It was also fragmented and scattered, taking place across diverse and cobbled-together sets of tools, many providing governance mechanisms unfamiliar in legacy institutions. Cryptoeconomic governance did not appear to be converging toward a single mechanism but was diverging into webs of diverse and interconnected processes. From the Kleros judiciary to 1Hive’s various social halls, economic incentives are present at every layer, even where participants articulate non-economic goals. Lane Rettig of Spacemesh says, “It is turtles all the way down”—meaning, by turtles, that cryptoeconomic systems sit atop more cryptoeconomics, and so on (personal communication, April 27, 2021).

Enthusiasts envision that DAOs will someday reorganize every level of organizational life, and perhaps they will. Current practice suggests that doing so would mean a radical financialization of everyday interactions. Projects apparently engaged in non-financial activities, like the immersive game Decentraland and the social-media network Hive (not to be confused with 1Hive), differ little from their corporate competitors except by distributing power through along cryptoeconomic lines and providing new means of commodifying the experience. Vote-buying, a practice usually considered anathema in legacy political systems, has risen to an art in cryptoeconomic design (Automata Finance, 2021; Buterin et al., 2018), suggesting a culture in which economics is a preferable replacement for politics.

Yet, as the processes of The Graph suggest, cryptoeconomic mechanisms are only part of the story. De Filippi & Loveluck (2016) pointed out an “invisible politics” at work in the early Bitcoin community. The role of personal relationships, cabals, private chat groups, invite-only calls, and other flows of “off-chain” power remain salient, while the cryptoeconomic mechanisms are only part of the story. In earlier-stage projects aspiring to “progressive decentralization”—that is, gradually expanding ownership

and control from a particular founder or company to a wider community of stakeholders (Walden, 2020)—participants perform cryptoeconomics even where it does not yet fully reign, because cryptoeconomics is the engine of the confidence machine. When the machine is not yet fully operational, cryptoeconomic performances can engender trust until confidence presumably replaces them.

One can also find longings for less-economic logics among cryptoeconomic designers. Maria P. Gomez Gelvez, an advisor to Orca Protocol and former Aragon employee, believes that “a DAO is closer to a country than to a corporation” (personal communication, May 20, 2021). The Graph team rejects the goal of simple profit maximization in favor of more capacious stakeholder governance (Ramirez, 2020). Gitcoin founder Kevin Owocki wrote in a tweet, “The momentum behind ETH/Defi has a greater purpose than profit,” and describes Gitcoin’s purpose with the economic concept of “public goods,” the goods often outside the view of markets (Owocki, 2021). Later in the same Twitter thread, he added [sic], “i only hope we dont let people down + actually create lasting good [heart emoji].” Ethereum founder Vitalik Buterin has lamented that “plutocracy is still bad,” despite its prevalence in cryptoeconomic systems, including his own (Buterin, 2018). He has also called for ways of determining community membership beyond simple token-holding (Buterin, 2021a). And yet he maintains, “The answer is what we’ve been saying all along: *cryptoeconomics*” (Buterin, 2018).

## Cryptoeconomic limitations

If the purpose of a governance system is to enable participants to have as much self-determination as possible—a tolerable oversimplification, I hope—whatever inhibits that self-determination becomes a limitation. If a governance system faces serious limitation on its ability to problem-solve, how deserving is it of either trust or confidence?

The purpose of this section is to identify the limitations on governance that reliance on cryptoeconomics currently does or might incur. I review several apparent limitations. These reflect widely recognized attributes of cryptoeconomic systems, and they are sites of active development that may be addressed as practice evolves. But for now, I argue, these limitations suggest that older concerns about the corrosive effects of economics on democratic governance are also relevant to cryptoeconomic domains.

At the root of these limitations is the blindness of cryptoeconomics to the

identity and integrity of human users—a persistent, but not necessarily permanent condition. In most pre-digital political and economic governance systems, identifying participants is not an existential problem. Difficulties arise in edge-cases. Fraud, which can be minimized with laws that threaten to punish it. Authorities may not have simple processes in place for when citizens’ names or gender identification changes. Refugees crossing borders may have trouble identifying themselves. But many people find that they can take government-based identity infrastructure for granted. Dominant Internet platforms have also come to incorporate users’ politically defined identities into their systems, either directly (such as by requiring government-issued identification) or indirectly (such as through bank accounts or phone numbers).

Cryptoeconomics typically seeks to avoid reliance on centralized institutions such as governments. For developers of distributed-ledger systems, representing the personhood of participants is a chronic problem, precisely because of how cryptography obscures its users and how economic incentives reward deception. A common anxiety is the danger of “Sybil” attacks, in which a single user can benefit by masquerading as many users (Conte de Leon et al., 2017). Such attacks can be easy and damaging. Some applications may require users to verify their identities by multiple means, such as by posting a code on social media accounts, producing a video of themselves, and submitting biometric data. In cryptoeconomic contexts, personhood cannot be taken for granted, and establishing it incurs costs. Enduring a complex process of identity verification, for instance, may prevent less-motivated users from completing the on-boarding process, thus reducing adoption.

For many blockchain enthusiasts, the lack of reliance on personal identity is a feature not a bug, offering advantages in terms of privacy and permissionless participation. Cryptoeconomics could also produce identification protocols that improve on existing options, such as through “self-sovereign identity” mechanisms based on reputation and mutual attestation of others across a network (Tobin & Reed, 2017). This approach could give users unprecedented control over how they represent themselves and could be less vulnerable to the coercion or collapse of governments. But cryptoeconomics has yet to deliver a widely adopted means of identifying unique human users. Therefore the control of economic units, rather than units based on personhood, remains the basic logic of governance. This presents challenges for governance if personhood should still possess intrinsic importance.

## Persistent plutocracy

The prevailing consensus mechanisms, known as “proof of work” and “proof of stake,” grant governance rights roughly in proportion to a given node’s buy-in on the network—through computing power or token holdings, respectively. Applications and organizations built on such networks tend to follow a similar logic, granting power to whomever holds their tokens. Those with more tokens than others hold more decision-making power than others. Vitalik Buterin (2018) therefore comes by his anxieties about plutocracy honestly; rule according to wealth has so far been the norm in cryptoeconomic designs.

Governance by economics is nothing new. Joint-stock companies conventionally operate on plutocratic governance—more shares equals more votes. This arrangement is economically efficient for aligning shareholder interests (Davidson and Potts, this issue), even while it may sideline such externalities as fair wages and environmental impacts. Yet companies operate within the constraints of state policy, which ultimately govern obligations among state-recognized persons, whether corporate or natural. The earliest companies formed to fulfill the charters of mercantilist monarchs; today, companies must at least adhere to the rules of governments that purport to represent the will of society as a whole, not just the company’s participants. Governments impose rules about transparency, conduct, accounting, equity trading, and more. So while plutocracy is prevalent in the joint-stock universe, governments can counteract it through progressive taxation, collective bargaining rights, environmental regulations, antitrust enforcement, and more. If distributed ledgers are based on cryptoeconomics “all the way down,” without an underlying political order, such options are not available. But if “a DAO is closer to a country than to a corporation,” participants will expect countermeasures against rule by wealth.

For cryptoeconomic systems, as in many economic markets, the primary means of accountability and redress against plutocracy is user exit—leaving one network and moving to a more agreeable one. But exit may not be as easy as it appears, whether it be from a social-media network (Matias, 2018) or a protocol (Galloway, 2006). The persistent dominance of early-to-market blockchains like Bitcoin and Ethereum suggests that cryptoeconomics similarly favors incumbency. Mechanisms like quadratic voting can reduce plutocracy by lessening the influence of large vote-buyers in comparison to smaller ones (Buterin et al., 2018; Wright, 2019–2020). But this comes at the cost of greater vulnerability to Sybil attacks in the absence of robust means of establishing personhood.

For now, plutocracy may be endemic in cryptoeconomic systems. Ferreira et al. (2019) predict a high likelihood of corporate capture in proof-of-work blockchains such as Bitcoin. Many hope that the influence of venture-capital firms in token markets might be warded off with efficient vote-selling (Automata Finance, 2021) or other incentive designs that make plutocracy less attractive (Buterin, 2018; Eyal, 2019). 1Hive counteracts large holders by rewarding non-monetary participation with tokens and making decisions with mechanisms that weigh commitment, not just wealth. But as long as governance is reducible to economics, it will be difficult to prevent the feedback loops between wealth and power from spiraling into plutocratic outcomes.

### Suppressing participant interests

Like economics itself, cryptoeconomics is surely normative as well as descriptive. Ferraro et al. (2005) find across numerous studies that “self-interested behavior is learned behavior, and people learn it by studying economics and business.” Although this picture of human flourishing finds limited validation in empirical psychology and anthropology, *homo economicus* has spread across organizational life through managers with economics-informed business education. It shapes the institutions people create, as well as people themselves.

The anthropology underlying cryptoeconomic institutional design—“explicit economic incentives for good behavior and economic penalties for bad behavior” (Buterin, 2018)—assumes that users have a common desire to maximize their economic rewards; incentives based on those rewards comprise the structure of organizations and nudge the behavior of participants. Remarkably, cryptoeconomic design has produced multi-billion-dollar financial networks that are resistant to fraud, without government coercion to enforce their claims. Yet perhaps the anthropology embedded in these systems—that *homo cryptoeconomicus* of incentive nudges—helps explain why distributed-ledger adoption has been primarily among finance-related applications, a field already premised on self-interested value-maximizing. Outside of finance, people might expect systems that can see different sides of their natures.

The subjectivity of a cryptoeconomic juror on Kleros seeking to earn a fee is surely different from that of jurors deliberating in a legal courtroom, repeatedly reminded of their civic duty. “Community” takes on a different meaning if it is a fandom of authors freely sharing fan-fiction, in comparison to Honey-holders in 1Hive who stand to profit from the market value of their

shared token.

Relying on cryptoeconomic incentives limits governance to a narrow subset of the techniques that other kinds of institutions have used. Cryptoeconomics sees only a certain slice of the people involved. Concepts such as self-sacrifice, duty, and honor are bedrock features of most political and business organizations, but difficult to simulate or approximate with cryptoeconomic incentive design. Labor unions can produce economic benefit for members, but achieving and maintaining those benefits has required cultivating an “expanded community of fate” that is anything but self-interested (Levi, 2020). As Albert O. Hirschman (1970) famously showed, the most economically valuable forms of organizational loyalty often grow out of non-economic forms of relationship. When people complain that others seem to vote against their own economic interests, it should be a reminder that economic interests do not encapsulate the totality of human needs and wants (Haidt, 2012). Governance regimes should reflect that multiplicity.

In a survey of diverse governance domains, Gritsenko & Wood (2020) found that, while introducing algorithmic processes can increase efficiency, doing so also results in “decreasing the space for governing actors’ discretion.” Algorithms can also increase the space of their initial designers’ power, compared to the power of future users (Galloway, 2006). Incentive-based systems meanwhile have trouble seeing aspects of the world around them not already captured in the algorithms.

### **Discounting externalities**

On May 13, 2021, the billionaire entrepreneur Elon Musk issued a statement that his company Tesla would stop accepting Bitcoin for car purchases due to concerns about the cryptocurrency’s fossil-fuel usage, almost instantly causing a 10 percent dive in Bitcoin’s value (Livni, 2021). In the guise of an erratic celebrity, this was a rare case in which Bitcoin faced at least a semblance of accountability for its country-sized energy consumption and environmental impact. The system is governed by its users—especially the “miners” who carry out its energy-intensive computation—and those users generally stand to benefit from ignoring their collective carbon footprint. A busier network roughly correlates to higher energy consumption and a higher trading price. Competing cryptocurrencies have promised lower environmental impact, but the incentives associated with Bitcoin’s dominant market position have prevented mass exodus.



The environmental costs are classic externalities—invisible to the feedback loops that the system understands and that communicate to its users as incentives. Other externalities relevant to distributed ledgers include money laundering, dealings in dangerous drugs and weaponry, tax evasion, and the growth of ransomware attacks on public infrastructure that cryptocurrencies have facilitated.

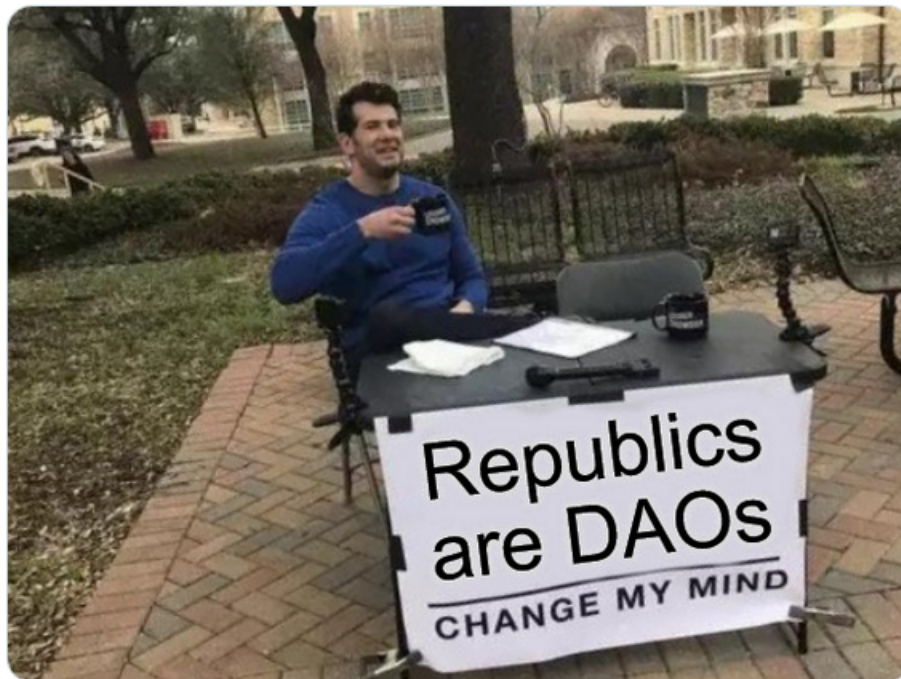
Non-cryptoeconomic systems have some similar properties; shareholders of oil companies also have incentives to pollute, and paper money can support dangerous black markets. But such abuses, at least in principle, are subject to oversight and enforcement by governments tasked with protecting the common good. Political processes enable participants to negotiate compromises among a variety of economic and non-economic interests. If the firm on its own does not see a given externality, the regulatory layer can compel it to do so, such as through disclosure requirements or selective taxation. The externality thus becomes visible to the firm’s incentive structures. For distributed ledgers, similar oversight remains either crude or nonexistent.

Cryptoeconomics can accommodate designs that integrate new variables into their incentive structures; Bitcoin could conceivably incorporate a software update with incentives for reducing energy consumption. “Oracle” mechanisms like that of `reality.eth`, which resulted in Kleros case 532, enable cryptoeconomic systems to take input from arbitrary phenomena that would otherwise be outside the view of their algorithms. “Non-fungible tokens” (NFTs) have made representations of non-quantifiable works of art legible and quantifiable on distributed ledgers. If things must be quantified to be seen, however, what meaning might be lost in the process of quantification?

The challenge of funding “public goods” is another example of an externality—and one that threatens the sustainability of cryptoeconomic systems (Buterin et al., 2018). As has been the case for commons-based software in general (Arp et al., 2018), market mechanisms struggle to support critical infrastructure that does not produce direct financial returns. Non-market institutions such as governments and (at vastly smaller scales) charities have been necessary for the provision of public goods before cryptoeconomics; increasingly, distributed ledgers are reinventing them through fee-funded treasuries and donor grant pools. In this and other respects, cryptoeconomic designers are beginning to venture into the realm of the political.



Dave White  
@\_Dave\_\_White\_



7:35 PM · Feb 27, 2021 · Twitter Web App

2 Retweets 1 Quote Tweet 22 Likes



Figure 4: Meme posted on Twitter by a cryptoeconomic protocol designer.

## **Toward politics**

Julia Rosenberg and Maria P. Gomez Gelvez of Orca Protocol have noticed a phenomenon that the cryptoeconomic confidence machines were supposed to do away with: the emergence of “protocol politicians” who gain outsized power through delegated tokens (personal communication, May 20, 2021). In a quest to create a “people-first” system for “governance that works,” Orca instead enables DAOs to delegate decisions more intentionally to various “pods” of qualified users. Joining a pod requires some cryptoeconomic ante, such as staked tokens or evidence of participation. But once over that threshold, pod members deliberate and decide in a less-economic virtual space, where they can be insulated from the short-term incentives that might otherwise steer a vote among token-holders at large. The pods are a way of carefully re-inserting pockets of trust, and of human politics, into technology that was supposed to be trustless.

Recent cryptoeconomic practice appears to be reinventing some old wheels of institutional life. The Kleros judiciary, the board-like Graph Council, the constitutionalism of 1Hive, the protocol politicians—they are not the same as their old-world counterparts, but their reappearance also suggests a growing recognition of the need for political institutions in some form. The implementations break from past practice in intriguing ways, often opening the doors wider for participation and transparency. Yet if mechanisms such as these rely on cryptoeconomics as their sole logic, their feats of liberation will come with limitations on the range of motion for governance.

A napkin sketch of classical, never-quite-achieved liberal democracy (Brown, 2015) would depict a market (governed through economic incentives) enclosed in politics (governed through deliberation on the common good). Economics has its place, but the system is not economics all the way down; the rules that guide the market, and that enable it in the first place, are decided democratically, on the basis of citizens’ civil rights rather than their economic power. By designing democracy into the base-layer of the system, it is possible to overcome the kinds of limitations that cryptoeconomics is vulnerable to, such as by counteracting plutocracy with mass participation and making visible the externalities that markets might otherwise fail to see.

## **State regulation**

Marcella Atzori (2015), after raising early concerns about the erosion of the political by the economic, argues that the state should assert itself to ensure

democratic control over blockchain networks. This is already happening, to the extent that governments are intervening in the taxation, securities compliance, and mining of these systems. Jurisdictions such as the US state of Wyoming have developed blockchain-friendly incorporation statutes (Wright & Law, 2021). China and Russia have attempted to establish cryptocurrencies of their own, while also placing sweeping prohibitions on blockchains they do not control. Already, relying solely on governments seems likely to inhibit some of the benefits that cryptoeconomics offers, such as the ability to experiment with radically diverse governance, permissionless participation, and censorship resistance (Alston, 2021). Relying on territorial regimes also lessens the capacity of these technologies to enable equality among users across borders.

State regulation is one tool for disciplining cryptoeconomics with democracy, and it can be a productive one, particularly when states provide a framework that encourages innovation and inhibits abuse (COALA, 2021). But leaning on governments too heavily could undermine cryptoeconomic possibilities altogether. Distributed ledgers can be a design space for democratic practice that governments may be unable to explore on their own, due to gridlock or path dependency. It is probably not sufficient or desirable to merely outsource politics to governments.

### **Cooperative design**

Cooperatives are businesses that practice democratic ownership and governance among active participants, rather than serving profit-seeking outside investors (Schneider, 2018). They blend person-centric governance (one member, one vote) with market-based incentives (patronage dividends in proportion to participation). Cooperatives have historically served as a social and legal framework for activities that DAOs and other distributed-ledger projects seek to enable, such as accepting small, early-stage investment from participants and distributing financial rewards. The cooperative principles of autonomy and member control resemble the certain cryptoeconomic aspirations (Davila, 2021; Walden, 2019), while “concern for community” encourages internalizing social externalities (International Co-operative Alliance, n.d.). Cooperativism provides a framework for democratic governance that can help counteract the plutocratic tendencies. For these reasons, a growing number of blockchain projects are incorporating legal entities as cooperatives. For instance, Kleros operates through a cooperative legal structure in France. The US entrepreneur John Paller has taken advantage of

flexible cooperative statutes in the state of Colorado to form the legal basis of two tokenized projects: Opolis, an employment platform, and ETHDenver, a conference that attracts international Ethereum developers and investors (Ahonen, 2021).

Cooperative structures could reside primarily at the legal layer, or they could guide the design of distributed ledgers themselves, such as through decision-making based on egalitarian membership rather than token holdings. The largely abandoned cryptocurrency FairCoin implemented a novel consensus mechanism called “proof-of-cooperation” that sought to ground its cryptoeconomics in cooperative membership among participant organizations that served as network nodes (König et al., 2018). More recently, a series of manifestos have called for “distributed cooperative organizations,” or DisCOs, integrating distributed ledgers and cooperative values, as well as feminist commitments to reward the care work and public goods that markets often fail to recognize (Troncoso & Utratel, 2020). Distributed ledgers could also enable cooperatives that self-govern by methods not found among offline cooperatives, from Kleros-like random juries (Fan & Zhang, 2020) to “liquid” delegation of representatives in real time (Blum & Zuber, 2016). In a call for “moving beyond coin governance,” Buterin (2021d) points to “proof of personhood” and “proof of participation” systems that could tie governance to the logics of human persons and contribution—using cryptoeconomics to reinvent democratic strategies that offline cooperatives have employed for generations.

A cooperative ledger could govern a particular application, as in the case of Opolis or Kleros, or span a larger ecosystem, akin to the role of the Ethereum blockchain in setting ground-rules for the diverse contracts built on top of it. Whereas democracy through state regulation would likely come from outside the network, cooperative democracy depends on network participants to invest in egalitarian spaces—as those in some cryptoeconomic projects already have.

### **Mission orientation**

The aborted Ethereum-based project Civil sought to leverage cryptoeconomics to protect journalism against censorship and degraded professional standards (Schneider, 2020). Part of the system was the Civil Council, a board of prominent journalists who served as a kind of supreme court for adjudicating the practices of the network’s newsrooms. Token holders could earn rewards by successfully challenging a newsroom’s practices; the success

or failure of a challenge ultimately depended on the judgment of the Civil Council, designed to be free of economic incentives clouding its deliberations. In this way, a cryptoeconomic enforcement market served a non-economic social mission.

This kind of design could enable cryptoeconomic networks to serve purposes not reducible to economic feedback loops. 1Hive does so with its combination of a values-laden Community Covenant and enforcement through a cryptoeconomic dispute-resolution system; the community proposes this as a replicable model, known as “Gardens,” for other communities to adopt (sacha, 2021). Protocols could also incorporate “golden share” mechanisms, by which a purpose-focused foundation or member-governed cooperative could hold veto power to ensure a network does not stray from a predefined purpose (Purpose Foundation, 2020). Governments have also used golden shares to retain some control over companies managing privatized services (Pezard, 1995–1996). Enforceable mission orientation can counteract plutocracy and make externalities more visible to the system.

### **Temporal modulation**

In their quest for “people-first” governance, the founders of Orca Protocol do not want to depart from economic incentives altogether. But by creating “pods” of users with economic skin in the game, they hope to elevate longer-term thinking over short-term (and potentially short-sighted) feedback loops. Temporal mechanisms can make visible certain externalities that would be less salient under short-term decision-making. The conviction voting system that 1Hive uses, for instance, rewards prolonged commitment. Outside of cryptoeconomics, the US-based Long-Term Stock Exchange is an effort to create an equity market that encourages executives to plan around a more distant horizon than the quarterly cycle that dominates conventional markets. National constitutions generally seek to balance short-term and long-term elected offices, alongside career officials and lifetime appointments. Mechanisms such as term limits, sunset provisions, and reporting requirements can be used to modulate the time-frames around incentives, thereby placing them in the foreground or background, as appropriate.

Long-term incentives are not intrinsically better than short-term ones. But introducing diverse temporal frames can enable diverse inputs, making a system responsive to a wider range of concerns.

## Hybridity

The trend toward more complex forms of cryptoeconomic governance reflects a recognition that one-size-fits-all mechanisms are not adequate to the needs of projects or their communities. As Shagun Jhaver (2021) argues, multi-level governance is an important component of successful online communities. And Voshmgir & Zargham (2020) usefully describe blockchains as complex systems, inevitably subject to overlapping influences and emergent properties. To the extent that I offer a polemic here, it should not be understood as a call to replace one unified theory with another, but to recognize the already existing polycentricity of the field (Ostrom, 2010).

I have argued that pairing cryptoeconomics with political systems can help overcome the limitations that bedevil cryptoeconomic governance alone. Introducing purpose-centric mechanisms and temporal modulation can compensate for the blind-spots of token economies. But I am not arguing against cryptoeconomics altogether. Nor am I arguing that these sorts of politics must occur in every app and protocol. Liberal democratic theory permits diverse forms of association and business within a democratic structure, and similarly politics may be necessary only at key leverage points in an ecosystem to overcome the limitations of cryptoeconomics alone. Projects that provide politics as a utility service could enable streamlined “governance minimization” (Ehram, 2020) among other projects that utilize the service. Political logics could be especially valuable at the level of “cross-chain governance” (Chai, 2021), spanning multiple protocols and enforcing shared standards among them. There is also growing appreciation for building inclusive governance cultures off-chain (Shorin et al., 2021), and these can be even more critical to day-to-day governance than formal mechanisms.

Designers of distributed-ledger projects are already building much more sophisticated governance systems than they were just a few years ago, but there remains a widespread commitment to cryptoeconomics as self-sufficient for governance. I find that earlier critics of neoliberalism, together with more recent critics of cryptoeconomics, are right to worry about the dangers of rule by incentives alone, particularly incentives oriented around a narrow type of self-interest. The answer is not another totalizing paradigm, but a commitment to research and experimentation in more varied approaches to governance.

## Conclusion

When he first introduced Ethereum at a Bitcoin conference in early 2009, Vitalik Buterin ended his talk on the possibilities of distributed-ledger computation with a mic-drop reference to Skynet—the fictional computer system in the *Terminator* movies determined to exterminate the human race that created it (Buterin, 2014). This bit of hyperbole posed what might still be the fundamental problem of cryptoeconomic governance: How do we design programmable systems that are still accountable to humans and the never-quite-programmable things we care about? Long before blockchains, old-world stock exchanges and corporations produced incentives that stymie efforts to address collective challenges, such as climate change and economic inequality. But the autonomy of cryptoeconomic systems from external regulation could make them even more vulnerable to runaway feedback loops, in which narrow incentives overpower the common good. The designers of these systems have shown an admirable capacity to devise cryptoeconomic mechanisms of many kinds. But for cryptoeconomics to achieve the institutional scope its advocates hope for, it needs to make space for less-economic forms of governance.

Some might read this as a curmudgeonly complaint against an emerging technology whose possibilities are still only partly explored. Perhaps it is akin to the “blockchain paradox” of Vili Lehdonvirta (2016): that “once you address the problem of governance, you no longer need blockchain.” If cryptoeconomics needs a political layer, and is no longer self-sufficient, what good is cryptoeconomics? One answer might be that cryptoeconomics can be the basis for securing more democratic and values-centered governance, where incentives can reduce reliance on military or police power. Through mature designs that integrate with less-economic purposes, cryptoeconomics might transcend its initial limitations.

Politics needs cryptoeconomics, too. Distributed-ledger experiments have produced a uniquely creative barrage of exploration around voting systems, dispute resolution, collective resource management, and other processes that can advance democratic traditions (Mannan, 2019). While political theorists propose introducing mechanisms like sortition in novel ways (Landemore, 2020), blockchain communities are already doing so. By integrating cryptoeconomics with democracy, both legacies seem poised to benefit. I hope my provocation encourages future explorations into more specific cases of limitations in cryptoeconomic governance and strategies for how less-economic mechanisms might overcome them.



Even short of Skynet, the multi-billion-dollar stakes in distributed-ledger networks today have proven both unnerving and generative. Buterin (2021c) writes, “Crypto is the ultimate training zone: if you can build something that can survive in this environment at scale, it can probably also survive in the bigger world as well.” As this training zone develops, participants should be attentive not only to how their systems succeed and fail in cryptoeconomic terms, but also to what aspects of human flourishing they do not yet take into account. I suspect that doing so will mean building the confidence machine with well-chosen forms of trust.

## Disclosure

For purposes of ongoing experimentation, I have obtained quantities of tokens tied with many of the projects mentioned in this paper. I therefore stand to benefit from fluctuations in the value of these tokens, which represents a potential conflict of interest.

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