Decentralized Governance and Digital Asset Prices*

IAN APPEL JILLIAN GRENNAN

University of Virginia UC-Berkeley

ABSTRACT

For digital assets, is traditional corporate governance still ideal? We explore the governance of hundreds of prominent Decentralized Autonomous Organizations (DAOs), classifying 28 distinct characteristics related to aspects of governance such as token holder's privileges to bring improvement proposals, the voting process, consensus mechanisms, and security features. Our findings reveal that governance practices fostering broad participation or heightened security are linked with positive abnormal returns, while barriers to improvement proposal adoption correspond to negative returns. This outperformance is also evident in non-financial metrics like user growth and lack of security breaches. Further, evidence from a regression discontinuity design using close-call votes on governance proposals suggests these innovative governance features significantly change value. Overall, our research suggests the benefits of decentralized governance models surpass those that solely concentrate on traditional corporate concerns, such as reducing agency costs, in digital markets.

JEL classification: G32, G24, G28

Keywords: DAOs, cryptocurrency, blockchain, tokens, digital assets, decentralization, digital governance, Web3, FinTech, decentralized finance, DeFi, protocols, voting rights, cybersecurity, compliance, board of directors, delegates, cooperatives

*Authors: Appel, University of Virginia (e-mail: appeli@darden.virginia.edu), Grennan, UC Berkeley, Haas School of Business (e-mail: jillian.grennan@berkeley.edu). We thank Vivianna Fang He (discussant), Frank Partnoy, Jason Sandvik (discussant), Donghwa Shin (discussant), David Yermack (discussant), and seminar participants at UC-Berkeley, UC-Santa Barbara, University of Mannheim, U.S. Treasury Office of Financial Research, the American Economic Association, the American Law and Economics Association, the Conference on Empirical Legal Studies (U. Chicago), GSU-RFS FinTech Conference, the University Blockchain Research Initiative Conference, Drexel University's Corporate Governance Conference, SCU Crypto Conference, Owners as Strategist Conference (U. Bocconi), RnDAO, and the International Corporate Governance Forum for helpful comments on an earlier draft of this study. We gratefully acknowledge financial support from Ripple's University Blockchain Research Initiative. We thank Nick Dahlborg, Allison Hart, George Iyalomhe, Rayan Malik, Dominic Parante, and Ryan Schmitzer for helping to collect DAO improvement proposal data.

A prominent theory of the firm views it as a nexus of both explicit and implicit contracts between owners, managers, and other stakeholders (Coase, 1937; Jensen and Meckling, 1976). Agency conflicts emerge, in part, because contracts are incomplete and costly to enforce. Recently, blockchain technology has facilitated the creation of "smart contracts" that may mitigate these frictions. Smart contracts are programs that run on a blockchain (e.g., Ethereum) that automatically execute transactions or operations when pre-determined conditions are satisfied. Not only do smart contracts potentially expand the contracting space of organizations, but their self-executing nature renders the issue of enforcement moot.

An important byprodut of the advent of smart contracts is the emergence of a new organizational form: the Decentralized Autonomous Organization (DAO). DAOs are internet-based communities that raise funds via the sale of tokens. In contrast to corporations and other types of business organizations, they typically do not have managers or a board of directors. Rather, decision-making authority rests solely with the token holders, who submit and vote on proposals that dictate the DAO's operations. The governance structures of a DAO are defined by a smart contract that encodes features of the proposal and voting processes (e.g., support needed for a proposal to be implemented). Smart contracts can automatically implement proposals, thus negating, at least in part, the need for centralized management.

DAOs can have virtually any objective. Commonly, they are used to govern decentralized finance (DeFi) protocols that seek to provide traditional financial services without centralized intermediaries (Harvey et al., 2021; Makarov and Schoar, 2022). MakerDAO, which governs the protocol for the Dai stablecoin, provides an instructive example. Dai is a cryptocurrency that seeks to maintain a $1 value. To borrow Dai, users make an overcollateralized loan of an approved cryptocurrency and agree to an interest rate. If the value of the collateral falls below the loan amount, the loan is automatically liquidated via a smart contract. MakerDAO controls Dai's protocol. For example, the DAO decides which assets to lend against and sets corresponding collateralization rates. The governance token associated with MakerDAO, MKR, is traded on secondary markets such as Coinbase. Interest charged on DAI loans are, in part, used for repurchases. As of December 2022, MKR's market capitalization is approximately $500 million, down from a high of over $5 billion the previous year.

The growth of DAOs in recent years has been rapid. The first DAO, an investment collective called "The DAO," was created in 2016. As of the middle of 2022, there are over four thousand (Cointelegraph, 2022). Despite this growth, relatively little is known about the governance of DAOs. We aim to fill this gap in the literature. Specifically, we have three primary goals. First, we shed light on the economic activities of a sample of prominent DAOs by classifying their primary functions. Second, we highlight common governance mechanisms used by our sample of DAOs, specifically focusing on voting mechanisms/processes, organizational design, and security features. Third, we analyze the value implications of DAOs' governance structures, particularly focusing on features that promote or impede broad involvement in the proposal and voting process.

We collect data on the activities and governance structures of 150 prominent DAOs using both commercial databases and hand-collecting information from public sources (e.g., white papers). We classify each DAO into one of three broad categories (DeFi, Web3, and Infrastructure) and further refine their activities into 21 specific functionalities. We classify the governance structures for each DAO, focusing on 28 dimensions related to voting mechanisms/processes, organizational design, security features, and governance models. Finally, we assemble a comprehensive database of all 11,141 token holder proposals for our sample of DAOs. We use the market reactions associated with these proposals to study the relationship between governance design and asset prices.

We first analyze the activities of DAOs in our sample. In other words, what do DAOs do? Consistent with anecdotal evidence, the majority (60%) of DAOs in our sample primarily engage in DeFi. Common functionalities for DeFi DAOs include staking cryptocurrencies, borrowing/lending, decentralized exchanges, and stablecoins. Web3 DAOs, which create decentralized internet services and platforms, constitute 32% of the sample. The specific activities undertaken by these DAOs relate to virtual reality, talent/gig work, public goods, and asset management/crowdfunding. Finally, infrastructure DAOs, which primarily build tools for the crypto ecosystem (e.g., bridges to facilitate communication and asset transfers between blockchains) constitute 7% of our sample.

We next turn attention to DAOs' governance structures. We focus on four broad dimensions: voting mechanisms, voting processes, organizational design features, and security. For voting mechanisms, the bulk (70%) of DAOs in our sample use relative quorum voting, under which a proposal passes if it is approved by a majority of voters. The main alternative to a quorum system is weighted voting (19% of DAOs), in which votes have more/less influence based on a metric (e.g., time tokens have been owned). DAOs also use mechanisms that functionally encourage or discourage wide participation in the voting/proposal process. Examples of mechanisms that discourage participation include requirements (e.g., minimum token ownership) to create a formal proposal (63%) or to submit executable code along with a proposal (8%). Factors that encourage participation include holding votes "off-chain" so participants do not need to pay transaction ("gas") fees associated with "on-chain" votes. Organizational design features also potentially play an important role in the governance of DAOs. Some DAOs adopt corporate-like governance mechanisms, including the appointment of representatives/councils and the use of vesting schedules for key members. Over a quarter of DAOs in our sample delegate responsibility via the formation of subDAOs.

Security plays a unique role in the governance of DAOs. In contrast to shareholders of a corporation, token holders do not owe a fiduciary duty to each other, thus subjecting DAOs to "governance attacks" in which majority token holders expropriate the minority. A common form of such an attack features the use of short-term "flash" loans to obtain control of a DAO, allowing an attacker to implement any proposal, including the transfer of a DAO's treasury assets.[1] DAOs implement governance mechanisms to mitigate the risk of such an attack. For example, 44% of DAOs in our sample require a "multi-sig" (i.e., signatures from multiple authorized parties) for proposals to be implemented. Other common mechanisms include allowing the core or developer team to override proposals or requiring a delay prior to implementation.

In the second part of our analysis, we consider the relation between DAO governance and performance. We consider three fundamental aspects of DAO governance: broad participation in decision-making (inclusive governance features), barriers to adopting improvement proposals (re-

[1]For example, Beanstalk, a DeFi protocol, was subject to a governance attack in April of 2022. The attacker obtained a flash loan for approximately $1 billion, allowing it to bypass a supermajority voting requirement to make instant changes to the protocol via an improvement proposal. The attacker then created and approved a proposal to transmit funds from the protocol to itself. For additional details, see https://medium.com/coinmonks/beanstalk-exploit-a-simplified-post-mortem-analysis-92e6cdb17ace.

strictive governance features), and provisions that mitigate malicious behavior (security governance features). We classify the dimensions of governance discussed above into these three categories. For example, inclusive governance features include provisions such as permitting off-chain voting and providing incentives to vote. Restrictive governance features include quorum and supermajority voting requirements. Security features include requiring feasibility studies for proposals or multisig before implementation. Our analysis indicates that inclusive and security governance features are positively associated with abnormal returns around the adoption of improvement proposals, consistent with the idea that they improve DAO decision-making. However, provisions that impede the improvement proposal process are associated with lower abnormal returns.

We also rule out alternative stories through additional tests. For instance, there is the possibility that digital asset returns may be inefficient because of whales manipulating prices, segmented markets, or irrational exhuberance leading to deviations from underlying fundamentals (Griffin and Shams, 2020). Therefore, we extend our analysis to examine the relation between governance features and real effects. First, we focus on the DeFi DAOs as their business model is more readily understandable in that having greater trading volume is associated with higher profitability and performance. We find that our decentralized governance index is positvely related to DEX trading volume. Next, we focus on the two subcomponents unique to decentralized governance – security features and inclusivity provisions. We find having more secure governance features is negatively correlated with DAO-specific crypto news about scams or hacks. We also find that having more inclusive governance features is positively associated with user growth which we proxy for with social media followers.

Finally, while our index results are primarily descriptive corrlations, we also pursue an regression discontinuity design (RDD) approach for identification that exploits the discontinuous probability of enhancing DAO governance as a function of close-call votes on DAO improvement proposals. This approach follows the popular econometric approach in nonexperimental settings of examining discontinuous changes at known cutoffs (Lee and Lemieux, 2010; Cunat et al., 2012). As long as there is some arbitrariness in the cutoff (e.g., vote passes with 50.1% or fails with 49.9% of the vote), DAOs just below the cutoff are good comparisons to those just above the cutoff, or "as close as random." While RDD is known to have high internal validity due to the relatively mild assumptions required for identification (i.e., continuity near the threshold), the inferences made on those estimates may not generalize, due to low coverage within the optimal bandwidth. Indeed, the sample of close-call proposals that we have is only 5% of the full sample of proposals. Nevertheless, with this small sample, we still find that stronger decentralized governance is associated with positive crypto-adjusted returns for the digital assets in the week and month after the passing vote. This suggests that expected improvements in DAO governance through the approval of an improvement proposal is associated with positive abnormal returns, of 3.1%, and are consistent with the broader correlations we document.

By combining a large set of decentralized governance provisions into an index which proxies for traditional aspects of governance (strength of tokenholders rights through restrictive governance features) as well as novel aspects of digital governance (empowering tokenholder wisdom through inclusive governance features and eliminating hacking vulnerability through security features), and then studying the empirical relationship between this index and digital asset performance, we demonstrate that both traditional and novel aspects of digital governance matter for returns. Our analyses do not use random assignment, so we cannot make claims about causality. We do, however, explore the implications in a variety of contexts and assess the supportive evidence for our hypotheses about decentralized governance. For example, we show that our results are robust to looking at unadjusted returns, suggesting it is not something about our adjustment process. We also show that the patterns hold when looking at weekly and monthly returns, suggesting that it is not some type of private information being revealed solely through the voting process.

Our paper joins the growing literature on the economics of decentralization which advances in blockchain and artificial intelligence catalyzed. Yermack (2017) explores the implications of the transparency afforded by smart contracts (and blockchains, more generally) on various dimensions of firm behavior. Many of the DAOs that we study provide DeFi services, which are a prominent use of smart contracts (Harvey et al., 2021; Makarov and Schoar, 2022; John et al., 2023). A growing theoretical literature models how commitment enabled by smart contracts can mitigate underinvestment (Cong et al., 2022), limit conflicts between platforms and users (Sockin and Xiong, 2022), and alter incentives to compete (Cong and He, 2019; Goldstein et al., 2022). A related strand of literature studies the use of digital tokens to finance entrepreneurial ventures via initial coin offerings (ICOs) (e.g., Howell et al., 2020; Li and Mann, 2021). Papers also study specific protocols that are controlled by DAOs, such as decentralized exchanges (Augustin et al., 2022; Lehar and Parlour, 2023).

The application of smart contracts to DAOs is being explored in a series of contemporaneous papers. Appel and Grennan (2023) and Laturnus (2023) study the concentration of voting on DAO proposals, while Han et al. (2023) focus on conflicts of interest between a major investors ("whales") and retail participants. Retail investors beliefs when investing in digital assets are thought to be different than fundamentals (Kogan et al., 2023; Oh et al., 2022; White and Wilkoff, 2023). The focus on ownership of digital assets heralds back to prominent theories of ownership in organizational economics (Hansmann, 2000; Baker et al., 2002) and the role of commons. The theoretical literature, thus far, has focused more on the platform nature of decentralized organizations. For instance, Bena and Zhang (2023) model the optimal design of decentralized governance when the platform leverages user data as input. Mei and Sockin (2023) explore the extent to which speculation in native tokens on DAOs prohibit the adoption of the platform's services because the because the risk-adjusted benefit of adoption is lower than that from speculation. More recently, Atta-Darkua (2023) focuses on cash management at DAOs.

In addition, we contribute to the literature on crowd wisdom and the voice of investors (Admati and Pfleiderer, 2009; Broccardo et al., 2022). Financial economists are interested in the extent to which technology can be used to empower crowd wisdom and generate more efficient outcomes for shareholders (Dugast and Foucault, 2018; Cookson and Niessner, 2019; Da and Huang, 2020; Grennan and Michaely, 2020). While the evidence in the corporate context suggests that crowd wisdom improves market efficiency, the verdict is still out about crowd wisdom in the shareholder proposal context. In July 2022, the U.S. Securities and Exchange Commission (SEC) proposed amending Rule 14a-8, which governs shareholders right to make proposals to the management team for consideration, to allow more shareholder ideas to be considered. To the extent that a setting like the DAO setting resembles the expanded shareholder proposals, our evidence, which shows more inclusive governance processes, is associated with positive returns in digital asset markets points to the power of crowd wisdom (Grennan and Michaely, 2022; Dessaint et al., 2022).

Importantly, we expand the rich literature examining corporate governance, voting rights, and equity returns (Zingales, 1995; Gompers et al., 2003; Bebchuk et al., 2009; Cunat et al., 2012; Kalay et al., 2014). By showing a correlation between our decentralized governance index with digital asset returns, we further establish that democracy matters beyond equity markets but also that digital asset markets are not orthogonal to equity markets. This comparison between decentralized frameworks and their centralized counterparts build on important work doing exactly this focusing on the role of exchanges, broker-dealers, and even fiat currencies (e.g., Gorton and Zhang (2023)).

Finally, a key contribution of our study is to make the DAO governance data publicly available, so that other scholars can build for DAOs what is missing in the corporate governance literature. As Frankenreiter et al. (2021) demonstrate, corporate governance data availability matters and unfortunately, most corporate governance data is behind a paywall and difficult to collect, organize, and analyze because of jurisdiction-level differences (e.g., Delaware makes it very expensive to get corporate charters) which has led to significant error rates, often exceeding eighty percent, even in the G-Index. We hope that researchers use this rich setting to better understand fundamental questions like the need for active involvement in organizations such as through the extensive and costly monitoring (Appel et al., 2016; Lewellen and Lewellen, 2021) or if this alternative paradigm could render concerns about common ownership (Azar et al., 2018; Backus et al., 2021) less vital.

1 Institutional Background

1.1 What is a DAO?

DAOs are collectively-owned, internet-based organizations that are governed by token holders. The creation of this organizational form is credited to Dan Larimer who, in 2013, coined the term decentralized autonomous corporation (DAC). The following year, Vitalik Buterin, the inventor of Ethereum, expanded on this idea. In Ethereum's white paper, Buterin argued that the idea of a DAC could be applied to a broader set of (non-capitalist) organizations, and he discussed the implementation of such structures on the Ethereum blockchain.[2] The first DAO, a collective venture capital fund called "The DAO," was formed in 2016. While The DAO failed following a hack of its treasury, resulting in a "fork" (i.e., invalidation of transactions) of the Ethereum blockchain, its basic structure has been employed by subsequent organizations (Huberman et al., 2019).

The defining feature of DAOs is the lack of centralized leadership (e.g., a CEO). Instead, decision-making authority lies with the token holders of the DAO via a voting system. The decentralization of decision making is made possible by a smart contract, which formalize the rules of the DAO and automates on-chain transactions (e.g., making payments) when a proposal passes. Decentralization is further promoted by the use of a public blockchain (e.g., Ethereum) to deploy smart contracts, so a DAO's treasury and transactions are transparent and difficult to censor by third parties. Proponents of DAOs argue that decentralization confers important benefits, including improved decisionmaking, censorship resistance, and fairness.[3]

There is considerable uncertainty regarding the legal status of DAOs. Commentators often argue that, by default, DAOs are general partnerships. As such, the members of the DAO may be subject to joint and several liability for any claims against the DAO.[4]. However, some jurisdictions have formalized the legal status of DAOs. For example, Wyoming and Tennessee are the only states that explicitly recognize DAOs as legal entities, allowing them to register as LLCs. See Appendix A for additional discussion of the legal status of DAOs.

There is significant heterogeneity in the purpose of DAOs. A prominent class of DAOs control open source protocols. Such DAOs are often associated with DeFi protocols that provide traditional financial services in a disintermediated manner. For example, Uniswap is a decentralized exchange (DEX) that allows users to trade digital assets. Uniswap is open source, but changes to the protocol are determined by UNI token holders. However, many DAOs are not protocols and instead serve a

[2]See https://ethereum.org/669c9e2e2027310b6b3cdce6e1c52962/Ethereum_Whitepaper_-_Buterin_2014.pdf

[3]See Vitalik Buterin, "DAOs are not corporations: where decentralization in autonomous organizations matters" available at https://vitalik.ca/general/2022/09/20/daos.html.

[4]See, for example, "DAOs: A game changer in need of new rules" available at https://www.reuters.com/legal/legalindustry/daos-game-changer-need-new-rules-2022-10-07/

community function. Examples include investment DAOs (e.g., Pleasr DAO, Constitution DAO), social groups and members' clubs DAOs (e.g., Friends With Benefits, ApeCoin), public goods DAOs (e.g., BitDAO, Gitcoin), advocacy-oriented DAOs (e.g., Bankless, Lobby3).

While DAOs have a wide range of purposes, they share a number of common features. Given their goal of decentralization, DAOs act through collective action that is primarily implemented by code rather than through intermediaries and other formal systems. DAO voting can occur on chain or off chain. With on-chain voting, individual votes are submitted as transactions and recorded directly on the blockchain. Submitting votes on chain requires users to pay gas fees for each vote, but the outcome of the vote can be automatically implemented via smart contracts. In contrast, with off-chain voting, individual votes are not submitted as blockchain transactions and no gas fees are necessary. Instead, users are typically prompted to sign messages with their cypto wallets to vote, and the resulting data is stored via an oracle or some type of decentralized file storage system.

Given that DAOs are a new organizational form, there has been significant experimentation with aspects of their governance. In the next section, we provide a case study of Compound in order to motivate our discussion of governance.

1.2 Case Study: Compound

Compound is a lending platform built on the Ethereum blockchain that enables users to permissionlessly borrow or lend from a pool of pre-selected digital assets. Intermediaries do not set the interest rates after a detailed review process involving loan officers; instead, interest rates are determined algorithmically based on the proportion of assets lent out. In this sense, Compound is a typical DeFi application and its purpose is as a "protocol" rather than as a social community.

Compound launched on Ethereum in September 2018 via a tokenless protocol. While the protocol is non-custodial, initially, developers retained some centralized, administrative privileges. For the developers to remove themselves from this centralized position, and thereby, fulfill their purpose of creating a sustainable, decentralized protocol, the developers introduced a token called COMP meant to govern the protocol. Between April and June 2020, the administrators of the

Compound protocol replaced themselves with a community governance system, which meant that all changes or proposals had to come from community members. Specifically, the administrators demonstrate the proposal system to implement improvements when they held all of the tokens, and then they distributed tokens to all users of the platform.

Through the COMP token, the community of COMP users or those who bought the governance token on token platforms like Coinbase, are the ones responsible for making changes to the protocol by proposing improvements and voting on their adoption. Given the importance of U.S. securities law considerations, the documentation for the COMP token states there is no expectation of profit from COMP, which gives it a stronger case for passing the Howey Test used to determine if an asset is a security.[5] While there is no expectation of profit in the short run, there is a contingent of token holders who believe that they could propose, approve, and implement a mechanism to capture and claim some of the cash flows of the protocol in the future.

COMP tokenholders' belief that they could claim some of value from lending process and distribute that value to COMP holders is very similar to what traditional equity investors are doing when they invest in a non-dividend paying firms yet expect to receive payout at some future date. The key difference is that COMP holders can vote to receive payout. In contrast, for corporations, the board of directors, who have fiduciary duties to the shareholders who elect them, decide on whether and when cash distribution to shareholders occurs (i.e., dividends or repurchases).

While there are not examples of token holders electing to pay themselves dividends yet, there are example governance attacks that have done something very similar. For example, a hacker slowly bought enough stake (33%) to control True Seigniorage Dollar's DAO voting process, and then, the hacker proposed a new implementation in the code and using his own stake, passed the changes and when implementing it, and inserted a malicious code to mint himself coins that wiped out the value of the treasury. Because the possibility of bad actors is always present, protocols strive to develop and implement protections against such security risks. Two common approaches, which we detail below, are the requirement of multiple signatures and inability to access certain

[5]For a more detailed description of the legal risks and regulation surrounding cryptocurrencies, see Grennan (2022).

functions like minting.

In general, for a protocol like Compound, the majority of the proposals involve some type of business judgment. To date, the COMP community has introduced more than 100 proposals. Most proposals are technical and involve some type of process innovation (i.e., change a risk parameter changes, adjust the rewards, allow for different digital assets). Some proposals are business-oriented (e.g., hire an auditor, make changes to the developer team, develop a partnership) and some are about the soundness of the decentralization process (e.g., multisig considerations, voting thresholds).

Given that most of the proposals involve some type of business judgment, a key design decision then involves the threshold of voter participation required or the ability of voters to delegate their shares to experts. As of writing, Compound is governed entirely on-chain by COMP holders where one token equals one vote. COMP token holders can vote directly or delegate their voting rights to another party they deem more capable of making decisions. All governance activity occurs through Governor Alpha, which Compound developed itself, and then upgraded to Governor Bravo to include additional meta data features such as voter history. Governance Alpha and Governor Bravo are open-source, and as such, several other DAOs have adopted it.

At its core, the Governor system is code that has six main functions: proposal initiation, vote casting, vote delegation, proposal canceling, proposal queuing, and proposal execution. Any smart contract with a token balance can vote, and they do so in proportion to their token balance. In the case of COMP, the threshold is set such that anyone with 1% of tokens held or delegated to them is eligible to submit a proposal. The proposal must include executable code that can be directly incorporated into the protocol after passing. Once the proposal is submitted, there is a voting period. In the case of COMP token holders, the voting period is 3 days and either COMP holders or their delegates can cast their votes. There is a minimum threshold for the number of votes cast, and a passing threshold. For COMP, at least 400,000 votes must be cast and 50% is the passing threshold. The votes are made on-chain, so that the governance smart contract can total up the votes and determine what proposals pass. On-chain voting cost gas. Once passed, the proposed code becomes part of the queue to be executed after a delay period. The COMP delay period is two days and serves as an additional security measure.

1.3 DAO Governance

Modifiable voting parameters is a key feature of DAO governance. In fact, many of the other DAOs adopting Compound's Governor Alpha and Bravo systems tweak the modifiable voting parameters. For example, Uniswap follows the Compound Governor system, but they have a week long voting period and a lower threshold for bringing forward a proposal. This flexibility in voting features is consistent with design choices in business law whereby some corporations have strong governance practices and some weaker governance practices. For example, supermajority vote thresholds are considered weak governance (Gompers et al., 2003), and DAOs may select this feature as a default. Similarly, the rule that one must own a certain number of shares or tokens to make a proposal is also consistent with corporate law, in which a shareholder must own a certain amount of shares and have held them for a certain amount of time before being able to bring forward a shareholder proposal.

The main drawback of the Compound voting mechanism is that it is costly. The gas fees associated with voting on-chain do not incentivize voter participation. A few alternatives are available to avoid the costly gas fees associated with exercising the right to vote. First, vote signaling that occurs off-chain is common. Typically, discussions of improvement proposals occur among community members or users of the DAO protocol on a forum or Discord chat. Then, interested users vote on a preliminary proposal off-chain. For example, a preliminary vote may occur on Snapshot, which is an off-chain, open-source, gasless multi-governance client with easy to verify and hard to contest results. Snapshot also allows for flexible voting strategies (vote with tokens or NFTs) and systems (approval votes, quadratic voting, ranked choices, etc.).

Depending on the DAO's specific rules, there are a few options available when the preliminary proposal passes. First, administrators with mutlisig power can implement the proposal on-chain through a vote, and only the admins need to pay the gas fee.[6] Obviously, this is not as decentral-

[6]Multisig refers to systems that require multiple signatures to execute. For security reasons, developers distribute multiple administrative keys. This mitigates risk, because any hacker trying to access the digital

ized as the admins could presumably choose not to implement a proposal that received approval. Second, only a few community members vote on-chain for a formal proposal that is the same as the preliminary proposal, thereby avoiding all the fees. Third, some DAOs require the person submitting the proposal to have reserve funds available to refund the gas fees. Fourth, some oracles exist that could be used to execute proposals associated with off-chain votes on-chain.

From a voter participation perspective, the gas fee challenges are even more problematic, because most theories of voting acknowledge most voters are not the marginal voter, and thereby have no incentives to vote. In the corporate setting, regulators recognized the challenges associated with shareholder passivity, and through a series of reforms in beginning in the late 1980s, regulators set out to ensure that institutional investors like private pension plans diligently exercised their proxy voting duties as part of their fiduciary duties to their clients (Grennan and Michaely, 2019). In practice, this means that fiduciary responsibilities lead to high voter turnout and active governance even for passive investors (Appel et al., 2016). To meet their fiduciary duties, many asset managers began contracting out to third-party advisers like GlassLewis and ISS to get recommendations on how to vote. Presumably, especially for some complex DAOs, where users may not have the expertise to vote on a given topic, they could delegate their vote to someone who did have the authority.

In equity markets, collective action challenges are overcome by fiduciary duties that require institutional investors to actively vote shares on behalf of their clients. In contrast, DAOs face old governance challenges such as voter participation and new governance challenges that are intricately linked to the technology such as scale and resilience. For example, anecdotes suggest that voter engagement is typically low, so one-token-one-vote systems tend toward plutocracies, in which the whole is governed by those with the most voting rights, often the wealthiest.

Vote delegation lets token holders transfer their voting power to another user, without giving up control of the underlying asset. Vote delegation can be withdrawn at any time, which helps ensure that protocol advocates remain aligned with their supporters. Vote delegation lowers the

assets of the DAO are going to need several keys to do so. Similarly, no single bad actor in a community or a DAO is going to be able to withdraw funds without the consent or administrative access of others.

cost of participating in governance. By delegating to another user, token holders can avoid the time involved in reviewing each individual proposal as well as the transaction fee required to submit their vote on chain. Delegation also allows smaller token holders to aggregate their stakes to gain a bigger voice in governance discussions. As an example, many protocols have minimum vote requirements to submit and pass proposals; vote delegation gives ordinary users the opportunity to meet these thresholds despite limited personal resources.

2 Data

2.1 DAO characteristics

Our sample of DAOs includes all DAOs for which we could obtain both the text of the individual improvement proposals and the individual voting choices. In total, this gives us data on 150 DAOs and spans voting actions from 2020Q1 through 2022Q3. To better understand what the purpose and origin of each DAO is, we read each DAO's documents (i.e., white papers and FAQs) and any related writing such as Medium or Notion posts. We classify the DAOs into three mutually exclusive categories, which include DeFi, infrastructure, and Web3, based on their primary operational area. We recognize that young organizations often pivot as they learn what market niches they can fulfill. For this reason, we also create non-mutually exclusive subcategories for each DAO that recognizes the various functionalities that they encompass. The full list of DAOs, a Web2 site, and digital asset ticker are available in Appendix C.

2.2 DAO governance and voting

Unlike corporations, which have their corporate charter and bylaws and a uniform process through which shareholders can submit proposals for a potential vote at the annual shareholder meeting, there is no uniformity in the governance structure and voting process for DAOs. Thereby, we spend meaningful time going through each DAO's documents (i.e., white paper and FAQs) to understand and classify the governance structure and voting process. For example, we create variables characterizing the voting mechanism, the voting process, specific organizational design features, and security features that the DAOs put in place. Appendix B defines the dimensions of governance that we use in this study.

2.3 DAO improvement proposals

We gather over 10,141 improvement proposals from across four sources – Boardroom, Tally, Snapshot, and Messari. In Figure 1, we provide an example improvement proposal and voting outcomes from 1Inch, a decentralized exchange (DEX), that was started by the community member "Radar" on the 1inch Forum on July 21, 2021. It subsequently went to an off-chain vote on August 8, 2021. The proposal's aim was to implement a robust deflationary mechanism to 1INCH token that removes single-asset-staking and farming completely. We examine abnormal returns around proposal votes to measure DAO performance.

We also introduce a novel classification for the improvement proposals to estimate the scope of decisions being made. We access and examine each DAO's Forum, Discord, and voting page to understand the content of the proposal. In Figure 2, we showcase the wide range of issues requiring votes. For example, governance issues such as how treasury funds should be spent to evaluating the quality of code-upgrade proposals, to soliciting user feedback on service experience, aggregating product quality ratings, combating fake news, and many others. The five main categories of DAO improvement proposals include finance, governance, management, tokenomics, and viability. Below each main category are subcategories representative of different kinds of proposals.

2.4 Digital asset prices

We gather information on governance token prices as well as prices for the crypto market more generally. To do so, we compile data on individual digital assets from either Coingecko, Coinmarketcap, DeFi Lama, or Messari. While digital assets trade continuously, we use daily close prices based on UTC time to construct returns. To generate a crypto market factor, we follow a process similar to Liu et al. (2022). Our market factor is based on the overall market capitalization of five dominant digital assets (Bitcoin, Ethereum, Ripple, Cardano, and Solano). We then adjust daily governance token returns based on this dominant-five market factor.

In most of our specifications, we use proposal-specific returns. For these proposals, we calculate the returns from the date the voting window opens to when it ends. Some DAOs have voting windows of three days and others a week. In each case, we use the window that is unique to the DAOs specific voting process. The process at some DAOs may involve introducing and discussing potential proposals in Forums or on Discord ahead of time, but not all DAOs do this. For consistency, we use open as the beginning date. This open date represents when the proposal is formally submitted either on-chain or off-chain (e.g., to Snapshot) for a vote. In the Appendix, we consider a subsample for which we have the date of first discussion.

2.5 Real outcomes

We gather information on real outcomes for the DAOs in our study by focusing on trading volumes on decentralized exchanges (DEXs), occurrences of fraud or security breaches, and social media engagement metrics. Given that DeFi protocols and DEXs have the most well-established business model and make up the majority of our sample, we start by collecting data on the daily trading volumes of DEXs and DeFi protocols, normalizing the data in terms of Bitcoin equivalence for consistent cross-platform comparability. Next, we address the aspect of security within the DeFi space. Here, we utilize an advanced NLP algorithm to sift through Messari's crypto newsfeed, identifying and marking dates of known security breaches. The algorithm is designed to detect specific security-related keywords in articles from leading crypto news outlets. Additionally, we integrate data from Molly White's "Web3 is Going Just Great" archive, which provides a unique perspective on the challenges and exploits faced in the Web3 domain. Lastly, we turn our attention to the social media to proxy for user growth and engagement with DAOs. For this, we normalize and log-transform the number of daily social media users recorded on various platforms, including X (formerly known as Twitter), Reddit, and Telegram. In sum, our data on real outcomes spans DEX trading volume, security incidents, and user engagement, providing a rich dataset to analyze the real effects and decentralized governance.

3 Characterizing DAOs

3.1 Types and functions

Table 1 characterizes the DAOs in our sample. Panel A classifies DAOs into three broad categories: DeFi, Infrastructure, and Web3. DeFi DAOs have a primary function related to providing financial services in a decentralized manner (e.g., borrowing/lending). Infrastructure DAOs build tools to facilitate the development of crypto ecosystems (e.g., bridges to facilitate communication or asset transfers between blockchains). Web3 DAOs conduct a variety of activities related to new internet services and platforms facilitated by blockchains (e.g., gaming and media, social clubs).[7] We also include DAOs that promote such activities (e.g., via accelerators, crowdfunding, or the production of public goods) in the Web3 category. Overall, 61% (91 out of 150) of DAOs in our sample have a primary function related to DeFi, followed by Web3 (32%), and Infrastructure (7%). The third column of Panel A reports the number of proposals in our sample corresponding to each type. The average number of proposals per DAO is 71.6 for DeFi, 22.4 for infrastructure, and 83.4 for Web3.

Panel B of Table 1 sheds further light on the functions of DAO. For each of the three broad categories (DeFi, Infrastructure, and Web3), we provide a granular breakdown of the DAO functions that are common in our sample. Functions are not mutually exclusive and can cut across the three broad categories. For example, BitDAO, which has close to $2 billion in Treasury assets, invests in crypto projects and produces public goods by building tools for DAO governance/treasury management as well as providing grants to researchers.[8] The average DAO in our sample has more than three functions under our classification, highlighting the diverse nature of activities that they undertake. The most common DeFI functions include liquidity staking/yield farming (58 DAOs),

[7]While there is not a consensus definition of "Web3," decentralization as well ownership by users and creators are often regarded as important aspects. See, for example, Roose (2022)

[8]See https://medium.com/bitdao/introducing-bitdao-464ebf80eb56

decentralized exchanges (44), borrowing and lending (24), and stablecoins (20). The functions of infrastructure DAOs are data and identity (14), multichain (11), and tooling (37). The most common Web3 functions are virtual reality (55), talent/gig work (28), public goods (28), and asset management/crowdfunding (25).

3.2 Governance structures

Table 2 provides an overview of the governance structures used by DAOs. We focus on five dimensions of governance: voting mechanism, voting process, organizational design, security features, and governance system model. We discuss each dimension in turn.

First, we consider voting mechanics, arguably the cornerstone of DAO governance. The majority of DAOs in our sample (70%) use relative quorum voting. The use of this voting mechanism is similar for the two main categories, DeFi and Web3 (columns 3 and 4 of Panel B). A relatively small number of DAOs use variations on this idea. For example, 2% use relative quorum voting with a differential. Under this system, if token turnout is low for a vote, a greater differential in favor (e.g., 10 percentage points rather than a single vote) is required for a proposal to pass. Only 5% use a simple quorum which requires approval from a majority of tokens, not just voters. In general, most DAOs using quorum voting abide by the majority, but 11% have a supermajority requirement. The most common alternative to quorum systems is weighted voting (19%), which places different weights on token holders' votes. Common weighting criteria include reputation (e.g., how active has the token holder been in the DAO) or the amount of time tokens have been held. Other voting systems (e.g., quadratic or plural voting) are relatively rare, though 15% of DAOs have voting requirements that vary by the nature of the proposal.

Second, we turn attention to the voting process. For the majority of DAOs (73%), the voting process originates with informal discussion among token holders on a message board (e.g., Discord), allowing the community to discuss the merits of the proposal and offer refinements. Creating a formal proposal requires the use of a uniform template for 54% of DAOs, and 8%, primarily in the DeFi category, require proposals to include executable code. More than half of the DAOs in our sample impose other requirements to create a formal proposal (e.g., minimum token holdings). The majority of DAOs conduct votes "off chain," meaning that they use platforms that allow for token holders to vote on proposals without incurring transaction ("gas") fees associated with transactions on a blockchain. Finally, 45% of DAOs permit votes to be delegated to other parties.

Third, we examine the organizational design of DAOs. Some DAOs implement corporate-like structures to delegate decision-making. For example, 33% of DAOs in our sample have representatives or board-like councils, while 27% have "sub DAOs" that specialize in a particular aspect of the DAO's mission. Similar to executive compensation in corporations, 18% of DAOs have multi-year token-vesting schedules for key members. Finally, some DAOs reward participation by members via incentives to vote (8%) or proof of attendance badges (5%). Such incentives highlight the idea that token holders not only provide capital to the DAO but also the labor.

Fourth, we examine security features that mitigate the risk of malicious governance. To this end, some DAOs employ ex post mechanisms. For example, 44% of DAOs in our sample require multiple signatures ("multisig") to execute a proposal, a third (42% in the DeFi category) allow the core or developer team to override a proposal, and a quarter have a delay before implementation. Some DAOs also use ex ante mechanism, including requiring a feasibility study prior to a proposal vote (17%).

Finally, some DAOs are modeled after specific governance systems. Governor Bravo, Compound's governance system, is the model for 11% of DAOs in our sample. The governance of 6% of DAOs is based on a framework developed by Aragon, which offers a suite of tools to set up a DAO. Five percent of DAOs in our sample use some other governance model.

3.3 DAO Governance Index

Having characterized the DAO governance and voting process, we next seek to construct an index of decentralized governance. For every DAO, we add one point for every feature that enhances inclusivity and security and we deduct a point for features that serve to restrict the flexibility of DAOs and make them more corporate-like. Such a simple index may not accurately reflect the relative impact of different features, but we believe this simple design as a first attempt provides advantages in terms of transparency and reproducability.

4 Governance and Performance

We next seek to shed light on the relationship between DAO governance and performance. We consider three fundamental aspects of governance. First, to what extent do governance structures intended to promote broad participation in decision-making help DAOs achieve their goals? Such structures help to incorporate a of a variety of viewpoints in DAO decision-making, thus harnessing the wisdom of crowds. It is not clear, however, that inclusive decision-making is necessarily desirable. Token holders, similar to shareholders of a corporation, have incentives to free ride (Grossman and Hart, 1980; Shleifer and Vishny, 1986). If free rider incentives are sufficiently strong, encouraging broad participation in decision-making may be counterproductive. Second, do restrictions that impede DAO decision-making improve performance? Such restrictions help to ensure proposals have broad community support but also present a barrier to reforms. Finally, does security enhance a DAO's ability to achieve its objectives? On the one hand, mitigating the risk of malicious governance is obviously consistent with DAOs' objectives. On the other hand, security features may centralize decision-making and impede the flexibility inherent to this organizational form (e.g., by impeding how quickly proposals can be passed).

Addressing these questions requires a measure of DAO performance. In the corporate context, objectives are generally framed in terms of shareholder value maximization (e.g., Gompers et al., 2003; Bebchuk et al., 2009). DAOs, however, rarely focus on explicit goals related to token value. Rather, they often pursue non-financial objectives (e.g., long-term viability of the protocol, community growth). Our analysis assumes that the extent to which a DAO's objectives are achieved is reflected by the token price. For example, if a DAO's primary goal is the long-term viability of its protocol, we assume its token price will increase in response to actions that increase the likelihood of the survival of the protocol.

We classify individual governance provisions into three categories: Inclusive, restrictive, and security governance features. Inclusive governance features include provisions that encourage broad participation in DAO decision-making (e.g., providing uniform templates for proposals, off-chain voting, providing incentives to vote). Restrictive governance features limit members' abilities to implement proposals (e.g., quorum or supermajority requirements). Finally, security features reduce the risk of governance attacks (e.g., requiring feasibility studies for proposals or multisig before implementation). Figure 3 provides a heat map of the provisions within each category. In the following analysis, we consider the relationship between individual governance provisions and token returns associated with improvement proposals. We also conduct analysis on indexes of governance features, which we construct by summing the indicators for each type of provision.

Table 3 analyzes the relationship between individual DAO governance structures and proposal returns. The dependent variable is market-adjusted returns associated with proposals, measured from the introduction of a proposal to the end of voting. All specifications include year, geographic location, and DAO-type fixed effects. Column 1 reports coefficients for inclusive governance features. Estimated coefficients are positive for 3 of the 5 variables (off-chain voting, ability to delegate votes, and proof of attendance badges). The coefficient for providing uniform proposal templates is negative, and the coefficient for vote incentives is statistically indistinguishable from zero. Column 2 reports coefficients for restrictive governance features. Coefficients are negative for 4 of 8 governance features (executable code requirements, voting requirements varying by content, the use of board-like councils, and the inclusion of subDAOs), 2 out of 8 provisions have positive coefficients (formal proposal requirements and supermajority voting), and the coefficient for a quorum requirement is indistinguishable from zero. Column 3 reports coefficients for security features. Coefficients for multisig requirements, feasibility studies, and the use of Safesnap are positive, while those for delays before implementation and ability of the core/developer team to override proposals are indistinguishable from zero. Finally, columns 4 and 5 report specifications including all three types of provisions. Patterns observed in columns 1–3 are even more apparent in these specifications. Specifically, 4 out of 5 coefficients are positive for inclusive governance features, 6 out of 8 are negative for restrictive governance features, and 4 out of 5 are positive for security features.

In Table 4 we aggregate provisions into indexes of inclusive, restrictive, and security governance features by summing indicators for the provisions within each group. This test is similar to the analysis of corporate governance provisions by Gompers et al. (2003) and Bebchuk et al. (2009). Echoing the findings in Table 3, we find that the inclusive voting and security indexes are positively related to abnormal returns, while the restrictive voting index is negatively related. Our inferences are similar when considering indexes individually (columns 1-3) or in joint specifications (columns 4-5).

If decentralized governance matters for digital asset returns, then the price should quickly incorporate any changes brought about. In Table 5, we aggregate into a single index of decentralized governance and analyze the relationship between the index and proposal returns. It shows a strong, positive correlation between the index and the proposal returns both with and without controls. Further, when we analyze the relation between a low score on the index, a middle score on the index, and a high score on the index, we see a consistent pattern that higher decentralized governance scores are associated with higher proposal returns whereas lower decentralized governance index scores are associated with lower proposal returns.

We recognize that these are interesting conditional correlations and not causal. Given that DAO token returns are analyzed following a vote on a new improvement proposal, our study faces the difficulty that new provisions may be driven by contemporaneous conditions at the DAO (i.e., the adoption of provision may be related to the governance structure and provide a signal of whoever suggested the proposal's private information). One way to avoid these difficulties is to take a calendar-horizon approach and view the relationship over time. In Table 6, this is exactly what we do. We use the aggregated single index of decentralized governance and analyze the relationship between the index and weekly crypto-adjusted returns. It shows a strong, positive correlation between the decentralized governance index and weekly crypto-market adjusted returns. Further, when we analyze the relation between a low score on the index, a middle score on the index, and a high score on the index, we see a consistent pattern that higher decentralized governance scores are associated with higher weekly returns whereas lower decentralized governance index scores are associated with lower weekly returns.

Overall, our findings highlight the relation between governance and performance in DAOs. Dimensions of governance that promote broad participation by token holders or reduce the likelihood of malicious behavior are associated with improved performance. However, governance provisions that impede improvement proposals are negatively related to performance.

4.1 Alternative Return Specifications

In Appendix D, we consider several alternative return specifications as robustness checks. First, we examine the non-crypto market adjusted returns and document, in almost all cases even stronger statisical results. This suggests this is not something driven by our adjustment process. Next, for a subsample of proposals, we have the date the discussion started online. We re-run our analysis based on the longer window and find similar results. Third, we examine monthly returns rather than weekly returns. Again, we find similar patterns even when we focus on monthly returns.

4.2 Testing Real Outcomes

Next, we examine the efficacy of the digital asset return findings by evaluating real outcomes. We do so because there are many factors other than decentralized governance that potentially influence digital asset pricing dynamics. Among these factors are the potential roles of major investors (often termed "whales") play, which can lead to price manipulation, the existence of segmented markets, and the phenomenon of irrational exuberance, which might lead to deviations from underlying economic fundamentals. To address these concerns and to rule out these alternate narratives, our analysis is extended to explore the connection between our decentralized governance index and components and real outcomes associated with performance and success.

First, we look within the DeFi space as these DAOs often offer a more straightforward business model to interpret. In this context, a higher trading volume typically correlates with improved profitability and overall performance. As demonstrated in Table 7, we estimate a positive relationship between the decentralized governance index and the trading volume on DEXs. This suggests that effective decentralized governance, as proxied by our index, contributes more broadly to the organization and helps to attract additional trading activity within these platforms.

Second, we delve deeper into the components of the decentralized governance index by concentrating on two distinctive features of decentralized governance relative to traditional corporate governance: security features and inclusivity provisions. As shown in Columns 3 and 4 of Table 7, our analysis uncovers a negative correlation between adopting security features and the frequency of DAO-specific crypto news pertaining to scams or hacks. This indicates that stronger security measures in decentralized settings may contribute to reducing the incidence of such adverse events. Finally, as shown in Columns 5 and 6 of Table 7, we find a positive association between the inclusivity components of our governance index and user growth. Here, we use the number of social media followers as a proxy for user growth. This suggests that governance systems that are more open and inclusive may be more effective in attracting and engaging users.

In summary, our additional tests exploring real outcomes are consistent with the tests that we have highlighting crypto-market adjusted returns associated with the voting window for improvement proposals. This suggests that the significance of security and inclusivity in the decentralized governance index are not just mere speculation or the influence of whales, but rather, on average, reflect a respective real link to trading volumes, hacks or scams, and user engagement.

4.3 Estimates from a Regression Discontinuity Design

One important question that arises when trying to infer the value of decentralized governance is exactly what to look at when considering returns. While we have examined returns surrounding proposals as well as real outcomes, for identification purposes we would want to identify the the impact of decentralized governance changes with an "as if random" counterfactual. Close-call governance proposals offer one such option. However, we note that given that the vast marjority of proposals pass or fail by more than 80% this meaningfully limits our sample size. Nevertheless, we have 624 governance proposals (or about 5% of our total proposals) that are close-call and that would directly impact the contstruction of our index. For instance, 1inch had a proposal to reduce the quorum threshold which would making the voting process less restrictive in our index. In determining our restricted sample, we focus only on observations within an optimally derived bandwidth of the threshold. Specifically, we follow the econometric procedure developed by **?** and further refined in **?** and **?**. The procedure allows for different bandwidth selection on either side of the threshold and distinguishes between mean-square error (MSE) optimal bandwidths and coverage error ratio (CER)-optimal choices. Different estimators will have different bias and variance terms depending on the outcome of interest and the assumptions on heteroskedasticity and clustering. We consider a variety of optimal bandwidth selectors and report them in Appendix D. We observe little difference between the various MSE-optimal bandwidth selectors and the various CER-optimal selectors, and so choose the median bandwidth for each type as it may have better rate properties. We do, however, see more meaningful differences between the MSE-optimal and CER-optimal choices, something we explore more when we turn to the evidence for changes in DAO performance.

We start by exploring the visual evidence for increases in DAO performance following the support of governance improvement proposal. Figure 4 presents visual evidence for a discontinuity in changes in crypto-adjusted returns during the week after the close-call vote as a function of the vote share crossing the win threshold. This discontinuity is critical for estimating the effect of an increase in the governance index on DAO performance. The figure illustrates the discontinuity by plotting the average change in performance as a function of the proximity to the win threshold. If the proposal passes as is indicated by being above the win threshold, then the average DAO changes by 0.03 to 0.05 standard deviations depending on the line of best fit. This establishes visual evidence for a discontinuity.

Next, Table 8 shows the regression evidence for the discontinuity. Columns (1) to (4) examine the MSE-optimal bandwidth, columns (5) to (8) examine the CER-optimal bandwidth, and columns (9)-(12) use the full sample but allow for flexible polynomial form on either side of the threshold. Panel A examines short-term returns (one week). In all 12 regressions, we find a statistically significant increase in digital asset returns in relation to a close-call improvement proposal passing. Across the various specifications, the point estimates are similar and suggest anywhere from 0.048 to 0.057 standard deviation increase. Panel B examines the returns in the longer-term as proxied by one month returns. Here, again, we see variation across the bandwidths. While each estimate is positive, only the MSE-optimal and polynomial bandwidths are statistically significant. Taken together, this evidence is consistent with prior results suggesting that decentralized governance matters for digital asset returns.

5 Conclusion

The DAO organizational form has gained prominence in recent years. In contrast to corporations, decision-making authority lays with members of the DAO rather than mangers. In this paper, we provide some of the first evidence on governance mechanisms used by DAOs and examine their performance implications. We document rich heterogeneity in both the purposes of DAOs and the governance mechanisms they employ. Consistent with anecdotal evidence, the majority of DAOs have primary functions related to DeFi, though a sizable portion engage in other activities related to Web3. DAOs employ a variety of governance structures related to voting mechanisms and processes, organizational design, and security. We find that dimensions of governance that promote inclusive decision-making and security are positively associated with DAO performance. Restrictive structures that impede reaching consensus are associated with worse performance on average.

In conclusion, our research reveals that DAOs, with their unique, experimental approach to decentralized governance, offer valuable insights beyond academic realms, particularly for policymakers navigating the evolving landscape of decentralized economics. Our findings indicate that traditional legal structures like the limited-liability joint stock corporation or the hearladed precedent of Delaware General Corporate Law, might not be ideally suited for DAOs. We find that DAOs adopting traditional corporate structures to reduce agency costs tend to see a decrease in the value of their associated digital assets. In contrast, DAOs that prioritize inclusivity and security witness an increase in digital asset value. This underscores the need for lawyers, regulators, and academics to consider and embrace new governance models that align with and bolster the growth of the decentralized ecosystem.

References

Admati, A. R., Pfleiderer, P., 2009. The wall street walk and shareholder activism: Exit as a form of voice. Review of Financial Studies 22, 2645–2685.

Appel, I., Gormley, T., Keim, D., 2016. Passive investors, not passive owners. Journal of Financial Economics 121, 111–141.

Appel, I., Grennan, J., 2023. Control of decentralized autonomous organizations. AEA Papers and Proceedings 113, 182–185.

Atta-Darkua, V., 2023. Decoding decentralized liquidity: A study of dao cash reserves. Working Paper .

Augustin, P., Chen-Zhang, R., Shin, D., 2022. Yield farming. working paper .

Azar, J., Schmalz, M., Tecu, I., 2018. Anticompetitive effects of common ownership. Journal of Finance 73, 1513–1565.

Backus, M., Conlon, C., Sinkinson, M., 2021. Common ownership in america: 1980–2017. American Economic Journal: Microeconomics 13, 273–308.

Baker, G., Gibbons, R., Murphy, K. J., 2002. Relational contracts and the theory of the firm. Quarterly Journal of Economics 117, 39–84.

Bebchuk, L., Cohen, A., Ferrell, A., 2009. What matters in corporate governance? The Review of financial studies 22, 783–827.

Bena, J., Zhang, S., 2023. Token-based decentralized governance, data economy and platform business model. UBC Working Paper .

Broccardo, E., Hart, O., Zingales, L., 2022. Exit versus voice. Journal of Political Economy 130, 3101–3145.

Calonico, S., Cattaneo, M. D., Farrell, M. H., 2019. Optimal bandwidth choice for robust bias-corrected inference in regression discontinuity designs. The Econometrics Journal 23, 192–210.

Coase, R. H., 1937. The nature of the firm. Economica 4, 386–405.

Cointelegraph, 2022. Dao: The evolution of organization. White Paper .

Cong, L. W., He, Z., 2019. Blockchain disruption and smart contracts. The Review of Financial Studies 32, 1754–1797.

Cong, L. W., Li, Y., Wang, N., 2022. Token-based platform finance. Journal of Financial Economics 144, 972–991.

Cookson, A. J., Niessner, M., 2019. Why don't we agree? Evidence from a social network of investors. Journal of Finance forthcoming.

Cunat, V., Gine, M., Guadalupe, M., 2012. The vote is cast: The effect of corporate governance on shareholder value. Journal of Finance 67, 1943–1977.

Da, Z., Huang, X., 2020. Harnessing the wisdom of crowds. Management Science forthcoming.

Dessaint, O., Foucault, T., Fresard, L., 2022. Does alternative data improve financial forecasting? the horizon effect. Journal of Finance .

Dugast, J., Foucault, T., 2018. Data abundance and asset price informativeness. Journal of Financial Economics 130, 367–391.

Frankenreiter, J., Hwang, C., Nili, Y., EricTalley, 2021. Cleaning corporate governance. University of Pennsylvania Law Review 170, 1–70.

Goldstein, I., Gupta, D., Sverchkow, R., 2022. Utility tokens as a commitment to competition. Working Paper .

Gompers, P., Ishii, J., Metrick, A., 2003. Corporate governance and equity prices. The quarterly journal of economics 118, 107–156.

Gorton, G., Zhang, J. Y., 2023. Taming wildcat stablecoins. University of Chicago Law Review 90, 909.

Grennan, J., 2022. Fintech regulation in the United States: Past, present, and future. working paper .

Grennan, J., Michaely, R., 2019. The deleveraging of U.S. firms and institutional investors' role. Working Paper .

Grennan, J., Michaely, R., 2020. FinTechs and the market for financial analysis. Journal of Financial and Quantitative Analysis 56, 1877–1907.

Grennan, J., Michaely, R., 2022. Artificial intelligence and high-skilled work: Evidence from analysts. working paper .

Griffin, J., Shams, A., 2020. Is bitcoin really untethered? The Journal of Finance 75, 1913–1964.

Grossman, S. J., Hart, O. D., 1980. Takeover bids, the free-rider problem, and the theory of the corporation. The Bell Journal of Economics pp. 42–64.

Han, J., Lee, J., Li, T., 2023. Dao governance. Working paper .

Hansmann, H., 2000. The Ownership of Enterprise. Harvard University Press.

Harvey, C., Ramachandran, A., Santoro, J., 2021. DeFi and the Future of Finance. Wiley.

Howell, S. T., Niessner, M., Yermack, D., 2020. Initial coin offerings; financing groth with cryptocurreny token sales. Review of Financial Studies 33, 3925–3974.

Huberman, G., Leshno, J. D., Moallemi, C., 2019. An economist's perspective on the bitcoin payment system. AEA Papers and Proceedings 109, 93–96.

Jensen, M. C., Meckling, W. H., 1976. Theory of the firm: Managerial behavior, agency costs and ownership structure. Journal of Financial Economics 3, 305–360.

John, K., Kogan, L., Saleh, F., 2023. Smart contracts and decentralized finance. Annual Review of Financial Economics 15.

Kalay, A., Karakş, O., Pant, S., 2014. The market value of corporate votes: Theory and evidence from option prices. The Journal of Finance 69, 1235–1271.

Kogan, S., Niessner, M., Makarov, I., Schoar, A., 2023. Are cryptos different? evidence from retail trading. Working paper .

Laturnus, V., 2023. The economics of decentralized autonomous organizations. Working paper .

Lee, D. S., Lemieux, T., 2010. Regression discontinuity designs in economics. Journal of Economic Literature 48, 281–355.

Lehar, A., Parlour, C., 2023. Decentralized exchange: The uniswap automated market maker. Journal of Finance .

Lewellen, J., Lewellen, K., 2021. Institutional investors and corporate governance: The incentive to be engaged. Journal of Finance 77, 213–264.

Li, J., Mann, W., 2021. Digital tokens and platform building. Working Paper .

Liu, Y., Tsyvinski, A., Wu, X., 2022. Common risk factors in cryptocurrency. Journal of Finance 77, 1133–1177.

Makarov, I., Schoar, A., 2022. Cryptocurrencies and decentralized finance (defi). Working Paper .

Mei, K., Sockin, M., 2023. A theory of speculation in community assets. Working Paper .

Oh, S., Rosen, S., Zhang, A. L., 2022. Investor experience matters: Evidence from generative art collections on the blockchain. Working paper .

Roose, K., 2022. What is web3? New York Times p. March 18.

Shleifer, A., Vishny, R. W., 1986. Large shareholders and corporate control. Journal of Political Economy 94, 461–488.

Sockin, M., Xiong, W., 2022. Decentralization through tokenization. Journal of Finance .

White, J., Wilkoff, S., 2023. The effect of celebrity endorsements on crypto: Evidence from initial coin offerings (icos). Working paper .

Yermack, D., 2017. Corporate Governance and Blockchains. Review of Finance 21, 7–31.

Zingales, L., 1995. What determines the value of corporate votes? The Quarterly Journal of Economics 110, 1047–1073.

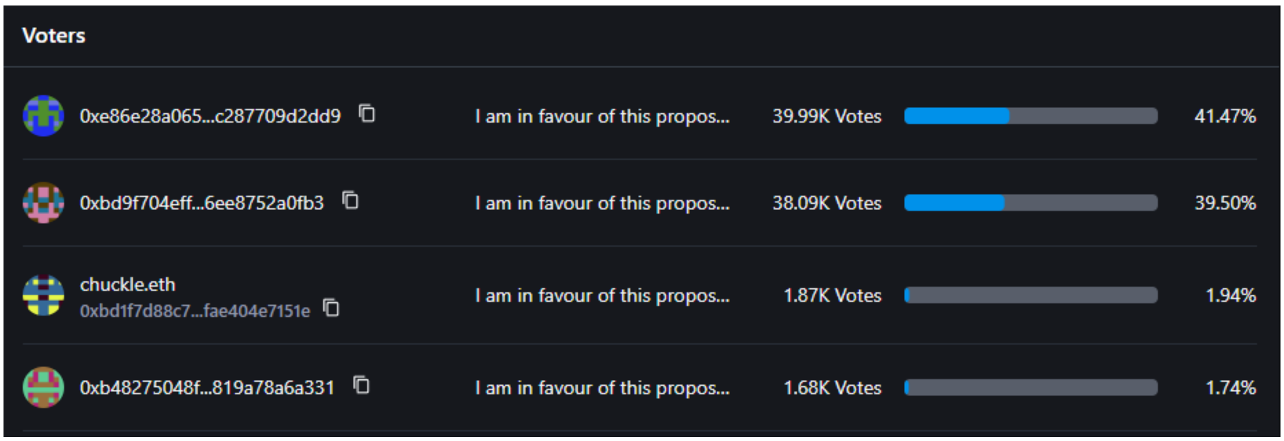

Figure 1. Voters on 1Inch proposal. The figure depicts the voters and outcomes on a 1inch proposal.

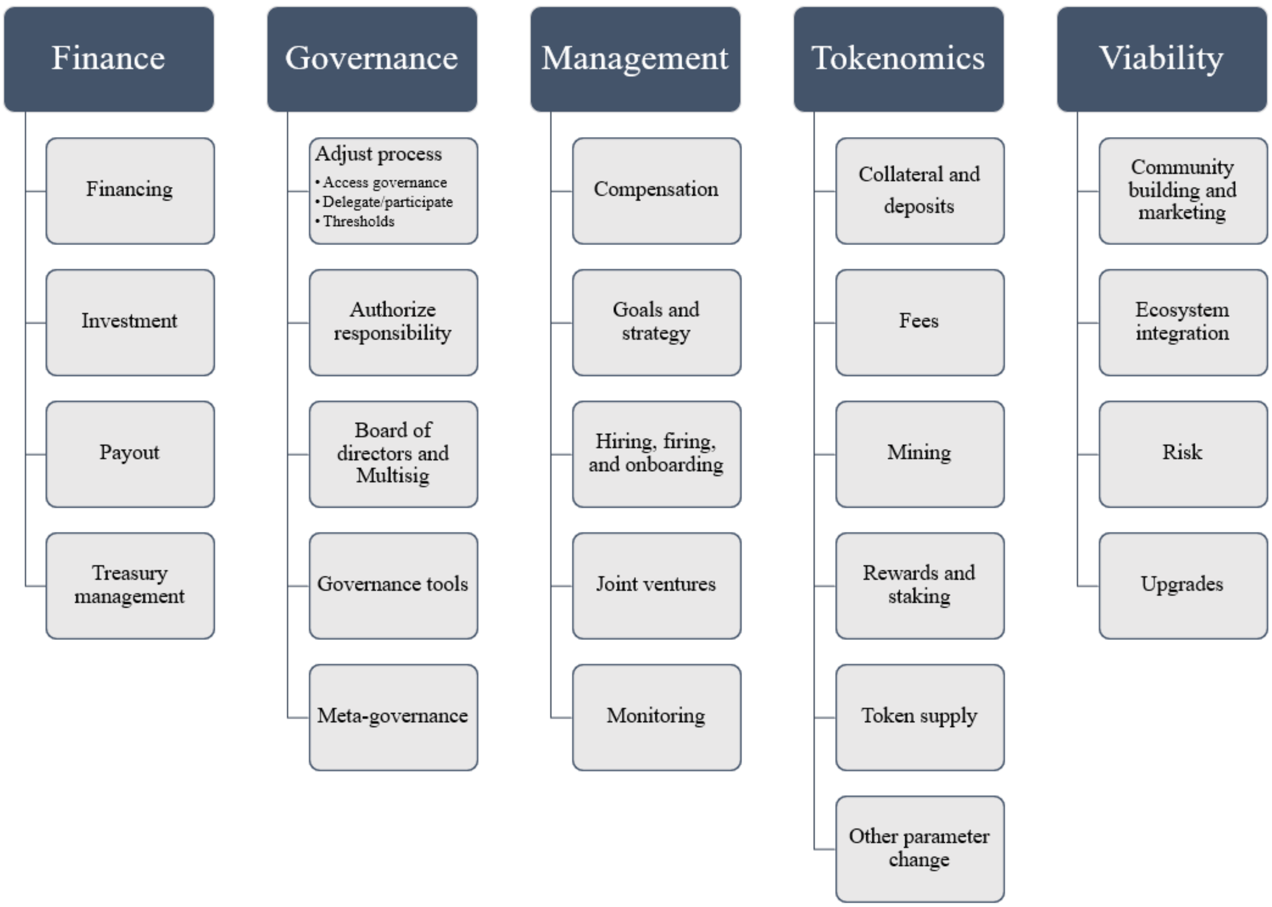

Figure 2. DAO improvement proposal categories. The figure depicts the five main categories of DAO improvement proposals: finance, governance, management, tokenomics, and viability. Below each main category are subcategories representative of different kinds of proposals.

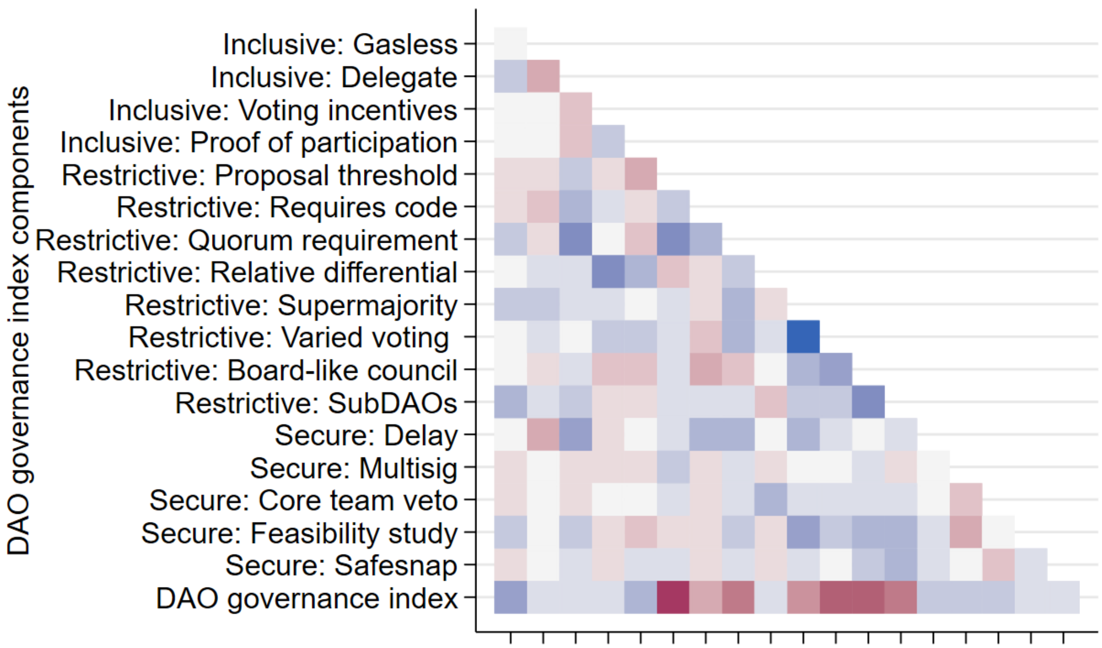

Figure 3. DAO governance heatmap. The DAO governance index includes 17 components which are categorized into three main groups: inclusive, restrictive, and secure. This figure displays a heatmap of the correlations between the DAO governance index, which is displayed on the bottom row, and all of its individual components. Red reflects a negative correlation and blue a positive correlation.

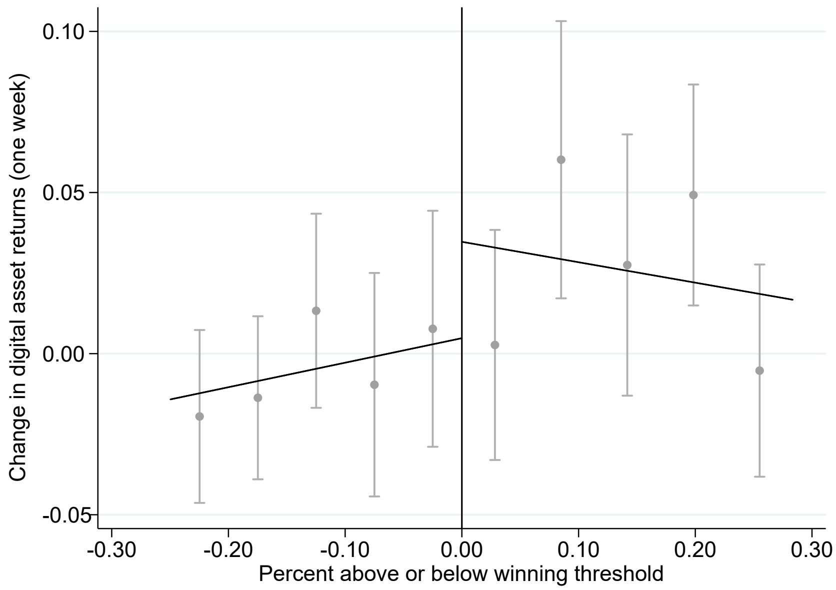

Figure 4. The figure displays the average change in digital asset value following a close-call vote involving a governance improvement proposal. If the improvement proposal wins as is indicated by being above the passing threshold based on the DAOs' rules, then the digital asset is significantly more likely to increase in value. Each dot is the average change in digital asset value within the optimally derived bin width as derived by Calonico et al. (2019) and contains multiple underlying observations. The lines associated with the dots represent the upper and lower 90% confidence intervals. Solid lines are estimated using linear regressions on either side of the threshold and represent a monomial fit.

Table 1.

Characterizing DAOs

This table presents the percentage of DAOs with each governance provision. The data are collected from DAO white papers, Forum rules, and Snapshot pages. See Appendix A for detailed information on each of these provisions. The sample consists of 150 DAOs for which we have proposal text, voting outcomes, and digital asset returns.

Panel A. Main DAO types	Number of DAOs (1)	Number of Proposals (2)
DeFi	91	6513
Infrastructure	11	246
Web3	48	4005
Total	150	10764
Panel B. Detailed DAO functionalities		
DeFi		
Borrowing/lending	26	1266
Decentralized exchanges and automated market makers	44	3911
Derivatives, leverage, and margin trading	17	925
Insurance and risk management	10	346
Liquidity staking and yield farming	58	3248
Payments	12	642
Stablecoin	20	1714
Infrastructure		
Data and Identity	14	595
Multichain	11	262
Tooling	37	2049
Web3		
Asset management/crowdfunded investments	25	1715
Entrepreneurial accelerators	5	193
Gaming	14	1931
Media and content curation	18	2274
NFTs	6	178
Porting assets between Web3 and real world	10	537
Public goods	28	1186
Single-purpose	10	499
Social clubs	21	1169
Talent and gig work	28	1137
Virtual and augmented reality	55	4248

Table 2.

DAO Governance Provisions

This table presents the percentage of DAOs with each governance provision. The data are collected from DAO white papers, Forum rules, and Snapshot pages. See Appendix A for detailed information on each of these provisions. The sample consists of 150 DAOs for which we have proposal text, voting outcomes, and digital asset returns.

	All DAOs	DeFi DAOs	Web3 DAOs
	(1)	(2)	(3)
DAO voting mechanism			
Simple quorum voting	5%	2%	10%**
Relative quorum voting	70%	70%	71%
Relative quorum voting with differential	2%	2%	2%
Supermajority voting	11%	12%	8%
Weighted voting	19%	21%	13%
Quadratic voting	3%	2%	2%
Conviction voting	1%	0%	2%
Lazy consensus	7%	8%	4%
Voting requirements vary by content	15%	15%	10%
DAO voting process			
Ideas start via informal discussion (e.g., on Discord)	73%	78%	67%
Requirements to create a formal proposal (e.g., hold X tokens)	63%	67%	56%
Uniform, transparent templates for proposals	54%	54%	50%
Requires executable code in proposal (i.e., no developer help)	8%	11%	2%*
Off-chain gasless vote for signaling (e.g., Snapshot)	88%	85%	94%
Quorum requirement (e.g., 5% of token supply)	56%	66%	33%***
Votes can be delegated to individuals or DAOs	45%	49%	38%
DAO organizational design features			
Includes subDAOs	27%	26%	31%
Includes appointed representatives or board-like councils	33%	29%	35%
Includes multi-year, token-vesting schedule for key members	18%	23%	6%**
Provides incentives to vote (e.g., increased rewards)	8%	10%	4%
Provides proof of attendance badges	5%	2%	10%**
Security features			
Delay or timelock before implementation	25%	25%	25%
Multisig before implementation	44%	47%	38%
Core or developer team can override	33%	42%	21%***
Feasibility study (e.g., technical, financial, security)	17%	16%	17%
Safesnap	7%	11%	0%**
Governance systems modeled after			
Aragon	6%	7%	4%
Governor Bravo	11%	14%	8%
Other	5%	7%	0%*

Table 3.

Return Regression on Improvement Proposals by Individual Governance Features

This table estimates the relation between governance features and crypto-market adjusted returns from the opening date of the proposal to the voting end. The governance features are grouped into the subindex components: inclusive, restrictive, and secure. Year, geographic location, and DAO type fixed effects are included. Controls include DAO age, an indicator for an early proposal, vote duration, and the detailed industry characterization. Robust standard error are reported in parantheses and significance at the 10 percent, 5 percent and 1 percent levels is indicated by *, **, and ***, respectively.

	Dep. var. = Crypto-adjusted returns on proposal votes				
	(1)	(2)	(3)	(4)	(5)
Inclusive governance features					
Uniform, transparent templates for proposals	-0.312**			0.018	-0.004
	(0.136)			(0.136)	(0.161)
Off-chain gasless vote for signaling	0.300**			0.510***	0.761***
	(0.145)			(0.162)	(0.223)
Votes can be delegated to individuals or DAOs	0.176*			0.737***	0.757***
	(0.096)			(0.153)	(0.186)
Provides incentives to vote	0.590*			1.000***	2.383***
	(0.354)			(0.357)	(0.535)
Provides proof of attendance badges	0.240			2.104***	2.775***
	(0.420)			(0.602)	(0.694)
Restrictive governance features					
Requirements to create a formal proposal		0.621***		0.455***	0.715***
		(0.135)		(0.124)	(0.224)
Requires executable code in proposal		-0.238		-0.512**	-0.969***
		(0.170)		(0.219)	(0.285)
Quorum requirement		-0.417**		-0.682***	-0.806***
		(0.163)		(0.168)	(0.284)
Relative quorum voting with differential		-0.064		-2.191***	-3.320***
		(0.141)		(0.461)	(0.681)
Supermajority voting		0.213		-0.409**	-1.095***
		(0.156)		(0.206)	(0.253)
Voting requirements vary by content		-0.621***		-0.726***	-0.502**
		(0.203)		(0.189)	(0.238)
Includes appointed representatives of board-like council		-0.480***		-0.658***	-0.919***
		(0.125)		(0.149)	(0.220)
Includes subDAOs		-0.691***		-1.043***	-0.813***
		(0.101)		(0.164)	(0.165)
Secure governance features					
Delay or timelock before implementation			0.126	0.287*	0.474**
			(0.135)	(0.161)	(0.236)
Multisig before implementation			0.188*	0.359***	0.935***
			(0.097)	(0.118)	(0.213)
Core or developer team can override			-0.107	0.106	0.372
			(0.100)	(0.144)	(0.237)
Feasibility study			0.518***	1.467***	1.998***
			(0.197)	(0.294)	(0.387)
Safesnap			0.748**	1.114***	0.432
			(0.337)	(0.355)	(0.385)
Fixed effects	Yes	Yes	Yes	Yes	Yes
Controls	No	No	No	No	Yes
Observations	8,534	8,534	8,534	8,534	8,534
R-squared	0.019	0.029	0.020	0.061	0.084

Table 4.

Return Regression on Improvement Proposals by Governance Indices

This table estimates the relation between governance features and crypto-market adjusted returns from the opening date of the proposal to the voting end. The governance features are grouped into the subindex components: inclusive, restrictive, and secure. Year, geographic location, and DAO type fixed effects are included. Controls include DAO age, an indicator for an early proposal, vote duration, and the detailed industry characterization. Robust standard error are reported in parantheses and significance at the 10 percent, 5 percent and 1 percent levels is indicated by *, **, and ***, respectively.

	Dep. var. = Crypto-adjusted returns on proposal votes				
	(1)	(2)	(3)	(4)	(5)
Inclusive voting features	0.056			0.318***	0.199**
	(0.042)			(0.062)	(0.086)
Restrictive voting features		-0.288***		-0.489***	-0.484***
		(0.041)		(0.063)	(0.076)
Secure voting features			0.178***	0.399***	0.419***
			(0.051)	(0.072)	(0.104)
Fixed effects	Yes	Yes	Yes	Yes	Yes
Controls	No	No	No	No	Yes
Observations	8,534	8,534	8,534	8,534	8,534
R-squared	0.014	0.019	0.016	0.030	0.053

Table 5.

Return Regression on Improvement Proposals by Decentralized Governance Index

This table estimates the relation between decentralized governance index and crypto-market adjusted returns from the opening date of the proposal to the voting end. The governance features are grouped into a single index defined as inclusive less restrictive plus secure features. Year, geographic location, and DAO type fixed effects are included. Controls include DAO age, an indicator for an early proposal, vote duration, and the detailed industry characterization. Robust standard error are reported in parantheses and significance at the 10 percent, 5 percent and 1 percent levels is indicated by *, **, and ***, respectively.

	Dep. var. = Crypto-adjusted returns on proposal votes							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Decentralized governance index	0.362***	0.324***						
	(0.049)	(0.059)						
Low index			-0.489***	0.034				
			(0.087)	(0.122)				
Mid-range index					0.366***	0.089		
					(0.103)	(0.133)		
High index							1.219***	1.014***
							(0.243)	(0.276)
Fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	No	Yes	No	Yes	No	Yes	No	Yes
Observations	8,534	8,534	8,534	8,534	8,534	8,534	8,534	8,534
R-squared	0.029	0.052	0.015	0.043	0.016	0.043	0.023	0.048

Table 6.

Weekly Regressions by Decentralized Governance Index

This table estimates the relation between decentralized governance index and crypto-market adjusted returns using weekly returns. The governance features are grouped into a single index defined as inclusive less restrictive plus secure features. Robust standard error are reported in parantheses and significance at the 10 percent, 5 percent and 1 percent levels is indicated by *, **, and ***, respectively.

	Dep. var. = Crypto-adjusted weekly returns							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Decentralized governance index	0.513***	0.526**						
	(0.195)	(0.219)						
Low index			-2.367***	-1.763**				
			(0.771)	(0.778)				
Mid-range index					-0.416	-1.060*		
					(0.600)	(0.643)		
High index							2.196**	2.454**
							(0.918)	(0.961)
Observations	11,330	11,330	11,330	11,330	11,330	11,330	11,330	11,330
R-squared	0.015	0.025	0.015	0.025	0.015	0.025	0.015	0.025

Table 7.

Real Outcomes and Decentralized Governance

This table estimates the relation between the decentralized governance index and real outcomes. The key dependent variables are average DEX trading volume, an indicator variable for a hack or scam, and user growth. Observations are at the DAO-month level. Year, geographic location, and DAO type fixed effects are included. Controls include DAO age and detailed industry characterization. The decentralized governance index represents when the governance features are grouped into a single index defined as inclusive less restrictive plus secure features. Robust standard error are reported in parantheses and significance at the 10 percent, 5 percent and 1 percent levels is indicated by *, **, and ***, respectively.

	Dep. var. = Real outcomes					
	DEX volume		Hack or scam		User Growth	
	(1)	(2)	(3)	(4)	(5)	(6)
Decentralized governance index	0.433**	0.418**				
	(0.211)	(0.199)				
Secure voting features			-0.491*	-0.426*		
			(0.281)	(0.237)		
Inclusive voting features					0.846**	0.232*
					(0.385)	(0.123)
Fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Controls	No	Yes	No	Yes	No	Yes
Observations	1,589	1,589	2,610	2,610	2,610	2,610
R-squared	0.033	0.041	0.034	0.035	0.033	0.041

Table 8.

Digital Asset Performance after Close-call Governance Improvement Proposal Vote

This table presents regressions of the change in digital asset performance on whether or not an improvement proposal won in a close-call vote. Panel A examines digital asset performance in the short-term (one week), and Panel B examines digital asset performance in the long-term (one month). Estimates in columns (1) to (4) use the optimal mean square error (MSE) bandwidth; columns (5) to (8) use the optimal coverage error rate (CER) bandwidth, and columns (9) to (12) introduce a polynomial on each side of the threshold and uses the full sample. Pre-vote DAO controls include whale ownership, functionality, and governance. Robust standard errors are reported below the coefficient estimates. ***, ** and * indicate p-values of 1%, 5%, and 10%, respectively.

	Dep. var. = Crypto-adjusted returns (one week post vote)											
	MSE-optimal bandwidth				CER-optimal bandwidth				Polynomial			
Panel A.	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Governance improvement proposal wins	0.048***	0.049***	0.048***	0.048***	0.049**	0.050**	0.050**	0.049**	0.057***	0.048**	0.057***	0.055**
	(0.017)	(0.017)	(0.017)	(0.017)	(0.025)	(0.024)	(0.025)	(0.024)	(0.021)	(0.021)	(0.022)	(0.021)
Size of bandwidth	[0.250, 0.285]				[0.143, 0.163]				Full sample			
Pre-vote DAO controls	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Time fixed effets	No	No	Yes	Yes	No	No	Yes	Yes	No	No	Yes	Yes
	Dep. var. = Crypto-adjusted returns (one month post vote)											
	MSE-optimal bandwidth				CER-optimal bandwidth				Polynomial			
Panel B.	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Governance improvement proposal wins	0.031**	0.031**	0.030**	0.029**	0.026	0.026	0.026	0.027	0.036**	0.037**	0.030*	0.030*
	(0.013)	(0.013)	(0.013)	(0.013)	(0.019)	(0.019)	(0.019)	(0.019)	(0.016)	(0.016)	(0.016)	(0.016)
Size of bandwidth	[0.250, 0.285]				[0.143, 0.163]				Full sample			
Pre-vote DAO controls	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Time fixed effets	No	No	Yes	Yes	No	No	Yes	Yes	No	No	Yes	Yes

Internet Appendix

A Legal Analysis of DAOs

Regulators reduced regulatory uncertainty surrounding DAOs by commenting on the sale of the original DAO tokens. As described in Grennan (2022), the SEC maintained that the extent to which an instrument has the signs or indications of an investment contract, then it should be offered and sold in compliance with the securities laws. Another key regulatory decision came in December 2017, when the SEC took its first enforcement action relating to the sale of digital assets, ultimately issuing a cease-and-desist letter to halt the sale of Munchee tokens after concluding that the sale was in fact an unregistered securities offering. A key lesson of the Munchee enforcement action was that a developer's decentralized design was not enough to bypass the securities distinction and instead, expectation of profit is what mattered. Specifically, since Munchee offered the digital assets to prospective investors under an investment intent, it constituted a securities offering subject to the U.S. federal securities laws.

As the regulator stance helped to clarify an organization can classify itslef as a DAO, but if the organization is aiming to make a profit of some sort, then it is likely an implied partnership without any partnership agreement to define rights and obligations of members. This means lack of limitation of liability, fiduciary duties, and rights that members have against other members.

States recognized the need for a legal framework for DAOs. In 2018, Vermont enacted a law that enables Blockchain-Based Limited Liability Company (BBLLCs). Then, in 2019, the first legally established Decentralized Autonomous Organization (DAO) under United States law was formed in Vermont. The protocol, known as dOrg, deployed its DAO on the Ethereum blockchain, and also formed a BBLLC, known as dOrg LLC. By linking the DAO to the BBLLC, the DAO obtained official legal status, allowing it to enter contractual agreements and offer participants liability protections. Other states have created similar legislation. As of July 1, 2021, Wyoming put into place legislation pertaining to DAOs that made it possible to register DAOs and to convert existing LLCs into DAOs without requiring residence in the state. In contrast, Delaware, the most common jurisdiction for corporations to incorporate, still does not recognize DAOs but does recognizes organizations that do not classify themselves as implied partnerships.

Unlike corporations, which typically can obtain default charters from the state that they are incorporating in, there is no default DAO structure. Instead, a set of service providers are helping DAOs with their legal structure. For example, in 2017 Tribute Labs was launched to support and create DAO communities through open-source frameworks built on Ethereum. The founders' vision was to help crypto projects create, execute, and store legal agreements in one place. Its main function today is to provide software and support services to help form and run DAOs, with the crucial feature of handling legal matters. The team was able to successfully wrap traditional DAOs as legal entities. In July 2021, Tribute Labs launched the Tribute DAO framework, which enables building and managing DAOs through a modular architecture offering.

Other open source technologies are also helping to facilitate the creation of DAOs. Specifically, there are many DAO tooling companies that serve to help DAOs set up legally, to outsource aspects of the governance process, especially off-chain voting and social dynamics, and to facilitate some functions commonly associated with personnel economics like human resources.

B Variable Definitions

Main categories of DAOs

- **DeFi DAOs** or "decentralized finance" DAOs provide financial products and services without relying on centralized intermediaries by using smart contracts on a blockchain.
- **Infrastructure DAOs** provide products and services (i.e., tools) that DAOs use to operate. These tools may include software for governance or treasury management, data to execute smart contracts, smart contract templates, cross-chain services, etc.
- **Web3 DAO** help non-financial consumers connect to the benefits of blockchain by allowing both users and developers to orchestrate actions with tokens in a decentralized manner.

DAO DeFi functionalities

- **Borrowing and lending** indicates that the DAO is involved in making loans that are denominated in cryptocurrencies. These loans may involve collateral that is a traditional asset or digital asset and the loans may be made to individual for real-world purposes.
- **Decentralized exchanges and automated market makers** indicates that the DAO is involved in a DEX or AMM. A DEX is a digital currency exchange that allows users to buy crypto through direct, peer-to-peer cryptocurrency transactions, all over an online platform without an intermediary. An AMM is a type of DEX protocol that automates the process of pricing and matching orders on the exchange, typically using an algorithm to determine the prices at which buyers and sellers can trade assets. This means that users can purchase and sell crypto assets in a trustless, peer-to-peer fashion without needing to rely on a custodian or other third party.
- **Derivatives, leverage, and margin trading** indicates that the DAO is involved in some type of more advanced financial product or service such as derivatives trading in which digital asset like a perpetual derives its value from some other digital assets.
- **Insurance and risk management** indicates that the DAO is involved in the insurance or risk management business. This functionality can vary widely from DAO members deciding which insurance claims are valid to risk modeling platforms for quants controlled by a DAO.

- **Liquidity staking and yield farming** indicates that the DAO offers liquidity staking and/or yield farming. Liquidity staking is the process of staking tokens in pools to earn rewards in return. Yield farming is a method of earning rewards (i.e., interest) by depositing your cryptocurrency into a pool with other users. In most cases, the pooled funds are used to carry out other decentralized finance services via smart contracts actions such as borrowing or lending.
- **Payments** indicates that the DAO is involved in transactions associated with various payment means and card schemes such as providing solutions to interconnect with traditional banks or payment service providers.
- **Stablecoin** indicates that the DAO has its own stablecoin, which is a cryptocurrency designed to trade at par with a reference asset (e.g., the US dollar).

DAO infrastructure functionalities

- **Data and identity** indicates that the DAO is involved in a decentralized market to publish, discover, and use data or is involved in confirming identity or transactions.
- **Mutlichain** indicates that the DAO is involved in building some type of infrastructure for blockchain users that enables cross-chain activity (e.g., transfers or communication)
- **Tooling** indicates that the DAO is involved in providing some type of tooling for DAOs whether this be tools to automate traditional organizational activities like risk management and expense management or tools for DAO-specific services like decentralized voting and crowdfunding.

DAO web3 functionalities

- **Asset management/crowdfunded investments** indicates that the DAO is a blockchain alligned group of investors that team up to buy goods whether they be culturally significant investments like NFTs or more traditional business investments.
- **Entrepreneurial accelerators** indicates that the DAO is involved in funding early stage blockchain and Web3 ventures.

- **Gaming** indicates that the DAO is involved in development, marketing, and monetization of video games with a Web3 component.
- **Media and content curation** indicates that the DAO is involved in the media or publishing business and/or provides some type of curation and storytelling to convey certain information or value to Web3 users.
- **NFTs** indicates that the DAO has some NFT aspect to it.
- **Porting assets between Web3 and real world** indicates that the DAO is involved in porting assets or providing provenance for real-world assets in the Web3 space with the most common applications so far being art and real estate.
- **Public goods** indicates that the DAO is involved in the efficient distribution of donations to fund a project or service that will benefit the well-being of all members of a society (e.g., Web3 education).
- **Single-purpose DAOs** indicates that the DAO has a single purpose (e.g., buying the Constitution).
- **Social clubs** indicates that the DAO has a social aspect and that part of tokenholders benefits are the entertainment, social interaction, and positive vibes.
- **Talent and gig work** indicates that the DAO is involved in providing either technical or non-technical talent and advisory services for either real-world or Web3 organizations.
- **Virtual and augmented reality** indicates that the DAO is involved in some type of experience in which users can participate in or create their own shared virtual- or augmented-reality world.

DAO voting mechanisms

- **Simple quorum** is the most basic mechanism used for decision-making in DAOs, and it requires that the majority of tokens vote in favor of a proposal for it to pass. One token is equivalent to one vote and the overall quorum is defined by the total token supply.
- **Relative quorum** is similar to a simple quorum in that it requires the majority of tokens vote in favor of a proposal for it to pass and that one token is equivalent to one vote. But

the overall quorum is defined relative to the total number of tokens that actually vote. Even if only one token holder votes, this is still a quorum.

- **Relative quorum voting with differential** is a relative quorum with the additional requirement that the differences between the yes votes and the no votes have a certain percentage differential. For example, if 20% of the tokens vote, and the required differential is 15%, and 6% of the total tokens votes "no" then, the proposal would fail, because the differential would require that the threshold to define the quorum is raised to 21%, because 6% no plus at least 15% more yes = 21% quorum.
- **Supermajority voting** stipulates a higher percentage, usually between 67% and 90% for a proposal to pass. This higher threshold requirement means it is often very difficult to pass a proposal.
- **Weighted voting** or other reputation-based voting takes into account the contributions a voter made rather than the capital the voter provided. Common considerations include how long the tokens have been held for or give a higher weight to certain member tokens based on their history of participation in the DAO. Reverse escrow voting also falls into this category. Reverse escrow voting is a process whereby holders of vesting tokens are allowed to participate in governance, but with their voting weight reduced using a multiplier applied to their token balances.
- **Quadratic voting** allows would-be voters to buy tokens and acquire greater voting power. The voting power increases by the square of the number of tokens a voter has. So, while the representative impact of a single vote is one, it increases to four for two votes and nine for three votes. This system comes with its pros and cons: It discourages people without a vested interest from voting on an issue and gives a minority a more prominent voice on issues they are passionate about.
- **Conviction voting** leads to the approval of proposals based on the aggregated preference of community members, expressed continuously. This means token holders are continuously asserting their preference for which proposals they would like to see approved, rather than casting votes one time. A member can change their preference at any time, but the longer

they keep their preference for the same proposal, the stronger their conviction gets. This added conviction gives long-standing community members with consistent preferences more influence than short-term participants potentially trying to influence a single vote.

- **Lazy consensus** assumes that all improvement proposals are legitimate unless proven otherwise. Each proposal once formalized is put in a queue and schedule for an on-chain transaction that will execute by default at a pre-specified date, unless it is specifically challenges by a member. In practice, this means that uncontroversial decisions can be made quickly and without costs or voter exhaustion, but more divisive proposals can be challenged in when necessary.
- **Voting requirements vary by content** This indicates that the DAO stipulates different voting requirements based on the content of the proposal. For example, supermajority to remove a member of the DAO council or conviction voting for the DAO budget.

DAO voting process

- **Ideas start via informal discussion (e.g., on Discord)** Before bringing a proposal forward, members are encouraged to post their proposal idea for discussion either in a Forum chat or on Telegram or Discord for members to review and comment on.
- **Requirements to create a formal proposal (e.g., hold X tokens)** Requirements to make a formal proposal vary. A common requirement is to hold a certain number of tokens. Typically, the number is so large that the individual putting forward the formal proposal has an outsized interest (e.g., a founder or an early investor) rather than an ordinary community member. Other common requirements include a minimum number of comments during the idea stage or receiving support from the majority in a temperature check vote at the idea stage. In some DAOs, this is a point at which the proposal must be reviewed by a governance subDAO or elected representatives to ensure it meets some requirement.
- **Uniform, transparent templates for proposals** This indicates that the DAO has proposal templates that members should adopt as a standard. While there has yet to be any uniform templates across all DAOs, some DAOs provide their own templates to promote

transparency and ensure token holders have sufficient information to make an informed decision.

- **Requires executable code in proposal (i.e., no developer help)** indicates that the DAO requires the community member proposing the change to write the code themselves that implements the change on-chain.
- **Off-chain gasless vote for signaling (e.g., Snapshot)** indicates that the DAO uses off-chain gasless voting for signaling purposes. Snapshot and Tally are two popular DAO tooling companies, but some DAOs have created their own bespoke gasless voting systems.
- **Quorum requirement (e.g., 5% of token supply)** means that the DAO has a minimum acceptable number of tokens that need to vote to make the proceedings of the vote valid. This requirement is typically meant to ensure there is sufficient representation before any changes are made
- **Votes can be delegated to individuals or DAOs** indicates that users can allow another entity to vote tokens on their behalf.

DAO organizational design features

- **Includes subDAOs** indicates that the DAO has subDAOs which can either be like subsidiaries in a corporation or like business lines in a corporation. Typically, the subDAOs operate with autonomy while remaining strategically and monetarily aligned with the main DAO.
- **Includes appointed representatives or board-like councils** indicates that the DAO has a structure that follows some type of hierarchical management model, in which representatives are either appointed or elected.
- **Includes multi-year, token-vesting schedule for key members**
- **Provides incentives to vote (e.g., increased rewards)** provides some type of monetary incentive to vote such as an increased yield or issuance of additional governance tokens.
- **Provides proof of attendance badges** POAP, meaning Proof of Attendance Protocol, refers to an NFT (non-fungible token) that is given to participants in an event, course, or

activity. Essentially, it is a badge of honor or recognition for having been present or having participated in an online or in-real-life event.

DAO security features

- **Delay or timelock before implementation** indicates that the DAO has a delay period (e.g., 48 hours) before the change is implemented on-chain.
- **Multisig before implementation** indicates that the DAO requires a certain number of authorized multiple signers to sign-off on the implementation of a proposal before it can go into effect.
- **Core or developer team can override** indicates that the core or developer team can veto or override a proposal even if it passes all other hurdles.
- **Feasibility study (e.g., technical, financial, security)** indicates that the community requires a feasibility study for any variety of reasons. For example, have the code audited before implementation for security reasons. Or estimate the expected financial returns from implementing a proposal.
- **Safesnap** allows trustless, on-chain execution based on the outcome of off-chain votes, via a Gnosis Safe module connected to Reality.eth (an escalation-game-based oracle). This means teams can continue to secure their assets in a Gnosis Safe, avoid needing gas for on-chain voting, and ease into decentralization.

Governance systems modeled after

- **Aragon** is a tooling company for DAOs that provides modular systems for DAO developers to use when composing their organization. Aragon created a system that divides governing power into three branches: legislative, executive, and judicial. Aragon Govern is a smart contract that acts as a DAO's executive branch, responsible for enacting the will of the community as expressed by the legislature. The legislative role is performed by Aragon Voice, where token holders may make proposals and vote on them. If there is a disagreement between the executive and legislative branch, then the digital dispute is resolved in Aragon

Court. In "digital court," subjective disputes are handled just as in a traditional court system with human judgement, except here jurors scroll in their dashboard and vote, thus completing actions to earn special tokens. Aragon is often used to implement Lazy Consensus voting within DAOs.

- **Governor Bravo** indicates that the DAO uses a system based on Compound's Governor Alpha or Governor Bravo (the upgraded version) for its governance. This means that the governance runs on-chain, so that there is no way for an admin to change smart contract parameters without an on-chain vote. The main features are that anyone with enough votes can propose a change to the protocol. Any token holder can cast a token-weighted vote on a proposal. Any tokenholder can assign their vote to anyone including themselves. Anyone can cancel a proposal if the proposer stops having enough votes. Once a proposal passes, anyone can queue the proposal in the timelock and after the timelock expires the proposal is executed on-chain.

Real outcomes

- **DEX volume** is daily trading volume on a $BTC-equivalent basis for comparability across decnetralized exchanges and protocols. Data is pulled from Coingecko for all decentralized exchanges or DeFi protocols with swap functionality. We then match by name those that are governed by a DAO.
- **Hack or scam** is an indicator variable equal to one marking the date of a known security breaches. To identify security breaches, we use an natural language processing (NLP) algorithm to identify articles likely to have information about security breaches from Messari's crypto newsfeed, which mostly covers prominent crypto outlets like Blockworks, CoinDesk, Cointelegraph, Crypto News, the Daily HODL, Decrypt, etc... This initial screen is based on a dictionary that includes security breach keywords such as "attack," "breach," "butchering," "cyberattack," "hacker," "malicious," "scam," "security," "spoofing," etc... as well as dictionary for litigious words in finance developed by **?**. We supplement this crypt-news-based data with Molly White's "Web3 is Going Just Great" archive which is a weekly Substack

chronicling exploits in Web3.

- **Social metrics** is the log of a normalized number of daily social media users/followers for a DAO. The social media outlets, we pull data from include X (formerly known as Twitter), Reddit, and Telegram. For each social media outlet, we first normalize the quantity of users to account for differences in popularity across platforms. If more than one series is available for a particular DAO, we take the maximum across the multiple series. We pull this from a variety of sources that puport to track it (e.g., X, Messari, and Coingecko). If days are missing between observations, we interpolate between days.

C List of DAOs

Table C.1.

DAOs in Sample

This table lists the DAOs in our sample as well as the digital asset ticker and website.

DAO name (1)	Ticker (2)	DAO website (3)
earthfund	1EARTH	https://www.earthfund.io/
1inch dao	1INCH	https://1inch.exchange/
aave	AAVE	https://aave.com/
abachi	ABI	https://www.abachi.io/
akropolis	AKRO	https://www.akropolis.io/
alchemix dao	ALCX	https://app.alchemix.fi/
aladdin dao	ALD	https://aladdin.club/
alpaca finance dao	ALPACA	https://www.alpacafinance.org/
alpha dao	ALPHA	https://alpha-dao.com/
amp dao	AMP	https://amptoken.org/
angle labs	ANGLE	https://app.angle.money/
angle protocol	ANGLE	https://www.angle.money/
yuga labs	APE	https://www.yugalabs.io/
ap wine dao	APW	https://www.apwine.fi/
armorfi/ease	ARMOR	https://ease.org/
airswap	AST	https://www.airswap.io/
baconcoin	BACON	https://www.baconcoin.com/
badger dao	BADGER	https://app.badger.finance/
balancer dao	BAL	https://balancer.finance/
bankless dao	BANK	https://www.bankless.community/
beanstalkfarmseth	BEAN	https://bean.money/
beethoven X	BEETS	https://beets.fi/
bifi	BIFI	https://bifi.finance/
bit dao	BIT	https://www.bitdao.io/
bancor dao	BNT	https://home.bancor.network/
barnbridge	BOND	https://barnbridge.com/
boring dao	BOR	https://www.boringdao.com/
b.protocol dao	BPRO	https://www.bprotocol.org/
basis dollar	BSD	https://www.basis.io/
biswap	BSW	https://biswap.org/
redactedcarteleth	BTRFLY	https://redacted.finance/
braintrust	BTRST	https://www.usebraintrust.com/
pancakeswap	CAKE	https://pancakeswap.finance/
celer network	CELR	https://www.celer.network/
city dao	CITY	https://www.citydao.io/
credmark	CMK	https://www.credmark.com/
candle	CNDL	https://candlelabs.org/
developer dao	CODE	https://www.developerdao.com/
compoud dao	COMP	https://compound.finance/

Table C.2.

DAOs in Sample (Cont.)

This table continues the DAOs in our sample as well as the digital asset ticker and website.

DAO name (1)	Ticker (2)	DAO website (3)
cryptocorgis	CORGI	https://cryptocorgis.co/
cream dao	CREAM	https://cream.finance/
curvefi	CRV	https://curve.fi/
cryptex/c2x	CTX	https://c2x.world/
primedao	D2D	https://www.prime.xyz/
streamreth	DATA	https://streamr.network/
decentral games	DG	https://decentral.games/
dhedge	DHT	https://www.dhedge.org/
dodo dao	DODO	https://dodoex.io/
doodles dao	DOODLE	https://doodles.app/
piedao	DOUGH	https://www.piedao.org/
drc	DRC	https://drcglobal.org/
dsd	DSD	https://dynamicsetdollar.medium.com/
dydx	DYDX	https://dydx.exchange/
armorfi/ease	EASE	https://ease.org/
elyfi	ELFI	https://www.elyfi.world/en
ens	ENS	https://ens.domains/
empty set dao	ESD	https://www.emptyset.finance/
euler	EUL	https://www.euler.finance/
harvestfinance	FARM	https://harvest.finance/
fei	FEI	https://fei.money/
forefront	FF	https://forefront.market/
ampleforth dao	FORTH	https://www.ampleforth.org/
shapeshift fox token	FOX	https://shapeshift.com/
frax	FRAX	https://frax.finance/
friends with benefits	FWB	https://fwb.help/
gasdao	GAS	https://www.gasdao.org/
gcr	GCR	https://globalcoinresearch.com/
gearbox	GEAR	https://gearbox.fi/
gelato	GEL	https://www.gelato.network/
goldfinch dao	GFI	https://goldfinch.finance/
aavegotchi	GHST	https://www.aavegotchi.com/
gmx	GMX	https://gmx.io/
gnosis dao/safe	GNOSIS	https://gnosis-safe.io/
gro dao token	GRO	https://www.gro.xyz/
the graph	GRT	https://thegraph.com/
gitcoin dao	GTC	https://gitcoin.co/
hbotprpeth	HBOT	https://hummingbot.org
hop protocol	HOP	https://hop.exchange/
idle	IDLE	https://idle.finance/
ilveth	ILV	https://illuvium.io/
indexcoop dao	INDEX	https://app.indexcoop.com/

Table C.3.

DAOs in Sample (Cont.)

This table continues the DAOs in our sample as well as the digital asset ticker and website.

DAO name (1)	Ticker (2)	DAO website (3)
instadapp	INST	https://instadapp.io/
inverse	INV	https://www.inverse.finance/
juicebox dao	JBX	http://juicebox.fun/
klima dao	KLIMA	https://www.klimadao.finance/
krausehouse	KRAUSE	https://www.krausehouse.club/
thelanddaopropeth	LAND	devour.landdao.io
thelao	LAO	https://www.thelao.io/
lido	LDO	https://lido.fi/
linear DAO	LINA	https://linear.finance/
links dao	LINKS	https://linksdao.io/
tokenlon	LON	https://tokenlon.im/
treasure dao	MAGIC	https://treasure.lol/
decentraland	MANA	https://decentraland.org/
mask	MASK	https://mask.io/
merit circle	MC	https://www.meritcircle.io/
mclub	MCLB	http://app.charmverse.io
magic internet money	MIM	https://abracadabra.money/
alchemist dao	MIST	https://alchemist.farm/
makerDAO	MKR	https://makerdao.com/en/
moondao	MOONEY	https://www.moondao.com/
mstable dao	MTA	https://mstable.org/
indexed	NDX	https://indexed.finance/
nftx	NFTX	https://nftx.io/
nounsdao	NOUNS	https://nouns.wtf/
nexus mutual	NXM	https://nexusmutual.io/
official ocean dao	OCEAN	https://oceanprotocol.com/dao
origin protocol	OGN	https://www.originprotocol.com/
origin dollar governance	OGV	https://www.ousd.com/
olympus dao	OHM	https://www.olympusdao.finance/
mantra dao	OM	https://mantradao.com/
ooki	OOKI	https://hello.ooki.com/
optimism collective	OP	https://optimism.io/
opium	OPIUM	https://opium.network/
paladin	PAL	https://paladin.vote/
dopewars dao	PAPER	https://dopewars.gg/
pleasrdao	PEEPS	https://pleasr.org/
peopledaoeth	PEOPLE	https://www.constitutiondao.com/
perpetual protocol	PERP	https://perp.fi/
phonon	PHONON	https://phonon.network/
pickle	PICKLE	https://pickledao.io/
unipiloteth	PILOT	https://unipilot.io/
pocket network	POKT	https://www.pokt.network/
pooltogether	POOL	https://pooltogether.com/
premia	PREMIA	https://premia.finance/

Table C.4.

DAOs in Sample (Cont.)

This table continues the DAOs in our sample as well as the digital asset ticker and website.

DAO name (1)	Ticker (2)	DAO website (3)
paraswap dao	PSP	https://paraswap.io/
epns dao	PUSH	https://epns.io/
quickswap	QUICK	https://quickswap.exchange/
radicle	RAD	https://radicle.xyz/
reflexer	RAI	https://reflexer.finance/
superrare	RARE	https://superrare.co/
rarible dao	RARI	https://rarible.com/
ribbon finance	RBN	https://ribbon.finance
ren	REN	https://renproject.io/
rari	RGT	https://www.rari.capital/
daosquare	RICE	https://www.daosquare.io/
rally	RLY	https://rally.io/
metafactory	ROBOT	https://twitter.com/TheMetaFactory
rome	ROME	https://romedao.finance/
keeper dao	ROOK	https://keeperdao.com/
rocket pool	RPL	https://rocketpool.net/
rss3	RSS3	https://rss3.io/
saddle finance	SDL	https://saddle.finance/
sdt	SDT	https://stakedao.org/
saffron	SFI	https://saffron.finance/
sharkdaoeth	SHARK	https://sharks.wtf/
silo	SILO	https://www.silo.finance/
synthetix dao	SNX	https://synthetix.io/
opendao	SOS	https://www.theopendao.com/
xdai chain/gnosis chain	STAKE	https://docs.gnosischain.com/
stargate finance	STG	https://stargate.finance/
sushiswap dao	SUSHI	https://www.sushi.com/
stakewise	SWISE	https://stakewise.io/
synapse dao	SYN	https://synapseprotocol.com/landing
threshold	T	https://threshold.network/
token engineering commons	TEC	https://tecommons.org/
tornado cash	TORN	https://tornadocash.eth.link/
truefi dao	TRU	https://www.trusttoken.com/
trust wallet dao	TWT	https://community.trustwallet.com/
proof of humanity	UBI	https://www.proofofhumanity.id/
unlock	UDT	https://unlock-protocol.com/
uniswap	UNI	https://app.uniswap.org/
union	UNN	https://unn.finance/
vsp	VSP	https://vesper.finance/
blockzerolabs	XIO	https://blockzerolabs.io/
yam	YAM	https://yam.finance/
yfbeta	YFBETA	http://yfbeta.finance/
yearn finance	YFI	https://yearn.finance/
yup	YUP	https://yup.io/
0xgov	ZRX	https://0x.org/

D Additional Tables

Table D.1.

Robustness Check: Unadjusted Return Regressions by Individual Governance Features

This table estimates the relation between governance features and unadjusted returns from the opening date of the proposal to the voting end. The governance features are grouped into the subindex components: inclusive, restrictive, and secure. Year, geographic location, and DAO type fixed effects are included. Controls include DAO age, an indicator for an early proposal, vote duration, and the detailed industry characterization. Robust standard error are reported in parantheses and significance at the 10 percent, 5 percent and 1 percent levels is indicated by *, **, and ***, respectively.

	Dep. var. = Unadjusted returns on proposal votes				
	(1)	(2)	(3)	(4)	(5)
Inclusive governance features					
Uniform, transparent templates for proposals	-0.323***			-0.055	-0.060
	(0.120)			(0.106)	(0.125)
Off-chain gasless vote for signaling	0.316***			0.412***	0.599***
	(0.119)			(0.120)	(0.167)
Votes can be delegated to individuals or DAOs	0.163**			0.606***	0.643***
	(0.077)			(0.122)	(0.153)
Provides incentives to vote	0.297			0.665***	1.769***
	(0.248)			(0.249)	(0.388)
Provides proof of attendance badges	0.241			1.566***	2.057***
	(0.295)			(0.425)	(0.503)
Restrictive governance features					
Requirements to create a formal proposal		0.536***		0.356***	0.561***
		(0.111)		(0.093)	(0.183)
Requires executable code in proposal		-0.273**		-0.418**	-0.797***
		(0.131)		(0.165)	(0.218)
Quorum requirement		-0.273**		-0.506***	-0.616***
		(0.122)		(0.129)	(0.238)
Relative quorum voting with differential		0.032		-1.536***	-2.570***
		(0.113)		(0.335)	(0.543)
Supermajority voting		0.259*		-0.243	-0.782***
		(0.145)		(0.187)	(0.214)
Voting requirements vary by content		-0.630***		-0.658***	-0.408**
		(0.173)		(0.151)	(0.185)
Includes appointed representatives of board-like council		-0.360***		-0.548***	-0.775***
		(0.097)		(0.116)	(0.178)
Includes subDAOs		-0.537***		-0.849***	-0.640***
		(0.080)		(0.134)	(0.128)
Secure governance features					
Delay or timelock before implementation			0.105	0.218*	0.388*
			(0.114)	(0.132)	(0.202)
Multisig before implementation			0.208***	0.317***	0.793***
			(0.079)	(0.100)	(0.174)
Core or developer team can override			-0.056	0.121	0.405**
			(0.082)	(0.120)	(0.198)
Feasibility study			0.446***	1.214***	1.596***
			(0.167)	(0.252)	(0.323)
Safesnap			0.787**	1.048***	0.564*
			(0.313)	(0.318)	(0.315)
Fixed effects	Yes	Yes	Yes	Yes	Yes
Controls	No	No	No	No	Yes
Observations	8,534	8,534	8,534	8,534	8,534
R-squared	0.017	0.027	0.020	0.059	0.082

Table D.2.

Robustness Check: Unadjusted Return Regressions by Governance Indices

This table estimates the relation between governance features and unadjusted returns from the opening date of the proposal to the voting end. The governance features are grouped into the subindex components: inclusive, restrictive, and secure. Year, geographic location, and DAO type fixed effects are included. Controls include DAO age, an indicator for an early proposal, vote duration, and the detailed industry characterization. Robust standard error are reported in parantheses and significance at the 10 percent, 5 percent and 1 percent levels is indicated by *, **, and ***, respectively.

	Dep. var. = Crypto-adjusted returns on proposal votes				
	(1)	(2)	(3)	(4)	(5)
Inclusive voting features	0.033			0.260***	0.147**
	(0.032)			(0.051)	(0.072)
Restrictive voting features		-0.220***		-0.395***	-0.381***
		(0.031)		(0.051)	(0.061)
Secure voting features			0.180***	0.360***	0.395***
			(0.044)	(0.063)	(0.090)
Fixed effects	Yes	Yes	Yes	Yes	Yes
Controls	No	No	No	No	Yes
Observations	8,534	8,534	8,534	8,534	8,534
R-squared	0.011	0.016	0.016	0.029	0.053

Table D.3.

Robustness Check: Unadjusted Return Regressions by Decentralized Governance Index

This table estimates the relation between decentralized governance index and unadjusted returns from the opening date of the proposal to the voting end. The governance features are grouped into a single index defined as inclusive less restrictive plus secure features. Year, geographic location, and DAO type fixed effects are included. Controls include DAO age, an indicator for an early proposal, vote duration, and the detailed industry characterization. Robust standard error are reported in parantheses and significance at the 10 percent, 5 percent and 1 percent levels is indicated by *, **, and ***, respectively.

	Dep. var. = Crypto-adjusted returns on proposal votes							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Decentralized governance index	0.300***	0.257***						
	(0.042)	(0.048)						
Low index			-0.386***	0.036				
			(0.070)	(0.093)				
Mid-range index					0.330***	0.083		
					(0.088)	(0.114)		
High index							0.957***	0.759***
							(0.205)	(0.230)
Fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
Controls	No	Yes	No	Yes	No	Yes		
Observations	8,534	8,534	8,534	8,534	8,534	8,534	8,534	8,534
R-squared	0.028	0.050	0.013	0.042	0.014	0.042	0.020	0.046

Table D.4.

Robustness Check: Monthly Returns Rather than Weekly or Proposal Returns

This table estimates the relation between decentralized governance index and unadjusted monthly returns. The governance features are grouped into a single index defined as inclusive less restrictive plus secure features. Robust standard error are reported in parantheses and significance at the 10 percent, 5 percent and 1 percent levels is indicated by *, **, and ***, respectively.

	Dep. var. = Crypto-adjusted returns on proposal votes							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Decentralized governance index	0.106	0.115						
	(0.066)	(0.075)						
Low index			-0.747***	-0.378				
			(0.278)	(0.274)				
Mid-range index					-0.480**	-0.636***		
					(0.199)	(0.213)		
High index							0.692**	0.922***
							(0.315)	(0.324)
Observations	2,791	2,791	2,791	2,791	2,791	2,791	2,791	2,791
R-squared	0.023	0.048	0.024	0.047	0.024	0.050	0.024	0.050

Table D.5.

Robustness Check: Return Window from Discussion Boards Rather than Vote Start

This table estimates the relation between decentralized governance index and crypto-market adjusted returns for a subsample of proposals for which we have the start date in the discussion forums, Discord, Telegram, etc.. The governance features are grouped into a single index defined as inclusive less restrictive plus secure features. Year, geographic location, and DAO type fixed effects are included. Controls include DAO age, an indicator for an early proposal, vote duration, and the detailed industry characterization. Robust standard error are reported in parantheses and significance at the 10 percent, 5 percent and 1 percent levels is indicated by *, **, and ***, respectively.

	Dep. var. = Crypto-adjusted discussion board returns on proposal votes	
	(1)	(2)
Decentralized governance index	0.788***	0.716***
	(0.174)	(0.175)
Fixed effects	Yes	Yes
Controls	No	Yes
Observations	1,803	1,803
R-squared	0.018	0.029