Voter coalitions in Decentralized Autonomous Organization (DAO): Evidence from MakerDAO[1] [2]

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Abstract

Decentralized Autonomous Organization (DAO) provides a decentralized governance solution through blockchain, where decision-making process relies on on-chain voting and follows majority rule. This paper focuses on MakerDAO, and we find five voter coalitions after applying clustering algorithm to voting history. The emergence of a dominant voter coalition is a signal of governance centralization in DAO, and voter coalitions have complicated influence on Maker protocol, which is governed by MakerDAO. This paper presents empirical evidence of multicoalition democracy in DAO and further contributes to the contemporary debate on whether decentralized governance is possible.

Keywords: governance; Decentralized Autonomous Organization (DAO); voting

EFM classification: 150, 530

[1] The online appendices can be accessed: https://drive.google.com/file/d/1hVmHYoMJwEjAk2NM6z1IvE2cu8fJxP21/view?usp=sharing

[2] If accepted, Xiaotong Sun will attend and present this paper.

1.Introduction

Is decentralized governance possible? Benefiting from blockchain technology, *Decentralized Autonomous Organization (DAO)* is proposed as a feasible attempt (Jentzsch, 2016). In DAO, there is no centralized coalition, and any suggested changes to DAO should be jointly decided by DAO members. To distribute decision-making power, DAO will usually issue *governance token*, which are tradable cryptocurrency. Voters' decision-making power relies on the amount of governance token, and the proposal that gets most voting power will be implemented. Benefiting from the transparency and accuracy of blockchain, voting results are publicly visible and hard to be tampered, and DAO has been the most widely adopted choice for on-chain governance.

Unfortunately, governance centralization is an inevitable problem for DAO. First, blockchain itself is not safe haven for decentralization. Buterin (2021), as the co-founder of Ethereum blockchain, proposes that complete decentralization is impossible if blockchain pursues scalability and securities at the same time. In fact, a few key developers propose most changes to blockchain (Hsieh et al., 2017; Yermack, 2017), implying that these developers have more control. Furthermore, DAO is not immune from governance centralization. By investigating voting history of several leading DAO, DAO governance is controlled by several dominant voters, and their centralized power has complicated influence (Sun, Stasinakis and Sermpinis, 2022; Fritsch, Müller and Wattenhofer, 2022).

The previous studies mainly focus on centralization problems at individual level, however, DAO governance is likely to be battlefield of voter coalitions with different interests. Given the fact that voting is all about social choice functions (Arrow, Sen and Suzumura, 2011; Kelly, 1988; Plott, 1976; Schwartz, 1986), voters with similar interests and characteristics can form coalitions (Downs, 1957; Black, 1990; Enelow and Hinich, 1994; Tajfel and Turner, 2004), while voters with different beliefs will vote against each other (Adams, Merrill and Grofman, 2005; Abramson et al., 2009). In corporate finance, voting rights are distributed among shareholders, and both small shareholders and large shareholders can form their own coalitions. Smaller shareholders collaborate in order to protect their own rights (Bennedsen and Wolfenzon, 2000; Zwiebel, 1995), while large shareholders attempt to extract private benefits by seizing more control (Bennedsen and Wolfenzon, 2000; Dyck and Zingales, 2004). In DAO, we expect to detect voter coalitions since both dominant voters and minority voters exist, and the interlinks between voters can help to depict DAO governance better.

This paper asks two research questions: (1) if voter coalitions exist in DAO; (2) how voter coalitions influence DAO. We choose the most influential DAO, namely MakerDAO, as a case study. MakerDAO is probably the most successful DAO in blockchain because it sets industry standards, e.g., 'one token – one vote' principle and a combination of on-chain governance and off-chain discussion. The main role of MakerDAO is to manage Maker protocol, which is a leading financial system on Ethereum blockchain. Maker protocol issues Dai (DAI) stablecoin, which is soft-pegged to US dollar, and any agents can borrow DAI by locking collateral. In other words, Maker protocol is a multi-collateral DAI system, where MakerDAO decides how this system develops.

To study MakerDAO, we retrieve voting history of governance polls from 15th August 2019 to deployed on 25th July 2022, where all voters' choices and voting power are available. After applying K-means clustering algorithm to MakerDAO dataset, we identify five distinguished voter coalitions, and the largest coalition, mentioned as coalition 0, has the most voters and contribute to most total votes. Though the other four coalitions have only a few voters, they can win governance polls of Maker protocol, implying that MakerDAO governance is battlefield for these coalitions.

Then, we are curious about how voter coalitions influence Maker protocol. For each voter coalition, we first calculate its voting share in every governance poll and then apply a series of factor analysis. Here, three factors specific to Maker protocol are studied, including DAI volatility, total revenue and new users of Maker protocol, and some interesting findings are presented. For example, when voting share of coalition 0 is higher, DAI will be more volatile, and total revenue of Maker protocol will decrease. However, coalition 2 and coalition 3 have the opposite effects. Previous literature (e.g., Sah and Stiglitz, 1988; Sah and Stiglitz, 1991) mainly discuss how (de)centralization affects firm performance, however, they ignore that coalitions may affect the underlying financial system very differently.

Beside voting share, group cohesion also matters for voter coalitions. We adopt a measurement named *Agreement Index (AI)* (Hix, Noury and Roland, 2005), which is widely used in political science. A higher AI means that group members tend to choose the same option, while AI will be close to 0 if voting power of a group is equally distributed among all options. Empirical studies point out that more cohesive teams can contribute to better firm performance (Hogg, 1992; Pepitone and Reichling, 1955; Schachter et al., 1951), we are interested in if a more cohesive voter coalition is good for Maker protocol. Surprisingly, DAI will be more stable when coalition 0 is more cohesive, while cohesive coalition 4 can bring more volatility. Therefore, in DAO, the influence of group cohesion should be considered together with uncertainty of voting outcomes. As the largest voter coalition, coalition 0's winning will be more certain when they concentrate voting power on the same option, and the outcomes will be more predictable. As a result, crypto markets can be more prepared to the changes to Maker protocol and DAI, which helps DAI remain stable. On the other hand, smaller coalitions are not the usual winner, their decisions may introduce more uncertainty (Allen and Gale, 1999; Garlappi et al., 2017), so DAI will be more volatile.

We also consider the interlinks between Maker protocol and crypto market. DAI, as a primary stablecoin, can be traded in various blockchain-based platforms. Here we choose five destinations of financial flows of DAI, including *Centralized Finance (CeFi), Decentralized Exchanges (DEXes), Lending Protocols (LPs)*, *External Owned Address (EOA)*, and *bridges*. Our findings show that voter coalitions can drive DAI flows in differently ways. For example, coalition 0 and coalition 2 can lead to less DAI transferred to LPs, while coalition 3 has the opposite effects. The findings prove that these coalitions have dissimilar interests, but some voter coalitions can (unconsciously) work on the same goal if they have certain similar preference, e.g., where to transfer DAI. So, the collaboration and competition between voter coalitions make DAO resemble multicoalition democracy.

Finally, we attempt to find potential opinion leaders in the largest voter coalition, i.e., coalition 0. Given on-chain activities of voters, MakerDAO voters can be labeled. Here, we are most interested in *Ethereum Name Service (ENS)* owners. To be simple, ENS is a unique identifier of Ethereum address, and some people will use ENS as their Twitter names. After re-estimate regression models, we show that ENS owners and Twitter users are potential opinion leaders in coalition 0. The findings are not very surprising since ENS owners are probably more enthusiastic about blockchain, and these voters' discussion on Twitter may affect other voters.

The remainder of our paper is organized as follows. Section 2 provides necessary background knowledge and related work. The dataset for MakerDAO, clustering algorithm, and measurements of group cohesion are defined in section 3. The main empirical results are presented in section 4 and section 5, while section 6 provides robustness checks. Section 7 concludes.

2. Background

2.1 Decentralized Finance (DeFi) and Decentralized Autonomous Organization (DAO)

Powered by programmable blockchain, any agents can replicate financial activities on blockchain, where the third coalition is not necessary component. Simply, *Decentralized Finance (DeFi)* refers to blockchain-based financial applications without any centralized intermediaries. DeFi can replicate most traditional financial systems, such as trading platforms and borrowing and lending marketplaces, and the rapid growth of DeFi brings forward both opportunities and challenges. For more details of DeFi and its potential risks, we refer readers to Werner et al. (2021), Makarov and Schoar (2022), and Carapella et al. (2022).

Beside financial risks inherently existed in DeFi, another inevitable plain point is: how to govern DeFi? Without relying on any third coalition, DeFi naturally tends to expand such decentralization to its governance. Among all novel solutions to decentralized governance, the most widely adopted organizational form is *Decentralized Autonomous Organization (DAO)*, which is first proposed by Jentzsch (2016). Formally, DAO is an entity structure lead by community instead of centralized authority. In a DAO, decision-making power is distributed among all DAO members, and decisions about the future of the DAO will be jointly made by members via voting. In other words, DAO is owned and managed by their members.

In practice, most DeFi protocols are governed by DAO (e.g., Maker protocol is governed by MakerDAO), and DAO will usually issue their own *governance token*, which resembles shares in corporate finance. If there are any suggested changes to the DeFi protocol, governance token holders can state their opinions via voting, and their voting power relies on the amount of governance token. Benefiting from underlying blockchain, voting records can be documented on blockchain, and on-chain voting is more precise and transparent than decision-making process in corporations (Hsieh, Vergne and Wang, 2017).

DAO governance relies on voting. Among all voting procedures, most DAO chooses Plurality voting procedure, meaning that only the candidate who gets votes more than any other countercoalition will be elected (Arrow, Sen and Suzumura, 2011). In DAO, given a proposal, only the option that get the most votes will be deployed. As for voting principle, though quadratic voting exists, most DAOs adopts ‘one token – one vote’. However, Burkart and Lee (2008) argue that such a voting mechanism will be optimal only when several agents compete.

2.2 MakerDAO and Maker protocol

Created in 2014, MakerDAO has grown up to the most successful DAO (MakerDAO, 2020). Governed by MakerDAO, Maker protocol has adopted large market share in on-chain lending. Maker protocol issues two native cryptocurrencies, namely Dai (DAI) and Maker (MKR). DAI is a stablecoin soft-pegged to the US dollar, and people can borrow DAI by locking collaterals (usually cryptocurrencies accepted by Maker protocol). In a way, Maker protocol is a Multi-Collateral Dai (MCD) system. MKR is the governance token, and any MKR holders can participate in on-chain voting in Maker protocol. For more details of the governance structure in MakerDAO, we refer readers to Sun, Stasinakis and Sermpinis (2022).

Currently, Maker protocol applies ‘one token – one vote’ rule, therefore, voters with more MKR will have more decision-making power. Empirically, a small group of voters control most voting power in MakerDAO, and governance centralization can be witnessed in other DAOs as well (Fritsch, Müller and Wattenhofer, 2022). Surprisingly, though governance centralization is not intention of DAO believers, centralized decision-making power can have positive effects on the underlying DeFi protocol (Sun, Stasinakis and Sermpinis, 2022). In this paper, we dive more deeply into the voting history of MakerDAO, and beside individual level of governance centralization, more information can be revealed by considering potential coalitions of voters.

2.3 Governance centralization

Sun, Stasinakis and Sermpinis (2022) have provided empirical evidence of centralized governance in DAO, and governance centralization has a nexus of complicated effects on DAO and its underlying DeFi. Similarly, in the contexts of traditional finance, governance centralization is also regarded as a double-edge sword.

A well-studied example is banks. If the ownership is more centralized, banks will have better capital buffers (Klein, Maidl and Woyand, 2021), and powerful CEOs can lead to better performance banks (Mollah and Liljeblom, 2016). Furthermore, higher ownership concentration can contribute to better loan quality and lower insolvency risks (Iannotta et al., 2007). However, if bank CEOs have dominant decision-making power, more risk-taking decisions will be made, and unacceptable outcomes can happen (Mollah and Liljeblom, 2016; Dbouk et al, 2020). Since Maker protocol resembles a bank in crypto markets, we suspect similar complex findings should be observed.

In corporate finance, governance centralization also attracts discussion (e.g., Shleifer and Vishny, 1997). For example, interest alignments and monitoring are easier when decision-making is not highly dispersed (Shleifer and Vishny, 1997), but blockholders can have self-serving actions (Burkart and

Lee, 2008). On the other hand, smaller shareholders face difficulties of protecting their own interests. Usually, most decisions are decided by large investors (Shleifer and Vishny, 1997), small stakeholders do not have enough incentives to collect information and study details of every proposal, therefore, they may not participate in governance very actively (Burkart and Lee, 2008). Currently, DAOs suffer from similar problems, i.e., low participation of governance.

More recent literatures believe that governance centralization can introduce more uncertainty to firm performance. Using stock return as a proxy, Tran and Turkiela (2020) show that more centralized governance leads to higher volatility, but more diverse decision-makers can lower stock return volatility (Bernile et al., 2018). The findings are consistent with theoretical analysis. Theoretically, equally distributed decision-making power can contribute to less extreme decisions and outcomes (Sah and Stiglitz, 1988; Sah and Stiglitz, 1991). As a result, stock return will be more volatile when decision-making power is more concentrated.

However, some literatures argue that decentralized governance is the source of uncertainty. An important reason is that decision makers will propose more choices (Allen and Gale, 1999), and thereby the decisions made by an organization will be lack of consistency (Garlappi et al., 2017). Moreover, Demsetz and Villalonga (2001) demonstrate that firm performance may be not statistically related to ownership structure.

Previous studies show very dissimilar conclusions, implying that the internal structure of governance has not been well explored. Here, a pain point is data limitation since the internal structure of corporate governance is not very transparent (e.g., Hermalin and Weisbach, 2003; Adam, Hermalin and Weisbach, 2010). However, in DAO, all voters and their voting patterns are publicly observable, and we can examine if arguments in corporate finance can apply to DAO and DeFi.

2.4 Shareholder coalition

Governance will be even more complicated when shareholder coalitions exist. From a formal economic perspective, the emergence of shareholder coalitions seems to be inevitable (Maury and Pajuste, 2005; Crespi and Renneboog, 2010). Usually, shareholders with similar goals can form coalitions (Black, 1990; Tajfel and Turner, 2004). For example, to influence corporate policy, minority shareholders can form a shareholder coalition (Zwiebel, 1995; Bennedsen and Wolfenzon, 2000). On the other hand, Bennedsen and Wolfenzon (2000) show that large shareholders can form coalitions as well, and several coalitions compete to seize control for their own private benefits. Driven by private benefits, shareholder coalitions may withhold critical information, though extremely negative actions, e.g., lying or stealing, are not very common (Wathne and Heide, 2000).

To defend private benefits, shareholder coalitions will attempt to affect vote outcomes. Large shareholders, e.g., institutional investors, tend to support management, and they may never vote against management-sponsored proposal (Dressler, 2020), and Matvos and Ostrovsky (2010) show that some shareholders are consistently friendly to management in voting process. However, conflicts of interest can destroy such harmony in voting process (Hamdani and Yafeh, 2013; Cvijanović et al., 2016), especially when it comes to controversial proposals (Ginzburg et al., 2022). For example, outside shareholders could vote against inside shareholders or management (Marquardt et al., 2018).

In DAO, the holders of governance token resemble shareholders in corporate finance. Intuitively, we expect that voter coalitions exist, and their voting patterns should affect the performance of DAO and the underlying DeFi protocol. Given that all transactions are publicly observable, it will be easier to reveal voters' private benefits.

3. Data collection and clustering algorithm

3.1 Data Collection

The details of governance polls and voting history are publicly available. In *Maker Governance Portal*, poll details, including titles, review of proposals, and options can be found. For each poll, several labels, e.g., 'risk parameter' and 'collateral onboard' are shown for better understanding the content of governance polls. To get the voters' addresses, their choices and voting power, we query the voting history from *MCD Voting Tracker*. We investigate governance polls from Poll 16 (deployed on 15th August 2019) to Poll 838 (deployed on 25th July 2022). Poll 16 is the first governance poll that MKR holders can participate in. Some polls failed[3], so they are not documented in the portal. Hence, the dataset consists of a total of 809 successful governance polls. After retrieving voters' addresses, 1717 unique voters are found, and the voters' public names and their labels can be manually collected by searching for their addresses on Maker Governance Portal and *Watchers.pro*.

3.2 Data pre-process

The first step of data pre-process is to replace textual options with numerical values. Most Maker governance polls have three options, including "Yes", "No", and "Abstain". For this type of polls, we will assign 1, -1, 0 to "Yes", "No", and "Abstain", respectively. For other polls, online appendix 1 presents value assignment. Noticeably, in all governance polls, we assign 0 to "Abstain".

Another question is how to assign value if a voter (e.g., voter i) does not participate in a certain poll (e.g., poll j). In the context of clustering algorithms, such cases will bring forward missing values, i.e., *NA* in the dataset. Two common solutions are (1) to delete observations with NAs and (2) to fill NAs with mean, however, these two solutions are not the best choices here. The first solution will delete voters who do not participate all voting polls, as a result, few voters will be preserved. The second solution will misinterpret the nature of not participating. If we fill NAs with mean, in a way, we 'make decisions' on behalf of the voters who do not vote. But their actions, i.e., not voting, imply that they abstain. Therefore, we will assign 0 to NAs, meaning that voter i that does not participate in poll j will choose "abstain".

Before applying clustering algorithm, we need to pre-process voting datasets, including data standardization and dimension reduction. Given a dataset X, the formula of transferring $x \in X$ is

$$\frac{x-\bar{X}}{\mathrm{X.std}} \quad (1)$$

[3] Poll 28, 39, 47, 69, 78, 183, 282, 284, 286, 500, 604, 769, 818 and 821 failed.

Where $\bar{X}$ is the mean of dataset X and $\mathrm{X.std}$ refers to the standard deviation.
In the context of clustering algorithm, each poll in voting datasets is a feature. With more than 800 polls, the dataset for voting history is high-dimensional, and we need to reduce dimensions for better modelling. Here, we choose *Principal Component Analysis (PCA)* for dimensionality reduction. Simply, PCA can compute the principal components of a dataset and only keep the first few ones. In this way, a high-dimensional dataset can be transferred to a lower-dimensional dataset without losing much of data's information. Generally, the new dataset generated by PCA should keep at least 95% of variance in the original dataset, therefore, we preserve 115 principal components and 95.01% of variance is contained in the lower-dimensional dataset.

3.3 K-means clustering

To detect voters with similar voting patterns, we choose *K-means*, which is a widely adopted clustering algorithm. Given a set of voters' voting history $(v_1, v_2, \ldots, v_n)$, where each voting history is a d-dimensional real vector, K-means aims to cluster voters into $k(\leq n)$ sets $V = \{V_1, V_2, \ldots V_k\}$ so as to minimize the *within-cluster sum of squares (WCSS)*.
Formally, the objective is to find

$$\underset{V}{\operatorname{argmin}} \sum_{i=1}^{k} \sum_{x \in S_i} \left| |v - \mu_i| \right|^2 = \underset{V}{\operatorname{argmin}} \sum_{i=1}^{k} |V_i| Var V_i \; (2)$$

Where μ_i is the mean of points in V_i.

In our case, v_i is a vector that records voter i's choices in all governance polls, and d denotes the number of governance polls in the MakerDAO dataset. Given a poll j and voter i, if the voter do not participate in poll j, then $v_{i,j} = 0$, which has the same value as "Abstain". Assuming that K-means can generate k sets, i.e., $V = \{V_1, V_2, \ldots V_k\}$, each V_i can be regarded as a 'voter coalition', where voters share similar voting patterns.

To run K-means, the number of clusters, i.e., the parameter k should be optimally chosen. Two common criteria are *elbow method* and *silhouette score*, and more formal introduction can be found in Malik and Tuckfield (2019). Simply, an optimal cluster number, i.e., k^*, should have high silhouette score, and the curve of distortion score flattens when k is larger than k^*. Combing information in Figure 1, we choose $k^* = 5$.

[Figure 1 here]

3.4 Measurement of group cohesion

Given a voter coalition, their members may have split opinions on certain governance polls. Intuitively, less division of opinions implies better group cohesion of a coalition. Here, we introduce the modified index of *Agreement Index (AI)*.

Previously, Rice (1928) develops an index to measure the rate of 'not voting identically', however, this index can only describe 'yes' – 'no' option. Then, Hix, Noury and Roland (2005) introduce *Agreement Index (AI)*, which can be applied to polls with three options, i.e., "yes", "no", and "abstain". Formally, AI of voter coalition i can be calculated as

$$AI_i = \frac{\max\{Y_i, N_i, A_i\} - \frac{1}{2}[(Y_i + N_i + A_i) - \max\{Y_i, N_i, A_i\}]}{Y_i + N_i + A_i} \quad (3)$$

where Y_i, N_i, A_i denote the number of "yes", "no" and "abstain" votes, respectively.

Similarly, we can expand AI to polls with $j(\geq 3)$ options as below

$$AI_i = \frac{\max\{Option_1, \dots, Option_j\} - \frac{1}{j-1}\left[\left(Option_1 + \cdots + Option_j\right) - \max\{Option_1, \dots, Option_j\}\right]}{Option_1 + \cdots + Option_j} \quad (4)$$

where $option_j$ denote the number of votes of option j.

Given a voting poll and voter coalition i, AI_i will be a numeric value between 0 and 1. A higher AI_i means better group cohesion. For example, if all members of coalition i choose the same option, AI_i should equal to 1. However, if the votes of coalition i are equally divided among all available choices, AI_i will be 0.

4. Detect voter coalitions in MakerDAO

This section summarizes the empirical results of this study. The first sub-section presents the descriptive statistics of both polls and voter coalitions and shows that MakerDAO is governed by dominant voter coalitions. The second sub-section focuses on the internal structure of voter coalitions to investigate if opinion leaders exist.

4.1 Governance polls in the Maker protocol

Table 1 presents descriptive statistics of Maker governance polls (from poll #16 to poll #838), and we illustrate total votes and the number of voters (See figures 2 and 3). Though total votes gradually increase, the number of voters volatiles. Most polls only have less than 60 voters, which is a small group comparing with the total users of Maker protocol. To some extent, the decision-making power is controlled by voters who frequently participate in voting and have large balance of MKR. If voter coalitions exist, then Maker governance is an example of competition of coalitions on blockchain.

[Table 1 here]

[Figures 2 and 3 here]

4.2 Voter coalitions in MakerDAO

After applying K-means clustering algorithm, Table 2 shows that 5 voter coalitions are detected. Voter coalition 0 has the most members and much more total votes than the other four coalitions. However, in most governance polls, only less than 40 voters from coalition 0 state their opinions, implying that the significant total votes of coalition 0 are actually from a small group of core members (See figure 4). Since coalition 0 started voting in 2017, they participated in most governance polls. On the other hand, though coalitions 1-4 are smaller, their total votes should not be ignored. As coalitions 1-4 emerged after 2019, they may get more control over Maker governance if they get more voters with large MKR balance.

[Table 2 here]

[Figure 4 here]

Based on all polls in our sample, figure 5 shows the distribution of votes from different voter coalitions, and coalition 0 contributed to more than a half of total votes. To better illustrate decision-making power of different coalitions, we calculate their voting share. Not surprisingly, as the largest coalition, coalition 0 shows high voting share in most polls, whereas they only accounted for less than 20% of total votes in some polls (See figure 6). The voting share of other four coalitions also varies, and in certain polls, these four coalitions accounted dominant voting share (See online appendix 2). So, Maker governance polls are charged by different coalitions by turns, since most polls could be decided by a single voter coalition.

[Figures 5 and 6 here]

4.3 Group cohesion of voter coalitions in MakerDAO

After calculating AI of the five voter coalitions, Table 3 shows that group cohesion of all coalitions is usually high, though the minimum of AI is a signal of opinion differences in certain voting polls. The figure below further illustrate that the votes of the same coalition can be distributed among different options in a single poll[4].

[Table 3 here]

[Figure 7 here]

According to the contents of polls, Maker governance polls fall into different categories. To help Maker community better understand the importance of polls, Maker Governance Portal labels all governance polls[5]. A natural conjecture is that group cohesion in different types of polls may differ, since managers tend to avoid making difficult decisions (Bertrand and Mullainathan, 2003). For example, polls with the label 'risk Parameter' are related to key parameters, e.g., interest rates of loans of certain cryptocurrencies, while polls with the label 'delegates' could be about introducing new voting delegates. Though voters in the same coalition share similar voting pattern, they can have interest conflicts in certain cases. Therefore, we are interested that if opinions are more likely to diverge in certain types of polls. By taking coalition 0 as an example, we illustrate their AI for the polls with three labels, namely 'risk parameter', 'greenlight', and 'MIP'[6]. The figures below show that opinion differences exist within a coalition, implying that solidarity and cooperation of members in a coalition are suspicious. In other words, a high level of uncertainty for voting results in MakerDAO still exists, though coalition 0 has the most voters and largest total votes.

[Figure 8-10 here]

[4] The figures for AI of voter coalitions 1-4 are in online appendix 3.
[5] Appendix 1 introduces labels of Maker governance polls.
[6] We also illustrate group cohesion of other voter coalitions in different types of polls, where only the labels that show in more than 30 polls are considered. The figures are presented in online appendix 4.

4.4 Internal structure of voter coalitions in MakerDAO

Beside voting share and group cohesion, the identities of voters in different voter coalitions are of particular interest. The contexts of corporate finance show that more diverse boards can have complicated influences (Bernile et al., 2018; Giannetti and Zhao, 2019). So, we attempt to reveal more information.

To describe a voter more comprehensively, we first collect voters' Ethereum Name Service (ENS) names shown on Maker Governance Portal. Simply, ENS is a unique identifier for a blockchain address. Then, we will search for ENS on Twitter, because some blockchain users will use ENS as their Twitter account. Though most blockchain users prefer anonymity, ENS owners and Twitter users may be more publicly known.

Based on voters' historical transactions, we can create labels to describe their behavior, including DEX trading, liquidity providing, Non-fungible token (NFT) trading. Moreover, we also consider if MakerDAO voters are 'whales', which are entities that hold the significant amount of tokens. Benefiting from data on watchers.pro, we can scan all voters' historical activities and attach right labels.

Table 4 gives the first look at the composition of voter coalitions. Not surprisingly, most known users (users with ENS names or Twitter accounts) are in coalition 0, implying that the communication costs for coalition 0 are lower. Since most delegates are in coalition 0 as well, opinions leaders' suggestions can be more easily taken via both forum of Maker protocol and social media (e.g., Twitter). Furthermore, coalition 0 has the most whales, and these wealthy users may influence Maker protocol by participating Maker governance. Noticeably, there are 6 MKR whales in coalition 0[7], including a16z and other 5 anonymous voters, and the existence of MKR whales is a part of dominant voting power of coalition 0.

[Table 4 here]

Voters' activities in blockchain also matter, and the figure below shows the different structure of voter coalitions. For example, about a half of voters in coalition 0 and coalition 1 are DEX traders, the proportion of DEX traders in coalition 3 is less than a quarter. As for providing liquidity, more than 3/4 of voters in coalition 2 are liquidity providers, however, none of voters in coalition 4 provide liquidity. Such obvious and significant differences imply that voters in different coalitions are not the same type of investors, and their interests can be centralized in certain blockchain-based applications, e.g., DEX.

[Figure 11 here]

5. How voter coalitions influence Maker protocol

This section investigates how voter coalitions influence Maker protocol. In corporate finance,

[7] The details of whales in coalition 0 are given in online appendix 5.

shareholders will join forces with other to reduce uncertainty (Hogg, 2000), so strong coalitions can emerge (Sauerwald and Peng, 2013). For example, large shareholders can form coalitions to extract private benefits (Bennedsen and Wolfenzon, 2000), while minority shareholders will collaborate to protect their own interests (Zwiebel, 1995; Bennedsen and Wolfenzon, 2000). Furthermore, if shareholder coalitions have sufficient voting rights to influence decision making, interest conflicts should be observed (Sauerwald and Peng, 2013; Marquardt et al., 2018), especially when it comes to controversial proposals (Ginzburg et al., 2022). However, the impact of conflicts between shareholder coalitions are not well studied (Dyck and Zingales, 2004).

Given that voting history of MakerDAO is transparent, we expect to investigate how voter coalitions affect Maker protocol. Here, we focus on three specific factors of Maker protocol, including DAI volatility, total revenue of Maker protocol, and new users. To estimate regressions, two poll-level measurements, i.e., voting share and AI of voter coalitions, are transferred to daily measurements by taking weighted average, where weights are total votes of polls. The descriptive statistics of voting share and AI on daily basis are given in appendix 2.

5.1 Voting share

First, we are curious about how voting share of voter coalitions, especially coalition 0, is related to performance and growth of Maker protocol. In banking literature, centralized ownership can have complicated effects on firm performance, e.g., better capital buffers (Klein, Maidl and Woyand, 2021) and more risk-taking decisions (Dbouk et al., 2020). Therefore, firms with centralized governance structure have strong performance volatility (Giannetti and Zhao, 2019; Tran and Turkiela, 2020). Since Maker protocol resembles a bank in crypto markets, we expect that centralized governance is a double-edged sword for Maker protocol.

Price stability of DAI is a primary goal for MakerDAO, and Maker protocol aims to have more users and make more profits for long-term growth. Therefore, we expect to observe positive relationship between voting share of the largest coalition, i.e., coalition 0, and total revenue and new users. If higher voting share of coalition 0 contributes to more predictable decisions, lower volatility of DAI should be observed. In order to examine our hypotheses, we estimate the following regressions:

$$factor_t = \beta_0 + \beta_1 voting\ share_{i,t} + \beta_2 total\_asset_t + \beta_3 ETH_t + \beta_4 Dai\_volume_t + \beta_5 Mkr\_price_t + \beta_6 Total\_MakerDAO_t + \beta_7 Surplus\_buffer_t + \varepsilon_t \quad (5)$$

Where:

- $i = \{coalition\ 0, coalition\ 1, coalition\ 2, coalition\ 3, coalition\ 4\}$
- $factor = \{Dai\_volatility, Total\_revenue, New\_MakerDAO\}$

Beside voting share, we also consider key variables that can affect Maker protocol[8]. First, the value of total assets locked in Maker protocol for lending directly decides liquidity in Maker, and we consider the value of locked Ether (ETH) since ETH is the underlying cryptocurrency of Ethereum blockchain. Daily volume of DAI, to some extent, can reflect on the demand of DAI and how frequently DAI is traded. Higher volume usually implies optimistic prospects of a cryptocurrency. MKR, as the governance token of Maker protocol, resembles stocks in corporate finance. So, MKR price can be a signal of market valuation of Maker protocol, which may relate to measurements of performance of Maker protocol. For Maker protocol, more total users are crucial for better network adoption, while more surplus buffer makes the protocol safer.

The empirical results bring forward some interesting findings. First, DAI price is more volatile when coalition 0 has more voting share, while the voting share of coalition 2 and coalition 3 shows negative relationship with DAI stability. Though higher voting share implies higher winning possibility of a voting coalition, it does not mean that DAI will be more stable when a coalition is more likely in charge. The findings are consistent with Bernile et al. (2018), i.e., centralization can cause higher volatility. Theoretically, 'one share – one vote' mechanism will be optimal only when several bidders compete (Burkart and Lee, 2008). But in this case, more stable DAI may not be optimal choice for a certain voter coalition.

Another explanation on the relationship between DAI volatility and coalition 0 is based on uncertainty of voters' choices within the same coalition. Though coalition 0 is the most powerful coalition, their dominant control can work well only if most members choose the same options of a governance poll. But, if the governance poll is controversial, voter coalition 0 could suffer from more dispersed opinions. We will dive into this conjecture more deeply in the next sub-section.

Furthermore, we observe coalitions 2 and 3 can contribute to DAI stability. A potential explanation is based on the number of voters in these two coalitions (coalition 2 has 12 members, while coalition 3 has 14 members). For voters in coalitions 2 and 3, they can be in agreement more easily, and their significant voting power will help them to win polls. In this case, the options supported by these two coalitions are easier to win, and the results of a governance poll are more predictable. As a result, the future of DAI is more certain, and the price stability will also increase.

For the case of total revenue of Maker protocol, higher voting share of coalitions 0 and 5 can decrease the total revenue, and coalitions 2 and 3 show the opposite effects. The findings here first demonstrate that coalitions have different effects, which are not necessarily bad. Research on corporate governance (such as Shleifer and Vishny, 1997; Maury and Pajuste, 2005) shows that active large shareholders may or may not be beneficial, which are consistent with our findings. A reason of dissimilar effects of voter coalitions is that they do not share the same beliefs or interests. Total revenue, as one of the most crucial financial indicators, can reflect on the status of Maker protocol and

[8] The definitions of variables related to Maker protocol are given in appendix 3

benefits of Maker users. Usually, Maker protocol benefits from more total revenue. However, if Maker governance is battlefield of voter coalitions for their own interests, both positive and negative outcomes can happen, and the decreasing total revenue be a signal of some certain coalition's victory. Berglof and Burkart (2003) discuss similar issues in corporations. When shareholders have their own interests, they may attempt to pursue private benefits by diverting corporate resources, and the influences are complicated. When it comes to voting, shareholders' decisions depend on their private interests (Hamdani and Yafeh, 2013; Cvijanović et al., 2016), and the impact of such behavior is not very clear (Dyck and Zingales, 2004). Since Maker governance relies on voting process, voter coalitions will make decisions for their private benefits, which can have either positive or negative influence on Maker protocol. Therefore, on-chain governance is not immune from conflicts of interests, and voter coalitions, along with their decisions, can be either beneficial or harmful. Besides, we do not observe relationship between voter coalitions and new users of Maker protocol.

[Tables 5 – 7 here]

5.2 Group cohesion

Group cohesion of voter coalitions matters. Voters in the same coalitions can have different opinions sometimes, though they share similar voting patterns. Assuming that group cohesion of a coalitions is higher, this coalition is more likely to win a governance poll, and the decision-making process will have lower uncertainty. As a result, Maker community and other participants in crypto markets can be more prepared to changes to Maker protocol. On the other hand, when it comes to a more controversial proposal, group cohesion may be relatively low, and uncertainty of voting results can affect Maker protocol. Furthermore, we expect to observe different effects of coalitions' group cohesion since there are several coalitions in MakerDAO and their voting power varies. In order to examine our hypotheses, we estimate the following regressions:

$$factor_t = \beta_0 + \beta_1 agreement\ index_{i,t} + \beta_2 total\_asset_t + \beta_3 ETH_t + \beta_4 Dai\_volume_t + \beta_5 Mkr\_price_t + \beta_6 Total\_MakerDAO_t + \beta_7 Surplus\_buffer_t + \varepsilon_t \quad (6)$$

Where:

- $i = \{coalition\ 0, coalition\ 1, coalition\ 2, coalition\ 3, coalition\ 4\}$
- $factor = \{Dai\_volatility, Total\_revenue, New\_MakerDAO\}$

Our findings further reveal the relationship between DAI volatility and voter coalitions. When agreement index of coalition 0 is higher, DAI price is less volatile. Combing with the negative relationship between voting share of coalition 0 and DAI volatility, we show that both the voting share and group cohesion are crucial to the influence of a given voting coalition. Moreover, group cohesion of coalition 0 does contributes to Maker protocol, since DAI stability is a primary goal.

Beside coalition 0, other coalitions' group cohesion, e.g., coalition 4, also shows relationship with

DAI volatility. The opposite effects of these two coalitions depict multi-coalition democracy in Maker protocol, since DAI volatility undoubtedly relates to Maker governance. Furthermore, the case of coalition 4 proves again the importance of group cohesion. With a few members and less overwhelming voting power, coalition 4 can win only if they act as a tightly knitted group. And, if a minority voting coalition wins, their decisions may not be consistent with former decisions (Garlappi et al., 2017). As a result, the crypto market may react to the inconsistency, and DAI volatility will increase. Another explanation is that, voters in coalition 4 may only focus on own interests, which have conflicts with DAI stability.

For the case of total revenue of Maker protocol, voter coalitions' group cohesion has different effects. For coalition 3, their AI shows positive relationship with total revenue. But when coalitions 3 and 4 are more united, Maker protocol will suffer from less revenue, which further enhances our guesses about potentially selfish profit-seeking goals of voter coalitions.

[Tables 8 – 10 here]

5.3 Where is DAI?

As DAI is primary cryptocurrency issued by Maker protocol, the decision-making process of MakerDAO probably has influence on DAI. Beside price stability of DAI, we also investigate if voter coalitions can affect financial flows of DAI, i.e., where DAI is. Given the destination of DAI flows, we can have preliminary guesses of functions of DAI. Here, we consider five destinations of financial flows of DAI, including *Centralized Finance (CeFi)*, *Decentralized Exchanges (DEXes)*, *Lending Protocols (LPs)*, *External Owned Address (EOA)*, and *bridges*. In this paper, CeFi refers to blockchain-based financial applications ran by centralized companies. Usually, the centralized companies play the role of a trusted third coalition, and two well-known examples are *Binance*[9] and *Coinbase*[10]. For more detailed comparison between CeFi and DeFi, we refer readers to Qin et al. (2021). DEXes are crypto exchange platforms without any centralized third coalition, while LPs resemble banks in crypto ecosystem, and any agents can borrow and lend cryptocurrencies via interacting with LPs. Since there is no trusted third coalition in DEXes or LPs, all transactions will be processed and executed by smart contracts. For more introduction to the two categories of DeFi, we refer readers to Harvey et al. (2021) and Werner et al. (2021). As for EOA, we can simply regard it as Ethereum addresses controlled by human beings instead of computers. Besides, bridges refer to technical design that helps to achieve cross-chain transactions. Chen et al. (2020) and McCorry et al. (2021) provide more technical description for EOA and bridges, respectively.

Given the functions of different destinations of DAI financial flows, the roles of DAI can vary. For example, if DAI is transferred to LPs, it may be locked as collateral, or deposited as available liquidity. If more DAI is held in EOA, DAI is probably a part of less risky cryptoassets in the portfolio. The addresses included in the five categories are presented in online appendix 6. To investigate the effects

[9] Binance.com
[10] Coinbase.com

of voter coalitions on DAI flows, we estimate the regressions below:

$$Dai\ transferred_t = \beta_0 + \beta_1 voting\ share_{i,t} + \beta_2 total\_asset_t + \beta_3 ETH_t + \beta_4 Dai\_volume_t + \beta_5 Mkr\_price_t + \beta_6 Total\_MakerDAO_t + \beta_7 Surplus\_buffer_t + \varepsilon_t \quad (7)$$

Where:

- $i = \{coalition\ 0, coalition\ 1, coalition\ 2, coalition\ 3, coalition\ 4\}$
- $Dai\ transferred = \{CeFi, DEX, LP, EOA, Bridge\}$

For each voting coalition, we present how their voting share relates to DAI financial flows (see Tables 11-15), and Table 16 summarizes our findings. Not very surprisingly, voting coalition 0, as the largest voting coalition, shows significant influence on DAI financial flows. When voting coalition 0 has higher voting share, there will be more DAI transferred to DEXes and EOA, but the amount of DAI that flow to LPs and bridges will decrease.

Voter coalitions 1-4 can also increase and decrease DAI flows to certain blockchain-based applications, and the complicated relationship implies potential conflicts between different coalitions. For example, voter coalition 2 has similar influence on DAI flows to LPs and EOAs with voter coalition 0. However, coalition 3 has completely opposite effects. In this case, coalition 2 is an 'ally' of coalition 0, while coalition 3 is the common 'enemy' of coalition 0 and coalition 2. By observing the complex relationship between voter coalitions and DAI flows, we show that voter coalitions can either cooperate or defy each other, and cooperation is not always solid.

In the context of political science, coalition-directed voting exists in multiparty democracy. Duch, May and Armstrong (2010) argue that voters' choices rely on coalition, and Meffert and Gschwend (2007) show that coalition signals can inform strategic voters' choices in multiparty systems. The case of MakerDAO can expand the previous political studies to DeFi. First, MakerDAO is a multiparty system, and all suggested changes are proposed and decided by the Maker community. Then, DAI flows can be driven by competition of voter coalitions. For example, when voters feel unsatisfied with status quo of DAI, e.g., the distribution of DAI among CeFi and DeFi, some voters can propose certain changes, e.g., bans of transferring DAI to certain platforms. With different intention and preference, voter coalitions naturally have dispersed opinions on DAI and will vote accordingly. To summarize, varying flows of DAI are both a reason and evidence of multicoalition democracy in DAO.

[Tables 11 – 16 here]

6. Robustness checks

6.1 Are certain types of governance polls more important

In all governance polls, there are three most frequently shown labels, including 'risk parameter', 'MIP' and ‘greenlight’. We suspect that these three types of governance polls may be more crucial, and beside more dispersed opinions, some voters may avoid to participated in these polls (Bertrand and Mullainathan, 2003). So, it will be intriguing to examine that how voter coalitions’ behavior in certain types of governance polls can affect Maker protocol.

For each voting coalition, we first calculate voting share and AI based on the selected three types of governance polls. Then, we estimate regressions (5) and (6) again, and results in appendix 4 bring forward some interesting findings. First, for the cases of DAI volatility and new users, we do not observe significant results. But, when focusing on the total revenue of Maker protocol, higher voting share of smaller voter coalitions still has positive influence, while higher voting share of coalition 0 in ‘greenlight’ polls can decrease total revenue.

Surprisingly, group cohesion in certain types of governance polls matters. Consistent with prior discussion, DAI will be less volatile when voter coalition 0 has better group cohesion in ‘risk parameter’ and ‘greenlight’ polls. However, for other smaller coalitions, the findings may not hold. Therefore, the importance of governance polls cannot be evaluated by only labels. And, the influence of voter coalitions should be studied based on full voting records.

6.2 Who are the potential opinion leaders

A natural question about the largest voter coalition, i.e., coalition 0, is that: are there potential opinion leaders? Theoretically, herd behavior exists in voting and can affect the voting outcomes (Ali and Kartik, 2012; Dekel and Piccione, 2000). The first natural idea is influencers, e.g., influencers on social media. Here, we will consider voters who are ENS owners and Twitter users. If a user owns an ENS name, we believe she is probably more enthusiastic about Ethereum, and crypto people may track ENS owners’ transactions. On Twitter, people can discuss everything about blockchain and cryptocurrency, and influencers’ opinions can be spread. The finance contexts (e.g., Colla and Mele, 2010; Ozsoylev and Walden, 2011; Pedersen, 2022; Walden, 2019) prove how influential investors can affect markets via social networks.

Beside social media, the trading activities of voters can have extreme variation. Cohen, Frazzini and Malloy (2008) and Han, Hirshleifer and Walden (2021) discuss how investors’ strategies are related to network. To describe voters’ activities, we consider four categories of DeFi users, including DEX traders, liquidity providers, Non-fungible token (NFT) traders, and whales. For different types of voters from coalition 0, we calculate voting share and AI again, and appendix 5 shows the descriptive statistics[11].

Then, for each type of voters in coalition 0, we estimate regressions (5) – (7) again, and ENS owners and Twitter users are possible leaders in voter coalition 0. For example, for the case of these two types of voters, the relationship between Maker protocol and their voting is consistent with prior findings. However, when focusing on group cohesion, no significant evidence is found. So, the leadership of

[11] For different types of voters from coalition 0, online appendices 5 and 6 present the figures of voting share and AI, respectively.

ENS owners and Twitter users is probably from their voting power.

Then, we also examine how DAI flows are driven by different types of voters in coalition 0. For the cases of ENS owners, Twitter users, and DEX traders, the results for DAI flows to EOA and Bridges are similar to prior results. The only difference is that, for ENS owners and Twitter users, higher voting share can decrease DAI flows to CeFi, but the effects of DEX traders are opposite. Besides, liquidity providers in coalition 0 show the opposite influence on DAI flows, compared to the results for all voters in coalition 0. By classifying voters in coalition 0, we partly reveal their dissimilar interests, e.g., where DAI is transferred, and the difference may be from their various trading activities in DeFi.

Overall, ENS owners and Twitter users are potential opinion leaders in voter coalition 0, and their influence is probably from their voting power. But, in coalition 0, some voters, e.g., liquidity providers, can have different interests from others, which can be a reason for low AI in certain polls. Similar to arguments by Hermalin and Weisbach (2003) and Adam, Hermalin and Weisbach (2010), we need more exploration on internal structure of decision-makers in DAO.

[Tables 17-23 here]

6.3 Constrained K-means clustering

To examine if our empirical results hold using other clustering algorithms, we adopt constrained K-means clustering (Bradley, Bennett and Demiriz, 2000), which requires each cluster has at least a minimum number of points in it. In other words, we can equally divide voters into five voter coalitions, and there will not be a dominant cluster (i.e., coalition 0).

All results for constrained K-means are presented in online appendix 7. We observe that some voters are re-allocated, and by reestimating regressions, we find that the new voter coalitions still affect Maker protocol differently. Therefore, our empirical findings based on K-means are less likely to be simple coincidence, though different clustering algorithms can give dissimilar clustering results.

7. Conclusion

Voters in MakerDAO can probably form coalitions. In fact, it is found that five voter coalitions exist in MakerDAO after applying K-means to voting record of governance polls. Furthermore, these voter coalitions can affect Maker protocol differently, implying their dissimilar interests. For example, the largest coalition can cause higher volatility of DAI, while smaller coalitions can contribute to price stability of DAI. Coalition 0's voting share shows negative relationship with revenue of Maker protocol, while other coalitions can bring forwards more revenue when they control more voting power. Beside voting share, group cohesion is also crucial for voter coalitions. When coalition 0 is more cohesive, or smaller coalitions are less cohesive, DAI will be more stable. An explanation is that voting results will be more predictive when a strong coalition is more cohesive, and more certainty contributes to DAI stability.

This paper extends discussion in corporate governance to decentralized governance, which is a heat topic in the era of DeFi. For now, DAO is the most popular solution to decentralized governance, however, empirical studies (Sun, Stasinakis and Sermpinis, 2022; Fritsch, Müller and Wattenhofer, 2022) reveal centralized distribution of voting power in DAO. Compared with these studies, our paper further reveals collaboration of DAO voters and investigates how voter coalitions drives underlying DeFi. In corporate governance, shareholder coalitions are common, especially when some shareholders share similar goals (Black, 1990; Tajfel and Turner, 2004), and such coalitions can influence corporate decisions (Zwiebel, 1995). Though researchers realize the importance of voter coalitions, it is not very easy to present empirical research because of data limitations (Adam, Hermalin and Weisbach, 2010). Fortunately, benefiting from blockchain technology, decision-making process in DAO is transparent and precise, and anyone can easily retrieve the full voting history of any DAO. Therefore, DAO allows us to better explore the relationship between governance and performance of a financial system, and our paper can serve as a best example of research on on-chain governance.

Our findings can further contribute to arguments about shareholder behavior in corporate governance. Usually, shareholders make decisions based on their private benefits, and voting results depend on interactions among shareholders (Bennedsen and Wolfenzon, 2000). To illustrate dissimilar interests of voter coalitions, we choose cash flows of DAI as a proxy and track how coalitions drive DAI to different on-chain financial applications. Interestingly, coalitions will increase DAI flows to on-chain applications very differently. For example, coalition 0 and coalition 2 prefer DAI flows to LPs and EOAs, while voting coalition 3 is their common 'enemy'. Such observations are consistent with Meffert and Gschwend (2007) and May and Armstrong (2010), where several voter coalitions may work together for certain goals. Further study can attempt to investigate more interactions between voter coalitions in DAO and examine if such interactions can affect the underlying DeFi protocol. Moreover, if DAO voters' private benefits can be revealed, we will be able to know more about why coalitions are formed and show how private benefits drive DeFi protocols.

Although our findings appear conceptually and empirically robust, they should be interpreted with their limitations in mind. First, we cluster voters based on their voting records, because there is no clear coalition membership in DAO. But we should realize that DAO community will not reveal their vulnerability by committing the potential coalitions of voters. Second, it is hard to identify the opinion leaders in voter coalitions because of anonymity of blockchain. Though not all voters can be matched with an entity in real life, some voters with publicly known identities, e.g., ENS names and Twitter, may be opinion leaders in coalition 0. Further studies may attempt to reveal more information of DAO voters, and the leaders in DAO will be a intriguing research topic. Third, we do not investigate why voter coalitions' voting share and group cohesion change. Voters, beside voting, can have more complex activities using the underlying DeFi, and their voting behavior can be influenced by all their financial activities. Therefore, motivations of participating in DAO should be better studied. Finally, assuming that voter coalitions exist, voters can turn to different voter coalitions. Therefore, the influence of multicoalition democracy on DAO and its underlying protocol should be more complicated than the discussion in this paper.

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Tables

Table 1. Descriptive statistics of Maker governance polls

	Total votes	Total voters	Breakdown votes	Breakdown ratio	Vote share of the largest voter coalition
Mean	47934.36	25.97	40492.13	0.88	0.74
Median	37477.47	22	34011.03	0.98	0.72
Maximum	293911.44	158	176846.86	1	1.00
Minimum	259.74	5	232.80	0.35	0.37
Std	33940.98	15.92	26878.17	0.17	0.16

Table 2. Descriptive statistics of voter coalitions in MakerDAO

	Number of voters	Involved polls	Total votes	First poll
Voter coalition 0	1674	787	22235328.27	2017-12-18
Voter coalition 1	8	627	2885765.90	2019-04-11
Voter coalition 2	12	438	4353640.14	2020-11-14
Voter coalition 3	14	484	2488075.43	2019-06-04
Voter coalition 4	9	406	6712065.12	2019-08-22

Notes: For all voter coalitions, we exclude voters whose total votes equal to zero. Though these voters stated their opinions, they do not influence the results of voting.

Table 3. Descriptive statistics of Agreement Index (AI) of voter coalitions

	Voter coalition 0	Voter coalition 1	Voter coalition 2	Voter coalition 3	Voter coalition 4
Mean	0.84	0.91	0.96	0.96	0.93
Median	0.99	1	1	1	1
Maximum	1	1	1	1	1
Minimum	0	0.17	0.44	0.45	0
Std	0.26	0.18	0.10	0.12	0.23

Table 4. Internal structure of voter coalitions

	Voter coalition 0	Voter coalition 1	Voter coalition 2	Voter coalition 3	Voter coalition 4
ENS owner	344	0	5	2	0
Twitter user	149	0	3	1	0
DEX trader	873	4	3	3	3
Liquidity provider	414	2	1	1	0
NFT trader	622	4	2	3	0
Whale	79	0	0	0	1
Delegate	64	0	4	0	0
Total voters	1674	8	12	14	9

Table 5. The relationship between DAI volatility and voting share of voter coalitions

	(1)	(2)	(3)	(4)	(5)
Voting share	**0.12****	-0.12	**-0.20****	**-0.17****	0.05
	(2.03)	(-1.54)	**(-2.44)**	**(-2.19)**	(0.77)
Total_asset	0.19	0.16	0.47**	0.17	0.22
	(0.87)	(0.72)	(1.96)	(0.79)	(1.00)
ETH	-0.26	-0.25	-0.21	-0.26	-0.23
	(-1.56)	(-1.49)	(-1.32)	(-1.58)	(-1.37)
Dai_volume	0.14	0.18	0.22	0.18	0.22
	(0.77)	(1.02)	(1.24)	(1.01)	(1.19)
Mkr_price	**-0.40*****	**-0.33****	**-0.55*****	**-0.33****	**-0.41*****
	(-3.08)	**(-2.31)**	**(-4.15)**	**(-2.46)**	**(-3.04)**
Total_MakerDAO	0.07	-0.02	-0.08	-0.05	-0.10
	(0.61)	(-0.18)	(-0.86)	(-0.52)	(-0.87)
Surplus_buffer	-0.08	0.00	-0.05	0.03	0.03
	(-0.46)	(-0.03)	(-0.32)	(0.17)	(0.18)
N	174	174	174	174	174
Adj. R-sq	0.23	0.23	0.24	0.24	0.22

Note: This table reports the regression coefficients and standard t-statistics in the parentheses for the case of DAI volatility. Columns (1) – (5) presents results for voter coalitions 0 – 4, respectively. *, **, and *** denote significance levels at the 10%, 5%, and 1% levels based on the standard t-statistics. The definitions of the variables are given in Table A.4.

Table 6. The relationship between total revenue of Maker protocol and voting share of voter coalitions

	(1)	(2)	(3)	(4)	(5)
Voting share	**-0.11*** **	**0.26*** **	**0.24*** **	0.00	**-0.09** **
	(-3.58)	**(7.00)**	**(5.79)**	(0.10)	**(-2.36)**
Total_asset	0.07	0.18	**-0.26** **	0.04	0.03
	(0.59)	(1.58)	**(-2.18)**	(0.36)	(0.29)
ETH	**0.66*** **	**0.67*** **	**0.62*** **	**0.63*** **	**0.63*** **
	(7.56)	**(8.47)**	**(7.50)**	**(6.99)**	**(7.12)**
Dai_volume	0.10	0.07	0.02	0.04	0.01
	(1.02)	(0.86)	(0.18)	(0.44)	(0.11)
Mkr_price	**0.33*** **	**0.14** **	**0.51*** **	**0.37*** **	**0.32*** **
	(4.90)	**(2.01)**	**(7.58)**	**(5.02)**	**(4.48)**
Total_MakerDAO	-0.02	0.01	**0.13*** **	**0.10* **	**0.17*** **
	(-0.37)	(0.29)	**(2.64)**	**(1.77)**	**(2.75)**
Surplus_buffer	-0.12	**-0.18** **	-0.13	**-0.19** **	**-0.24*** **
	(-1.37)	**(-2.40)**	(-1.60)	**(-2.11)**	**(-2.70)**
N	174	174	174	174	174
Adj. R-sq	0.84	0.87	0.86	0.83	0.83

Note: This table reports the regression coefficients and standard t-statistics in the parentheses for the case of total revenue of Maker protocol. Columns (1) – (5) presents results for voter coalitions 0 – 4, respectively. *, **, and *** denote significance levels at the 10%, 5%, and 1% levels based on the standard t-statistics. The definitions of the variables are given in Table A.4.

Table 7. The relationship between new users of Maker protocol and voting share of voter coalitions

	(1)	(2)	(3)	(4)	(5)
Voting share	0.01	0.01	0.00	0.00	-0.02
	(0.42)	(0.30)	(0.06)	(-0.06)	(-0.71)
Total_asset	0.01	0.01	0.01	0.01	0.01
	(0.08)	(0.15)	(0.07)	(0.10)	(0.08)
ETH	0.00	0.00	0.00	0.00	0.00
	(-0.07)	(-0.01)	(-0.03)	(-0.04)	(-0.03)
Dai_volume	-0.01	-0.01	-0.01	-0.01	-0.01
	(-0.20)	(-0.12)	(-0.13)	(-0.13)	(-0.23)
Mkr_price	0.01	0.00	0.01	0.01	0.00
	(0.29)	(0.05)	(0.23)	(0.23)	(-0.02)
Total_MakerDAO	**-0.34*** **	**-0.35*** **	**-0.35*** **	**-0.35*** **	**-0.33*** **
	(-8.44)	**(-10.04)**	**(-10.18)**	**(-10.26)**	**(-8.51)**
Surplus_buffer	-0.01	0.00	0.00	0.00	-0.01
	(-0.10)	(-0.01)	(0.00)	(0.00)	(-0.20)
N	174	174	174	174	174
Adj. R-sq	0.58	0.58	0.58	0.58	0.58

Note: This table reports the regression coefficients and standard t-statistics in the parentheses for the case of new users of Maker protocol. Columns (1) – (5) presents results for voter coalitions 0 – 4, respectively. *, **, and *** denote significance levels at the 10%, 5%, and 1% levels based on the standard t-statistics. The definitions of the variables are given in Table A.4.

Table 8. The relationship between DAI volatility and group cohesion of voter coalitions

	(1)	(2)	(3)	(4)	(5)
Agreement Index	**-0.25*** **	-0.08	-0.09	0.02	**0.32** **
	(-3.61)	(-0.89)	(-1.00)	(0.19)	**(2.12)**
Total_asset	0.28	-0.37	0.32	**0.85* **	-2.16
	(1.27)	(-0.38)	(1.49)	**(1.78)**	(-1.01)
ETH	-0.24	0.41	**-0.28* **	-0.39	0.39
	(-1.43)	(0.89)	**(-1.82)**	(-1.42)	(0.23)
Dai_volume	0.24	0.02	0.27	0.09	-0.36
	(1.36)	(0.10)	(1.63)	(0.64)	(-0.09)
Mkr_price	**-0.43*** **	**-0.59*** **	**-0.27** **	**-0.37*** **	0.19
	(-3.37)	**(-2.95)**	**(-2.04)**	**(-2.76)**	(0.24)
Total_MakerDAO	0.02	-0.07	-1.31	-0.06	0.14
	(0.15)	(-0.64)	(-0.55)	(-0.74)	(0.59)
Surplus_buffer	-0.12	0.12	0.16	-0.43	-0.20
	(-0.71)	(0.17)	(0.53)	(-1.41)	(-0.10)

N	166	121	107	102	67
Adj. R-sq	0.27	0.29	0.23	0.27	0.14

Note: This table reports the regression coefficients and standard t-statistics in the parentheses for the case of DAI volatility. Columns (1) – (5) presents results for voter coalitions 0 – 4, respectively. *, **, and *** denote significance levels at the 10%, 5%, and 1% levels based on the standard t-statistics. The definitions of the variables are given in Table A.4.

Table 9. The relationship between total revenue of Maker protocol and group cohesion of voter coalitions

	(1)	(2)	(3)	(4)	(5)
Agreement Index	0.00	-0.03	**0.22*** **	**-0.13** **	**-0.04** **
	(0.07)	(-0.74)	**(3.62)**	**(-2.16)**	**(-2.07)**
Total_asset	0.07	**-1.26*** **	-0.08	**-1.79*** **	**2.32*** **
	(0.56)	**(-2.72)**	(-0.56)	**(-5.67)**	**(9.22)**
ETH	**0.61*** **	**1.46*** **	**0.66*** **	**1.30*** **	**-0.43** **
	(6.69)	**(6.50)**	**(6.35)**	**(7.14)**	**(-2.21)**
Dai_volume	0.02	-0.12	-0.01	-0.05	**-1.76*** **
	(0.15)	(-1.48)	(-0.09)	(-0.47)	**(-3.92)**
Mkr_price	**0.36*** **	**0.51*** **	**0.30*** **	**0.32*** **	0.04
	(5.10)	**(5.34)**	**(3.34)**	**(3.60)**	(0.49)
Total_MakerDAO	**0.11** **	**0.12** **	1.46	**0.24*** **	**-0.12*** **
	(2.07)	**(2.29)**	(0.91)	**(4.11)**	**(-4.06)**
Surplus_buffer	**-0.21** **	0.19	-0.27	**0.88*** **	**0.71*** **
	(-2.34)	(0.57)	(-1.32)	**(4.36)**	**(2.95)**
N	166	121	107	102	67
Adj. R-sq	0.82	0.89	0.72	0.83	0.97

Note: This table reports the regression coefficients and standard t-statistics in the parentheses for the case of total revenue of Maker protocol. Columns (1) – (5) presents results for voter coalitions 0 – 4, respectively. *, **, and *** denote significance levels at the 10%, 5%, and 1% levels based on the standard t-statistics. The definitions of the variables are given in Table A.4.

Table 10. The relationship between new users of Maker protocol and group cohesion of voter coalitions

	(1)	(2)	(3)	(4)	(5)
Agreement Index	0.00	-0.01	0.00	-0.01	-0.02
	(0.20)	(-0.37)	(-0.45)	(-0.12)	(-0.46)
Total_asset	0.01	0.37	**0.02** **	-0.02	0.77
	(0.13)	(0.85)	**(2.40)**	(-0.09)	(1.46)
ETH	0.00	-0.13	0.00	0.01	-0.48
	(-0.08)	(-0.60)	(0.63)	(0.05)	(-1.16)
Dai_volume	-0.01	-0.02	-0.01	-0.01	1.22
	(-0.18)	(-0.22)	(-1.38)	(-0.18)	(1.30)
Mkr_price	0.01	0.07	0.00	0.00	0.06
	(0.17)	(0.73)	(0.32)	(0.04)	(0.31)
Total_MakerDAO	**-0.35*** **	**-0.39*** **	**-1.30*** **	**-0.35*** **	**-0.36*** **
	(-9.74)	**(-7.77)**	**(-12.70)**	**(-7.30)**	**(-6.01)**
Surplus_buffer	0.00	-0.28	**0.10*** **	0.02	-0.38
	(-0.02)	(-0.89)	**(7.89)**	(0.10)	(-0.76)
N	166	121	107	102	67
Adj. R-sq	0.58	0.53	0.84	0.55	0.56

Note: This table reports the regression coefficients and standard t-statistics in the parentheses for the case of new users of Maker protocol. Columns (1) – (5) presents results for voter coalitions 0 – 4, respectively. *, **, and *** denote significance levels at the 10%, 5%, and 1% levels based on the standard t-statistics. The definitions of the variables are given in Table A.4.

Table 11. The relationship between DAI flows and voting share of voter coalition 0

	(1)	(2)	(3)	(4)	(5)
Voting share	0.07	**0.13*** **	**-0.21*** **	**0.05** **	**-0.11*** **
	(0.79)	**(3.31)**	**(-2.57)**	**(2.11)**	**(-3.10)**
Total_asset	**0.94*** **	**1.16*** **	**0.50*** **	**0.32*** **	**1.92*** **
	(6.57)	**(17.79)**	**(3.52)**	**(8.14)**	**(31.28)**
ETH	**-0.56*** **	**0.34*** **	0.14	-0.02	**-0.40*** **
	(-5.17)	**(6.87)**	(1.34)	(-0.60)	**(-8.71)**
Dai_volume	**0.21***	0.05	-0.15	0.04	0.00
	(1.76)	(0.92)	(-1.28)	(1.17)	(0.04)
Mkr_price	**0.31*** **	**-0.32*** **	**0.64*** **	-0.02	**-0.19*** **

	(1)	(2)	(3)	(4)	(5)
	(3.46)	**(-7.66)**	**(7.20)**	(-0.70)	**(-5.03)**
Total_MakerDAO	**0.18*****	-0.01	**-0.14****	**0.06*****	**-0.25*****
	(2.76)	(-0.09)	**(-1.99)**	**(3.09)**	**(-7.48)**
Surplus_buffer	**-0.27****	**-0.52*****	**0.22***	**0.77*****	**-0.74*****
	(-2.36)	**(-9.71)**	**(1.88)**	**(24.32)**	**(-14.88)**
N	174	161	173	174	170
Adj. R-sq	0.71	0.97	0.88	0.99	0.97

Note: This table reports the regression coefficients and standard t-statistics in the parentheses for the case of voter coalition 0. Columns (1) – (5) presents results for DAI flows to CeFi, DEXes, LPs, EOA and Bridge, respectively. *, **, and *** denote significance levels at the 10%, 5%, and 1% levels based on the standard t-statistics. The details of different categories of blockchain-based applications are given in Table A.5.

Table 12. The relationship between DAI flows and voting share of voter coalition 1

	(1)	(2)	(3)	(4)	(5)
Voting share	**0.24*****	-0.01	-0.01	0.00	-0.02
	(6.30)	(-0.45)	(-0.22)	(0.05)	(-0.91)
Total_asset	**1.05*****	**1.15*****	**0.51*****	**0.32*****	**1.92*****
	(8.05)	**(16.77)**	**(3.49)**	**(7.89)**	**(30.17)**
ETH	**-0.46*****	**0.35*****	0.12	-0.01	**-0.42*****
	(-4.67)	**(6.74)**	(1.09)	(-0.43)	**(-8.75)**
Dai_volume	**0.22****	0.07	-0.18	0.05	-0.01
	(2.02)	(1.25)	(-1.53)	(1.38)	(-0.89)
Mkr_price	0.00	**-0.35*****	**0.73*****	-0.04	**-0.13*****
	(-0.04)	**(-7.69)**	**(7.36)**	(-1.33)	**(-3.07)**
Total_MakerDAO	-0.02	-0.02	-0.09	**0.05****	**-0.21*****
	(-0.29)	(-0.34)	(-1.21)	**(2.39)**	**(-5.59)**
Surplus_buffer	-0.14	**-0.45*****	0.10	**0.80*****	**-0.81*****
	(-1.47)	**(-8.75)**	(0.88)	**(26.62)**	**(-17.01)**
N	174	161	173	174	170
Adj. R-sq	0.77	0.96	0.87	0.99	0.96

Note: This table reports the regression coefficients and standard t-statistics in the parentheses for the case of voter coalition 1. Columns (1) – (5) presents results for DAI flows to CeFi, DEXes, LPs, EOA and Bridge, respectively. *, **, and *** denote significance levels at the 10%, 5%, and 1% levels based on the standard t-statistics. The details of different categories of blockchain-based applications are given in Table A.5.

Table 13. The relationship between DAI flows and voting share of voter coalition 2

	(1)	(2)	(3)	(4)	(5)
Voting share	**0.10***	0.04	**-0.37*****	**0.08*****	**0.12*****
	(1.94)	(1.50)	**(-8.69)**	**(6.29)**	**(6.19)**
Total_asset	**0.82*****	**1.11*****	**0.96*****	**0.22*****	**1.77*****
	(5.31)	**(15.22)**	**(7.36)**	**(5.66)**	**(28.78)**
ETH	**-0.57*****	**0.34*****	**0.19****	-0.03	**-0.43*****
	(-5.31)	**(6.78)**	**(2.06)**	(-0.99)	**(-10.11)**
Dai_volume	**0.20***	0.07	-0.13	0.03	-0.03
	(1.73)	(1.16)	(-1.27)	(1.12)	(-0.72)
Mkr_price	**0.37*****	**-0.33*****	**0.36*****	**0.04***	-0.03
	(3.94)	**(-7.22)**	**(4.50)**	**(1.69)**	(-0.88)
Total_MakerDAO	**0.19*****	-0.03	**-0.16*****	**0.06*****	**-0.21*****
	(2.89)	(-0.52)	**(-2.74)**	**(3.73)**	**(-6.90)**
Surplus_buffer	**-0.23****	**-0.45*****	0.09	**0.80*****	**-0.79*****
	(-2.22)	**(-8.90)**	(0.98)	**(30.07)**	**(-18.88)**
N	174	161	173	174	170
Adj. R-sq	0.72	0.96	0.91	0.99	0.97

Note: This table reports the regression coefficients and standard t-statistics in the parentheses for the case of voter coalition 2. Columns (1) – (5) presents results for DAI flows to CeFi, DEXes, LPs, EOA and Bridge, respectively. *, **, and *** denote significance levels at the 10%, 5%, and 1% levels based on the standard t-statistics. The details of different categories of blockchain-based applications are given in Table A.5.

Table 14. The relationship between DAI flows and voting share of voter coalition 3

	(1)	(2)	(3)	(4)	(5)
Voting share	0.05	**-0.04****	**0.15*****	**-0.03*****	-0.01
	(1.29)	**(-2.25)**	**(4.33)**	**(-3.47)**	(-0.78)
Total_asset	**0.95*****	**1.14*****	**0.57*****	**0.30*****	**1.92*****
	(6.66)	**(17.04)**	**(4.14)**	**(7.87)**	**(30.38)**

	(1)	(2)	(3)	(4)	(5)
ETH	**-0.55***** **(-5.10)**	**0.35***** **(6.92)**	0.14 (1.33)	-0.02 (-0.56)	**-0.41***** **(-8.72)**
Dai_volume	**0.23*** **(1.91)**	0.06 (1.15)	-0.16 (-1.39)	0.04 (1.25)	-0.02 (-0.33)
Mkr_price	**0.26***** **(3.08)**	**-0.35***** **(-8.63)**	**0.64***** **(7.87)**	-0.02 (-0.84)	**-0.15***** **(-3.87)**
Total_MakerDAO	**0.16***** **(2.47)**	-0.02 (-0.31)	**-0.14**** **(-2.12)**	**0.06***** **(3.26)**	**-0.23***** **(-6.68)**
Surplus_buffer	**-0.25**** **(-2.36)**	**-0.44***** **(-8.78)**	0.06 (0.55)	**0.81***** **(28.10)**	**-0.79***** **(-16.94)**
N	174	161	173	174	170
Adj. R-sq	0.71	0.96	0.89	0.99	0.96

Note: This table reports the regression coefficients and standard t-statistics in the parentheses for the case of voter coalition 3. Columns (1) – (5) presents results for DAI flows to CeFi, DEXes, LPs, EOA and Bridge, respectively. *, **, and *** denote significance levels at the 10%, 5%, and 1% levels based on the standard t-statistics. The details of different categories of blockchain-based applications are given in Table A.5.

Table 15. The relationship between DAI flows and voting share of voter coalition 4

	(1)	(2)	(3)	(4)	(5)
Voting share	**-0.15***** **(-3.03)**	**0.05**** **(2.01)**	-0.03 (-0.55)	**-0.02*** **(-1.81)**	**0.05**** **(2.25)**
Total_asset	**0.93***** **(6.68)**	**1.16***** **(17.32)**	**0.52***** **(3.55)**	**0.32***** **(8.01)**	**1.93***** **(31.04)**
ETH	**-0.56***** **(-5.30)**	**0.35***** **(6.99)**	0.12 (1.13)	-0.01 (-0.48)	**-0.41***** **(-8.79)**
Dai_volume	0.17 (1.44)	0.09 (1.55)	-0.19 (-1.59)	0.04 (1.12)	0.00 (0.05)
Mkr_price	**0.19**** **(2.25)**	**-0.34***** **(-7.99)**	**0.70***** **(7.76)**	**-0.05**** **(-2.06)**	**-0.12***** **(-3.13)**
Total_MakerDAO	**0.30***** **(3.96)**	-0.07 (-1.28)	-0.08 (-0.92)	**0.07***** **(3.29)**	**-0.27***** **(-7.10)**
Surplus_buffer	**-0.34***** **(3.11)**	**-0.42***** **(-7.96)**	0.08 (0.71)	**0.78***** **(25.34)**	**-0.76***** **(-15.77)**
N	174	161	173	174	170
Adj. R-sq	0.72	0.96	0.87	0.99	0.96

Note: This table reports the regression coefficients and standard t-statistics in the parentheses for the case of voter coalition 4. Columns (1) – (5) presents results for DAI flows to CeFi, DEXes, LPs, EOA and Bridge, respectively. *, **, and *** denote significance levels at the 10%, 5%, and 1% levels based on the standard t-statistics. The details of different categories of blockchain-based applications are given in Table A.5.

Table 16. The relationship between voter coalitions and DAI flows

	CeFi	DEX	LP	EOA	Bridge
Voting share 0		+	-	+	-
Voting share 1	+				
Voting share 2	+		-	+	+
Voting share 3		-	+	-	
Voting share 4	-	+		-	+

Note: This table reports how voting share of voter coalitions is related to DAI flows. '+' means higher voting share will be positively related to DAI flows to a certain destination, while '-' means higher voting share will decrease DAI flows to the destination.

Table 17. The relationship between DAI volatility and voting share of different types of voters from coalition 0

	(1)	(2)	(3)	(4)	(5)	(6)
Voting share	**0.25***** **(2.91)**	**0.47***** **(3.74)**	**-0.14*** **(-1.79)**	-0.14 (-0.58)	-0.15 (-1.25)	-0.13 (-1.02)
Total_asset	0.15 (0.70)	0.13 (0.59)	0.22 (1.03)	0.21 (0.96)	0.22 (0.98)	0.21 (0.98)
ETH	**-0.33**** **(-1.98)**	**-0.44***** **(-2.60)**	-0.24 (-1.45)	-0.23 (-1.39)	-0.23 (-1.38)	-0.24 (-1.42)
Dai_volume	0.19 (1.04)	0.17 (0.96)	0.28 (1.49)	0.19 (1.04)	0.20 (1.10)	0.19 (1.06)
Mkr_price	**-0.29**** **(-2.18)**	-0.18 (-1.23)	**-0.42***** **(-3.26)**	**-0.43***** **(-3.30)**	**-0.44***** **(-3.44)**	**-0.42***** **(-3.21)**
Total_MakerDAO	-0.02	-0.01	-0.12	-0.05	-0.11	-0.10

	(-0.18)	(-0.06)	(-1.15)	(-0.53)	(-1.03)	(-0.92)
Surplus_buffer	-0.18	-0.17	-0.02	0.00	0.00	0.00
	(-1.05)	(-1.05)	(-0.14)	(-0.03)	(0.03)	(0.02)
N	174	174	174	174	174	174
Adj. R-sq	0.25	0.28	0.23	0.22	0.22	0.22

Note: This table reports the regression coefficients and standard t-statistics in the parentheses for the case of DAI volatility. Columns (1) – (6) presents results for ENS owners, Twitter users, DEX traders, liquidity providers, NFT traders, and whales from voting coalition 0, respectively. *, **, and *** denote significance levels at the 10%, 5%, and 1% levels based on the standard t-statistics. The definitions of the variables are given in Table A.4.

Table 18. The relationship between total revenue of Maker protocol and voting share of different types of voters from coalition 0

	(1)	(2)	(3)	(4)	(5)	(6)
Voting share	**-0.33*** **	**-0.33*** **	0.06	-0.09	0.01	0.02
	(-8.43)	**(-5.01)**	(1.38)	(-0.66)	(0.14)	(0.26)
Total_asset	0.13	0.11	0.04	0.04	0.04	0.04
	(1.29)	(0.95)	(0.33)	(0.33)	(0.36)	(0.36)
ETH	**0.77*** **	**0.78*** **	**0.64*** **	**0.63*** **	**0.63*** **	**0.63*** **
	(9.96)	**(8.76)**	**(7.09)**	**(6.98)**	**(7.01)**	**(7.01)**
Dai_volume	0.06	0.07	0.01	0.04	0.04	0.04
	(0.73)	(0.71)	(0.10)	(0.38)	(0.44)	(0.44)
Mkr_price	**0.18*** **	**0.19*** **	**0.37*** **	**0.39*** **	**0.38*** **	**0.37*** **
	(2.81)	**(2.52)**	**(5.27)**	**(5.48)**	**(5.44)**	**(5.29)**
Total_MakerDAO	0.04	0.06	**0.12*** *	**0.10***	**0.10***	**0.10***
	(0.96)	(1.20)	**(2.15)**	**(1.81)**	**(1.68)**	**(1.73)**
Surplus_buffer	0.05	-0.07	**-0.18*** *	**-0.19*** *	**-0.19*** *	**-0.19*** *
	(0.60)	(-0.80)	**(-2.03)**	**(-2.11)**	**(-2.11)**	**(-2.12)**
N	174	174	174	174	174	174
Adj. R-sq	0.88	0.85	0.83	0.83	0.83	0.83

Note: This table reports the regression coefficients and standard t-statistics in the parentheses for the case of total revenue of Maker protocol. Columns (1) – (6) presents results for ENS owners, Twitter users, DEX traders, liquidity providers, NFT traders, and whales from coalition 0, respectively. *, **, and *** denote significance levels at the 10%, 5%, and 1% levels based on the standard t-statistics. The definitions of the variables are given in Table A.4.

Table 19. The relationship between new users of Maker protocol and voting share of different types of voters from coalition 0

	(1)	(2)	(3)	(4)	(5)	(6)
Voting share	0.00	0.01	-0.02	0.00	**-0.10*** *	0.05
	(0.08)	(0.17)	(-0.63)	(-0.06)	**(-2.39)**	(1.26)
Total_asset	0.01	0.01	0.01	0.01	0.01	0.01
	(0.09)	(0.08)	(0.12)	(0.10)	(0.10)	(0.11)
ETH	0.00	-0.01	0.00	0.00	0.00	0.00
	(-0.05)	(-0.08)	(-0.06)	(-0.03)	(-0.05)	(0.03)
Dai_volume	-0.01	-0.01	0.00	-0.01	-0.01	-0.01
	(-0.13)	(-0.14)	(0.02)	(-0.14)	(-0.12)	(-0.09)
Mkr_price	0.01	0.01	0.01	0.01	0.01	0.00
	(0.24)	(0.27)	(0.30)	(0.23)	(0.32)	(-0.03)
Total_MakerDAO	**-0.35*** **	**-0.35*** **	**-0.36*** **	**-0.35*** **	**-0.38*** **	**-0.33*** **
	(-10.16)	**(-10.14)**	**(-9.87)**	**(-10.25)**	**(-10.49)**	**(-8.93)**
Surplus_buffer	0.00	0.00	0.00	0.00	0.01	0.00
	(-0.04)	(-0.05)	(-0.05)	(-0.01)	(0.10)	(-0.07)
N	174	174	174	174	174	174
Adj. R-sq	0.58	0.58	0.58	0.58	0.59	0.58

Note: This table reports the regression coefficients and standard t-statistics in the parentheses for the case of new users of Maker protocol. Columns (1) – (6) presents results for ENS owners, Twitter users, DEX traders, liquidity providers, NFT traders, and whales from coalition 0, respectively. *, **, and *** denote significance levels at the 10%, 5%, and 1% levels based on the standard t-statistics. The definitions of the variables are given in Table A.4.

Table 20. The relationship between DAI volatility and group cohesion of different types of voters from coalition 0

	(1)	(2)	(3)	(4)	(5)	(6)
Agreement Index	-0.03	-0.07	**-0.16***	-0.10	-0.05	**-0.33*****
	(-0.37)	(-0.70)	**(-1.66)**	(-0.95)	(-0.54)	**(-2.88)**
Total_asset	0.21	0.24	**0.44***	0.35	0.39	0.59
	(0.87)	(1.08)	**(1.69)**	(1.14)	(1.40)	(1.57)
ETH	-0.24	-0.27	**-0.40****	-0.34	**-0.43***	-0.19
	(-1.34)	(-1.56)	**(-2.00)**	(-1.48)	**(-1.87)**	(-0.79)
Dai_volume	0.17	0.21	0.19	0.18	0.19	0.10
	(0.86)	(1.13)	(0.97)	(0.88)	(0.99)	(0.63)
Mkr_price	**-0.47*****	**-0.31****	**-0.38*****	**-0.41*****	**-0.31****	**-0.38*****
	(-3.20)	**(-2.05)**	**(-2.64)**	**(-2.56)**	**(-1.99)**	**(-2.67)**
Total_MakerDAO	-0.01	-0.12	-0.05	-0.10	-0.02	-0.10
	(-0.04)	(-0.81)	(-0.48)	(-0.82)	(-0.22)	(-1.04)
Surplus_buffer	-0.03	0.02	-0.12	-0.06	-0.07	-0.35
	(-0.19)	(0.12)	(-0.66)	(-0.27)	(-0.35)	(-1.34)
N	131	104	154	128	128	80
Adj. R-sq	0.22	0.18	0.23	0.24	0.21	0.33

Note: This table reports the regression coefficients and standard t-statistics in the parentheses for the case of DAI volatility. Columns (1) – (6) presents results for ENS owners, Twitter users, DEX traders, liquidity providers, NFT traders, and whales from coalition 0, respectively. *, **, and *** denote significance levels at the 10%, 5%, and 1% levels based on the standard t-statistics. The definitions of the variables are given in Table A.4.

Table 21. The relationship between total revenue of Maker protocol and group cohesion of different types of voters from coalition 0

	(1)	(2)	(3)	(4)	(5)	(6)
Agreement Index	-0.05	-0.07	0.02	0.01	0.01	0.13
	(0.28)	(-1.20)	(0.38)	(0.12)	(0.31)	(1.56)
Total_asset	0.07	0.10	0.01	-0.04	-0.05	-0.33
	(0.55)	(0.74)	(0.07)	(-0.26)	(-0.33)	(-1.18)
ETH	**0.61*****	**0.62*****	**0.60*****	**0.61*****	**0.59*****	**0.82*****
	(6.48)	**(6.20)**	**(5.95)**	**(5.31)**	**(4.87)**	**(4.49)**
Dai_volume	-0.01	-0.02	-0.01	-0.02	-0.02	-0.04
	(-0.12)	(-0.19)	(-0.05)	(-0.20)	(-0.17)	(-0.32)
Mkr_price	**0.29*****	**0.24*****	**0.41*****	**0.41*****	**0.46*****	**0.32*****
	(3.73)	**(2.75)**	**(5.58)**	**(5.20)**	**(5.63)**	**(3.11)**
Total_MakerDAO	**0.15****	**0.16****	**0.12****	**0.16*****	**0.12****	**0.17****
	(2.24)	**(1.96)**	**(2.15)**	**(2.49)**	**(2.28)**	**(2.27)**
Surplus_buffer	**-0.24****	**-0.30*****	**-0.17***	-0.16	-0.14	-0.05
	(-2.46)	**(-2.86)**	**(-1.78)**	(-1.54)	(-1.38)	(-0.26)
N	131	104	154	128	128	80
Adj. R-sq	0.80	0.76	0.83	0.81	0.83	0.81

Note: This table reports the regression coefficients and standard t-statistics in the parentheses for the case of total revenue of Maker protocol. Columns (1) – (6) presents results for ENS owners, Twitter users, DEX traders, liquidity providers, NFT traders, and whales from coalition 0, respectively. *, **, and *** denote significance levels at the 10%, 5%, and 1% levels based on the standard t-statistics. The definitions of the variables are given in Table A.4.

Table 22. The relationship between new users of Maker protocol and group cohesion of different types of voters from coalition 0

	(1)	(2)	(3)	(4)	(5)	(6)
Agreement Index	-0.01	0.00	0.02	0.01	0.04	0.00
	(-0.31)	(0.03)	(0.62)	(0.65)	(1.05)	(-0.05)
Total_asset	0.01	0.00	0.02	0.02	0.01	0.01
	(0.10)	(0.02)	(0.16)	(0.33)	(0.10)	(0.06)
ETH	0.00	0.01	-0.01	-0.01	-0.02	0.00
	(-0.02)	(0.08)	(-0.11)	(-0.17)	(-0.18)	(-0.03)
Dai_volume	-0.01	-0.02	-0.01	-0.01	-0.02	-0.03
	(-0.16)	(-0.28)	(-0.20)	(-0.36)	(-0.20)	(-0.67)
Mkr_price	0.01	-0.01	0.01	0.01	0.01	-0.02
	(0.16)	(-0.23)	(0.19)	(0.20)	(0.22)	(-0.46)
Total_MakerDAO	**-0.38*****	**-0.43*****	**-0.35*****	**-0.31*****	**-0.36*****	**-0.27*****
	(-8.81)	**(-7.94)**	**(-9.48)**	**(-13.26)**	**(-8.74)**	**(-10.00)**

Surplus_buffer	0.00	0.01	-0.01	-0.01	0.00	-0.03
	(0.05)	(0.07)	(-0.10)	(-0.33)	(0.02)	(-0.38)
N	131	104	154	128	128	80
Adj. R-sq	0.61	0.56	0.57	0.76	0.57	0.77

Note: This table reports the regression coefficients and standard t-statistics in the parentheses for the case of new users of Maker protocol. Columns (1) – (6) presents results for ENS owners, Twitter users, DEX traders, liquidity providers, NFT traders, and whales from coalition 0, respectively. *, **, and *** denote significance levels at the 10%, 5%, and 1% levels based on the standard t-statistics. The definitions of the variables are given in Table A.4.

Table 23. The relationship between DAI flows and different types of voters from coalition 0

Panel A: ENS owners					
	(1)	(2)	(3)	(4)	(5)
Voting share	**-0.24*** **	0.00	0.05	0.02	**-0.08*** **
	(-5.18)	(0.05)	(0.78)	(1.53)	**(-3.42)**
Total_asset	**1.01*** **	**1.16*** **	**0.50*** **	**0.31*** **	**1.95*** **
	(7.54)	**(16.98)**	**(3.46)**	**(7.81)**	**(31.80)**
ETH	**-0.44*** **	**0.35*** **	0.11	-0.02	**-0.38*** **
	(-4.30)	**(6.71)**	(0.95)	(-0.76)	**(-8.07)**
Dai_volume	**0.23** **	0.07	-0.19	0.04	-0.014
	(2.12)	(1.26)	(-1.55)	(1.35)	(-0.20)
Mkr_price	0.12	**-0.36*** **	**0.74*** **	-0.02	**-0.20*** **
	(1.41)	**(-8.40)**	**(8.14)**	(-0.83)	**(-5.21)**
Total_MakerDAO	**0.13** **	-0.04	-0.09	**0.05*** **	**-0.24*** **
	(2.13)	(-0.65)	(-1.36)	**(2.93)**	**(-7.46)**
Surplus_buffer	-0.05	**-0.45*** **	0.07	**0.78*** **	**-0.74*** **
	(-0.43)	**(-8.28)**	(0.59)	**(24.87)**	**(-15.33)**
N	174	161	173	174	170
Adj. R-sq	0.75	0.96	0.87	0.99	0.97
Panel B: Twitter users					
	(1)	(2)	(3)	(4)	(5)
Voting share	**-0.25*** **	0.07	-0.07	**0.06*** **	**-0.12*** **
	(-3.02)	(1.63)	(-0.87)	**(2.58)**	**(-3.41)**
Total_asset	**0.98*** **	**1.14*** **	**0.53*** **	**0.31*** **	**1.95*** **
	(7.01)	**(16.92)**	**(3.64)**	**(7.76)**	**(31.80)**
ETH	**-0.44*** **	**0.32*** **	0.16	-0.04	**-0.36*** **
	(-3.94)	**(5.99)**	(1.37)	(-1.29)	**(-7.33)**
Dai_volume	**0.24** **	0.07	-0.18	0.04	-0.01
	(2.03)	(1.18)	(-1.49)	(1.28)	(-0.13)
Mkr_price	0.14	**-0.33*** **	**0.67*** **	0.00	**-0.22*** **
	(1.49)	**(-7.16)**	**(6.88)**	(-0.04)	**(-5.38)**
Total_MakerDAO	**0.15** **	-0.02	-0.11	**0.06*** **	**-0.24*** **
	(2.29)	(-0.45)	(-1.58)	**(3.11)**	**(-7.46)**
Surplus_buffer	-0.15	**-0.47*** **	0.13	**0.78*** **	**-0.75*** **
	(-1.38)	**(-9.03)**	(1.13)	**(25.72)**	**(-16.04)**
N	174	161	173	174	170
Adj. R-sq	0.72	0.96	0.87	0.99	0.97
Panel C: DEX traders					
	(1)	(2)	(3)	(4)	(5)
Voting share	**0.13*** **	-0.01	-0.06	**0.03** **	**-0.06*** **
	(2.58)	(-0.39)	(-1.09)	**(2.32)**	**(-2.84)**
Total_asset	**0.93*** **	**1.16*** **	**0.52*** **	**0.32*** **	**1.93*** **
	(6.61)	**(17.10)**	**(3.59)**	**(8.03)**	**(31.35)**
ETH	**-0.54*** **	**0.35*** **	0.12	-0.01	**-0.42*** **
	(-5.12)	**(6.85)**	(1.10)	(-0.36)	**(-9.01)**
Dai_volume	0.15	0.08	-0.15	0.03	0.02
	(1.22)	(1.32)	(-1.23)	(0.82)	(0.41)
Mkr_price	**0.26*** **	**-0.36*** **	**0.73*** **	**-0.04* **	**-0.14*** **
	(3.13)	**(-8.94)**	**(8.56)**	**(-1.81)**	**(-3.78)**
Total_MakerDAO	**0.23*** **	-0.04	**-0.13* **	**0.06*** **	**-0.26*** **
	(3.43)	(-0.70)	**(-1.77)**	**(3.40)**	**(-7.56)**
Surplus_buffer	**-0.22** **	**-0.45*** **	0.09	**0.80*** **	**-0.81*** **
	(-2.10)	**(-8.85)**	(0.86)	**(27.47)**	**(-17.61)**
N	174	161	173	174	170
Adj. R-sq	0.72	0.96	0.88	0.99	0.96
Panel D: Liquidity providers					

	(1)	(2)	(3)	(4)	(5)
Voting share	-0.09	**-0.15****	**0.64*****	**-0.18*****	-0.03
	(-0.55)	**(-1.97)**	**(4.16)**	**(-4.26)**	(-0.42)
Total_asset	**0.93*****	**1.15*****	**0.54*****	**0.31*****	**1.92*****
	(6.51)	**(17.19)**	**(3.91)**	**(8.20)**	**(30.51)**
ETH	**-0.56*****	**0.35*****	0.14	-0.02	**-0.41*****
	(-5.14)	**(6.87)**	(1.37)	(-0.65)	**(-8.70)**
Dai_volume	**0.21***	0.06	-0.14	0.03	-0.02
	(1.79)	(1.08)	(-1.21)	(1.06)	(-0.32)
Mkr_price	**0.29*****	**-0.35*****	**0.65*****	-0.02	**-0.15*****
	(3.44)	**(-8.64)**	**(7.95)**	(-0.75)	**(-3.95)**
Total_MakerDAO	**0.17*****	-0.02	**-0.12***	**0.05*****	**-0.23*****
	(2.68)	(-0.53)	**(-1.86)**	**(3.08)**	**(-6.78)**
Surplus_buffer	**-0.24****	**-0.45*****	0.10	**0.80*****	**-0.80*****
	(-2.23)	**(-8.97)**	(0.97)	**(28.39)**	**(-17.07)**
N	174	161	173	174	170
Adj. R-sq	0.71	0.96	0.89	0.99	0.96

Panel E: NFT traders

	(1)	(2)	(3)	(4)	(5)
Voting share	0.01	-0.04	0.05	-0.02	-0.04
	(0.12)	(-0.58)	(0.66)	(-0.73)	(-1.09)
Total_asset	**0.94*****	**1.16*****	**0.52*****	**0.32*****	**1.93*****
	(6.53)	**(17.07)**	**(3.56)**	**(7.96)**	**(30.66)**
ETH	**-0.55*****	**0.35*****	0.13	-0.01	**-0.41*****
	(-5.12)	**(6.88)**	(1.15)	(-0.45)	**(-8.72)**
Dai_volume	**0.22***	0.07	-0.18	0.05	-0.01
	(1.84)	(1.24)	(-1.53)	(1.38)	(-0.27)
Mkr_price	**0.28*****	**-0.36*****	**0.71*****	-0.03	**-0.15*****
	(3.39)	**(-9.04)**	**(8.43)**	(-1.50)	**(-4.03)**
Total_MakerDAO	**0.18****	-0.04	-0.08	**0.04****	**-0.25*****
	(2.47)	(-0.70)	(-1.05)	**(2.19)**	**(-6.62)**
Surplus_buffer	**-0.24****	**-0.45*****	0.10	**0.80*****	**-0.80*****
	(-2.23)	**(-8.86)**	(0.89)	**(26.99)**	**(-17.03)**
N	174	161	173	174	170
Adj. R-sq	0.71	0.96	0.87	0.99	0.96

Panel F: Whales

	(1)	(2)	(3)	(4)	(5)
Voting share	0.03	0.02	-0.02	-0.01	-0.05
	(0.38)	(0.43)	(-0.19)	(-0.30)	(-1.51)
Total_asset	**0.94*****	**1.16*****	**0.52*****	**0.32*****	**1.93*****
	(6.54)	**(17.08)**	**(3.55)**	**(7.95)**	**(30.76)**
ETH	**-0.55*****	**0.35*****	0.12	-0.01	**-0.42*****
	(-5.10)	**(6.89)**	(1.13)	(-0.46)	**(-8.82)**
Dai_volume	**0.22***	0.07	-0.18	0.05	-0.02
	(1.85)	(1.27)	(-1.53)	(1.37)	(-0.32)
Mkr_price	**0.28*****	**-0.37*****	**0.72*****	-0.03	**-0.14*****
	(3.25)	**(-8.75)**	**(8.30)**	(-1.43)	**(-3.67)**
Total_MakerDAO	**0.18*****	-0.02	-0.11	**0.05****	**-0.25*****
	(2.58)	(-0.39)	(-1.41)	**(2.37)**	**(-6.84)**
Surplus_buffer	**-0.24****	**-0.45*****	0.10	**0.80*****	**-0.79*****
	(-2.25)	**(-8.86)**	(0.93)	**(26.93)**	**(-17.06)**
N	174	161	173	174	170
Adj. R-sq	0.71	0.96	0.87	0.99	0.96

Note: This table reports the regression coefficients and standard t-statistics in the parentheses. Columns (1) – (5) presents results for DAI flows to CeFi, DEXes, LPs, EOA and Bridge, respectively. *, **, and *** denote significance levels at the 10%, 5%, and 1% levels based on the standard t-statistics. The details of different categories of blockchain-based applications are given in Table A.5.

Figures

Figure 1. Elbow method and silhouette score

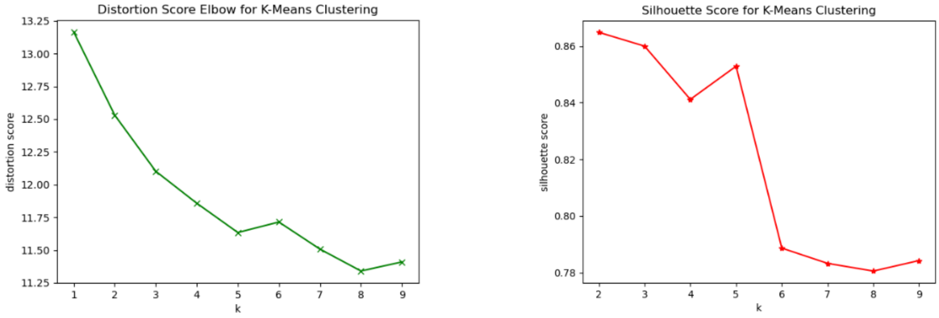


Figure 2. Voters of Maker governance polls (Poll #16 – Poll #838)

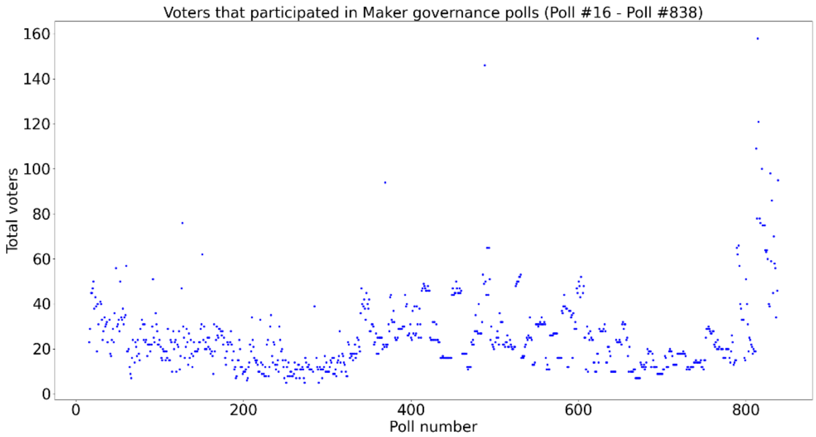


Figure 3. Total votes of Maker governance polls (Poll #16 – Poll #838)

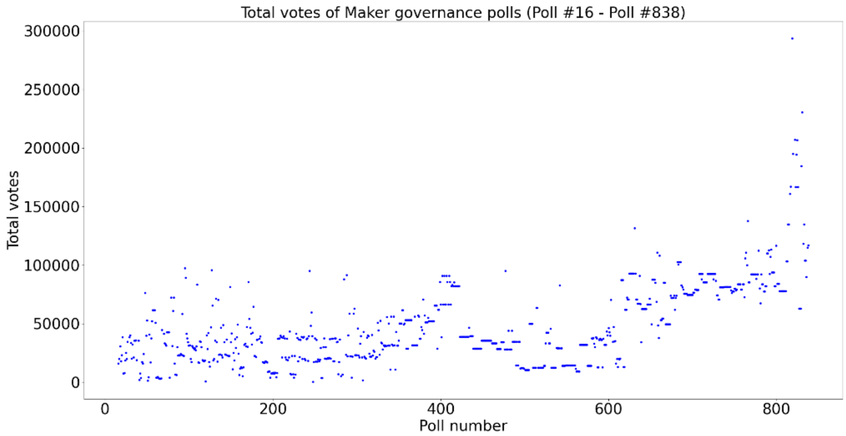


Figure 4. Voters from coalition 0

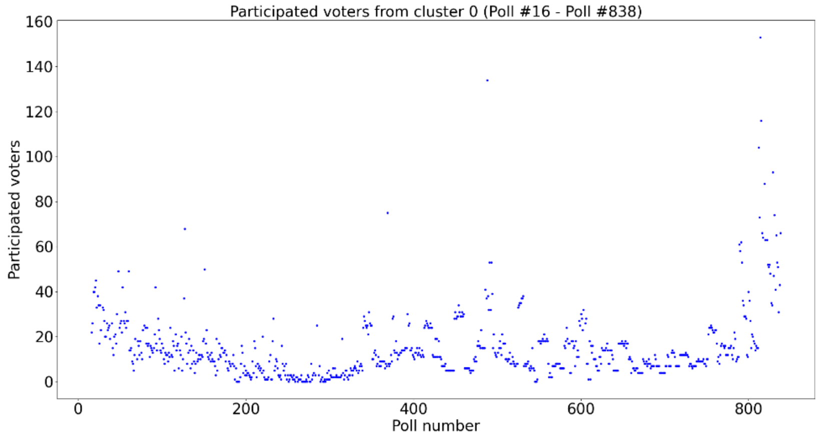


Figure 5. Total votes from different voter coalitions

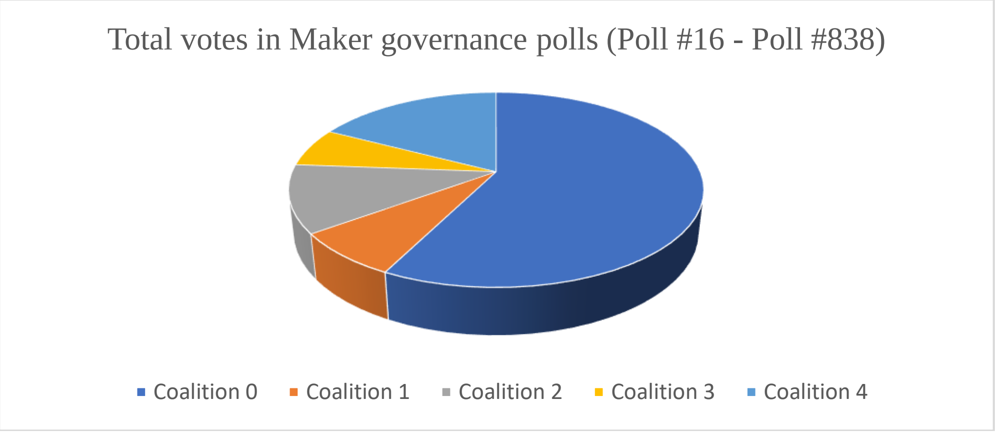


Figure 6. Voting share of coalition 0

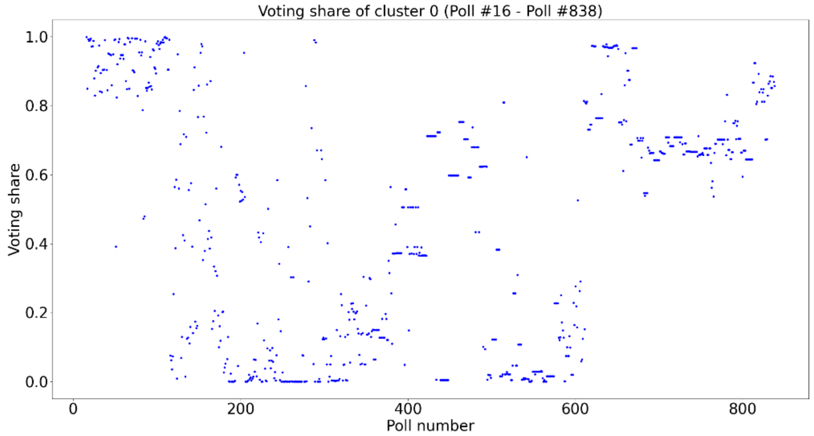


Figure 7. Agreement Index (AI) of coalition 0

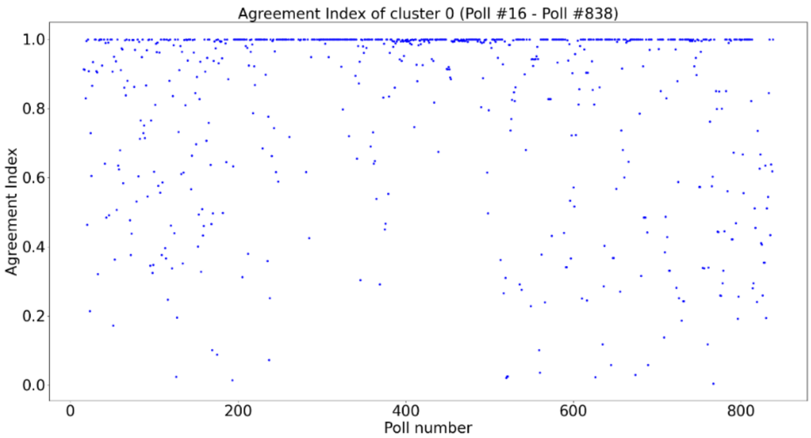


Figure 8. Agreement Index (AI) of coalition 0 for 'Risk Parameter'

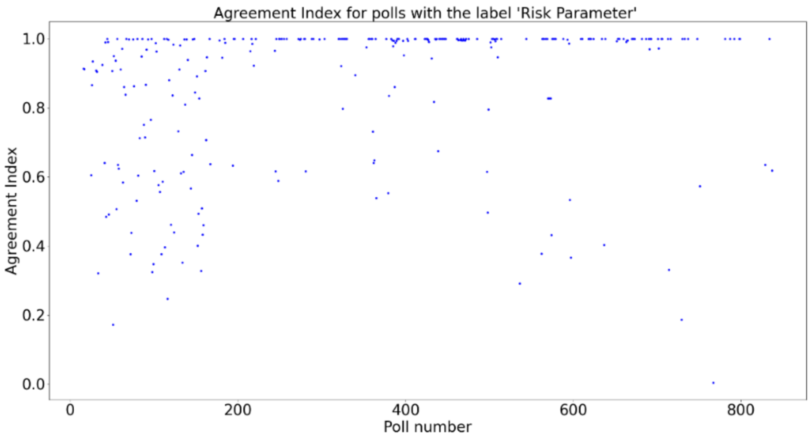


Figure 9. Agreement Index (AI) of coalition 0 for 'Greenlight'

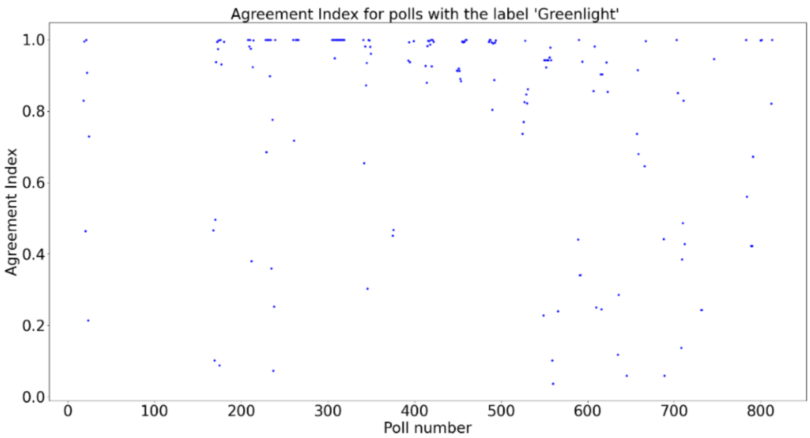


Figure 10. Agreement Index (AI) of coalition 0 for 'MIP'

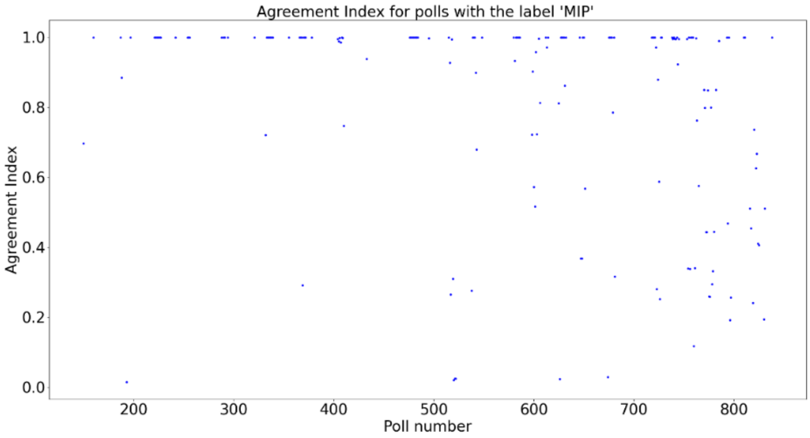
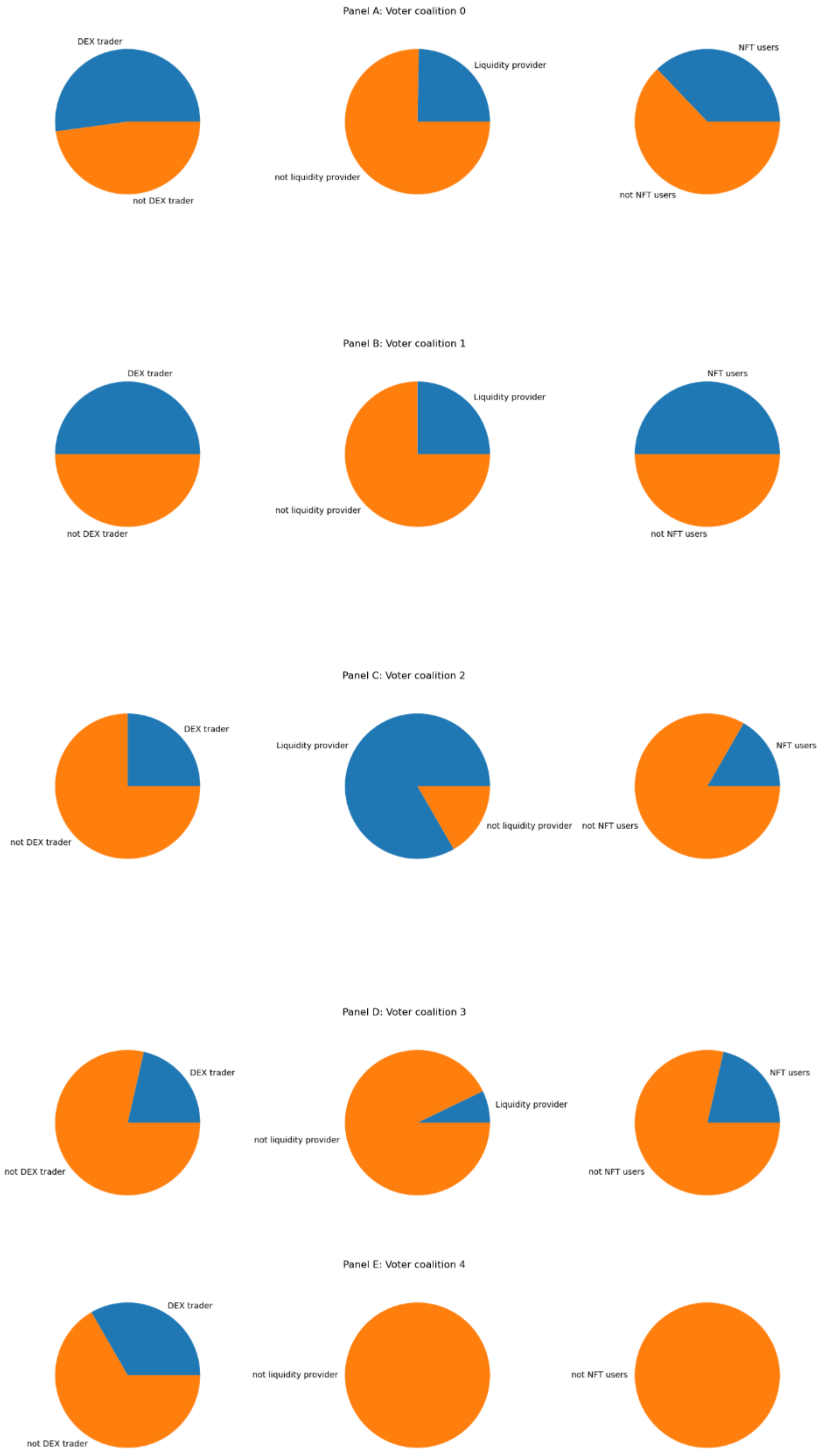


Figure 11. Activities of voters in different voter coalitions



Appendices

Appendix 1. Labels of Maker governance polls

Table A.1. Labels of Maker governance polls

	Number of polls	Total voters	Total votes
Risk Parameter	297	6125	11620405.21
Ratification Poll	103	3180	9191601.36
Inclusion Poll	71	1514	2419753.25
Collateral Onboarding	63	1370	2864764.94
Collateral Offboarding	19	298	1381079.48
Greenlight	173	5549	7894197.78
Real World Asset	37	1051	2271616.02
Misc Governance	29	1108	1844854.05
Misc Funding	14	569	1480519.35
MakerDAO Open Market Committee	22	476	1294594.31
MIP	182	4800	11667401.86
Budget	61	1636	4511723.76
Oracle	42	761	1383196.90
System Surplus	10	263	721589.11
DAI Direct Deposit Module	10	215	820019.35
Multi-chain Bridge	5	126	385882.47
Technical	20	429	914487.67
Auction	23	421	715394.51
Delegates	5	53	338567.60
Peg Stability Module	14	252	643171.78
Core Unit Onboarding	29	899	1888838.96
Dai Savings Rate	28	662	959804.04
Black Thursday	4	172	265698.72
Multi-Collateral DAI Launch	5	165	192941.15
Prioritization Sentiment	2	55	54826.02

Note: There are several labels related to oracle. For convenience, we merge these labels into one category, namely 'oracle'.

Appendix 2. Descriptive statistics of daily measurements

Table A.2. Descriptive statistics of voting share of voter coalitions

	Voter coalition 0	Voter coalition 1	Voter coalition 2	Voter coalition 3	Voter coalition 4
Mean	0.56	0.12	0.08	0.06	0.18
Median	0.66	0.03	0.02	0.00	0.00
Maximum	1.00	0.89	0.36	0.69	0.99
Minimum	0.00	0.00	0.00	0.00	0.00
Std	0.34	0.21	0.12	0.13	0.31

Table A.3. Descriptive statistics of Agreement Index (AI)

	Voter coalition 0	Voter coalition 1	Voter coalition 2	Voter coalition 3	Voter coalition 4
Mean	0.82	0.91	0.94	0.97	0.92
Median	0.91	0.97	1.00	1.00	1.00
Maximum	1.00	1.00	1.00	1.00	1.00
Minimum	0.02	0.27	0.47	0.63	0.05
Std	0.22	0.13	0.10	0.06	0.15

Appendix 3. Definitions of variables related to Maker protocol

Table A.4. Definitions of variables

	Definitions
Total_asset	The value of total assets locked in Maker protocol for lending
Total_revenue	Total interest revenue from total assets locked for lending
ETH	The value of Ether (ETH) locked in Maker protocol for lending
Dai_volatility	Volatility of DAI
Dai_volume	Transaction volume (in USD) of DAI daily
Mkr_price	Price (in USD) of Maker (MKR)
Surplus_buffer	The maximum amount of DAI that can accrue to the protocol from Stability Fee revenue prior to FLAP auctions being triggered
Total_MakerDAO	The number of the users who borrow from Maker protocol
New_MakerDAO	Daily new users who borrow from Maker protocol

Note: More introduction to surplus buffer can be found: https://makerdao.world/en/learn/governance/paramsystem-surplus-buffer/

Table A.5. Calculation of variables

	Definitions
Total_asset	Assuming that $token_i, i = \{1, \dots, n\}$, are locked in Maker protocol for lending, the variable 'total_asset' can be calculated as $$\sum_{i=1}^{n} value_i$$ Where $value_i$ is the value in USD of the locked $token_i$.
Total_revenue	Assuming that $token_i, i = \{1, \dots, n\}$, are locked in Maker protocol for lending, the variable 'total_revenue' can be calculated as $$\sum_{i=1}^{n} revenue_i$$ Where $revenue_i$ is the value in USD of revenue earned by the locked $token_i$.
ETH	Assuming that $token_i, i = \{1, \dots, n\}$, are locked in Maker protocol for lending, the variable 'ETH' can be calculated as $value_{ETH}$, where $value_{ETH}$ is the value in USD of the locked Ether (ETH).
Dai_volatility	Assuming that the closing price of DAI on day t is P_t, the daily volatility can be defined by $$V_t = \ln\left(\frac{P_t}{P_{t-1}}\right)$$

Appendix 4. Voting share and Agreement Index (AI) based on different types of governance polls

Table A.6. Descriptive statistics of voting share of voter coalitions

Panel A: Risk Parameter					
	Voter coalition 0	Voter coalition 1	Voter coalition 2	Voter coalition 3	Voter coalition 4
Mean	0.06	0.02	0.01	0.01	0.02
Median	0.00	0.00	0.00	0.00	0.00
Maximum	1.00	0.89	0.36	0.69	0.99
Minimum	0.00	0.00	0.00	0.00	0.00
Std	0.21	0.08	0.04	0.04	0.13
Panel B: MIP					
	Voter coalition 0	Voter coalition 1	Voter coalition 2	Voter coalition 3	Voter coalition 4
Mean	0.02	0.01	0.00	0.00	0.01
Median	0.00	0.00	0.00	0.00	0.00
Maximum	0.97	0.87	0.36	0.60	1.00
Minimum	0.00	0.00	0.00	0.00	0.00
Std	0.10	0.06	0.03	0.03	0.07
Panel C: Greenlight					
	Voter coalition 0	Voter coalition 1	Voter coalition 2	Voter coalition 3	Voter coalition 4
Mean	0.02	0.01	0.00	0.00	0.01
Median	0.00	0.00	0.00	0.00	0.00
Maximum	0.97	0.87	0.36	0.60	1.00
Minimum	0.00	0.00	0.00	0.00	0.00
Std	0.10	0.06	0.03	0.03	0.07

Table A.7. Descriptive statistics of Agreement Index (AI) of voter coalitions

Panel A: Risk Parameter					
	Voter coalition 0	Voter coalition 1	Voter coalition 2	Voter coalition 3	Voter coalition 4
Mean	0.85	0.90	0.98	0.97	0.92
Median	0.93	0.98	1.00	1.00	1.00
Maximum	1.00	1.00	1.00	1.00	1.00
Minimum	0.00	0.27	0.75	0.59	0.02
Std	0.20	0.16	0.06	0.08	0.20
Panel B: MIP					
	Voter coalition 0	Voter coalition 1	Voter coalition 2	Voter coalition 3	Voter coalition 4
Mean	0.88	0.96	0.96	0.97	0.91
Median	0.99	1.00	1.00	1.00	1.00
Maximum	1.00	1.00	1.00	1.00	1.00
Minimum	0.46	0.76	0.77	0.82	0.33
Std	0.16	0.07	0.06	0.05	0.18
Panel C: Greenlight					
	Voter coalition 0	Voter coalition 1	Voter coalition 2	Voter coalition 3	Voter coalition 4

Mean	0.74	0.87	0.90	0.93	0.93
Median	0.83	0.94	1.00	0.98	0.98
Maximum	1.00	1.00	1.00	1.00	1.00
Minimum	0.06	0.51	0.47	0.63	0.69
Std	0.28	0.16	0.16	0.10	0.10

Table A.8. The relationship between DAI volatility and voting share in different types of polls

Panel A: Risk Parameter					
	(1)	(2)	(3)	(4)	(5)
Voting share	0.02	-0.06	-0.01	-0.09	0.06
	(0.52)	(-0.99)	(-0.26)	(-1.00)	(1.26)
Total_asset	**0.40*** **	**0.40*** **	**0.40*** **	**0.40*** **	0.40
	(4.29)	**(4.28)**	**(4.30)**	**(4.28)**	(4.31)
ETH	**-0.28*** **	**-0.28*** **	**-0.27*** **	**-0.28*** **	**-0.27*** **
	(-3.79)	**(-3.80)**	**(-3.76)**	**(-3.79)**	**(-3.79)**
Dai_volume	**0.47*** **	**0.47*** **	**0.47*** **	**0.47*** **	**0.47*** **
	(4.07)	**(4.13)**	**(4.10)**	**(4.14)**	**(4.13)**
Mkr_price	**-0.41*** **	**-0.41*** **	**-0.41*** **	**-0.41*** **	**-0.41*** **
	(-7.54)	**(-7.44)**	**(-7.55)**	**(-7.42)**	**(-7.43)**
Total_MakerDAO	-0.06	-0.06	**-0.06***	**-0.06***	**-0.07***
	(-1.56)	(-1.58)	**(-1.65)**	**(-1.65)**	**(-1.77)**
Surplus_buffer	**-0.18*** **	**-0.18*** **	**-0.18*** **	**-0.18*** **	**-0.17*** **
	(-2.52)	**(-2.55)**	**(-2.53)**	**(-2.53)**	**(-2.47)**
N	973	973	973	973	973
Adj. R-sq	0.22	0.22	0.22	0.22	0.22
Panel B: MIP					
	(1)	(2)	(3)	(4)	(5)
Voting share	0.02	-0.03	-0.02	-0.05	-0.05
	(0.38)	(-0.37)	(-0.28)	(-0.44)	(-0.60)
Total_asset	**0.40*** **	**0.40*** **	**0.41*** **	**0.40*** **	**0.40*** **
	(4.28)	**(4.28)**	**(4.30)**	**(4.28)**	**(4.30)**
ETH	**-0.27*** **	**-0.27*** **	**-0.28*** **	**-0.27*** **	**-0.27*** **
	(-3.76)	**(-3.78)**	**(-3.79)**	**(-3.79)**	**(-3.78)**
Dai_volume	**0.47*** **	**0.47*** **	**0.47*** **	**0.47*** **	**0.47*** **
	(4.11)	**(4.11)**	**(4.10)**	**(4.11)**	**(4.10)**
Mkr_price	**-0.41*** **	**-0.41*** **	**-0.41*** **	**-0.41*** **	**-0.41*** **
	(-7.55)	**(-7.53)**	**(-7.55)**	**(-7.49)**	**(-7.57)**
Total_MakerDAO	**-0.06***	-0.06	**-0.06***	**-0.06***	-0.06
	(-1.65)	(-1.62)	**(-1.64)**	**(-1.63)**	(-1.59)
Surplus_buffer	**-0.18*** **	**-0.18*** **	**-0.18*** **	**-0.18*** **	**-0.18*** **
	(-2.53)	**(-2.53)**	**(-2.54)**	**(-2.52)**	**(-2.54)**
N	973	973	973	973	973
Adj. R-sq	0.22	0.22	0.22	0.22	0.22
Panel C: Greenlight					
	(1)	(2)	(3)	(4)	(5)
Voting share	-0.08	-0.11	**-0.12***	-0.10	-0.04
	(-1.48)	(-0.95)	**(-1.90)**	(-1.06)	(-0.64)
Total_asset	**0.40*** **	**0.40*** **	**0.40*** **	**0.40*** **	**0.40*** **
	(4.23)	**(4.29)**	**(4.25)**	**(4.28)**	**(4.29)**
ETH	**-0.27*** **	**-0.28*** **	**-0.27*** **	**-0.28*** **	**-0.27*** **
	(-3.70)	**(-3.82)**	**(-3.66)**	**(-3.82)**	**(-3.79)**
Dai_volume	**0.46*** **	**0.47*** **	**0.46*** **	**0.47*** **	**0.47*** **
	(4.04)	**(4.10)**	**(4.05)**	**(4.09)**	**(4.10)**
Mkr_price	**-0.41*** **	**-0.41*** **	**-0.42*** **	**-0.41*** **	**-0.41*** **
	(-7.60)	**(-7.42)**	**(-7.68)**	**(-7.43)**	**(-7.56)**
Total_MakerDAO	-0.06	-0.06	**-0.06***	-0.06	-0.06
	(-1.60)	(-1.59)	**(-1.65)**	(-1.62)	(-1.59)
Surplus_buffer	**-0.17*** *	**-0.18*** **	**-0.17*** *	**-0.18*** **	**-0.18*** **
	(-2.44)	**(-2.54)**	**(-2.43)**	**(-2.51)**	**(-2.55)**
N	973	973	973	973	973
Adj. R-sq	0.22	0.22	0.23	0.22	0.22

Note: This table reports the regression coefficients and standard t-statistics in the parentheses for the case of DAI volatility. Columns (1) – (5) presents results for voter coalitions 0 – 4, respectively. *, **, and *** denote significance levels at the 10%, 5%, and 1% levels based on the standard t-statistics. The definitions of the variables are given in Table A.4.

Table A.9. The relationship between total revenue of Maker protocol and voting share in different types of polls

	Panel A: Risk Parameter				
	(1)	(2)	(3)	(4)	(5)
Voting share	-0.03	**0.09*** **	0.03	**0.10** **	-0.03
	(-1.54)	**(2.65)**	(0.99)	**(2.16)**	(-1.37)
Total_asset	-0.01	-0.01	-0.01	-0.01	-0.01
	(-0.13)	(-0.10)	(-0.18)	(-0.11)	(-0.16)
ETH	**0.73*** **	**0.73*** **	**0.72*** **	**0.73*** **	**0.72*** **
	(18.36)	**(18.42)**	**(18.24)**	**(18.37)**	**(18.33)**
Dai_volume	**0.31*** **	**0.30*** **	**0.31*** **	**0.30*** **	**0.31*** **
	(4.95)	**(4.80)**	**(4.87)**	**(4.80)**	**(4.84)**
Mkr_price	**0.33*** **	**0.32*** **	**0.33*** **	**0.32*** **	**0.32*** **
	(11.01)	**(10.80)**	**(11.08)**	**(10.80)**	**(10.89)**
Total_MakerDAO	0.07	**0.07*** **	**0.08*** **	**0.08*** **	**0.08*** **
	(3.41)	**(3.48)**	**(3.66)**	**(3.67)**	**(3.78)**
Surplus_buffer	**-0.18*** **	**-0.17*** **	**-0.18*** **	**-0.18*** **	**-0.18*** **
	(-4.50)	**(-4.44)**	**(-4.48)**	**(-4.50)**	**(-4.54)**
N	980	980	980	980	980
Adj. R-sq	0.84	0.84	0.84	0.84	0.84
	Panel B: MIP				
	(1)	(2)	(3)	(4)	(5)
Voting share	-0.01	0.07	0.04	0.02	-0.02
	(-0.34)	(1.40)	(1.00)	(0.32)	(-0.55)
Total_asset	-0.01	-0.01	-0.01	-0.01	-0.01
	(-0.14)	(-0.11)	(-0.23)	(-0.14)	(-0.15)
ETH	**0.72*** **	**0.72*** **	**0.76*** **	**0.72*** **	**0.72*** **
	(18.28)	**(18.31)**	**(18.34)**	**(18.31)**	**(18.30)**
Dai_volume	**0.31*** **	**0.31*** **	**0.31*** **	**0.31*** **	**0.31*** **
	(4.85)	**(4.83)**	**(4.88)**	**(4.85)**	**(4.86)**
Mkr_price	**0.33*** **	**0.33*** **	**0.33*** **	**0.33*** **	**0.33*** **
	(11.03)	**(10.99)**	**(11.03)**	**(10.97)**	**(11.00)**
Total_MakerDAO	**0.08*** **	**0.07*** **	**0.08*** **	**0.08*** **	**0.08*** **
	(3.65)	**(3.57)**	**(3.65)**	**(3.64)**	**(3.68)**
Surplus_buffer	**-0.18*** **	**-0.18*** **	**-0.17*** **	**-0.18*** **	**-0.18*** **
	(-4.48)	**(-4.48)**	**(-4.45)**	**(-4.49)**	**(-4.50)**
N	980	980	980	980	980
Adj. R-sq	0.84	0.84	0.84	0.84	0.84
	Panel C: Greenlight				
	(1)	(2)	(3)	(4)	(5)
Voting share	**-0.06** **	0.07	0.01	-0.07	-0.03
	(-2.04)	(1.15)	(0.35)	(-1.37)	(-0.75)
Total_asset	-0.01	-0.01	-0.01	-0.01	-0.01
	(-0.24)	(-0.14)	(-0.14)	(-0.17)	(-0.15)
ETH	**0.73*** **	**0.73*** **	**0.72*** **	**0.72*** **	**0.72*** **
	(18.42)	**(18.35)**	**(18.25)**	**(18.26)**	**(18.30)**
Dai_volume	**0.30*** **	**0.31*** **	**0.31*** **	**0.31*** **	**0.31*** **
	(4.78)	**(4.87)**	**(4.87)**	**(4.84)**	**(4.86)**
Mkr_price	**0.33*** **	**0.32*** **	**0.33*** **	**0.33*** **	**0.33*** **
	(10.98)	**(10.87)**	**(11.03)**	**(11.12)**	**(11.02)**
Total_MakerDAO	**0.08*** **	**0.07*** **	**0.08*** **	**0.08*** **	**0.08*** **
	(3.70)	**(3.59)**	**(3.64)**	**(3.68)**	**(3.69)**
Surplus_buffer	**-0.17*** **	**-0.18*** **	**-0.18*** **	**-0.17*** **	**-0.18*** **
	(-4.36)	**(-4.47)**	**(-4.49)**	**(-4.46)**	**(-4.50)**
N	980	980	980	980	980
Adj. R-sq	0.84	0.84	0.84	0.84	0.84

Note: This table reports the regression coefficients and standard t-statistics in the parentheses for the case of total revenue of Maker protocol. Columns (1) – (5) presents results for voter coalitions 0 – 4, respectively. *, **, and *** denote significance levels at the 10%, 5%, and 1% levels based on the standard t-statistics. The definitions of the variables are given in Table A.4.

Table A.10. The relationship between new users of Maker protocol and voting share in different types of polls

		Panel A: Risk Parameter			
	(1)	(2)	(3)	(4)	(5)
Voting share	0.01	0.01	0.00	0.01	-0.01
	(0.99)	(0.28)	(0.02)	(0.22)	(-0.92)
Total_asset	0.01	0.01	0.01	0.01	0.01
	(0.39)	(0.41)	(0.40)	(0.41)	(0.40)
ETH	-0.01	-0.01	-0.01	-0.01	-0.01
	(-0.29)	(-0.26)	(-0.27)	(-0.27)	(-0.26)
Dai_volume	0.02	0.02	0.02	0.02	0.02
	(0.44)	(0.49)	(0.50)	(0.50)	(0.49)
Mkr_price	0.00	0.00	0.00	0.00	0.00
	(0.14)	(0.10)	(0.12)	(0.10)	(0.05)
Total_MakerDAO	**-0.32*** **	**-0.32*** **	**-0.32*** **	**-0.32*** **	**-0.32*** **
	(-25.63)	**(-25.95)**	**(-25.98)**	**(-25.98)**	**(-25.73)**
Surplus_buffer	-0.01	-0.01	-0.01	-0.01	-0.01
	(-0.42)	(-0.42)	(-0.43)	(-0.43)	(-0.47)
N	980	980	980	980	980
Adj. R-sq	0.62	0.62	0.62	0.62	0.62
		Panel B: MIP			
	(1)	(2)	(3)	(4)	(5)
Voting share	-0.01	0.01	0.00	0.00	0.00
	(-0.46)	(0.45)	(0.03)	(0.09)	(0.02)
Total_asset	0.01	0.01	0.01	0.01	0.01
	(0.42)	(0.42)	(0.40)	(0.41)	(0.40)
ETH	-0.01	-0.01	-0.01	-0.01	-0.01
	(-0.28)	(-0.27)	(-0.27)	(-0.27)	(-0.27)
Dai_volume	0.02	0.02	0.02	0.02	0.02
	(0.49)	(0.49)	(0.50)	(0.50)	(0.50)
Mkr_price	0.00	0.00	0.00	0.00	0.00
	(0.12)	(0.11)	(0.12)	(0.11)	(0.12)
Total_MakerDAO	**-0.32*** **	**-0.32*** **	**-0.32*** **	**-0.32*** **	**-0.32*** **
	(-25.95)	**(-25.98)**	**(-25.98)**	**(-25.98)**	**(-25.89)**
Surplus_buffer	-0.01	-0.01	-0.01	-0.01	-0.01
	(-0.42)	(-0.43)	(-0.43)	(0.43)	(-0.43)
N	980	980	980	980	980
Adj. R-sq	0.62	0.62	0.62	0.62	0.62
		Panel C: Greenlight			
	(1)	(2)	(3)	(4)	(5)
Voting share	0.00	-0.01	0.00	-0.01	0.01
	(0.02)	(-0.27)	(0.11)	(-0.17)	(0.31)
Total_asset	0.01	0.01	0.01	0.01	0.01
	(0.41)	(0.40)	(0.41)	(0.40)	(0.41)
ETH	-0.01	-0.01	-0.01	-0.01	-0.01
	(-0.27)	(-0.28)	(-0.27)	(-0.27)	(-0.27)
Dai_volume	0.02	0.02	0.02	0.02	0.02
	(0.50)	(0.50)	(0.51)	(0.50)	(0.50)
Mkr_price	0.00	0.00	0.00	0.00	0.00
	(0.12)	(0.15)	(0.13)	(0.14)	(0.13)
Total_MakerDAO	**-0.32*** **	**-0.32*** **	**-0.32*** **	**-0.32*** **	**-0.32*** **
	(-25.97)	**(-25.94)**	**(-25.98)**	**(-25.97)**	**(-25.94)**
Surplus_buffer	-0.01	-0.01	-0.01	-0.01	-0.01
	(-0.43)	(-0.43)	(-0.43)	(-0.42)	(-0.42)
N	980	980	980	980	980
Adj. R-sq	0.62	0.62	0.62	0.62	0.62

Note: This table reports the regression coefficients and standard t-statistics in the parentheses for the case of new users of Maker protocol. Columns (1) – (5) presents results for voter coalitions 0 – 4, respectively. *, **, and *** denote significance levels at the 10%, 5%, and 1% levels based on the standard t-statistics. The definitions of the variables are given in Table A.4.

Table A.11. The relationship between DAI volatility and group cohesion in different types of polls

	(1)	(2)	(3)	(4)	(5)
Panel A: Risk Parameter					
Agreement Index	**-0.08*** **	**-0.07***	**-0.31*** **	0.00	**0.08***
	(-2.49)	**(-1.95)**	**(-2.58)**	(-0.07)	**(1.75)**
Total_asset	0.00	0.00	0.00	0.00	0.00
	(-0.06)	(-0.54)	(0.23)	(0.57)	(-0.63)
ETH	0.00	0.00	0.00	0.00	**0.00***
	(0.04)	(0.92)	(-0.24)	(-0.51)	**(1.72)**
Dai_volume	0.00	0.00	0.00	0.00	0.00
	(0.73)	(0.33)	(0.99)	(0.73)	(-1.32)
Mkr_price	0.00	**0.00*** **	**0.00****	**0.00****	0.00
	(-3.33)	**(-2.34)**	**(-2.40)**	**(-2.06)**	(-0.94)
Total_MakerDAO	0.00	0.00	0.00	0.00	0.00
	(0.67)	(-0.12)	(-0.08)	(-0.40)	(-0.24)
Surplus_buffer	0.00	0.00	0.00	0.00	**0.00***
	(0.36)	(0.38)	(0.34)	(-0.25)	**(-1.91)**
N	104	86	52	64	51
Adj. R-sq	0.22	0.24	0.29	0.23	0.20
Panel B: MIP					
	(1)	(2)	(3)	(4)	(5)
Agreement Index	-0.09	-0.04	0.01	0.01	0.07
	(-0.84)	(-0.46)	(0.04)	(0.06)	(0.47)
Total_asset	**1.25*** **	1.56	**1.17****	**1.56*** **	-1.28
	(3.25)	(0.76)	**(2.72)**	**(4.05)**	(-0.31)
ETH	**-0.81****	-0.17	**-0.76***	-0.39	5.76
	(-2.33)	(-0.21)	**(-1.97)**	(-0.97)	(1.72)
Dai_volume	**2.20***	0.78	2.03	0.87	-0.10
	(1.93)	(0.62)	(1.46)	(1.02)	(-0.02)
Mkr_price	-0.21	-0.44	-0.27	-0.35	-2.14
	(-0.71)	(-1.30)	(-0.70)	(-1.53)	(-1.57)
Total_MakerDAO	-0.53	-0.62	-0.35	**-1.00*** **	-0.46
	(-1.23)	(-1.18)	(-0.08)	**(-3.51)**	(-0.46)
Surplus_buffer	**-0.72****	-1.17	-0.69	**-0.88*** **	-6.12
	(-2.24)	(-0.81)	(-1.12)	**(-3.14)**	(-1.14)
N	35	26	25	21	16
Adj. R-sq	0.31	0.36	0.24	0.72	-0.02
Panel C: Greenlight					
	(1)	(2)	(3)	(4)	(5)
Agreement Index	**-0.11****	**0.13****	**-0.09****	0.05	0.06
	(-2.44)	**(2.12)**	**(-2.12)**	(0.71)	(0.42)
Total_asset	0.21	1.04	**0.31***	0.71	-0.86
	(1.19)	(0.65)	**(1.89)**	(0.87)	(-0.23)
ETH	0.07	-0.26	0.06	-0.14	0.09
	(0.57)	(-0.39)	(0.56)	(-0.36)	(0.04)
Dai_volume	**1.45*** **	0.71	**1.13*** **	0.27	-1.21
	(3.16)	(0.58)	**(2.79)**	(0.25)	(-0.17)
Mkr_price	**-0.31*** **	-0.29	**-0.24*** **	**-0.20***	0.62
	(-3.62)	(-1.27)	**(-3.01)**	**(-1.94)**	(0.60)
Total_MakerDAO	0.01	0.16	0.19	-0.77	0.59
	(0.06)	(0.39)	(0.10)	(-0.95)	(0.62)
Surplus_buffer	**-0.40*** **	-0.92	**-0.46***	-0.51	-1.81
	(-3.18)	(-0.84)	**(-1.88)**	(-1.02)	(-0.66)
N	37	25	30	23	14
Adj. R-sq	0.51	0.45	0.47	0.41	-0.10

Note: This table reports the regression coefficients and standard t-statistics in the parentheses for the case of DAI volatility. Columns (1) – (5) presents results for voter coalitions 0 – 4, respectively. *, **, and *** denote significance levels at the 10%, 5%, and 1% levels based on the standard t-statistics. The definitions of the variables are given in Table A.4.

Table A.12. The relationship between total revenue of Maker protocol and group cohesion in different types of polls

Panel A: Risk Parameter					
	(1)	(2)	(3)	(4)	(5)
Agreement Index	-0.08	-0.04	0.10	-0.09	-0.01
	(-1.54)	(-1.03)	(1.22)	(-1.51)	(-0.77)
Total_asset	-0.01	-0.43	-0.09	**-3.30*** **	**2.30*** **
	(-0.04)	(-0.72)	(-0.31)	**(-6.25)**	**(7.73)**
ETH	**0.69*** **	**0.95*** **	**0.68*** **	**2.04*** **	-0.33
	(5.28)	**(3.02)**	**(3.79)**	**(7.02)**	(-1.13)
Dai_volume	-0.04	**-0.15***	-0.09	-0.09	**-1.90*** **
	(-0.42)	**(-1.83)**	(-0.64)	(-1.13)	**(-3.21)**
Mkr_price	**0.39*** **	**0.74*** **	**0.31** **	**0.21***	0.00
	(4.11)	**(5.23)**	**(2.02)**	**(1.75)**	(-0.03)
Total_MakerDAO	**0.12** **	0.06	1.56	**0.32*** **	**-0.11*** **
	(2.09)	(1.07)	(0.68)	**(5.54)**	**(-3.08)**
Surplus_buffer	-0.19	-0.26	-0.33	**1.78*** **	0.66
	(-1.36)	(-0.63)	(-1.07)	**(5.46)**	(1.64)
N	104	86	52	64	51
Adj. R-sq	0.85	0.89	0.67	0.89	0.96
Panel B: MIP					
	(1)	(2)	(3)	(4)	(5)
Agreement Index	-0.07	0.07	**0.31*** **	-0.09	0.01
	(-0.95)	(1.28)	**(3.23)**	(-0.58)	(0.61)
Total_asset	0.12	**-3.30** **	-0.01	0.11	**2.45*** **
	(0.49)	**(-2.48)**	(-0.05)	(0.19)	**(4.99)**
ETH	**0.71*** **	**2.31*** **	**0.71*** **	0.41	-0.46
	(3.19)	**(4.42)**	**(3.38)**	(0.70)	(-1.18)
Dai_volume	**1.88** **	-0.71	0.78	2.02	-0.64
	(2.58)	(-0.86)	(1.02)	(1.60)	(-0.84)
Mkr_price	0.18	0.19	**0.43***	0.34	**-0.32***
	(0.93)	(0.87)	**(2.01)**	(1.02)	**(-2.02)**
Total_MakerDAO	0.40	**0.88** **	-0.16	0.36	**-0.27** **
	(1.46)	**(2.60)**	(-0.07)	(0.85)	**(-2.27)**
Surplus_buffer	**-0.44** **	1.43	-0.10	-0.40	**1.56** **
	(-2.16)	(1.52)	(-0.30)	(-0.97)	**(2.47)**
N	35	26	25	21	16
Adj. R-sq	0.83	0.92	0.82	0.72	0.99
Panel C: Greenlight					
	(1)	(2)	(3)	(4)	(5)
Agreement Index	-0.01	-0.09	**0.17** **	**-0.19** **	0.00
	(-0.12)	(-1.33)	**(2.17)**	**(-2.45)**	(0.01)
Total_asset	0.20	**-3.90** **	0.07	**-3.36*** **	**3.01** **
	(0.73)	**(-2.14)**	(0.58)	**(-4.01)**	**(2.81)**
ETH	**0.52** **	**2.49*** **	**0.54** **	**2.13*** **	-0.83
	(2.55)	**(3.30)**	**(2.59)**	**(5.46)**	(-1.44)
Dai_volume	**1.28***	-1.20	**1.26***	0.46	-1.94
	(1.74)	(-0.86)	**(1.74)**	(0.42)	(-0.98)
Mkr_price	**0.28***	0.22	**0.30** **	0.15	0.05
	(1.99)	(0.86)	**(2.05)**	(1.42)	(0.16)
Total_MakerDAO	0.32	0.78	1.60	-0.52	-0.33
	(0.95)	(1.66)	(0.47)	(-0.63)	(-1.25)
Surplus_buffer	**-0.38***	1.98	-0.37	**1.92*** **	0.73
	(-1.86)	(1.59)	(-0.83)	**(3.69)**	(0.96)
N	37	25	30	23	14
Adj. R-sq	0.75	0.84	0.69	0.87	0.98

Note: This table reports the regression coefficients and standard t-statistics in the parentheses for the case of total revenue of Maker protocol. Columns (1) – (5) presents results for voter coalitions 0 – 4, respectively. *, **, and *** denote significance levels at the 10%, 5%, and 1% levels based on the standard t-statistics. The definitions of the variables are given in Table A.4.

Table A.13. The relationship between new users of Maker protocol and group cohesion in different types of polls

Panel A: Risk Parameter					
	(1)	(2)	(3)	(4)	(5)
Agreement Index	0.00	-0.01	0.00	0.00	0.00
	(-0.06)	(-0.16)	(0.26)	(0.01)	(-0.09)
Total_asset	0.04	0.63	**0.03****	0.02	0.79
	(0.22)	(0.91)	**(2.08)**	(0.03)	(1.27)
ETH	-0.02	-0.29	0.00	-0.03	**-1.02***
	(-0.17)	(-0.80)	(-0.11)	(-0.08)	**(-1.67)**
Dai_volume	-0.01	-0.03	**-0.01***	-0.02	1.17
	(-0.15)	(-0.32)	**(-1.97)**	(-0.20)	(0.94)
Mkr_price	0.02	0.13	0.00	0.02	0.34
	(0.30)	(0.80)	(0.60)	(0.13)	(1.10)
Total_MakerDAO	**-0.36*****	**-0.39*****	**-1.36*****	**-0.35*****	**-0.33*****
	(-7.07)	**(-6.02)**	**(-11.94)**	**(-4.66)**	**(-4.37)**
Surplus_buffer	-0.02	-0.44	**0.11*****	-0.01	0.22
	(-0.15)	(-0.91)	**(7.21)**	(-0.02)	(0.27)
N	104	86	52	64	51
Adj. R-sq	0.52	0.46	0.89	0.48	0.56
Panel B: MIP					
	(1)	(2)	(3)	(4)	(5)
Agreement Index	0.00	0.01	0.01	-0.02	0.05
	(0.32)	(0.61)	(1.21)	(-0.84)	(1.34)
Total_asset	0.00	-0.36	**0.03****	0.04	-0.51
	(0.00)	(-0.67)	**(2.19)**	(0.47)	(-0.47)
ETH	0.01	0.12	0.02	-0.04	-0.03
	(0.33)	(0.57)	(1.37)	(-0.48)	(-0.04)
Dai_volume	0.20	0.05	**0.13*****	0.30	-1.42
	(1.36)	(0.15)	**(3.15)**	(1.59)	(-0.85)
Mkr_price	-0.05	-0.07	-0.01	-0.05	-0.04
	(-1.34)	(-0.82)	(-1.11)	(-0.89)	(-0.11)
Total_MakerDAO	**-0.18*****	-0.07	**-1.61*****	-0.10	0.15
	(-3.19)	(-0.52)	**(-13.15)**	(-1.62)	(0.59)
Surplus_buffer	-0.05	0.21	**0.13*****	-0.07	0.29
	(-1.14)	(0.55)	**(7.14)**	(-1.17)	(0.21)
N	35	26	25	21	16
Adj. R-sq	0.76	0.48	0.95	0.62	0.08
Panel C: Greenlight					
	(1)	(2)	(3)	(4)	(5)
Agreement Index	-0.02	0.02	-0.01	**-0.04*****	0.00
	(-0.86)	(0.55)	(-1.07)	**(-3.63)**	(-0.06)
Total_asset	-0.01	-0.48	0.04	0.22	-1.45
	(-0.13)	(-0.63)	(1.41)	(1.66)	(-0.71)
ETH	0.00	0.18	0.00	-0.08	0.35
	(0.06)	(0.55)	(-0.01)	(-1.31)	(0.32)
Dai_volume	0.11	0.36	0.00	**0.32***	3.16
	(0.58)	(0.61)	(0.00)	**(1.88)**	(0.83)
Mkr_price	-0.03	-0.09	-0.01	-0.02	-0.33
	(-0.92)	(-0.86)	(-0.49)	(-1.34)	(-0.59)
Total_MakerDAO	**-0.21****	-0.10	**-1.31*****	**-0.36*****	-0.02
	(-2.56)	(-0.52)	**(-4.48)**	**(-2.80)**	(-0.04)
Surplus_buffer	-0.03	0.29	**0.09****	-0.12	1.21
	(-0.63)	(0.56)	**(2.48)**	(-1.53)	(0.83)
N	37	25	30	23	14
Adj. R-sq	0.57	0.42	0.69	0.75	-0.08

Note: This table reports the regression coefficients and standard t-statistics in the parentheses for the case of new users of Maker protocol. Columns (1) – (5) presents results for voter coalitions 0 – 4, respectively. *, **, and *** denote significance levels at the 10%, 5%, and 1% levels based on the standard t-statistics. The definitions of the variables are given in Table A.4.

Appendix 5. Different types of voters in coalition 0

Table A.14. Descriptive statistics of different types of voters in coalition 0

Panel A: total votes from different types of voters in coalition 0

	ENS	Twitter user	DEX trader	Liquidity provider	NFT trader	Whale
Mean	16521.71	9773.58	5667.47	663.50	986.57	2486.17
Median	13.29	0.58	1521.44	81.94	50.04	50.00
Maximum	133502.20	70592.90	40639.55	9052.15	40442.53	64333.09
Minimum	0	0	0	0	0	0
Std	28271.24	16668.50	8899.02	1173.70	3355.23	6769.23d

Panel B: voting share of different types of voters in coalition 0

	ENS	Twitter user	DEX trader	Liquidity provider	NFT trader	Whale
Mean	0.20	0.12	0.16	0.02	0.04	0.07
Median	0.00	0.00	0.03	0.00	0.00	0.00
Maximum	0.97	0.95	0.99	0.59	0.98	0.98
Minimum	0	0	0	0	0	0
Std	0.32	0.20	0.25	0.05	0.12	0.17

Panel C: Agreement Index (AI) of different types of voters in coalition 0

	ENS	Twitter user	DEX trader	Liquidity provider	NFT trader	Whale
Mean	0.82	0.87	0.91	0.90	0.91	0.96
Median	1.00	1.00	1.00	1.00	1.00	1.00
Maximum	1.00	1.00	1.00	1.00	1.00	1.00
Minimum	0.00	0.03	0.05	0.00	0.05	0.07
Std	0.27	0.23	0.19	0.20	0.20	0.12