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**Airdrops as a governance tool
for DAOs?**

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Airdrops as a governance tool for DAOs?

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Abstract:

An empirical analysis of 19 DAO airdrops with regard to the governance activity of the recipients: Airdrops are a well-known incentive mechanism for blockchain protocols. In recent years, DAOs in particular have discovered "retroactive" airdrops that reward early adopters of a protocol. However, this type of token distribution is also considered a possible solution for centralisation or a lack of voting participation in DAOs. The topic of this thesis is therefore the effect of airdrops on governance activity in DAOs. For this purpose, 19 DAOs were empirically analysed. We compare the voting participation of airdrop recipients on snapshot or (if available) on-chain with that of all token holders. We also analyse the distribution of airdrops, the holding period and the delegation share. We find that the participation of airdrop recipients is on average higher than that of non-airdrop recipients. However, whether airdrops are suitable as a governance instrument must be considered on a case-by-case basis.

Content

Abstract: I

Content II

List of figures	IV
List of tables	V
1 More than "free money"?	1
2 Background	3
2.1 Blockchain/DLT and Web3.....	3
2.2 DAOs - Exodus to the community	5
2.3 Governance in DAOs	11
2.4 Incentives (in cooperation structures)	16
2.5 Airdrops.....	17
2.6 Relevance.....	21
3 Data Analysis.....	23
3.1 Methodology.....	23
3.2 Selected Airdrops	28
3.2.1 Describing the Airdrops	29
3.2.2 Comparing the airdrops.....	38
3.3 Results.....	42
3.3.1 Comparison of size and time period.....	43
3.3.2 Distribution and behaviour after the airdrop.....	45
3.3.3 Snapshot voting activity in general.....	47
3.3.4 Snapshot voting activity of Airdrop recipients	49
3.3.5 On-chain voting activity	51
3.3.6 Delegations	53
3.4 Discussion.....	55
3.5 Outlook	64
4 After the airdrop	67
Literature	70

Attachments.....	83
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Declaration of independence	85
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List of figures

Figure 1: Number of airdrop recipients (own illustration).....	55
Figure 2: Token distribution (percentiles) (own illustration)	57
Figure 3: Actions after the airdrop (own illustration)	58
Figure 4: Governance retention ratio (own illustration).....	59
Figure 5: On-chain governance retention ratio (own illustration).....	60
Figure 6: Airdrop governance retention ratio (own illustration)	61
Figure 7: Difference between airdrop voters and voters excluding airdrop recipients (own illustration)	62
Figure 8: On-chain airdrop governance retention ratio (own illustration).....	62
Figure 9: General share of delegation (own illustration)	63
Figure 10: Delegation share of airdrop recipients (own illustration)	64

List of tables

Table 1: Requirements for the DAO airdrops.....	27
Table 2: Airdrops not taken into account	28
Table 3: Selected Airdrops	29
Table 4: About the airdrop (own illustration according to Dune Analytics)	44
Table 5: About the recipients (own illustration according to Dune Analytics)	45
Table 6: Airdrop distribution and post-airdrop actions (own illustration according to Dune Analytics)	46
Table 7: Snapshot proposals (own illustration according to Dune Analytics)	48
Table 8: Snapshot activity in general (own illustration according to Dune Analytics)	49
Table 9: Snapshot activity of airdrop recipients and exclusive airdrop recipients (own illustration according to Dune Analytics)	51
Table 10: On-chain proposals (own illustration according to Dune Analytics).....	51
Table 11: On-chain voting activity in general (own illustration according to Dune Analytics)	52
Table 12: On-chain voting activity of airdrop recipients (own illustration according to Dune Analytics)	53
Table 13: Delegations in general (own illustration according to Dune Analytics)	54
Table 14: Delegations of airdrop recipients (own illustration according to Dune Analytics) ..	54

1 More than "free money"?

On 16 September 2020, the decentralised exchange Uniswap announced its own UNI token (cf. Uniswap Labs Blog 2020). The exchange thus followed many other decentralised protocols. What made this special, was that all Ethereum addresses that interacted with the exchange by 1st September 2020 were eligible for an "airdrop". These approximately 250,000 Uniswap users were each able to claim an amount of 400 UNI (approx. 1,600 US dollars at the time), liquidity providers could also claim more (cf. jhackworth 2022).

With the release of the tokens, Uniswap also announced the launch of "community governance" (cf. Uniswap Labs Blog 2020). From now on, the exchange should operate as a DAO (Decentralised Autonomous Organisation) that is "managed" by the community. Each UNI token is therefore not only a share in the protocol, but also a voting right. This is also called a "governance token".

It was the first time that "free tokens" were issued by a DAO on a large scale. Airdrops became particularly well known in the course of ICOs to promote projects (cf. Allen, 2023). However, Uniswap carried out a "retrospective" airdrop, the tokens were only issued to previous users. This type of airdrop offers little incentive for new users. Rather, Uniswap rewarded early supporters of the protocol. Retrospective airdrops are thus intended to appeal to intrinsically motivated users rather than users who are specifically looking for airdrops ("airdrop farming") (cf. *ibid.*).

With regard to the governance function of the tokens, however, airdrops in DAOs have another important feature: they distribute the tokens in the community in a "decentralised" manner (Lommers et al., 2023). After all, the recipients are the initial "voter base" that will make decisions about the protocol in the future. With this step, Uniswap created a kind of "airdrop renaissance", and many other protocols have subsequently followed the same path.

In general, airdrops should lead to more users participating in decisions (decentralising governance) (cf. Aragon Blog n.d.). This is particularly relevant in light of the fact that many DAOs face governance challenges, e.g., unequal token distribution, strategic voting or a lack of participation in voting (cf. Barbereau et al., 2022).

But are airdrops really a suitable instrument for increasing governance activity in DAOs? Previous analyses suggest that the majority of airdrop tokens are transferred or sold after a short time, in line with the "free money" concept (cf. Fan et al., 2023). Accordingly, the effectiveness of airdrops in terms of governance is controversial. The governance activity of airdrop recipients has hardly been investigated to date. The aim is therefore to empirically analyse a group of DAO airdrops with regard to the voting activity of the airdrop recipients in contrast to the other token holders.

This is followed by a brief introduction to blockchain and web3, the concept of DAOs and governance in DAOs, before airdrops and previous analyses are presented. The methodology and the selected airdrops are then presented, followed by the results and the analysis. The paper concludes with an evaluation and reflection.

2 Background

In order to understand what constitutes DAOs as an organisational structure, the evolution towards blockchain-based services will first be explained. In this context, the core elements of DAOs, decentralisation and automation, will also be described in more detail. It shows how DAOs - and the understanding of them - have evolved in recent years. Governance is highlighted as a key challenge for digital organisations, supported by a series of (empirical) analyses. A section on incentives explains why DAOs are seen as a model for combining incentives and collaborative action, before finally describing DAOs themselves. This will show how airdrops have changed in recent years.

2.1 Blockchain/DLT and Web3

In recent decades, there have been several attempts to introduce "digital cash", but none of them achieved significant distribution (cf. Pitta, 1999). This changed (slowly) with the introduction of Bitcoin. The white paper described a "peer-to-peer electronic cash system": the open source network is managed by decentralised nodes that register the transactions. This allows digital transactions to be processed without a third party (cf. Nakamoto, 2008). Although the transactions are transparent, they are pseudonymised using cryptographic methods.

Bitcoin was also the first application of blockchain technology to become more widespread. The transactions are processed in data packets (time-stamped), known as "blocks", which are added to the database at regular intervals (cf. Antonopoulos, 2017). Bitcoin is considered a comparatively light and stable protocol that primarily focuses on payment functionality. In order to expand the use cases, there have been various attempts to build programming functions on top of Bitcoin or to introduce new protocols. The most widespread is Ethereum, which was founded in 2015 (cf. Ethereum Whitepaper, 2023).

Ethereum is programmable and therefore capable of advanced computation. Code deployed on the blockchain is called a "smart contract". The applications of smart contracts are many and varied. For example, Ethereum enables tokenisation, i.e., the creation of digital assets (cf. Antonopoulos, 2018). Tokens can be used in "decentralised applications" (DApps). This enables the "decentralisation" of various business areas, such as finance, cloud computing, data storage or identity. Finally, there are now concepts for setting up blockchain-based organisations themselves. These entities are called "Decentralised Autonomous Organisations" (DAOs).

What does "decentralised" mean?

The development of the internet seems comparatively rapid to us today. Arkko, for example, concludes: *"In some cases, the changes have also given rise to the creation of centralised service deployment models and industry consolidation"* (Arkko, 2020). In this context, reference is often made to large platform providers. In contrast, there are a number of applications that are explicitly more "collaborative" than "centralised". They are also referred to as "distributed" or "decentralised" systems. This is also one of the central arguments put forward for "Decentralised Autonomous Organisations" (DAOs) as an organisational form, or is even reflected in the name (cf. WEF, 2022, p.3).

(De)centralisation goes beyond the physical location - and also the underlying technology. Rather, the degree of centralisation depends on several factors (cf. Arkko, 2020). Buterin identifies three different axes of (de)centralisation: "Architectural decentralisation" describes how the computers in a network are physically distributed. A key factor here is how many of them can fail without the network being affected (cf. Buterin, 2017). "Political decentralisation", on the other hand, refers to how many people or organisations control these computers. Finally, "logical decentralisation" refers to how monolithic the system itself is in its structure (cf. *ibid.*). Blockchains would be characterised as architecturally and politically decentralised, or at least this is the preferred state, while they are not logically decentralised (cf. *ibid.*).

On the architectural level, blockchains are not just about the distribution of nodes, but also about client software, proposals and the distribution of tokens. However, political decentralisation is an even greater challenge. In order to create a diverse network and a lively exchange between network participants, there must be a balanced discourse: "enough coordination for a protocol to evolve and move forward, but not enough to enable attacks" (*ibid.*).

Political decentralisation in particular is a central element for DAOs and is often discussed under the term "governance". On the one hand, the organisations adopt the degree of (de)centralisation from the underlying blockchain, but are themselves subject to (de)centralisation at the protocol level. This applies in part to the architectural level (e.g. distribution of the governance token), but also to the political level (e.g. decision-making) (cf. *ibid.*).

As far as the advantages of decentralised systems are concerned, they should have a higher fault tolerance as they are based on many separate components. They should also be more resistant to attacks due to higher attack costs and (ideally) the absence of sensitive centralised points (cf. *ibid.*). Buterin also mentions a higher "collusion resistance". For example, it should be more difficult for participants in decentralised systems to collude or

act fraudulently. On the other hand, it is generally more difficult to achieve or maintain decentralisation than to set up a centralised system.

"web3"

Decentralised or blockchain-based applications are often referred to as "web3" applications. The term stands for the "next iteration of the internet", which is more decentralised or controlled by its users using blockchain (cf. Ethereum.org, 2023b). The development of the three Internet "generations" is often described as "read - write - own". The web1 from the 1980s onwards was primarily characterised by static websites ("write"). Web2 is driven by rapid growth and new opportunities for interaction ("write") (cf. Dixon, 2018). The web2 is characterised by large platform economies that use network effects. However, these are also criticised. They would hinder innovation and create social tensions (e.g., through algorithmic biases) (cf. *ibid.*).

The "web3" promises a shift from the platform models of web2 and a return to the open source culture of web1. Users should not only co-design the services, but are also part of the infrastructure ("own"). This inherent "tokenisation" allows users to be involved in a protocol and - in the case of DAOs - to participate in the governance process. Thus, DAOs are often created with the aim of involving the user base to a greater extent in development (cf. Wright & De Philippi 2015).

The projects should thus be more closely orientated towards their community (cf. Dixon, 2018). However, this is also controversial. The term "web3" is sometimes incorrectly used for protocols that are only controlled by a small group or a single person (cf. White, 2023). With regard to the web3 industry, it is often pointed out that projects are used for speculation and have security vulnerabilities, causing investors to lose money (cf. *ibid.*).

2.2 DAOs - Exodus to the community

"These digitally native organisations, referred to as DAOs, hold out the hope, at least in the eyes of their creators, to serve as the primary organizational structure for the Internet Age" (Wright 2021, p.154).

"We are buying the United States Constitution." This was the motto of the "Constitution DAO". Its aim was to raise capital to buy one of the copies of the original US Constitution from 1787 (cf. Irwin 2021). This was auctioned off at Sotheby's in November 2021 (cf. *ibid.*). Over 17,000 addresses took part in the DAO and raised more than 11,000 Ether - more than 42 million dollars at the time - in just seven days (cf. Juicebox 2023). In return, the participating addresses received a number of PEOPLE tokens (the governance token issued by the DAO) corresponding to their contribution, which serve as an anonymous digital representation of their participation.

The token would later become a share in the artefact and serve as a means of voting on how to proceed with the document. In the end, the DAO narrowly lost the auction to another bidder, probably also because the amount collected was transparent (cf. Irwin 2021). The Constitution DAO subsequently decided to close itself down. Since then, users have been able to have their PEOPLE tokens refunded (cf. Constitution DAO n.d.).

The DAO writes on its X account: "We didn't get the Constitution, but we made history nonetheless" (ConstitutionDAO X n.d.). The popularity of the project even led to the value of the PEOPLE token rising far beyond its original price (cf. Brown 2021). The DAO also inspired the creation of many other such organisations with a focus on community fund-raising - or the use of DAOs in general.

Development of DAOs

DAOs are not a new phenomenon: "The DAO" was the first large-scale DAO in 2016. The aim was to raise money in exchange for tokens and serve as a kind of decentralised venture fund to finance projects in the Ethereum ecosystem (cf. Jentzsch 2017). The project was an unexpected success and raised more than 12 million Ether, which at the time equated to 16% of the ether supply or around 150 million dollars - the largest crowdfunding of all time to date (cf. Falkon 2017). Today, "The DAO" is known for being hacked before it could realise its plan. Ultimately, the situation led to a hard fork of the Ethereum blockchain (and the creation of Ethereum Classic) to compensate the participants (cf. *ibid.*). The "first" DAO has shown what these "digital organisations" can achieve. Or as Buterin wrote back in 2014: *"all in all, it is safe to say that "DAOism" is well on its way to becoming a quasi-cyber-religion"* (Buterin 2014).

In fact, DAOs have developed significantly since then. In recent years, on-chain organisations have evolved into a multifaceted phenomenon that serves a variety of purposes beyond fund-raising. In the first three years of Ethereum, there were only a handful of DAOs (cf. Rikken et al. 2021, p.2). Since then, DAO tooling has improved significantly: governance frameworks make it easy to create DAOs and facilitate voting, and security companies have specialised in auditing smart contracts. There are also tools for managing treasury, community management and legal services (cf. WEF 2022, p.11).

The emergence of DeFi protocols and NFT projects organised as DAOs is also seen as a catalyst. In particular, the number of DAOs increased significantly in 2020 and 2021: DeepDAO, a DAO analysis service, now lists almost 20,000 aggregated governances (cf. DeepDAO 2023). This number has multiplied in just a few years. At the beginning of 2022, just over 200 DAOs were listed (cf. Santana & Albareda 2022, p.1). However, not all of them are certainly active or meet the criteria of DAOs: some may have been created as an experiment, while others have already ceased their activities (cf. Constitution DAO n.d.). DeepDAO also includes Snapshot Spaces, whose designation as a DAO is sometimes

controversial. The site also refers to "nonsencial DAOs" (cf. DeepDAO 2023). Similar growth was seen in DAO treasuries, which increased 40 times in 2021 (to over \$16 billion) (cf. WEF 2023, p.4).

The fact that the number of DAOs is difficult to determine is also due to the fact that the DAO concept itself is controversial: despite the popularity of the phenomenon, there is no common understanding of what constitutes a DAO (cf. Rikken et al. 2021, p.1).

Related concepts

There are several examples of longer-standing concepts that are related to these characteristics. Examples of self-organising systems from nature or biology are cited, e.g., the process of protein formation (cf. EthDenver 2022). Similar concepts can also be found in colonies, such as ants or bees, also known as "swarm intelligence" (cf. Wang et al. 2019, p.870). At the organisational level, DAOs are also associated with cooperatives. The concept is much older and comparatively widespread in the USA, for example (cf. Walden 2019).

Cooperatives are committed to a "cooperative" approach. The members own and manage the organisations, usually via cooperative shares. This should lead to better "value alignment" than with traditional companies (cf. *ibid.*). Platform models in particular are seen as a possible alternative to large companies (cf. Robey 2022). The idea of the so-called "chaordic organisation", which goes back to the founder of VISA, pursues a similar approach (cf. Büch 2022).

In this respect, the models are very similar to DAOs, with the difference that they are digital or global by design. Walden sees the advantage in the fact that DAOs are easier to bootstrap. In this way, they can be set up, financed and scaled more quickly: "cryptonetworks - what we call "community owned and op-erated networks" - could unlock a new paradigm for continued cooperation, while still sus-taining strong network effects" (Walden 2019). If you look at history, DAOs as a form of organisation are even a "logical consequence":

The evolution from bureaucratic to algorithmic entities represents a logical continuation of a core human activity. For millennia, organisations have emerged to coordinate economic and social interactions in response to novel business challenges of the time (Wright et al. 2021, p.153).

However, there are also a number of differences. While cooperatives generally operate with "one member - one vote", DAOs usually operate with "one token - one vote". Co-operatives therefore tend to be better at addressing inequalities (cf. Robey 2022).

Core elements of DAOs

"These digitally native organisations, referred to as DAOs, hold out the hope, at least in the eyes of their creators, to serve as the primary organizational structure for the Internet Age" (Wright 2021, p.154).

The basic idea of such digital organisations and/or companies has been around for many years. For example, Dilger described a similar idea ("multi-agent systems") in the 1990s, at that time in the context of IOT systems (cf. Dilger 1997). The introduction of Ethereum in 2015 finally seemed to create a possible technological basis for implementing the concept on a larger scale.

DAOs in their current form were first mentioned in a blog post by Ethereum co-founder Vitalik Buterin in 2014 (cf. Buterin 2014). Prior to this, "decentralised autonomous companies/corporations" (DACs) had already been discussed as an advanced application of smart contracts (cf. Buterin 2013, cf. Larimer 2013). The term DAO later became established. In contrast to DACs, DAOs are more general and not necessarily monetarily driven (cf. Buterin 2014). Today, DACs are considered more of a sub-class of DAOs.

Different types of organisations can be mapped as DAOs, including companies, investment funds, communities or non-profit organisations. Some DAO enthusiasts even see the concept at a national level (cf. Clay 2021). As the name suggests, the core elements of DAOs are decentralisation and automation. A preliminary stage is "decentralised organisations" (DO) (cf. Buterin 2014). According to Buterin, they differ from "decentralised applications" (DAs) in that they have "internal capital" (cf. *ibid.*). DOs follow the concept of an organisation, but in a decentralised manner.

Various dimensions of decentralisation have already been described: it can relate, for example, to the number and distribution of nodes, the distribution of DAO members or the concentration of power and resources in the community (cf. WEF 2022, p.15). The concept of DAOs adds the "autonomous" component, which can be even more difficult to achieve:

"The ideal of a decentralised autonomous organisation is easy to describe: it is an entity that lives on the internet and exists autonomously, but also heavily relies on hiring individuals to perform certain tasks that the automaton itself cannot do" (cf. Buterin 2014).

DAOs are not fully automated like AIs, but they partially automate decision-making or the execution of decisions. Buterin therefore describes DAOs as "automation at the centre, humans at the edges" (*ibid.*). Despite the autonomous aspect, DAOs are dependent on humans for coordination and operational implementation or the creation of a social consensus. Instead of removing people from the equation, DAOs/DACs would rather replace management (cf. Buterin 2013). Büch also notes that organisations are always a "social

(communication) system" and therefore not completely algorithmically controlled (Büch 2019).

DAOs are particularly obvious in the management of open-source projects that work "by design" with (partially) autonomous software - including via blockchain applications (cf. Wright 2021, p.154). The WEF also sees DAOs as possible forms of organisation for social challenges (e.g. ESG issues) where "collective action" is required (cf. WEF 2022, p.19). This is reflected in the "Solarpunk" or "ReFi" movement (regenerative finance), among others (Schletz et al. 2023).

Definition of DAOs

"The DAO is like an elephant: easy to recognise, but difficult to describe" (Büch 2019).

DAOs were already described in the Ethereum whitepaper as "digital entities" whose members can determine the majority of code changes and spend money (cf. Ethereum whitepaper 2023). These rules are enforced thanks to the blockchain: "This essentially replicates the legal trappings of a traditional company or nonprofit but using only cryptographic blockchain technology for enforcement" (ibid.). The Ethereum Foundation also emphasises that the members of a DAO each have a specific goal or mission in common. Thus, DAOs are "a collectively-owned, blockchain-governed organisation working towards a shared mission" (Ethereum.org 2023a).

Wright also agrees with the participatory focus: *"DAOs are not run by boards or managers, but rather aim to be governed by democratic or highly participatory processes or algorithms."* (Wright 2021, p.152). DAOs typically have no formal hierarchy and members are regarded as equals. Membership is equally unbound, and may only last for a short period of time (cf. ibid. p.56). DAOs tend to be characterised by "bottom-up" interaction and coordination (cf. Wang et al. 2019, p.871).

According to Wang et al, DAOs should be understood as a concept rather than a specific business or organisational model (cf. ibid., p.5). They are characterised by the fact that coordination takes place online and they are deployed on a blockchain (cf. ibid.). While traditional organisations are usually hierarchical and tied to a presence or embedded in the legal system, the rules of DAOs are defined in smart contracts. This is an autonomous process that takes place without a central controlling authority (cf. ibid.). As Hassan & De Filippi write:

"A DAO is a blockchain-based system that enables people to coordinate and govern themselves mediated by a set of self-executing rules deployed on a public blockchain, and whose governance is decentralised (i.e., independent from central control)" (Hassan & De Filippi 2021, p.2).

Technically speaking, DAOs are a collection of these contracts (cf. Wright & De Filippi 2015, p.15). Wright and De Filippi also refer to this code-based rule pattern as "Lex Cryptographia" (cf. *ibid.*). Sulkowski refers to "hardcoding business ethics" (Sulkowski 2019). They also stand out because they are efficient in collecting and deploying capital ("operational efficiencies") (cf. Wright 2021, p.153). The transparency of the blockchain serves as an internal control mechanism and is also the basis for global distribution (cf. Xie 2021).

Consequently, there is a broad understanding of what a DAO can be. For this reason, Rikken et al. systematically analysed different definitions and derived key characteristics from a DAO dataset (Rikken et al. 2021, p.2). Two functional characteristics stood out, which were present in almost all DAOs analysed: Firstly, the "storage and transfer of value functionality", in relation to the management of a common treasury. In addition, DAOs had a "trusted notary functionality" with regard to decision-making (*ibid.*, p.5).

In addition, Rikken et al. examined the most common characteristics of DAOs: they concluded that DAOs are mostly described as decentralised, at the infrastructure and application level. In addition, they are mostly defined as blockchain-based. Decisions are made and/or executed autonomously (*ibid.*, p.9). On this basis, they propose the following definition:

"A DAO is a system in which storage and transaction of value and notary (voting) functions can be designed, organized, recorded, and archived and where data and actions are recorded and autonomously executed in a decentralised way" (ibid.).

As the various definitions show, there is a wide variety of forms, e.g., in relation to the technical structure, the governance process, the community organisation or the financial management of a DAO (cf. Ziegler & Welppe 2022).

Limits of the definition

The extent to which DAOs must be embedded "on-chain" to be considered as such is controversial. For example, there are (self-proclaimed) DAOs that have a "shared treasury", usually in the form of a multi-signature wallet for the DAO's balance, but no governance token of their own (cf. Ziegler & Welppe 2022, p.11). They are also described as "an online group with a shared bank account" (Forbes Digital Assets 2022). Another variant is DAOs that have a governance token but vote off-chain (cf. Snapshot n.d.).

And even if a governance token has been issued, there are different ideas about how "autonomous" a DAO should be and how much "human" control it should have (cf. Hassan & De Filippi 2021, p.6). Some DAOs have created smart contracts in which decisions are executed automatically. Others rely on the participants to implement the voting results. They are therefore less "autonomous" (cf. Rikken et al. 2021, p.19). The WEF speaks of algorithmic vs. participatory DAOs (cf. WEF 2022, p.15).

According to Rikken et al.'s understanding of DAOs, voting must not only take place on-chain, but must also be executed automatically. Otherwise, they are "perceived" DAOs, which may be decentralised but not autonomous (cf. Rikken et al. 2021, p.2). Accordingly, organisations that do not meet these criteria are not "real" DAOs. Depending on the interpretation, there are currently few or no DAOs that fulfil this definition. This applies to the degree of decentralisation, but even more so to the autonomous execution of decisions. The latter is considered complex to implement, as all possible voting results must be converted into code in advance (cf. *ibid.*).

There is also the idea of "progressive decentralisation" (cf. Walden 2020). In this model, a product should benefit from development by a small team in the early stages and only pass into the hands of the community at a later stage ("exit to the community") (cf. *ibid.*). It can therefore take several years before a project becomes a "complete" DAO.

2.3 Governance in DAOs

The venture capital fund a16z is invested in many crypto protocols and therefore also has significant voting rights in some DAOs (cf. Kessler 2023). This became particularly clear at the beginning of the year when Uniswap proposed which bridge the DEX should use to operate on the BNB chain, Wormhole or LayerZero (in which a16z is also invested). The vote didn't end in favour of a16z. Nevertheless, the discussion raised the question of how decentralised many DAO votes are. Especially since a16z has currently delegated a large part of its Uniswap tokens, which reduced its influence (cf. *ibid.*).

However, the problems with DAO governance go beyond the distribution of tokens. There are several examples where DAO governance appears to be failing: For example, when a hacker shaped the code of a Tornado Cash DAO proposal at the end of May in such a way that he was able to secure an absolute majority - before voluntarily giving it back after one day (cf. Bergmann 2023). Or when the Arbitrum DAO voted in its first proposal to allocate 750 million ARB for operational costs (cf. Pereira 2023). When the majority voted against the proposal, it turned out that some of the tokens had already been issued. The Arbitrum Foundation later announced, to the annoyance of the token holders, that it was only a ratification of the decision and not an actual vote (cf. *ibid.*).

The following sections will describe in more detail what is meant by governance in DAOs, what previous analyses indicate and how the problems surrounding on-chain voting could be addressed.

Definition of blockchain governance

"... blockchains may teach us more about governance in the next 10 years than we have learnt from the "real world" in the last 100 years" (Ehrsam 2020).

While DAOs were discussed more in terms of their technical design in the early years, the discourse today focuses more on the governance challenges (cf. Hassan & De Filippi 2021, p.6). After all, the way decisions are made is a crucial element in many organisations. In many ways, DAOs are an opportunity for experimentation with decision-making processes (cf. Fritsch et al. 2022, p.1). The use of tokens creates new possibilities, e.g., regarding the idea of "liquid democracy", in which voters can decide whether to cast their vote directly or delegate it (cf. *ibid.*). DAO votes can be processed comparatively quickly, globally, and anonymously. According to Beck et al., the DAO principle is more far-reaching than simply processing decisions digitally: Rather, DAOs would change our perception of governance (cf. Beck et al. 2018).

What is meant by governance also depends on the respective area, e.g., political, economic or technical (cf. Fritsch et al. 2022). Regarding IT governance in particular, Beck et al. focus on three dimensions, "rights, accountability and incentives" (*ibid.*, p.1022). Governance therefore determines who has decision-making rights, how decisions are ensured and monitored and how decision-making actions are rewarded (monetary or non-monetary) (cf. *ibid.* p.1023).

Reijers et al. define the governance context of blockchain: *"On-chain governance refers to rules and decision-making processes that have been encoded directly into the underlying infrastructure of a blockchain-based system"* (Reijers et al. 2021, p.822). On-chain governance should be distinguished from off-chain governance, which usually takes place in advance in social media or forums (cf. *ibid.*). In fact, on-chain voting is usually the last step of a multi-stage process after (off-chain) opportunities for discussions, adaptation proposals or "temperature checks" (cf. Fritsch et al. 2022, p.1).

Fischer and Valiente therefore emphasise that blockchain governance is always a social process, despite the "outsourcing" to smart contracts: *"As stated previously, all governance is ultimately a social construct, comprising not simply laws (or bylaws), but also norms, culture, institutions, and individuals"* (Fischer & Valiente 2021, p.4). Governance should therefore be viewed as a whole (more than rules set out in code).

Rikken et al. distinguish between "self-coded" and "parameterised DAOs" in DAO governance (cf. Rikken et al. 2021, p.5). While the former are deployed with self-written code, the latter use templates from DAO frameworks or fork existing DAOs. A number of these templates are now available that can be used to "assemble" DAOs using the no-code principle ("DAO as a service"), e.g. Aragon, DAOstack, DAOhaus or Colony (cf. Faquir et al 2020).

A central question when setting up a DAO is also the voting mechanism. Many DAOs are experimental in this respect, e.g., reputation-based voting, the "futarchy" model (based on a prediction market), "continuous approval voting" (more votes must be collected for each proposal) or "optimistic governance" (decisions can be contested) (cf. Kurniawan et al. n.d., p.16, WEF 2023, p.15). Especially in the context of decentralisation, "quadratic voting" is discussed, in which greater influence costs voters more or smaller token holders carry more weight (cf. Allen et al. 2017). However, the majority of DAOs still rely on one-token-one-vote (cf. snapshot above).

In addition to the type of voting, further rules must be defined, e.g., who may make proposals, which structure they follow, whether there is a minimum participation (quorum), how large the majority must be (threshold) and whether decisions can be contested. There are already numerous options when proposing the proposal, which can, for example, be open to all, only with the support of a token holder, only for token holders or linked to certain threshold values (staked) tokens or to whitelisting or verification (cf. Sharma et al. 2023, p.5).

Governance analyses

Governance systems in DAOs have already been covered in some publications, even if there is still a need for empirical analyses (cf. Faqir et al. 2020). Rikken et al. note that there has been a strong increase in "parameterised" (framework-based) DAOs, especially since the introduction of Aragon at the end of 2018 (cf. Rikken et al. 2021). However, these show lower levels of voting activity than those that are "self-coded" (cf. *ibid.* p.12). The former are also much easier to set up. Rikken et al. also show that a minimum of 20 participants is a threshold for long-term activity as a DAO (cf. *ibid.*). Arroyo et al. empirically analysed the DAOHaus, Aragon and DAOstack platforms and observed similarly low levels of on-chain activity. On DAOHaus, for example, only a third of DAOs were active within a year (cf. Arroyo et al. 2022, p.194). This could be due to the fact that activity took place off-chain but is an indicator that many DAOs are no longer being continued (cf. *ibid.*).

In their analysis, Fritsch et al. focus on the three DAOs Compound, Uniswap and ENS. Using a network analysis of the token holders, they establish that both the distribution of voting rights and the delegates can hardly be described as decentralised (cf. Fritsch et al. 2023, p.4). However, they add that a token holder can also have several addresses or delegate them to themselves (cf. *ibid.*). Barbereau et al. analyse governance participation in a set of DeFi protocols and also come to the conclusion that this is not very decentralised. Rather, one could speak of a "minority rule" or oligarchies (cf. Barbereau et al. 2022). In general, participation in voting is low and even tends to fall (cf. *ibid.*, p.1). This is also confirmed by Jensen et al., who examined several DeFi protocols with regard to their degree of decentralisation (cf. Jensen et al. 2021). Barbereau et al. see this as a consequence of tradable voting rights and the lack of regulations against their concentration. The

governance tokens would be used more for trading than for voting or delegating, and would therefore primarily have a speculative character (cf. Barbereau et al., p.11). Feichtinger et al. write, for example:

"By measuring low decentralisation we find evidence that DAOs might be used as a marketing tool, or worse yet, as means to justify and veil decisions of a ruling dictatorship behind the facade of a community" (Feichtinger et al. 2023, p.15).

The authors empirically analysed a set of DAOs and found a high concentration of voting rights. They also point to high hidden costs associated with on-chain governance, mainly due to transaction fees on Ethereum (cf. *ibid.*). Sharma et al. see a mixed situation when it comes to the decentralisation of DAO voting. For one-person-one-vote DAOs, the distribution has improved over time (cf. Sharma et al. 2023, p.2). On the other hand, DAOs in this model must verify the participants to avoid sybils. With one-token-one-vote, they see similar disadvantages as other authors:

"Token-based governance disincentivizes grassroots holders from participating in the decision-making process, particularly with regard to the tendency for core or managerial teams to hold a majority of tokens, leading to centralised decision-making by a small group" (ibid., p.6).

Sharma et al. also investigated whether proposals are more successful if they are supported by "whales". This varies depending on the DAO, but there is a positive correlation between token holdings and voting activity (cf. *ibid.*, p.13). Smaller token holders would vote less frequently in many DAOs than those with large holdings (cf. *ibid.*, p.9).

Han et al. have investigated how the distribution of token holders can affect the growth of platform DAOs. They found that the concentration of token holders correlates negatively with platform growth (cf. Han et al. 2022). Rapid growth, illiquid tokens and long-term incentives are factors that can counteract this. However, very large token holders ("whales") could also have a positive influence if they are not too numerous and participate in the long term (cf. *ibid.*, p.4). Zhao et al. analysed the platform performance regarding the type of proposal at MakerDAO. They conclude that strategic (long-term) decisions through voting have a positive influence on operational performance, while purely operational (short-term) proposals tend to paralyse performance (cf. Zhao et al. 2022, p.650).

Against on-chain governance?

"There is no such thing as autonomy in community. The need for subjective algorithms to monitor peoples' behaviours towards outcomes in "DAO" infrastructure shows that the idea of individual autonomy and self-governance fades in a trade-off with belonging to a collective community" (cf. Nabben 2021, p.23).

The analyses largely confirm that many DAOs have problems with on-chain governance, particularly in terms of participation and decentralisation. In the context of participation, there is also talk of "voter fatigue" or "voter apathy" (cf. WEF 2023, p.30). There are doubts as to whether DAOs are better than traditional organisations (cf. Zamfir 2018). In particular, the fact that token holders are usually also investors in the DAO could create false incentives (cf. *ibid.*). In 2021, Buterin called for DAOs to move beyond "coin voting" (one-token-one-vote) (cf. Buterin 2021). In most DAOs, it is possible to buy voting rights ("vote-buying") (cf. Buterin 2017). This could remain unrecognised if the tokens are distributed to addresses; this is also referred to as a "dark DAO" scenario (Daian et al. 2018).

However, other voting methods, such as reputation-based models, have also been criticised. Nabben writes, for example, that the pursuit of decentralisation can also have the opposite effect, as transparency facilitates algorithmic monitoring, a kind of "panopticon of algorithmic governance" (cf. Nabben 2021, p.18).

There are various proposals to improve on-chain governance in DAOs: The proposal process is an important factor. Zhao et al. recommend leaving operational decisions more to the team or introducing separate voting processes to give strategic decisions more time and space for discussion (cf. Zhao et al. 2022, p.670). Proposals that are of poor quality, lengthy or difficult to understand can increase voting fatigue or slow down innovation in DAOs (cf. WEF 2023, p.30).

Zhao et al. also concluded that transparency and communication on various channels is an important factor for participation (cf. Zhao et al., p.670). Other suggestions involve a deviation from token-weighted voting or allowing smaller voters to participate more strongly (e.g., quadratic voting) (cf. Allen et al. 2017). To strengthen participation and coordination within a DAO, a DAO can be divided into smaller teams or "sub-DAOs" (cf. WEF 2023, p.11). Many larger DAOs have now introduced the delegation of tokens so that token holders can pass on their vote. This means that token holders do not have to be involved in all decisions, but on the other hand it can lead to centralisation (cf. *ibid.*). As a result, there are now even full-time "protocol politicians" (cf. Turley 2020).

Incentives are another obvious option for DAOs, especially for smaller token holders. Incentives can be designed very specifically thanks to the characteristics of DAOs:

"Because a DAO is a programmable technology that can automatically weight and assess actions based on various inputs, there can be any number of ways to structure, reward and encourage positive behaviours, as defined by each DAO" (cf. WEF 2023, p.11).

2.4 Incentives (in cooperation structures)

Incentives are a popular means of steering people's behaviour in a certain direction in many areas. These "incentives" are often of a financial nature. Today, they are particularly well known in the context of companies. Economic theories have long been concerned with how incentive systems can be used efficiently (cf. Fehr & Falk 2002, p.687). They also coined the name (cf. Grant 2022). However, incentives can take many different forms:

"An incentive is an offer of something of value, sometimes with a cash equivalent and sometimes not, meant to influence the payoff structure of a utility calculation so as to alter a person's course of action" (ibid., p.111).

As both sides benefit, incentives are considered ethically unproblematic, e.g., in contrast to penalties (cf. ibid.). One could also speak of a kind of exchange ("trade") between two parties. On the other hand, an incentive always also represents an extrinsic motivation; the recipient does not actually have to be "convinced" of the respective action or have a genuine interest in a product (cf. ibid. p.136). Grant therefore also sees incentives as a form of control (cf. ibid.). This could even counteract the desired effect.

It is often assumed that non-profit organisations in particular have an incentive problem (cf. Borgen 2004). Due to a community or non-profit approach, such organisations typically do not have such strong "incentives" as the private sector (e.g., payment of bonuses) (cf. Speckbacher 2012). A loose structure also makes it more difficult to align incentives with specific goals. Members would not have sufficient incentive to get involved, instead there are many followers ("free rider problem") (cf. Borgen, p.285).

Fehr and Falk, on the other hand, argue that incentives are viewed too strongly from a financial perspective. Non-monetary incentives would also shape human behaviour, e.g., social recognition (cf. Fehr & Falk 2022, p.687). Employees of non-economic organisations often stand out more due to their intrinsic motivation (cf. Speckbacher 2012). Bogen has analysed cooperatives in this respect and found that the members should be viewed less as "rational investors" (cf. Borgen 2004, p.392). Rather, one should focus more on the individual motives of the users. However, relying purely on intrinsic motivation is problematic, also because this varies greatly (cf. Speckbacher 2012, p.1018). There is rarely a "perfect match" in this respect (cf. ibid.).

DAOs are seen as a way of combining cooperative action and incentives (cf. Walden 2019). This is not least due to the inherent tokenisation. In many protocols, the tokens are both a governance instrument and part of the business model. They are also liquid and offer the prospect of a price increase, unlike shares in "traditional" cooperation structures. In this respect, DAOs are more closely aligned with companies (cf. Robey 2022).

2.5 Airdrops

Airdrops are probably the best-known incentive mechanism in the blockchain ecosystem (cf. Lommerst et al. 2023). Basically, it is the distribution of free tokens: *"A cryptocurrency token airdrop is a novel means of distributing rights over a blockchain project to a community of users and owners for free"* (cf. Allen et al. 2023, p.1). Fan et al. describe airdrops as a type of "digital coupon" that transfers tokens to a wallet (cf. Fan et al. 2023, p.2). This practice is intended to reward existing "customers" or attract new ones.

"Although airdrops within web3 are a new vehicle, as a concept they are no different than loyalty programmes or price discounts offered by traditional non-web3 companies: they aim to confer value to those who engage with the product or service while encouraging future involvement" (cf. Lommers et al. 2023, p.2).

The protocols act in a similar way to large platform companies. They incentivise early users in order to generate network effects, even if this means a large investment ("cold start problem") (cf. Allen et al. 2023, p.1). In contrast to companies, however, the tokens are to be understood as shares ("equity") rather than cash, which have ownership and governance rights (cf. *ibid.*). For the protocols, it is generally more favourable to distribute a self-created token. The rewards are also not always distributed directly or announced at all. Some airdrops are passive, and you only qualify by owning a token ("token-based") or a wallet. It is therefore possible to receive an airdrop without having interacted with a protocol or even intending to do so (especially in the case of dubious airdrops). Some airdrops are aimed specifically at users of competing protocols to win over users ("vampire attacks") (cf. Lommers et al. 2023, p.12). Airdrops are generally more diverse than "web2" incentives (cf. Allen et al. 2023, p.2).

Auroracoin (starting in 2014), a Litecoin fork that could be claimed by all citizens of Iceland, is considered the "first" blockchain airdrop (cf. *ibid.*, p.3). Whether blockchain forks, some of which were carried out earlier, count as airdrops is disputed. It is difficult to determine how many airdrops have taken place to date. Some did not take place on-chain (e.g., on centralised exchanges), small airdrops can be distributed manually. Airdrops from NFTs are also widespread. The "Airdrop Alert" page lists more than 2,300 airdrops (cf. Allen et al, p.3). However, as not all airdrops are listed, it can be assumed that there are more in total.

Incentives were particularly widespread in 2017 and 2018, when many ICOs were held (cf. *ibid.*). However, many of these projects were not sustainable or even turned out to be fraudulent, e.g., by requesting personal information or deposits. As a result, the reputation of airdrops declined (cf. *ibid.*). The phenomenon became more present again from around 2020 with the emergence of DAOs that distribute governance tokens via airdrops (cf. *ibid.*). An airdrop often marks the launch of a token and is intended to decentralise the project.

Fan et al. observe three "phases" in the way airdrops are allocated. Until around 2020, airdrops were often found in which most users received the same amount of tokens (e.g. Uniswap), also known as "fair allocation" (cf. Fan et al. 2023, p.2). This was followed by airdrops in which the total amount of tokens paid out is based on various criteria ("differential allocation", e.g., dydx) and finally airdrops of the "threshold differential allocation" type (e.g., paraswap). They are even more selective, as a certain threshold value of interactions must have taken place to be considered for the criteria (cf. *ibid.*). In general, it can be observed that the protocols have become more strict in the selection of participants. Airdrops that are linked to specific activities ("activity-based") are now the norm (cf. Lommers et al. 2023, p.6). Allen even concludes that the protocols and airdrop hunters are in a kind of "co-evolutionary process" that is slowly making airdrops more sophisticated (cf. Allen 2023).

There is also a temporal dimension to airdrops: Lommers et al. distinguish between "past-value-based" and "future-value-based" airdrops. While the former use past transactions for allocation, the latter are linked to future interaction with a protocol (cf. Lommers et al., p.5). One can also speak of "retrospective" or "announced" airdrops. It can be assumed that in the case of previously announced airdrops, the focus is more on user acquisition or increasing protocol activity. This was a particularly popular model for ICOs (cf. *ibid.*).

Retrospective airdrops, on the other hand, are better suited to rewarding early users and distributing the token more effectively (cf. *ibid.*). DAOs are particularly well known for this type of airdrop (cf. Allen et al. 2023, p.8). If an airdrop is not expected, this also prevents "airdrop hunting" or "farming". However, today, few airdrops are actually "surprising". There is much speculation, as some airdrops have proven to be very lucrative. Some airdrops have been announced semi-officially or without a specific date. Lommers et al. even assume that a certain degree of uncertainty is an additional incentive mechanism, similar to a "mystery box" (cf. *ibid.*, p.10). Nevertheless, a significant increase in activity is regularly seen in protocols where a governance token launch is possible (cf. Katte 2023).

Why Airdrops?

"We find that two primary rationales for airdrops are marketing (to attract new users and to maintain a community) and decentralisation of ownership and control of a project (building community, providing regulatory protection, and enhancing security)" (cf. Allen et al. 2023, p.1).

Airdrops are often seen as a marketing tool. They generate attention for a project, also since there have been marketing bans for ICOs in some cases (cf. *ibid.*, p.5). This effect is also confirmed by some authors: Li, for example, found that potential investors are significantly more likely to invest in ICOs (by more than a factor of 2) if they carry out an airdrop (cf. Li 2021). Makridis et al. found growth in DEXes that hold an airdrop (Makridis et al. 2022).

Decentralisation is a factor that is considered "desirable" for many protocols or that many services strive for, not only to be considered "community-oriented". Token distribution is also a security factor against attacks on the protocol. If projects are "sufficiently decentralised", they are also less likely to be classified as security by the US authorities (cf. Allen et al 2023, p.6). Depending on the jurisdiction, airdrops can also have tax advantages (cf. *ibid.*). The gas costs for the distribution can be reduced via bundled transactions or redirected to the users (cf. Fröwis & Böhme 2019).

Allen et al. also attribute liquidity advantages to airdrops: if a token is launched with the airdrop and thus becomes publicly tradable for the first time, distribution as an airdrop is said to be a strategy to promote price discovery and reduce volatility (cf. Allen et al., p.7). On the other hand, selling a significant portion of the supply could also lead to a price drop, especially for already established tokens (cf. N3mo 2022). An analysis of 31 airdrops showed that almost three quarters of the projects traded below the initial price of the token after 200 days (cf. *ibid.*). On average, the best time to sell an airdrop is directly after the distribution (cf. *ibid.*). In this respect, selling is a logical consequence for airdrop hunters. However, in view of the volatility of the crypto market, the time period of the selected airdrops was relatively short for a generalised statement.

Airdrops can be played out in a very targeted manner by adapting them to on-chain criteria. As a rule, participants are pseudonymous and do not have to disclose any personal data (cf. Lommers et al., p.5). In this respect, airdrops are more "private" than incentives outside of Web3 (Harrigan et al. 2018). Nevertheless, the wallet history can tell us a lot about a user. At least which addresses are authorised for an airdrop, even without claiming, can be encrypted using cryptographic methods (Wahby et al. 2020). For airdrops based on on-chain activities, however, this can be easily investigated.

Airdrop farming

Fan et al. deduce that blockchain communities tend to have fewer altruistically motivated participants than traditional internet communities due to the integration of digital assets (cf. Fan et al. 2023, p.2). Airdrops can therefore trigger false incentives, which is particularly evident in airdrop farming. This refers to systematic participation in airdrops, sometimes even the creation of multiple accounts ("Sybils") in order to receive an airdrop multiple time (cf. Lui & Zhu 2022). This is a hindrance to the decentralisation of protocols and can give a false picture of how large or active a community is (cf. Fan et al. 2023, p.2).

However, it is not easy to recognise or exclude airdrop farmers, especially in the run-up to an airdrop (cf. Lui & Zhu 2022). They can sometimes be detected by analysing the network of participating addresses. Non-custodial account addresses that have (repeatedly) transferred with each other and interact with the same DApps may belong to airdrop farmers. It is also typical for Sybils that tokens from different addresses are accumulated on a wallet after the airdrop (cf. *ibid.*). On this basis, Liu and Zhu propose a "detection system" that uses transaction graphs to recognise Sybil wallets. Such an approach was used, for example, in the HOP Protocol airdrop (cf. *ibid.*). In fact, other protocols also used the list created by HOP (e.g., Arbitrum) (cf. Arbitrum Foundation). The HOP team offered additional rewards for users who were able to identify Sybil addresses (cf. Kelly 2023). However, Liu and Zhu emphasise that it cannot be proven with certainty whether an account is an airdrop farmer (cf. Lui & Zhu 2022). Addresses could therefore also be unlawfully excluded.

Fan et al. carried out an empirical analysis in relation to the Paraswap airdrop. They analysed the efficiency of the airdrop and identified different types of recipients (cf. Fan et al. 2023). Most protocols today would rely on some kind of "filter mechanism" to select the participants. In the case of Paraswap, for example, only just under 20,000 addresses were authorised, while over 1.3 million addresses interacted with the DApp (cf. Fan et al. 2023, p.2). The authors note that users who were more active in the community also received more tokens (cf. *ibid.*).

Fan et al. analyse which actions the recipient addresses have carried out since the airdrop (transfer, sale, holding the tokens, repurchasing, liquidity providing or staking) (cf. *ibid.* p.7). An address can also perform several of these actions, e.g., transfer some of the tokens and stake the rest. They found that the majority of airdrop recipients did not keep the tokens. Over 85% of the recipients transferred the tokens within approx. 6 months (cf. *ibid.*, p.5). The reason for this could be the collection of tokens on wallets (through farming) or the sale of the tokens. This can be confirmed for just under 40% of recipients who sent the tokens directly to an exchange (cf. *ibid.*, p.6). Only a small proportion participated in staking, liquidity providing or bought tokens (cf. *ibid.*).

Previous work on airdrops suggests that although they can be an effective marketing tool, these effects are not very sustainable, at least as far as the holding period of the tokens is concerned (cf. Lommers et al. 2023, p.9). The fact that "purchased" (extrinsically motivated) users do not offer any long-term added value is one of the disadvantages described in incentive research (cf. Grant 2002).

There are also corresponding doubts regarding suitability as a distribution mechanism. Airdrop farming in particular is a problem for many protocols. To distribute tokens more "fairly", some have adapted to activity-based airdrops (cf. *ibid.*, p.6). In addition, retrospective airdrops have been introduced, which DAOs have discovered for themselves (cf. Allen et al. 2023).

2.6 Relevance

While much has been learned about governance systems in DAOs, there has been little analysis of the impact of airdrops on governance. In theory, airdrops are a way to address governance issues. They decentralise token ownership and thus lead to a more balanced distribution and a larger base of voting candidates (see Aragon Blog n.d.). More voters promise a better reflection of the community and give more weight to decisions. This would counteract plutocracy in DAOs.

If the governance process is (more) decentralised and smaller token holders also have a "voice", this in turn could positively increase voting activity (cf. Zhao et al. 2022, p.670). In this way, airdrops could also counteract a lack of voting participation. An airdrop promotes user loyalty and may be an incentive for recipients to engage in the governance process and "give something back" to the protocol (cf. Aragon Blog n.d.).

However, there is little empirical evidence to support the assumption that airdrops are a governance tool. Previous analyses of airdrops tend to show that most recipients sell their tokens or leave the community. This means that the shares could even accumulate again. This paper therefore investigates the behaviour of governance voting.

The research question is therefore: **What effect do airdrops in Decentralised Autonomous Organisations (DAOs) have, regarding the governance activity of the recipients?**

3 Data Analysis

There are many assumptions around DAO governance and airdrops, based on already extensive research on governance in general, the behaviour of online communities and theories on incentives (cf. Reijers et al. 2021, cf. Plant 2004, cf. Grant 2002). However, given the lifespan of the DAO phenomenon, there is not yet much empirical evidence to support these assumptions. On-chain applications are characterised by very high data availability, even if these are generally pseudonymous (cf. Arroyo et al. 2022).

First, the basis on which the analysed airdrops were selected, and which data sources were used is explained. This is followed by a brief overview of the individual protocols and special features of the airdrops before the results are presented.

3.1 Methodology

To analyse the governance activity of airdrop recipients, the airdrop addresses are compared with the voters of the respective DAO (on Snapshot and on-chain). The proportion of addresses found in both groups is then compared with the governance activity of all token holders. This allows conclusions to be drawn about the activity of airdrop recipients compared to addresses that have not received an airdrop. For better comparability, a set of DAO airdrops is used, in a period of six and twelve months after the airdrop, as well as at the current time (October 2023). The delegation rate was also queried for DAOs with on-chain governance. This describes the proportion of token holders who have passed on their voting rights.

User retention or customer retention is a well-known indicator used to assess the "stickiness" of users to a product or service (cf. Fader & Hardie 2007). For this purpose, the proportion of active or repeat users is calculated for a certain period (cf. Viljanen et al. 2016). This principle will also be used to analyse governance activity. We refer to this as the "governance retention ratio" or "airdrop governance retention ratio". The proportion of token holders who participated in governance (in period t) is calculated as follows:

$$\text{Governance Retention Ratio} = \frac{\text{Voter}(t)}{\text{Token Holders}(t)}$$

For the proportion of airdrop recipients who took part in governance, the number of airdrop voters (in period t) is divided by the number of all airdrop recipients:

$$\text{Airdrop Governance Retention Ratio} = \frac{\text{Airdrop Voter}(t)}{\text{Airdrop Recipients}}$$

Data collection

The addresses of the airdrop recipients were determined using SQL queries on Dune Analytics¹. The web-based platform allows public blockchain data to be queried and displayed graphically (cf. Dune Docs n.d.).

The transaction data can be filtered there using the airdrop contract address. Some of the addresses were found in publications of the protocols or determined via Etherscan². The name of the contract, as well as the time and pattern of transactions or the existence of a "claim" method can indicate an airdrop. In some cases, the protocols were contacted to find out or confirm the airdrop contract address.

The voting is based on data from Snapshot³ and (if applicable) on-chain voting data, which is also available on Dune Analytics. The Snapshot data comes from an API, as it is an off-chain voting tool. Snapshot is the most widely used voting platform for DAOs, partly because of the (high) fees for on-chain transactions (cf. Wang et al. 2022). On-chain elections are also more difficult to implement, especially when a dedicated governance portal is designed, while Snapshot is considered very "convenient" (cf. *ibid.*).

As a result, most DAOs have a Snapshot "space". The platform only requires a wallet signature to verify the token ownership of the respective address, a "snapshot" of the authorised voters. This means there are no transaction fees. The voting itself is not recorded on-chain. The contents of the proposals, data from the spaces and the results are stored on the decentralised storage service IPFS (cf. *ibid.* p.4).

All selected protocols have a Snapshot space, some also vote on-chain. In these cases, the transactions of the (on-chain) governance contracts and the delegation contract were also used. The following example shows an SQL query in Dune Analytics that calculates the proportion of Uniswap Airdrop voters on Snapshot six months after the Airdrop. Further queries for the Uniswap example are available [here](#).

¹ <https://dune.com/>

² <https://etherscan.io/>

³ <https://snapshot.org/>


```

SELECT
  'six months after the airdrop' AS description,
  TRY_CAST(COUNT(DISTINCT s.voter) AS REAL) -- get total airdrop voters
  / TRY_CAST(
    (
      SELECT
        COUNT(DISTINCT recipient)
      FROM
        uniswap_ethereum.airdrop_claims
    ) AS REAL -- divide through the number of airdrop recipients
  ) * 100 AS percentage_of_voters -- get the ratio
FROM
  uniswap_ethereum.airdrop_claims AS c
  LEFT JOIN dune.shot.dataset_votes_view AS s ON CAST(c.recipient AS
varbinary) = s.voter -- join airdrop recipients and voters
WHERE
  space = 'uniswap'
  AND created BETWEEN 1600291972 AND 1600291972 + 15778458 -- get the
votes of airdrop recipients within six months of the airdrop (unix time)

```

Selection of airdrops

The target group for this question is basically all DAOs who have carried out an airdrop. However, it is difficult to estimate how many of them actually have. Airdrops do not always leave traces "on-chain", for example when they are distributed via centralised exchanges or other custodial applications. Even on-chain airdrops cannot always be recognised as such, e.g. to distinguish them from other payouts. Small DAOs in particular sometimes distribute tokens manually. A randomised sample therefore did not seem possible.

In addition, it is necessary that proposals and voting activity can be observed during the analysis period and that information about the airdrop can generally be found. This is often not the case with smaller DAOs, especially since Wang et al. found that a large part of the activity in the ecosystem is concentrated on a small number of DAOs ("Pareto principle") (cf. Wang et al. 2022). Even with airdrops, attention is often focussed on a few central (positive) examples ("high-profile airdrops") (cf. Shin 2023). The approach chosen was therefore to focus on the largest DAO airdrops. These also have the advantage that they already have an established governance process.

It is difficult to determine the size or relevance of an airdrop, as the number of recipients can be distorted by airdrop farming and the assets distributed also fluctuate greatly (cf. Allen et

al. 2023). The DAO landscape, on the other hand, is much better mapped, so the digital organisations on DeepDAO⁴ can be sorted according to various criteria (cf. DeepDAO 2023). The decision was therefore made to select the largest DAOs by treasury ("bank account" of the DAO) or number of "Lifetime Participants" (total number of voters to date). The aim is to select the most important DAOs in terms of financial strength and community. The number of proposals or votes were ruled out as criteria, as this is heavily dependent on how restrictive DAOs are when proposing proposals and how long a DAO has been in existence.

The criteria were defined in such a way that the sample covers the most important DAO airdrops but can be processed within the scope of the master's thesis. The selection according to the size of the DAO or availability of information corresponds to "convenience sampling" or "purposive sampling" (cf. Taherdoost 2016; cf. Berndt 2020). To select the DAOs, a snapshot was taken by DeepDAO on 15th September 2023 of all DAOs that either have a *treasury of at least USD 25 million* or have *at least 5,000 lifetime participants*. While the value of treasuries is subject to major fluctuations, the total number of voters can only increase.

This corresponds to approximately the top 50 DAOs for both criteria. In the next step, these DAOs were checked for an airdrop that met the criteria mentioned below. This is the case for around half of these DAOs, although there were some DAOs that were in both lists. It cannot be ruled out that airdrops were overlooked during the search or that the data on DeepDAO is not entirely complete.

Almost all the DAOs in the list had already issued tokens as an incentive. In order to exclude smaller bounties, at least 1% of the supply should have been distributed. In addition, the airdrop should be assigned to a clearly definable period. Permanent referral programmes or incentives should not be counted as "airdrops". For the same reason, airdrops that are subject to vesting, i.e., only become available in a few months or years, have been excluded. In addition, the distributed token should be a governance token, i.e., actually used for voting. Finally, one criterion is that the airdrop was public (not just internal) and corresponding information (airdrop criteria, contract address) is available.

The final step was to check whether data was available on the airdrops. A total of 19 DAO airdrops were selected for analysis. The criteria applied are shown in *Table 1*. The airdrops that were excluded in the second and third steps are shown in *Table 2*.

⁴ <https://deepdao.io/organizations>

1. Size	2. Airdrop	3. data
Treasury of at least \$25 million	At least 1% of the token supply reserved for the airdrop	Airdrop distributed on an EVM-chain (available on Dune Analytics)
Lifetime participants min. 5,000	Continuous airdrop, no vesting	Governance on Snapshot
	Airdrop publicly available	At least 1 proposal in each analysis period
	Airdrop of a governance token	

Table 1: Requirements for the DAO airdrops

Excluded airdrops				
Airdrop	Treasury	Lifetime part.	Reason	Remark
Mantle (Bitdao)	3.2b	15k	off-chain	Distribution via the Bybit exchange ⁵
Lido	244m	6k	less than 1% Supply	Reward for early stakers, only approx. 600 addresses eligible ⁶
Fei	114m	5k	not enough proposals	DAO now discontinued ⁷
Yield Guild Games	110m	45	less than 1% supply, no official Snapshot space	Airdrop of NFTs that later generate tokens, no governance communication ⁸
Origin	52m	400	off-chain	Largely issued via CEXes ⁹
Phala	41m	6	non-EVM	Substrate-based ¹⁰
Solend	28m	250	less than 1% Supply, non-EVM	Solana-based ¹¹
UXD Protocol	26m	150	non-EVM	Solana-based ¹²
Hifi Finance	25m	500	not enough proposals	Only two proposals in total ¹³
PancakeSwap	260k	131k	no contiguous airdrop	Several small bounty programmes ¹⁴
Wonderland/Betswap.gg	34k	39k	not a governance token	BSGG tokens issued to Wonderland users, BSGG itself no DAO ¹⁵

⁵ <https://airdropalert.com/bitdao-x-bybit-airdrop>⁶ <https://docs.lido.fi/guides/early-staker-airdrop/>⁷ <https://fei.money/>⁸ <https://medium.com/yield-guild-games/how-to-claim-your-ygg-community-airdrop-e41ed10e4577>⁹ <https://aaron-faulkner.medium.com/how-to-claim-and-stake-your-ogv-for-triple-digit-apys-24e8fce22cb9>¹⁰ <https://medium.com/phala-network/phala-airdrop-program-wave-i-94bc418d384a>¹¹ <https://blog.solend.fi/og-airdrop-nope-conversion-25f28679f250>¹² <https://twitter.com/UXDProtocol/status/1513130964373098497>¹³ <https://snapshot.org/#/hifi-finance.eth>¹⁴ <https://blog.pancakeswap.finance/articles/participate-in-pancake-swap-v3-launch-claim-135-k-cake-airdrop-and-receive-an-exclusive-nft-for-early-supporters>¹⁵ <https://bowtiedisland.com/trouble-in-wonderland-bsgg-airdrop-falls-flat-amid-growing-concerns/>

Biswap	<i>n/a</i>	<i>16k</i>	<i>no c contiguous airdrop</i>	<i>Bounty programme¹⁶</i>
Maverick Protocol	<i>n/a</i>	<i>15k</i>	<i>not enough proposals</i>	<i>Airdrop not until June 2023¹⁷</i>
Jade protocol	<i>n/a</i>	<i>11k</i>	<i>no contiguous airdrop</i>	<i>Bounty programme¹⁸, DAO now discontinued¹⁹</i>
Trust Wallet	<i>1.9m</i>	<i>9k</i>	<i>partly off-chain, no coherent airdrop</i>	<i>Several bounty programmes²⁰</i>
Yule Swap	<i>n/a</i>	<i>5k</i>	<i>not enough proposals</i>	<i>Only one proposal to date²¹, governance token relaunch in March 2023²²</i>

Table 2: Airdrops not taken into account

3.2 Selected Airdrops

The following 19 airdrops were selected for analysis. Table 3 also shows (if available) the date until which airdrop recipients could qualify ("snapshot date") as well as the respective voting tools of the DAO and the name on Snapshot.

¹⁶ <https://ecency.com/hive/@sujitsawant/biswap-airdrop>

¹⁷ <https://medium.com/maverick-protocol/maverick-incentive-program-pre-season-ae5b6d1ee857>

¹⁸ <https://coinchapter.com/jade-protocol-token-price-continues-crash-scam-allegations-mount/>

¹⁹ <https://vote.jadeprotocol.io/#/proposal/0x41a54aefd1049ae8036f7a0ab8730855fcae2b8c950b0ad2ea342d1a55a25e31>

²⁰ <https://www.airdropbob.com/trust-wallet>

²¹ <https://snapshot.org/#/juldao.eth>

²² <https://docs.julswap.com/juld-token/juld-token-swap-march-2023>

Selected Airdrops							
<i>No.</i>	<i>Protocol</i>	<i>Treasury</i>	<i>Lifetime part.</i>	<i>Airdrop Chain</i>	<i>Airdrop Snapshot date</i>	<i>Voting</i>	<i>Snapshot space</i>
Treasury size und lifetime participants							
1	Optimism 1	3.1b	89k	Optimism mainnet	25.03.2022	Optimism Agora	opcollective.eth
2	Arbitrum	2.8b	202k	Arbitrum One	06.02.2023	Snapshot, Tally	arbitrumfoundation.eth
3	Uniswap	1.8b	30k	Etheruem mainnet	01.09.2020	Snapshot, Uniswap Governance Portal	uniswap
4	dydx	628m	4k	Etheruem mainnet	26.07.2021	Snapshot, dydx Governance Portal	dydxgov.eth
5	Ens	557m	88k	Etheruem mainnet	31.10.2021	Snapshot, Tally	ens.eth
6	Galxe	100m	40k	Etheruem mainnet	28.04.2022	Snapshot	gal.eth
7	Gitcoin	53m	13k	Etheruem mainnet	01.04.2021	Snapshot, Tally	gitcoindao.eth
Treasury size							
8	Frax	150m	1.4k	Etheruem mainnet	20.02.2022	Snapshot	frax.eth
9	Ribbon	84m	1.6k	Etheruem mainnet	n/a	Snapshot	rbn.eth
10	Euler Finance	49m	800	Etheruem mainnet	21.03.2022	Snapshot	eulerdao.eth
11	Instadapp	45m	110	Etheruem mainnet	16.06.2021	Snapshot, Atlas	instadapp-gov.eth
12	Hop	32m	1.8k	Etheruem mainnet	01.04.2022	Snapshot, Tally	hop.eth
13	Superrare	29m	600	Etheruem mainnet	21.07.2021	Snapshot	superraredao.eth
14	Thales Markets	25m	800	Etheruem mainnet	06.09.2021	Snapshot	thalesgov.eth thalescouncil.eth
Lifetime participants							
15	Swapr	n/a	18k	Arbitrum One / Gnosis Chain	01.07.2021	Snapshot	swpr.eth
16	Badger	5.8m	11k	Etheruem mainnet	n/a	Snapshot	badgerdao.eth
17	Open	n/a	11k	Polygon Mainnet / Ethereum Mainnet	23.12.2021	Snapshot	theopendao.eth
18	Ape	9.9m	8k	Etheruem mainnet	n/a	Snapshot	apecoin.eth
19	Convex Finance	4.6m	5k	Etheruem mainnet	23.04.2021	Snapshot	cvx.eth

Table 3: Selected Airdrops

3.2.1 Describing the Airdrops

The selected protocols are briefly presented below, and the individual airdrop criteria and governance processes are analysed in more detail. After the presentation, the properties are compared with each other in order to draw initial conclusions.

Optimism 1

Optimism is a layer-2 scaling solution based on Optimistic Rollups (cf. Optimism n.d.).

Airdrop criteria

The Optimism Airdrop was distributed based on six criteria (cf. Optimism Docs 2021a). Each criterion was endowed with a fixed amount of tokens that could be added up (cf. *ibid.*). In addition to the use of the Optimism blockchain, the airdrop was aimed at active Ethereum users, including voters in other DAOs, multig signers, users who donated on Gitcoin and addresses that bridged to other layer 2 networks ("users priced out of Ethereum") (cf. *ibid.*).

In this analysis, only the first airdrop of Optimism was considered ("Optimism1"), but the protocol has planned a series of airdrops. A total of 14% of the supply is to be distributed in this way (cf. *ibid.* 2023c). The second airdrop in February 2023 was aimed at all addresses that had delegated their tokens, as well as addresses that had paid many gas fees on Optimism (cf. *ibid.* 2023b). The third airdrop additionally rewarded addresses that had delegated to an active delegator. In contrast to the first airdrop, the following two were paid out automatically. In addition, the amount distributed was significantly smaller in each case.

Governance

Optimism governance is divided into two separate processes: The "Token House", which focuses more on the OP protocol, and the "Citizen House", which is responsible for retroactive "public goods" funding (cf. Optimism Github 2023). The latter works based on "identity-based governance" (one-person-one-vote), which was not taken into account for this analysis (cf. *ibid.*).

Optimism has created its own governance portal ("Optimism Agora"), which allows on-chain voting on Optimism (cf. Optimism Agora n.d.). The protocol encourages token holders to delegate their tokens: *"Participating in governance of the Optimism Token House will require a serious time commitment. For this reason, we will strongly encourage people to delegate the voting power of their tokens to a community member who has explicitly volunteered to play an active role in Token House governance"* (cf. *ibid.*). To this end, profiles of the delegates are available on the portal for users to view (cf. *ibid.*).

Arbitrum

Arbitrum is also a layer-2 blockchain based on optimistic rollups (cf. Arbitrum n.d.).

Airdrop criteria

The airdrop comprises a total of 18 criteria, at least three of which had to be fulfilled in order to receive the airdrop (cf. Arbitrum DAO - Governance docs 2023a). Depending on the number of points, a fixed amount could be claimed. The duration of activity, number of transactions and transaction volume on Arbitrum One and Arbitrum Nova were taken into account. For example, one point was awarded for transactions in two different months and another for transactions in six different months (cf. *ibid.*).

Part of the airdrop (just under 10% of the airdrop or 1.13% of the total supply) was not distributed "publicly" by Arbitrum, but to other DAOs whose applications were deployed on Arbitrum (cf. *ibid.*). This portion was not considered in the analysis.

Governance

The Arbitrum DAO distinguishes between "constitutional" and "non-constitutional" proposals (cf. Arbitrum DAO - Governance docs 2023b). Proposals relating to the "DAO constitution" have a higher threshold and take longer.

Snapshot is used for temperature checks. Only if a proposal is accepted there is it voted on-chain via Tally (cf. *ibid.*). Tally is a "frontend for onchain decentralised organisations" (cf. Tally docs 2023). DAOs can deposit governance contracts there and vote or present the results (cf. *ibid.*).

Uniswap

Uniswap is a decentralised exchange for swapping various tokens (cf. Uniswap Labs Blog 2021).

Airdrop criteria

All addresses that had interacted with Uniswap by the snapshot date received a fixed amount of 400 UNI tokens (cf. *ibid.*). Approximately one third of the airdrop was distributed to liquidity providers, and a small portion to holders of a Uniswap NFT.

Governance

The Uniswap governance process is divided into three stages: If a temperature check on Snapshot is successful, a "consensus check" (also on Snapshot) is held, which incorporates feedback from the last phase (cf. Uniswap Governance 2020). If this proposal is also successful, an on-chain vote is held on the Uniswap governance portal (cf. *ibid.*).

dydx

Dydx is a decentralised crypto-derivatives exchange specialising in perpetual contracts (cf. dydx n.d.).

<i>Airdrop criteria</i>	<p>At the launch of the token, dydx distributed "Retroactive Mining Rewards" (cf. Dydx Governane Docs 2023b). All addresses that had interacted with the exchange were eligible. The distributions were staggered according to the traded volume. The airdrop first had to be claimed in the exchange's dashboard and could only be paid out a few days later (cf. <i>ibid.</i>). The on-chain data in the analysis may therefore be slightly delayed.</p>
	<p>The exchange has a continuous trading reward system that distributes tokens at the end of each "epoch". However, only the retrospective airdrop was used for the analysis, as the rewards programme can be classified more as a bounty. A total of 20% of the supply is earmarked for rewards, with 7.5% being distributed as part of the airdrop (cf. <i>ibid.</i>).</p>
<i>Governance</i>	<p>Dydx distinguishes between four different types of proposals, which are associated with different requirements (cf. dydx Governance Docs 2023a). A proposal is first put to the vote in Snapshot (temperature check). If a proposal is accepted there, a vote follows in the dydx Governance Portal, which supports on- and off-chain voting (cf. dydx.vote n.d.).</p>

ENS

ENS is a blockchain naming standard that issues Web3 usernames (cf. ENS 2021).

<i>Airdrop criteria</i>	<p>All owners of an ENS domain qualified for the airdrop, depending on the holding period (cf. <i>ibid.</i>). The airdrop was distributed per address, regardless of how many domains an address owned.</p>
<i>Governance</i>	<p>In addition to Snapshot, the ENS DAO also uses Tally (cf. ENS Docs 2022). On-chain voting is only provided for if it is an "executable proposal": "This is a proposal for a series of smart contract operations to be executed by accounts the DAO controls" (cf. <i>ibid.</i>). Otherwise, only Snapshot voting applies.</p>

Galxe

Galxe is a platform for reward-based loyalty programmes ("web3 credentials") (cf. Galxe 2022).

<i>Airdrop criteria</i>	The airdrop was distributed to holders of selected NFTs on the platform (nine in total). Each NFT was assigned a specific token value, which could be added up if several NFTs were held (cf. <i>ibid.</i>).
<i>Governance</i>	Galxe uses Snapshot for voting, whereby tokens can be used on Ethereum and the Binance Smart Chain (cf. Galxe Forum 2022). However, the airdrop only took place on Ethereum.

Gitcoin

Gitcoin is a community platform that is primarily known for "quadratic funding", but also for bounties and hackathons (cf. Gitcoin support 2023).

<i>Airdrop criteria</i>	The tokens were distributed among the users and projects on the platform, depending on their activity and the amounts invested (cf. Airdrops.io 2021). The members of the KERNEL education programme received a small portion.
<i>Governance</i>	Gitcoin uses Snapshot and Tally (cf. Gitcoin Forum 2022). On-chain voting is required if the proposal concerns the treasury or the structure of the DAO. With an approval on Snapshot, a proposal is considered accepted. On-chain voting is only used for ratification and proposals may not be amended in the meantime (cf. <i>ibid.</i>).

Frax

Frax is a DeFi protocol that issues the USD stablecoin of the same name (crypto collateralised) (cf. Frax Finance n.d.).

<i>Airdrop criteria</i>	All FXS (Frax Share) stakers and liquidity providers were able to claim the FPIS token (cf. Frax Docs 2023). FPIS (Frax Price Index Share) is the governance token of the FPI stablecoin, which is managed in a Frax SubDAO (cf. <i>ibid.</i>).
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<i>Governance</i>	Frax uses Snapshot, whereby the governance of the FPI token has a sub-space (cf. Frax Finance Forum 2022). The Frax space (including the sub-space) was used for the analysis (cf. Frax Snapshot n.d.).
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Ribbon

Ribbon Finance is a protocol for structured products (e.g. options) based on cryptocurrencies (cf. Ribbon Finance, n.d.).

<i>Airdrop criteria</i>	Around 2/3 of the airdrop was distributed to users of the ribbon "Option Vaults" who had deposited at least \$100 (cf. Ribbon Finance 2021). Half of the amount was distributed to all addresses and the other half was distributed based on volume. To calculate the volume-based share, a function was used that weighted users with very high volumes (whales) less heavily (cf. <i>ibid.</i>). The remaining third was distributed to users of other option protocols and active ribbon discord users.
<i>Governance</i>	To be able to vote, users have to lock their ribbon tokens. In return, they receive veRBN (cf. Verse 2022). Proposals are processed via Snapshot. Ribbon has also implemented "Gauge Voting", a mechanism that determines which vaults the RBN revenue should flow into (cf. <i>ibid.</i>). Users can receive additional income ("bribing") if they vote in favour of certain vaults. Ribbon uses the "Hidden Hand" platform for vault voting (cf. Hidden Hand n.d.).

Euler Finance

Euler Finance is a DeFi protocol for borrowing and lending on the Ethereum blockchain (cf. Euler Finance n.d.).

<i>Airdrop criteria</i>	<p>The airdrop was distributed to Euler users. Two thirds of the tokens were allocated according to the volume deposited and one third of the tokens were distributed among all addresses (cf. Euler Docs 2023a).</p> <p>Similar to dydx, Euler has a permanent reward system that distributes tokens at the end of each epoch (cf. <i>ibid.</i>). Only the retroactive airdrop for users in epoch 0 was used for this analysis.</p>
<i>Governance</i>	Euler uses Snapshot and has set up Tally for on-chain voting (cf. Euler Docs 2023b). There was no proposal there at the time of the analysis, so only Snapshot was used.

Instadapp

Instadapp is a protocol for lending and borrowing and offers the DeFi wallet "Avocado" (cf. Instadapp, n.d.).

<i>Airdrop criteria</i>	The tokens could be claimed by users of the DeFi protocols Compound, Maker and AAVE on Ethereum (cf. Instadapp Blog 2021). A small portion (1 million tokens out of 11 million tokens for the airdrop) was distributed to AAVE users on Polygon (cf. <i>ibid.</i>).
<i>Governance</i>	Instadapp governance is only on Ethereum, so the airdrop recipients on Polygon were not included (unless they had bridged to the same address) (cf. Instadapp Guides 2023). Instadapp uses Snapshot and its on-chain governance portal "Atlas" (cf. Atlas n.d.). On-chain voting is only used for proposals that suggest "major changes" (cf. Instadapp Guides 2023).

Hop Exchange

Hop is a bridging protocol that offers the exchange of tokens across different chains (Hop Docs. 2023).

<i>Airdrop criteria</i>	<p>The airdrop was reserved for liquidity providers, token bonders and users of the HOP Bridge with at least 2 transactions and \$1,000 volume (cf. Whinfrey 2022). The amounts could be multiplied by up to a factor of three if users were on board early or exceeded certain volume limits. A small portion was distributed to the most active HOP Discord and Twitter users (cf. <i>ibid.</i>).</p> <p>As part of the airdrop, HOP initiated a "Sybil programme" in which users could report airdrop farmers for additional rewards. Airdrop farmers could also "advertise" themselves in order to still receive a share of the tokens. In this way, HOP excluded around 10,000 addresses (of the original 43,000) from the airdrop (cf. <i>ibid.</i>).</p>
<i>Governance</i>	HOP uses Snapshot for temperature checks and Tally for on-chain reconciliations (cf. Hop Docs 2023).

Superrare

Superrare is an NFT marketplace for crypto art (cf. Superrare Docs 2023b).

<i>Airdrop criteria</i>	Users of the Superrare NFT marketplace were eligible, depending on the number of transactions and the volume traded (cf. <i>ibid.</i>).
<i>Governance</i>	Superrare uses Snapshot for votes, which are then implemented by the 7-member Governance Council (cf. Superrare Docs 2023b).

Thales

Thales is a DeFi protocol for peer-to-peer parimutuel markets. It was forked from the Synthetix derivatives protocol (cf. Thales 2021).

<i>Airdrop criteria</i>	The airdrop was distributed to Synthetix (SNX) Staker. A total of 35% of the Thales supply is earmarked for this, but only the retrospective airdrop (2% of the supply) was used for the analysis (cf. <i>ibid.</i>).
<i>Governance</i>	<p>The Thales Council, which is made up of seven members, votes on Thales proposals (cf. Thales Docs 2023). The members of the council are elected by Thales holders on Optimism who have locked their tokens.</p> <p>Accordingly, Thales has two Snapshot spaces: "thalesgov.eth" is restricted to the Council members, while "thalescouncil.eth" is used to elect the Council (cf. Snapshot Thales Governance n.d.; Snapshot Thales Council n.d.). The analysis was limited to the thalescouncil.eth space, as this is the area in which all token holders can vote.</p>

Swapr

Swapr is a decentralised exchange on the Arbitrum network, developed by DxDAO (cf. Swapr, n.d.).

<i>Airdrop criteria</i>	Two thirds of the airdrop was distributed to holders of DxDAO tokens and one third to addresses that met at least one of nine criteria (cf. DXdao 2021). The criteria included the use of Swapr, other DEXes on Arbitrum, activity in selected DAOs and the holding of DxDAO POAPs (cf. <i>ibid.</i>).
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<i>Governance</i>	Swapr uses Snapshot for voting (cf. DAOtalk 2021). Token holders on Arbitrum and Gnosis Chain can vote there. According to the Swapr docs, Snapshot is only a transitional solution until on-chain voting is implemented (cf. <i>ibid.</i>). There, the tokens must be locked to be authorised for voting.
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Badger

Badger is a DeFi protocol for Bitcoin-based assets (cf. Badger n.d.).

<i>Airdrop criteria</i>	The airdrop was distributed based on 19 criteria. Addresses that had mined wrapped Bitcoin or used it in DeFi protocols (Compound, AAVE, Balancer, Maker, Curve, Uniswap), or had participated in the governance of selected DAOs or donated to Gitcoin (cf. BadgerDAO 2020) were primarily eligible.
<i>Governance</i>	Snapshot is used for voting. Grant requests are voted on by the seven members of the Badger Council, whose members are also elected via Snapshot (cf. Badger Docs n.d.).

OpenDAO

OpenDAO is a community centred around the SOS-DAO token (cf. OpenDAO n.d.).

<i>Airdrop criteria</i>	All addresses that were active on the NFT marketplace OpenSea up to the snapshot were able to claim the airdrop (cf. <i>ibid.</i>). The total was calculated from the number of transactions and the traded volume.
<i>Governance</i>	<p>The DAO distinguishes between "soft consensus" (e.g. Discord Voting) and "hard consensus" (Snapshot Voting) (cf. OpenDAO Forum 2022). Which type of voting is used depends on the type of proposal.</p> <p>The most recent proposal in February 2023 voted in favour of restructuring and relaunching the DAO team (cf. OpenDAO Snapshot 2022). OpenDAO had originally wanted to build an NFT marketplace and its own blockchain (cf. OpenDAO n.d.).</p>

Apecoin

The Apecoin DAO was founded for the Bored Ape Yacht Club (BAYC), an NFT collection on the Ethereum blockchain (cf. BAYC, n.d.).

<i>Airdrop criteria</i>	The airdrop could be claimed by all addresses that owned a "Bored Ape" NFT or one of the companion NFTs "Mutant Ape" or "Kennel Club" at the time of the claim (cf. Apecoin 2023a). The airdrop could also be claimed multiple times for several NFTs. Via NFT flashloans, some users succeeded in claiming the airdrop for Bored Apes that they had only borrowed (cf. Chawla 2023).
<i>Governance</i>	Each proposal is reviewed by a management team of the APE Foundation. Voting takes place on Snapshot (cf. Apecoin 2023b).

Convex

Convex is a DeFi protocol for increasing token rewards for liquidity providers on the Curve Lending protocol (cf. Convex Finance n.d.).

<i>Airdrop criteria</i>	The airdrop was distributed equally to all veCRV token holders and veCRV holders who voted in favour of adding Convex Finance to Curve (cf. Curve Docs n.d.a). "Vote-Escrowed CRV" (veCRV) are curve tokens that have been locked to be eligible for voting (cf. Curve Docs n.d.b).
<i>Governance</i>	Convex votes on proposals on Snapshot. Like Ribbon, the protocol has implemented gauge voting via the "Votium" platform (cf. Votium n.d.). Convex tokens must be locked for this purpose (veCVX).

3.2.2 Comparing the airdrops

Some governance rules are the same for all the protocols described: A proposal in the governance forum is usually the first step towards a vote (cf. Reijers et al. 2021, p.822). This is the opportunity to discuss the proposal and obtain an initial "rough consensus". The hurdles for voting vary, e.g., a certain amount of (delegated) tokens or approval by a forum moderator. What they have in common, however, is that proposals must fulfil certain quality criteria (cf. WEF 2023, p.30).

All protocols require a minimum participation ("threshold") in the form of a certain proportion of the supply or all delegated tokens for a vote to be considered valid (cf. Optimism Github 2023). This is a possible mechanism against plutocracy (cf. Sharma et al. 2023, p.5). However, whether the thresholds represent a hurdle was not investigated as part of the work.

A certain quorum (majority) must also be met for a proposal to be accepted (cf. Optimism Github 2023). Some of the protocols have different proposal categories, some of which require different levels of approval (including Arbitrum, Optimism, ENS, dydx, OpenDAO and Gitcoin). Optimism, for example, requires 76% approval for protocol changes, while only 51% is required for other decisions (cf. *ibid.*). This corresponds to the recommendation by Zhao et al. to align the governance process more closely with the proposals (cf. Zhao et al. 2022, p.670). Optimism even has two separate governance processes (for protocol matters and for grants), while Thales restricts voting to a council.

Governance processes

All the protocols in the data set use Snapshot, except for Optimism. The protocol discontinued its use at the beginning of 2023 in favour of its own (on-chain) governance portal (cf. Optimism Agora n.d.). Of the selected protocols, seven others have implemented on-chain voting in addition to Snapshot (off-chain voting).

Arbitrum, Uniswap, dydx and HOP have a two-stage voting process. Proposals must first be accepted on Snapshot ("temperature checks") before they go into on-chain voting. Uniswap even requires two Snapshot voting cycles before a proposal is qualified for on-chain voting (Uniswap Governance 2020). A multi-stage voting process allows proposals to be revised again after the first vote. ENS, Instadapp and Gitcoin make the voting platform dependent on the type of proposal. They use additional on-chain voting only for proposals that provide for fundamental protocol changes.

It is noticeable that it is mostly the larger protocols that have implemented on-chain voting. The DAOs from the data set, which were only selected via the lifetime participants, only use Snapshot (cf. Table 2). All the protocols with on-chain voting also allow delegations or even actively promote them. Optimism, for example, built its own "Delegation Hub", where information about delegates can be found (cf. Optimism Agora n.d.). Tally, which is used by Arbitrum, ENS, Gitcoin and HOP, has a similar function (cf. Tally Docs 2023). Some of the protocols also have a delegation possibility in Snapshot. However, the delegation data was only queried for the protocols that have implemented on-chain voting.

Ribbon and Convex require the tokens to be locked for voting. The protocols have implemented "gauge voting", where additional revenue can be generated (cf. Ribbon Finance 2021; Convex Docs n.d.b).

Airdrop criteria

The selected airdrops were all retrospective, even if some of the distributions (e.g., Arbitrum) were anticipated (cf. Gilbert 2023). This confirms the assumption that retrospective airdrops are particularly popular with DAOs (cf. Lommers et al.). In addition, all the airdrops were based on on-chain criteria. Ribbon Finance and HOP distributed a small portion to Discord users, which was the only "off-chain" criterion. The Galxe and Apecoin airdrops were NFT-based, with the rest focussing on previous transactions.

The comparison of the airdrops confirms, as assumed by Lommers, that the distributions are now more closely linked to criteria ("activity-based") (cf. *ibid.*, p.6). The selected airdrops started from September 2020 (Uniswap) to March 2023 (Arbitrum). The Uniswap airdrop was comparatively uniform, with almost all users of the exchange receiving the same amount of tokens (cf. Uniswap Blog 2020). To qualify for Arbitrum - the most recent of the airdrops - at least three criteria had to be met (cf. Arbitrum DAO - Governance docs 2023a). Nevertheless, the selected airdrops do not show a strong tendency towards more or fewer criteria during this period. For example, the Badger airdrop, which directly followed Uniswap, had comparatively many criteria.

However, it is worth noting that the airdrop amounts depend on the activity of the addresses in almost all cases. Among the selected airdrops, Uniswap and Thales correspond to the "fair allocation" model (almost all addresses received the same amount). The Ribbon Finance and Euler airdrops distributed a portion to all active counterparties and a portion according to volume, i.e., they partially utilised the "fair allocation" principle. The remainder, however, distributed individual amounts depending on the activity of the addresses ("differential allocation") (cf. Fan et al. 2023, p.2). This confirms Fan et al.'s assumption that the airdrop distribution has become more differentiated since around 2020.

Some of the airdrops are part of a long-term reward programme of the protocols (e.g. Optimism dydx or Euler), which retain part of the supply for this purpose. In all cases, however, the "initial" retrospective airdrop was the largest one-off payout. Many of the protocols also have "grants programmes" that provide funds for DApps that are based on their own product or protocol. Arbitrum integrated this into the airdrop and distributed a portion of the supply to Arbitrum applications and DAOs. The airdrop was therefore not aimed exclusively at end users.

Anti-Sybil measures

Allen noted that airdrop farming is one of the biggest challenges for protocols: Airdrop farmers and airdrop protocols would have to constantly adapt, this could even be described as a kind of "co-evolutionary process" (cf. Allen 2023). The use of airdrop criteria in general, but also the anti-sybil measures of more recent airdrops, supports this realisation.

The HOP Airdrop had a public "Sybil detection" programme. Using network analyses, the protocol excluded approx. 10,000 of the originally 43,000 authorised addresses from the airdrop ("blacklisting") (cf. Twitter Hop Protocol 2022). The protocol writes: "Sybil attackers stand directly at odds with a healthy distribution and attempt to take tokens that should be in the hands of positive-sum users" (cf. *ibid.*).

In a further step, HOP called on its own community to report airdrop farmers who had not yet been "discovered" themselves. The prerequisite for a report was that it contained at least 20 addresses and a comprehensible reason (cf. *ibid.*). The protocol also offered airdrop farmers the opportunity to report themselves. Of around 400 reports, 150 were labelled as valid (cf. Hop-Protocol Github, n.d.). Of the tokens that were not distributed to the reported wallets, 25% were distributed to the reporters (cf. HOP Forum 2023). Among the reports are also some users who see their addresses as illegally marked (cf. Hop-Protocol Github, n.d.).

For example, the Arbitrum airdrop utilised HOP's Sybil list and excluded these addresses from its own airdrop (cf. ArbitrumFoundation Github 2023). In addition, the protocol carried out its own network analysis of the authorised addresses to identify patterns that indicate airdrop farming: *"The subgraphs that have a large number of nodes and a high degree of connectivity were considered to be likely Sybil clusters"* (cf. Arbitrum DAO - Governance docs 2023c). However, more detailed information on the procedure or the excluded addresses is not available.

A similar procedure was observed with the Optimism Airdrop. In a first scrap, the protocol applied some "global filtering criteria" (cf. Optimism Docs 2023a). Addresses had to have been active for more than one day, for example, and known Snapshot bots and addresses associated with hacks were also excluded (cf. *ibid.*). In addition to these measures, Optimism also carried out its own network analysis: *"We identified a few patterns of likely sybil attackers, who often created tens, hundreds, or more duplicate addresses"* (cf. *ibid.*).

Following the announcement of the airdrop, Optimism applied further filter mechanisms that excluded additional 17,000 addresses. The addresses or the specific criteria that led to the exclusion were not named - probably also to protect themselves from airdrop farmers: *"In the interest of maintaining the integrity of future OP Airdrops, we will not be publishing the additional filters used to remove these addresses."* (cf. *ibid.*)

Airdrop target groups

Three different target groups could be roughly recognised among the selected airdrops: Most of the airdrops were aimed at early adopters of their own protocol or product. Some of them qualified all users (e.g., Uniswap, ENS, dydx or Apecoin), while others only allowed selected users. Ribbon Finance requires at least \$100 volume, HOP qualified addresses with at least 2 transactions and at least \$1,000 volume (cf. Ribbon Finance 2021; see Whinfrey

2022). This approach is in line with the intention of rewarding early users and binding them to the protocol.

The second group were airdrops, which specifically distribute tokens to users of another protocol to which they are connected. For example, Thales is a fork of Synthetix, Swapr was created by DxDAO and Convex was developed for users of Curve (cf. Thales 2021; cf. DXdao 2021; cf. Convex Finance n.d.). It can be assumed that they give something back to the "partner protocols" through the airdrop, but at the same time also intend to attract new users. Although this group of airdrops is retrospective, it is aimed at previously unknown users. Despite the retrospective nature of the airdrops, a marketing motive is recognisable in this group (cf. Allen et al. 2023). The example of Curve in particular shows that potential users can be addressed very specifically in this way.

Although OpenDAO has no such connection to OpenSea, it had planned to build a similar product (cf. OpenDAO n.d.). The focus on the popular NFT marketplace brought additional attention to the airdrop (cf. Stevens 2021). In this way, OpenDAO was able to address users who would be a good fit for its own product.

The third group shows a similar approach: protocols that have distributed the airdrop to users of competing protocols (including Instadapp, Badger, in some cases Ribbon Finance and Swapr). Here, too, a marketing motive can be assumed. It's also called a "vampire attack" (cf. Lommers et al. 2023, p.12). This is particularly useful if your own product does not yet have a user base. Airdrops could be a way of overcoming the "cold start problem" (cf. Allen et al. 2023, p.1).

Contrary to what one might expect with retrospective airdrops, DAO airdrops are therefore not only used for the subsequent rewarding of their own users. Rather, some DAOs use the distributions to win over existing users of other protocols. Unlike most ICO airdrops, on-chain activity can be used to select addresses that could be a good fit for one's own product (cf. *ibid.*).

3.3 Results

After a brief categorisation of the airdrops in terms of size, time period and distribution of the tokens, the voting activity in general and the voting activity of the airdrop recipients (for Snapshot and on-chain voting) are described. Voting activity was determined for the periods six and twelve months after the airdrop and at the current time (reporting date 27 October 2023). The on-chain and delegation data were queried on 13 November 2023.

All data, including the current status, can be found in the respective airdrop dashboards on Dune Analytics, which are [linked here](#). The tables can be accessed and filtered online [here](#).

3.3.1 Comparison of size and time period

Table 4 provides an overview of the airdrops from the data set. The number of eligible addresses and the total token and airdrop supply were taken from the documentation of the respective protocols. The number of airdrop recipients or the proportion of eligible addresses that have claimed the airdrop ("airdrop claimants") is derived from the on-chain transactions.

The "eligible addresses" could not be determined for all protocols. Instadapp and Badger only provided estimates (cf. Instadapp Blog 2021; cf. BadgerDAO 2020). The excluded Sybil addresses for HOP, Optimism and Arbitrum have already been deducted.

- **Number of recipients:** The Arbitrum airdrop had the most recipients with more than 580,000 addresses, followed by OpenDAO, Uniswap, Optimism 1 and ENS. The "smallest" airdrops in terms of participants were Ribbon (~1,300) and Frax (~1,500).
- **Airdrop allocation:** OpenDAO distributed the largest share of the total supply at 50%. ENS earmarked 25% for the airdrop. Euler Finance had the smallest share at 1% (airdrops below this were not included in the data set). On average, the 19 airdrops allocated 11% of their supply to the airdrop.
- **Authorised addresses:** The number of eligible recipients was not available for all airdrops. In this case, Arbitrum was the largest group with more than 625,000 eligible addresses. The Ribbon Finance airdrop, on the other hand, was only open to around 1,600 addresses.
- **Airdrop claim:** The Apecoin airdrop had the highest claim rate with almost 96% of all authorised addresses, followed by Euler Finance and dydx with around 95% each. Although the Instadapp airdrop was open to many addresses (the protocol stated approx. 360,000), it was only claimed by a fraction (2.43%).

<i>About the Airdrop</i>							
<i>No.</i>	<i>Protocol</i>	<i>Airdrop recipients</i>	<i>Token Supply</i>	<i>Airdrop Supply</i>	<i>Share of Supply [%]</i>	<i>Eligible addresses</i>	<i>Airdrop claims [%]</i>
1	Optimism 1	159,465	4,294,967,296	214,740,449	4.99	248,699	64.11
2	Arbitrum	583,137	10,000,000,000	1,162,166,000	11.62	625,143	93.28
3	Uniswap	220,539	1,000,000,000	150,000,000	15.00	251,534	87.68
4	dydx	30,541	1,000,000,000	75,000,000	7.50	32,457	94.10
5	ENS	102,821	100,000,000	25,000,000	25.00	137,689	74.68
6	Galxe	14,927	200,000,000	4,000,000	2.00	n/a	n/a
7	Gitcoin	14,607	100,000,000	15,000,000	15.00	n/a	n/a
8	Frax	1,565	100,000,000	10,000,000	10.00	n/a	n/a
9	Ribbon	1,328	1,000,000,000	30,000,000	3.00	1,620	81.98
10	Euler Finance	2,970	27,182,818	271,828	1.00	3,407	95.13
11	Instadapp	8,808	100,000,000	11,000,000	11.00	~362000	2.43
12	HOP	28,891	1,000,000,000	80,000,000	8.00	32,805	88.23
13	SuperRare	3,504	1,000,000,000	150,000,000	15.00	n/a	n/a
14	Thales	4,413	100,000,000	2,000,000	2.00	15,856	27.83
15	Swapr	2,341	100,000,000	4,000,000	4.00	n/a	n/a
16	Badger	7,887	21,000,000	2,100,000	10.00	~32.000	38.03
17	OpenDAO	305,882	100,000,000,000,000	50,000,000,000,000	50.00	n/a	n/a
18	Apecoin	15,059	1,000,000,000	150,000,000	15.00	15,757	95.57
19	Convex	2,810	100,000,000	2,000,000	2.00	5,839	48.12

Table 4: About the airdrop (own illustration according to Dune Analytics)

Table 5 describes the period and distribution of airdrops, including the number of tokens claimed and the share in relation to the reserved supply. The table also shows the smallest and largest number of tokens per recipient and the average amount received. Some of the airdrops are still open for claiming, but most of the airdrops had a limited claiming period.

- **Claimed tokens:** Similar to the share of airdrop claimers, the Apecoin airdrop also leads in the share of tokens that were claimed (~98%). The Instadapp airdrop only distributed just under 15% of the available tokens.
- **Timeframe:** The earliest airdrop from the dataset was Uniswap, which began in September 2020. The tokens can still be claimed on the exchange (cf. Uniswap, n.d.). Most airdrops took place from mid-2021 to mid-2022. The most recent airdrop was Arbitrum in March 2023.

About the recipients									
No.	Protocol	Tokens Claimed	Claim ed [%]	Tokens unclaimed	Average claim	Max. Claim	Min. claim	First claim	(So far) last claim
1	Optimism 1	165,520,661	77.08	49,219,788	1,038	32,432	10	31.05.2022	25.05.2023
2	Arbitrum	1,092,811,500	94.03	69,354,500	1,874	10,250	625	23.03.2023	24.09.2023
3	Uniswap	136,819,153	91.21	13,180,847	620	2,103,517	400	16.09.2020	26.10.2023
4	dydx	52,922,405	70.56	22,077,595	1,733	511,487	0.07	08.09.2021	08.10.2023
5	ENS	19,631,825	78.53	5,368,175	191	1,144	0.0001	09.11.2021	30.07.2022
6	Galxe	3,659,458	91.49	340,542	245	4,648	8	05.05.2022	04.06.2022
7	Gitcoin	10,567,116	70.45	4,432,884	654	216,022	0.04	24.05.2021	23.06.2021
8	Frax	7,454,316	74.54	2,545,684	4,763.14	612,959	0.00004	07.04.2022	19.08.2022
9	Ribbon	28,048,882	93.50	1,951,118	21,121	205,498	5,772	24.05.2021	24.09.2023
10	Euler Finance	251,684	92.59	20,144	85	6,906	27	23.06.2022	26.08.2023
11	Instadapp	1,621,971	14.75	9,378,029	184	19,284	0.00000 004	16.06.2021	25.09.2021
12	HOP	45,961,576	57.45	34,038,424	1,591	1,222,722	0.00001	09.06.2022	09.10.2023
13	SuperRare	145,029,952	96.69	4,970,048	41,390	4,432,844	705	17.08.2021	21.11.2021
14	Thales	604,581	30.23	1,395,419	137	137	137	15.09.2021	01.02.2022
15	Swapr	3,428,806	85.72	571,194	1,465	290,859	48	29.08.2021	31.12.2021
16	Badger	798,625	38.03	1,301,375	101	44,768	20	03.12.2020	12.12.2020
17	OpenDAO	41,843,992,50 0,190	83.69	8,156,007,4 99,810	136,797, 826	63,603,617 ,192	0.002	23.12.2021	12.01.2022
18	Apecoin	146,805,366	97.87	3,194,634	9,131	1,434,898	2,042	17.03.2022	15.06.2022
19	Convex	1,640,816	82.04	359,184	584	49,602	0.00000 01	17.05.2021	02.10.2023

Table 5: About the recipients (own illustration according to Dune Analytics)

3.3.2 Distribution and behaviour after the airdrop

In order to put the voting activity into perspective later on, some data on the distribution of the airdrop and the behaviour after the airdrop was queried. Graphical representations for the individual protocols can be found in the respective [dashboards on Dune Analytics](#).

To gain an insight into the distribution of an airdrop, the 10% and 1% percentiles were queried, i.e., the proportion of tokens received by the top 10% and top 1% of recipients respectively. The Thales airdrop does not contain any data for this, as all addresses received the same number of tokens (cf. Thales 2021). The "7-day claim" is aimed at the temporal distribution of the proportion of recipients who claimed tokens within the first week. Both key figures only provide a rough picture of the airdrop distribution.

For the "Post-Airdrop Actions", the addresses of the airdrop recipients were compared with the transfers of the corresponding tokens. This makes it possible to determine what proportion of airdrop recipients have transferred the token, are still holding it or have increased their position. This is just a rough categorisation. A (partial) transfer is an indicator, but not a confirmation of the sale of the tokens. It is also conceivable that addresses have

carried out several actions over time that have not been taken into account here. The query focuses on the current status, which can over-emphasise more recent airdrops.

- **Token distribution:** The Ribbon airdrop has distributed approx. 63% of the tokens to 10% of the token holders. Instadapp, Frax, OpenDAO and Gitcoin follow with approx. 55% each. Frax and Instadapp also have the highest values for the 1% percentile (~40%). ENS and Arbitrum have the lowest "concentration" in both percentiles.
- **Time distribution:** Galxe, Arbitrum and OpenDAO had the largest share of airdrop recipients in the first seven days of the distribution. In contrast, only a third of Swapr's recipients claimed the tokens in the first week.
- **Post-airdrop actions:** Uniswap had the most transfers among airdrop recipients, with almost 94% having now transferred the airdrop in full. Badger and dydx follow with over 90%. These airdrops also have the lowest proportion of "hodlers" (~2%), together with the airdrop from Euler Finance (~0.5%). The largest share of recipients still holding the token is (by far) OpenDAO (~49%). This airdrop also has the lowest transfer rate. On average, around 76% of airdrop recipients have transferred their tokens. The highest partial transfers are recorded by Optimism (~32%) and Arbitrum (~24%).

Airdrop distribution					Actions Post-Airdrop			
No.	Protocol	10% percentile	1% percentile	7 days Claim [%]	Transfer [%]	Partial transfer [%]	Hold [%]	Accumulated [%]
1	Optimism 1	38.82	8.88	83.90	59.50	31.57	7.79	1.14
2	Arbitrum	30.05	5.33	93.80	69.83	23.52	5.42	1.23
3	Uniswap	30.73	25.48	85.40	93.66	3.89	1.94	0.51
4	dydx	33.87	9.49	85.40	91.15	5.77	2.11	0.97
5	ENS	25.04	4.25	78.30	80.21	7.02	11.81	0.95
6	Galxe	35.20	6.74	96.60	86.92	5.31	7.32	0.45
7	Gitcoin	54.74	32.52	76.30	71.85	11.56	15.30	1.35
8	Frax	56.35	40.49	75.80	66.99	2.87	23.88	6.26
9	Ribbon	63.27	32.00	71.70	84.94	8.66	3.01	3.39
10	Euler Finance	48.96	29.62	73.40	88.11	6.60	0.44	4.85
11	Instadapp	56.67	40.34	82.50	87.42	3.18	4.24	5.17
12	HOP	35.36	24.34	59.00	69.42	4.34	24.97	1.27
13	SuperRare	54.13	21.16	80.40	64.38	13.73	19.12	2.77
14	Thales	n/a	n/a	55.00	65.13	1.07	31.16	2.65
15	Swapr	48.63	33.37	34.20	63.81	11.92	18.64	5.63
16	Badger	47.48	32.79	92.40	92.04	4.75	1.24	1.97
17	OpenDAO	55.67	22.12	93.60	47.66	1.94	48.98	1.42
18	Apecoin	37.66	14.96	85.30	74.97	21.55	2.55	1.10
19	Convex	40.58	22.31	51.30	79.11	11.64	3.74	5.52

Table 6: Airdrop distribution and post-airdrop actions (own illustration according to Dune Analytics)

3.3.3 Snapshot voting activity in general

Table 7 summarises some information about the Snapshot spaces of the protocols. For almost all protocols, the airdrop was a "genesis event"; the tokens were only launched on the market with the airdrop (cf. Table 4). Accordingly, the token launch also marked the start of governance or the first proposals. Exceptions are ENS, Thales and Frax, which had already established governance before the airdrop. In the case of Frax, the governance token of a sub-DAO was distributed (cf. Frax Docs 2023).

Uniswap governance has been active for more than three years, while only around half a year could be used for Arbitrum. The number of proposals or the absolute number of votes is therefore of limited significance.

- **Proposals:** The number of proposals varies greatly. It ranges from 6 (Swapr) to 745 (Convex).
- **Number of votes:** Arbitrum recorded the most votes overall (just under 3 million), followed by Optimism and Uniswap. These airdrops also have the most voters on average (per proposal). ENS shows a special feature: The DAO has the proposal with the most voters (approx. 85,000), while the average is only approx. 2,300.

<i>Snapshot Proposals</i>								
<i>No.</i>	<i>Protocol</i>	<i>No. of Proposals</i>	<i>First proposal</i>	<i>Latest proposal</i>	<i>Total votes</i>	<i>Average votes</i>	<i>Min. votes</i>	<i>Max. Votes</i>
1	Optimism 1	93	09.06.2022	12.01.2023	1,144,456	12,305	4,126	63,845
2	Arbitrum	119	27.03.2023	06.10.2023	2,860,337	24,036	15,649	53,609
3	Uniswap	104	22.09.2020	21.10.2023	260,970	2,509	0	15,219
4	dydx	35	10.09.2021	16.10.2023	18,790	536	97	899
5	ENS	49	04.05.2021	19.10.2023	116,846	2,384	215	84,350
6	Galxe	14	06.06.2022	10.10.2023	73,764	5,268	1,664	8,324
7	Gitcoin	113	27.05.2021	17.10.2023	112,540	995	170	2,931
8	Frax ²³	359	10.02.2021	20.10.2023	10,845	30	0	103
9	Ribbon	34	31.05.2021	18.07.2023	5,014	147	42	550
10	Euler Finance	54	29.06.2022	25.05.2023	8,290	153	29	606
11	Instadapp ²⁴	12	09.07.2021	30.03.2023	251	20	10	35
12	HOP	46	26.07.2022	29.09.2023	20,883	453	147	766
13	SuperRare	19	09.11.2021	13.09.2023	1,322	69	21	323
14	Thales ²⁵	15	22.07.2021	24.08.2023	1,215	81	0	351
15	Swapr	6	17.11.2021	22.06.2023	30,959	5,159	26	11,850
16	Badger	103	20.12.2020	23.07.2023	71,658	695	72	3,065

²³ Data for the Frax snapshot space, which includes the FPIS Sub-DAO

²⁴ The Instadapp Airdrop was distributed on Ethereum and Polygon, but voting is only possible on Ethereum.

²⁵ Data for the snapshot space thalescouncil.eth, in which all token holders for council members can vote

17	OpenDAO	27	24.12.2021	20.02.2023	29,912	1,107	210	4,791
18	Apecoin	170	23.03.2022	19.10.2023	103,830	610	206	1,774
19	Convex	745	19.08.2021	20.10.2023	85,524	114	3	1,993

Table 7: Snapshot proposals (own illustration according to Dune Analytics)

To determine the proportion of voters, the voting numbers are now set in relation to the number of all token holders (*governance retention ratio*). To ensure that the time of the airdrop does not distort the voting activity, in addition to the current data, the data for six and twelve months after the respective airdrop was also requested. In order to assess the "reliability" of the voters, the percentage of voters who voted at least three times was also determined. However, DAOs with many proposals have an advantage here.

- **Total voters:** Arbitrum, Optimism and ENS lead in terms of the number of unique voters in all time periods. Swapr, Instadapp and Thales had less than 100 voters in total after six and twelve months respectively.
- **Share of voters:** ENS-DAO has by far the largest share of voters with approx. 53%. It is followed by Badger (~18%) and Ribbon Finance (~16%). Uniswap, OpenDAO and Instadapp, on the other hand, have a voting share of less than 1%. The average share of voters after six months is 8.2%. After a further six months, the picture is similar. After twelve months, the average voting participation was 8.8%. Looking at the current data, ENS still has a high participation rate (~42%), ahead of Galxe (~24%) and Frax (~20%). Only Instadapp is still below 1%. The average participation rate has risen to 9.7%.
- **Voting frequency:** Despite the high voting participation, ENS shows a low voting frequency. Only 3% of voters have voted more than three times. The voters of Euler Finance, Arbitrum and HOP are particularly "loyal" (over 75%). On average, 45% participated in more than three proposals.
- **Comparison of voter share after six months or currently:** Overall, nine of the protocols have increased voting activity over time, five protocols have seen a decline and four protocols have hardly seen a change (less than one percent).

Snapshot voting activity in general								
<i>No.</i>	<i>Protocol</i>	<i>Voter (6 months)</i>	<i>Voter (12 months)</i>	<i>Voter currently</i>	<i>Voter share (6 months) [%]</i>	<i>Voter share (12 months) [%]</i>	<i>Voter share currently [%]</i>	<i>Voting frequency 3+ [%]</i>
1	Optimism 1	28,960	88,657	88,657	7.26	9.46	5.64	52.40
2	Arbitrum²⁶	119,573	n/a	128,432	7.37	n/a	7.51	75.70
3	Uniswap	393	2,197	27,852	0.06	0.24	2.23	62.60
4	dydx	1,873	3,175	4,623	2.78	3.91	3.31	44.40
5	ENS	84,941	85,598	87,362	52.55	47.22	41.83	3.30
6	Galxe	1,906	7,956	12,412	5.58	17.80	24.01	66.20
7	Gitcoin	4,031	4,466	10,808	10.26	9.88	8.44	68.10
8	Frax	355	543	1,258	6.59	9.09	19.94	54.00
9	Ribbon	992	1,250	1,484	16.47	11.28	9.05	31.80
10	Euler Finance	745	784	784	12.89	9.44	9.00	75.70
11	Instadapp	75	75	93	0.82	0.77	0.83	29.10
12	HOP	873	1,630	1,662	2.77	4.55	4.50	74.70
13	SuperRare	427	531	584	2.17	2.44	2.17	16.40
14	Thales	117	192	769	2.10	3.27	11.63	9.70
15	Swapr²⁷	49	49	18,032	1.30	0.70	7.32	4.60
16	Badger	9,883	10,735	11,221	17.96	16.08	13.95	44.80
17	OpenDAO	1,454	1,619	10,636	0.42	0.46	2.95	22.90
18	Apecoin	4,004	6,812	8,667	1.59	1.91	1.93	54.00
19	Convex	1,198	4,183	5,278	5.66	10.50	8.36	70.90

Table 8: Snapshot activity in general (own illustration according to Dune Analytics)

3.3.4 Snapshot voting activity of Airdrop recipients

To determine the voting participation of airdrop recipients (*airdrop governance retention ratio*), the voters who received an airdrop were compared to all airdrop recipients. As the number of airdrop recipients no longer changes (apart from a few claims), this proportion has only increased.

In addition, the voter share was calculated excluding the airdrop recipients, but only for the current time. To do this, the airdrop recipients were subtracted from all voters and divided by all token holders minus the airdrop recipients. This can illustrate the influence that the airdrop had on general voting activity.

²⁶ The Arbitrum Airdrop is less than twelve months old, so this information is missing.

²⁷ Swapr had no proposal in the period 6-12 months after the airdrop, so the number of voters is the same in the first two periods.

- **Total airdrop voters:** This is the same as the voting participation in general. ENS has the most airdrop voters in all time periods with over 80,000, followed by Arbitrum and Optimism.
- **Airdrop voters after six months:** The list is topped by ENS (~82%). Ribbon Finance (~53%) and Euler Finance (~23%) also have high scores. In contrast, less than 1% of airdrop recipients voted for Uniswap and Instadapp. On average, 14.2% of recipients voted. The percentages are very similar six months later. The average participation rate after twelve months was 15.7% . All projects have now seen a slight increase in the number of voters, with Frax (~28%) and Thales (~9%) seeing an increase compared to the 12-month period. The average is now 16.7%.
- **Voting frequency:** Optimism has the highest rate of airdrop voters who have voted at least three times, at around 81%. Euler Finance, Convex and Arbitrum also have over 70%. As with voting activity in general, ENS has the lowest rate (~2%).
- **Voter share excluding airdrop recipients:** For the majority of protocols (13), the voter share decreases (at the current time) if the airdrop recipients are excluded from the calculation. The largest discrepancy can be seen in ENS (approx. -79%) and Ribbon Finance (approx. -49%). In these cases, airdrop recipients are more active in governance than non-airdrop recipients. In six protocols, the proportion of voters without airdrop recipients is higher.

Snapshot activity of the Airdrop recipients									Without Airdrop recipients	
No.	Protocol	Voter (6 months)	Voter (12 months)	Voter currently	Airdrop voter (6 months) [%]	Airdrop voter (12 months) [%]	Airdrop voter (curr.) [%]	Voting frequency 3+ [%]	Voter without airdrop recipients	Voter share [%]
1	Optimism 1	10,082	13,130	13,130	6.32	8.23	8.23	81.30	75,527	5.43
2	Arbitrum	62,481	n/a	65,123	10.71	n/a	11.17	74.00	63,309	5.62
3	Uniswap	214	599	1,160	0.10	0.27	0.53	46.00	26,544	2.58
4	dydx	1,404	1,798	2,063	4.60	5.89	6.75	32.9	723	0.66
5	ENS	83,835	83,863	84,375	81.56	82.06	81.53	1.90	2,987	2.82
6	Galxe	1,719	2,248	2,479	11.52	15.06	16.61	57.80	9,933	27.02
7	Gitcoin	1,967	2,055	2,210	13.47	14.07	15.13	64.30	8,598	7.58
8	Frax	214	255	437	13.67	16.28	27.91	55.40	821	17.31
9	Ribbon	700	711	717	52.71	53.54	53.99	41.90	767	5.09
10	Euler Finance	671	682	682	22.59	22.96	22.96	79.40	102	1.78
11	Instadapp	16	14	14	0.19	0.17	0.17	12.40	77	0.76
12	HOP	668	949	960	2.31	3.28	3.32	65.70	702	8.75
13	SuperRare	264	301	305	7.53	8.59	8.70	18.70	279	1.19
14	Thales	91	124	377	2.06	2.81	8.54	10.6	400	28.21
15	Swapr	34	34	55	1.45	1.45	2.35	12.7	18,023	1.05

16	Badger	1,088	1,109	1,145	13.79	14.06	14.52	48.9	10,076	13.89
17	OpenDAO	8,221	8,268	8,307	2.69	2.70	2.72	16.9	2,329	4.30
18	Apecoin	1,563	1,969	2,149	10.37	13.07	14.26	55.4	6,518	1.50
19	Convex	266	468	504	9.47	16.65	17.94	77.5	4,774	7.91

Table 9: Snapshot activity of airdrop recipients and exclusive airdrop recipients (own illustration according to Dune Analytics)

3.3.5 On-chain voting activity

Eight of the protocols in the dataset have (additionally) implemented on-chain voting. Arbitrum, dydx, Instadapp and HOP held their first on-chain voting rather simultaneously with the launch of the token or the airdrop. In the case of Uniswap, Gitcoin and ENS, around three months passed between the airdrop and the first on-chain proposal. Until then, the protocols were only active on Snapshot and had already introduced delegations in the process.

Optimism launched the first on-chain voting in February 2023, approximately nine months after the beginning of the airdrop. The following tables show the on-chain voting participation and the proportion of addresses that have delegated their tokens as of 13th November 2023. Dydx also allows off-chain voting (similar to Snapshot) on its on-chain governance portal (cf. dydx.vote n.d.). It is therefore possible that not all votes were recorded for this protocol.

- **Proposals:** The number of on-chain proposals varies between 6 (Instadapp) and 79 (Gitcoin)
- **Number of votes:** In absolute numbers, Optimism and Arbitrum have by far the most on-chain votes.

<i>On-chain proposals</i>						
<i>No.</i>	<i>Protocol</i>	<i>No. of proposals</i>	<i>First proposal</i>	<i>Latest proposal</i>	<i>Total votes</i>	<i>Average votes</i>
1	Optimism 1	38	07.02.2023	02.11.2023	402,239	11,830
2	Arbitrum	13	23.03.2023	22.09.2023	445,101	34,238
3	Uniswap	61	12.10.2020	30.10.2023	41,755	683
4	dydx	16	03.10.2021	13.09.2023	2,489	155
5	ENS	20	05.01.2022	03.11.2023	4,191	209
6	Gitcoin	79	13.08.2021	08.11.2023	5,937	76
7	Instadapp	6	23.06.2021	02.11.2023	59	9
8	HOP	10	03.10.2022	09.10.2023	647	65

Table 10: On-chain proposals (own illustration according to Dune Analytics)

The on-chain voter share was determined according to the same scheme as on Snapshot. For this purpose, the (on-chain) transactions of the respective governance contracts were compared with all token holders (*Table 11*) and the airdrop recipients (*Table 12*).

- **Voter share:** After six and twelve months, the voter share for the protocols is below one per cent, with the exception of Optimism and Arbitrum. The average value after 6 months was 1.2% and is now 2.1%.
- **Airdrop voter share:** The share of airdrop recipients is also less than one percent for most protocols. For Optimism it is around 7% after 12 months and for Arbitrum around 9% after six months. The average participation rate is slightly higher at 1.7% after 6 months and 2.6% currently.
- **Voting frequency:** The most "reliable" voters are Optimism (~44%) and Arbitrum (~39%). Only 6% and 7% voted more than three times for HOP and ENS respectively.

<i>On-chain voting activity in general</i>								
<i>No.</i>	<i>Protocol</i>	<i>Voter (6 Mon.)</i>	<i>Voter (12 Mon.)</i>	<i>Voter currently</i>	<i>Voter (6 months) [%]</i>	<i>Voter (12 months) [%]</i>	<i>Voter (current) [%]</i>	<i>Voting frequency 3+ [%]</i>
1	Optimism 1²⁸	<i>n/a</i>	6,779	7,208	<i>n/a</i>	4.25	4.52	43.70
2	Arbitrum²⁹	109,097	<i>n/a</i>	117,168	6.73	<i>n/a</i>	6.60	38.90
3	Uniswap	682	1,204	17,734	0.21	0.28	0.46	17.70
4	dydx	203	224	1,436	0.30	0.28	1.01	10.90
5	ENS	473	933	2,405	0.29	0.51	1.15	7.40
6	Gitcoin	87	453	2,857	0.22	1.00	2.21	9.40
7	Instadapp	22	22	25	0.24	0.22	0.22	24.00
8	HOP	242	333	418	0.77	0.93	1.13	5.90

Table 11: On-chain voting activity in general (own illustration according to Dune Analytics)

²⁸ Optimism had not yet introduced on-chain voting six months after the airdrop.

²⁹ Less than twelve months have passed since the Arbitrum Airdrop.

<i>On-chain voting activity of the airdrop recipients</i>							
<i>No.</i>	<i>Protocol</i>	<i>Airdrop voter (6 months)</i>	<i>Airdrop voter (12 months)</i>	<i>Airdrop voter currently</i>	<i>Airdrop voter (6 months) [%]</i>	<i>Airdrop voter (12 months) [%]</i>	<i>Airdrop voter (currently) [%]</i>
1	Optimism 1	<i>n/a</i>	77,256	84,403	<i>n/a</i>	8.24	5.26
2	Arbitrum	52,768	<i>n/a</i>	56,014	9.05	<i>n/a</i>	9.61
3	Uniswap	473	611	1,017	0.21	0.28	0.46
4	dydx	647	819	1,084	1.44	1.82	2.41
5	ENS	547	639	827	0.53	0.62	0.80
6	Gitcoin	45	78	290	0.31	0.53	1.98
7	Instadapp	3	3	3	0.04	0.04	0.04
8	HOP	126	170	213	0.43	0.59	0.74

Table 12: On-chain voting activity of airdrop recipients (own illustration according to Dune Analytics)

3.3.6 Delegations

To determine the proportion of delegations, the delegation events are set in relation to all token holders or the airdrop recipients. This provides information on whether an address has delegated its tokens at least once at the time. Whether an address has changed the delegate or cancelled the delegation in the meantime was not determined. The number of delegations therefore only increases.

It is important to know that, depending on the protocol, the delegation of tokens is necessary to participate in on-chain voting. This is also the case with the selected protocols. The governor contracts of the OpenZeppelin library, which are frequently used, are structured in this way (cf. OpenZeppelin Docs n.d.). The "opt-in" principle makes it easier to understand how the voting power is distributed at a particular point in time: *"The full history of delegate votes is tracked on-chain so that governance protocols can consider votes as distributed at a particular block number to protect against flash loans and double voting"* (cf. *ibid.*).

Token holders can also delegate themselves and vote "directly" in this way. For this reason, the proportion of voting events in which the token holders specified themselves as delegates was also queried. With ENS, Gitcoin and HOP, delegation was even a (mandatory) part of the claim process. Accordingly, 100% of airdrop recipients delegated their tokens in these cases (cf. Stakingbits 2022; cf. ENS Youtube 2021; cf. Russo 2021).

- **Number of delegations:** In absolute terms, Optimism and Arbitrum token holders have delegated their tokens most frequently, with Optimism now having over 600,000 delegation events. For Instadapp and dydx, on the other hand, there are just a few hundred.

- **Delegation rate:** The range of delegations is wide. In HOP and ENS, the majority of token holders have delegated their tokens; HOP currently has a delegation rate of over 80%. Dydx, Instadapp and Uniswap protocols have comparatively low delegation rates.
- **Delegations to your own address:** The proportion of delegation events to their own address is between 30% (Instadapp) and over 90% (Uniswap).

Delegations								
No.	Protocol	Delegations (6 Mon.)	Delegations (12 Mon.)	Delegations (currently)	Share (6 months) [%]	Share (12 months) [%]	Share (current) [%]	Delegations to own address [%]
1	Optimism 1	164,615	461,911	626,502	41.25	49.29	38.89	29.61
2	Arbitrum	446,137	n/a	483,910	27.51	n/a	27.27	52.86
3	Uniswap	6,669	9,817	44,382	1.51	1.03	3.54	92.09
4	dydx	80	117	267	0.12	0.17	0.19	27.52
5	ENS	105,613	107,736	112,128	65.33	59.43	53.44	27.84
6	Gitcoin	17,178	17,869	28,047	43.73	39.54	21.73	39.58
7	Instadapp	100	102	122	1.10	1.12	1.08	27.34
8	HOP	27,123	29,608	30,250	86.21	94.10	81.64	29.20

Table 13: Delegations in general (own illustration according to Dune Analytics)

- **Airdrop delegations in total:** Over 100,000 airdrop recipients each from Arbitrum, Optimism and ENS have delegated tokens. With Instadapp and dydx, on the other hand, only a few addresses delegated.
- **Airdrop delegation share:** It is striking that the airdrop recipients of HOP, ENS and Gitcoin delegated (almost) without exception, which confirms the obligation to delegate when claiming. More than half of the recipients of Optimism and Arbitrum also delegated, whereas this is more of an exception for Uniswap, Instadapp and dydx.

Delegations from Airdrop recipients							
No.	Protocol	Airdrop Delegations (6 Mon.)	Airdrop Delegations (12 Mon.)	Airdrop Delegations (currently)	Airdrop share (6 months) [%]	Airdrop share (12 months) [%]	Airdrop share (currently) [%]
1	Optimism 1	111.333	120.619	121.075	69,82	75,64	75,93
2	Arbitrum	327.122	n/a	332.154	56,10	n/a	56,96
3	Uniswap	5.476	4.732	4.025	2,48	2,15	1,82
4	dydx	27	34	86	0,06	0,08	0,19
5	ENS	102.817	102.821	102.821	100,00	100,00	100,00
6	Gitcoin	14.607	14.607	14.607	100,00	100,00	100,00
7	Instadapp	6	6	8	0,07	0,07	0,10
8	HOP	26.577	28.415	28.974	91,73	98,07	100,00

Table 14: Delegations of airdrop recipients (own illustration according to Dune Analytics)

3.4 Discussion

The analysis of the 19 DAO airdrops shows that each airdrop is indeed individual. They vary greatly in terms of size and volume. This is also reflected in the voting activity. It is noticeable that some airdrops clearly stand out from the others in terms of participating addresses (cf. Fig. 1). These include Arbitrum, OpenDAO, Uniswap, Optimism and ENS, all of which recorded more than 100,000 airdrop recipients.

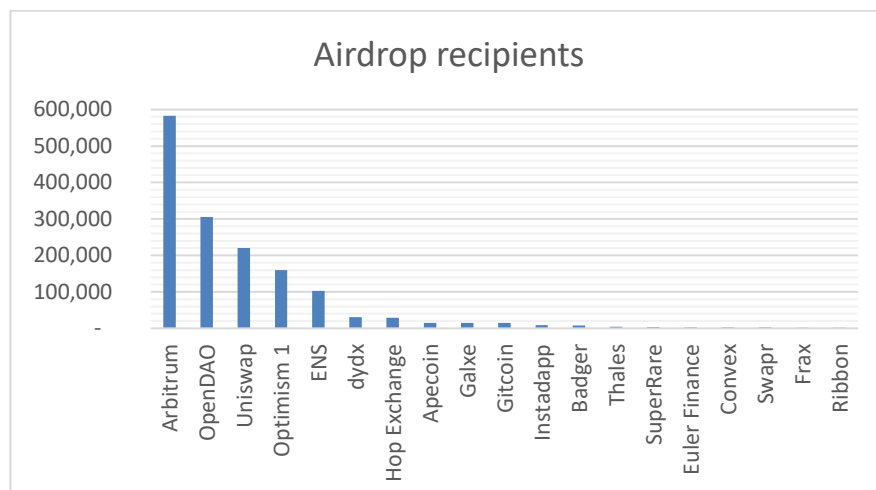


Figure 1: Number of airdrop recipients (own illustration)

They also differ greatly in the supply that is made available for the airdrop. On average, it is around 11% of the total token quantity. The exception is OpenDAO with 50% of the total supply. Unlike the other DAOs, OpenDAO did not have a product on which the airdrop was based. The DAO has not shown governance activity since the beginning of the year (cf. OpenDAO Snapshot 2023).

In terms of the proportion of addresses or tokens that are eventually claimed, it seems to be advantageous to have a fixed target group (e.g., Apecoin or Superrare). Protocols that have targeted users of competing protocols have tended to have lower rates (e.g., Instadapp or Convex). Airdrops aimed at existing users seem to (obviously) reach their recipients better.

It is also noticeable that almost all selected airdrops were distributed between mid-2021 and mid-2022. This generally coincides with a peak phase of the crypto market and the emergence of DAOs (cf. WEF 2022, p.11). The airdrops therefore also appear to correlate with the market, especially as projects often try to launch in a "favourable" market phase (cf. Saxena 2023).

Do airdrops help with decentralisation?

Previous analyses indicate that the distribution of voting rights in DAOs is hardly decentralised, especially in one-token-one-vote systems (cf. Fritsch et al. 2023; cf. Sharma et al. 2023). Barbereau et al. also speak of a "minority rule" (cf. Barbereau et al. 2022). Han et al. have even observed that a concentration of token holders correlates negatively with platform growth (cf. Han et al. 2022).

Airdrops are supposed to be a way of decentralising a token (cf. Aragon Blog n.d.). However, whether this is a long-term effect is controversial (cf. Fan et al. 2023). To this end, we have taken a closer look at the distribution of airdrop tokens and the holding period. Based on the number of recipients, airdrops (initially) certainly have a "decentralising" effect in the sense that the token is distributed. An airdrop can add several (hundred) thousand token holders to a project, which would otherwise not be possible, especially at the beginning. In almost all cases, the airdrop was a "genesis event" that heralded the launch of a governance token.

However, the sums distributed to the respective recipients are usually within a wide range. The widespread use of activity-based airdrops tends to reinforce this trend. Early users with high volumes sometimes receive very high sums. The analysis of the 1% and 10% percentiles supports this assumption. In this analysis, 10% of the token recipients accounted for ~44% of the tokens on average, and for six of the selected airdrops it was even more than half of the intended tokens. In the 1% percentile, an average of ~23% were distributed (see Fig. 2).

Some airdrops have capped the amounts or distributed part of the airdrop equally to all participating addresses (e.g., Ribbon and Euler). However, the distribution of these airdrops does not differ significantly from the others. The exception in this case is Thales, which distributed the same amount to all recipients. Although Uniswap distributed a fixed amount to all users of the exchange, the liquidity providers received significantly higher sums. The top 1% of recipients claimed around a quarter of the tokens.

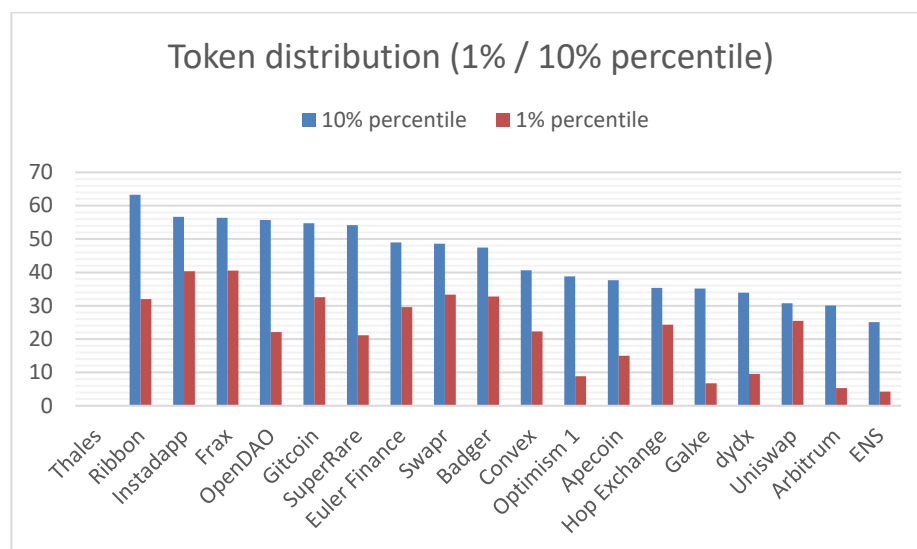


Figure 2: Token distribution (percentiles) (own illustration)

How long are the tokens held?

If you look at the "time distribution", airdrops are often a rather concise event. There is rarely much time between the announcement and the distribution of the airdrop, especially as the airdrops were retrospective. The majority of the tokens are usually claimed in the first few days, after a few weeks or months there are only a few recipients left.

Earlier studies have already cast doubt on whether airdrops have a sustainable effect (cf. Lommers et al. 2023, p.9). What happens to the tokens after the airdrop also plays a role in the decentralisation of a project. There are indications that most recipients sell the airdrop after a short time (for "free money") (cf. *ibid.*). In this analysis, only the current status was taken into account, regardless of how long ago the airdrop took place. The airdrops are therefore only comparable to a limited extent. As the "oldest" airdrops in the data set, Uniswap and Badger have the highest transfer rate.

Nevertheless, the analysis shows that most recipients do not keep their tokens. On average, ~76% of recipients have now fully transferred their tokens and only ~12% still hold the tokens at the same address. The median "hodling" rate is only ~7%, especially as OpenDAO has a very high holding rate of almost 50%. However, this is more likely to be related to the value of the token. The average amount of OpenDAO tokens claimed is currently worth less than \$3 (cf. Coinmarketcap 2023).

A transfer is not a confirmation of a sale, it could also be a transfer to a new wallet. However, it is reasonable to assume that the majority of the tokens have been sold - and therefore the recipients will not be participating in the governance.

The high transfer rate speaks in favour of Grant's assumption that "purchased" users do not offer any long-term added value (cf. Grant 2002). Instead, airdrops could count as an "extrinsic motivator" and thus lead to false incentives (e.g., airdrop farming) (cf. *ibid.*). Fan et al. also found that the majority of users sell the tokens (cf. Fan et al. 2023). They conclude that blockchain communities tend to attract less altruistically motivated members due to the integration of digital assets (cf. *ibid.*, p.2).

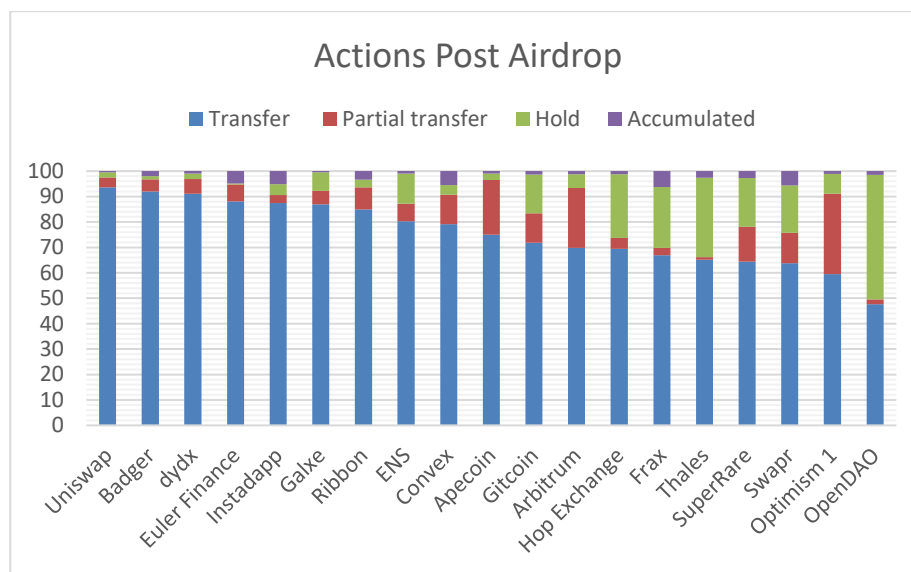


Figure 3: Actions after the airdrop (own illustration)

How high is the voting turnout?

Another level of decentralisation in DAOs is voting participation. Previous empirical analyses show that a lack of governance activity is a problem in many DAOs ("voting fatigue") (cf. Arroyo et al. 2022; cf. Sharma et al. 2023). The core question of this study was therefore what effect an airdrop has on participation.

Firstly, we looked at governance activity in general: DAOs are considered a way to experiment with different voting mechanisms (cf. Kurniawan et al. n.d.). However, the selected DAOs all use the (widespread) one-token-one-vote model with a variable threshold or quorum.

Both on Snapshot and on-chain, it can be seen that the DAOs are differently "active" in their governance in terms of the number of proposals. The airdrops with the fewest proposals (Swapr and Instadapp) also have comparatively low participation, while this effect is not seen in the DAOs with many proposals. The fact that there are regular proposals that can be

voted on seems to be a positive factor. As Zhao et al. observed, however, too many proposals can tend to favour voting fatigue (cf. Zhao et al. 2022). A certain continuity in the proposals, on the other hand, is a positive factor (cf. *ibid.*).

In absolute numbers (Snapshot and on-chain), participation differs greatly, with Optimism and Arbitrum clearly standing out with over one million votes each. These airdrops, together with Uniswap and ENS, also had the most participants. We can confirm Wang et al.'s assumption that activity in the ecosystem is concentrated on a small proportion of DAOs ("Pareto principle"). The airdrops of these DAOs are also referred to as "high-profile airdrops" (cf. Shin 2023).

When looking at the Snapshot voting activity, a wide range is noticeable. It is interesting to note that the governance retention ratio for protocols that initially had a high level of participation has tended to fall, while activity has tended to increase for the others. This could indicate a slow equalisation across the ecosystem. On average, overall Snapshot participation has increased from ~8.2% after six months to ~9.7% at this point.

However, it is important to take a closer look at an individual case: The high level of participation in ENS is mainly due to one proposal. This was the ratification of the "ENS Constitution", which airdrop recipients were asked to sign during the claim process (cf. ENS Youtube 2021). The voting frequency shows that around 91% of all ENS voters only voted once. The ENS Airdrop is therefore only comparable with the others to a limited extent.

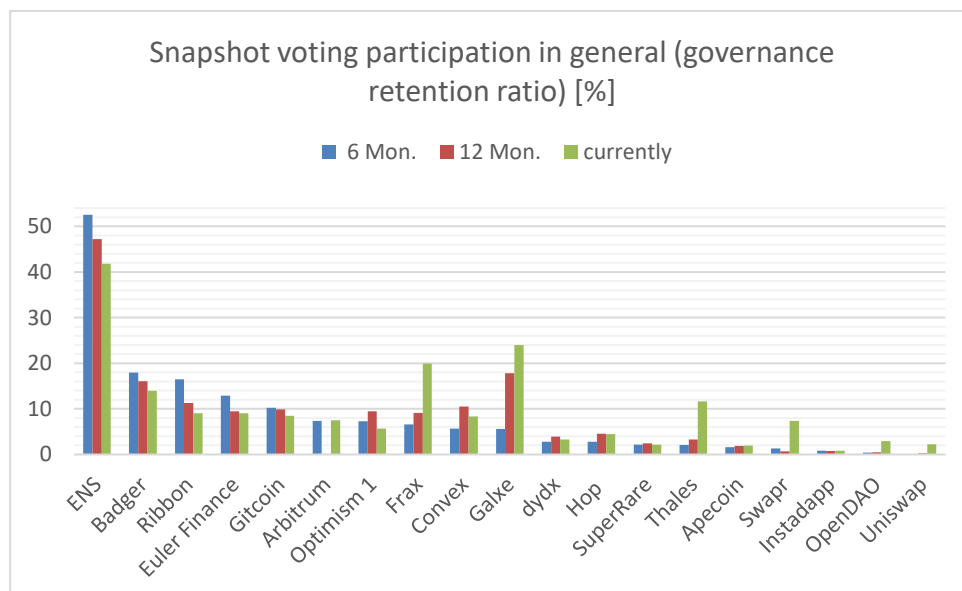


Figure 4: Governance retention ratio (own illustration)

Almost half of the analysed airdrops additionally use on-chain voting. As already shown in the presentation of the airdrops, the larger DAOs in particular can "afford" on-chain voting. Depending on the definition, voting "on" the blockchain is even a prerequisite for being considered a DAO (cf. Rikken et al. 2021).

The dominance of Optimism and Arbitrum is also noticeable here, with the most on-chain votes by far. The two DAOs each vote on their own protocol, while the other DAOs vote on Ethereum. The transaction fees could therefore contribute to the fact that activity on the other DAOs is significantly lower. This is one of the reasons why delegations are widely used for on-chain voting. The on-chain voting share is comparatively low or below the Snapshot share. Apart from Optimism and Arbitrum, the ratios are below ~2%.

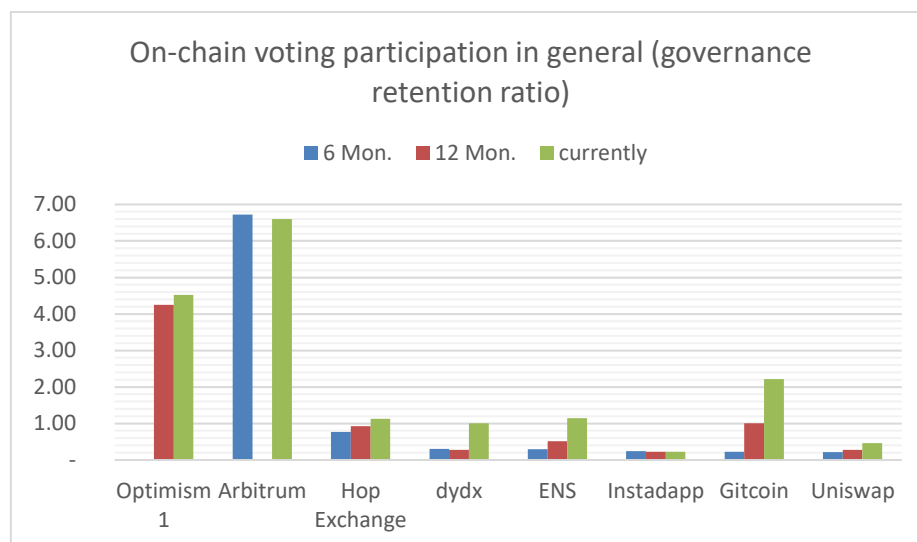


Figure 5: On-chain governance retention ratio (own illustration)

How high is the voting participation of Airdrop recipients?

The proportion of airdrop recipients who voted on Snapshot is on average about 6% higher than the general participation in all time periods (~14% after six months and ~17% currently). We therefore conclude that airdrop recipients in this dataset have increased overall voting participation. Contrary to what one might expect given the transfer rate, the voting activity of airdrop recipients has actually increased over time. *This suggests that at least some of the recipients are involved in the projects for the long term.*

The airdrop governance retention rate is calculated from all airdrop recipients who have voted at least once. As a result, the value can only increase and does not reflect the 'loyalty'

of the voters. However, the voting frequency of airdrop recipients is very similar to that of all voters. In both groups, 45% of voters have voted at least three times.

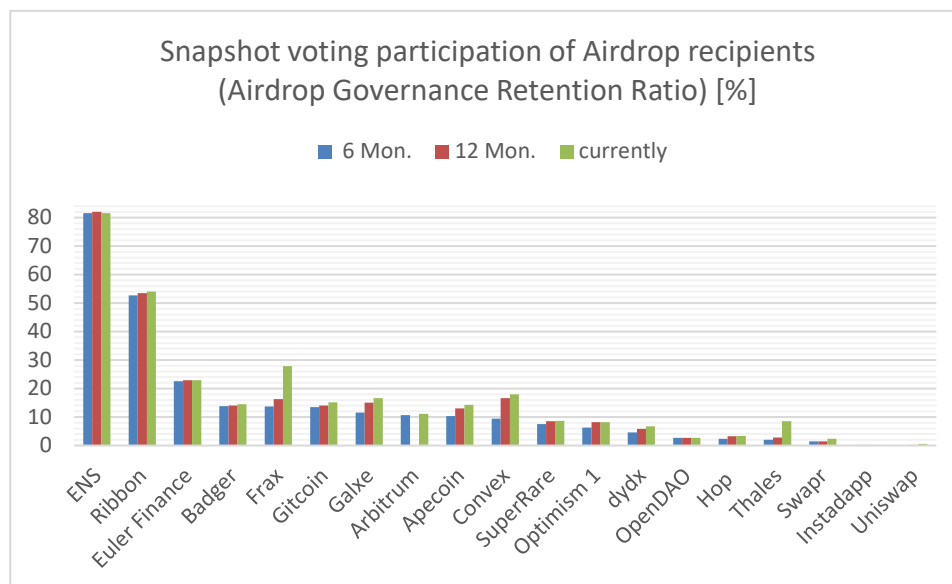


Figure 6: Airdrop governance retention ratio (own illustration)

The DAOs for which the airdrop recipients had an effect on voting participation can be seen even more clearly if the airdrop recipients are excluded from the calculation. To this end, we also calculated the governance retention ratio for voters excluding airdrop recipients, but only at the current time and only for Snapshot. Positive values indicate that a larger proportion of airdrop recipients were active in governance than token holders who did not receive an airdrop.

Unsurprisingly, airdrop recipients have significantly increased the average participation on Snapshot at ENS, as well as at Ribbon Finance and Euler. In contrast, airdrop recipients voted less frequently for Thales, Galxe and Uniswap.

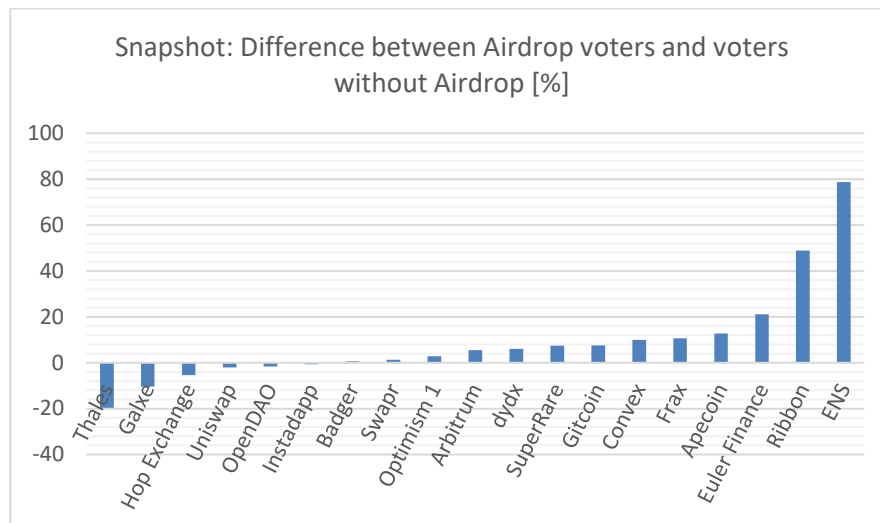


Figure 7: Difference between airdrop voters and voters excluding airdrop recipients (own illustration)

The proportion of on-chain airdrop voters is slightly higher than that of the general public, ~1.7% after six months and ~2.6% currently. Here, too, the figures are lower than on Snapshot. However, token holders who have delegated their voting rights are not included here.

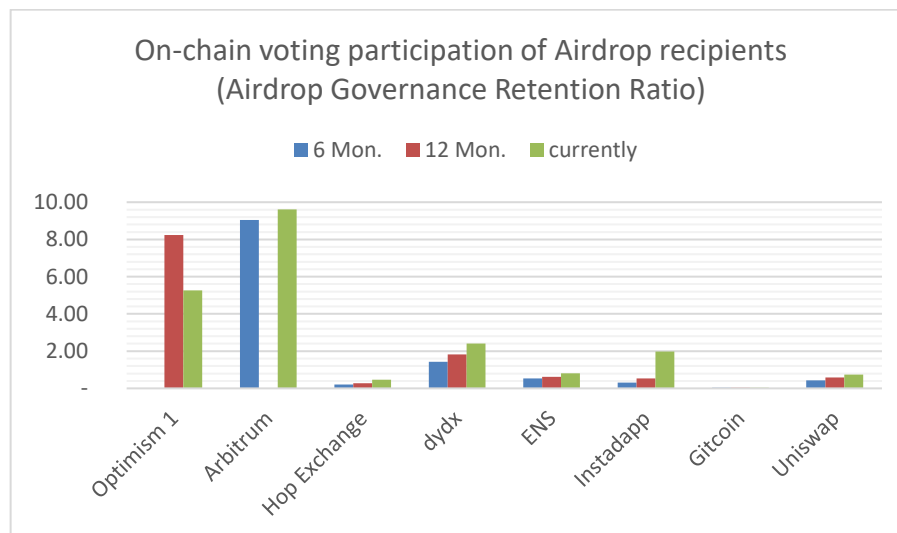


Figure 8: On-chain airdrop governance retention ratio (own illustration)

How many airdrop recipients have delegated tokens?

Delegating tokens is a popular way of "indirectly" increasing voting participation (cf. WEF 2023, p.11). The practice is particularly widespread for on-chain voting. Token holders can usually choose a delegate based on a public profile and transfer the voting rights. In many cases, delegation is even a prerequisite for voting. This is also the case for the DAOs analysed. In these cases, token holders must delegate to themselves in order to vote "directly".

At Optimism, for example, over 600,000 addresses have now delegated tokens. The proportion of all token holders who have delegated their tokens varies greatly. While it is over 80% at HOP, delegations at Uniswap, Instadapp and dydx are the exception rather than the rule. On average, ~41% of token holders have delegated to themselves. High values indicate that token holders prefer to vote for themselves (e.g. Uniswap).

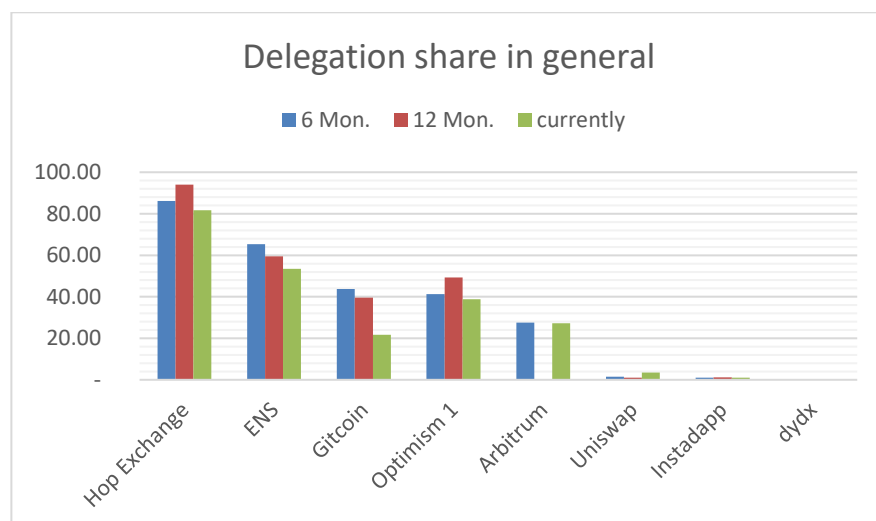


Figure 9: General share of delegation (own illustration)

In the case of HOP, ENS and Gitcoin, the delegation rate was favoured by the fact that delegation was a mandatory element when claiming the airdrop. This may be a deliberate strategy to improve governance participation. The airdrop recipients had to make a conscious decision as to whether they wanted to exercise their voting rights themselves or pass them on. On the other hand, the trend towards delegates illustrates that protocols deviate from the principle of "direct participation".

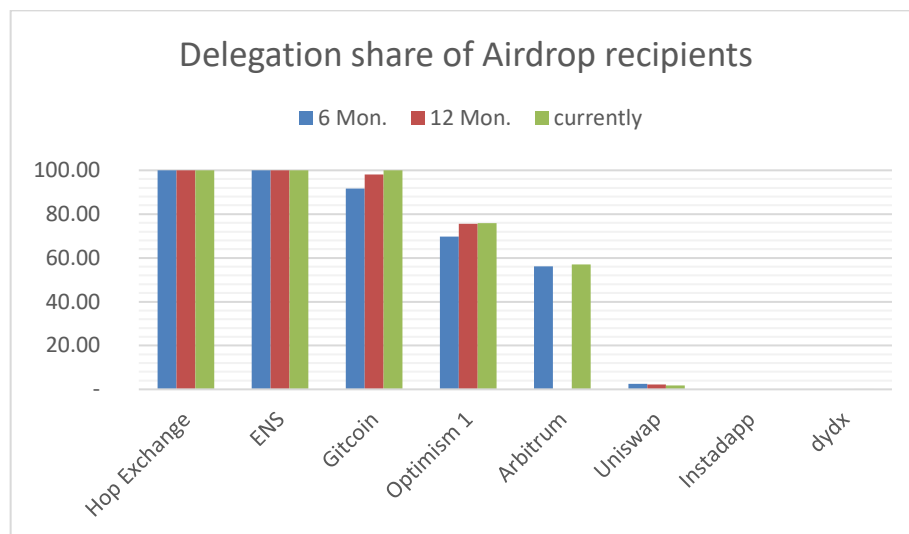


Figure 10: Delegation share of airdrop recipients (own illustration)

3.5 Outlook

In order to better understand DAO airdrops, a few things can be taken further in the analysis. Firstly, a larger data set would be useful to make more reliable statements. This would particularly include smaller DAOs or those with access requirements that have a more concentrated community. Voting activity could also depend on the role of the DAO token. In particular, it would be interesting to see whether the tokens primarily have a governance function or whether they are also used within the protocol (e.g., for rewards or fees). For example, it can be assumed that voting activity is lower if the governance function is only a "side effect".

Another option would be to differentiate according to the type of DAO, e.g. whether the DAO is used to manage a protocol (protocol DAO), is an investment vehicle (investment DAO) or focuses on the community function (social DAO) (cf. Coopahtraopa 2021). In terms of voting, the voting behaviour could be analysed in more detail, e.g. whether small or large token holders show similar patterns or whether token holders are active in several DAOs in parallel.

Barbureau et al. also see the lack of participation as being due to the fact that voting rights are tradable and there are no regulations against their concentration (cf. Barbureau et al., p.11). It would therefore be interesting to look at DAOs that deviate from the one-token-one-vote model, e.g., NFT-based DAOs.

As far as the airdrops are concerned, a more precise distinction could be made according to the target group or criteria, such as whether an airdrop is aimed at own or third-party users.

Similar to what some protocols have already done before the airdrop, it would be possible to analyse whether networks exist or arise among the recipient addresses that indicate airdrop farming. This would make it possible to compare the extent to which airdrop farming affects voting activity. Airdrops could also be related to other incentive options, e.g., reputation-based models, bounties or continuous rewards ("reward-streaming").

As already described in the analysis, the post-airdrop actions could be broken down in more detail, for example by time or what proportion of tokens were sent directly to an exchange. For protocols that offer staking or liquidity providing, this proportion could also be of interest.

In terms of data analysis, the airdrop amount could be related to voting activity. This could suggest that a recipient with large assets is more likely to vote. This would also need to include price data, as more tokens do not necessarily mean a higher value. The ENS example shows that individual proposals can distort the overall participation. It would therefore make sense to take greater account of voting frequency. Finally, the delegations could also be analysed in more detail, e.g., the concentration of tokens among the delegates or their activity.

There are many questions that empirical studies can still answer about DAOs. However, there is also a lack of qualitative analyses. Numerous data can be read from the blockchain, but these are largely pseudonymous. We know little about the characteristics of the participants in the vote or the recipients of the airdrops.

4 After the airdrop

Organisations that are governed by their members and whose decisions are enforced by code: DAOs are supposed to enable a whole new level of participation (cf. Wright 2021). But is this the reality? Previous work suggests that protocols are often controlled by a small group, or that only a few members vote at all (cf. Feichtinger et al. 2023).

In theory, airdrops are a way to address these governance problems. They reward users and distribute voting rights with the intention that they will then be used (see Aragon Blog n.d.). However, as with any incentive, it is questionable whether it will lead to the expected result (cf. Borgen 2004). We have therefore analysed some DAO airdrops empirically.

Retrospective airdrops common in DAOs

The selected airdrops were all retrospective and based on on-chain criteria. In almost all cases, the airdrop also marked the start of the token and governance. We can therefore confirm that this type of airdrop is widespread among DAOs (cf. Allen et al. 2023). The fact that retrospective airdrops are particularly popular with DAOs may not only be due to the community concept. The stimulus that can be generated by speculation about an airdrop should not be underestimated (cf. Lommers et al. 2023, p.15).

In almost all cases, the airdrop amounts were (broadly) tiered, depending on how many criteria a user met or how much volume a user contributed. The distribution of tokens is correspondingly "unequal". The top decile of recipients received on average 44% of the tokens. Most recipients also transferred the full airdrop amount (76% on average). Long-term airdrops are the exception rather than the rule. Therefore, the long-term impact of airdrops is questionable. The fact that the 'free tokens' are nevertheless a popular tool suggests that the protocols nevertheless see value in them.

One exception is airdrop farming. We observe that some protocols take sybil measures, and in some cases do not make the criteria transparent, in order to prevent airdrop hunting. Accordingly, we support Allen's assumption that protocols and airdrop hunters adapt to each other (cf. Allen 2023).

Most of the airdrops were directed at early users of the corresponding protocol. However, we identified two other groups targeting external users (of partner protocols or competing protocols). We conclude that DAO airdrops are not exclusively intended to reward early users, but in some cases also to target new users. In general, we observe that the airdrops have a wide range in terms of the number of participants, but also the absolute number of votes. Thus, the observation by Wang et al. that a large part of the activity is concentrated on only a few DAOs can also be transferred to DAO airdrops (cf. Wang et al. 2022).

Airdrops as one piece of the puzzle

But do airdrops serve as a governance tool? Airdrop recipients on Snapshot had an average participation rate about 6% higher than that of token holders in general. This effect was smaller for on-chain voting. On Snapshot, it averaged around 16% twelve months after the airdrop and around 2% on the chain. The voting frequency was comparable in both groups. *Accordingly, airdrops can certainly be a method to increase governance activity.* However, the specific impact has to be considered on a case-by-case basis. In about a third of the protocols, the activity of the airdrop recipients was smaller.

Overall, voting activity remains at a low level. Twelve months after the airdrop, voting participation was generally around 9% on Snapshot and around 1% on-chain. The participation has increased slightly over time, so the airdrops were not just a "short-term" effect. However, token holders' participation in governance is still the exception rather than the rule. Only a small proportion are active in voting over a longer period of time.

On-chain voting the exception

Overall participation in the on-chain voting is significantly lower than on Snapshot. The platform presumably benefits from its widespread use and fee-free voting, especially in comparison to Ethereum-based on-chain governance systems. However, the low on-chain share can also be partly explained by delegations, as token holders can delegate to themselves or to another address.

For example, as Optimism itself writes, it is not very realistic for the average token holder to familiarise themselves with all the proposals and make an 'informed' decision each time (cf. Optimism Agora n.d.). In this respect, many protocols have now shifted to delegations. The delegation rate is much higher than the voting rate, averaging 35% after twelve months.

Looking at airdrop recipients, the majority have delegated (54%). The higher proportion of airdrop recipients may be due to the fact that some protocols required delegation when the airdrop was requested. On average, 59% of delegations went to another address. We can therefore see that delegations are a popular tool to (indirectly) increase participation, especially in the case of airdrops.

After the airdrop

Airdrops are undoubtedly good at "rewarding" users. And as we all know, you can't expect anything in return for gifts. So it is not surprising that the free tokens are mostly sold. However, as the analysis shows, airdrops can at least play a role in improving participation.

However, airdrops are only one piece of the puzzle in establishing a DAO. After the initial impact of the airdrop, stable governance processes need to be established. As Zhao et al.

point out, the design of governance is an important element, such as the quality or continuity of proposals (cf. Zhao et al. 2022). Some of the tools to ensure the quality of decisions (thresholds, variable quorums, multi-stage voting) are already largely established in the DAOs analysed. Airdrops can also help to convey that smaller token holders also have an influence on the decision-making process (cf. *ibid.*). At best, the "extrinsic" motivation becomes an "intrinsic" one.

"For airdrops it would be important to create this sense of psychological co-ownership of the project compared to a pure mercenary or transactional relationship" (Lommers et al 2023, p.15).

Of course, the protocol itself is also an important factor. Governance is always orientated towards the respective product. Fan et al. emphasise the importance of a meaningful product with a good UX that is attractive even without additional incentives (cf. Fan et al. 2023, p.13). When longer-term rewards are used, these should primarily be aimed at users who use the protocol regularly (cf. Lommers et al. 2023, p.12).

Airdrops - like any reward - are a balancing act: the airdrop should be an initial incentive, but also long-term. The aim is to reward users while maintaining the price stability of the token. The same criteria should apply to everyone, but without enabling airdrop farmers. Airdrop recipients should be encouraged to vote, but this should remain voluntary. The objective is to decentralise the distribution of tokens as much as possible, but also to reward active members in particular. A protocol's ability to find proportionality in the airdrop design may determine whether the airdrop achieves the desired goal.

"One should try to strike a balance between rewarding stakeholders in a meritocratic way and achieving broader community engagement" (ibid., p.8).

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Attachments

Links to dashboards and example SQL queries for a dashboard:

<https://github.com/JanetMo/governance-activity-of-airdrop-recipients>

Data in Excel: https://hsmittweidade-my.sharepoint.com/:x:/g/personal/mmarz_hsmittweida_de/ES6p_wimjmtCuUOst66GZSABJK25E-jHq0ML2VLbwedbzA?e=XVdcto

Declaration of independence

I hereby declare that I have written this thesis independently, using only the literature and resources provided.

Passages taken literally or in spirit from sources have been identified as such.

This work has not been submitted in the same or a similar form to any other examining authority.

Munich, 30 November 2023

A handwritten signature in black ink, appearing to read 'M. Marz', with a stylized, cursive script.

Marlene Marz