Keynote II

European DAO Workshop

European DAO Workshop (DAWO24)

On Blockchain Governance

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PROFESSOR FOR DLT (BLOCKCHAIN) AND FINTECH, UNIVERSITY OF BASEL

University of Basel

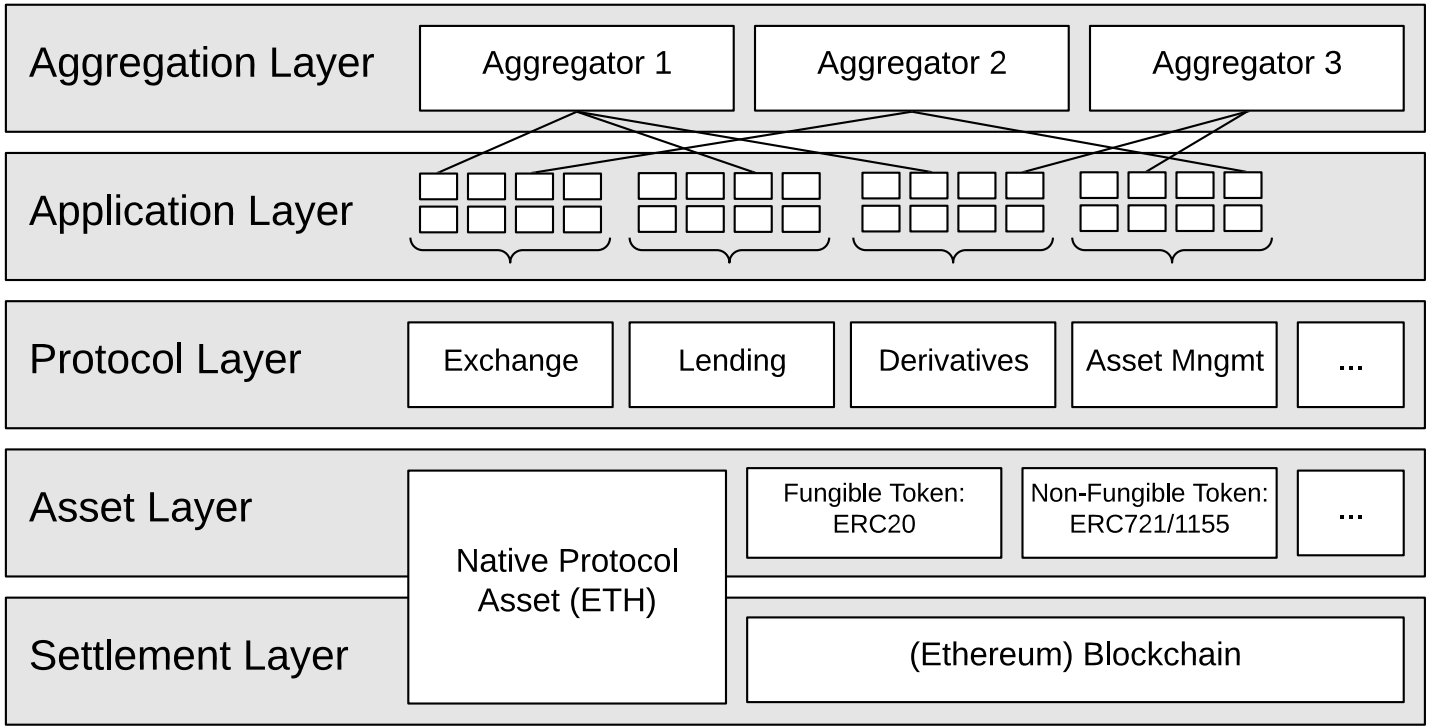
Faculty of Business and Economics

On Blockchain Governance: Insights from Various Research Projects

Keynote @DAWO24, ZHAW

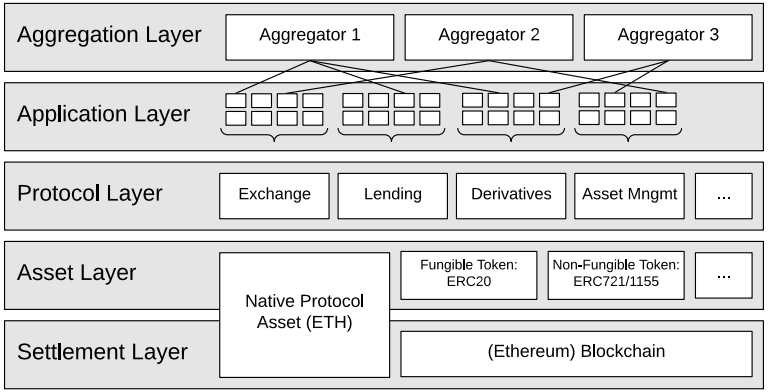
Fabian Schär, Univeristy of Basel

Why is Governance Important?



Schär (2021) Decentralized Finance: On Blockchain- and Smart Contract-based Financial Markets.

Prior Research on Crypto Governance in Our Research Group



Nadler and Schär (2022)
→ Governance token ownership

Goldberg and Schär (2023)
→ DAO voting behavior

Schuler, Cloots and Schär (2024)
→ Centralization vector analysis across all layers

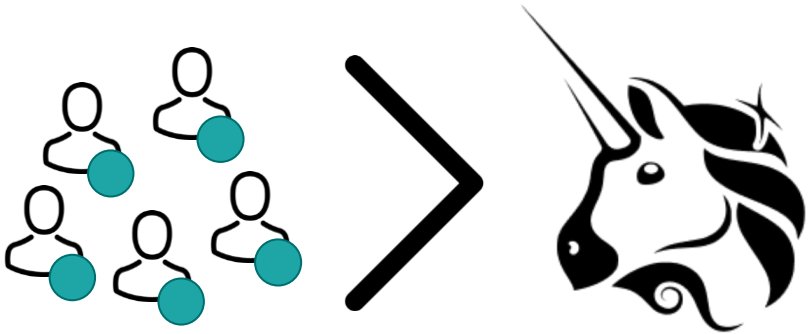
Fracassi, Khoja and Schär (2024)
→ Governance and transparency on settlement layer development.

ERC20 Holder Tables can be misleading…

A Naïve observation…

Address	Balance	Percentage
0x3d9819210A31b4961b30EF54bE2aeD79B9c9Cd3B	1,701,410.91	17.01%
0xc3d688B66703497DAA19211EEdff47f25384cdc3	900,000.35	9.00%
0xF977814e90dA44bFA03b6295A0616a897441aceC	369,711.56	3.70%
0x73AF3bcf944a6559933396c1577B257e2054D935	351,441.46	3.51%
0xfA9b5f7fDc8AB34AAf3099889475d47febF830D7	305,957.27	3.06%
0x3f4aa3Aa9Fa1AFe43897627A9A964235C0bF9375	284,576.62	2.85%
…		

A Scientific Response – Nadler and Schär (2022)



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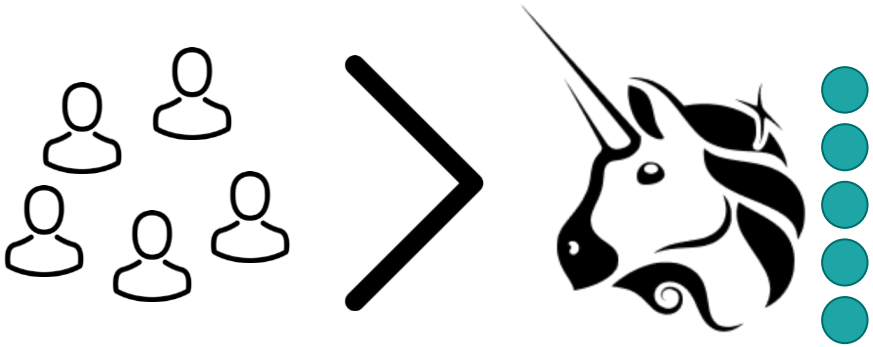
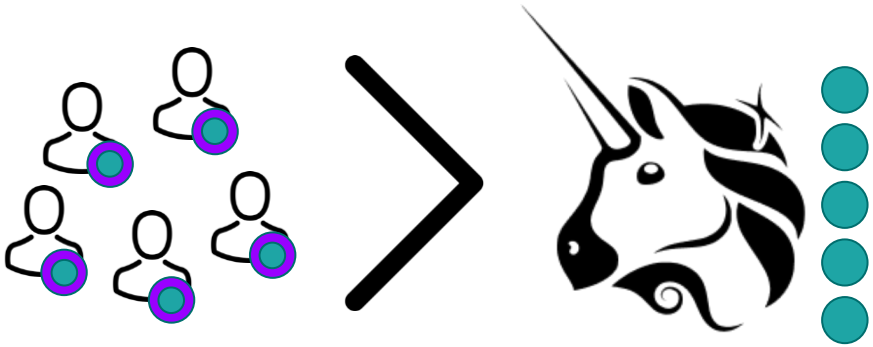


Naïve Observation:

- Account with very large token holdings.

A Scientific Response – Nadler and Schär (2022)



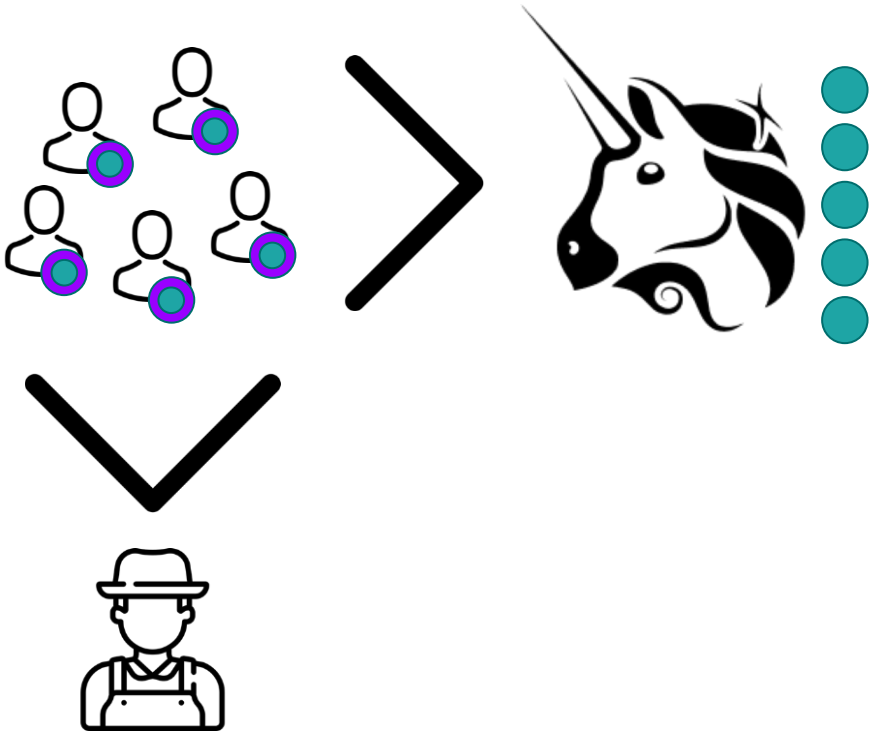
Naïve Observation:

- Account with very large token holdings.

Reality

- Thousands of liquidity providing accounts with partial ownership.

A Scientific Response – Nadler and Schär (2022)



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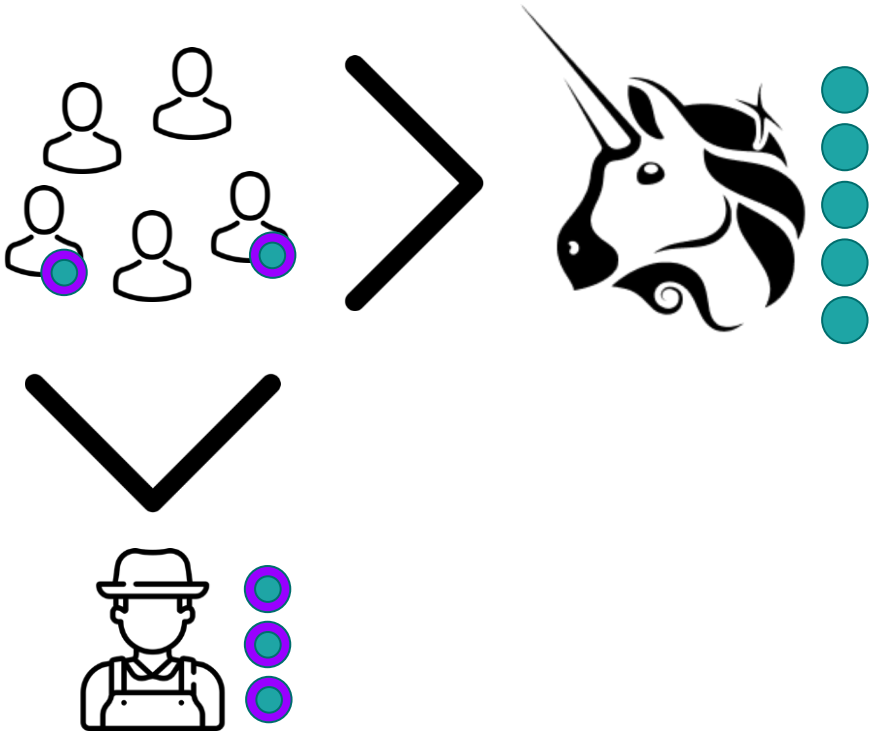
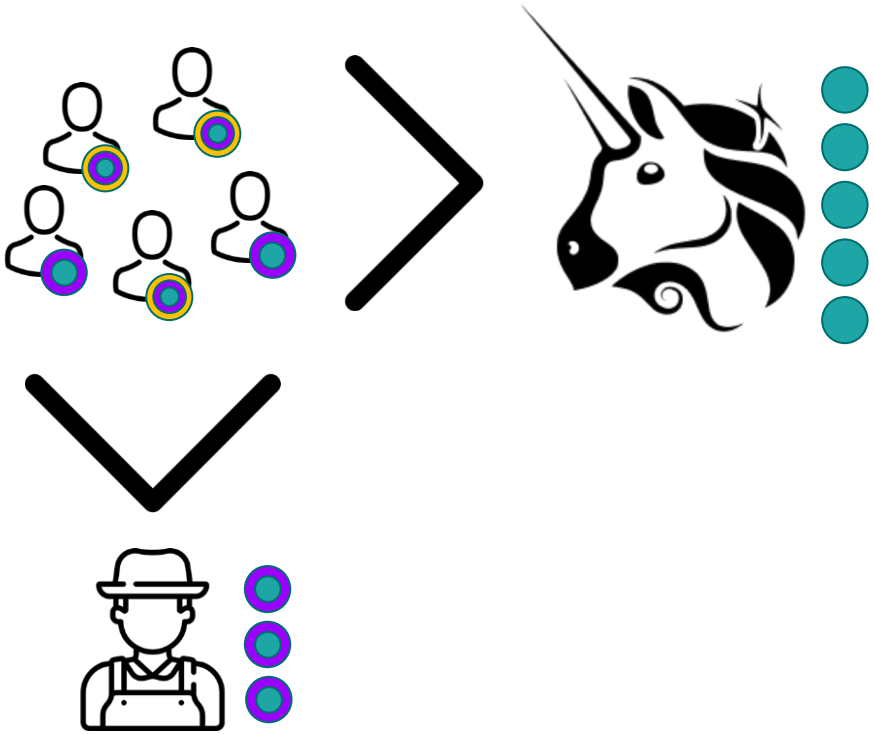


Naïve Observation:

- One Account with very large token holdings.
- One Account with very large LP token holdings.

A Scientific Response – Nadler and Schär (2022)



Naïve Observation:

- One Account with very large token holdings.
- One Account with very large LP token holdings.

Reality

- Thousands of liquidity providing accounts and farming accounts with partial ownership.

Token Wrapping Nadler and Schär (2022)

Token

Token Wrapper
Treat accordingly

Lending Market
Account for Debt.

Baskets
Remap

AMM LP
Remap

Manual contract analysis → Automated Remapping (Multiple Levels)
Our Algo lead to two proposal:
1. Ownership Concentration
2. Wrapping Complexity

Proposed Algorithm

Algorithm 1 Iterative Mapping Process

```
H ← initial token holder table
repeat
    sort H by token value, descending
    for all h ∈ top 1,000 rows of H do
        identify and categorize h
        apply inclusion logic to h
        if h is mappable then
            map h according to its category
        end if
    end for
until no mappable rows found in last iteration
assert every row with more than 0.1% of the total relevant
supply is properly identified and categorized
```

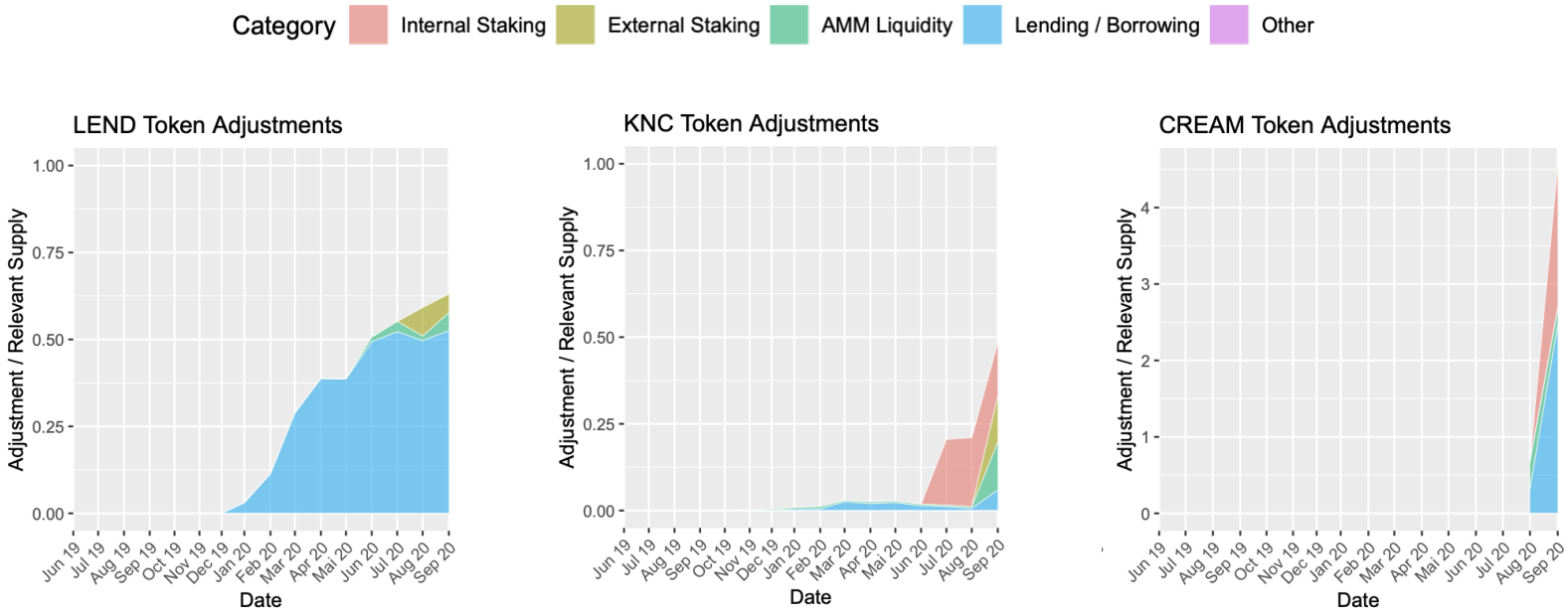
Summary of Results

	Min	1st Qu.	Median	Mean	3rd Qu.	Max
Top 5 VP share	0.0718	0.1428	0.2468	0.2672	0.3194	0.5692
Majority owners	2.00	14.50	23.50	45.61	50.75	166.00
Gini500	0.5531	0.6723	0.7843	0.7581	0.8294	0.9561

Table: Based on 18 most important DeFi governance tokens.

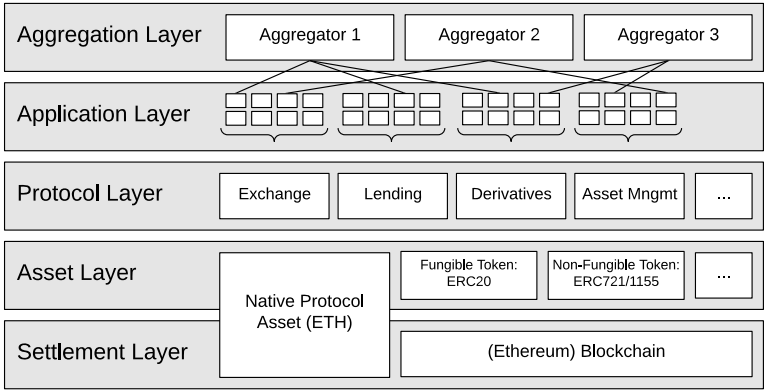
- For Top 5 VP Share and Majority Voters, these numbers must be interpreted as a best-case scenario (lower and upper bound respectively).
- Undetectable sybil and collusion attacks may make things worse.

Wrapping Complexity (Rehypothecation)



Nadler and Schär (2022)

Prior Research on Crypto Governance in Our Research Group



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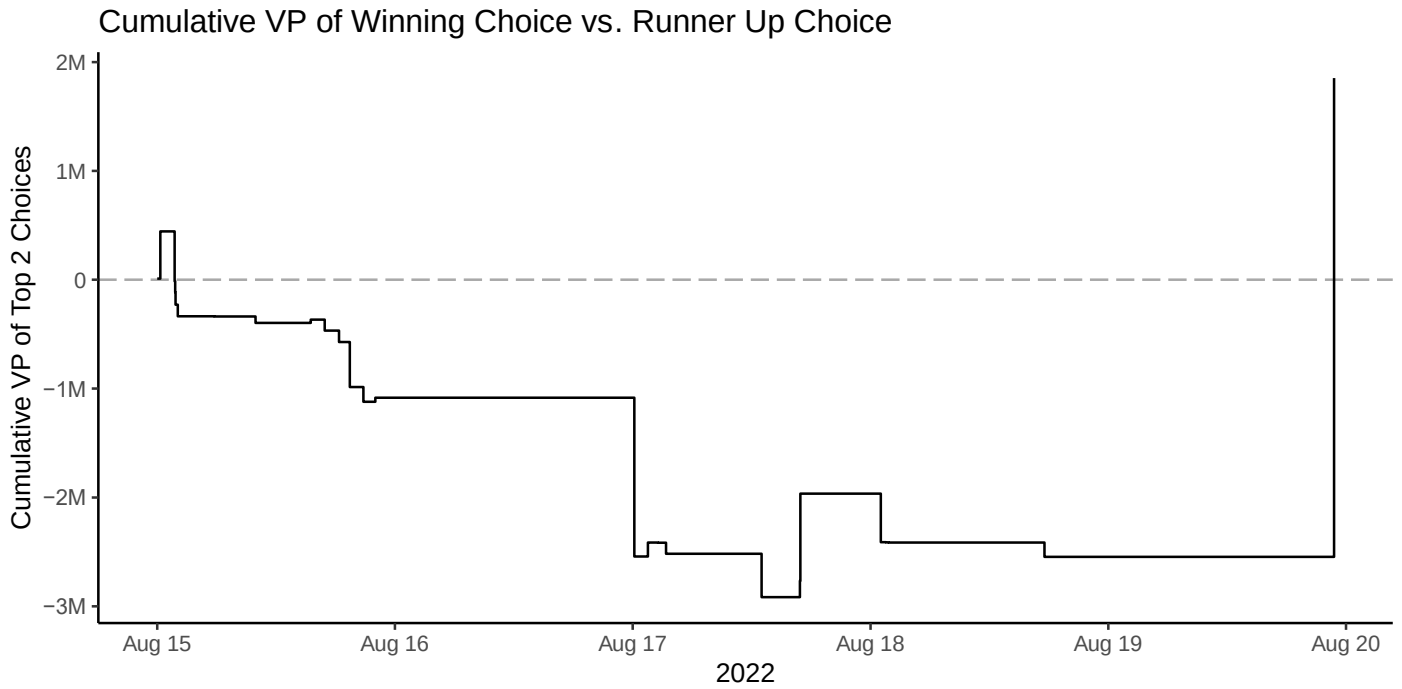
A Casual Observation…



Relative Time of Vote in Relation to Voting Power

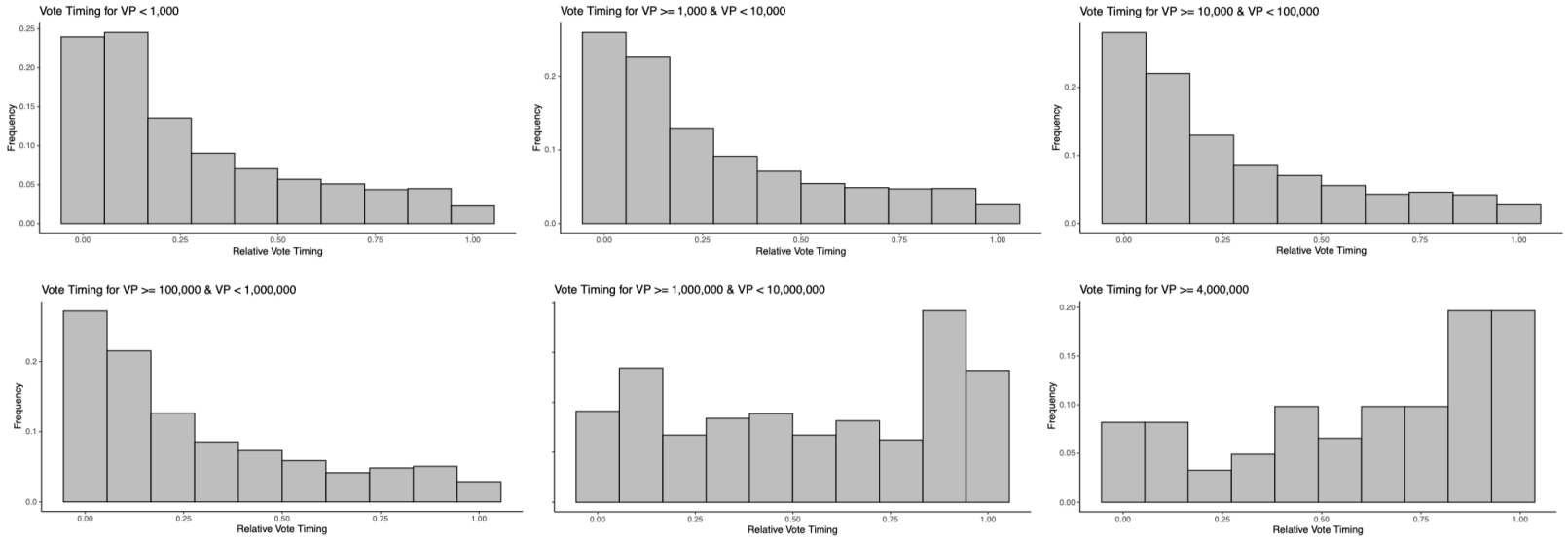


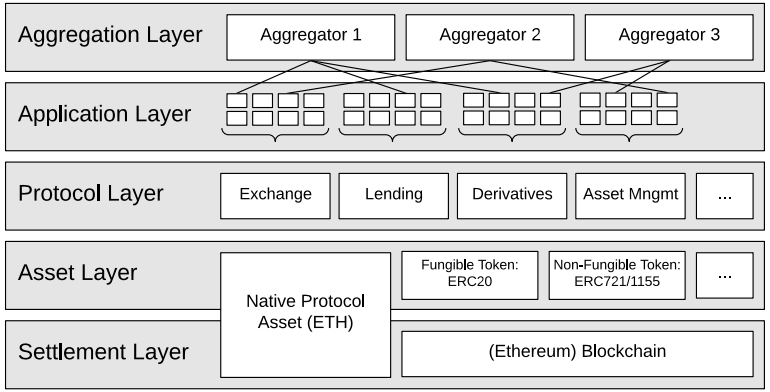
Figure 3: Relative time of vote for different categories of VP.

Would Ignoring the Most Powerful Voters Change the Outcome?

		Number of Abstaining Voters					
Type	Obs.	1	2	3	5	10	25
Ban Name	64	0.1094	0.1562	0.1719	0.2500	0.5625	0.9531
Catalyst	2	0.5000	0.5000	0.5000	0.5000	0.5000	1.0000
Grant	388	0.1057	0.1830	0.2629	0.3737	0.5799	0.8660
POI	362	0.1796	0.2790	0.3481	0.4475	0.6381	0.8370
Wearables	50	0.1400	0.2000	0.2800	0.4200	0.5600	0.8000
Poll	508	0.2657	0.3740	0.4646	0.5630	0.7165	0.9350
Draft	25	0.0400	0.1600	0.2400	0.3600	0.4800	0.6400
Governance	15	0.1333	0.1333	0.1333	0.3333	0.4000	0.6000

Table 3: Marginal voter analysis: Ratio of proposal outcomes that could have been changed for a given number of abstaining voters.

Prior Research on Crypto Governance in Our Research Group



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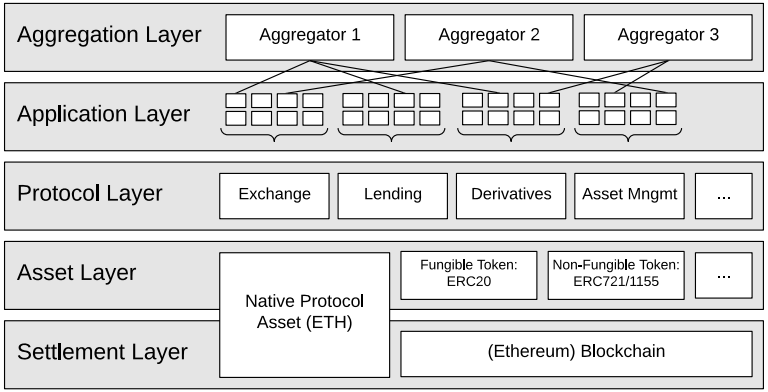

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Decision-Making in Ethereum Governance

How does it work?

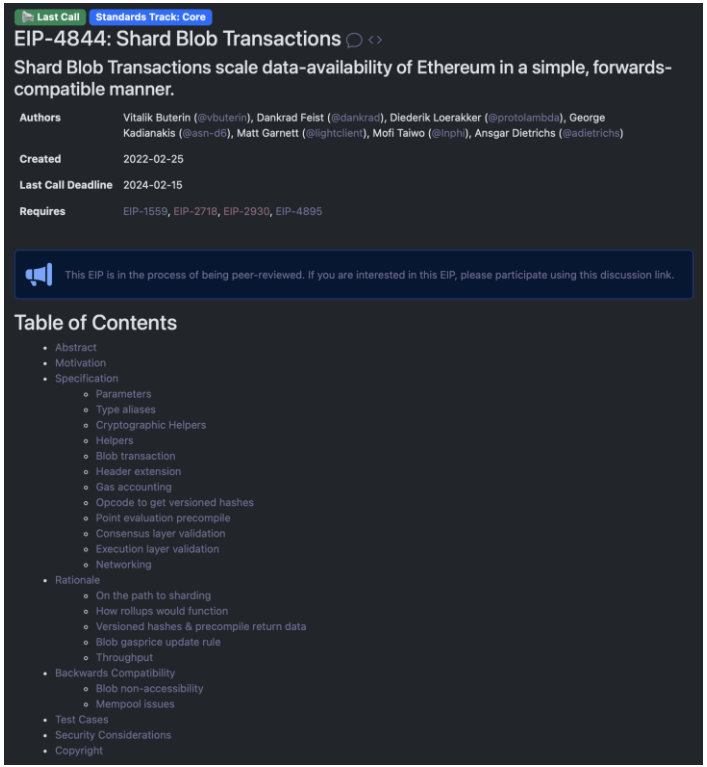
An Introduction to Open Source Communities and Rough Consensus

"We reject: kings, presidents, and voting. We believe in: rough consensus and running code."

David Clark – IETF, 1992

- Anyone can do whatever they want.
- No formal voting or people with special privileges who can force a change.
- Question of who actually supports the change.
- Threat of fork.

An EIP Example



Last Call | Standards Track: Core

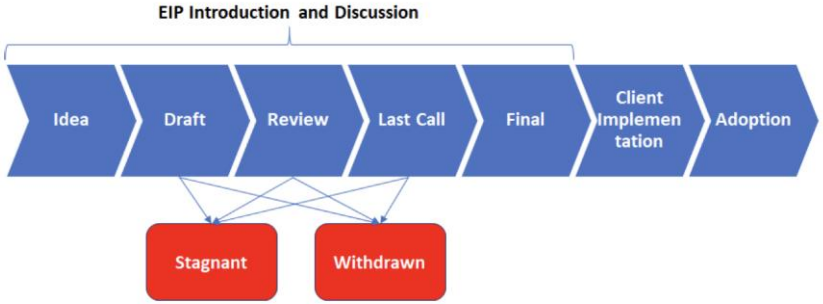
EIP-4844: Shard Blob Transactions

Shard Blob Transactions scale data-availability of Ethereum in a simple, forwards-compatible manner.

Authors	Vitalik Buterin (@vbuterin), Dankrad Feist (@dankrad), Diederik Loerakker (@protolambda), George Kadianakis (@asn-d6), Matt Garnett (@lightclient), Mofi Taiwo (@Inphi), Ansgar Dietrichs (@adietrichs)
Created	2022-02-25
Last Call Deadline	2024-02-15
Requires	EIP-1559, EIP-2718, EIP-2930, EIP-4895

This EIP is in the process of being peer-reviewed. If you are interested in this EIP, please participate using this discussion link.

Table of Contents



EIP Discussion Venues

- Github Repository
- Fellowship of Ethereum Magicians (Forum)
- Conferences and Twitter
- AllCoreDev Calls

EIP Categories

Core:
→ Critical changes, mostly s.t. consensus fork.

Networking:
→ Changes to devp2p sub protocol

Interface:
→ API/RPC specs and language level standards

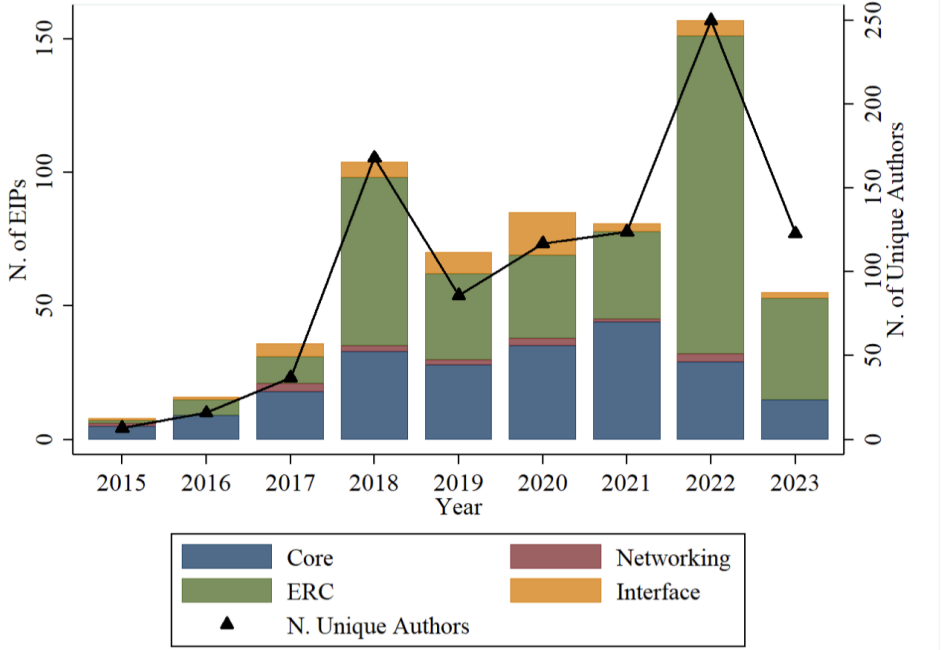
ERC:
→ Application level conventions

Meta:
→ Meta proposals, e.g. fork spec

Informational:
→ Information or guidelines. No new features or changes.

Figure 2. : Number of EIPs by Year

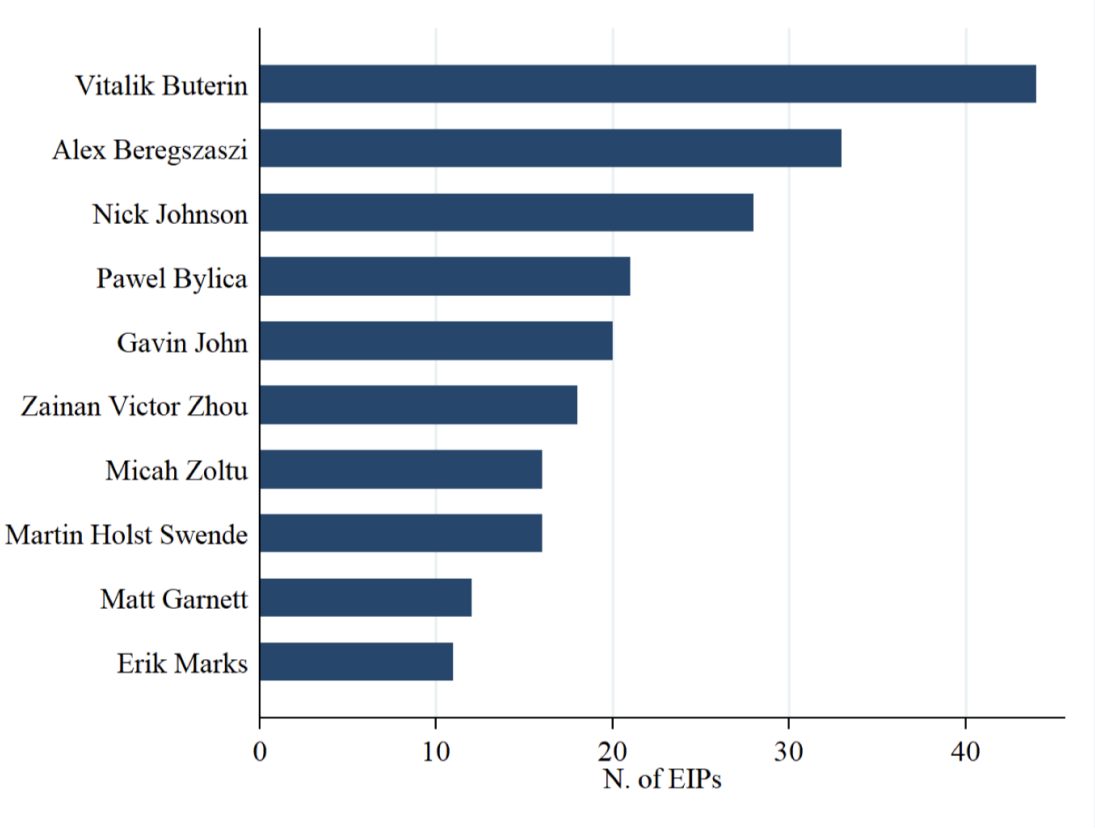
This table shows the number of EIPs by category (left axis) and the number of unique authors (right axis) over time. Year 2023 numbers are incomplete, as data collection ended on June 21.



Decision-Making in Ethereum Governance

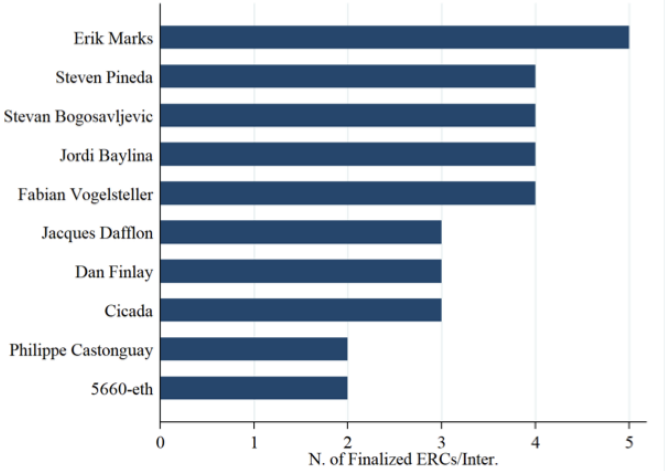
How concentrated is it?

EIP Top Authors (All Categories)

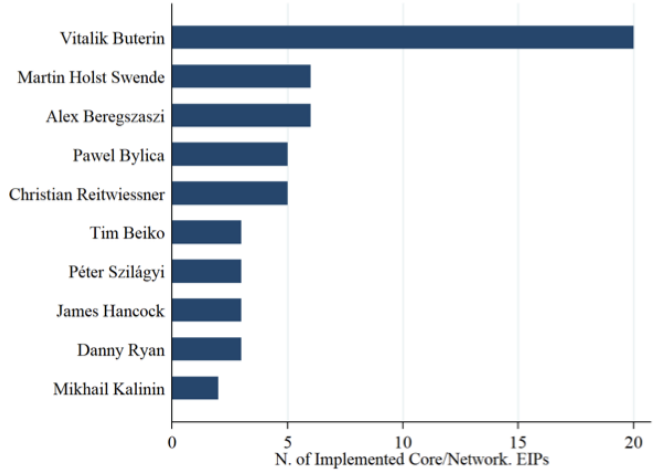


EIP Top Authors (ERC/Interface and Implemented Core/Network)

Finalized (ERC/Interface)

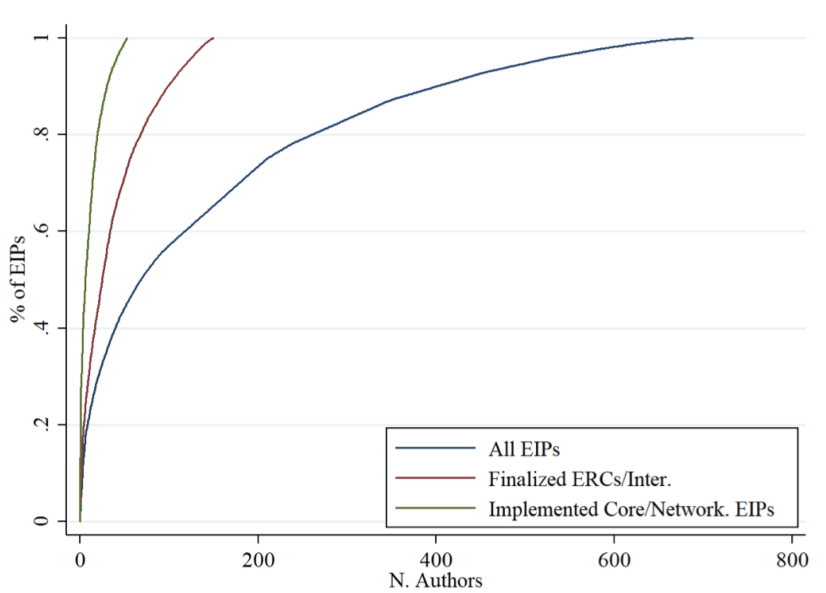


Implemented (Core/Network)

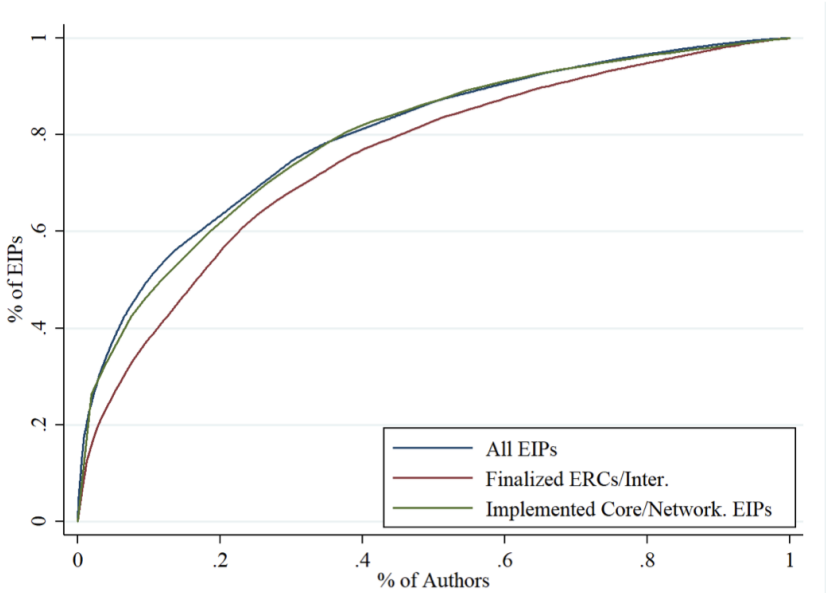


Author Lorenz Curve by Category (#of Authors and Percentile)

Number of Authors



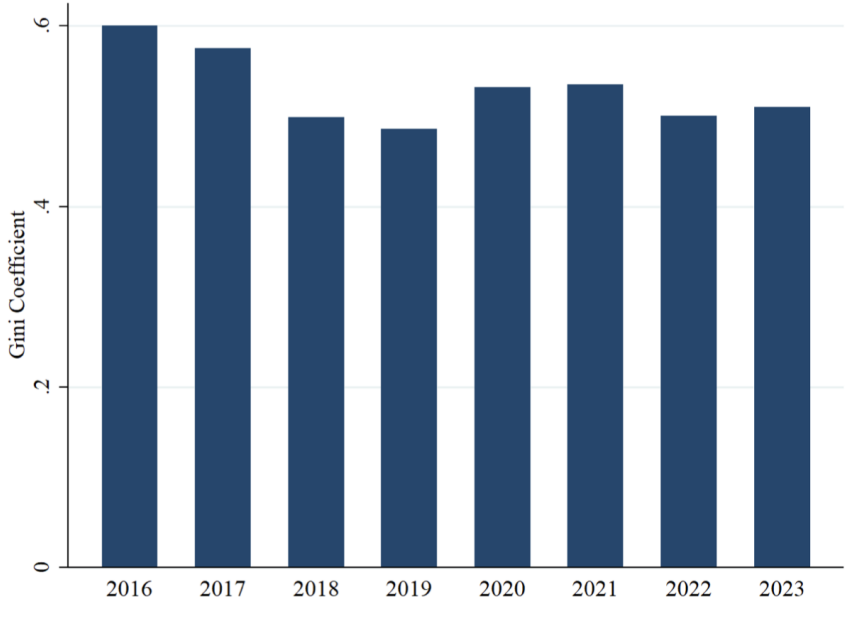
Percentile of Authors



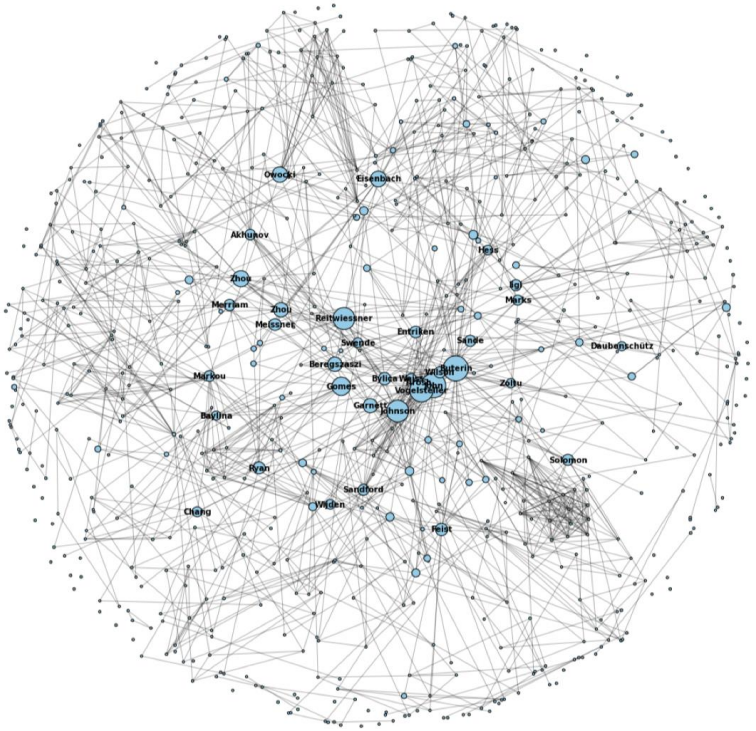
Gini Coefficient of EIP Production Over Time

Figure 9. : Concentration of EIP Production over Time

This table shows the Gini coefficient for each two-year rolling window. Year 2023 numbers are incomplete, as data collection ended on June 21.



EIP Co-Authorship Network

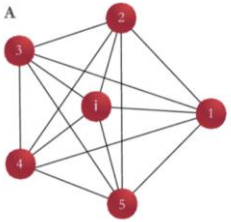


Computing the Clustering Coefficient:

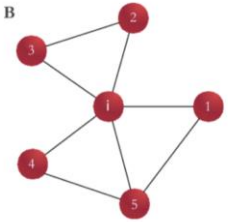
$$C = \frac{1}{n}\sum_i C_i = \frac{1}{n}\sum_i \frac{\sum_{j,k} A_{i,j}A_{j,k}A_{k,i}}{\sum_j A_{i,j}(\sum_j A_{i,j} - 1)}$$

Fully Connected

$C_i = 1$

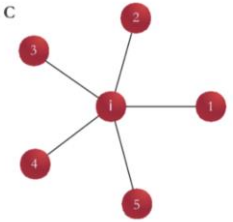


$C_i = 0.3$

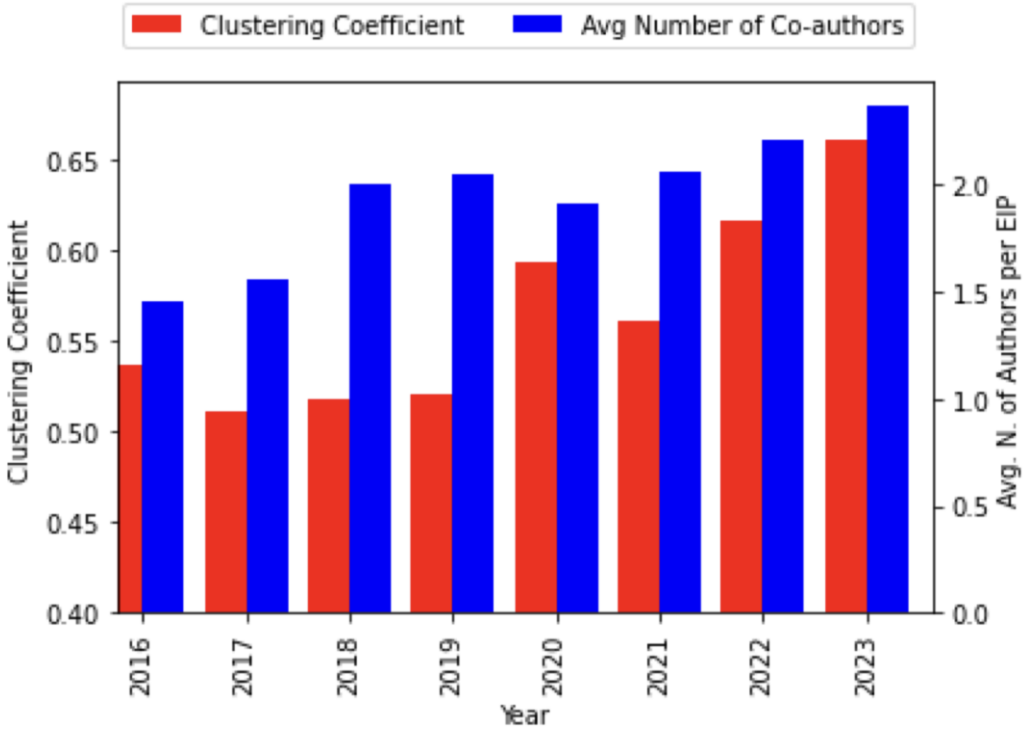


Hub-and-Spoke

$C_i = 0$



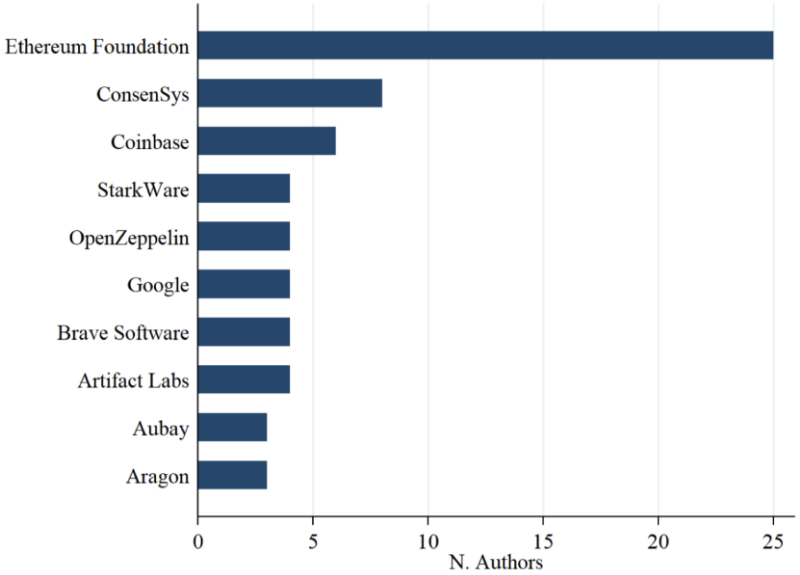
Clustering Coefficient and Avg. N. of Co-Authors Over Time



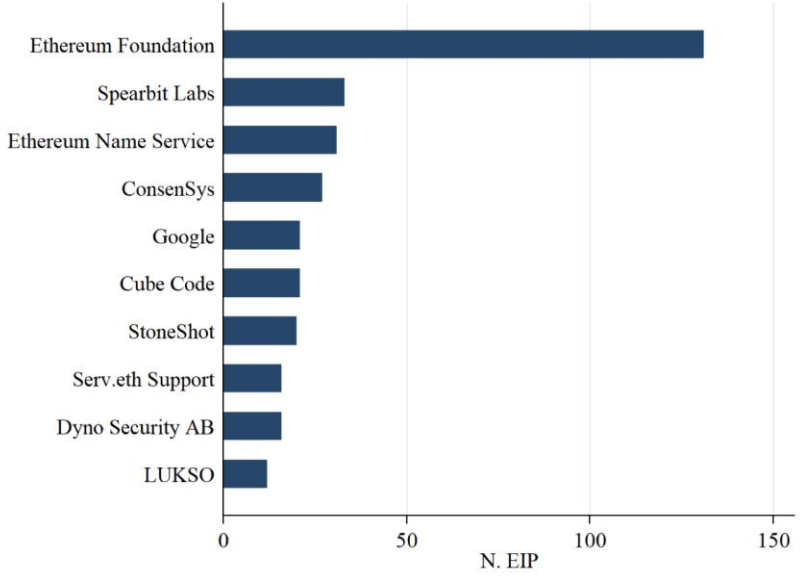
Concentration wrt Companies and Organizations

Company Affiliation by Number of Authors and EIPs

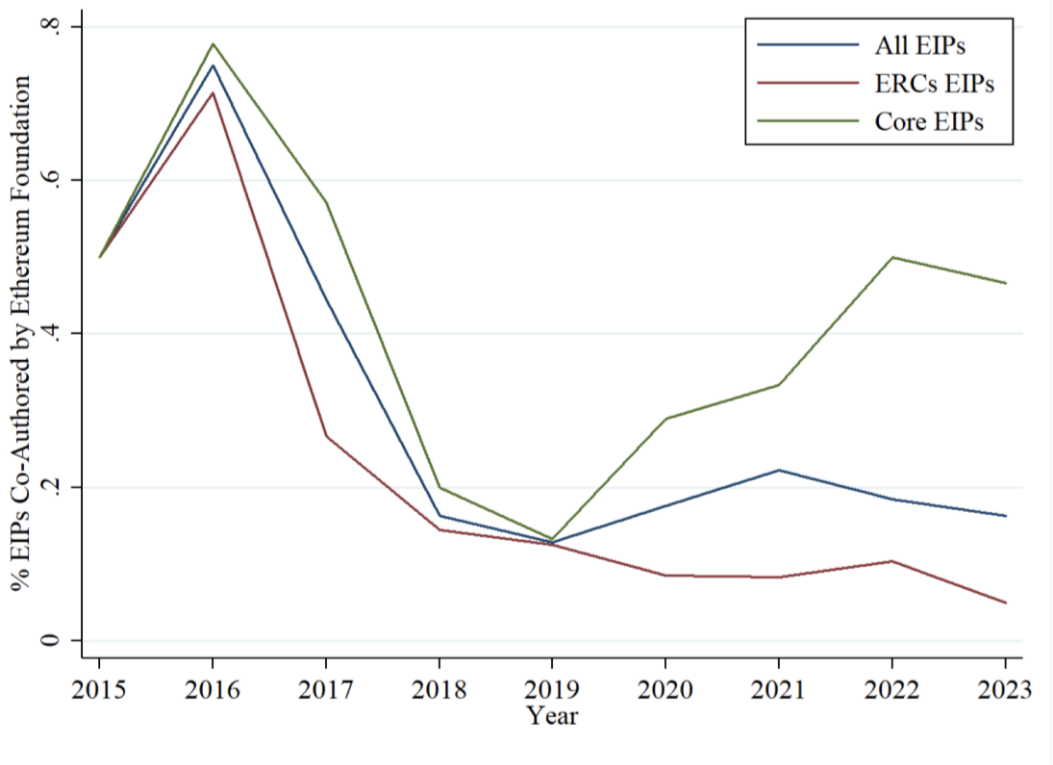
Number of Authors



Number of EIPs



Influence of Ethereum Foundation Over Time



Decision-Making in Ethereum Governance

What determines EIP success?

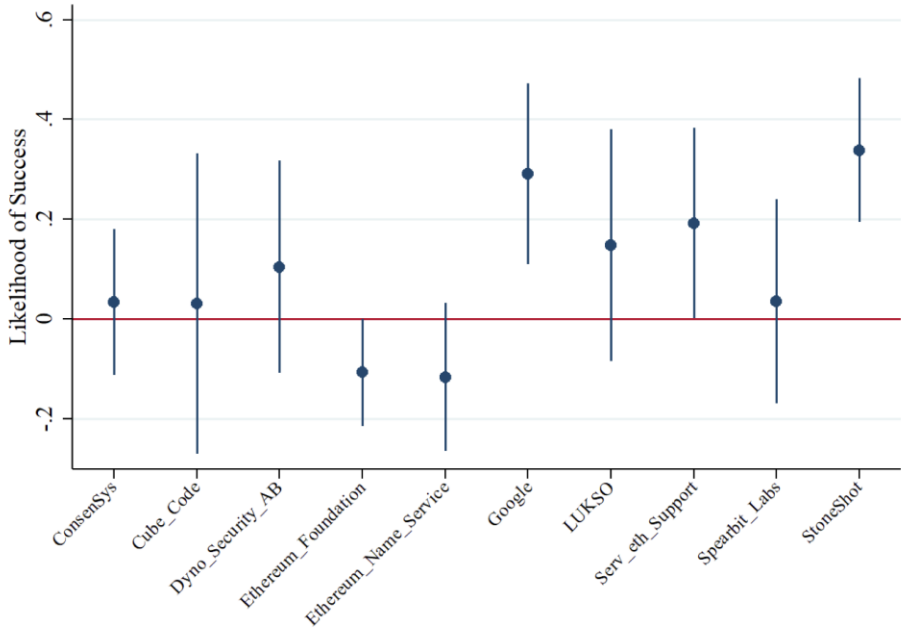
EIP Finalization/Implementation Success Factors

	Finalized				Implemented	
	All EIPs		ERC EIPs		Core EIPs	
	(1)	(2)	(3)	(4)	(5)	(6)
Social Influence Index	0.077***	0.112***	0.070***	0.103*	0.080***	0.097***
	(4.18)	(3.80)	(2.64)	(1.98)	(2.83)	(2.64)
N. EIP Authors	0.066***	0.083***	0.052**	0.070*	0.121***	0.105**
	(3.41)	(3.25)	(2.35)	(1.90)	(3.57)	(2.44)
N. Words in EIP (k)	0.016	-0.025	0.052**	0.033	-0.081**	-0.130***
	(0.87)	(-0.94)	(2.41)	(0.92)	(-2.46)	(-4.31)
Readability Score	0.002	0.001	0.004**	0.004	-0.003	-0.007**
	(1.19)	(0.23)	(2.14)	(0.86)	(-1.19)	(-2.06)
Community Engagement Index		0.026**		0.045		0.027
		(2.00)		(1.12)		(1.58)
Category FE	Yes	Yes	Yes	Yes	Yes	Yes
Company FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	431	220	249	107	178	112
Adjusted R^2	0.33	0.28	0.40	0.31	0.35	0.31

Revisiting Company / Organization Effects

Figure 19. : Company FE Coefficients

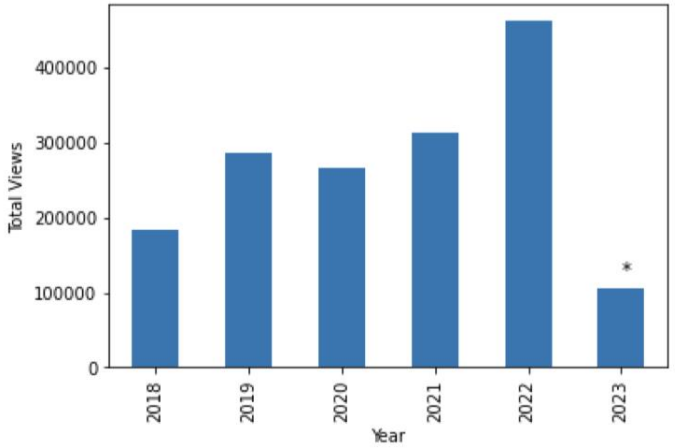
This figure shows the coefficients of the company dummies in specification (4) of table 3.



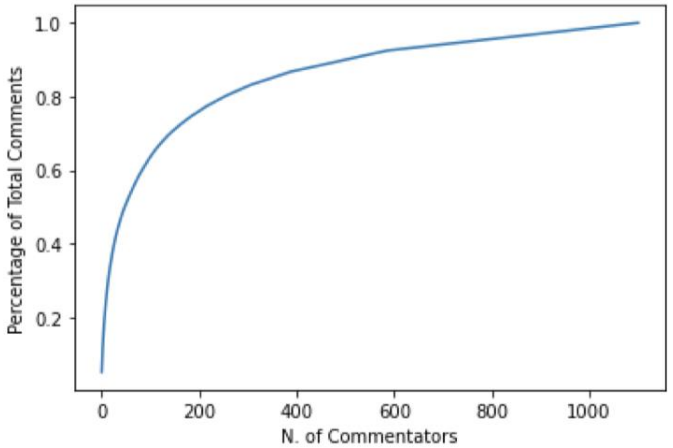
Decision-Making in Ethereum Governance

What is the effect of community engagement?

Community Engagement on «Ethereum Magicians» Forum



(a) FEM Views by EIP Year



(b) Lorenz Curve of FEM Contributors

Community Engagement Determinants

	(1) N. Comments	(2) N. Views	(3) N. Likes	(4) N. Unique Users
Number of EIP Authors	2.40	677.86	1.05	0.62
	(1.17)	(1.45)	(0.53)	(1.26)
Twitter Followers (log)	0.86*	372.75***	1.27*	0.39***
	(1.70)	(3.75)	(1.66)	(2.71)
GitHub Followers (log)	-0.15	-110.08	-0.90	0.01
	(-0.15)	(-0.61)	(-0.73)	(0.04)
Betweenness Centrality	247.80	83586.88	92.11	49.50
	(0.78)	(1.16)	(0.30)	(0.68)
Anonymous Author	-2.16	315.33	-0.67	0.64
	(-0.54)	(0.39)	(-0.19)	(0.51)
Word Count	0.01**	0.90**	0.01**	0.00**
	(2.44)	(2.12)	(2.02)	(2.07)
Readability	0.01	-38.82	-0.15	-0.01
	(0.05)	(-1.11)	(-0.74)	(-0.22)
ERC	-13.29**	-3703.27***	-11.93**	-3.73***
	(-2.44)	(-3.49)	(-2.15)	(-2.68)
Interface	-3.61	-1222.57	1.49	0.47
	(-0.62)	(-0.74)	(0.25)	(0.25)
Networking	-16.05***	-4365.58***	-10.87**	-3.89*
	(-2.92)	(-4.31)	(-2.06)	(-1.88)
Year FE	Yes	Yes	Yes	Yes
Observations	346	346	346	346
Adjusted R^2	0.10	0.17	0.05	0.13

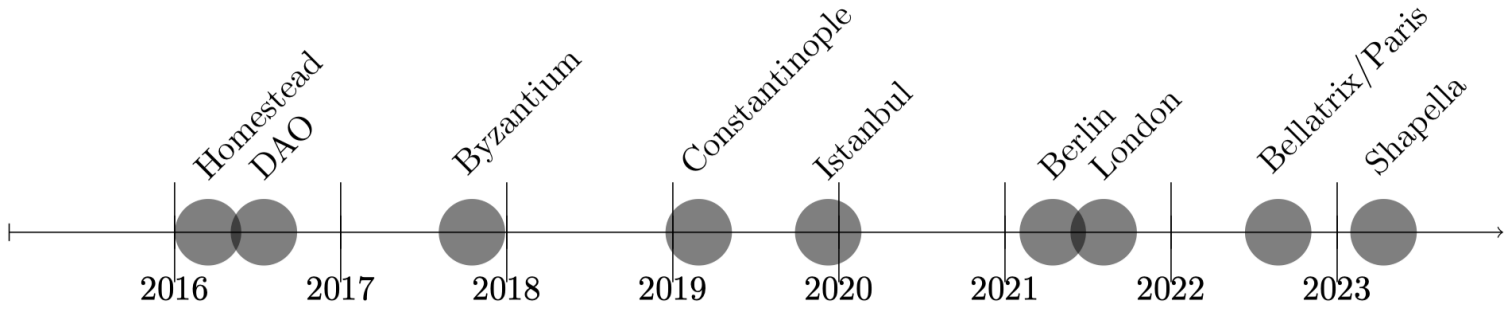
Decision-Making in Ethereum Governance

Client and Reverse Dependency

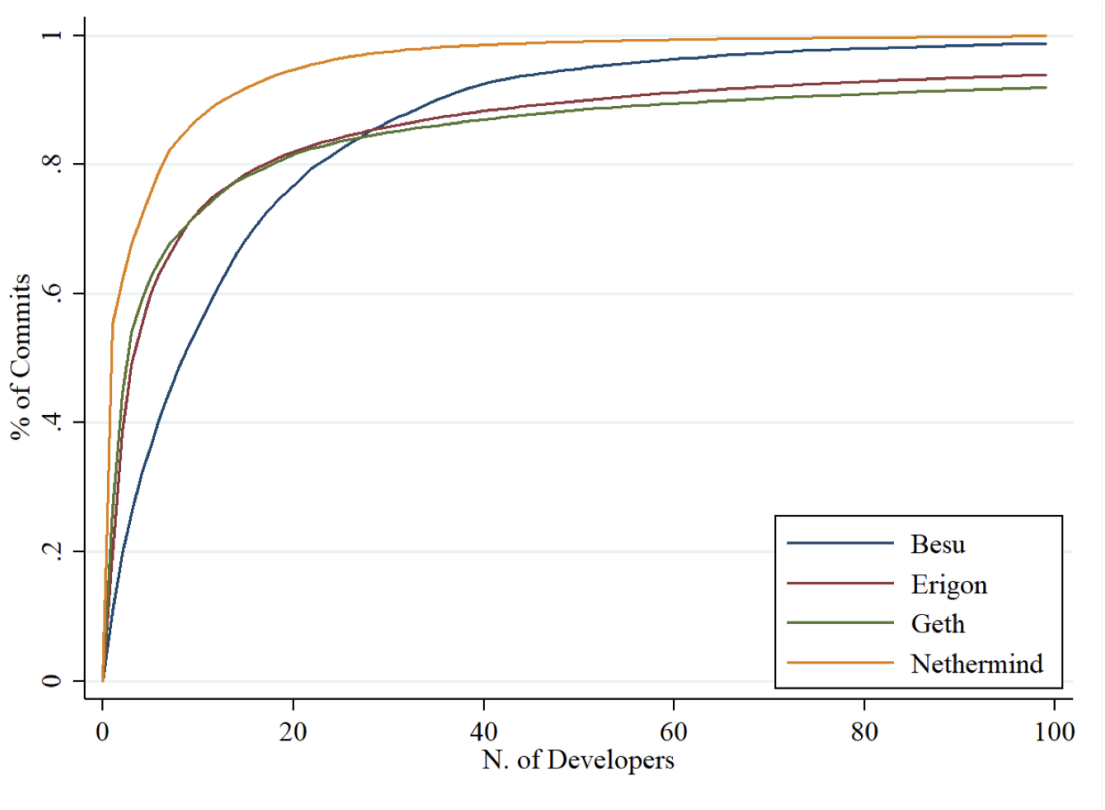
Hard Fork History

Figure 21. : History of Forks

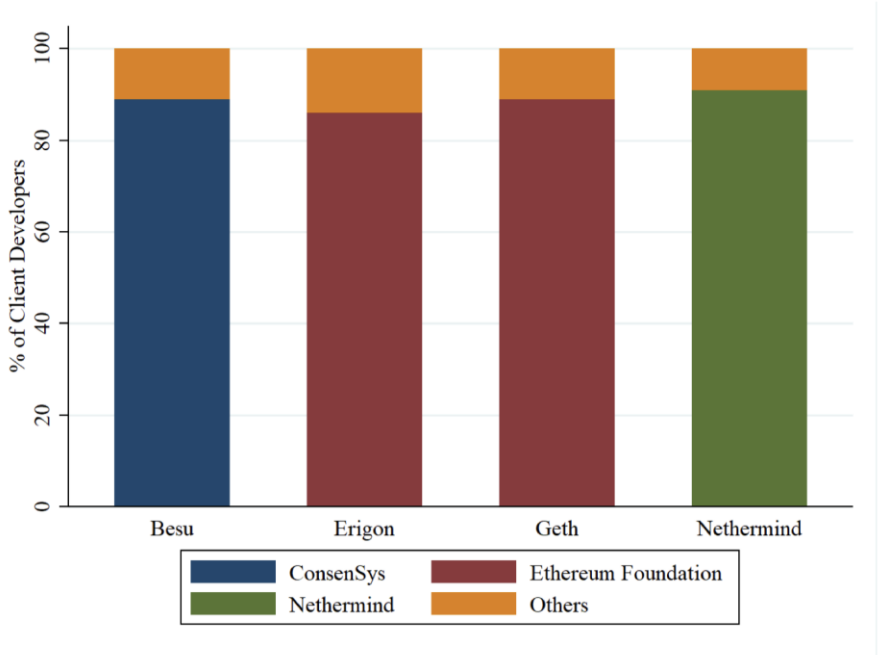
This figure shows the timeline of the major Ethereum hard forks.



Client Development Concentration by Commits

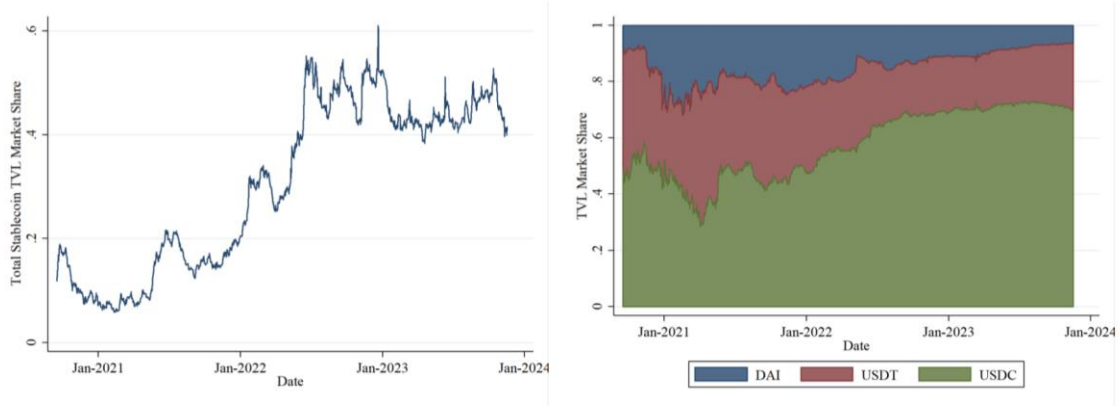


Client Development – Organization Influence



Stablecoin Concentration

Panel (a) shows the percentage of Total Value Locked (TVL) in liquidity pools that include one of the three major stablecoins USDC, USDT, and DAI over time. Panel (b) shows the TVL market share for each of the three major stablecoin USDC, USDT, and DAI over time.



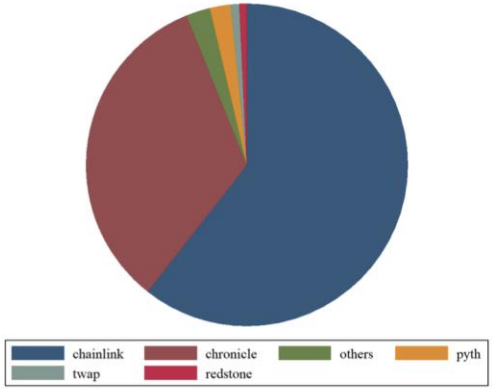
(a) Stablecoin Percentage in All Liquidity Pools

(b) Market Share of Major Stablecoin Issuers

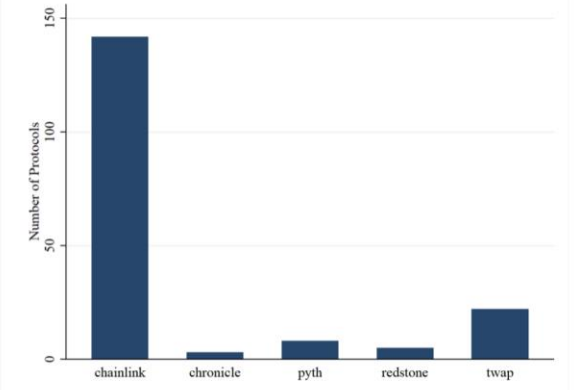
Oracle Concentration

Figure 23. : Oracle Concentration

Panel (a) shows the percentage of Total Value Locked (TVL) in liquidity pools that use a specific oracle provider. Panel (b) shows the number of protocols that use a specific oracle provider. Data from DefiLlama.com



(a) Protocols TVL by Oracle



(b) Number of Protocols by Oracle

Conclusion

Key Takeaways

Conclusion and Key Takeaways

- Ethereum governance is predominantly shaped by a core group of influential contributors.
- The success of these proposals is significantly driven by key attributes of the proposer, including their skills, social outreach and EIP engagement.
- The Developer calls are a critical forum for discussing and ratifying governance proposals.
- We observe a notable client developer concentration.
- We observe a large potential for reverse dependencies. Notable infrastructure providers, such as oracle networks and (off-chain collateralized) stablecoin issuers essentially have a veto right.
- The governance process is very transparent and the community engagement quite large.