Rotman

universität Witten/Herdecke

Phantom Liquidity in Decentralized Lending

Andreas Park and Jona Stinner

Annual WBS Gillmore Centre Academic Conference 2024

Motivation

DeFi and Liquidity Pooling

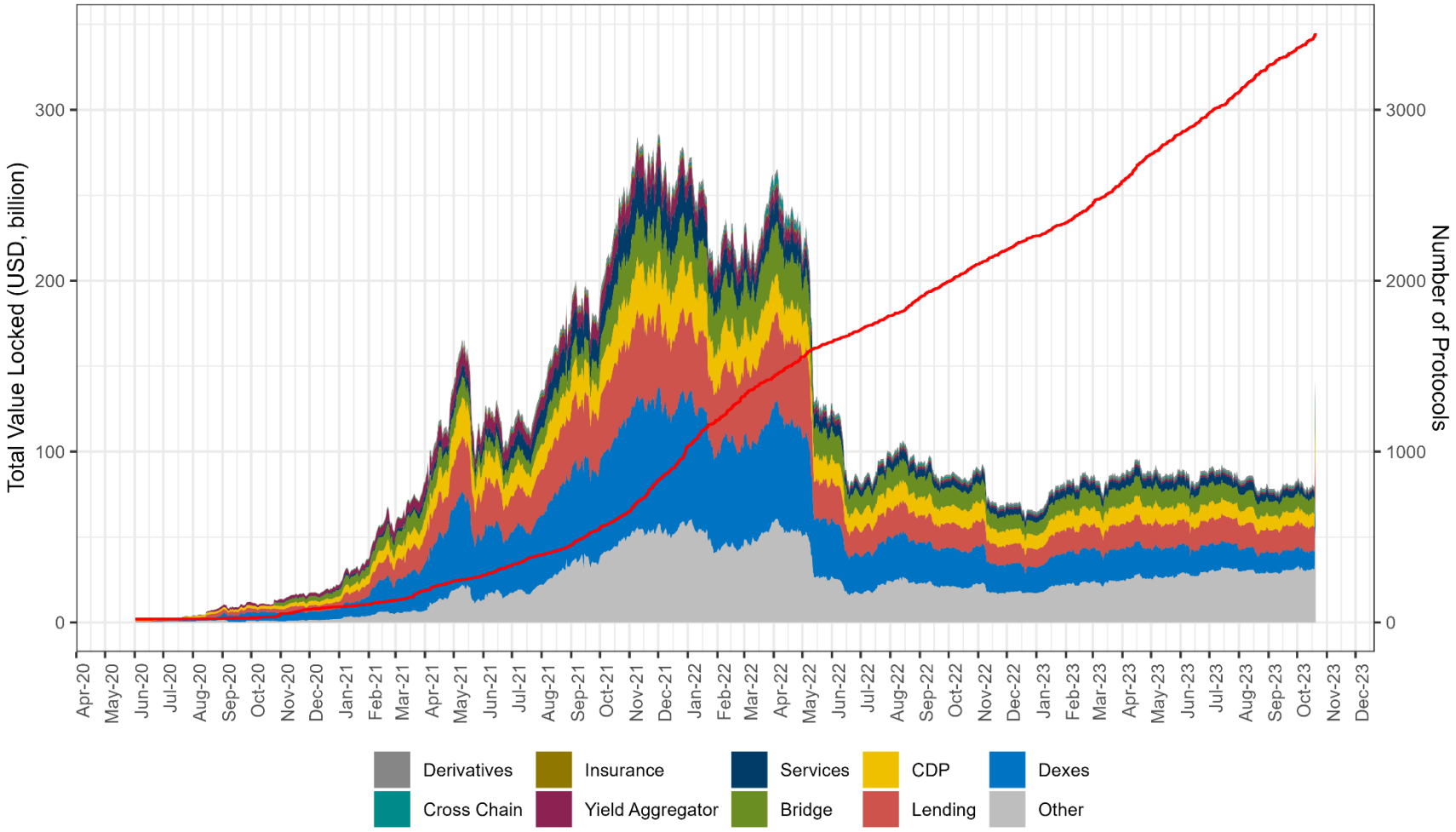


Fig. 1: *DeFi TVL and Number of Protocols* (May 2020 - Nov 2023).

Protocol Activity: Chicken and Egg Problem

Obstacles:

- No deposits => no borrowing
- Fierce competition for liquidity => why deposit if there are no borrowers?

➢ Must stimulate (early) liquidity and activity!

Protocol Activity: Chicken and Egg Problem

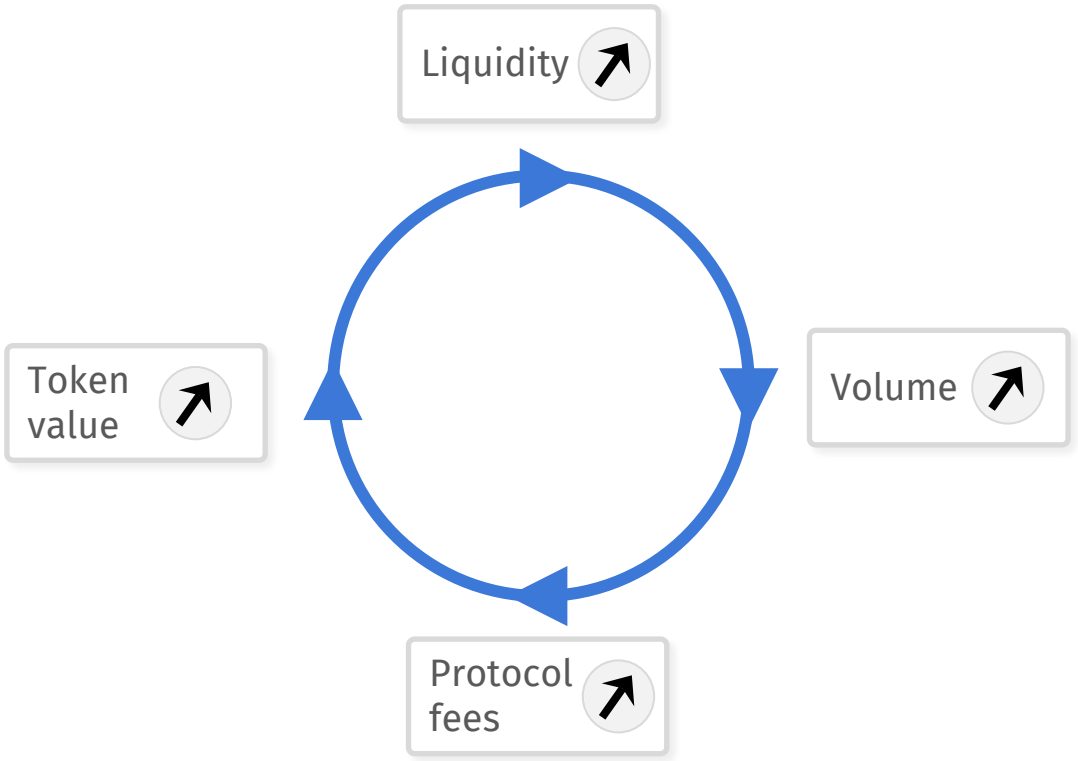
Obstacles:

- Limited incentives for early adoption.
- Fierce competition for liquidity.
- Network effects.

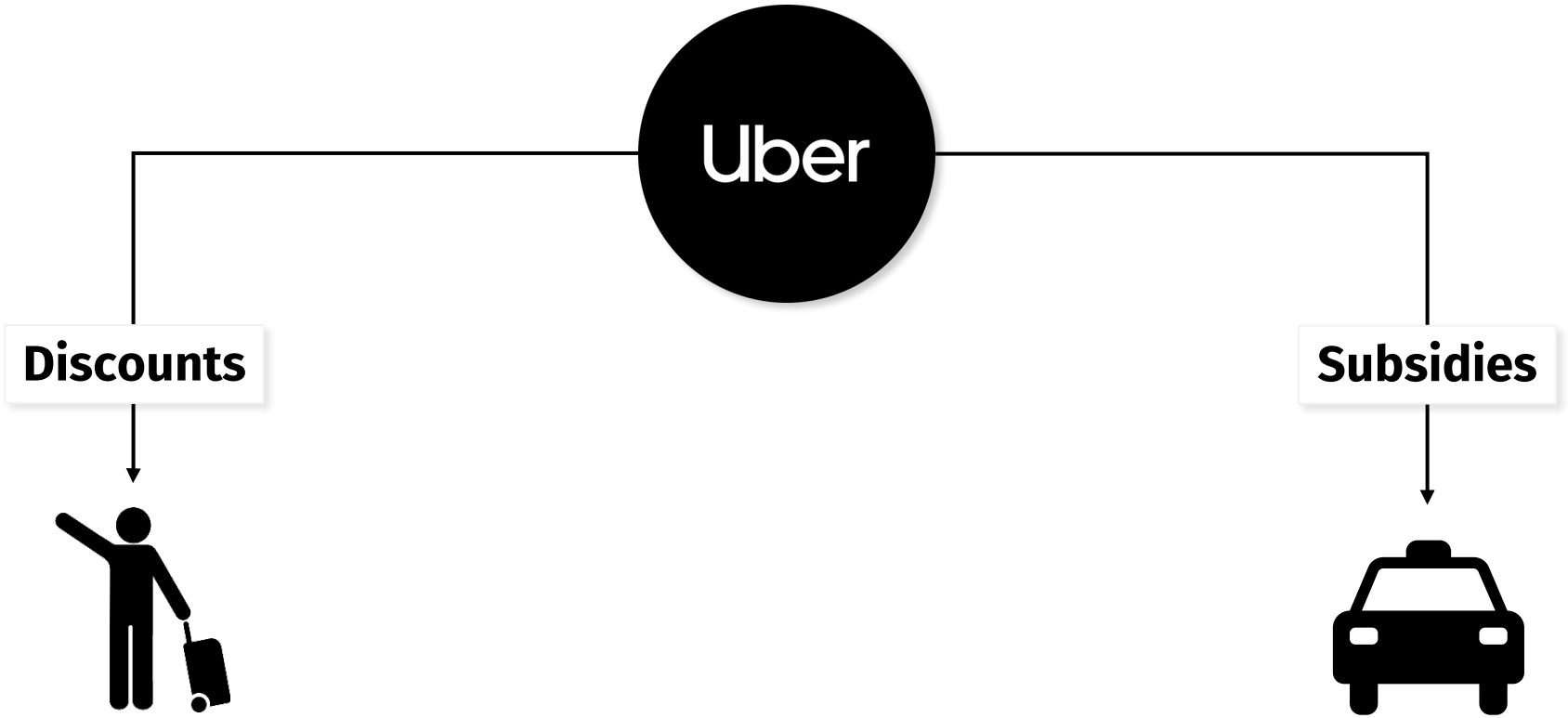
➢How to stimulate (early) liquidity and activity?

Liquidity Mining

- Issuance of equity-like protocol tokens for platforms usage.



Adoption Incentives on Centralized Platforms



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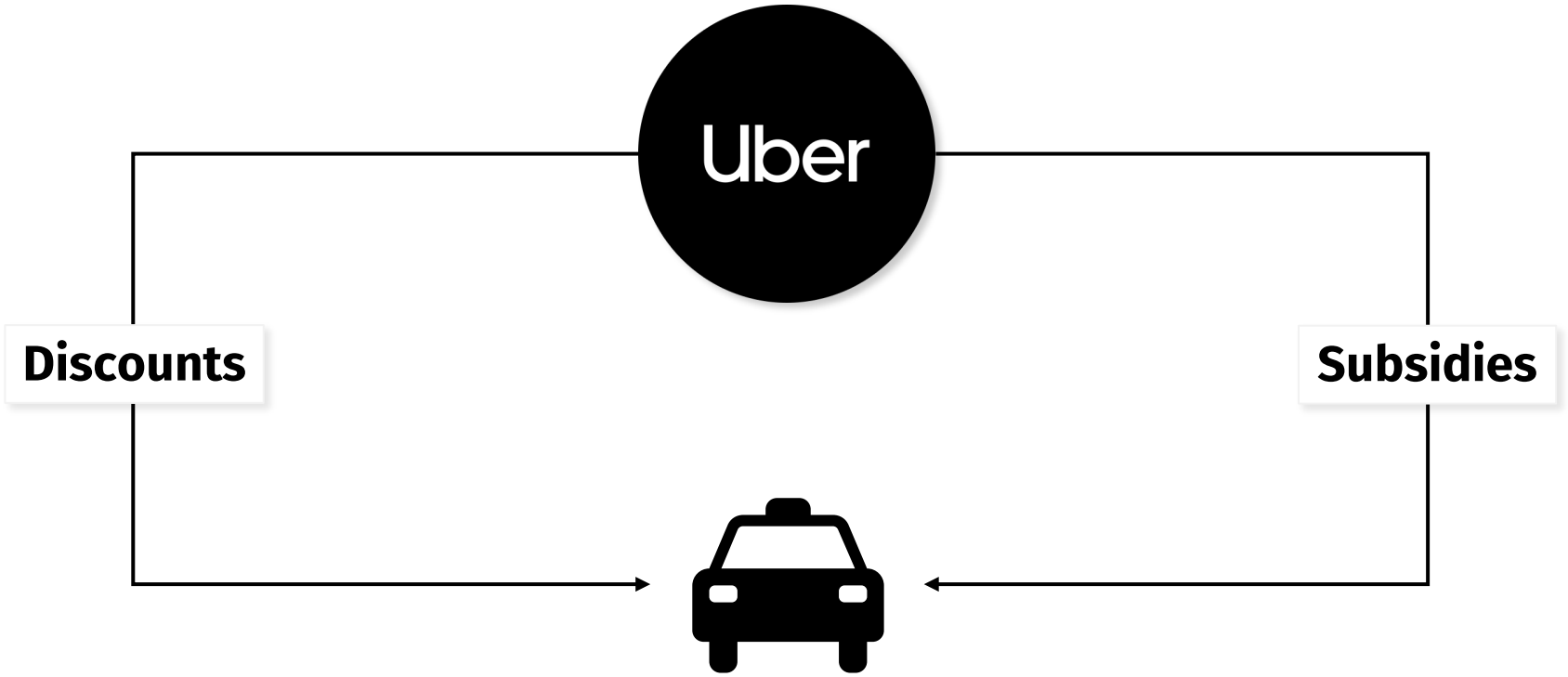

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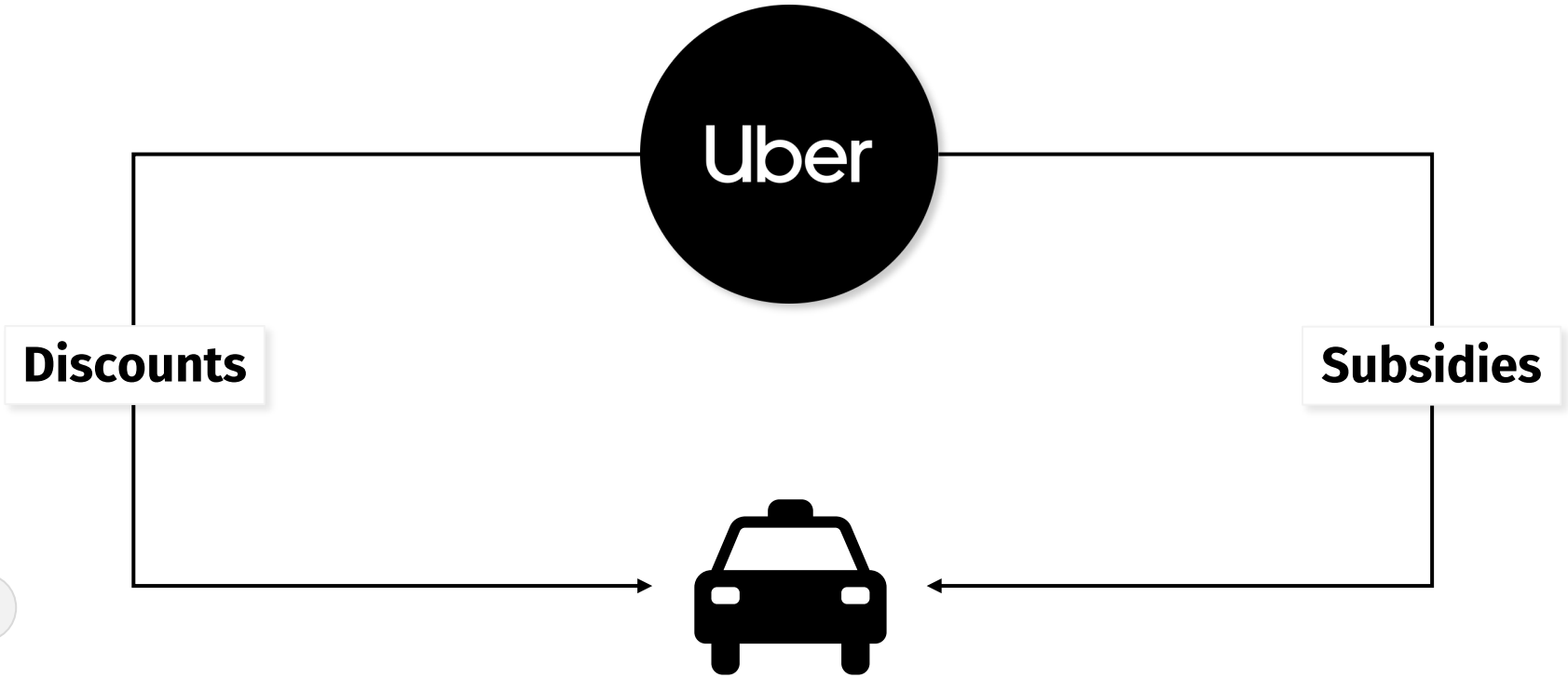


Prices ↗

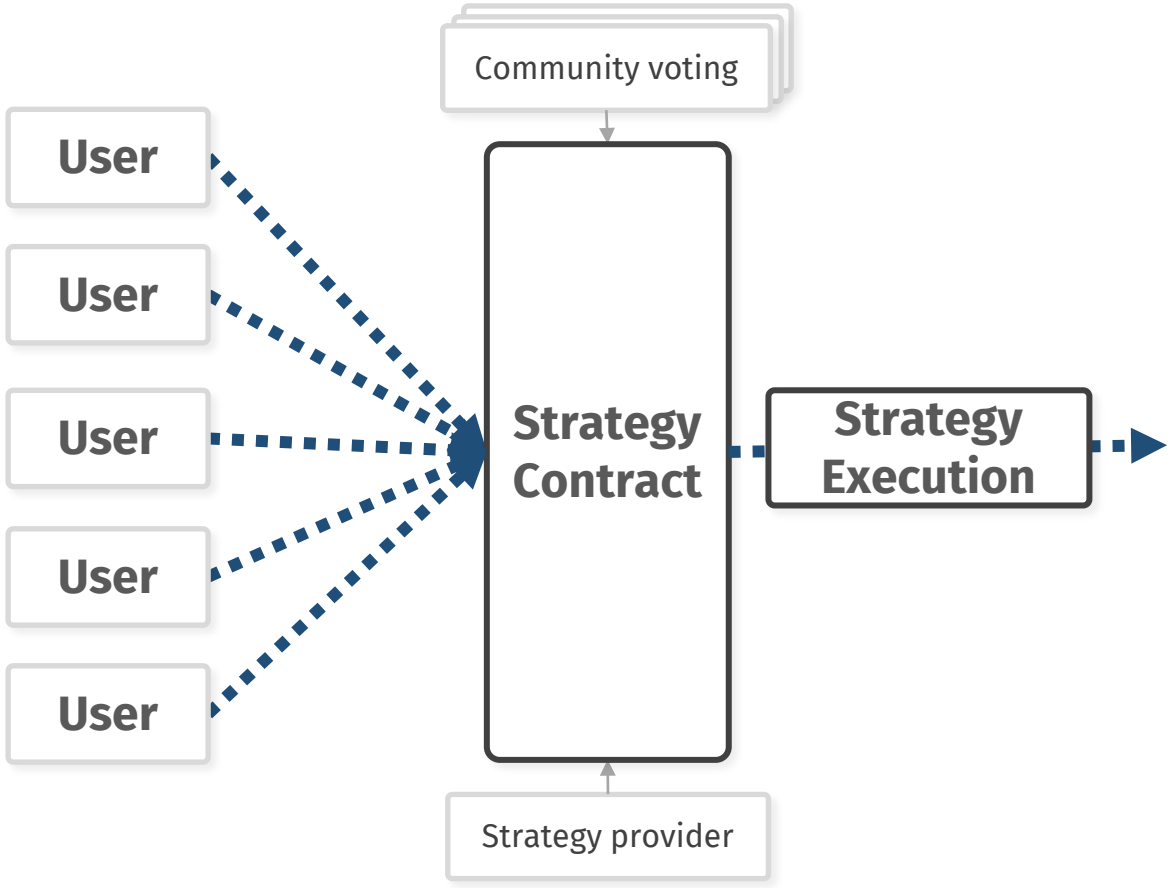
Platform Bootstrapping in DeFi – what's different to TradFi?

What is conceptually different about DeFi?

- Self custody of assets
- Self-access to financial infrastructure
- Blockchain = common resource
- no necessary intermediaries but platforms

What are the consequences?

- No intermediary => no direct subsidies.
- Individuals can act as producers **and** consumers.
- aggregated/pooled investment strategies organize capital allocation.



This Paper

Questions:

1. Does liquidity mining work?
2. Is the liquidity sticky or fleeting?

} Relatively standard questions (except for the specific influence of aggregation strategies)

3. Is the provided liquidity genuine or phantom?
4. Does phantom liquidity harm other users?

} ⇒ The blockchain difference: Can earn incentives on both sides

- Does it happen?
- Does it matter?

This Paper

Questions:

1. How effective is liquidity mining?
2. Does it generate long- or short-term liquidity?
3. Is the provided liquidity available or phantom?
4. Does phantom liquidity harm other users?

Key Results:

- Empirical study of Aave and Compound.
- Incentives drive activity; cessations cause outflows.
- Liquidity-mining creates significant **phantom liquidity**.
- Phantom liquidity creates a net **positive** externality.

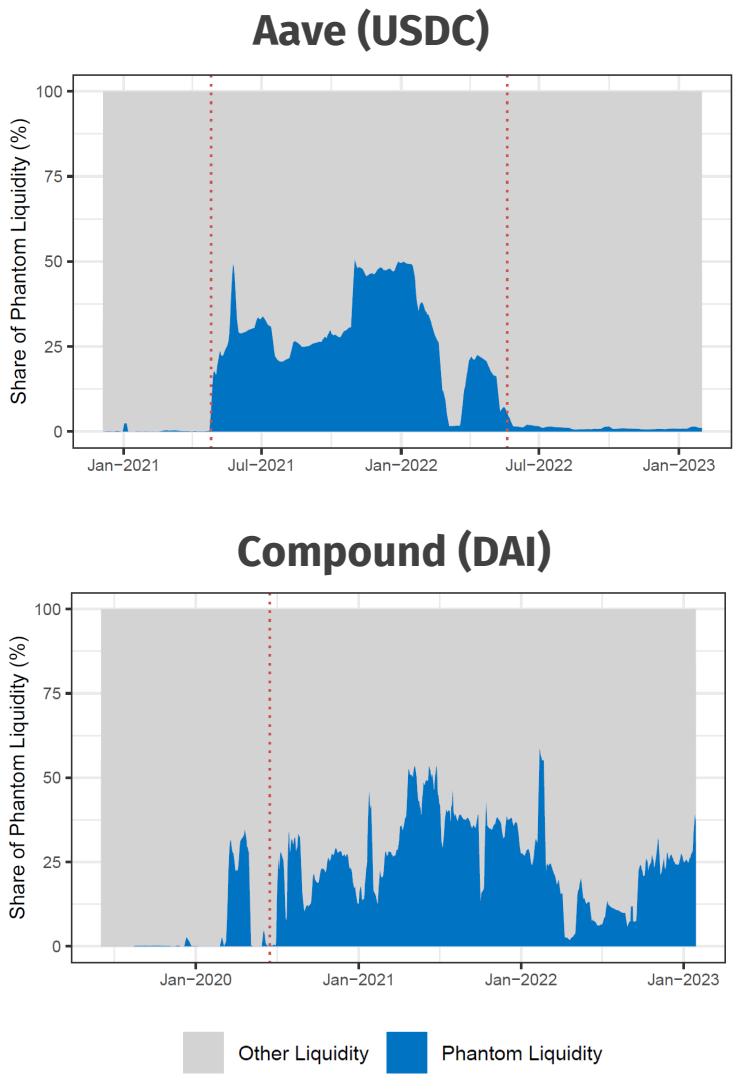


Fig. 2: *Phantom Liquidity in largest Protocol Pools.*

Literature

Platform Economics:

- Adoption: e.g., Rysman (2009); Cabral (2011); Evans & Schmalensee (2010).
- Externalities: e.g., Kampepalli et al. (2019); Liu et al. (2021); Reisinger et al. (2009).

Decentralized Finance:

- Lending: e.g., Rivera et al. (2023); Lehar & Palour (2022); Cornelli et al. (2023); Chaudhary et al. (2023).
- Yield Aggregators: e.g., Cousaert et al. (2022); Augustin et al. (2022).
- General: e.g., Makarov & Schoar (2022); John et al. (2023); Harvey et al. (2021).
- Wash trading: Cong et al. (2023).

Token Financing:

- Gryglewicz et al. (2021); Chod et al. (2022); Gan et al. (2021), among others.

Pool-Based Decentralized Lending

Pool-based Decentralized Lending – how does it work?

Key Features:

- Liquidity pooling
- Overcollateralization
- Floating interest rates based on utilization.
- Open liquidation mechanism.

Pool-based Decentralized Lending

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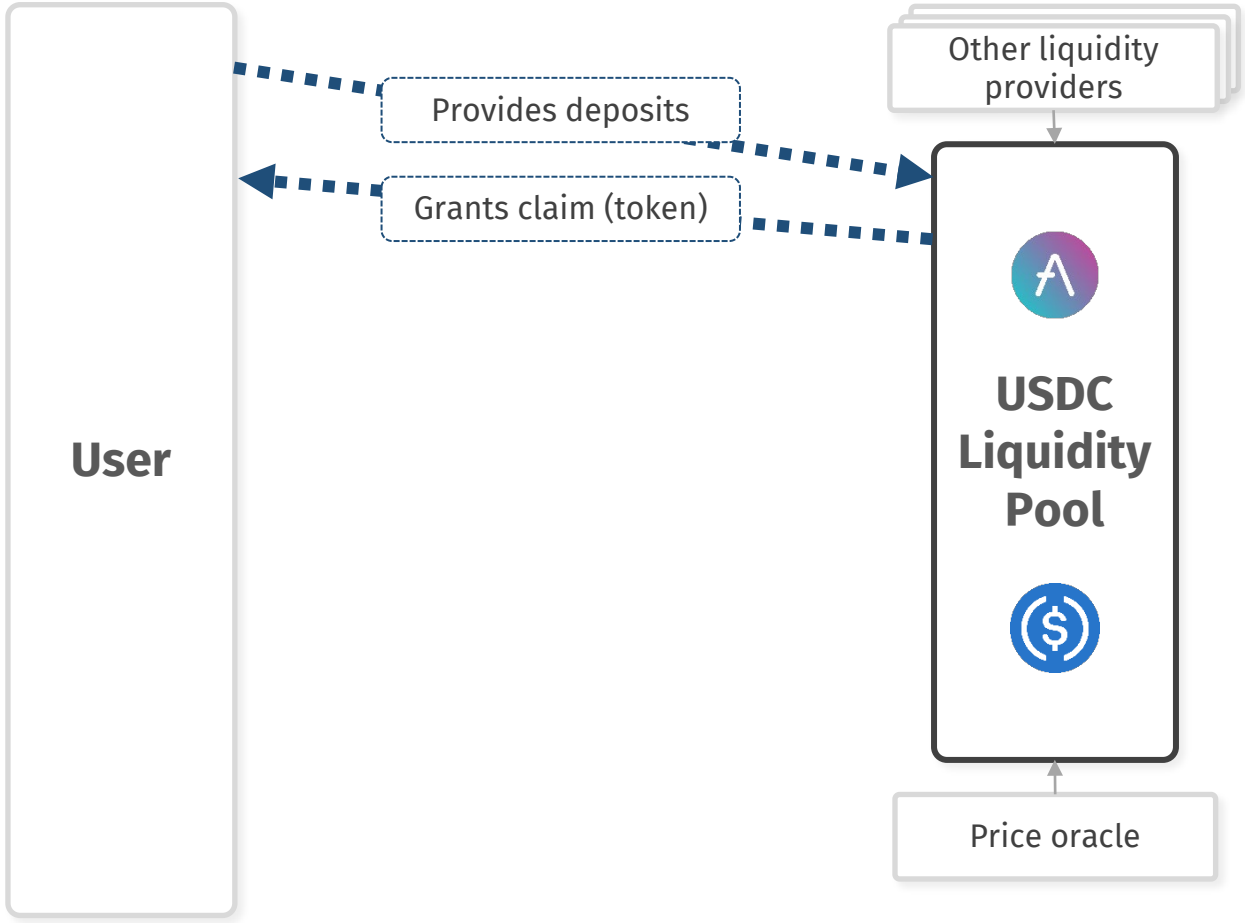

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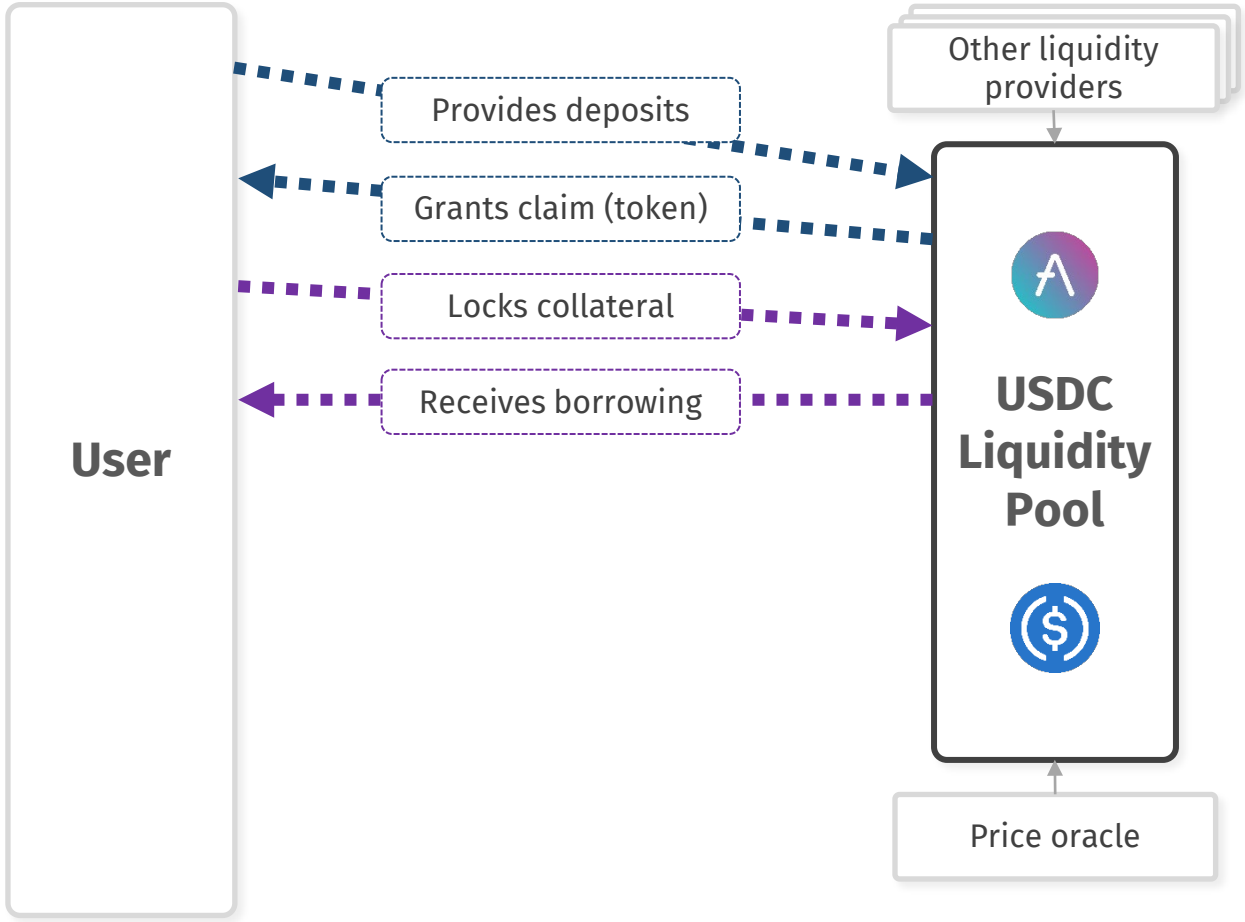

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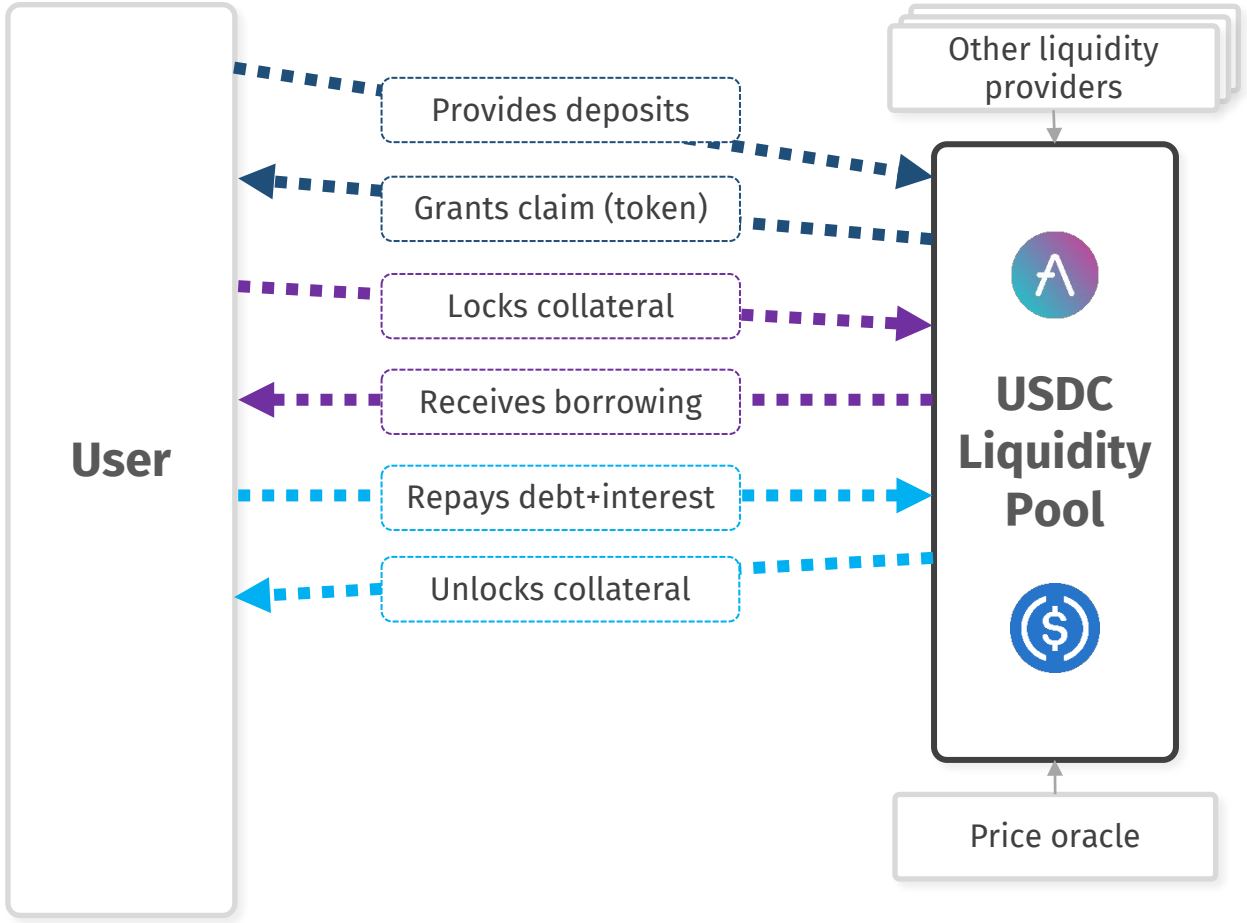

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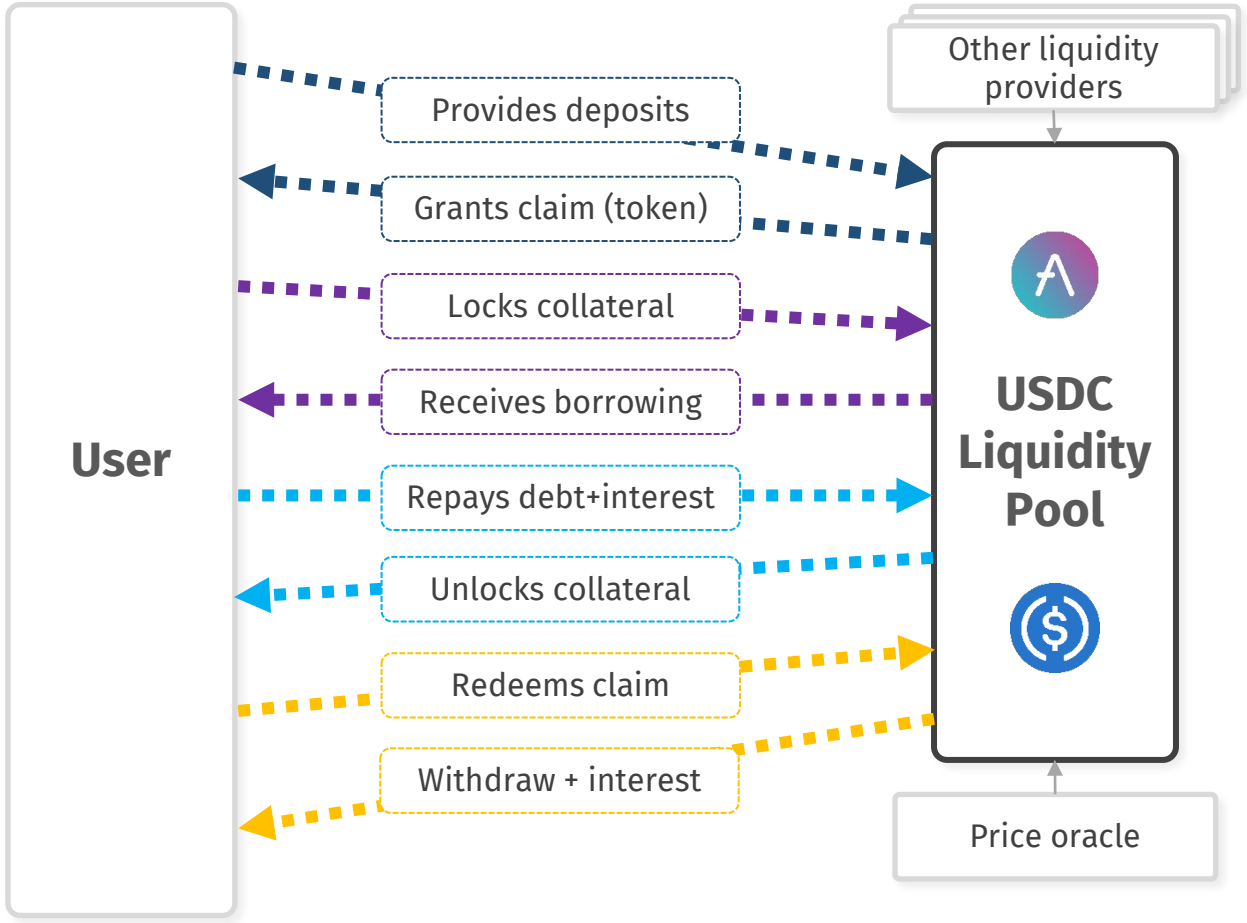


Interest Rates

Utilization:

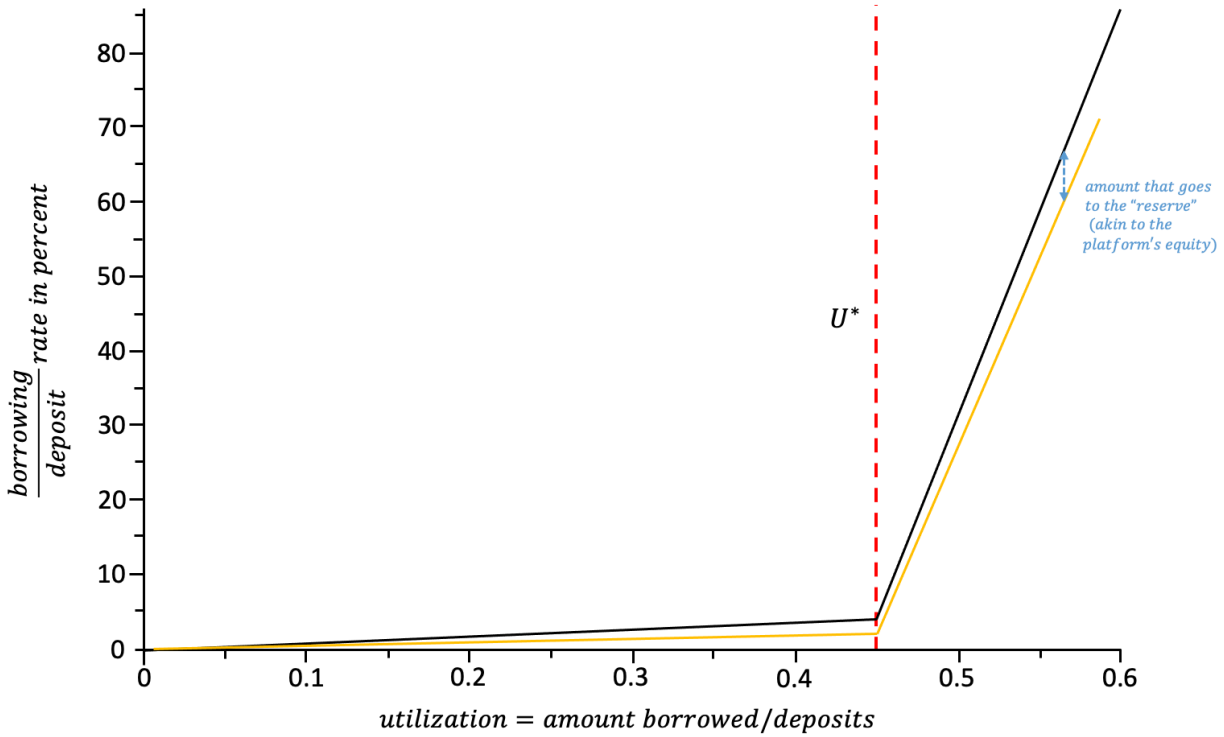
$$U = \frac{Total\ Borrowings}{Total\ Deposits}$$

Borrow interest rate:

- Stepwise linear function of utilization.
- Sharply increasing after threshold.

Deposit interest rate:

- Borrow rate minus reserve.



Example: Liquidity Mining on Compound – how does it work?

Reserve Contract
(4.23M COMP Token)

June 15, 2020

Compound

February 2023

≈1300 COMP/day
($71K)

97%

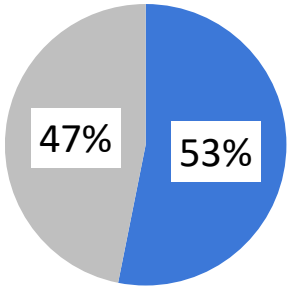
3%

Stablecoin pools

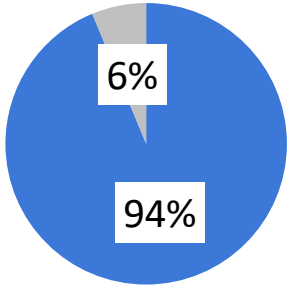
1:1

Volatile pools

1:1



Deposits



Borrowings

Stablecoins Volatile Coins

Pool-Level-Analysis

Data

1. **User, Pool, and Protocol Data**
   - May 2019 to February 2023.
   - 3.4M raw user interactions with 56 asset pools (across both AAVE & Compound)
   - Aggregated to day, user, pool, and protocol.

2. **Liquidity Mining Programs**
   - Historical liquidity mining rewards from 322 governance decisions.
   - Start, end, and adjustment dates; allocation per pool; depositor-to-borrower weight.
   - Complete time series of token and USD rewards.

Pool-Level Results: Total Rewards Distribution

- Aave: **$193M** (85% SC).
- Compound: **$453M** (83% SC).
- 135 protocol-token changes.

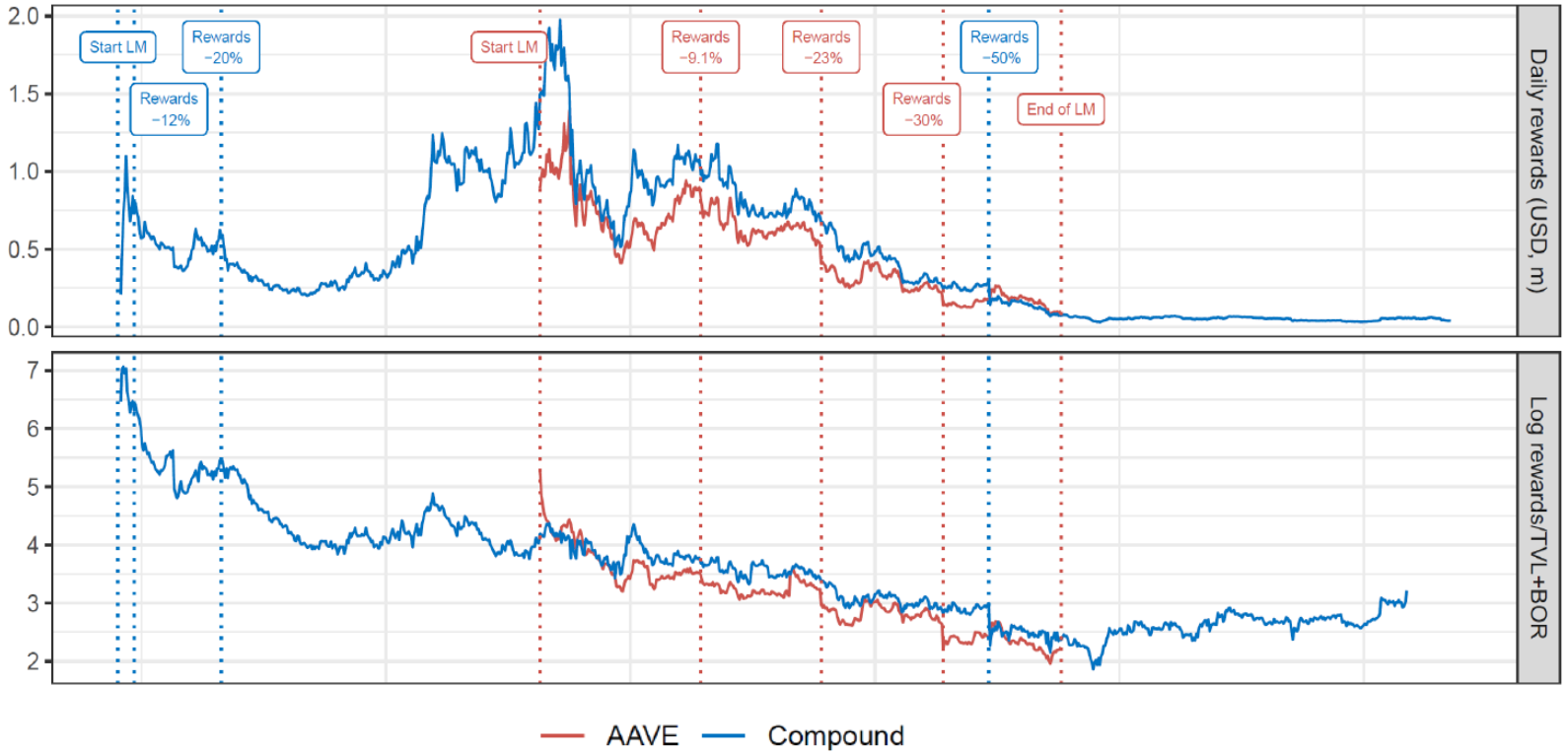


Fig. 4: Liquidity Mining Rewards (May 2019 – Feb 2023).

Pool-level Analysis (i)

Background

- Events: start, reduction, increase and end at pool and protocol level.
- Event windows of ±14 days for each change.
- Dependent variables: Normalized *deposits*, *loans*, *%of circ supply*, *utilization*, and net flows.

Econometric Approach

- Event study, comparing a treatment to all untreated protocol-token combinations.
- Unobserved structural model:

$$DV_{jit} = \beta_0 + \beta_1 LM\ change_{jt} \times treated_{jt} + \beta_2\ LM\ change_{jt} + \beta_3 treated_{jt} + time\ series\ controls_t + \epsilon_{jit}$$

Pool-level Analysis (ii)

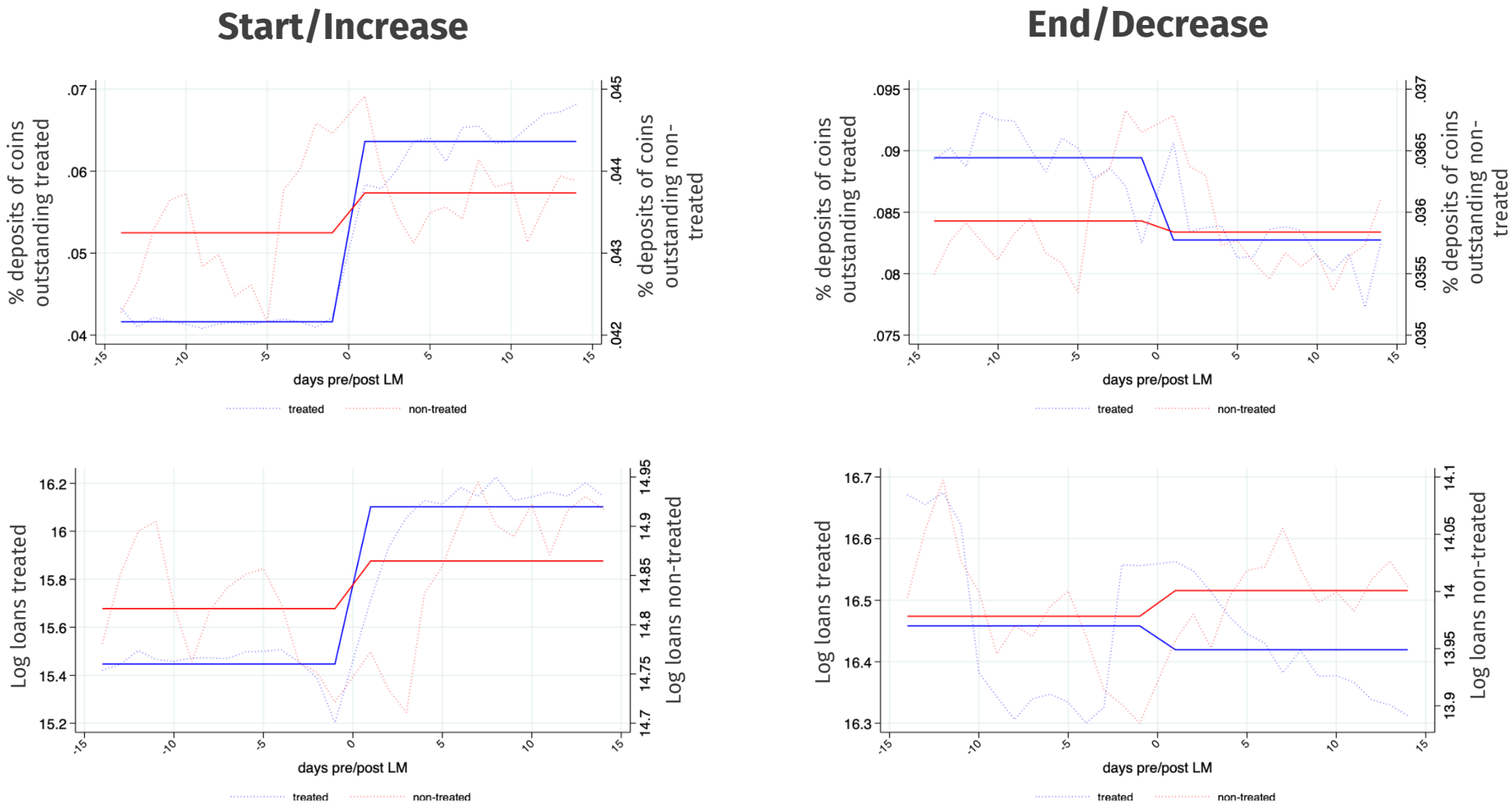


Fig. 5: Effect of Liquidity Mining on Lending Protocols

User-Level-Analysis

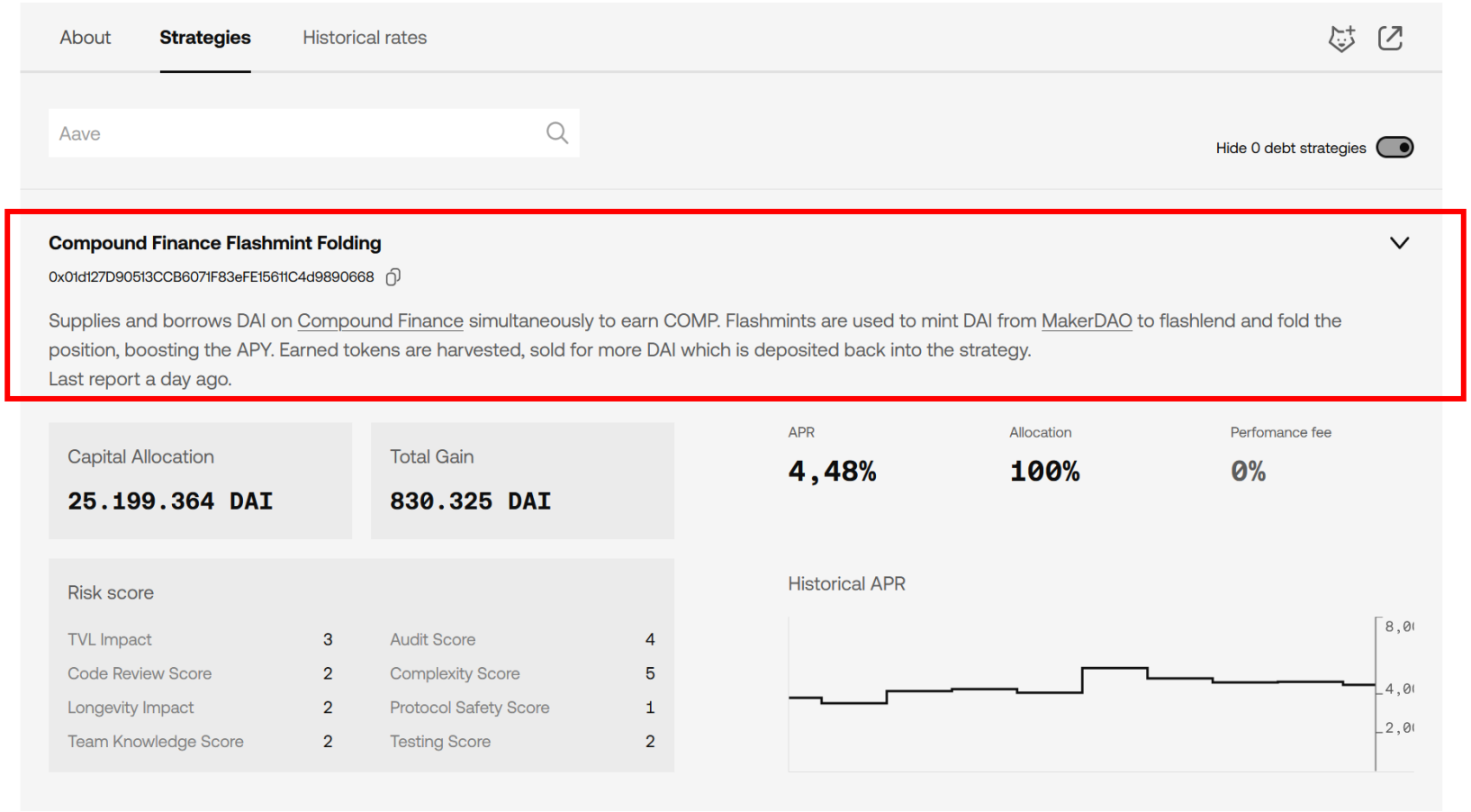
Yield Aggregators

Data:

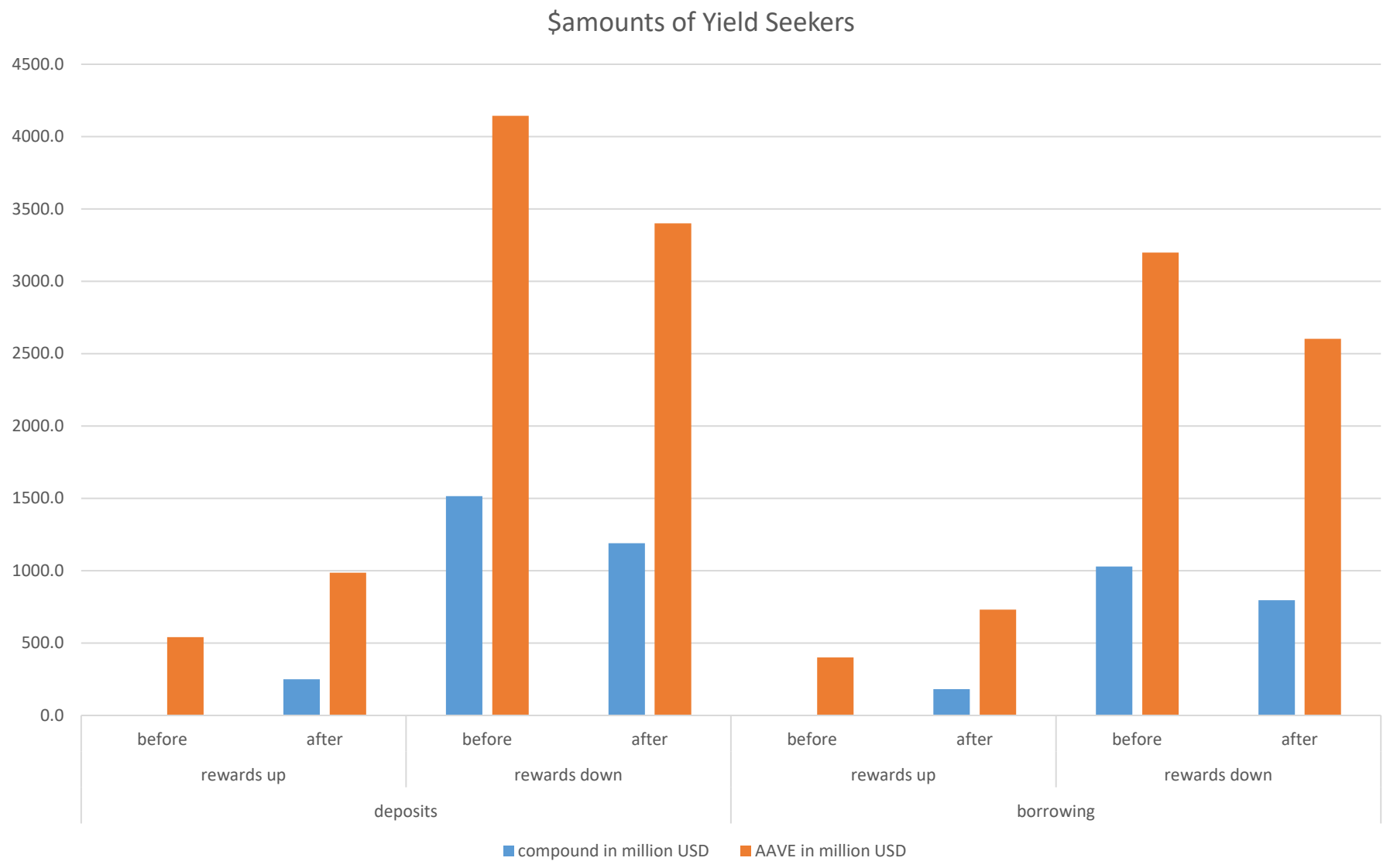
- Addresses of the 10 largest yield aggregators on Ether-eum (95% market share).
- 177 from 4,138 addresses interacted with Aave and Compound.

Yield Seeker:

- Stable-to-stable users = accounts that deposit and immediately borrow-back the same stablecoin
- Yield Aggregators.



Yield Aggregators Behavior: Summary stats



User-Level Analysis: Yield Seeker Shares

- **18%** and **31%** deposits and borrowings o.a.
- 92% of investments go to stablecoin pools.

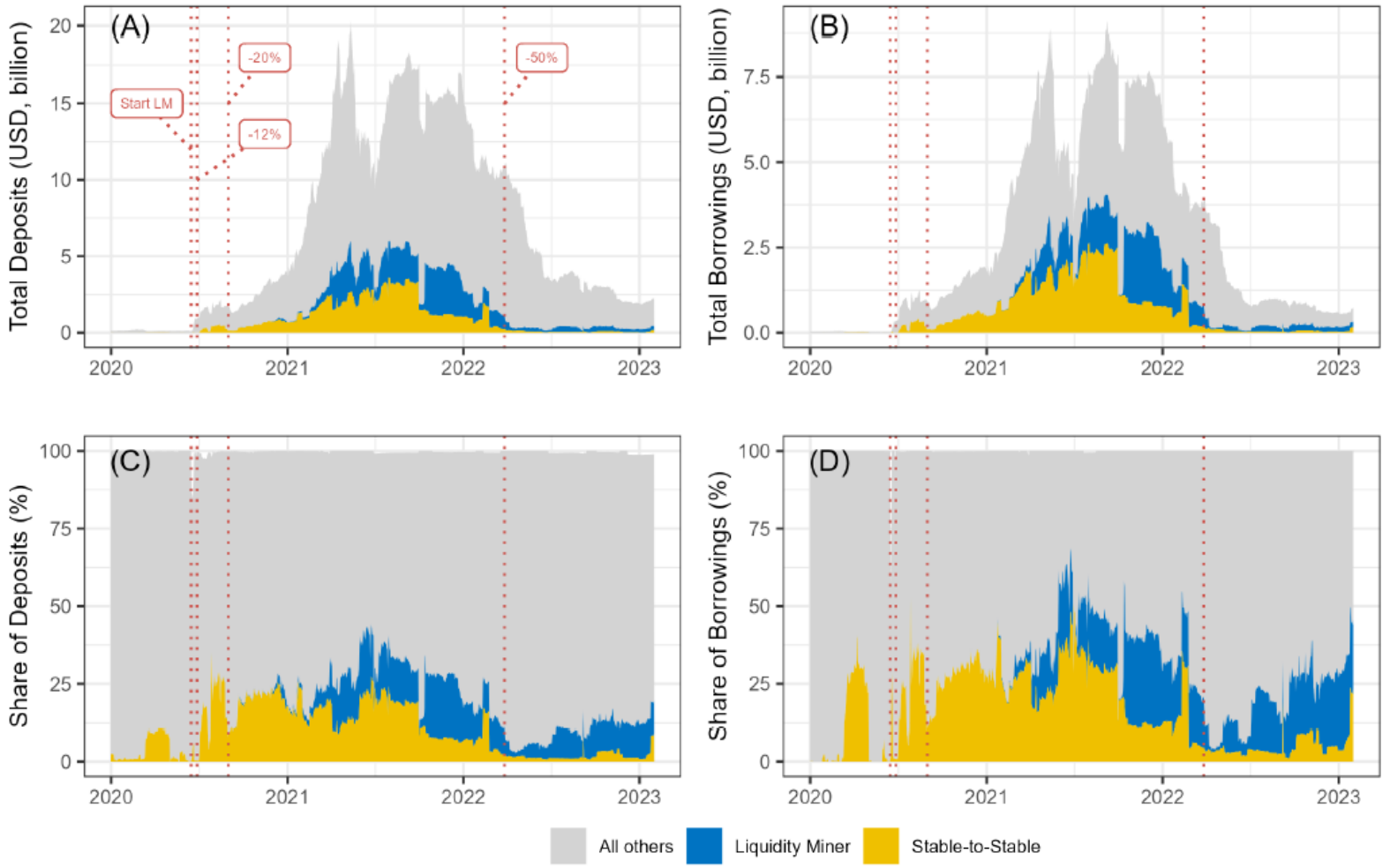


Fig. 6: Activity of Yield Seekers on Compound (May 2020 - Feb 2023).

Yield Seeker and Externalities

1. YS create phantom liquidity, obfuscating benchmarks (similar to wash-trading as identified by Cong et al., 2023).
2. YS alter pool utilization and deposit/borrow rates for **all** users.

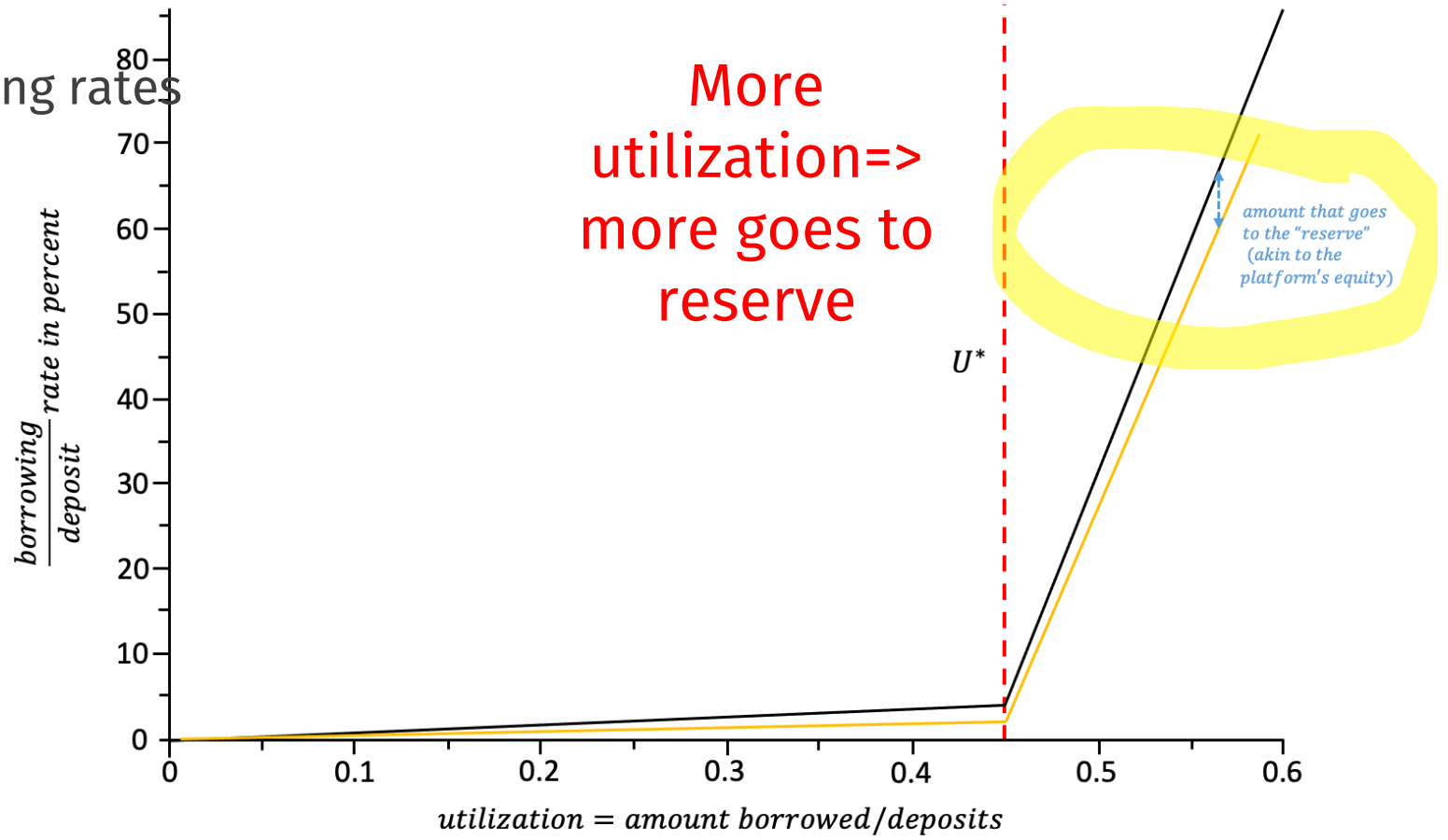
Impact of YS a on utilization: $U = \frac{B+B_a}{D+D_a} \Leftrightarrow U = \frac{B}{D}\left(\frac{1+\frac{B_a}{B}}{1+\frac{D_a}{D}}\right)$

Therefore $U(before)<U(after)$ iff $B_a/D_a>B/D$

Yield Seeker and Externalities: why does utilization matter?

Why does utilization matter?

- Higher utilization
  => higher borrowing & lending rates



Yield Seeker and Externalities

Our approach: take out the yield seekers

a) Counterfactual utilization, borrowing and lending rates

b) Cash value of interest that other users would have paid/received without Yield Seekers.

User-Level Analysis: Yield Seeker Externalities

- Reduce utilization by **3.7p.p.** and **2p.p.** on Compound and Aave.
- Depositors forfeit **$602M** in interest
- Borrowers saved **$649M.**
- Net positive effect of **$47M** (7% of LM)
- **25%** of TVL is phantom.

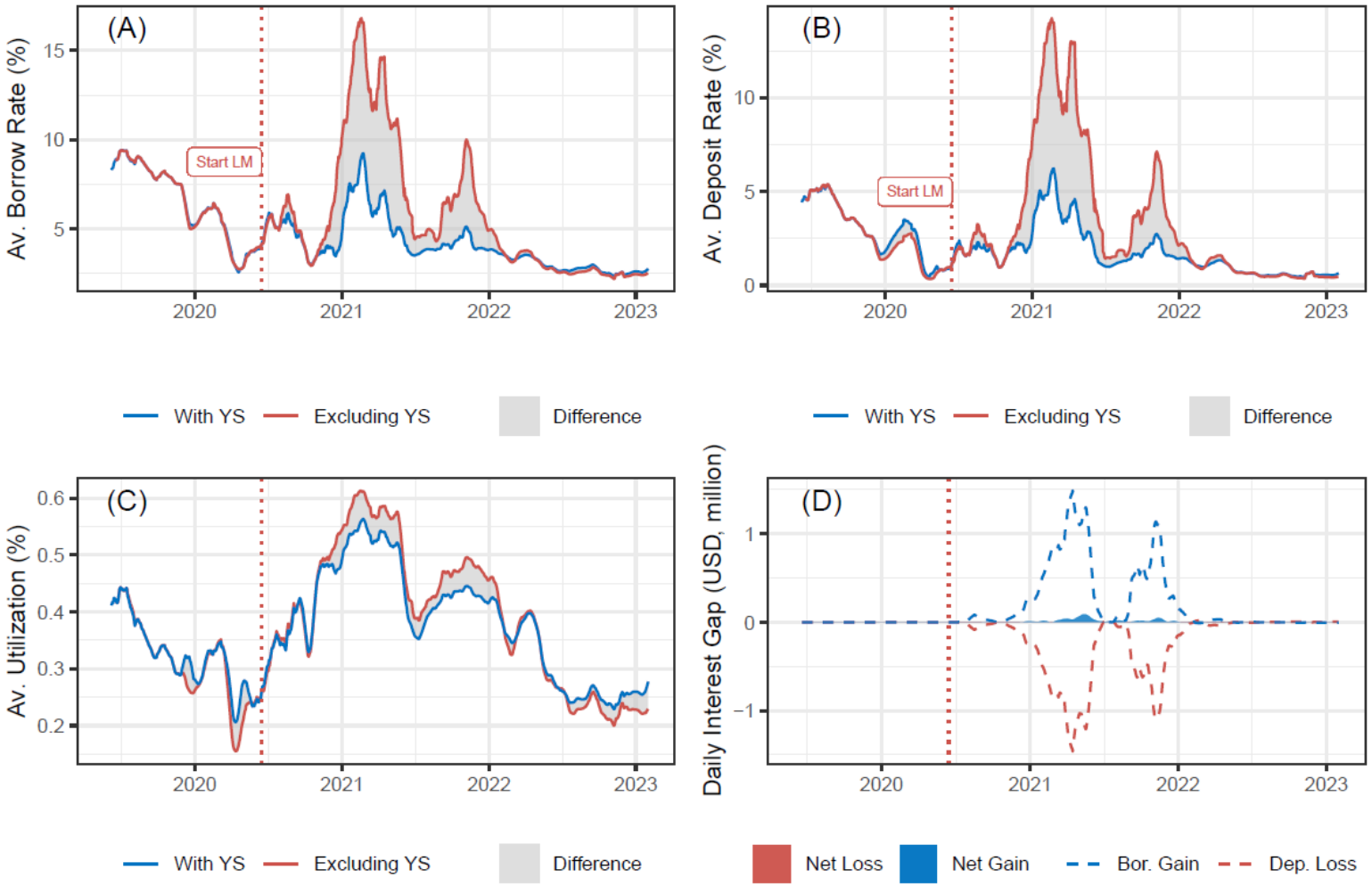
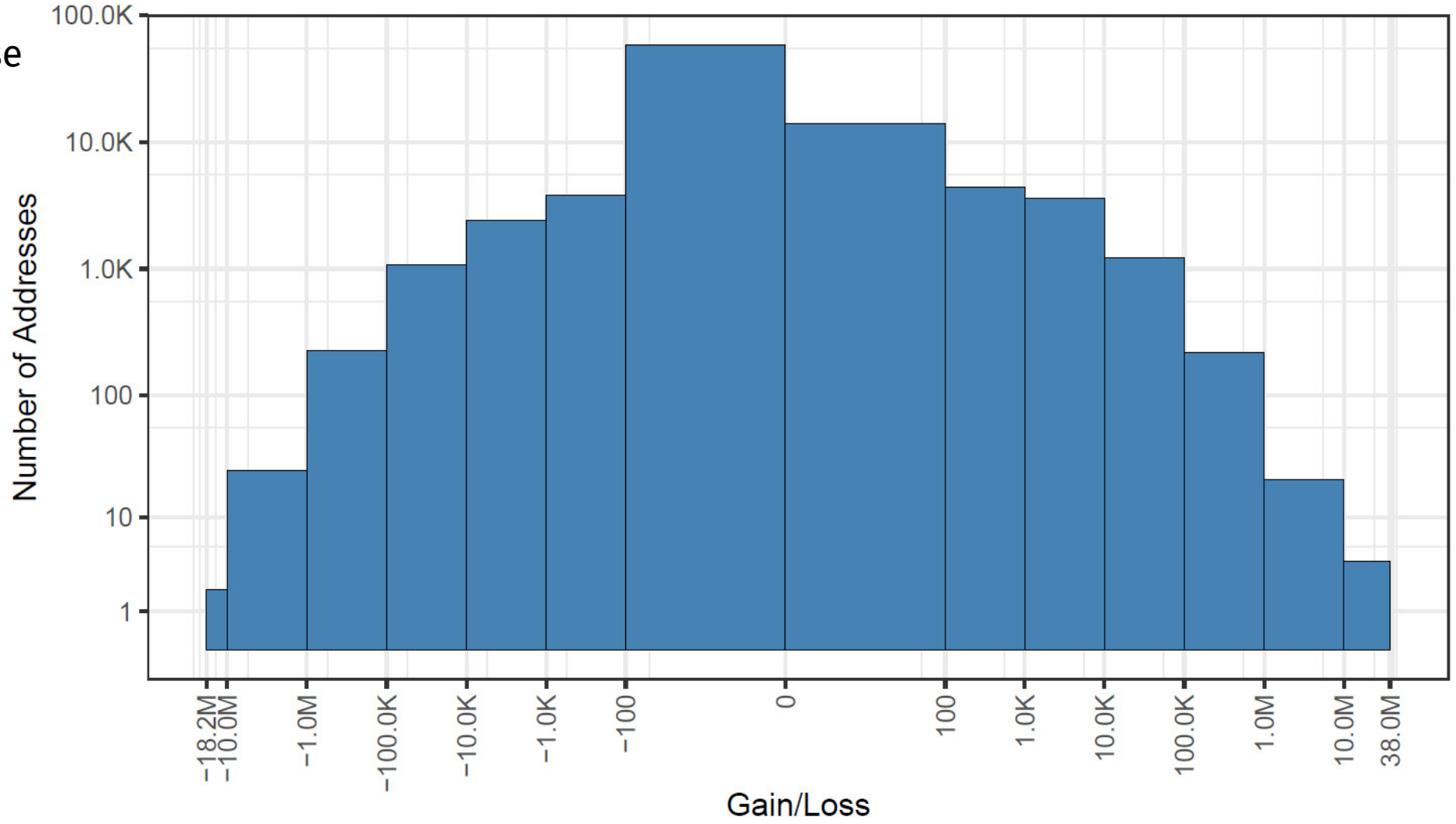


Fig. 7: Effect of Yield Seekers on Utilization and Lending Rates on Compound (May 2020 - Feb 2023).

Yield Seeker and Externalities: distribution of gains and losses for others

- 54% of addresses lose
- Max gain: $38M
- Max loss: $18M



Conclusion

- All DeFi platforms face a liquidity-activity dilemma
- Liquidity mining incentivizes users with native tokens to boost activity.

1. Do liquidity mining programs work? → **Yes!**
2. Do they generate long-term or transitory liquidity? → **short-term, fleeting liquidity**
3. Is the generated liquidity genuine or phantom? → **Large phantom share (approx. 25% of deposits)**
4. Do liquidity miners create externalities for other users? → **Yes, positive externalities**