

The Evolution of Blockchain: From Public to Private Mempools

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Question: Why does fee increase?

First unintended consequence:

- ▶ Introducing a private pool *increase* the average fee.
- ▶ Reason: more users are attracted, arbitrage is not eliminated
- ▶ The total number of validators doesn't matter for the determination of fee, because a validator is randomly chosen
- ▶ More general issue: Making a blockchain more attractive to users increase the fee?

Is there a fix?

- ▶ Can we let validators compete to lower the gas fee?
- ▶ Need a way to make it difficult for a validator to be selected more than 51% of the time.

Summary/Suggestion 1: Time Line

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- ▶ $t = 1$: Validators choose {adopt private pool, not adopt}
- ▶ $t = 2$: Users choose {Private, Public, None} and fee f_i
- ▶ $t = 3$: Arbitrageurs choose {Private, Public, Both} and fees f_{Dj} and f_{Lj}

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Main Tradeoffs:

- ▶ Users: execution risk (private pool) v.s. front-running risk (public pool)
- ▶ Arbitrageurs: execution risk (private pool) v.s. more competition from the other arbitrageur (public pool)
- ▶ Validators: see more transactions (adopt private pool) v.s. keep front-running and extract MEV (doesn't adopt)

Suggestion 2: Partial adoption versus Full adoption

The other main result:

- ▶ Version #1: Partial adoption is an equilibrium
- ▶ Version #2: Full adoption is not an equilibrium?
- ▶ Proposition 5 establishes Version #1.
- ▶ It looks like Version #2 doesn't hold: $r_{Dark}(\alpha) \geq r_{Lit}(\alpha)$ for any α
- ▶ Validators receive a lower payoff in the full adoption equilibrium than in the partial adoption equilibrium
- ▶ The full adoption equilibrium is socially efficient

Suggestion 3: Simplify Stage 3?

- ▶ Arbitrageurs act at $t = 3$.
- ▶ In the equilibrium where Arbitrageur #1 chooses Both, Arbitrageur #2 chooses Private, is Arbitrageur #1 strictly better off deviating to Private only?
- ▶ Simplify Stage 3 by limiting arbitrageurs choice to {Public} and f_j ?

Conclusion

- ▶ Innovative, elegant model unveiling novel tradeoffs in the adoption and usage of private pools
- ▶ Thought-provoking predictions
- ▶ Suggestions: draw a time line, simplify Stage 3, distinguish partial adoption versus no full adoption
- ▶ Question: let validators compete to lower the gas fee?