

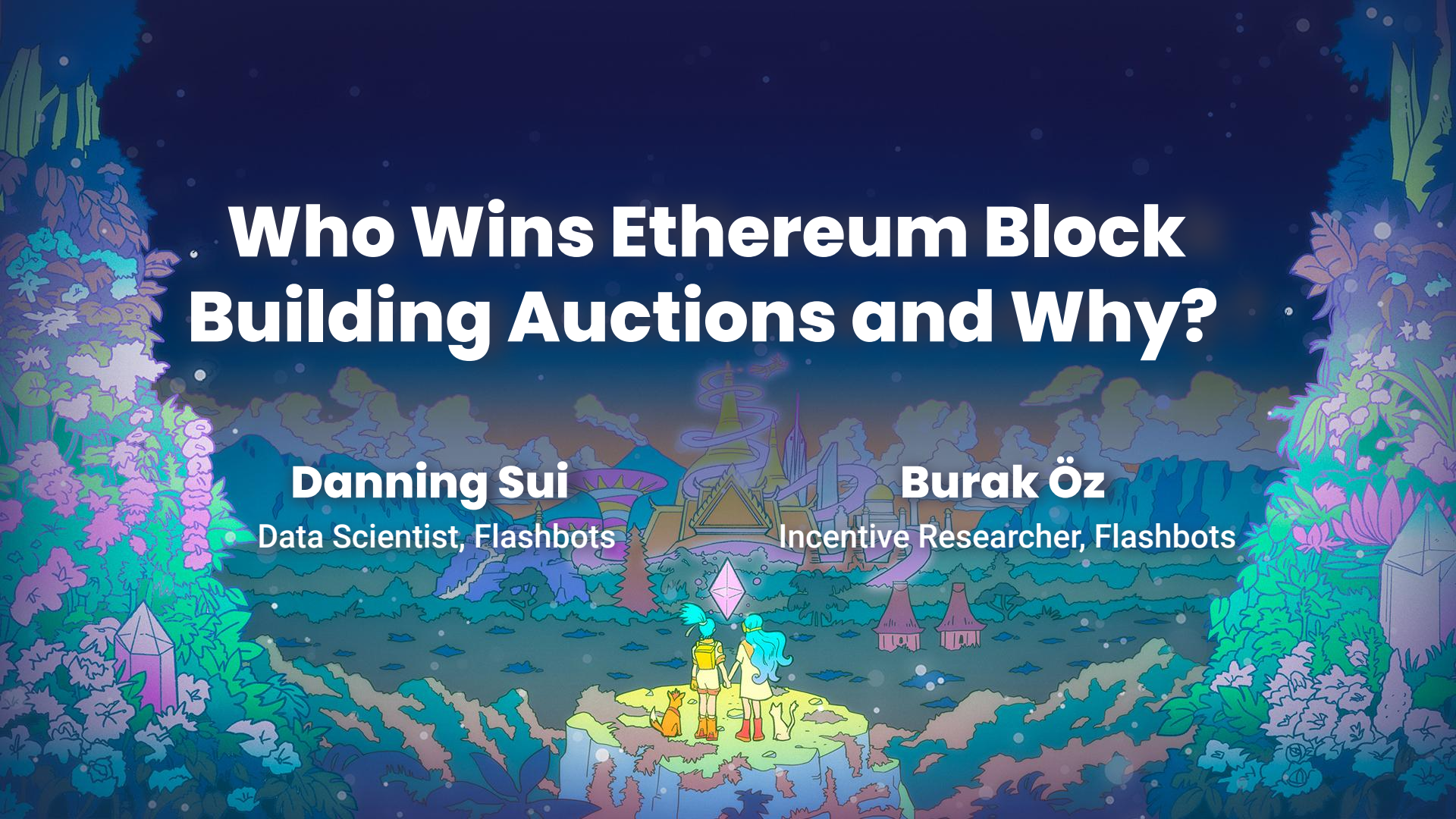
# Who Wins Ethereum Block Building Auctions and Why?

**Danning Sui**

• Data Scientist, Flashbots

**Burak Öz**

Incentive Researcher, Flashbots





# How are Ethereum blocks built today?

~10%



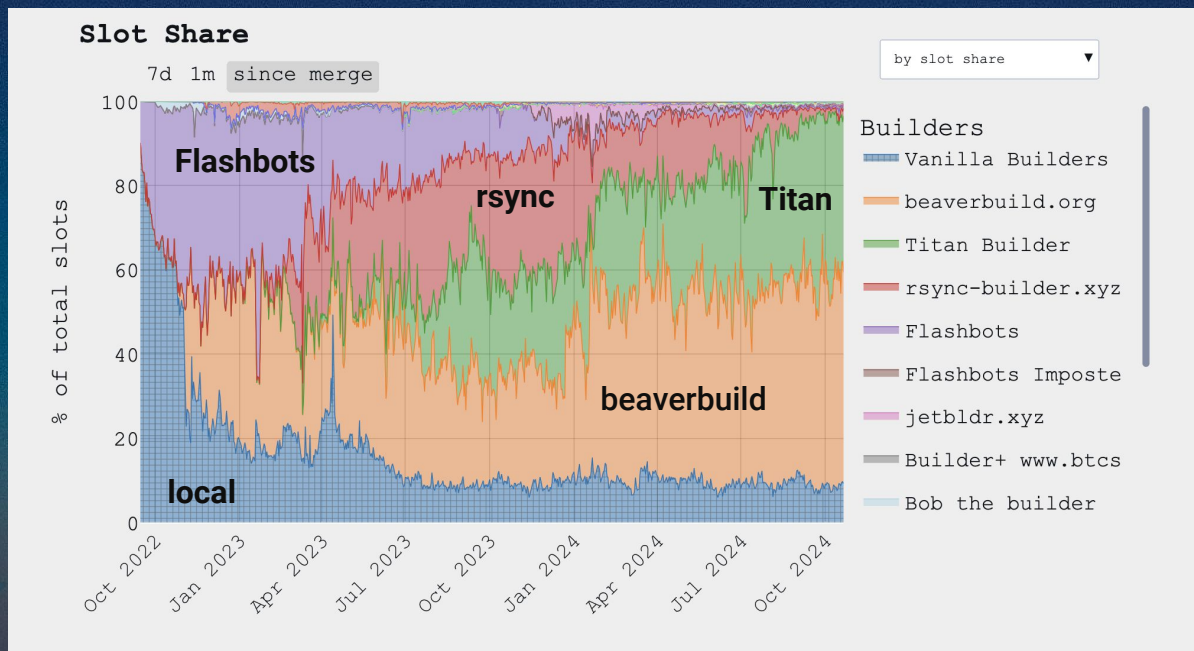
- + Full autonomy over block content
- Risk losing out on MEV rewards!

- + Get paid well
- Lose control over block content

~90%

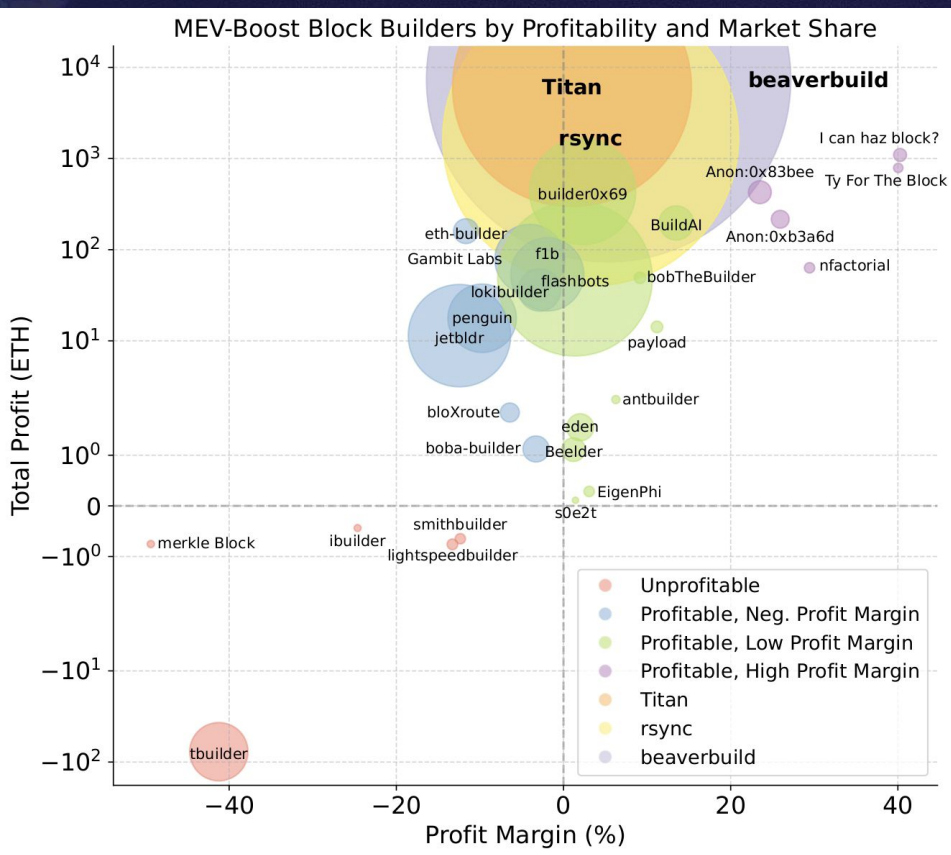
# Today's block builder market is centralized.

- Between October 2023 and April 2024, over 80% MEV-Boost blocks were built by three builders - **today, only two builders provide 95%!**





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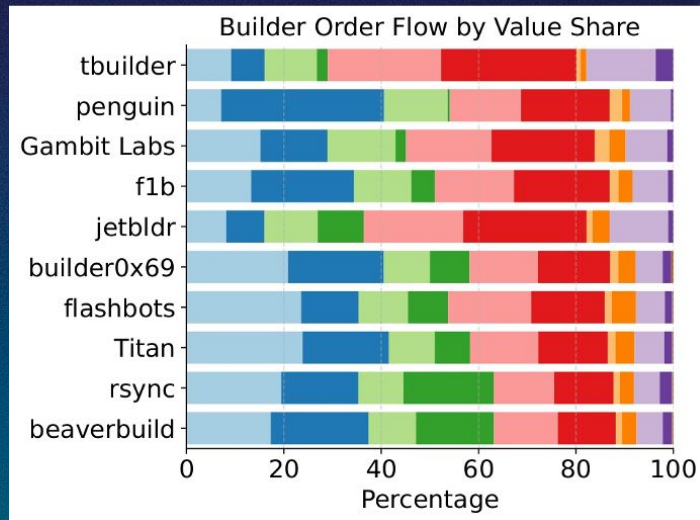
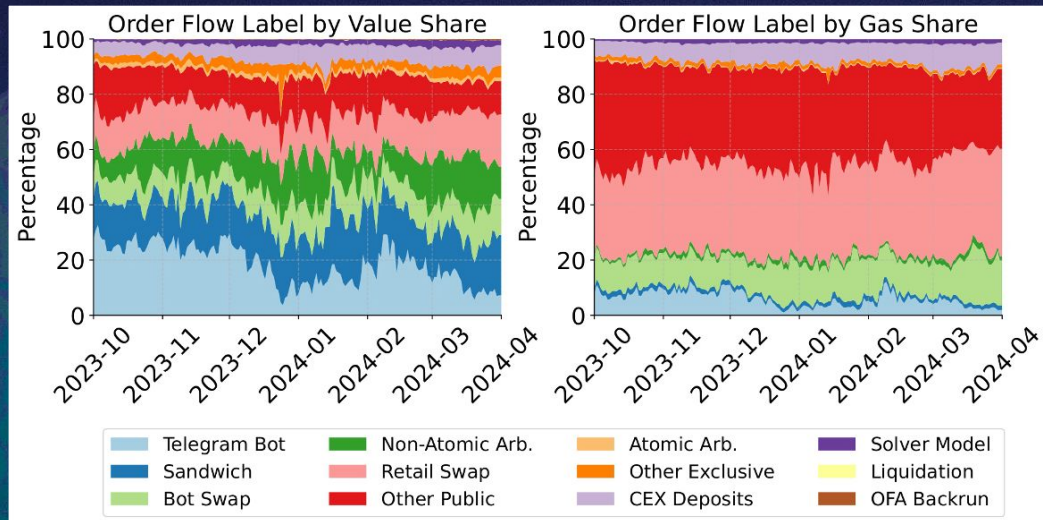


## Builder profiles vary by market share and profitability

- Generally, bigger market share builder maintain a positive profitability profile.
- How do some builder with tiny market share get to keep high profitability?
- Why are there builders keeping building blocks while losing money?

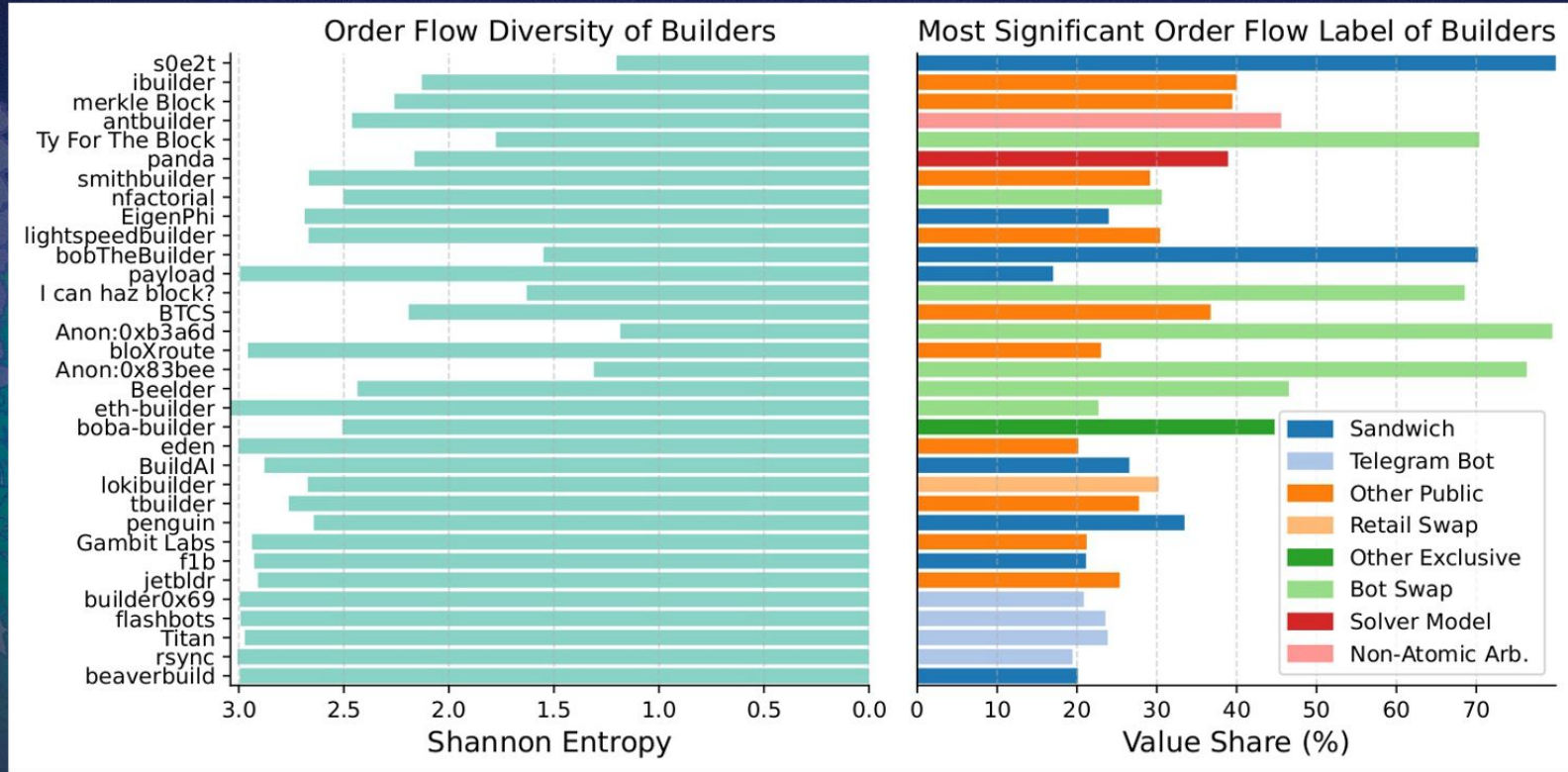


# Order Flow Significance: The 80-20 Rule



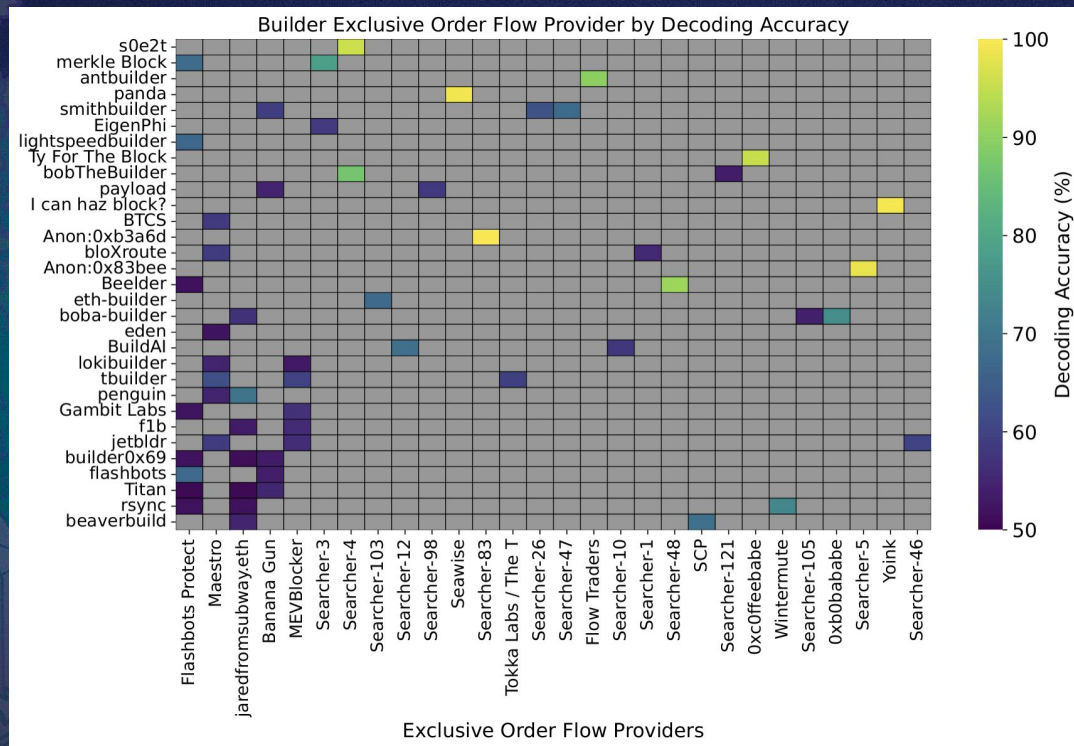
- **Telegram bot and MEV flow contribute 51% of block value and consume 10% of gas**
- Valuable order flow is exclusive and blocks are filled with less valuable, public flow
- Beaver, rsync, and Titan (BRT) have significant share of valuable order flows

# OF Diversity positively correlates with higher Market Share





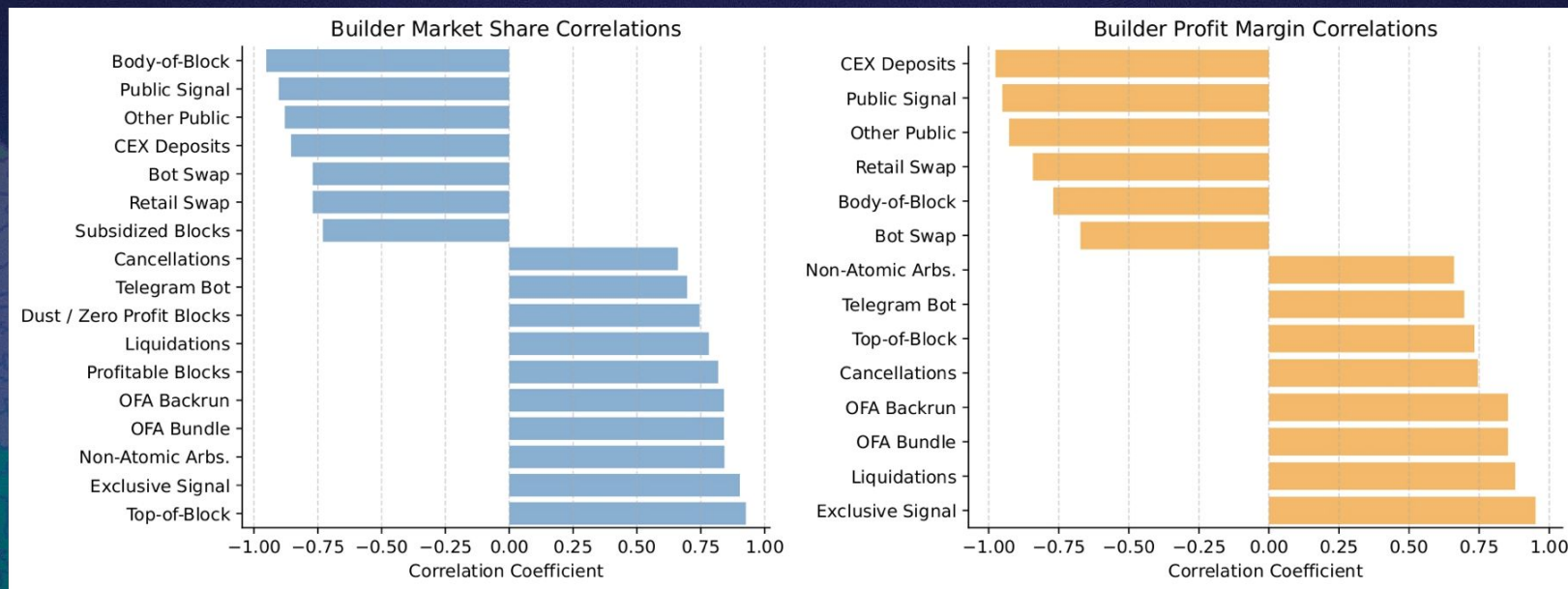
# OF Exclusivity positively correlates with higher Profitability



- ~55% of the builders have at least one Exclusive Provider (EP)
- EP builders have a higher rate of profitable blocks (46%) compared to those no-EP builders (20%).



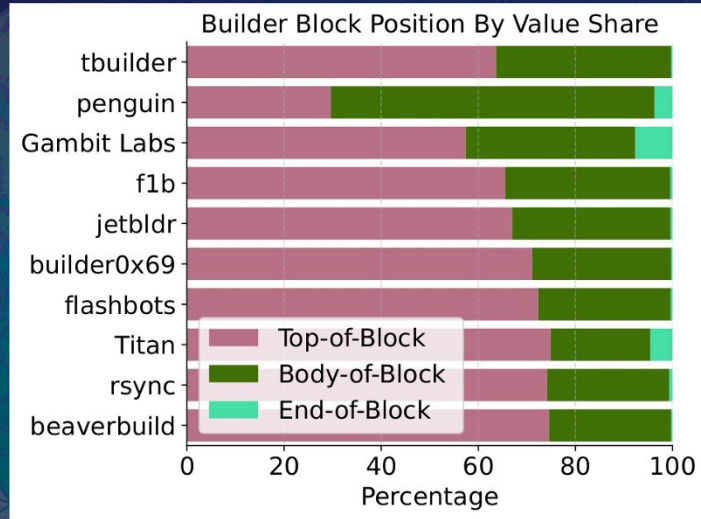
# Key Features for **Market Share** and **Profitability**



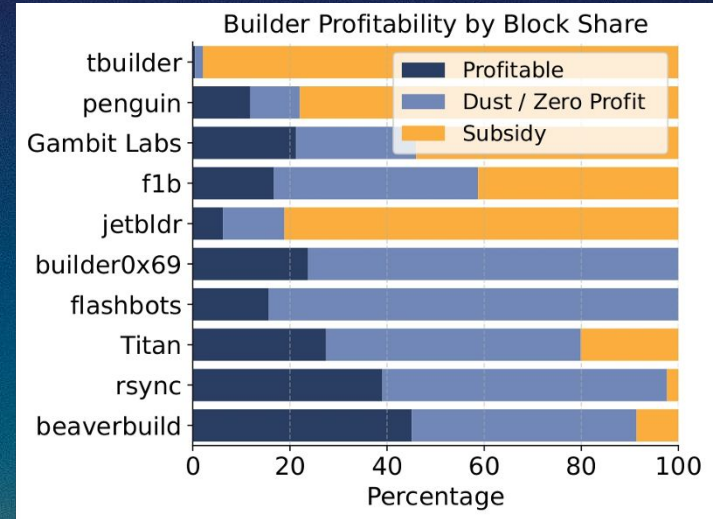
- **Positive correlation between market share and profit margin among the top ten builders**
- Exclusive signal, non-atomic arbs, and Telegram bot flow correlate with both metrics
- Highlights a **chicken-and-egg problem**

# Builder Strategies

## Block Packing



## Subsidy



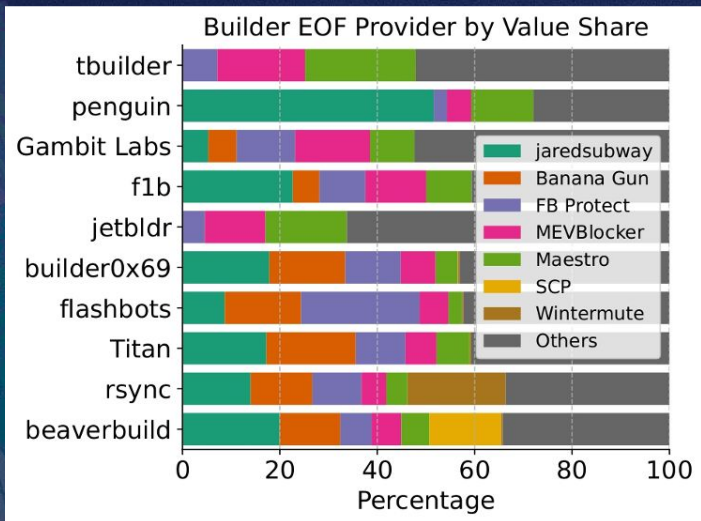
- Top-of-Block (ToB) contributes the most value to all top builders except penguin
- **More than 50% of exclusive tx volume resides in ToB (~88.5% of the total exclusive value)**
- BRT have the highest shares of profitable blocks, with beaverbuild exceeding 40%



# Builder Strategies

Exclusive OF Access

Latency and Bidding



**Table 2** Bidding and Latency Metrics of Top Ten Builders (UltraSound Relay).

Builder	Total Blocks [#]	Avg. Bids [#]	Avg. Update Lag [ms]	Avg. Winner Time [ms]	Total Cancels [#]	Avg. Cancels [#]
beaverbuild	137,721	31.54	130.41	586.59	248,195	1.74
rsync	95,310	25.27	166.21	531.38	212,504	2.29
Titan	47,539	31.11	186.25	605.83	91,337	1.78
flashbots	32,612	16.25	411.36	348.45	3,014	0.1
builder0x69	23,294	20.64	183.08	575.09	17,445	0.65
jetbldr	12,960	35.2	103.08	605.75	904	0.09
Gambit Labs	9,530	15.85	349.05	496.3	492	0.1
f1b	9,242	25.42	214.18	680.45	10,494	0.98
penguin	7,783	49.64	69.92	652.91	966	0.13
tbuilder	4,786	6.1	476.68	104.71	81	0.01

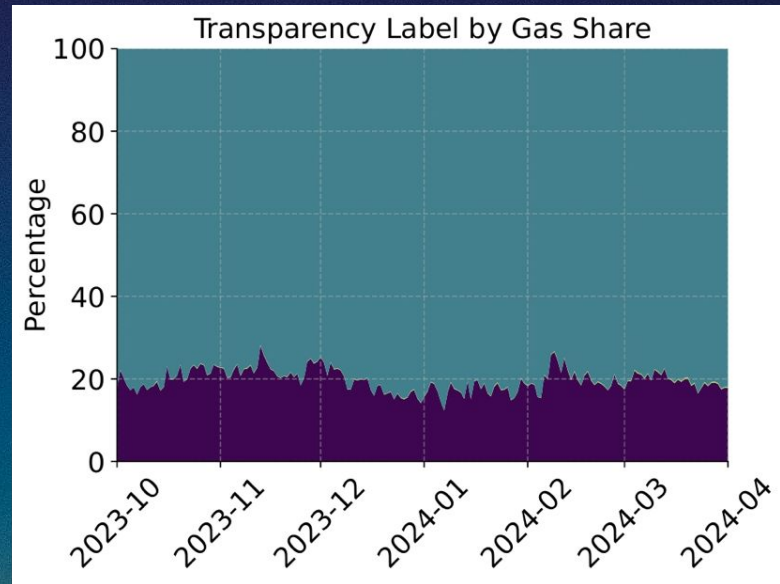
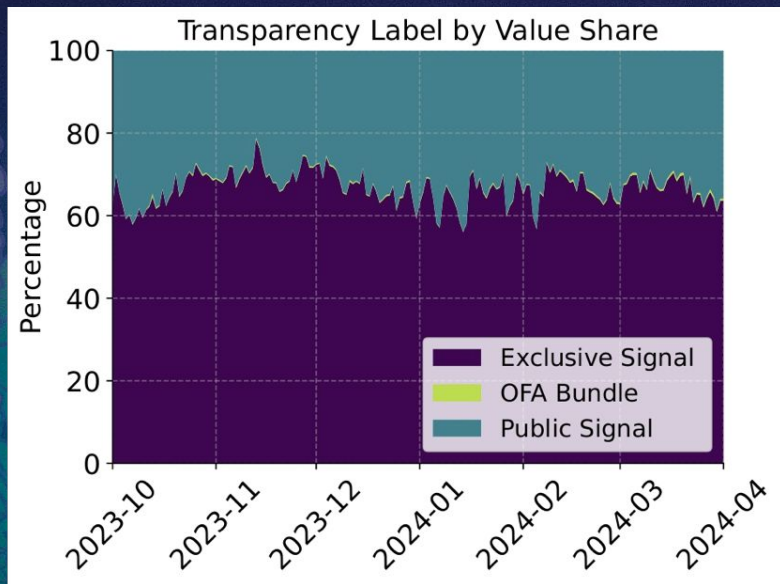
- **Seven EOF providers contribute ~70% of exclusive value in more than half of the blocks**
- **BRT issue more than one cancellation per slot** (further increased after UltraSound's bid adjustment feature)



So how did we end up with a such  
**centralized** market structure today?

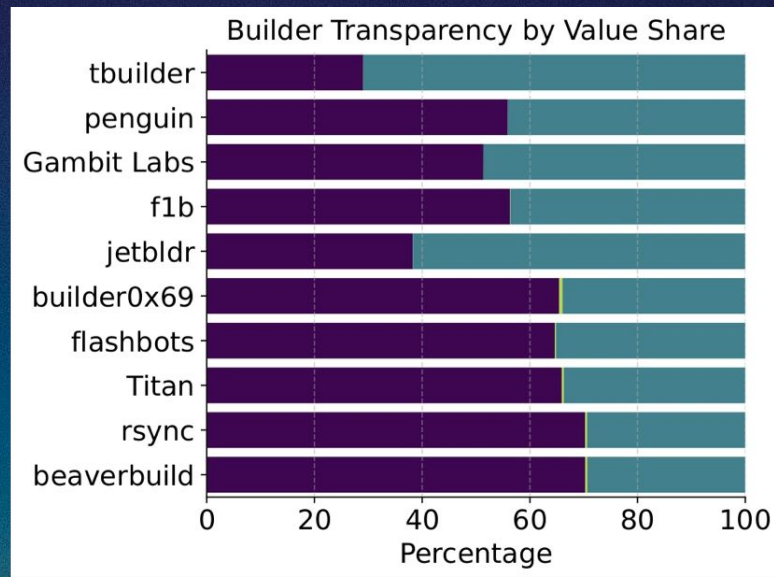
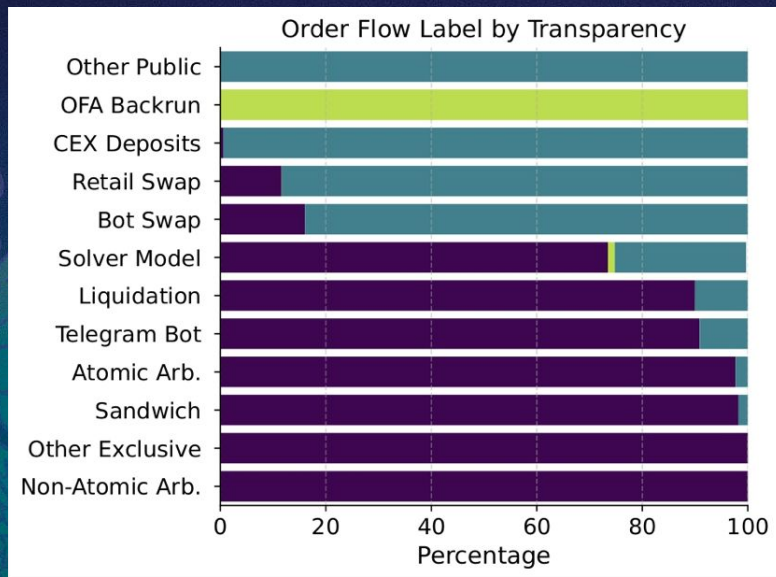


# Builder Competition Drives **Private Mempool Adoption**



- **Exclusive signal provides ~66% of all block value while taking up ~19% of all blockspace**
- **Constitutes 71% of all block value in more than 50% of the blocks**

# Builder Competition Drives Private Mempool Adoption

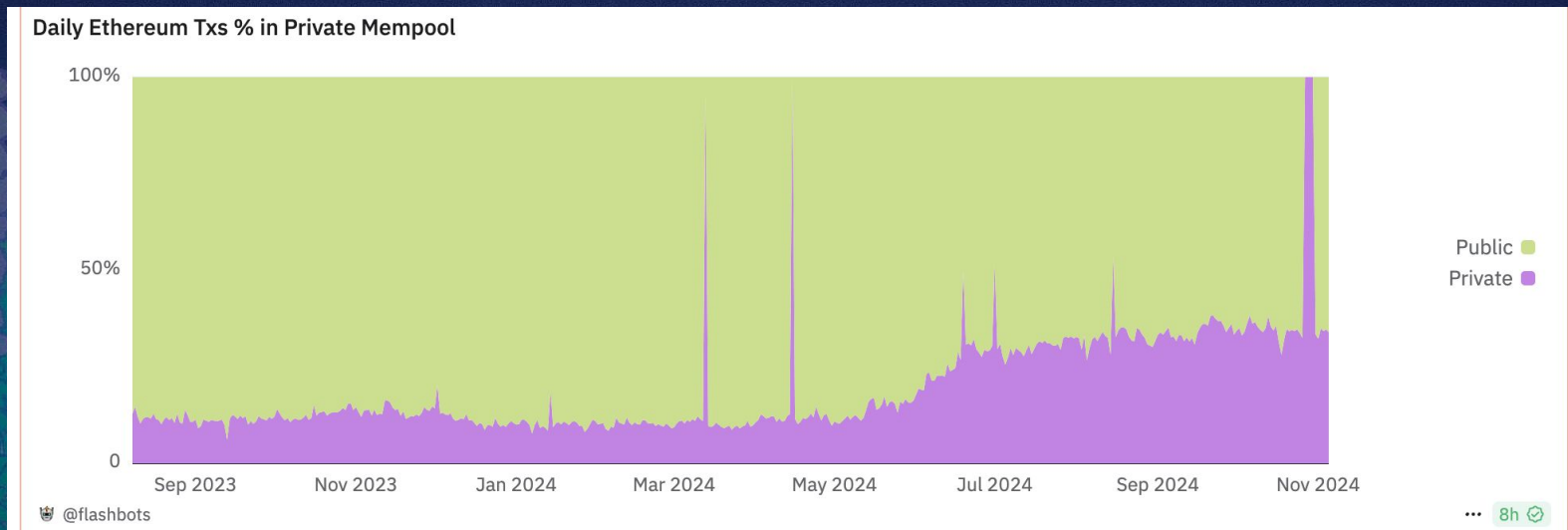


- Telegram bot flow and MEV strategies mostly bypass the public mempool (~99%)
- BRT receive the highest value share from exclusive flow, exceeding 65% of their total



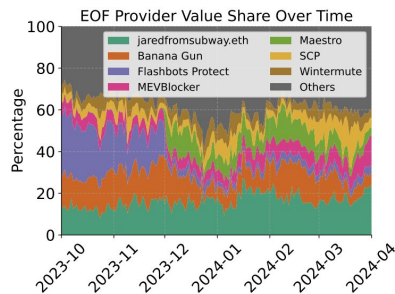
# Trend: The privatization of Order Flow Market

*...due to builder market competition!*

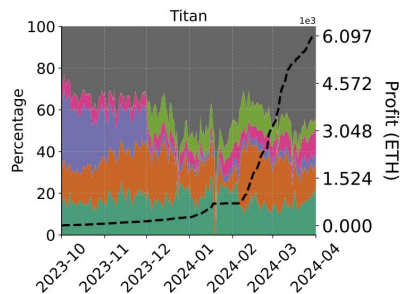


Data from 2023Q1:	3-5% (private mempool transactions %)
2023Q2:	10%
2023Q3-2024Q1:	15%
<b>2024Q2-Q4:</b>	<b>35%</b>

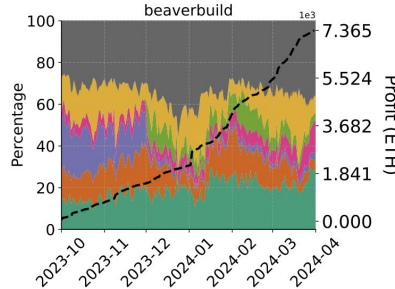
# What happened to the **jump** in 2024 Q2?



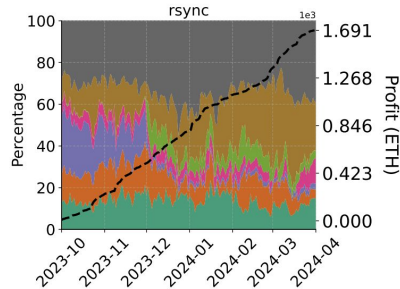
(a)



(b)



(c)



(d)

## Q1: Banana Gun Orderflow

A fierce “order flow acquisition war” happened quietly behind scenes among the top builders.

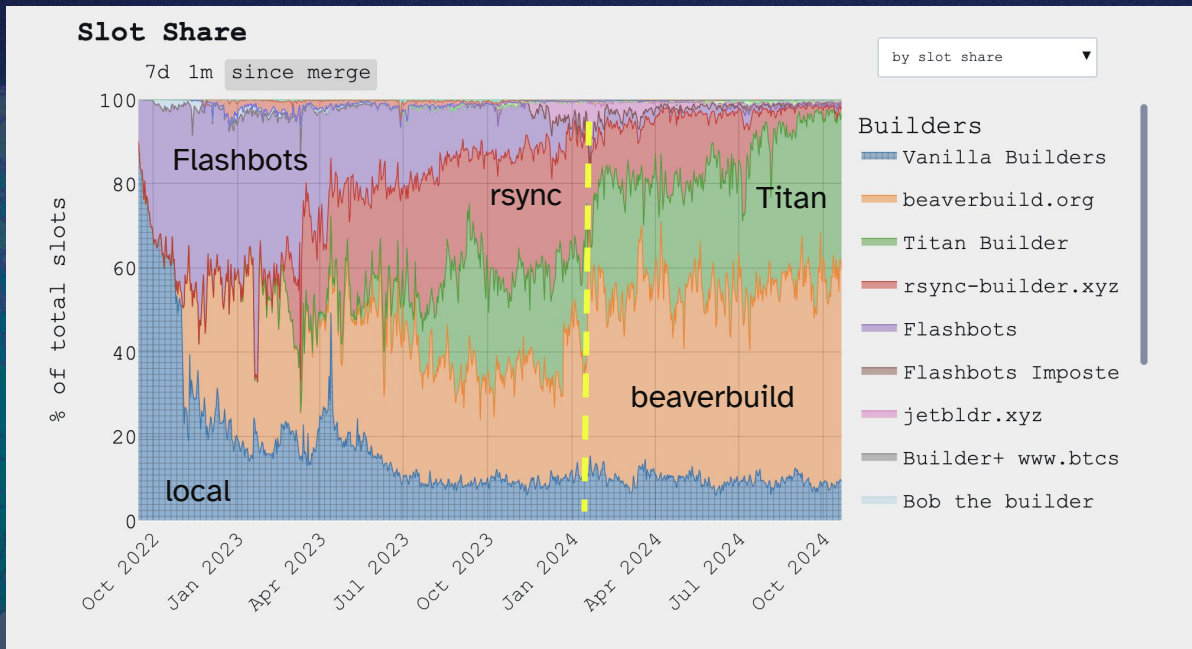
The winners? Titan & beaverbuild

The result? Even more centralized market structure

## Q2: Metamask Smart Tx's Auction



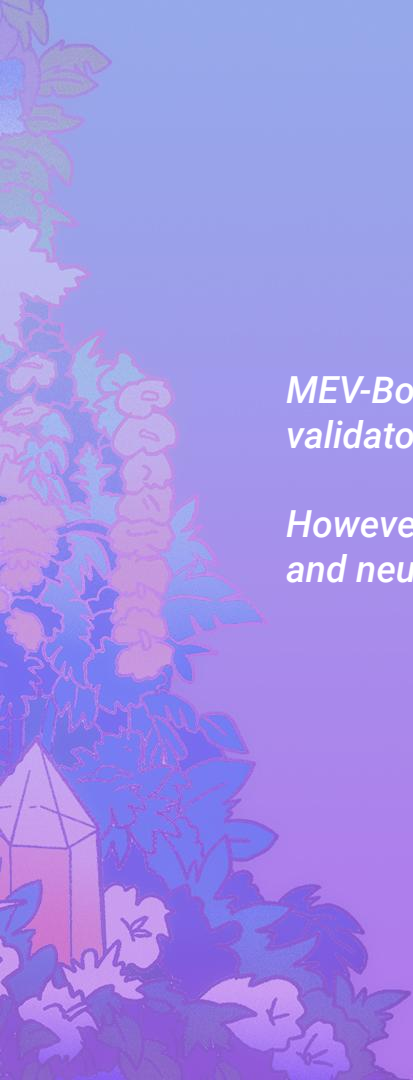
# Revisit: Block Builder Market since 2024 Q1



The result? Even more centralized market structure:

rsync gave up maintaining the inclusion market share since they lost the order flow deal

now the game is only between the 2 other builders



*MEV-Boost successfully enables uniform access to MEV rewards for Ethereum validators.*

*However, the current market structure undermines Ethereum's censorship resistance and neutrality properties.*



# But everyone wants a more **decentralized** market

*...including the top builders!!*

Beyond censorship resistance aspect, there is **inefficiency** in current block auction design:

- Different builders trying to acquire order flow exclusively, which then causes **non-conflicting transactions** from different builders' block **competing to bid** out more value to proposer to be included 🙅 unnecessary payouts towards **proposer monopoly**
- Block builders have to build up reputation to attract more order flow to then have inclusion guarantee, which then causes them to subsidize to kickstart and market themselves. This has evolved into toxic **0-sum game** that is **unsustainable** for builders and contributes to **proposer monopoly** as well.





What if we find a way to **decentralize** the builder set,  
and **redistribute** value back to them based on their  
orderflow value provided?



# Flashbots Builder Gas Refund

## Orderflow Attributes

- **Realized Value:** onchain total gas and tip payment
- **Block Value Delta:** marginal contribution the orderflow brings to the block
- **Refund:** marginal contribution (capped by realized value) times block builder profit

*[More refund rule details in the forum post!](#)*

## Refundable Value Stats

**662.69**

Total Gas & Tip from eligible Orders  
(ETH)

**296.09**

Total Contribution from eligible Orders  
(ETH)

**57.33**

Total Refunds (ETH)

**3.20**

Total Refunds Processed (ETH)

# Thank you!

Check out the paper if you interested! 🙌



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