I have been thinking about the game theory of late bidding in MEV burn—a simple design" and I thank Justin Drake for giving feedback on the following thoughts

. It seems rather intuitive that bidding after the deadline may evolve as an equilibrium strategy, as previously suggested by, e.g., jasalper and cometshock (also very relevant to this post: ethdreamer). The problem is that defecting from such an equilibrium strategy is not rewarded in any substantial way. What we need is a mechanism that rewards defecting builders for chiseling at the surplus of any emerging "late-bidding cartel". A potential solution is to reward the builder who submits the winning bid (in a majority of the attesters' view) at the observation deadline. A design could look like this:

At the observation deadline, attesters observe the highest bid and set their subjective payload base fee floor F_f

at this level. Attesters also remember the identity of the builder that provided the highest bid. If the same builder submits the block selected by the proposer, attesters vote TRUE

in a separate vote when they attest to timeliness. Otherwise they vote FALSE

, but still attest to the validity of the block as long as it is above their subjective payload base fee floor (and fulfills all other criteria). If the majority of attesters in the slot vote TRUE

, the winning builder receives a fraction x

of the payload base fee F

that would otherwise have been fully burned (e.g., x=0.05

). They thus receive the reward xF

in excess of any profit (or loss) they make from the payload. An attester who votes with the majority (either TRUE

or FALSE

) receives a small reward. The proposer's rewards should presumably not be determined by if it selects a TRUE

payload or not, to avoid incentivizing proposer sophistication. Its selection can be influenced via arbitrage by builders across the payload tip anyway.

The outcome of this additional vote is that builders race to win the preliminary auction at the observation deadline. The game-theoretical equilibrium strategy will depend on the size of x

. It should be set high enough to favor competition and disincentivize collusion (but not higher). Collusion is disincentivized since defection from late bidding is rewarded. This applies regardless of whether a late-bidding strategy would arise through builders' own accord or an oligopoly evolving into a cartel.

Note that builders will likely opt to bid slightly above the MEV at the observation deadline, the extent to which will depend on x

. They are incentivized to do so to attain the surplus xF

and because they can expect some additional opportunities for MEV to arise before the proposer will select a winning bid. The primary motive of this change to the MEV burn design is to reduce the risks of builder collusion by providing a lucrative way to defect. The fact that it pushes builders to estimate the block's full MEV already at the observation deadline (and in some settings may even bid above it), is an additional feature, which on balance should be positive.

A drawback is added complexity. The proposal also introduces some game theory for attesters that we may wish to study closer and make adjustments for. They may, e.g., gain from voting FALSE

even if they observed TRUE

if they registered a flurry of competing bids at the deadline. One way to try to adjust for this would be to reduce the majority threshold for TRUE

, but it feels safer to rely on a majority vote here. Finally, even if the design works with an honest majority when the winner is clear, we ultimately still need to be attentive to the risks of builder–attester or builder–attester–proposer collusion.

An example of a problematic issue to consider. Say that Builder A can control 15 % of the attesters of the slot. If the race to provide the highest bid at the observation deadline is very tight between Builder A and Builder B, the remaining 85 % of the validators may for example be distributed as A = 36 % vs B = 49 %. Then Builder A can achieve the vote TRUE

by relying on its control over the remaining 15 %. While early bidding and a high burn is incentivized, it can become a probabilistic game where builders may seek to influence attestations, which of course would be negative.

Curious to hear your thoughts!