It's sometimes taken as an article of faith that selling access to MEV on multiple chains will yield more revenue than selling it separately on each chain. The argument for this is that controlling MEV extraction on multiple chains is more valuable because of opportunities to capture cross-chain MEV are available to someone who knows they control MEV across multiple chains.

A simple model shows that this isn't always the case. Sometimes selling MEV separately gives more revenue.

Let's start by analyzing separate auctions for each chain. We'll assume a chain uses a sealed-bid, second-price auction to allocate MEV control over some time period. So we know that the revenue will equal the second-highest valuation of any bidder.

We'll assume that players i

's valuation for MEV on chain A will be

$$V_{A,i} = V_A^*+A_i$$

where V_A^*

is the "true valuation" which is unknown to the players and A_i

is a player-specific estimation error that is random and independent for each player, drawn from a normal distribution $\mathcal{N}(0, \sigma^2)$

.

If we auction the MEV rights on chain A among n

bidders, the resulting revenue will be

$$R_A = V_A^* + \sigma\cdot\alpha(n)$$

where $\alpha(n)$

is defined to be the expected value of the second-largest of n

samples from the standard normal distribution $\mathcal{N}(0, 1)$

. Note that $\alpha(n)$

is increasing in n

and is positive for $n > 3$

.

If we have two such chains, A and B, with different "true" values V_A^*

and V_B^*

but (for simplicity) the same σ

, then the expected total revenue from auctioning the two chains' value separately is

$$R_\mathrm{sep} = V_A^* + V_B^* + 2\sigma\cdot\alpha(n)$$

What if we auction the rights to both chains together, as a single unit? Then the valuation for party i

is

$$V_{AB, i} = V_A^* + V_B^* + C_i + M$$

where $C_i = A_i+B_i$

is random with distribution $\mathcal{N}(0, 2\sigma^2)$

, and M

is the extra value due to cross-chain MEV.

The revenue is then the expected second-highest value, which is

$$R_\mathrm{joint} = V_A^*+V_B^*+M+\sqrt{2}\sigma\cdot \alpha(N)$$

So we can see that

$$R_\mathrm{joint} - R_\mathrm{sep} = M-(2-\sqrt{2})\sigma\cdot\alpha(N)$$

If we generalize this to K

chains, we get that

$$R_\mathrm{joint}-R_\mathrm{sep} = M-(K-\sqrt{K})\sigma\cdot\alpha(N)$$

So we can see that even if there is some cross-chain MEV, a separate auction might still be better, because it assigns each chain to the party who values it most–which may not be possible in a joint auction.

At the very least, we can see that a joint auction is not a no-brainer. We would want to do some measurement, or adopt an auction structure that can accurately determine when to sell jointly versus separately.