Are L2s extractive to Ethereum?

Ren Crypto Fish
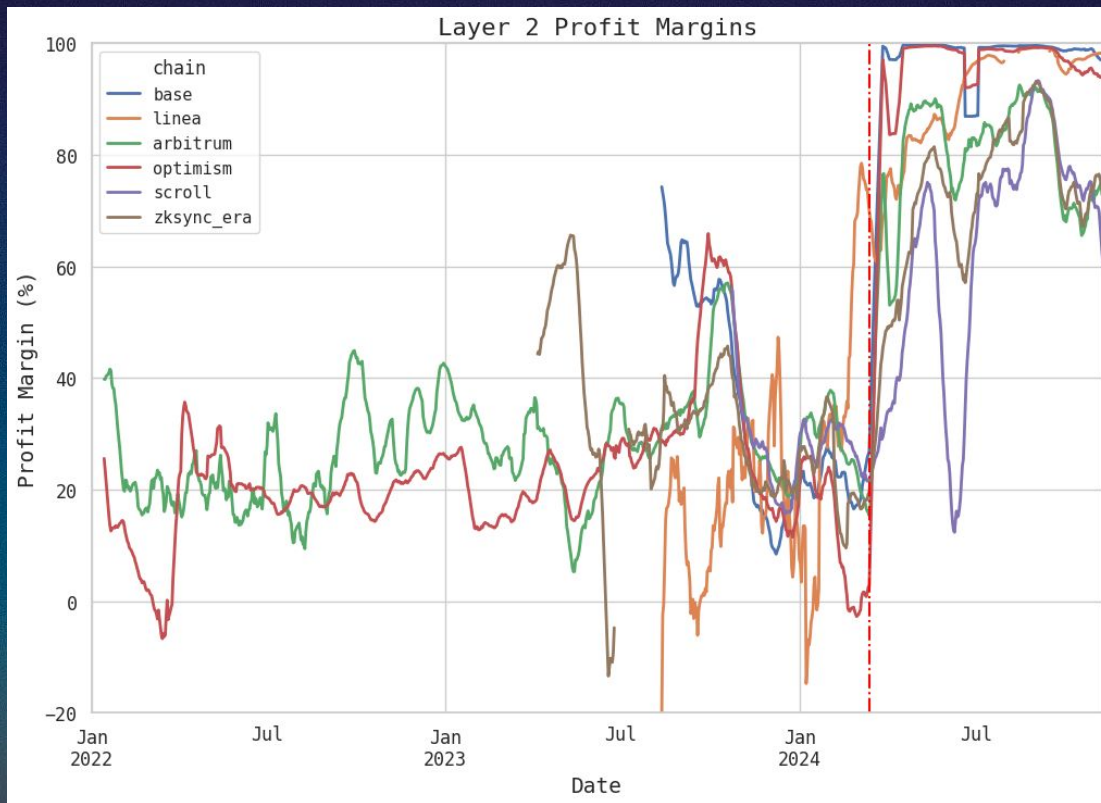Engineer, Partner, Electric Capital

Outline

1. L2s are keeping fees and not paying enough for blobs
2. Are L2s generating ETH activity and new holders of ETH?
3. What is the dynamic between L2s and Ethereum?

"L2s are keeping fees and not paying enough for blobs"

L2 margins have been elevated since EIP-4844


Source: growthepie.xyz

Blobs are still in the cold start period

- Davide Crapis predicted the cold start problem
- The simulation was run in March 2023 using assumptions from Arbitrum and Optimism at the time
- Would take 250 kb per block to get into price discovery. This is 1.8 gb per day (we're basically there on average per day, but not yet block by block)

Analysis 1: fee update in practice

Arbitrum demand for data comes at a rate of 14.6kb/block and Optimism demand at 13kb/block (Ethereum blocks). With the current setup of the fee update mechanism, **price discovery effectively does not start until the data demand load is above the block target of ~250kb**, about 10x the current load. To see this you can either assume that batch posters are smart in balancing and coordinating so that no block is above the target and the data price never moves from the initial minimum value of 1 wei, or simply notice that local increases in excess gas will quickly be absorbed so that the data price never goes much above 1.
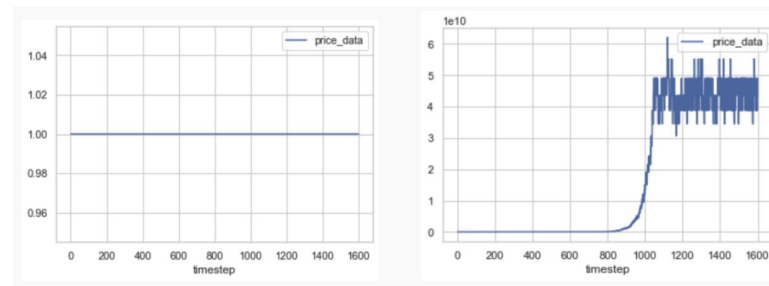
EIP-4844 data gas price dynamics in two backtest scenarios: blob data demand rate is similar to historical (left) and blob data demand rate is 10x historical (right). Both assume same distribution for `max_fee_per_data_gas`, uniform centered around 50 gwei (see link at the top for full simulation).

When potential demand is above the target, the price gets updated so that the blob transactions with lowest willingness to pay are dropped and balance with the sustainable target is maintained. But how long will it take? From January 2022 to December 2022 the combined data demand of Ethereum rollups increased 4.4x [17], which means that continuing at this rate (or slightly higher considering innovation and 4844 cost reduction), **it will take in the order of 1.5 years for the data price discovery mechanism kick-in and data price to start raising above 1**.

Having such a long time with data price at 1 creates **unreasonable expectations on blob data costs**. Users and apps on L1 may make adjustments to start using blobs, only to be forced back to type 2 transactions once L2 demand (with higher willingness to pay) raises above target. In the worst case, this severe underpricing may lead to taproot-like usecases [21] that will inject instability in the blob-data market that is undesirable from a rollup-economics perspective (as the next sections clarify).

There have been periods where blobs have gone into price discovery

Blob Fee Breakdown During the LayerZero Airdrop (above 2^25 wei base)

Blobspace Fees
Execution Fees

June 20th, 2024

@data_always
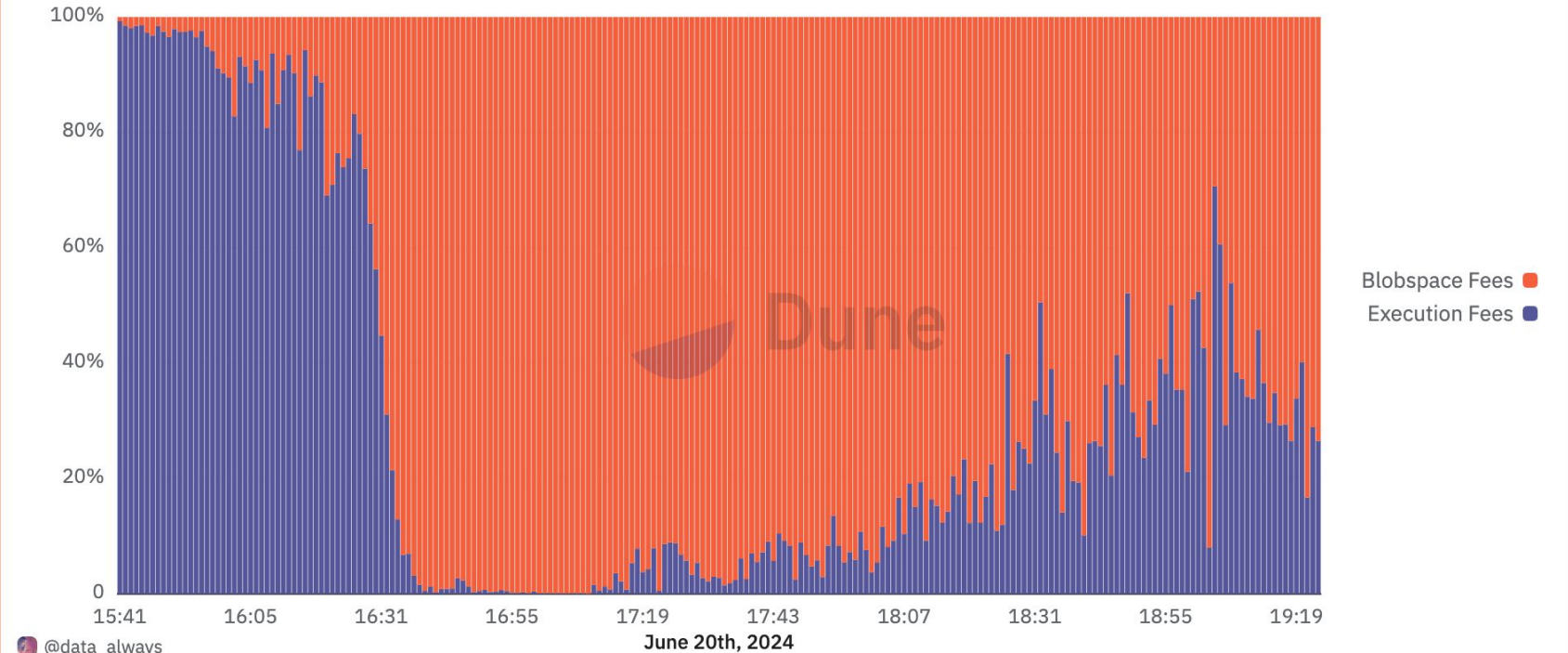
Recently blobs have been getting close to target but smart batching by L2s keeps it just at/below target

Average Blob Count per Block
Since Dencun

All ■
Blobs MA3 ■
Limit ■
Target ■
Average ■

@hildobby
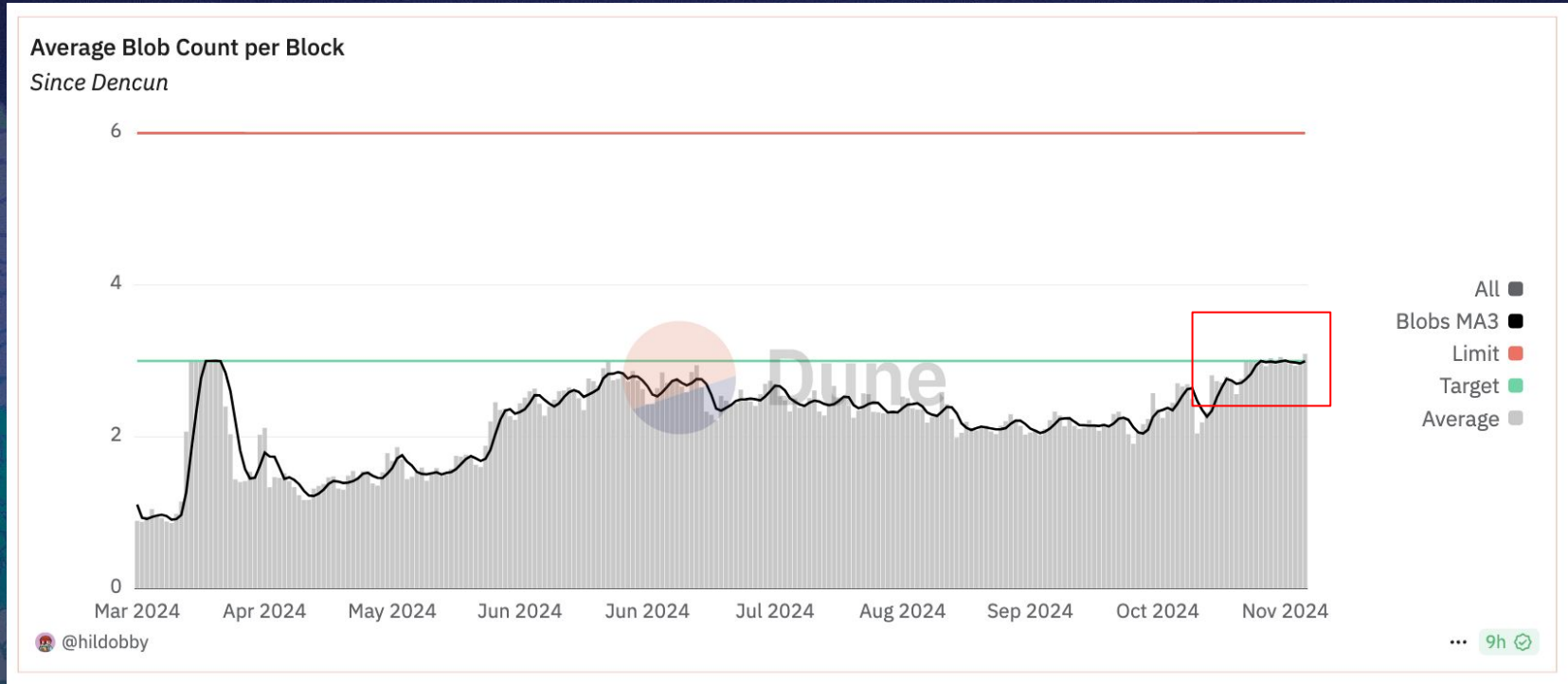
Layer 2s optimize blob posting to avoid price spikes
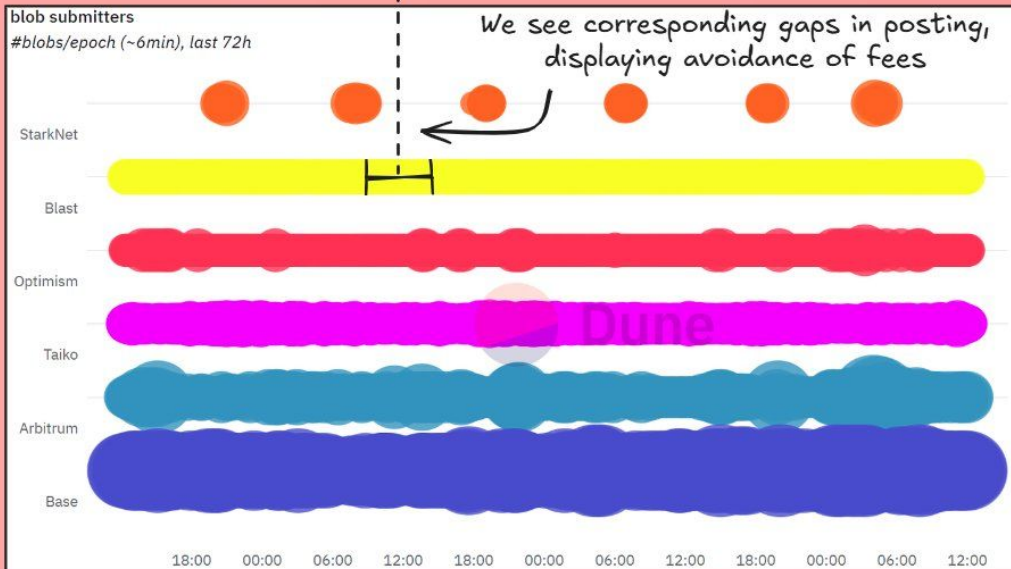
Another way to see this is the distribution of blobs per block

Blobs per Block
Since Dencun

Blocks with no blobs declining

Legend: All, None, 6, 5, 4, 3, 2, 1

X-axis: Mar 2024, Apr 2024, May 2024, Jun 2024, Jun 2024, Jul 2024, Aug 2024, Sep 2024, Oct 2024

@hildobby

Source: https://dune.com/hildobby/blobs
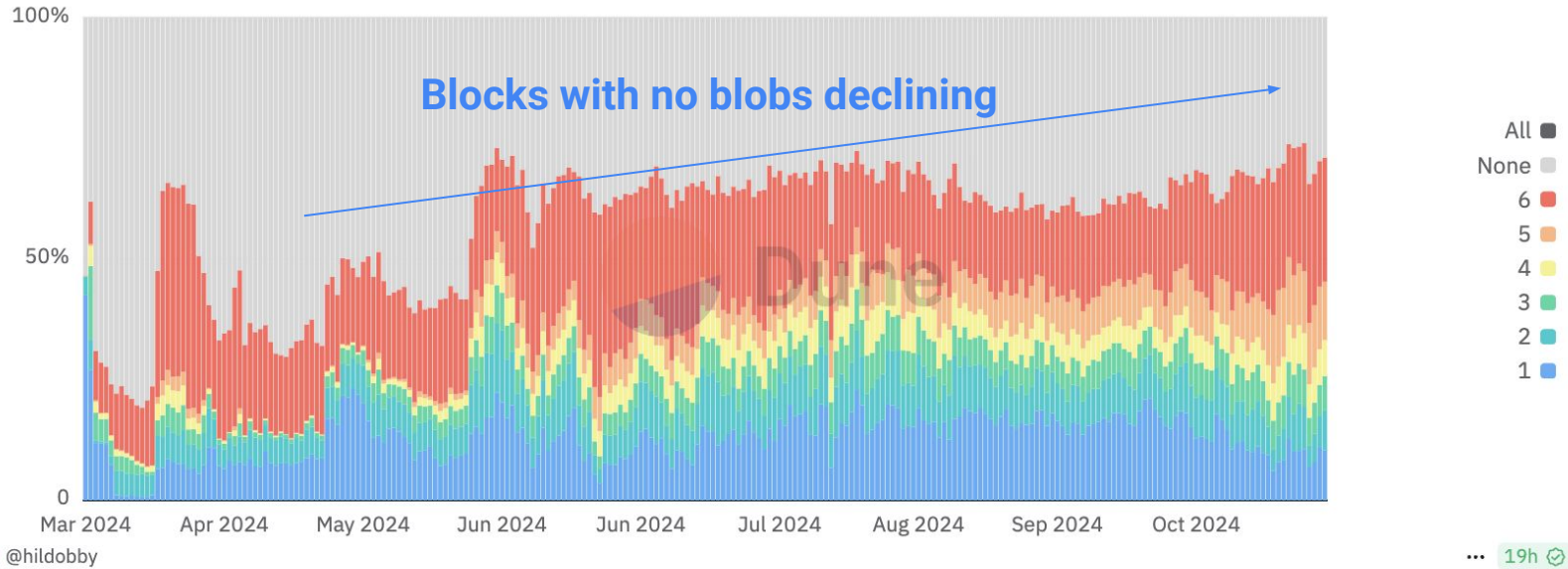
Unused blob capacity declined from 26% → 13% since summer

Daily Blob Data Used Share (%) CL Blobs Posted (GB)
Share of Blob Capacity Used

Unused capacity declining

Legend:
- All
- Unused Capacity
- All Others
- Taiko
- Linea
- Blast
- Scroll
- OP Mainnet
- Arbitrum
- Unichain
- Base

@glxyresearch
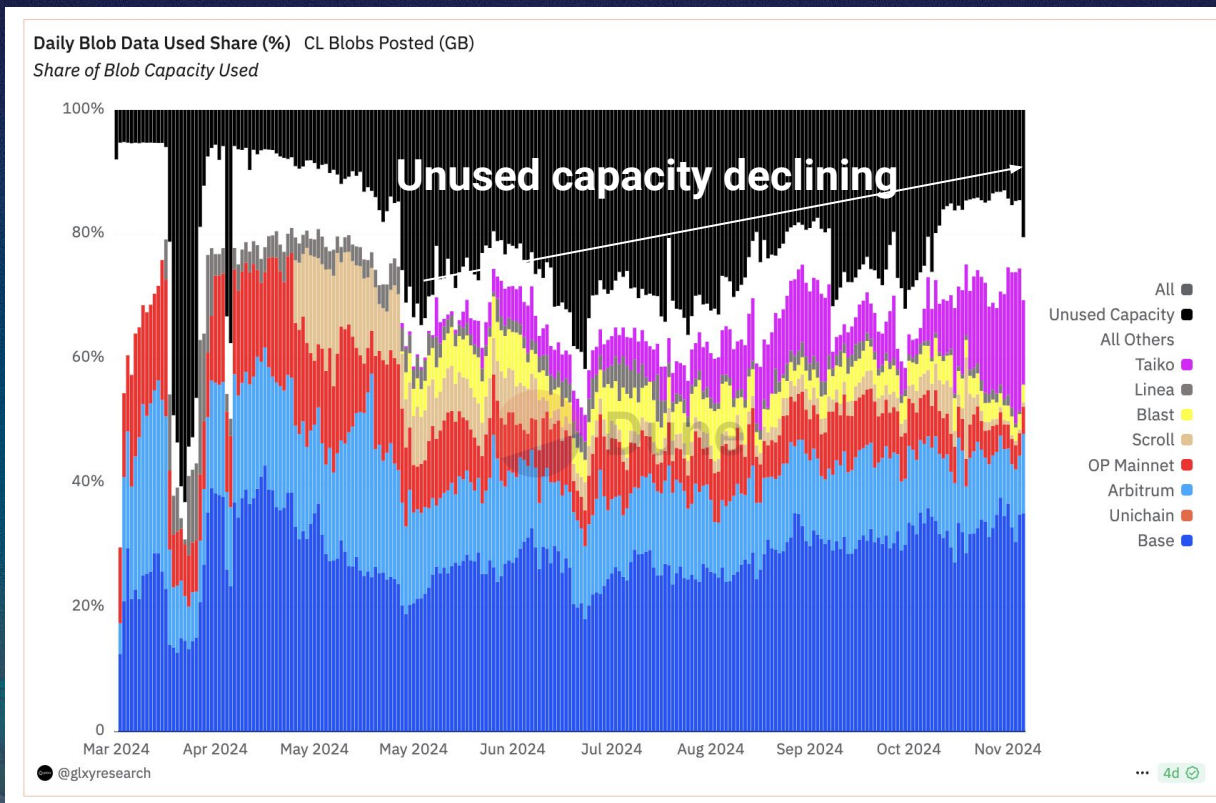
Overall blobs inflow per day at 2.4 gb per day (just above 250 kb/slot ~ 1.8 gb per day) which would trigger price discovery
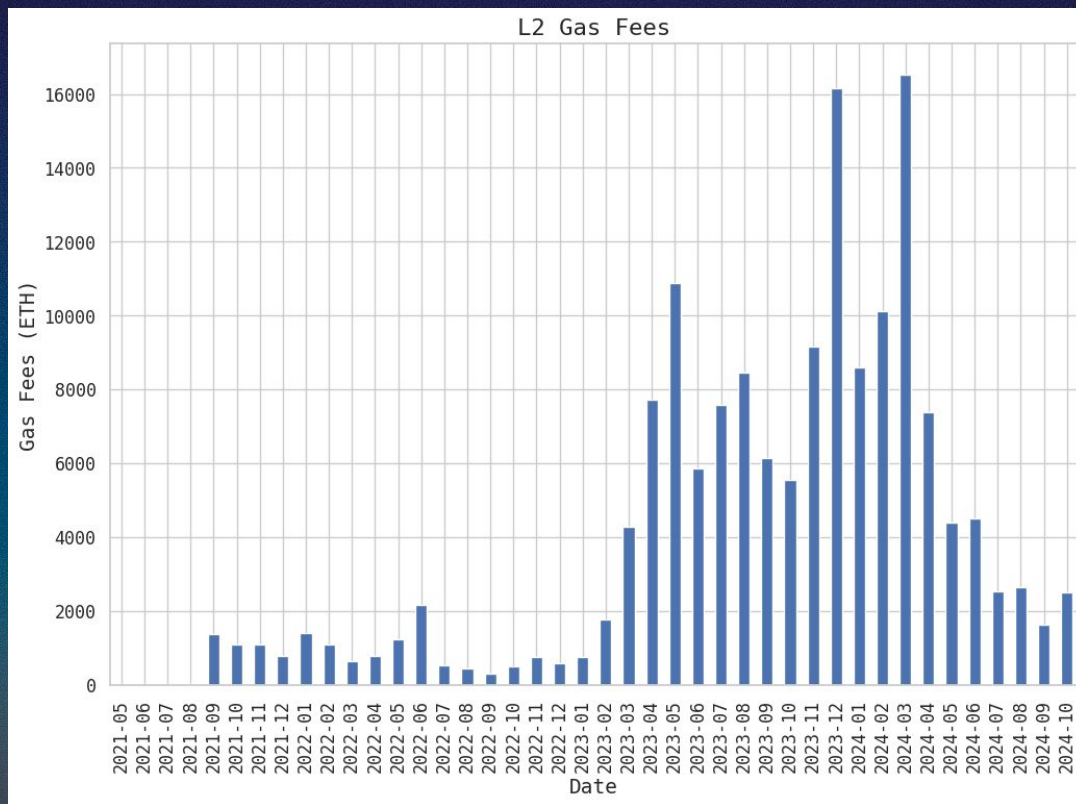

Blobs Data Inflow
Since Dencun

megabytes ●

👤 @rencryptofish   ⋯ 2min ✅
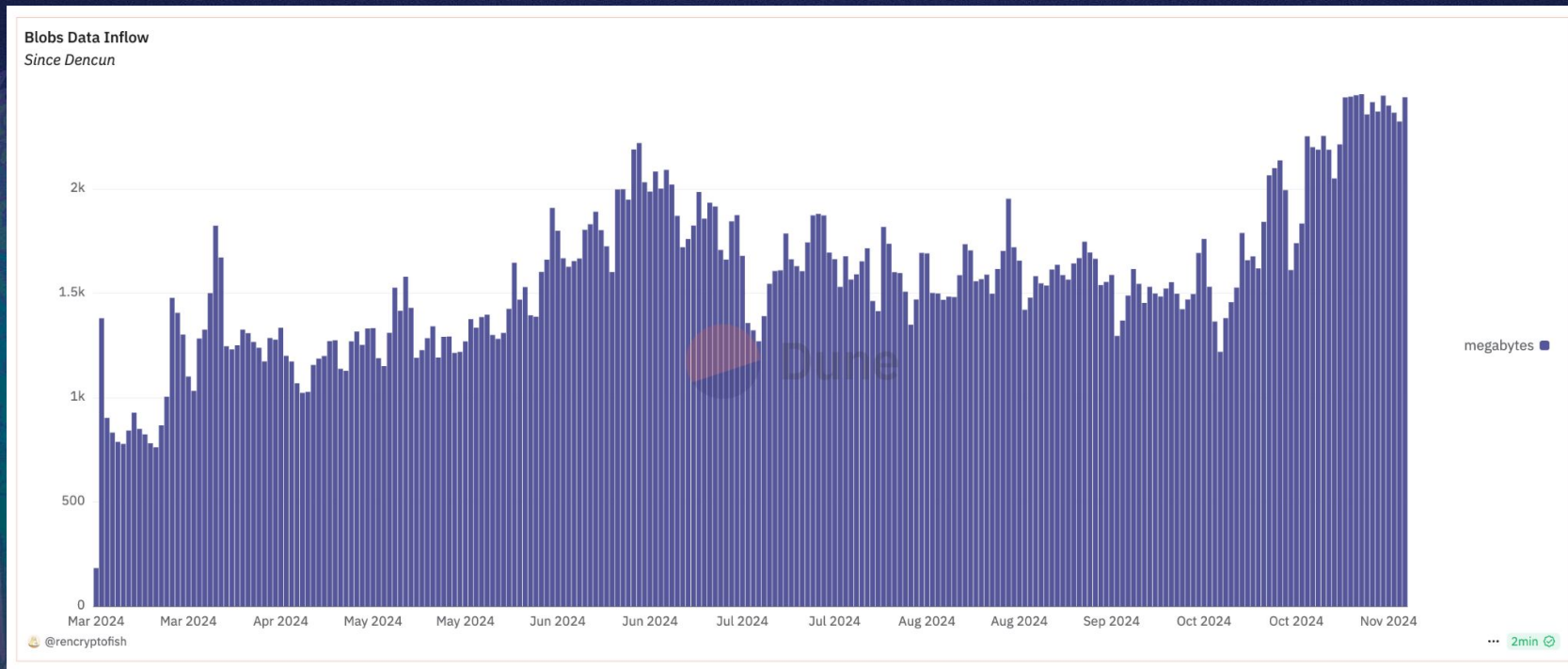
Are L2s generating activity and usage of ETH the asset?

L2 activity has grown tremendously
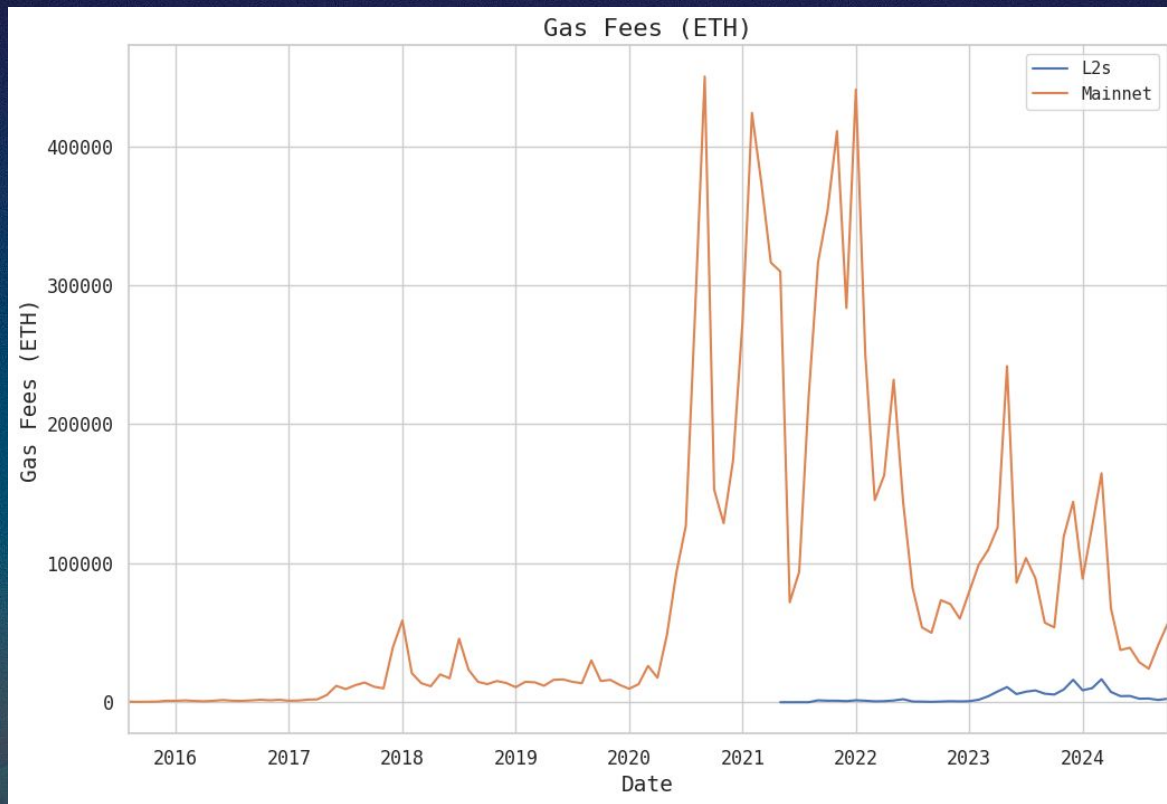

L2 Activity, using Ethereum as DA (L2Beat)

L2 usage of ETH as gas token has grown modestly due to lower L1 settlement fees despite higher activity

Zooming out, L2s are currently minor contributors to ETH being used as a gas token

Gas Fees (ETH)

L2 usage of ETH as an asset has grown tremendously

Total value locked stacked by type
2019 Dec 06 — 2024 Nov 11
Ξ12.00M
∞ / All time

Ξ14.40M
Ξ7.20M
Ξ0.00

2020   2021   2022   2023   2024

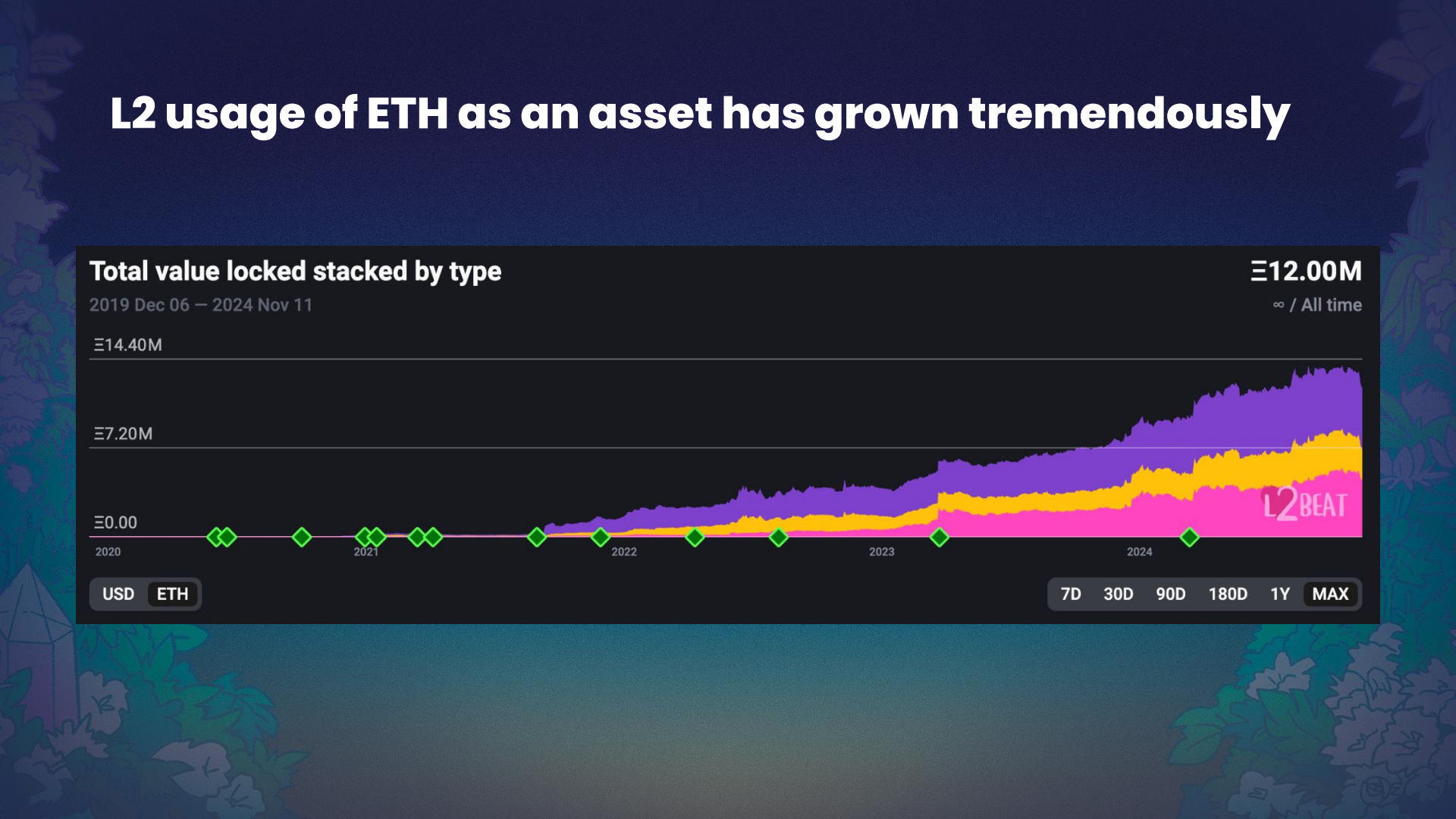USD ETH

7D 30D 90D 180D 1Y MAX

Current State

- There is not enough L2 blob demand to consistently get blob space into price discovery
- Blob pricing is currently in a bootstrapping period but has shown periods of price discovery and is approaching data inflow levels that would begin price discovery
- L2s drive a lot of new usage of ETH the asset but minor usage of ETH as a gas token (including blobs)

What is the dynamic between L2s and Ethereum?

At the limit, L2s and mainnet appear symbiotic

Tim Robinson had a great post on showing Ethereum blob market post surge

- 10,000 TPS
- 16 mbs of blobs per block
- 6.5% yield on ETH
- Reasonable user price sensitivity assumptions
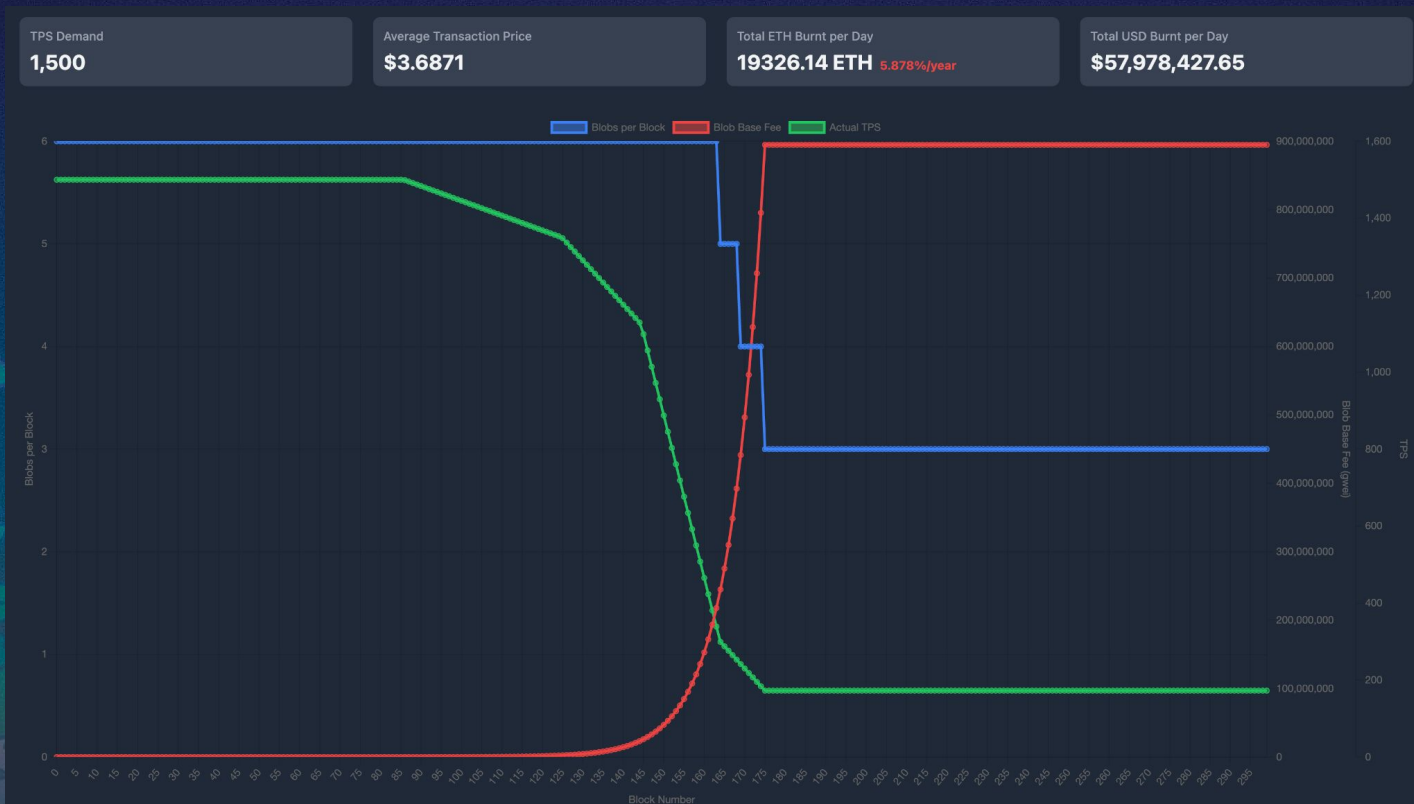
We are probably here

A few high throughput L2s with user price sensitivity can quickly congest blobs before Pectra B

TPS Demand	Average Transaction Price	Total ETH Burnt per Day	Total USD Burnt per Day
1,500	$3.6871	19326.14 ETH 5.878%/year	$57,978,427.65

Blobs per Block   Blob Base Fee   Actual TPS

Are L2s extractive?

We do not know.

Why we do not know:

1. L1 settlement fees have never been high enough to test Ethereum's network effect
2. L2s are relatively new and benefit tremendously from being able to bootstrap their vm, tooling, developers, users, community, from Ethereum
3. Most analysis treats N equal sized L2s which one might consider the current state, but does not consider the case where 1 or 2 L2s take 80-90% of activity and economic value and the remainder have marginal economic activity

Hypothetical conditions where L2s could be more extractive

- Limited L1 transaction processing capability
  - Economic situation of ETH riskier, L2s benefit from highly developed financial ecosystem on L1
- Power law for L2s
  - Dominant L2 would be the majority blob purchaser, clever batching could pin blob pricing below price discovery
- Incentive structures for L2 tokens or non ETH gas tokens
- Any form of escape hatch from mainnet settlement
- Siloed L2s with their own settlement kingdoms for L3s or similar
- Developing competing security models