CoinShares

POLYGON

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PURPOSE

Ethereum's Internet of Blockchains

THE SYSTEM

Layer 2
Scalable network of blockchains
Derives security from Validator set

Source: CoinShares

THE ASSET

Transaction Fees
Stake
Governance

Source: CoinShares

GENERAL INFO

Creators	Jaynti Kanani, Sandeep Nailwal, Anurag Arjun, Mihailo Bjelic
Launch	June 2020
Consensus	Proof of Stake
Asset	MATIC
Total Supply (native tokens)	10bn
Smallest Unit	Wei (ERC20, 10^18)
Core Products	Polygon POS, Miden, zkEVM, Nightfall, Zero, Avail. Supernets, Edge, ID
Language	Javascript, Typescript, Go, Rust, Solidity

Source: Polygon Docs, GitHub, Messari, CoinShares

PRICE ACTION

2020*	-16.93%
2021	15157.36%
2022 (YTD)	-68.88%

*"*Since June 2020.*
Source: MATIC/USD, Compass Financial Technologies. The figures shown relate to past performance. Past performance is not a reliable indicator of future results and should not be the sole factor of consideration when selecting a product. Transactions costs, fees and expenses not included. FIgures do not include any staking rewards.

QUICK STATS

Market Cap	$6.7bn
Circulating Supply (MATIC)	7,441,499,126
Staking APY	6.7%
Percentage Staked	33%
Number of active validators	100
Average Transaction Per Second	$0.01

Source: Polygonscan, Polygon Docs, CoinShares as of 24th August 2022

EXECUTIVE SUMMARY

This report simplifies and clarifies what MATIC is, the problem MATIC has tried to solve and its development since its launch. Strengths and weaknesses, opportunities and threats, core components and network architecture are also covered.

Polygon is a company with a growing suite of products that offers developers access to Layer 2 solutions and their main chain, Polygon POS, to scale Ethereum. Layer 2 removes the transactional burden and only communicates with Layer 1 to settle transactions with small security messages. This reduction in base layer congestion increases throughput and decreases cost. Leading by most metrics, the extent of Polygon's security, decentralisation and adoption sits between layer 1s such as Solana and Avalanche and layer 2s such as Arbitrum and Optimism. Yet, still, some risks are of note. Polygon's dependence on Ethereum and focus on Zero-Knowledge technology (the ability to verify blocks without revealing information) is innovative yet unproven and early.

PURPOSE, MOTIVATION AND SOLUTION

The co-founders of Polygon mention three main problems for Layer 1 adoption. Poor user experience from low throughput and high gas fees, slower finality (the point at which transactions cannot be reversed on-chain), and clogging risk of high throughput of transactions. Thus, Polygon POS - the only chain live as of writing - has these issues in mind resulting in fast and cheap transactions deriving settlement from Ethereum. Albeit with less economic security (total dollar value staked) and decentralisation due to a smaller distributed validator set. The team has grown to build a full technology stack for Web3. These ambitions have resulted in a growing spectrum of blockchains that tries to encompass users' needs, from speed to privacy to identity to sovereignty.

CORE PEOPLE

Jaynti Kanani is one of the Co-founders of Polygon and sits as CEO. Kanani worked as a software engineer and a data scientist at three companies before founding Polygon. He received his Bachelor of Engineering in Information Technology from Dharmsinh University in Pune, India.

Before Co-Founding Polygon, **Sandeep Naiwal** started a previous blockchain company called ScopeWeaver.com, then worked at Deloitte as a consultant and headed the Ecommerce division at Welspun Group. Naiwal received his MBA in Technology, Finance and Supply Chain Management from the National Institute of Industrial Engineering.

As another Co-Founder of Polygon, **Anurag Arjun** was the Associate Vice President of product management at IRIS. This role came after two prior product management roles at two other companies. Arjun started his career as an Analyst at Cognizant after receiving his Bachelor of Engineering in Computer Engineering.

As the last Co-Founder of Polygon to join the team, **Mihailo Bjelic** received his degree in Information Systems Engineering from the University of Belgrade. Before Polygon, Bjelic co-founded an AI/ML-powered platform for the automotive industry and several other smaller startups and side projects.

CORE COMPANY

Initial Token Distribution
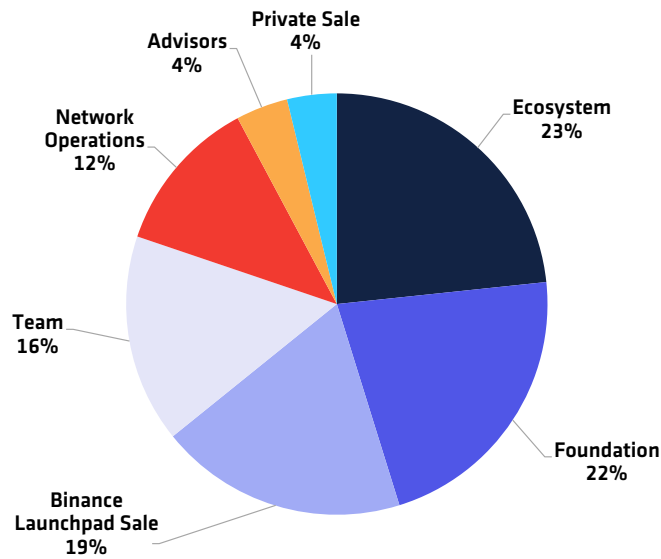
Source: Messari, CoinShares, data available as of close 23 August 2022

Founded in 2017, Polygon took three years to launch Mainnet Polygon POS, their first blockchain, in June 2020. To start the network, the team proceeded with seven validators managed by Matic foundation. Then they allowed other nodes to join in decentralising the network whilst opening delegation access for all. After gaining around 7m transactions over 200k addresses, they launched two chains while onboarding many applications. In February 2021, Matic rebranded to Polygon to guide and assist teams in navigating the unstructured Layer 2 landscape. Later that year, Polygon Edge and Polygon Avail launched in June and July. Polygon Miden launched in November, and Polygon Zero launched in December.

Polygon DAO is a group of people inside the Polygon ecosystem without a central authority or person in power. It has implemented its Bounty Board and an Ecosystem Job Board to allow everyone to contribute from day 1. Furthermore, Polygon Fund has partnered with large companies such as 776 ($200m raised) and Wintermute ($20m raised), as well as Outlier Ventures and Stable Node to fund and speed up token design, business strategy and community growth.

DEVELOPMENT

The number of developers on the network has declined almost 60% Year-over-Year (YoY), yet the number of pull requests - an important metric that reflects approved code changes - has only declined 15% YoY. This shows that Polygon likely has a core group of active developers as the number of authors per pull request has decreased 92% from its all-time high (ATH) of 200 to 14, and the number of pull requests per author stands only 6% below its ATH.
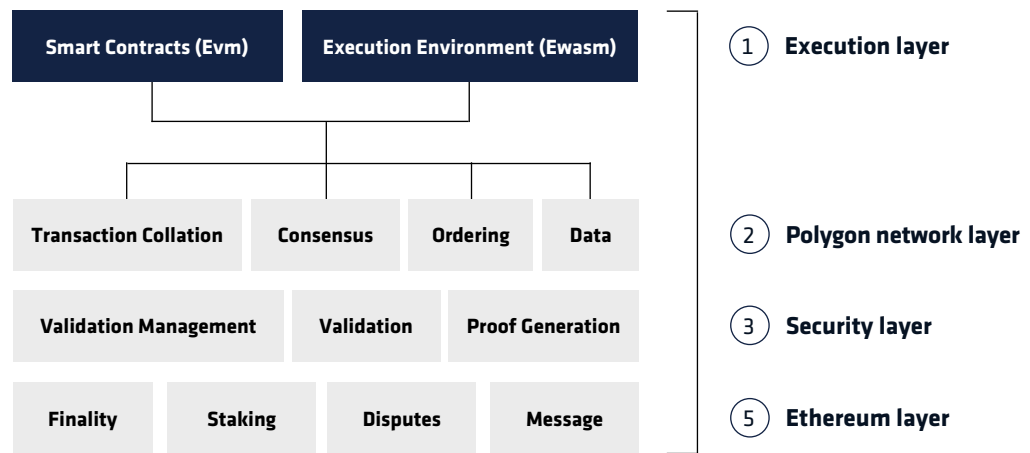
Polygon Developer Activity (30 Day Moving Average)

■ Number of Authors (LHS -76% ATH, -51% YoY)   ■ Number of Pull Requests (-28%, 7% YoY)
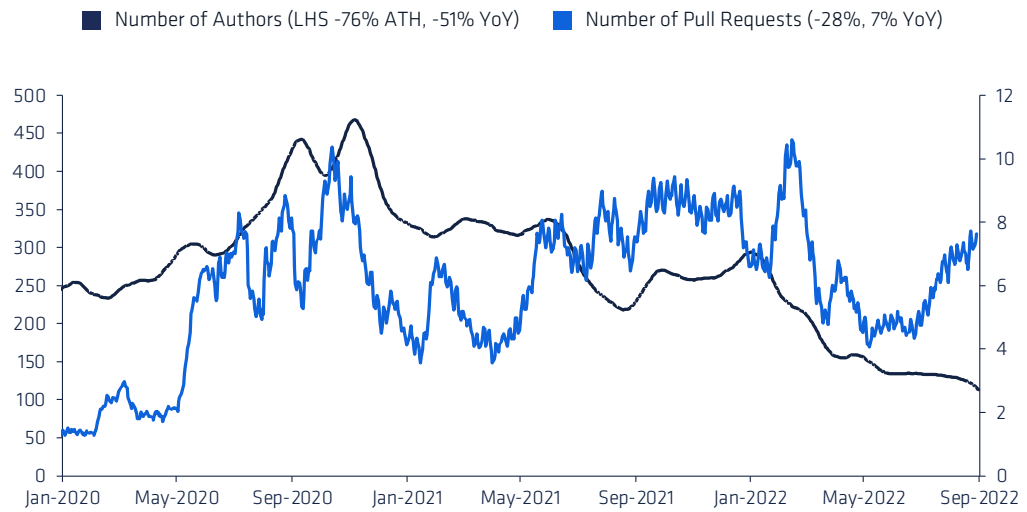
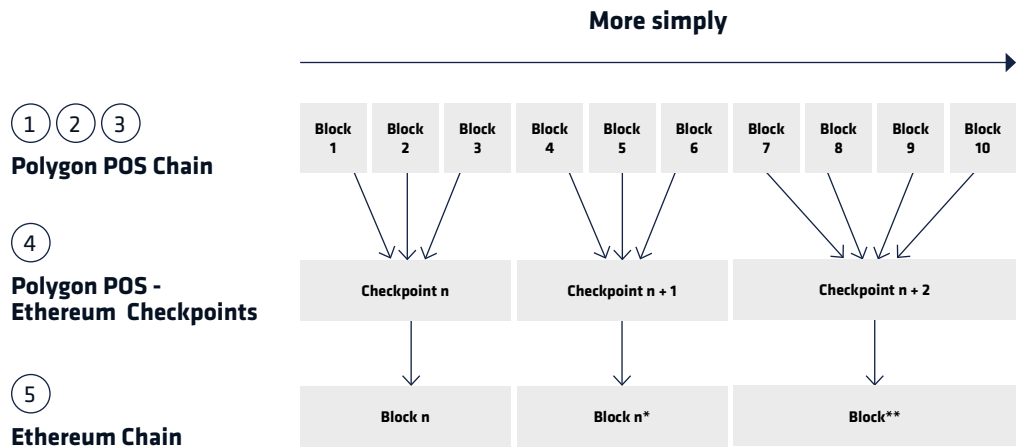*Source: GiThub, CoinShares, data available as of close 10 October 2022*

ARCHITECTURAL DESIGN

Network Architecture

Source: Polygon, CoinShares

1. At the top of the technology stack between Polygon and Ethereum is an execution platform that allows users to use applications and send transactions.
2. These transactions are put into blocks on the POS chain, otherwise known as the network layer.
3. Nodes validate transactions on the security layer, which runs parallel to Ethereum.
4. One of these nodes is selected randomly to gather confirmation signatures at a particular checkpoint and send screenshots of these blocks to the Ethereum chain.
   a) The next node to submit a block to a checkpoint also sends a confirmation message that the previous checkpoint transaction was successful.
   b) Checkpoints are crucial for both chains to stay up to date, provide finality of Polygon transactions on a secure base layer, and provide evidence of burn when withdrawing assets.

More simply

Block 1	Block 2	Block 3	Block 4	Block 5	Block 6	Block 7	Block 8	Block 9	Block 10

① ② ③

Polygon POS Chain

④

**Polygon POS -
Ethereum Checkpoints**

Checkpoint n	Checkpoint n + 1	Checkpoint n + 2

⑤

Ethereum Chain

Block n	Block n*	Block**

Source: Polygon, CoinShares

PRODUCTS

Polygon's teams are building a spectrum of products to fit people's different needs with different design trade-offs relating to composability and security. On one end are Polygon Supernets, powered by Polygon Edge, removing the complexity of blockchain development and the hassle of maintaining blockchain infrastructure. These sovereign independent chains derive no security from Ethereum and are connected with a bridge. These chains are much more flexible and customisable.

In the middle of the spectrum stands the only live product of nine: Polygon POS. This chain derives part of its security from Ethereum but has its own validator set. So far, it has reached over 1.9bn transactions, ~167m unique addresses, and ~263.5k daily unique addresses.

Other products across the spectrum include Edge, a blockchain framework; Nightfall for customisable, enterprise-specific blockchains; and Polygon ID for private self-identity. The latter innovates upon the current public-key model (similar to sort-code and account number) where everyone can see what tokens users hold.

On the other end of the spectrum are rollups. These rollup scaling solutions derive full security from Ethereum. Having had experience with Plasma architecture early in the development stages, the team grew to disbelieve in optimistic rollups, which Arbitrum and Optimism mostly use. These realisations led them down a route of Zero-Knowledge (ZK) rollups (Miden, Avail and Zero) - a way of processing transactions off-chain by submitting proofs on-chain to lower costs and increase speeds. Polygon's zkEVM has advanced from EVM compatibility to EVM equivalence (albeit with significant improvements from competitors as well). This dramatic developer experience could, theoretically, allow all apps on Ethereum to transfer seamlessly over to Polygon. Hence, growing network effects more.

Polygon tries to cover all bases to meet users' different wants and needs from distributed ledger technology (blockchain). This desire to provide a full Web3 stack opens up a vast net to capture value naturally flowing away from Ethereum.
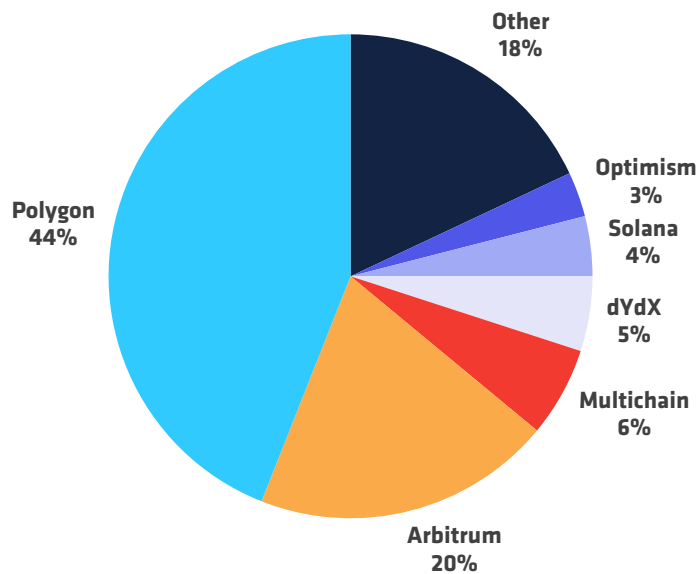
Internet of Blockchains
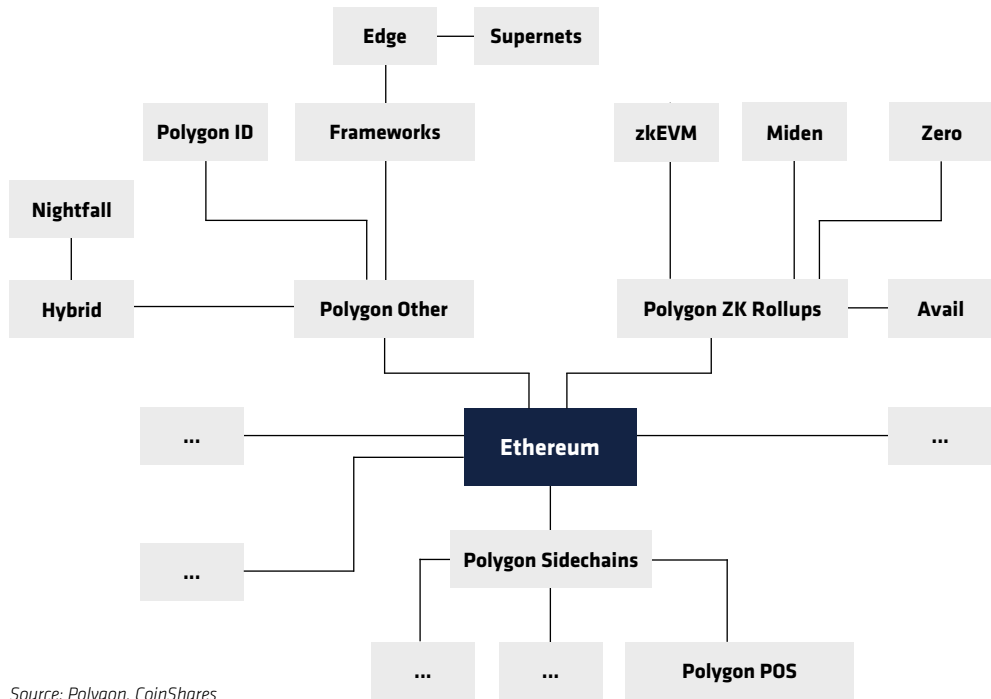
Source: Polygon, CoinShares

DEVELOPMENT

Total Value Locked

The amount of TVL on a bridge shows the direction of the flow of value between chains. Polygon comprises 44% of all bridge TVL from Ethereum, reaching around $5.2bn. Approximately 120% larger than the next biggest Layer 2 by bridge TVL, Arbitrum, at $2.4bn.

Bridge TVL Per Chain

Source: Etherscan, CoinShares, data available as of 26th July 2022

This dominance of bridge TVL stems from user preference for increased transaction speed and lower cost - a unique selling point. Our latest Bridge Sector Report unveils Polygon and MATIC's dominance across chains, layers and tokens.

Ethereum's Ecosystem TVL Comparison   ■ Polygon ■ Arbitrum ■ Optimism
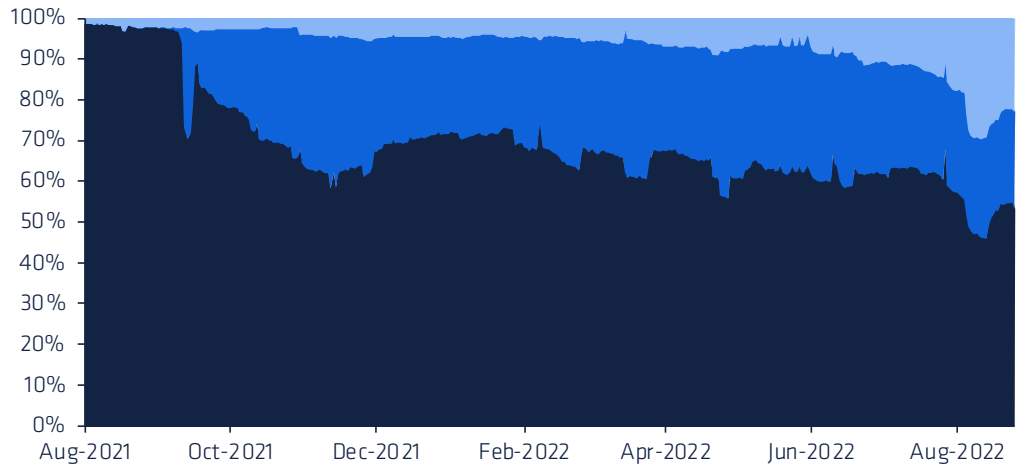
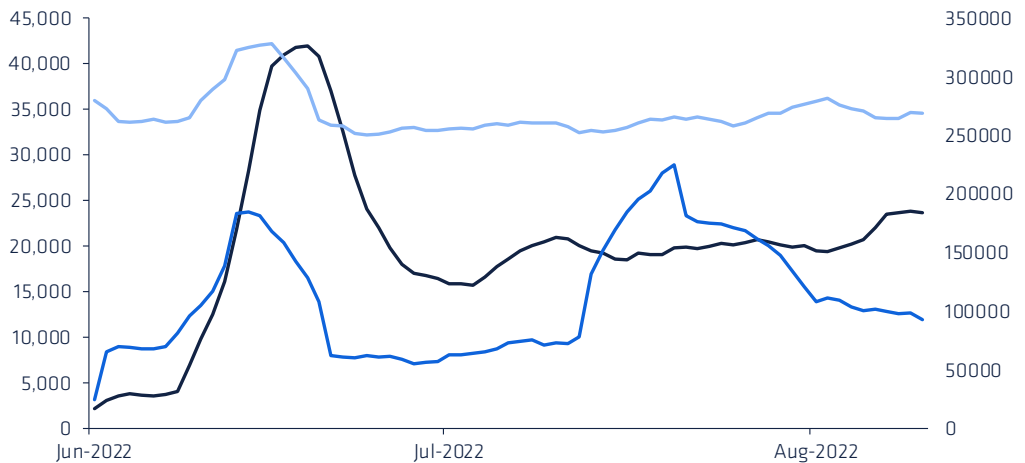*Source: DeFi Llama, CoinShares, data available as of close 24 August 2022*

Polygon also has over 37,000 applications and over a million users integrated into the Polygon network via the Coinbase wallet. The flow of value into the ecosystem has resulted in ~$1.5bn in TVL, 10%, 59% and 74% higher than Solana, Arbitrum and Optimism, respectively. Although around 6% lower than Avalanche, according to DeFi Llama.

STRENGTHS

Polygon is a far-away leader in most metrics. In terms of daily active addresses, Polygon has 2157% and 1038% more users than Optimism and Arbitrum, respectively. With regards to the number of transactions, Polygon has 2785% and 1713% more than Arbitrum and Optimism, respectively.
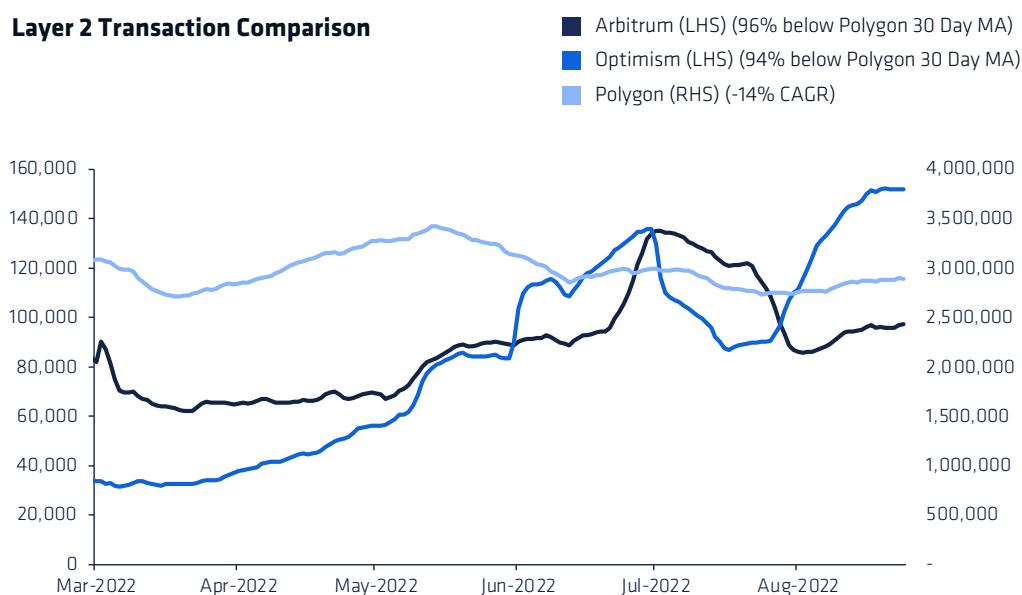
Layer 2 Daily Active Addresses   ■ Arbitrum (LHS) (91% below Polygon's 7 Day MA)
■ Optimism (LHS) (95% below Polygon's 7 day MA)
■ Polygon (RHS) (-18% CAGR)

Source: GokuStats, CoinShares, data available as of close 24 August 2022

Layer 2 Transaction Comparison

■ Arbitrum (LHS) (96% below Polygon 30 Day MA)
■ Optimism (LHS) (94% below Polygon 30 Day MA)
■ Polygon (RHS) (-14% CAGR)

Source: Dune Analytics, CoinShares, data available as of close 24 August 2022

WEAKNESSES

Polygon's heavy reliance on Ethereum means that the demise of Ethereum or the rise of other chains in a multi-chain world could negatively impact Layer 2 traction and adoption. Theoretically, if Ethereum were to be 51% attacked, the settlement layer would become untrustworthy. In this scenario, a malicious attacker could censor or stop the settlement of transactions on Ethereum executed on Polygon.

OPPORTUNITIES

Polygon's aim to be Ethereum's internet of blockchains requires the vision of a multi-chain thesis. Hence, a suit of teams, products and roadmaps are all being developed simultaneously across a spectrum of trade-offs to fit people's different needs. Each chain under the Polygon umbrella also has its own total addressable market for different use cases, all using the MATIC token to accrue value.

THREATS

Polygon supports a modular thesis - a world where blockchains have different parts for execution, consensus and data availability. Whereas blockchains similar to Solana and newer blockchains such as Aptos and Sui are monolithic, faster and more performant yet compromise on decentralisation. The path forward will be unveiled by user preferences - whether users care more about speed, security or decentralisation.

There is a possibility that ZK technology - an innovative and early technology - isn't the future. Optimistic rollup technology is production ready, offering an immediate solution to the high gas fees plaguing Ethereum - which ZK isn't. Optimistic systems have an inherent and considerable cost advantage compared to ZK systems. Therefore, if ZK technology doesn't live up to its promises, the vast amounts of time and resources Polygon spent could be its most significant downfall. To continue this debate; read here and here detailing two opposing theses from the Polygon and Arbitrum teams.

Other blockchains are scaling in similar ways to Polygon. Avalanche's Subnets, Polkadot's Parachains and Cosmos' Zones all scale horizontally (add more chains and computers to spread transaction load), yet to different extents and trade-offs regarding security, decentralisation and speed.

COMPARISON

Polygon is less secure, decentralised and adopted than Layer 1 competitors. But more secure, decentralised and adopted than its Layer 2 competitors. This net effect is likely due to the technology of Layer 2s developing later and more slowly than the Layer 1s. But also, most developers and value have been captured by Ethereum and flowed to other Layer 1 ecosystems rather than into Layer 2s.

	Solana	Avalanche	Polygon POS	Arbitrum	Optimism
Layer	Layer 1	Layer 1	Off-Chain	Layer 2 (Optimistic Rollup)	Layer 2 (Optimistic Rollup)
Purpose	High performance, permissionless blockchain	Digitize world assets	Ethereum's internet of blockchains	Scale Ethereum with low cost transactions	Scale Ethereum with low cost transasctions
Consensus Mechanism	Proof of Stake	Proof of Stake	Proof of Stake	Proof of Computation (Multi-Round Fraud Proofs)	Proof of Computation (Single-Round Fraud Proofs)
Decentra-lisation	Number of Validators = 1934 33% of Stake = 31 Validators Minimum stake for validator = 0 SOL ($...) although vote account is 0.02 SOL of which daily voting can cost up to 1.1 SOL ($39 combined) Minimum stake for delegator = 1 SOL ($32) Hardware require-ments = heavy	Number of Validators = 1266 33% of Stake = 32 Validators Minimum stake for validator = 2000 AVAX ($46.6k) Minimum stake for delegator = 25 AVAX ($580) Hardware requirements = modest	Number of Validators = 100 33% of Stake = Unknown Minimum stake for validator = 1 MATIC ($0.81) Minimum stake for delegator = 1 MATIC ($0.81) Hardware requirements = very modest	Number of Sequencers = 1	Number of Sequencers = 1 (OP Labs PBC)
Security	Total Stake = $14.3bn Staking Ratio = 76%	Total Stake = $6bn Staking Ratio = 64%	Total Stake = $2.1bn Staking Ratio = 22%	One active validator, the rest are defensive validators that prove fraud from the active validator	One trusted and centralised Sequencer
Adoption	Number of Transactions = ~18.6bn (non-vote) Average Transaction Fee = $0.0001 Number of Daily Addresses (30 Day MA) = ~44.8k Number of Unique Cumulative Addresses = ~13.5m Number of Daily Pull Requests (30 Day MA) = 49	Number of Transactions = ~263m Average Transaction Fee = $0.01 Number of Daily Unique Addresses (30 Day MA) = ~110k Number of Unique Cumulative Addresses = ~3m Number of Daily Pull Requests (30 Day MA) = 7	Number of Transactions = 1.96bn Average Transaction Fee = $0.01 Number of Daily Unique Addresses (30 Day MA) = ~263.5k Number of Unique Cumulative Addresses = ~167.3m Number of Daily Pull Requests (30 Day MA) = 9	Number of Transactions = ~23.6m Average Transaction Fee (30 Day MA) = $0.04 Number of Active Addresses (30 Day MA) = ~24k Number of Unique Cumulative Addresses = ~1.14m Number of Daily Pull Requests (30 Day MA) = 7	Number of Transactions = ~20.3m Average Transaction Fee (30 Day MA) = $0.14 Number of Daily Unique Addresses (30 Day MA) = ~18k Number of Unique Cumulative Addresses = ~1.39m Number of Pull Requests (30 Day MA) = 8
Toke-nomics	APY = 5.91% Inflation = 4.57% Real Yield = 1.34%	APY = 9% Inflation = 5.83% Real Yield = 3.17%	APY = 10.73% Inflation = 4.07% Real Yield = 6.66%	N/A	Inflation = 2%

Source: Dune, Staking Rewards, Solscan, Solana Docs, Avax Explorer, Avax Docs, Polygonscan, Polygon Docs, Nansen, Arbiscan, Medium, Gemini, Optimism Explorer, Optimism Community
Disclaimer: Yield metrics are calculated from staking not strategies of yield generation, Burn is calculated from native tokens

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