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# EXPLORING THE RESTAKING ECONOMY: A DATA-DRIVEN LOOK AT EIGENLAYER'S RESTAKING PRIMITIVE

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## ABSTRACT

EigenLayer is reshaping the provisioning and consumption of the crypto-economic security in the Ethereum ecosystem with its restaking primitive, which enables the reuse of ETH, Ethereum's native token on the consensus layer for extended crypto-economic security. Understanding EigenLayer's restaking economy and its players is crucial for every Ethereum ecosystem participant.

Spice AI provides enterprise-grade, high-availability data and AI infrastructure preloaded with Web3 data. Using EigenLayer native and liquid restaking datasets provided by Spice.ai, this paper will help builders and researchers better understand how Eigenlayer's restaking economics would impact the Ethereum ecosystem by exploring the following four topics: Restaking assets distribution, Restaker withdrawal behaviors, EigenLayer NFT owners, and Restaker backgrounds.

## 1 Introduction

A protocol built on Ethereum, EigenLayer introduces restaking, a new primitive in crypto-economic security that enables the reuse of ETH, Ethereum's native token, on the consensus layer. Restakers, the crypto-economic security providers of EigenLayer, can opt-into EigenLayer smart contracts to restake their beacon-chain ETH or their Liquid Staking Tokens (LSTs), and delegate their restaking balances to Operators. Operators, users who run the Actively Validated Services (AVS) software, utilize the shared crypto-economic security from delegated restaking balance by opting-into validating various AVS. AVS, the collection of services and middleware built on top of EigenLayer, consumes the extended crypto-economic security provided by restaking [1].

The EigenLayer Stage 1 launch in June 2023 introduced restaking on Ethereum Mainnet. In November 2023, EigenLayer launched Stage 2, onboarding operators on Goerli testnet and introducing the first AVS, EigenDA, a secure, high-throughput, and decentralized data availability (DA) service built on top of Ethereum.

Restaking introduces new concepts, processes, and questions to the crypto-economic security landscape in the Ethereum ecosystem. A good understanding of the restaking economy driven by EigenLayer, and the active participants within it will be critical for every player in Ethereum.

This paper focuses on four central topics important to the discourse on the supply-side dynamics of restaking economics and profiles and behaviors of restakers:

- Restaking Economics
  - Restaking assets distribution
- Restakers
  - Restaker withdrawal behaviors
  - EigenLayer NFT owners
  - Restaker backgrounds

## 2 EigenLayer Restaking Economics Insights

### 2.1 Restaking Assets Distribution

EigenLayer is a market for crypto-economic trust. Understanding the distribution of restaking assets helps frame crypto-economic trust supply dynamics within restaking economy.

Restaking enables three forms of programmable trust on EigenLayer: economic trust, decentralized trust, and Ethereum inclusion trust. Economic trust is driven by native and liquid restaking assets at risk, decentralized trust is driven by distinct and distributed operators, and Ethereum inclusion trust is driven by number of operators who are native restakers [3].

Currently, there are 2 types of restaking methods, each with a corresponding type of restaker on EigenLayer:

**Native Restaking** Native restakers who operate an Ethereum node restake by setting their withdrawal credentials to an Eigenpod, a contract that is deployed on a per-user basis to facilitate native restaking. Native Restaking requires higher upfront investment due to the 32ETH requirement and running an Ethereum validator.

**Liquid Restaking** Liquid restakers who hold Liquid Staking Tokens (LSTs) restake by transferring LST tokens into the EigenLayer protocol. Liquid restaking is a lower requirement, higher flexibility restaking method. Noted that Liquid restakers take additional smart contract risk depending on the LST tokens they are holding.

In EigenLayer, crypto-economic security providers (restakers) restake beacon ETH or LSTs to opt into securing AVS by delegating restaking assets to operators; Operators are the validators of the AVS they choose to opt into. An operator can be an Ethereum validator who natively restakes, a liquid restaker, or an Ethereum address that doesn't have any restaking balances. Security consumers (AVS) can in turn, choose the combination of programmable trust by specifying types of operators.

#### 2.1.1 Overall Restaking Asset Distribution, Ethereum

Currently, pooled crypto-economic security within EigenLayer mainly comes from liquid restaking. Based on the EigenLayer strategy manager and Eigenpod datasets (11/28/2023), only 31.3% of restaked assets on the Ethereum mainnet are beacon chain ETH. Out of all liquid restaking assets, stETH occupies the greatest restaked proportion and became the first LST to hit a 100k cap on Aug 22nd, shortly after EigenLayer announced the LST cap increase (Figure 1).

The limited Beacon ETH distribution level is likely due to the lack of AVS, which may demand Ethereum inclusion trust provided by operators who natively restake, and the lack of incentives for native restaking in the current launch, combined with high upfront capital investment and set up needed for running Ethereum validators.

#### 2.1.2 Native Restaking Asset, Ethereum

45% of native restakers on Ethereum mainnet create new validators for restaking. To start native restaking, restakers may choose one of the following approaches:

- Re-point existing validators with 0x00 withdrawal prefix to Eigenpod address with 0x01 withdrawal prefix
- Create new validators with 0x00 withdrawal prefix and re-point to Eigenpod address with 0x01 withdrawal prefix
- Create new validators and directly set withdrawal credential to Eigenpod (0x01 withdrawal prefix)

Aggregating the eth.beacon.bls\_to\_execution\_changes dataset and native restaking datasets (11/28/2023) reveals that around 55% of mainnet native restakers have gone through the re-pointing process, which means 45% of validators are newly created with withdrawal credentials directly set to Eigenpods (Figure 2).

Several “whales” are identified in Mainnet native restaking. Tracking the addresses and ENS names associated with any address that has restaked (11/28/2023) using the ENS ens.domains dataset and native restaking datasets shows that the biggest 5 Eigenpods take up around 51% of total natively restaked assets, and the largest Eigenpod restaked 16.2% of beacon ETH that has been restaked on EigenLayer (Figure 3).

Due to high concentrations of funds, whales can be both major contributors and threats to crypto-economic security. Closely and accurately monitoring suspicious activities of restakers becomes one of EigenLayer's top priorities as it scales the restaking economy.

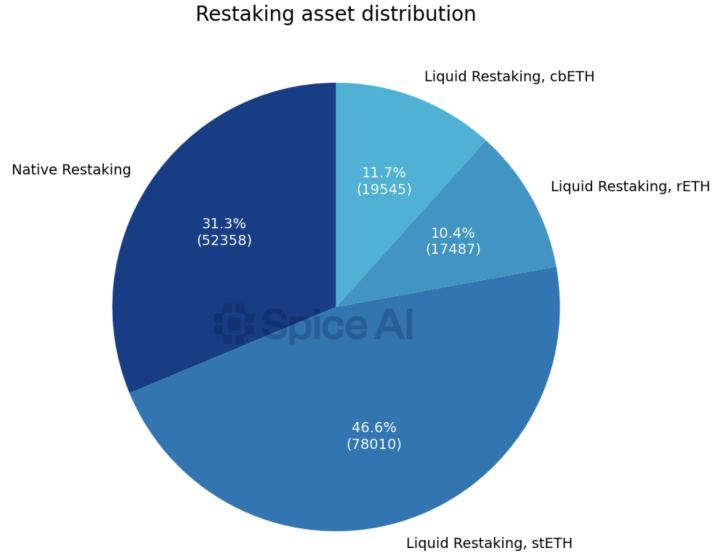


Figure 1: Distribution of Restaking Assets, Ethereum



Figure 2: Distribution of Repointed & Not-Repointed Validators, Ethereum

### 2.1.3 Liquid Restaking Asset, Ethereum

Liquid restaking comes with high flexibility and low requirements. Therefore, most liquid restakers may choose to participate in a lightweight sense: They either restake a low amount or a single type of LST (Figure 4 & 5).

EigenLayer strategy manager dataset (11/28/2023) shows that 95.67% of liquid restakers only restake one type of LST on Ethereum Mainnet, and more than 83% of LST of any type restaked is lower than 2 ETH value.

### 2.1.4 Involvement In Different Restaking Methods, Ethereum

Almost no restaker address diversifies its restaking risk by participating in native and liquid restaking at the same time. The combination of mainnet native and liquid restaking data (11/28/2023) shows that almost all addresses that restakes only participate in a single restaking method, either native or liquid. Notice that this phenomenon may also result from restakers using separate addresses for native and liquid restaking (Figure 6).

### 2.1.5 Summary

The above analysis demonstrates that the security provision of EigenLayer at this nascent stage is predominantly powered by liquid restaking. It also uncovered a tendency among restakers to concentrate rather than diversify their restaking asset distributions, with significant players, or "whales," present in both native and liquid restaking. These supply-side dynamics of restaking economy help inform how and where incoming participants can establish themselves in the EigenLayer ecosystem.

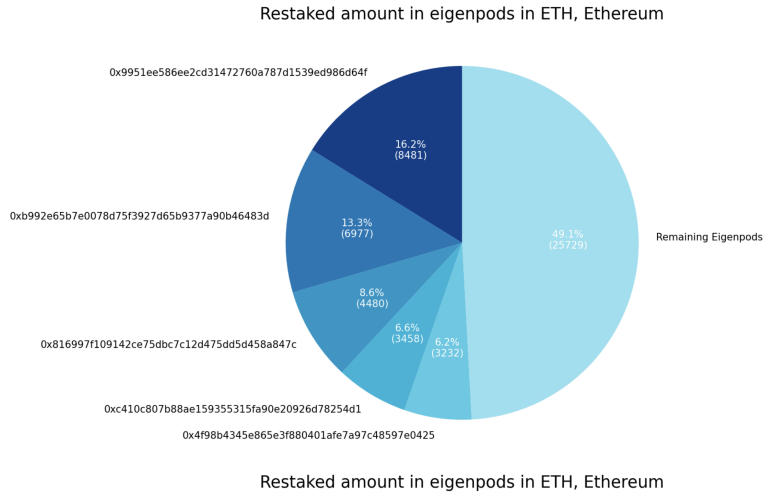


Figure 3: ETH Restaked by Eigenpods, Ethereum

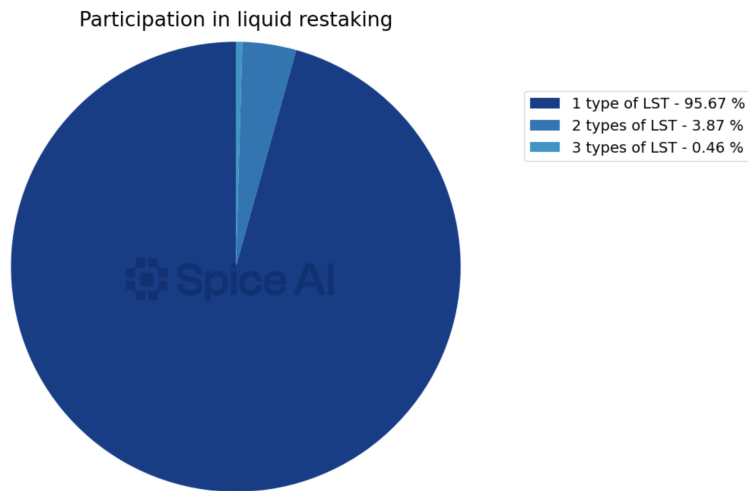


Figure 4: Types of LST Restaked by Each Restaker, Ethereum

### 3 EigenLayer Restakers Insights

#### 3.1 Restaker withdrawal behaviors

EigenLayer enforces a uniform withdrawal delay for every restaker, but the actual withdrawal time for each restaker varies, which correlates with the amount of assets withdrawn.

The initial launch comes with a withdrawal escrow period, 7 days on mainnet and roughly 2 minutes on testnet, during which withdrawals are reviewed for anything suspicious. To complete the whole withdrawal process on EigenLayer, users not only need to wait until the end of escrow period, but also manually claim the withdrawn amounts to transfer funds to their wallets. The period between the end of withdrawal escrow period and successful claim of withdrawal asset is called a withdrawal lag in this paper.

Traditionally, individuals are incentivized to expedite asset withdrawals, preferably at high volumes, to seize opportunities for payments or profit. We examine whether this dynamic applies to restaking asset withdrawals to understand the strategies and motivations of restakers.

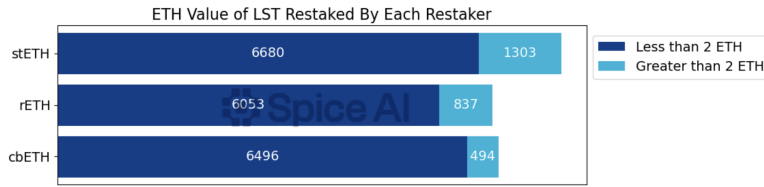


Figure 5: Amount of LST Restaked by Each Restaker, Ethereum

### Participation in different restaking methods

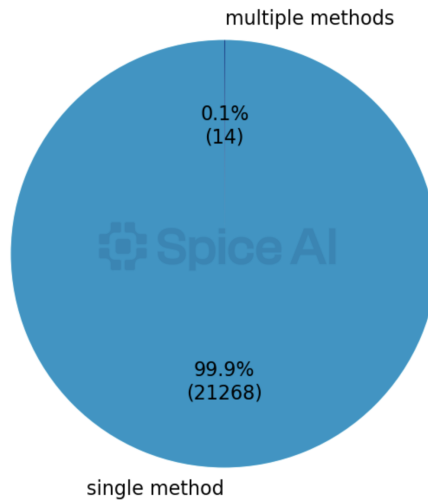


Figure 6: Participation in Different Restaking Methods, Ethereum

### 3.1.1 Native Restaking Asset Withdrawal, Ethereum

The withdrawal lag for native restaking assets exhibits a clear bar pattern around the withdrawn amount of 32ETH (Figure 7 8), shown by the query results leveraging withdrawal router creation and claim datasets (11/28/2023).

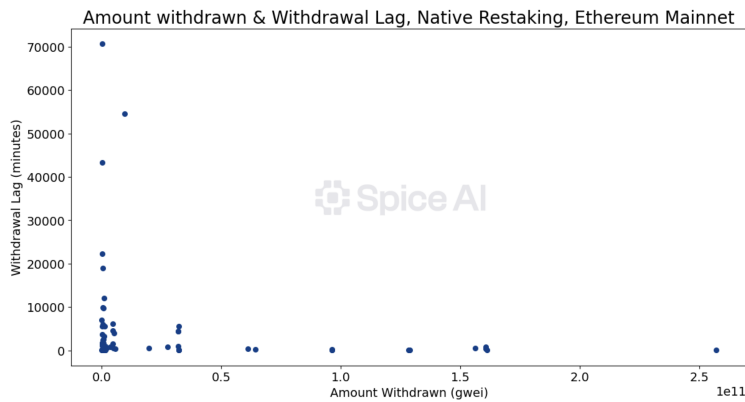


Figure 7: Withdrawal Amount & Withdrawal Lag, Native Restaking, Ethereum

Further segregate native withdrawals into 2 groups using the amount withdrawn of 31ETH, the approximate withdrawal value of whole validator balance minus an 1 ETH buffer. The average withdrawal lag for withdrawal greater than 31ETH is much smaller than withdrawal smaller than 31ETH both Ethereum Mainnet, while the difference on Goerli Testnet is much smaller. This withdrawal pattern coincides with people's traditional behavior regarding asset withdrawal, as mainnet ETH carries more real-world monetized value (Figure 9).

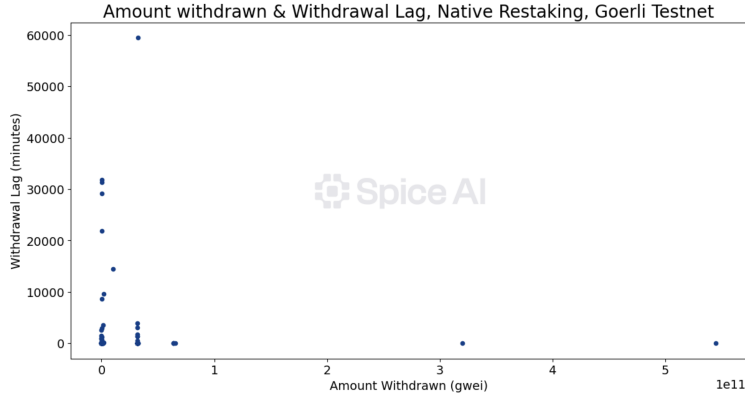


Figure 8: Withdrawal Amount & Withdrawal Lag, Native Restaking, Goerli

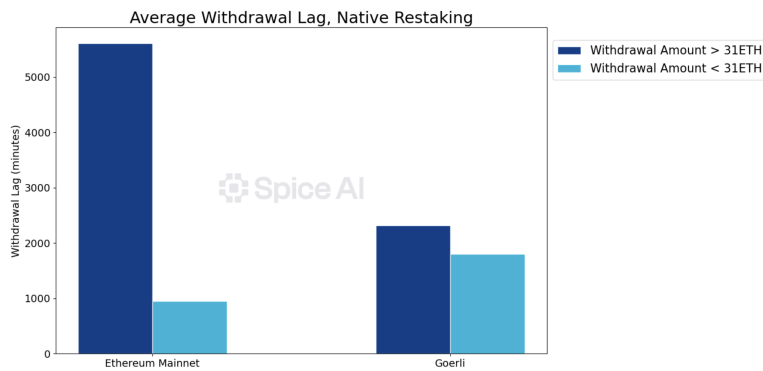


Figure 9: Average Withdrawal Lag, Native Restaking

### 3.1.2 Liquid Restaking Asset Withdrawal, Ethereum

While there's a obvious separation line of 32ETH, the validator balance, for native restaking withdrawals, liquid restaking withdrawals don't have such distinction and allow any amount of LST withdrawn from EigenLayer.

As shown by strategy manager withdrawal datasets (11/28/2023), large withdrawals typically experience minimal delays in liquid restaking (Figure 10 11). Although it's challenging to establish a statistically significant inverse relationship between withdrawal size and lag due to withdrawal method uniformity and imbalanced LST withdrawn amount distribution, the graphical representation still offers valuable insights. Specifically, withdrawal lags diverge for small amounts but become consistently shorter as the withdrawal size increases.

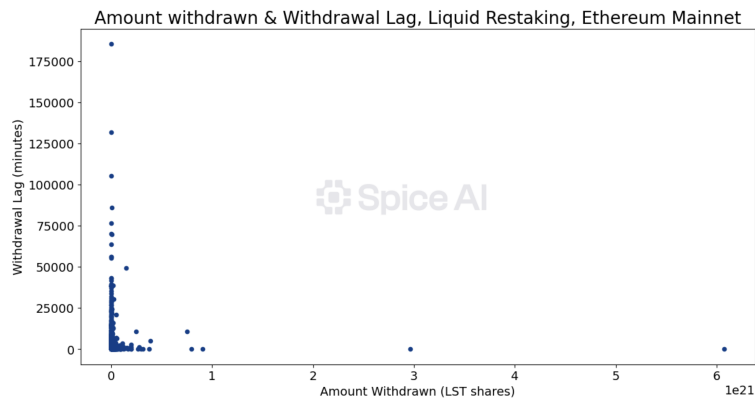


Figure 10: Withdrawal Amount & Withdrawal Lag, Liquid Restaking, Ethereum

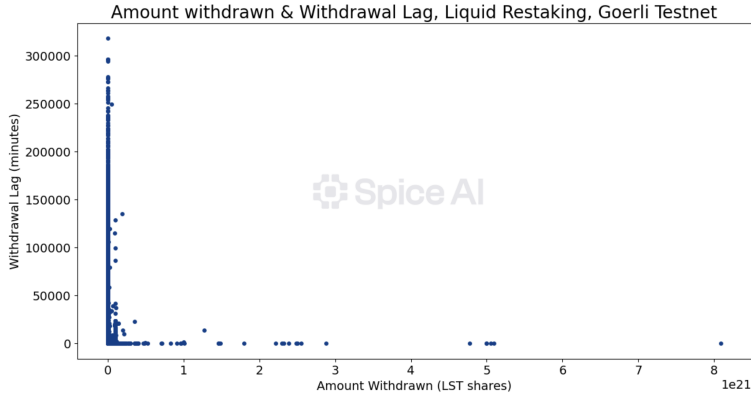


Figure 11: Withdrawal Amount & Withdrawal Lag, Liquid Restaking, Goerli

### 3.1.3 Summary

In this section, we examined a significant restaker behavioral pattern regarding withdrawal. Restakers tend to speed up withdrawals when dealing with large amount withdrawals, which holds true for both liquid and native asset withdrawal. Key insights here are critical for understanding the restakers’ strategies and psychology.

## 3.2 EigenLayer NFT Owners

EigenLayer NFT are successful representations of EigenLayer community members. Restakers actively collect EigenLayer NFT.

For an EigenLayer community member, restaking is the primary way of contributing to EigenLayer economy. While not all interested in EigenLayer would directly delve into restaking at this early stage, minting EigenLayer NFT serves as an alternative form of involvement. Considering the different nature of NFT collecting and restaking, a close examination of the common ground of the two groups will grant us a better understanding on EigenLayer community, as well as EigenLayer restaker patterns.

Up until now, EigenLayer has released 2 NFT collections. EigenLayer World Builders & EigenWorlds. EigenLayer World Builders is launched in June 2023 to celebrate EigenLayer’s mainnet launch. EigenWorlds is created on Aug 30th, 2023, for community members, including restakers and WorldBuilder minters, to mint their unique visual landmark on EigenLayer system [2].

### 3.2.1 Restakers Among EigenLayer NFT Owners

Aggregating NFT owners and EigenLayer native & liquid restaking datasets (11/28/2023) shows that restakers are the primary owners of EigenLayer NFT, in terms of both unique addresses and quantity. To date, restakers from Ethereum Mainnet & Goerli account for roughly half ownership of either EigenLayer NFT: More than 50% of WorldBuilder owners are EigenLayer restakers, and around 46% of Eigenworld owners are restakers (Figure 12).



Figure 12: Number of Restakers Among EigenLayer NFT Owners

As for quantity of EigenLayer NFT owned, restakers own around half of the EigenLayer World Builders NFT and EigenWorld NFT (Figure 13).

### 3.2.2 EigenLayer NFT Owners Among Restakers

EigenLayer NFT collections are shown to be popular among restakers. Among all Mainnet and Goerli restakers, around 10% of them own EigenLayer NFTs, while 2.44% of restakers own both. Considering the contrast magnitude

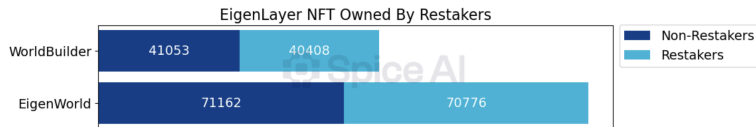


Figure 13: Number of EigenLayer NFT Owned by Restakers

of EigenLayer NFT total mints (around 220k) vs number of restakers (around 640k), 10% serves as a fair proof of EigenLayer NFT’s great popularity among restakers (Figure 14).

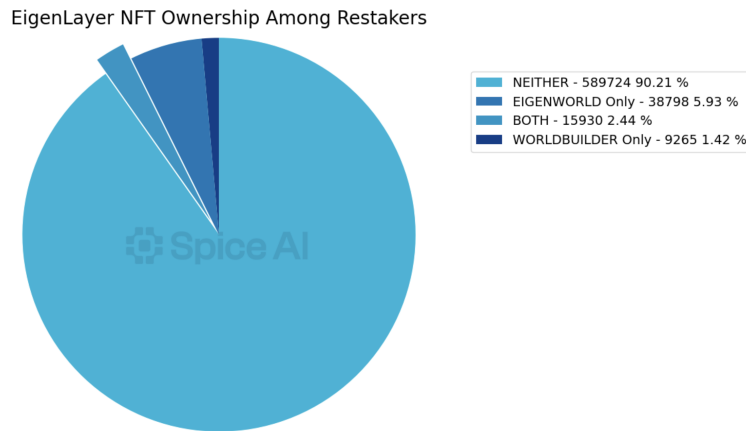


Figure 14: EigenLayer NFT Ownership Among Restakers

### 3.2.3 Correlation Between Restaking Balances & EigenLayer NFT Owned

By leveraging Eigenpod balances (Native Restaking) and Strategy Manager deposits and withdrawals (Liquid Restaking) datasets with EigenLayer NFT ownership data derived in the previous analysis (11/28/2023), we can analyze the relationship between the amount of restaking assets with EigenLayer NFT ownership. A simple calculation of the correlation coefficient demonstrates the low correlation between the two variables. The low correlation is likely caused by the different nature of restaking & NFT minting: there’s no direct relationship between the number of EigenLayer NFTs owned versus the amount of total restaking assets for restakers (Figure 15).

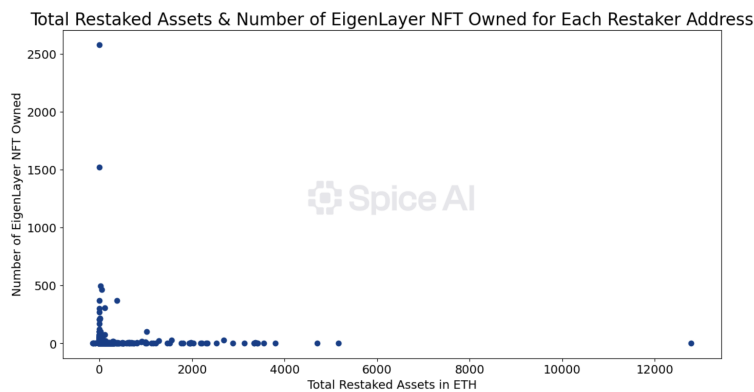


Figure 15: Total Balances of Restaking Assets (ETH) vs. Number of EigenLayer NFT Owned

### 3.2.4 Summary

In this section, we examined EigenLayer NFT owners’ profiles and behaviors. EigenLayer NFTs have proved to be a success: attracting not only NFT fanatics but also a substantial amount of restakers, who constitute around half of



EigenLayer NFT ownership. Additionally, there is no statistically significant relationship between restaked assets and EigenLayer NFT owned. Understanding this ownership composition and restakers role in it is critical for EigenLayer to tailor future community engagement strategy and deepens our overall understanding of dynamics within EigenLayer ecosystem.

### 3.3 Restaker Background

A great proportion of restakers were inactive before EigenLayer Mainnet launch, while those who are active restakers could be Defi enthusiasts.

EigenLayer is a game-changer for crypto-economic security. Understanding the background of current restakers: those who pioneered joining this innovative business is therefore critical. Are they active players on Ethereum mainnet before restaking? What contracts did they interact with before joining EigenLayer? By combining EigenLayer Mainnet native and liquid restaking data and Ethereum transactions dataset (11/28/2023), we will figure out answers to these questions.

#### 3.3.1 Restakers' Frequency of Interaction with Smart Contract, Ethereum

42.1% of restakers on Mainnet don't interact with any smart contracts 90 days (about 3 months) before EigenLayer Mainnet Launch (Figure 16). For most restakers who were active before EigenLayer mainnet launch, their frequency of contract interactions is less than 50 (Figure 17).

Mainnet Restakers' Interaction With Smart Contract 90 Days Before EL Mainnet Launch

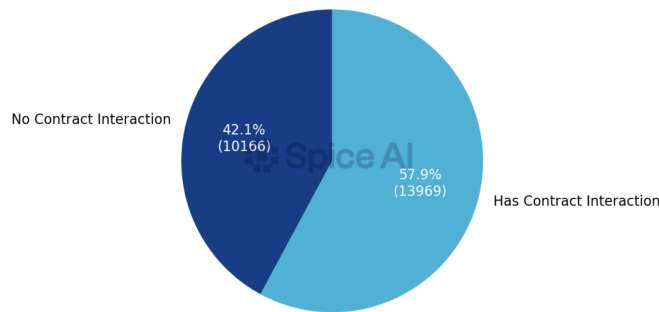


Figure 16: Mainnet Restakers' Interaction with Smart Contract, 3 Months Before EigenLayer Mainnet Launch

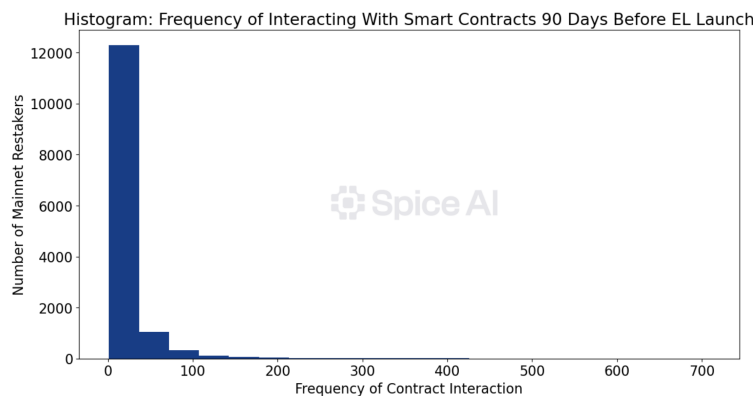


Figure 17: Frequency of Interacting with Smart Contract by Mainnet Restakers, 3 Months Before EigenLayer Mainnet Launch

#### 3.3.2 Smart Contracts Mostly Interacted by Restakers, Ethereum

USDC Token, USDT Stable Coin, and Wrapped Ether are among the top list of most frequently interacted contracts by mainnet restakers 90 days (about 3 months) before EigenLayer Mainnet Launch (Figure 18). These contract interactions

could imply Defi activities since users will typically convert their ETH into an ERC-20 token before depositing onto a Defi protocol.

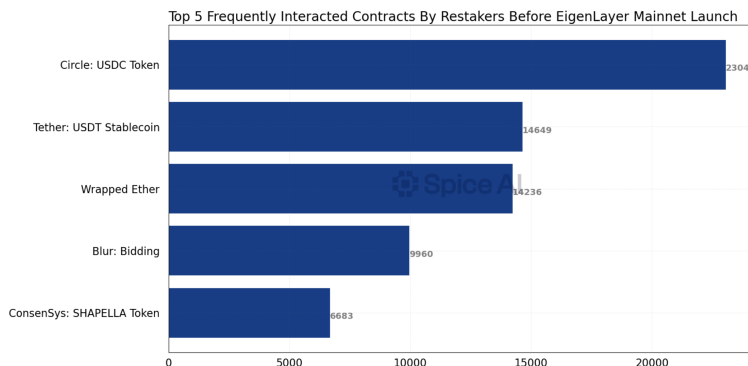


Figure 18: Top 5 Frequently Interacted Contracts by EigenLayer Mainnet Restakers, 3 Months Before EigenLayer Mainnet Launch

### 3.3.3 Summary

This section uncovers that current restakers, although not all previously active on Ethereum, are familiar with interacting with ERC-20 contracts. It would be worth examining restakers' transactions after token contracts interactions to better understand their behaviors and interests. These insights into restaker backgrounds would be vital for a comprehensive understanding of both EigenLayer's restaker community and the restaking economy they support.

## 4 Conclusion

This paper reveals critical insights on EigenLayer restaking economy dynamics and restakers. EigenLayer has an increasing amount of restaking assets deposits, with pooled crypto-economic security mainly coming from liquid restaking. Withdrawal from EigenLayer comes with a uniform escrow period and a user claiming lag, which is related to withdrawal asset amount. Restakers are active collectors of EigenLayer NFTs and commonly interact with popular ERC-20 tokens.

Note that some of the conclusions drawn here will require updating, for example, regarding the restaking asset distribution, since currently there's only security supply side on Ethereum Mainnet restaking, and the security consumption from AVS has just started on Goerli Testnet. As EigenLayer steadily scales its restaking economy, the community should anticipate exponential growth in both the number of restakers and AVS. Further data-driven insights can be developed on operator delegation, utility maximization for restakers and AVS, operator slashing and more.

All the analysis in the paper can be reproduced with data from Spice.ai. As a developer-first platform, Spice AI will continue supporting EigenLayer's restaking economy and Web3 builder community with high-performance, high-availability data infrastructure. Together we can usher in more secure, data-driven, AI-driven innovations.

## Acknowledgments

Thanks to Gautham Anant, Daniel Mancia, and Samuel Laferriere and the rest of the EigenLayer team for their review and support of this paper.

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