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EFFECTIVENESS OF INCENTIVE PROGRAMS IN VALUE CREATION: A STATISTICAL ANALYSIS OF LTIPP PROTOCOLS ON ARBITRUM

BY TEAM LAMPROS DAO

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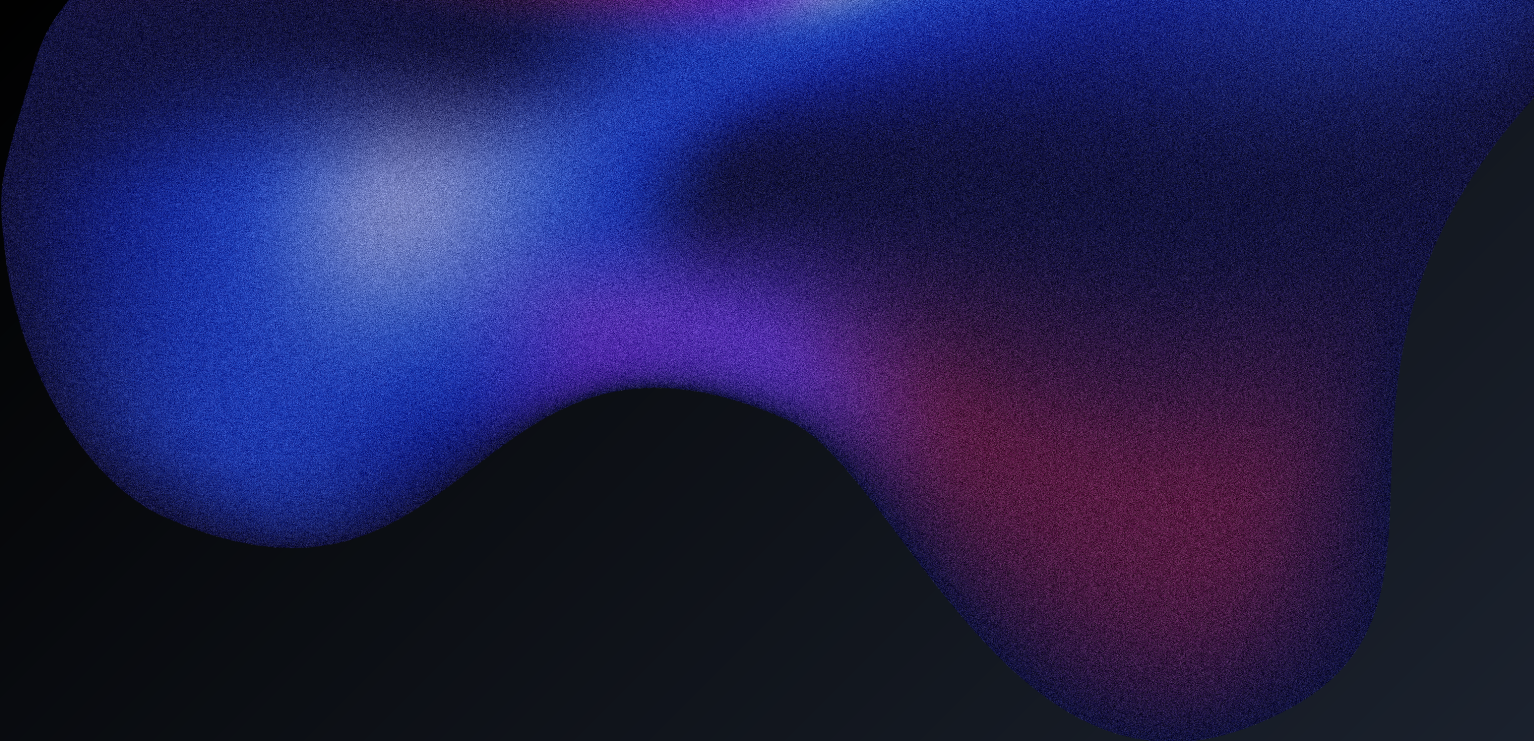
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Sector Growth, User Interaction, and Incentive Effectiveness

Statistical Insights on Sector Growth, User Engagement, and Incentive Performance

The statistical analysis of sector growth, user interaction, and incentive effectiveness indicates the significance of the differences between data from before and during the incentive. The cluster analysis reveals which sectors stood out throughout the analysis period, while the correlation analysis identifies which metrics had a greater impact on other metrics in both the pre-incentive and incentive periods, respectively.

T-test Analysis

Metrics	T-statistic	P-value
DAU	0.7299	0.4778
MAU	1.2881	0.21851
Transaction Count	0.9523	0.3570
TVL	-1.6869	0.1225

This table presents the results of paired t-tests conducted on four metrics—DAU (Daily Active Users), MAU (Monthly Active Users), Transaction Count, and TVL (Total Value Locked)—comparing data from before and during the incentives period.

Explanation of Terms

- T-statistic:** This value indicates the magnitude and direction of the difference between the two periods (before and during incentives) for each metric. A positive t-statistic suggests that the values were generally higher during the incentives period, while a negative value indicates they were lower.
- P-value:** This value indicates the statistical significance of the difference between the two periods. A p-value less than 0.05 (for a 5% significance level) typically suggests a statistically significant difference. Higher p-values indicate that the difference is not statistically significant.

Interpretation of the Table

For each metric, both the T-statistic and P-value are shown:

1. DAU:

- **T-statistic:** 0.7299
- **P-value:** 0.4778
- **Interpretation:** The positive t-statistic suggests that DAU increased during the incentive period, but the p-value (0.4778) indicates that this increase is not statistically significant. There is no strong evidence to conclude that the incentives had a significant effect on DAU.

2. MAU:

- **T-statistic:** 1.2881
- **P-value:** 0.21851
- **Interpretation:** Similarly, MAU showed an increase during the incentive period, as indicated by the positive t-statistic. However, the p-value (0.21851) is well above 0.05, indicating that this difference is also not statistically significant.

3. Transaction Count:

- **T-statistic:** 0.9523
- **P-value:** 0.3570
- **Interpretation:** Transaction Count also increased, but with a p-value of 0.3570, this difference is not statistically significant. There's no strong evidence that the incentives led to a notable change in transaction count.

4. TVL:

- **T-statistic:** -1.6869
- **P-value:** 0.1225
- **Interpretation:** The negative t-statistic suggests that TVL decreased during the incentive period. However, the p-value (0.1225) is not below the 0.05 threshold, indicating that this change is not statistically significant either.

Key Insights

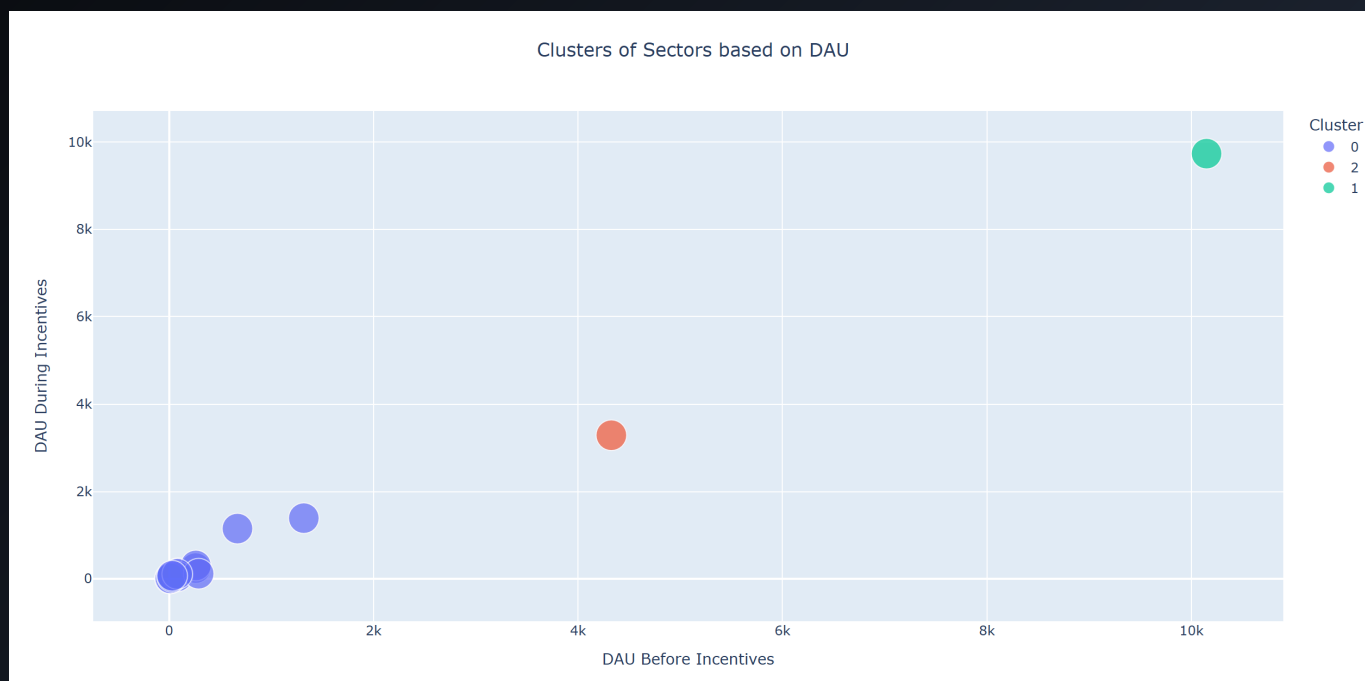
All four metrics have high P-values (well above 0.05), meaning none of the metrics show statistically significant differences across the groups being analysed. Although some metrics (like DAU, MAU, and Transaction Count) showed positive t-statistics with less magnitude, indicating slight increase, and TVL showed a decrease, the p-values for all metrics are above 0.05. Therefore, we cannot conclude that the incentive period led to significant changes in DAU, MAU, Transaction Count, or TVL based on this analysis.

Cluster Analysis

Clusters of Sectors based on DAU

The below scatter plot titled "**Clusters of Sectors based on DAU**" shows the clustering of sectors based on **Daily Active Users (DAU)** before and during an incentive period. The x-axis represents **DAU Before Incentives**, while the y-axis represents **DAU During Incentives**. There are three distinct clusters (0, 1, and 2), each represented by a different color:

- **Purple (Cluster 0)**
- **Green (Cluster 1)**
- **Yellow (Cluster 2)**



Visualization Link: [Clusters of sectors based on DAU](#)

Description of the Graph:

- **Cluster 0 (Purple):** This cluster encompasses the majority of data points, showing relatively low DAU both before and during incentives, and is concentrated near the origin. Sectors in this cluster include Gaming/Gambling, LST, RWA, bridge, lending, liquidity/leverage, miscellaneous, options, oracles, perpetual, stables/synthetics, wallet, and yield.
- **Cluster 1 (Green):** Representing an outlier, this cluster has DAU Before Incentives around 10,000 and DAU During Incentives around 9,500, indicating a sector with extremely high daily active users both before and during the incentives. The sector in this cluster is quest.

- **Cluster 2 (Yellow):** Positioned between Clusters 0 and 1, this cluster displays moderate DAU values, with approximately 4,000 users before incentives and around 2,000 users during incentives. The sector in this cluster is DEX.

Interpretation:

- **Cluster 0** consists of sectors that have relatively low DAU both before and during the incentive period. These sectors do not seem to attract many daily active users, regardless of the presence of incentives.
- **Cluster 2** represents a sector (DEX) that has moderate DAU before incentives and a noticeable drop during incentives, though its DAU is still higher than the sectors in Cluster 0.
- **Cluster 1** is a clear outlier, representing a sector (quest) that has very high DAU before and during the incentive period, indicating that this sector consistently attracts a large number of active users, and incentives may have less impact here.

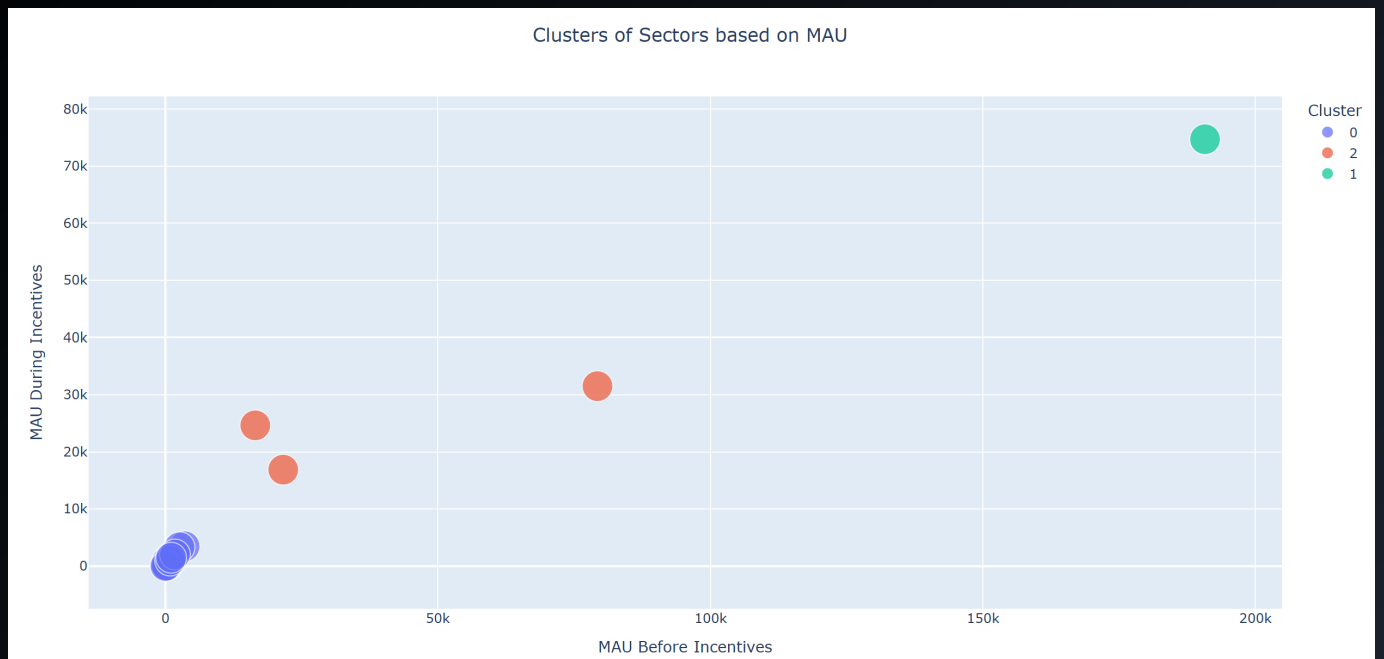
Key Insights:

The scatter plot effectively shows how different sectors are clustered based on DAU before and during the incentive period. Most sectors fall into Cluster 0 with relatively low DAU, while a few (Cluster 2 and Cluster 1) stand out with higher activity, with "**quest**" being the most significant outlier.

Clusters of Sectors based on MAU

The below scatter plot titled "**Clusters of Sectors based on MAU**" shows the clustering of sectors based on Daily Active Users (DAU) before and during an incentive period. The x-axis represents **DAU Before Incentives**, while the y-axis represents **DAU During Incentives**. There are three distinct clusters (0, 1, and 2), each represented by a different color:

- **Purple (Cluster 0)**
- **Green (Cluster 1)**
- **Yellow (Cluster 2)**



Visualization Link: [Clusters of sectors based on MAU](#)

Description of the Graph:

- **Cluster 0 (Purple):** This cluster contains the majority of data points, characterized by low MAU both before and during incentives, with values below 10,000. Sectors in this cluster include Gaming/Gambling, RWA, lending, liquidity/leverage, LST, miscellaneous, options, oracles, perpetual, stables/synthetics, and wallet.
- **Cluster 1 (Green):** An outlier, this cluster exhibits significantly high MAU, with around 200,000 users before incentives and about 75,000 during incentives. The sector represented in this cluster is quest.
- **Cluster 2 (Yellow):** This cluster demonstrates moderate MAU values, ranging from 25,000 to 75,000 before incentives, and between 10,000 and 30,000 during incentives. These sectors show higher monthly activity than those in Cluster 0 but fall short of the levels in Cluster 1. Sectors in this cluster include Bridge, DEX, and yield.

Interpretation:

- **Cluster 0** includes sectors with relatively low MAU both before and during the incentive period. These sectors do not experience significant monthly active user growth even during incentives.
- **Cluster 2** includes sectors (DEX) with moderate levels of MAU before and during incentives, suggesting that these sectors attract more monthly active users than Cluster 0 sectors, but still see some reduction in MAU during the incentive period.

- **Cluster 1** is a clear outlier, representing a sector (quest) with very high MAU before incentives (around 200,000) and a significant but still substantial decrease during incentives (around 75,000). This sector stands out for consistently attracting a high number of monthly active users, despite the decline during the incentive period.

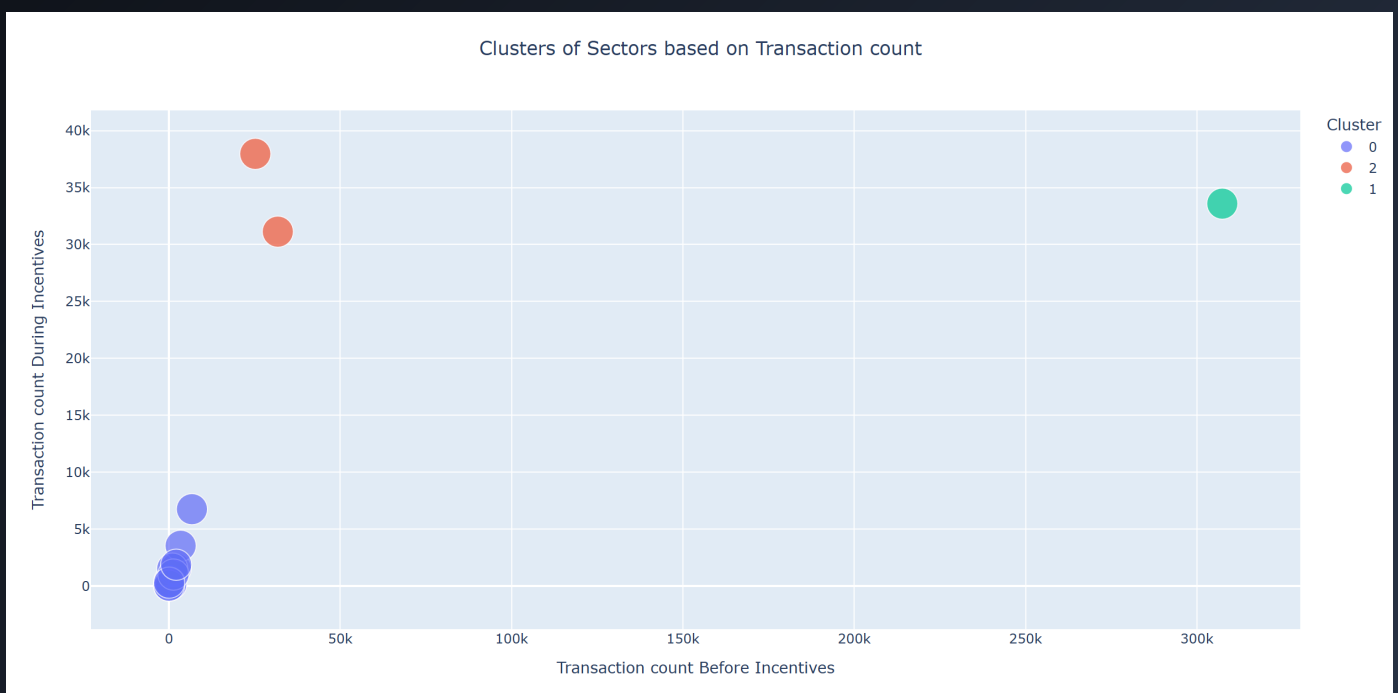
Key Insights:

The scatter plot reveals distinct clusters based on **MAU**. Most sectors fall into Cluster 0 with low monthly active users, while a few in Cluster 2 (DEX) have moderate MAU. The outlier in Cluster 1 (quest) shows exceptionally high MAU before incentives and a significant drop during incentives, indicating this sector's sustained popularity despite fluctuations in user activity.

Clusters of Sectors based on Transaction Count

The below scatter plot titled "Clusters of Sectors based on Transaction Count" shows the clustering of sectors based on **Transaction Count** before and during an incentive period. The x-axis represents **Transaction Count Before Incentives**, while the y-axis represents **Transaction Count During Incentives**. There are three distinct clusters (0, 1, and 2), each represented by a different color:

- **Purple (Cluster 0)**
- **Green (Cluster 1)**
- **Yellow (Cluster 2)**



Visualization Link: [Clusters of sectors based on Transaction Count](#)

Description of the Graph:

- **Cluster 0 (Purple):** This cluster contains the majority of data points, characterized by low Transaction Counts both before and during the incentives, with values below 10,000. Sectors in this cluster include Gaming/Gambling, LST, RWA, bridge, lending, liquidity/leverage, miscellaneous, options, oracles, perpetual, wallet, and yield.
- **Cluster 1 (Green):** An outlier, this cluster exhibits extremely high Transaction Counts, with approximately 300,000 transactions before incentives and about 33,000 during incentives. The sector represented in this cluster is stables/synthetics.
- **Cluster 2 (Yellow):** This cluster displays moderate Transaction Counts, ranging from 25,000 to 32,000 before incentives and between 30,000 and 40,000 during incentives. These sectors show higher activity than those in Cluster 0, though they are not as active as those in Cluster 1. Sectors in this cluster include DEX and quest.

Interpretation:

- **Cluster 0** includes sectors with relatively low Transaction Counts both before and during the incentive period. These sectors do not experience significant Transaction Count growth even during incentives.
- **Cluster 2** includes sectors (DEX, quest) with moderate levels of Transaction Count before and during incentives, suggesting that these sectors attract more transaction activity than Cluster 0 sectors.
- **Cluster 1** is a clear outlier, representing a sector (stables/synthetics) with very high Transaction Count before incentives (around 300,000) and a significant but still substantial decrease during incentives (around 33,000).

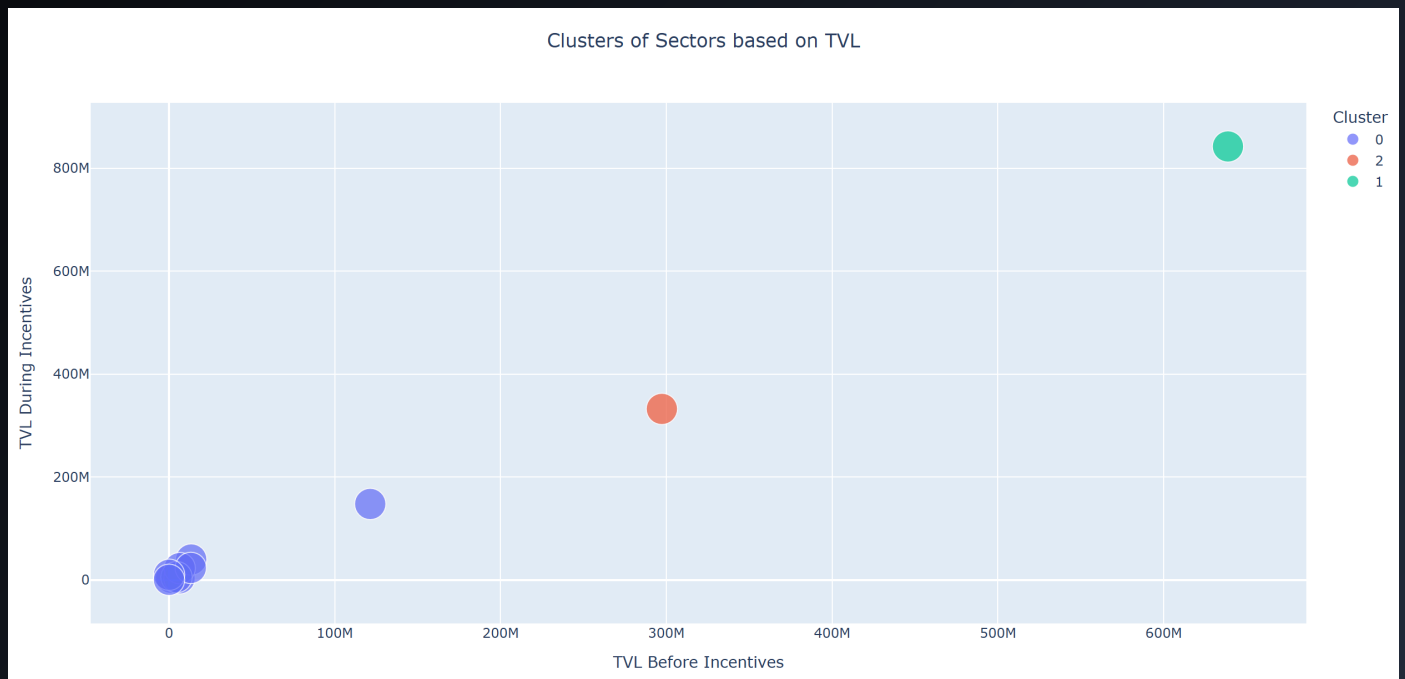
Key Insights:

The scatter plot reveals distinct clusters based on Transaction Count. Most sectors fall into Cluster 0 with low transaction activity, while a few in Cluster 2 (DEX, quest) have moderate transaction activity. The outlier in Cluster 1 (stables/synthetics) shows an exceptionally high Transaction Count before incentives and a significant drop during incentives.

Clusters of Sectors based on TVL

The below scatter plot titled "Clusters of Sectors based on TVL" shows the clustering of sectors based on TVL before and during an incentive period. The x-axis represents TVL Before Incentives, while the y-axis represents TVL During Incentives. There are three distinct clusters (0, 1, and 2), each represented by a different color:

- **Purple (Cluster 0)**
- **Green (Cluster 1)**
- **Yellow (Cluster 2)**



Visualization Link: [Clusters of sectors based on TVL](#)

Description of the Graph:

- **Cluster 0 (Purple):** This cluster encompasses most data points, characterized by low TVL both before and during the incentives, with values below 200 million. Sectors in this cluster include RWA, bridge, liquidity/leverage, miscellaneous, options, perpetual, stables/synthetics, wallet, and yield.
- **Cluster 1 (Green):** An outlier in the analysis, this cluster shows very high TVL, with approximately 700 million before incentives and around 800 million during incentives. The sector represented in this cluster is lending.

- **Cluster 2 (Yellow):** This cluster features moderate TVL, approximately 300 million before incentives and around 400 million during incentives. These sectors exhibit higher activity than those in Cluster 0, but are not as active as those in Cluster 1. The sector represented in this cluster is DEX.

Interpretation:

- **Cluster 0** includes sectors with relatively low TVL both before and during the incentive period. These sectors do not experience significant TVL growth even during incentives.
- **Cluster 2** includes sectors (DEX) with moderate levels of TVL before and during incentives, suggesting that this sector attracts more TVL than Cluster 0 sectors.
- **Cluster 1** is a clear outlier, representing a sector (lending) with very high TVL before incentives (around 700M) and a significant increase during incentives (around 800M).

Conclusion:

The scatter plot reveals distinct clusters based on TVL. Most sectors fall into Cluster 0 with low TVL, while in Cluster 2 (DEX) have moderate TVL. The outlier in Cluster 1 (lending) shows exceptionally high TVL before incentives and a significant increase during incentives.

Correlation Analysis

Before Incentives Period

This heatmap represents the **correlation matrix** for various metrics related to user engagement and transaction data, specifically before the incentives period. The metrics include DAU (Daily Active Users), MAU (Monthly Active Users), Transaction Count (tx), and TVL (Total Value Locked).



Visualization Link: [Correlation matrix-before incentives](#)

Explanation of the Correlation Matrix:

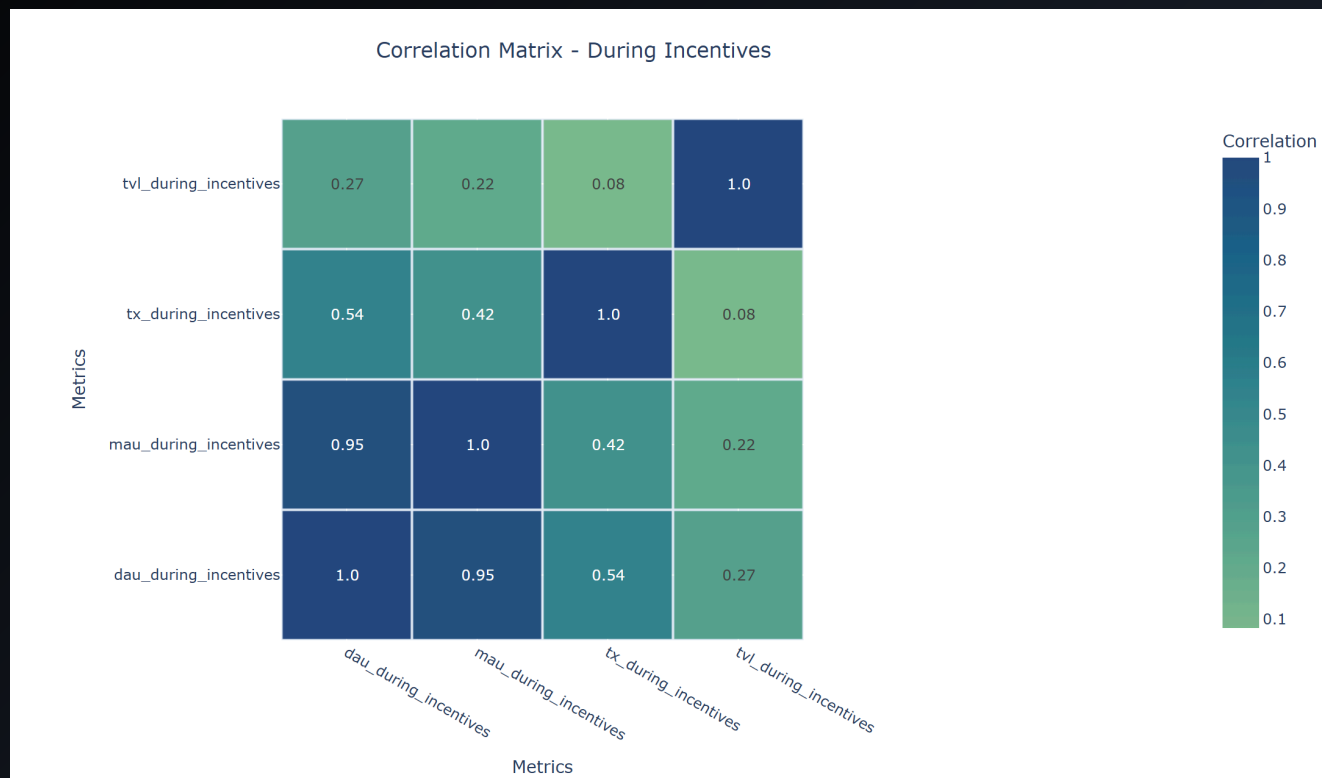
- **Color Scale:** The color scale on the right shows the degree of correlation. Darker shades represent higher positive correlations, while lighter shades represent lower or even negative correlations.
- **Values:** Each cell contains the correlation coefficient, which ranges from -1 to 1:
 - **1** indicates a perfect positive correlation.
 - **-1** indicates a perfect negative correlation.
 - **0** indicates no correlation.

Key Observations:

1. DAU and MAU have a strong positive correlation (0.98), suggesting that as daily active users increase, monthly active users also tend to increase. This is expected, as both metrics are closely related in measuring active user engagement.
2. DAU and TVL show a moderate positive correlation (0.35). This indicates that there is some positive association between daily active users and total value locked, but the relationship is not very strong.
3. MAU and TVL also have a moderate positive correlation (0.32), similar to the DAU-TVL relationship. Monthly active users seem to have a positive association with total value locked.
4. Transaction Count(tx) has low or negligible linear correlations with the other metrics there can be a non-linear correlation between them:
 - DAU (-0.05) and MAU (-0.04) correlations with Transaction Count are near zero, suggesting almost no relationship.
 - TVL has a slightly negative correlation with the Transaction Count (-0.13), indicating a weak inverse relationship.
5. The matrix reveals that user activity metrics (DAU and MAU) are strongly correlated with each other and moderately correlated with TVL. However, Transaction Count does not show a significant relationship with any of the other metrics. This suggests that user engagement (DAU and MAU) is more aligned with the total value locked, while transaction count may be influenced by other factors independent of user engagement.

During Incentives Period

This heatmap represents the **correlation matrix** for various metrics related to user engagement and transaction data, specifically during the Incentive period. The metrics include DAU (Daily Active Users), MAU (Monthly Active Users), Transaction Count (tx), and TVL (Total Value Locked).



Visualization Link: [Correlation matrix-during incentives](#)

Explanation of the Correlation Matrix:

- **Color Scale:** The color scale on the right shows the degree of correlation. Darker shades represent higher positive correlations, while lighter shades represent lower or even negative correlations.
- **Values:** Each cell contains the correlation coefficient, which ranges from -1 to 1:
 - **1** indicates a perfect positive correlation.
 - **-1** indicates a perfect negative correlation.
 - **0** indicates no correlation.

Key Observations:

1. DAU and MAU have a strong positive correlation (0.95), This suggests that as daily active users increase, monthly active users also tend to increase. This is expected, as both metrics track user engagement, with DAU contributing significantly to MAU.
2. DAU and Transaction Count (TX) show a moderate positive correlation (0.54), There is a moderate association between daily active users and the number of transactions during incentives. An increase in daily active users moderately drives an increase in transactions.
3. DAU and TVL show a weak positive correlation (0.27), This indicates a weak relationship between daily active users and total value locked during the incentive period. TVL is not heavily influenced by daily active user activity.
4. MAU and Transaction Count (tx) have a moderate correlation (0.42), Monthly active users have a moderate correlation with transactions, suggesting that long-term user engagement is somewhat related to transaction activity during incentives.
5. MAU and TVL show a weak positive correlation (0.22), This suggests a weak association between monthly active users and total value locked, similar to the DAU-TVL relationship.
6. Transaction Count (tx) and TVL have a negligible correlation (0.08), This indicates almost no linear relationship between the number of transactions and the total value locked during incentives. It implies that an increase in transactions does not directly correspond to changes in TVL.
7. The matrix reveals that user activity metrics (DAU and MAU) are strongly correlated with each other, and transactions have a moderate correlation with DAU and MAU. However, TVL shows weak correlations with all metrics, implying that factors beyond user activity and transaction count drive changes in TVL during the incentive period. Transaction count also has a negligible relationship with TVL, suggesting that its fluctuations do not significantly affect the total value locked.

Insights from Correlation Analysis:

The analysis shows a notable shift in the relationships among user engagement metrics and transaction-related data from before the incentives period to during it. While the strong correlation between DAU and MAU remains consistent, the introduction of incentives has led to a more significant association between DAU and Transaction Count. This indicates that user engagement is likely driving increased transaction activity during the incentive period.

Conversely, the correlation of both DAU and MAU with TVL has weakened, suggesting that total value locked is becoming less responsive to changes in user activity during incentives. This could imply that other factors beyond just user engagement are influencing TVL, or that the incentives themselves may have altered how these metrics interact. Overall, while incentives seem to boost transactional behavior, their effect on overall user engagement and TVL appears to be complex.

Regression Insights on Sector Dynamics, User Engagement, and Incentive Efficacy

The multiple regression analysis was conducted to understand how the retention rate is influenced by four key metrics: DAU (Daily Active Users), MAU (Monthly Active Users), Transaction Count, and TVL (Total Value Locked). By treating the retention rate as the dependent variable, this analysis aims to estimate how changes in these metrics could impact retention. Each metric DAU, MAU, Transaction Count, and TVL was treated as an independent variable to identify its unique contribution to the retention rate.

Variable	Coefficient
DAU	1.407397e-04
MAU	-3.383575e-06
Transaction Count	4.520881e-07
TVL	2.841741e-10

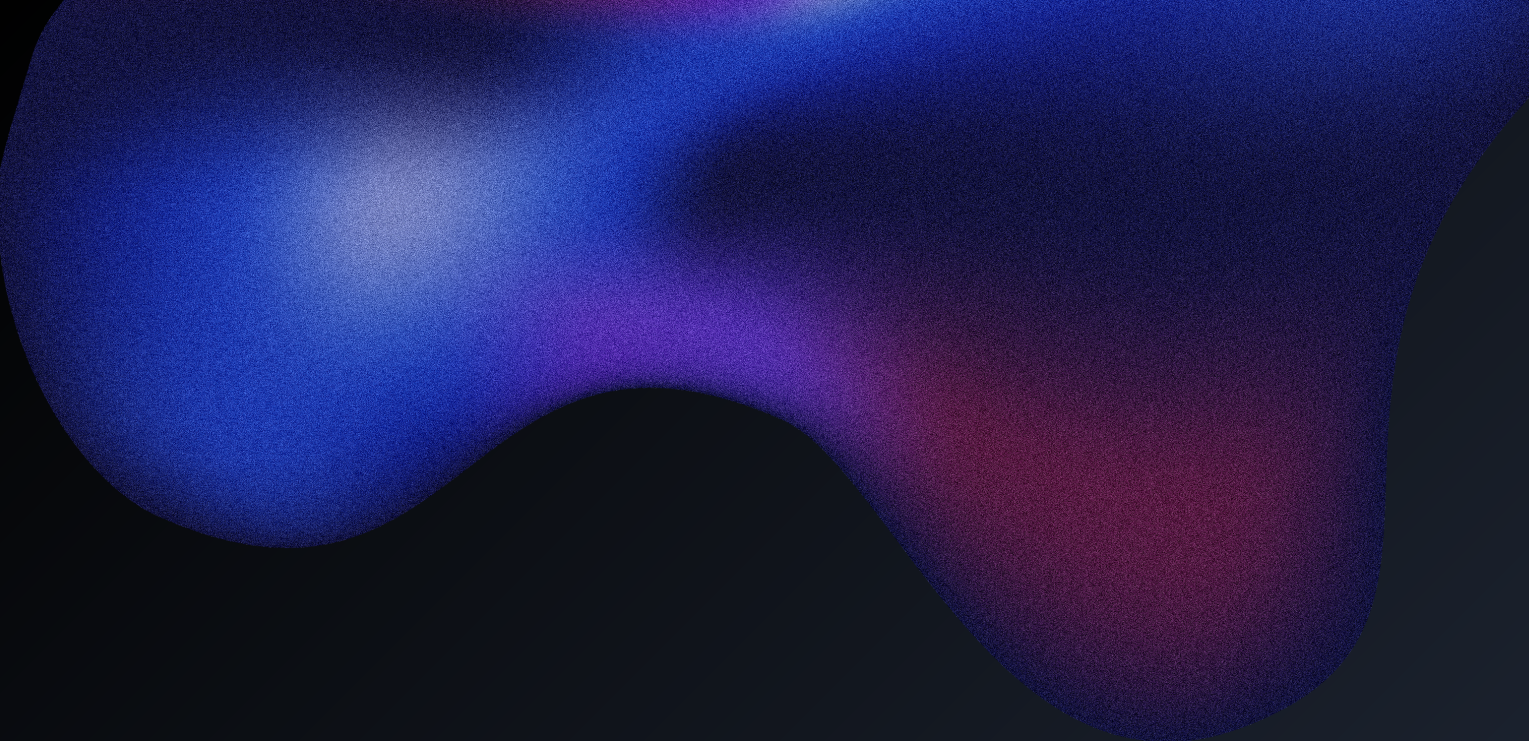
Interpretation of Coefficients:

- **DAU (Daily Active Users):** A coefficient of 1.407397e-04 suggests that for every one-unit increase in the change in DAU, the retention rate is expected to increase by approximately 0.0001407 (or 0.01407%). This indicates a positive relationship, implying that higher daily engagement correlates with an improved retention rate.

- **MAU (Monthly Active Users):** The coefficient of -3.383575×10^{-6} implies that for every one-unit increase in the change in MAU, the retention rate is expected to decrease by approximately 0.00000338 (or 0.000338%). This indicates a slight negative relationship, suggesting that changes in monthly active users may have a negligible negative impact on retention.
- **Transaction Count:** With a coefficient of 4.520881×10^{-7} , it indicates that for every one-unit increase in the change in Transaction Count, the retention rate is expected to increase by approximately 0.0000004521 (or 0.00004521%). This shows a very minimal positive effect on retention.
- **TVL (Total Value Locked):** The coefficient of 2.841741×10^{-10} suggests that for every one-unit increase in the change in TVL, the retention rate is expected to increase by approximately 0.0000000002842 (or 0.00000002842%). This indicates an extremely small effect on retention.

Insights from Regression Analysis:

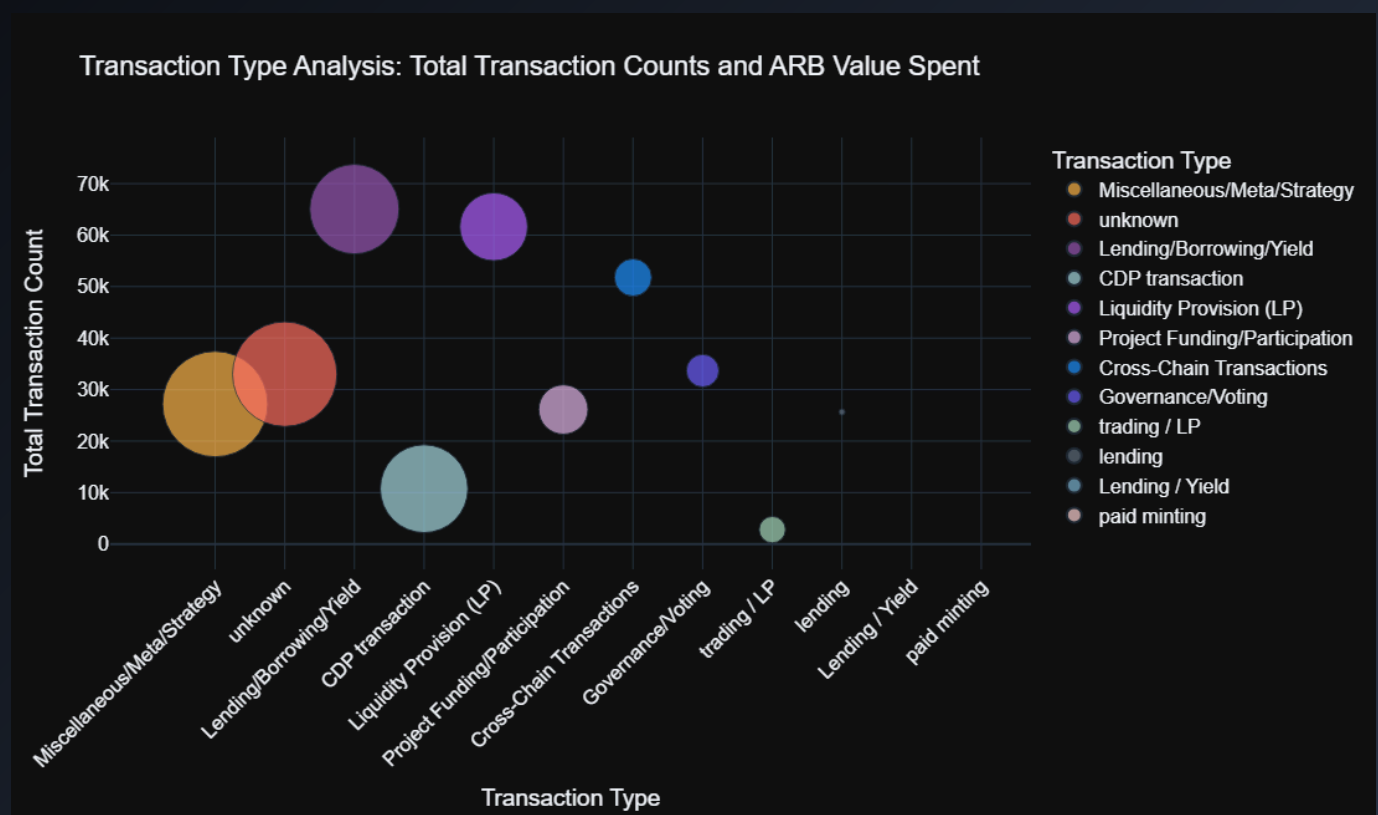
In conclusion, the regression analysis reveals that changes in Daily Active Users (DAU) have the most significant impact on retention rates, while the influences of Monthly Active Users (MAU), Transaction Count, and Total Value Locked (TVL) are minimal. This information can be useful for strategizing efforts to improve user retention.



User Actions with ARB Rewards and Unintended Incentivized Actions

Insights into User Activity after receiving ARB Rewards, With and Without Merkle Distribution

This analysis provides a focused overview of transaction behaviors and ARB spending across sectors, highlighting trends in user engagement, sectoral priorities, and financial strategies. Key findings show high transaction counts in Lending/Borrowing and Liquidity Provision, while Miscellaneous/Meta/Strategy categories see fewer, high-value transactions, indicating distinct spending patterns. Specialized spending is evident with CDP transactions dominating in the Bridge and Synthetics sectors, and a diversity of transaction types in Derivatives, LST, and Options. Through cluster and correlation analysis, this report reveals how sector-specific user behaviors and transaction patterns contribute to a complex, varied ARB ecosystem.

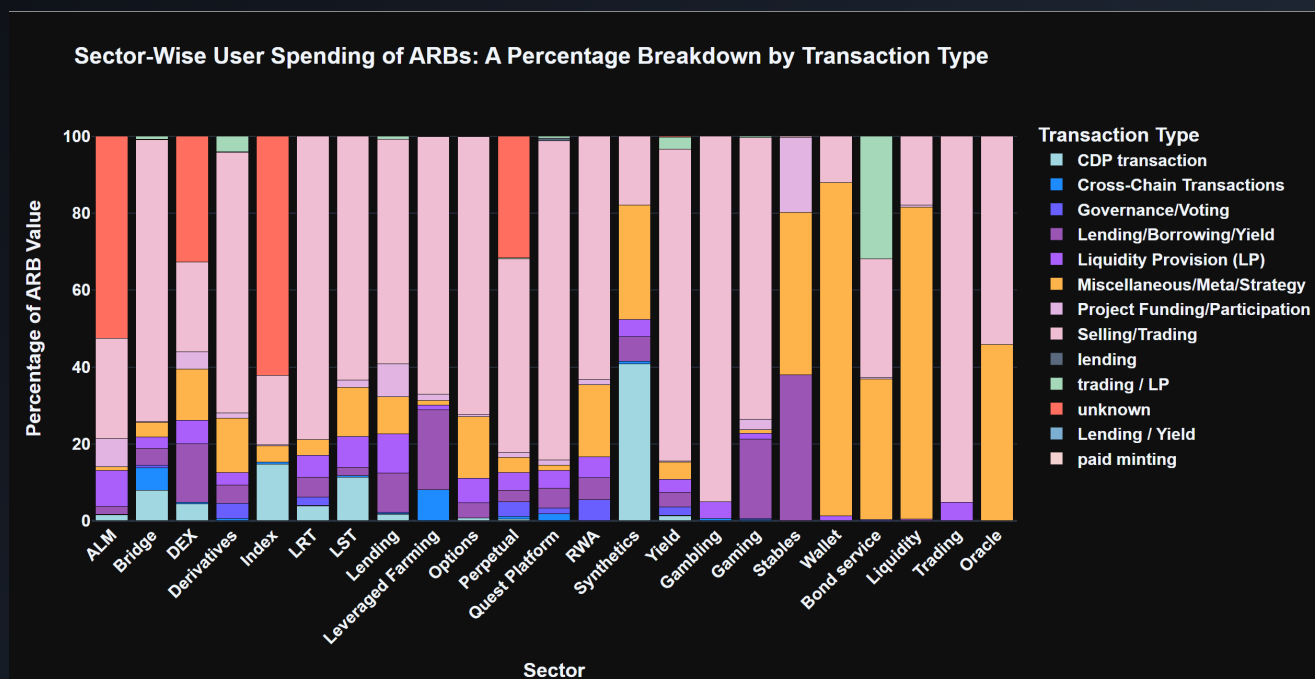


Visualization Link: [Transaction Type Analysis: Total Transaction Counts and ARB Value Spent](#)

This chart presents insights into transaction behavior across different categories, highlighting significant trends:

- **Lending/Borrowing/Yield and Liquidity Provision (LP):** These categories demonstrate the highest transaction counts, indicating substantial user engagement in these areas.
- **Miscellaneous/Meta/Strategy:** Despite having fewer transactions, this category shows the largest ARB value spent, suggesting that users are making high-value transactions.
- **Trading and Liquidity Provision (LP):** These categories exhibit lower transaction volumes and ARB expenditure, indicating less engagement compared to the other categories.

Sector-Wise User Spending of ARBs: A Percentage Breakdown by Transaction Type



Visualization Link: [Sector-Wise User Spending of ARBs: A Percentage Breakdown by Transaction Type](#)

The bar chart interprets the following insights regarding transaction types across various sectors:

- **Predominant Transaction Type:** Selling and trading are the most common transaction types across the majority of sectors.

- **Distinctive Transaction Patterns:**

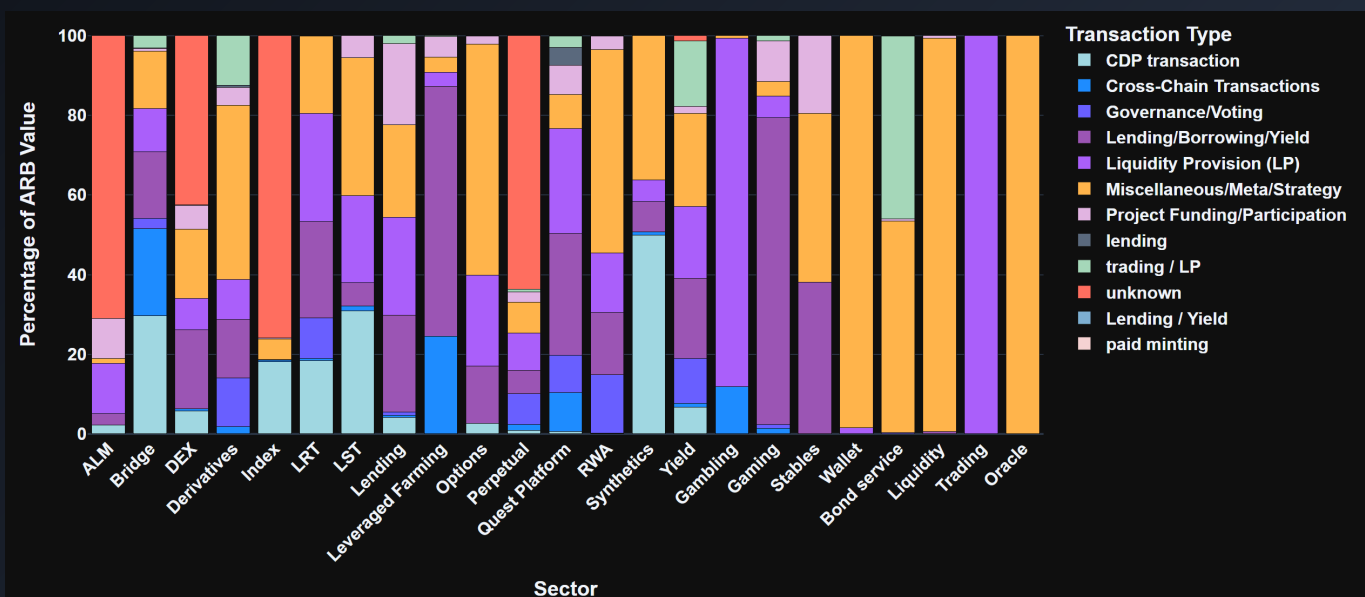
- **ALM and Index Sectors:** A significant portion of ARB expenditure is allocated to unidentified transactions, suggesting either a lack of transparency or unique activities within these sectors.
- **Synthetics Sector:** There is a marked emphasis on CDP transactions, indicating a heightened utilization of ARB for managing collateralized debt.

- **Miscellaneous, Meta, and Strategy Transactions:**

- **Bond Service, Liquidity, Stables, and Wallet Sectors:** These sectors show a considerable allocation towards these transaction types, which may reflect more complex or diversified strategic approaches.

These observations highlight that user behavior regarding ARB expenditure is not similar across sectors. While many users focus on selling and trading, certain sectors emphasize more specialized financial strategies or less transparent transaction types, indicating varying dynamics within different sectors.

Sector-Wise User Spending of ARBs: A Percentage Breakdown by Transaction Type(Excluding Selling/Trading)



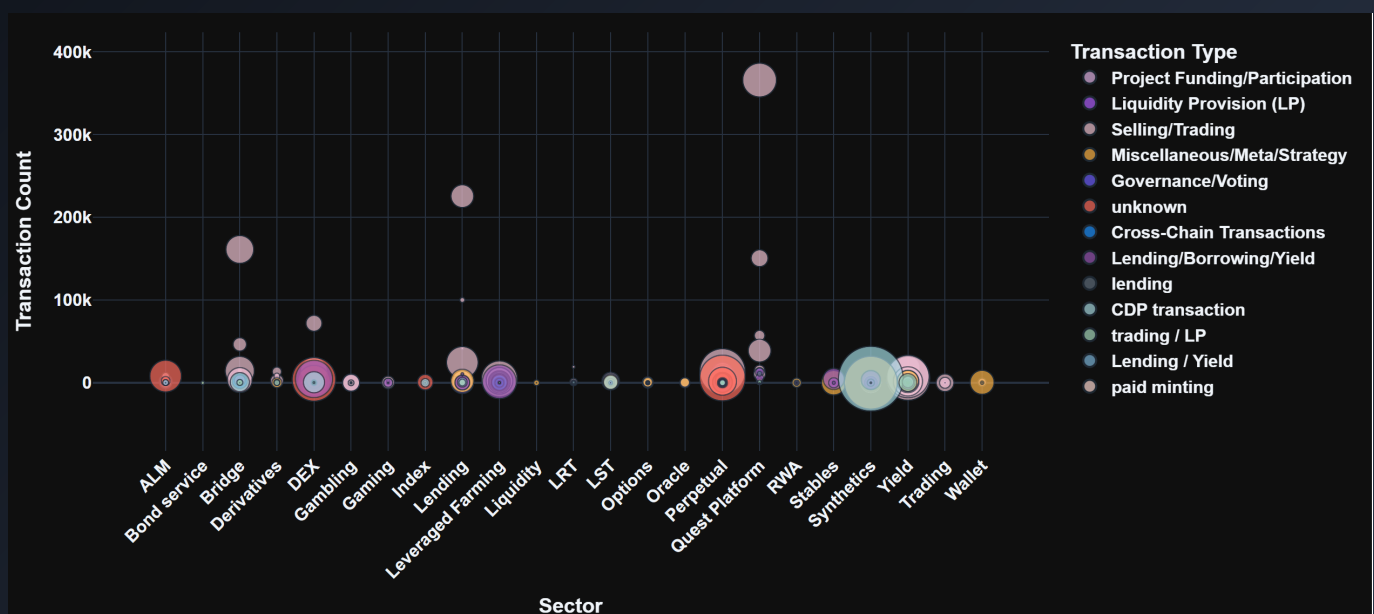
Visualization Link: [Sector-Wise User Spending of ARBs: A Percentage Breakdown by Transaction Type\(Excluding Selling/Trading\)](#).

Since selling and trading are the most common types of transactions, this bar chart emphasizes other transaction types to provide a clearer picture of sector-specific trends:

- **Bridge Sector:** The majority of ARB expenditure is directed towards CDP transactions, highlighting a strong focus on collateralized debt products.
- **Miscellaneous/Meta/Strategy Transactions:** These transactions are popular in sectors such as Derivatives, LST, Options, RWA, and Oracle, indicating a shift towards more intricate or varied transaction strategies.
- **Liquidity Provision (LP):** This category is prominent in the LRT, Gambling, and Trading sectors, suggesting a preference for liquidity management in these markets.
- **Lending/Borrowing/Yield Transactions:** Users in the Gaming, Quest Platform, and Leveraged Farming sectors are focusing on these transactions, likely driven by DeFi activities aimed at maximizing their ARB.

Overall, these patterns illustrate how different sectors leverage ARB for specialized activities, showcasing the rich diversity of economic behaviors across the ecosystem.

Sector-Based Overview of Transaction Counts and ARB Spending

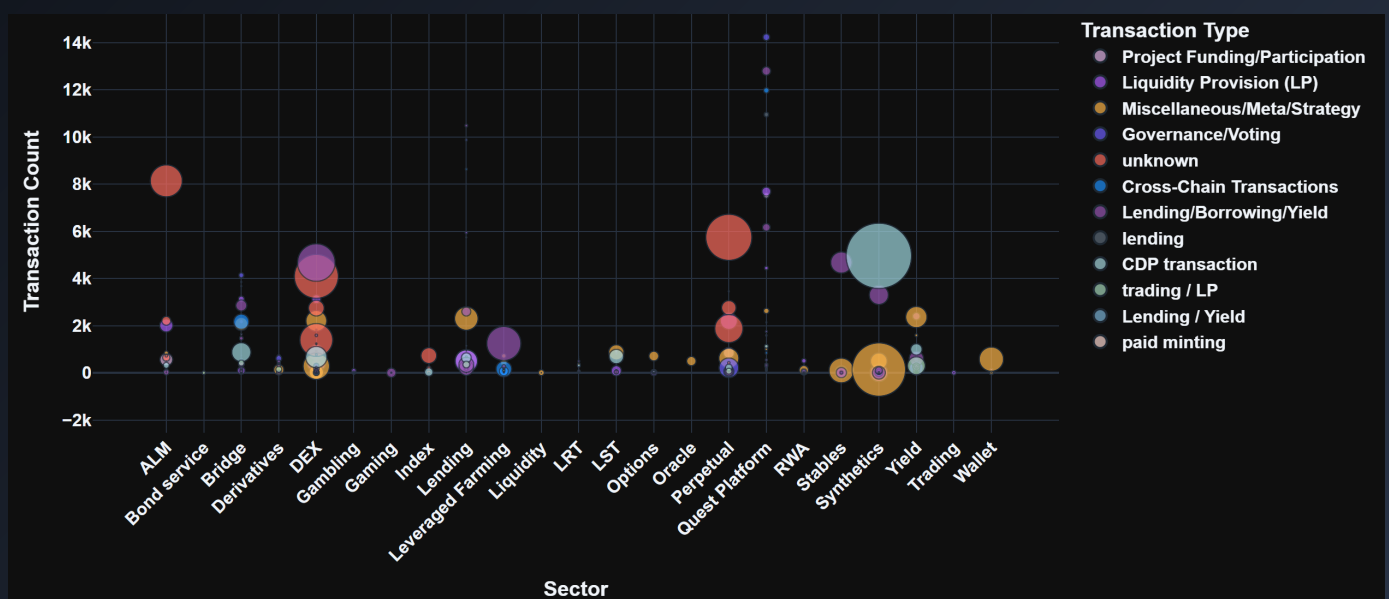


Visualization Link: [Sector-Based Overview of Transaction Counts and ARB Spending](#)

The chart highlights unique patterns in transaction counts and total ARB spending across various sectors:

- **Dominant Transaction Counts:**
 - **Quest Platform, Lending, and Bridge:** These sectors lead in transaction counts, primarily driven by Selling/Trading activities.
- **Variety of Transactions:**
 - **Perpetuals, DEX, Yield, and Stables:** These sectors showcase a diverse range of transactions.
- **Total ARB Expenditures:**
 - The sizes of the bubbles represent total ARB spending, with significant expenditures noted in the Perpetual, Synthetics, and Yield sectors.
 - **Prominent CDP Transactions:** These transactions are particularly noteworthy in the Synthetics sector.
- **Correlation Insights:**
 - The strong correlation between high transaction counts and larger bubble sizes in these sectors indicates a concentration of financial activity.
 - This suggests that engagement and investment in these areas are notably high.

Sector-Based Overview of Transaction Counts and ARB Spending(Excluding selling/trading)



Visualization Link: [Sector-Based Overview of Transaction Counts and ARB Spending\(Excluding selling/trading\)](#)

Excluding Selling/Trading from the chart reveals the following insights:

- **Lending and Quest Platform Sectors:**

- In these sectors, transaction counts can soar while total ARB value remains low.
- This suggests that these sectors are characterized by numerous smaller transactions rather than a few larger, impactful ones.

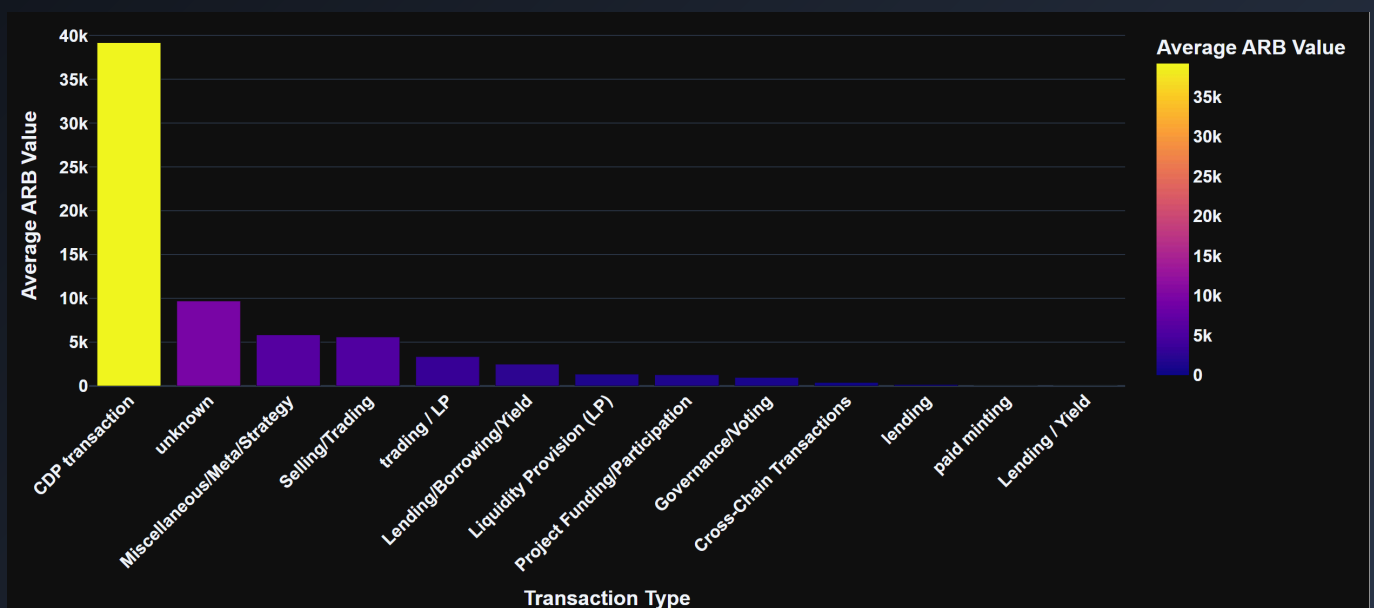
- **Variety of Transactions:**

- The absence of Selling/Trading allows for a clearer view of the diverse transaction types across all sectors, demonstrating that no single type dominates the chart.
- This highlights the varied transactional relationships between transaction counts and total ARB spent in each sector.

- **ALM Sector Engagement:**

- Notably, the ALM sector also showcases a high transaction count, indicating significant engagement activity.

Average ARB Value Spent by Users Based on Transaction Type



Visualization Link: [Average ARB Value Spent by Users Based on Transaction Type](#)

The chart illustrating average ARB expenditure uncovers critical insights into user behavior and market dynamics:

- **CDP Transactions:**

- A higher ratio in CDP transactions indicates that users are making fewer but larger transactions.
- This showcases substantial investments or strong confidence in this type of transaction.

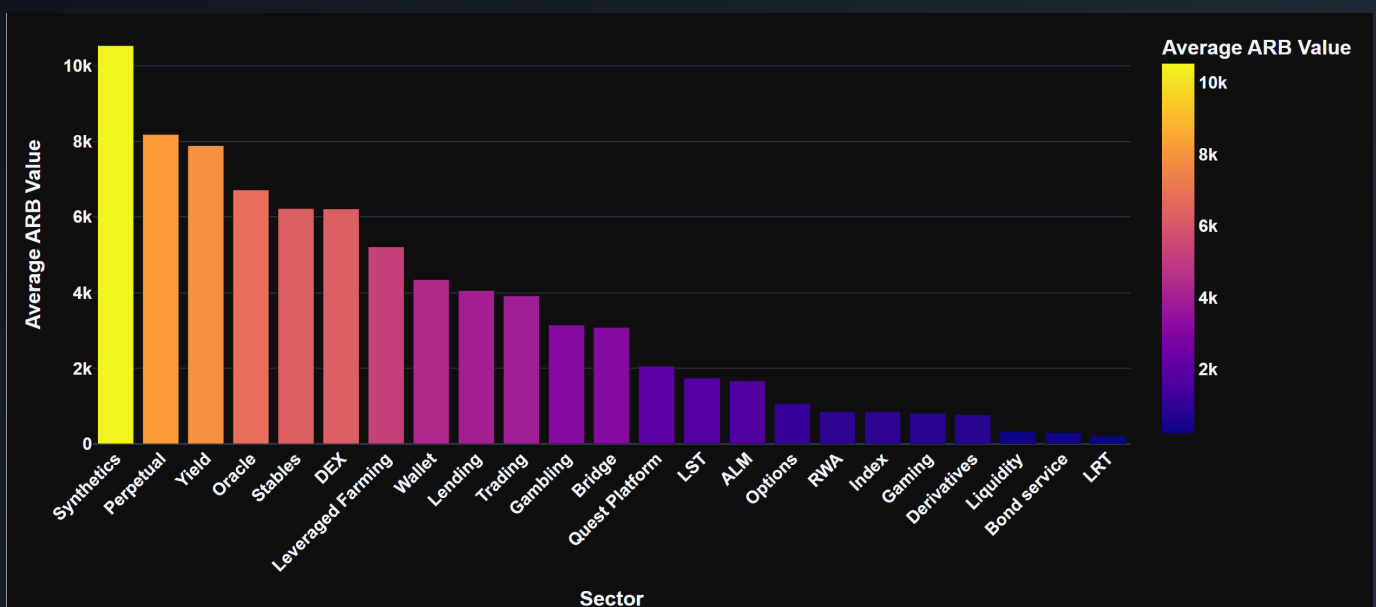
- **Lending/Yield and Paid Minting:**

- A lower ratio in these categories denotes more frequent, smaller transactions.
- This exemplifies accessibility and routine involvement by users.

- **Diverse Spending Patterns:**

- The varied spending behaviors unmistakably highlight the wide range of use cases for ARB.
- This exemplifies accessibility and routine involvement by users.

Average ARB Value Spent by Users Based on Sector Type



Visualization Link: [Average ARB Value Spent by Users Based on Sector Type](#)

The examination of total ARB expenditure divided by the total number of transactions across various user cohorts unveils distinct spending patterns:

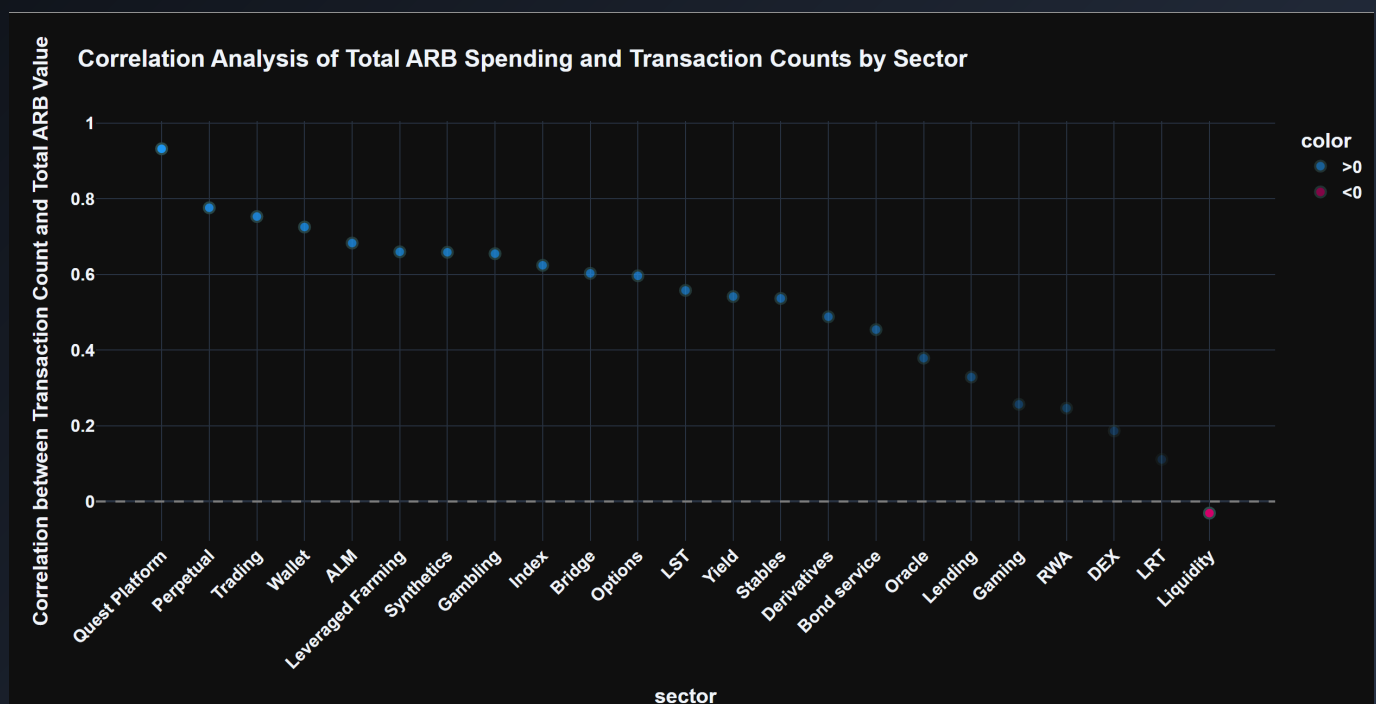
- **Elevated Ratios:**

- Specific cohorts such as **Synthetics, Stables, Perpetual, and Yield** exhibit higher ratios, signifying larger, more influential transactions.
- This demonstrates robust confidence in these sectors.

- **Reduced Ratios:**

- **LRT and Bond Service** cohorts show lower ratios, indicating a tendency for more frequent, smaller transactions.
- This highlights sectors that are highly accessible to a wider audience.

Correlation Analysis of Total ARB Spending and Transaction Counts by Sector



Visualization Link: [Correlation Analysis of Total ARB Spending and Transaction Counts by Sector](#)

This chart highlights how user engagement and financial spending vary across different sectors, revealing the complex relationship between user participation and spending habits:

- **Strong Correlation:**

- In sectors like the **Quest Platform**, a strong correlation between the number of transactions and total ARB spent suggests that as users engage more frequently, their overall spending tends to increase.
- This indicates that higher user engagement often leads to greater financial commitment.

- **Weak or Negative Correlation:**

- In sectors such as **Liquidity**, a weak or even negative correlation reflects more casual or smaller transactions that don't significantly impact overall spending trends in the market.

This analysis provides a clearer understanding of how different sectors function in terms of user activity and financial investment.



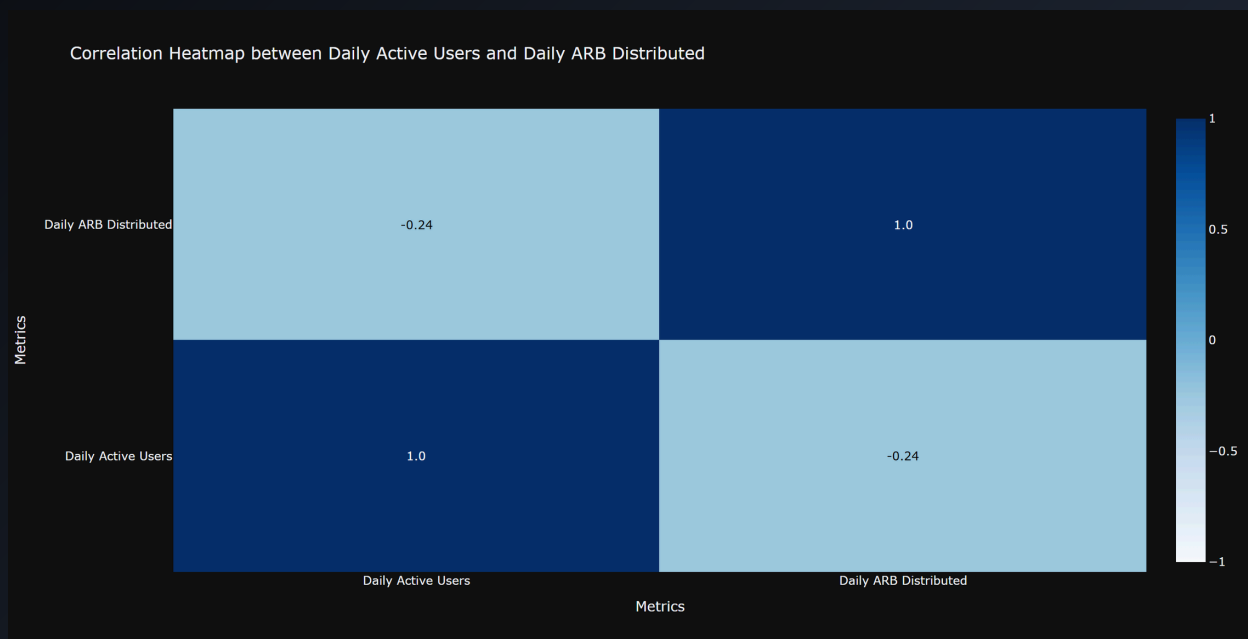
Reward/User Ratio and Market Demand

Correlation analysis

This analysis explores the relationship between ARB reward distribution and user engagement metrics, specifically Daily Active Users (DAU) and Daily Transaction Count. By using heat maps to visualize these correlations, the analysis identifies trends in how user activity influences or is influenced by reward distributions. This insight is essential for optimizing engagement strategies and refining reward allocation to better align with platform goals.

Clusters of Sectors based on DAU

A heat map has been created to illustrate the correlation between Daily Active Users (DAU) and Daily ARB rewards. The correlation matrix is visualized to highlight the relationship between these two key metrics. The dark blue regions represent a perfect correlation of a metric with itself, which is always 1.0, as expected. In contrast, the light blue regions depict the intensity of the correlation between DAU and Daily ARB rewards. This heat map provides a visual summary of how user engagement, as measured by DAU, might influence reward distribution activity on the platform.



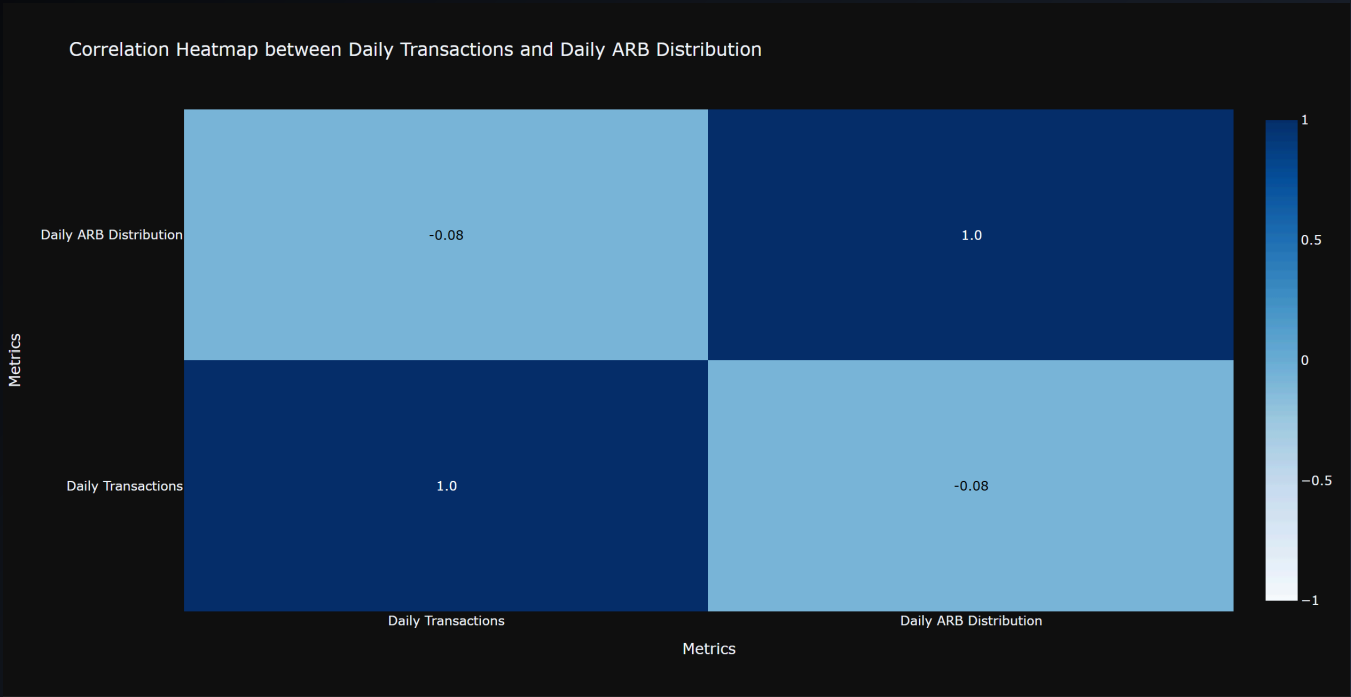
[Visualization Link - Correlation between ARB distribution and DAU](#)

In the heat map, the dark blue regions along the diagonal indicate a perfect positive correlation of 1, showing that each metric is perfectly correlated with itself. However, the light blue region representing the correlation between Daily Active Users and Daily ARB distributed shows a correlation of -0.24, indicating a slight negative linear relationship. This suggests that factors other than user engagement and activity may be more influential in determining ARB distribution value.

Understanding these correlations is essential for making data-driven decisions aimed at optimizing platform performance and user engagement strategies. By recognizing the dynamics between ARB distribution and user activity, stakeholders can better tailor their approaches to enhance overall user participation and reward effectiveness.

Correlation Between ARB Distribution and Transaction Count

A heat map has been created to illustrate the correlation between Daily Transaction Count and Daily ARB rewards. The correlation matrix is visualized to highlight the relationship between these two key metrics. The dark blue regions represent a perfect correlation of a metric with itself, which is always 1.0, as expected. Conversely, the light blue regions depict the intensity of the correlation between Daily Transaction Count and Daily ARB rewards. This heat map provides a visual summary of how user transactional activity might influence reward distribution on the platform.



Visualization Link: [Correlation between ARB distribution and transaction count](#)

The heat map reveals the correlation between Daily Transaction Count and Daily ARB Distribution. The dark blue cells along the diagonal indicate a perfect correlation of 1, confirming that each metric is perfectly correlated with itself. The light blue cell representing the correlation between Daily Transaction Count and Daily ARB distributed shows a correlation of approximately -0.08. This weak negative correlation suggests a slight inverse relationship: as the Daily ARB Distribution Value increases, the Daily Transaction Count tends to decrease slightly, and vice versa.

However, the correlation of -0.08 is so weak that it indicates there is almost no significant linear relationship between these variables. This suggests that while there may be a small trend, other factors are likely influencing transaction activity more significantly. Understanding these dynamics is crucial for making informed decisions to optimize platform performance and enhance user engagement strategies. By recognizing the limited correlation, stakeholders can focus on other potential drivers of transaction activity beyond just ARB distribution.

Key Observations:

This in-depth analysis provides a nuanced understanding of user engagement, sectoral dynamics, and the efficacy of incentives across the ARB ecosystem. The key takeaways are as follows:

- 1. Incentive Impact on User Metrics:** Paired t-tests on DAU, MAU, Transaction Count, and TVL revealed that changes during the incentive period were not statistically significant, showing only minor positive shifts in DAU, MAU, and Transaction Count, while TVL slightly decreased. This suggests that incentives alone may not be sufficient to drive sustained increases in user engagement or TVL growth across all sectors.
- 2. DAU as a Retention Predictor:** Daily Active Users (DAU) exhibited a strong positive correlation with retention, underscoring the importance of daily engagement for user retention. In contrast, MAU, Transaction Count, and TVL had minimal impact on retention, indicating that retention strategies may benefit from prioritizing daily activity over these other metrics.
- 3. Distinct Sector Clusters and Spending Patterns:** Cluster analysis identified sector groups with varying engagement levels, with "quest" standing out as a high-engagement sector regardless of incentives. Similarly, sector-specific spending behaviors show that Lending, Liquidity Provision, and Yield sectors have high transaction counts, while categories like Miscellaneous/Meta/Strategy have fewer but high-value transactions. CDP transactions dominate in the Synthetics and Bridge sectors, highlighting specialized financial strategies.
- 4. Transactional Activity vs. TVL Complexity:** Correlation analysis indicates that incentives boost transactional activity, evidenced by strengthened correlations between DAU and transaction count. However, the relationship between TVL and user engagement metrics weakened during the incentive period, suggesting that TVL is influenced by factors beyond user activity alone—such as market conditions or external investment flows.
- 5. Strategic Targeting for Incentive Efficacy:** While incentives increase transactional behaviors, they do not necessarily drive sustained engagement or substantial TVL growth across the board. Sectors with higher engagement, like Quest, tend to see greater financial commitment, whereas sectors like Liquidity reflect casual engagement with limited financial impact. Furthermore, a slight negative correlation between ARB rewards and DAU (-0.24) implies that incentives may not significantly enhance user engagement and that additional factors—such as platform functionality or sector-specific incentives—may be more effective.
- 6. The findings suggest that while incentives can temporarily boost user activity and transaction volume, they may need to be strategically aligned with high-engagement sectors or further tailored to stimulate long-term engagement and TVL growth. By focusing on daily engagement, incentivizing high-value sectors, and exploring other drivers of TVL, stakeholders can foster a more robust, engaged user base and promote sustainable growth within the ARB ecosystem.**

ReVisualization Links

1. ARB Distribution and Tracking Analysis

Description: This Google Sheet provides a comprehensive dataset of ARB tokens spent by protocols or returned to the original protocol from which they were claimed. The sheet includes detailed columns such as Protocol, Total ARB Requested, Total ARB Claimed, ARB distributed till 31 August, ARB distributed till 2nd September, ARB returned to LTIPP, Untracked addresses, Recipient Address, Intermediary Address, Distributor Address (Tracked and Untracked). This data reflects the analysis conducted up to this point, offering valuable insights into ARB token distribution and utilization patterns.

Access Link: [ARB distribution and tracking analysis](#)

2. Protocols Considered

Description: This document provides the detailed list of the protocols and their sectors. It also includes the list of protocols which were used for the analysis of the different questions.

Access Link: [Protocols considered](#)

3. Dashboards

Description: Dashboards have been created to help us by providing an organized, interactive, and visual representation of data. They allow for quick insights and decision-making by summarizing key metrics, trends, and patterns from the analysis. The dashboards include all the visualizations from the analysis, along with brief descriptions. A Dune dashboard has been created for sector growth, user interaction, and incentive effectiveness, while a combined Python dashboard has been created for all other sections of the analysis.

Access Link: [Python Dashboard](#)