



# Payroll and Competitive Performance in the NBA: An Analysis Across Eras (1990-2020)

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## **Abstract**

This study examines the relationship between team payroll and competitive performance in the NBA across three distinct eras: the 1990s, 2000s, and 2010s. Using team-level payroll data normalized by league averages, alongside performance indicators such as win percentage, net rating, and playoff qualification, the analysis evaluates how financial investment interact with on-court success over time. The results reveal a persistent but imperfect association between payroll and performance. While higher-spending teams are more likely to reach the playoffs on average, substantial variation exists within each era, including cases where low-payroll teams achieve strong competitive outcomes. Rank-based analyses further show that financial advantages were more dispersed in earlier decades, whereas payroll distributions became more compressed in the 2010s, coinciding with a greater emphasis on efficiency rather than sheer spending magnitude. Overall, the findings suggest that payroll influences competitive possibilities but does not guarantee success, highlighting the growing importance of how financial resources are translated into performance rather than their absolute level.

# 1. Introduction

Professional sports leagues are often viewed as competitive environments where financial resources play a determining role in gaining success. In the National Basketball Association (NBA), team payrolls vary substantially across franchises and over time, raising an important question: do higher payrolls lead necessarily into better competitive results?

Most of the data that fans and analysts focus on are on-court performance and game-related factors and they often don't pay attention to the impacts of the off-court decisions. This project deliberately shifts attention to the off-court side of professional sports, with the aim of understanding how financial and managerial decisions interact with on-court results. Specifically, the question motivating this analysis is whether paying more for a team's roster systematically leads to improved performance in terms of wins.

This project aims to investigate the relationship between team payroll and performance in the NBA over the period 1990 to 2020. In this context, team payroll refers to the total salaries paid to players on a team, while performance is primarily measured by the percentage of wins out of total games, playoff qualification and overall team efficiency indicators during a season. The central objective of the project is to assess whether higher financial investment in player salaries is associated with better competitive outcomes. It compares payroll levels with competitive outcomes across multiple seasons, highlighting broad patterns and disparities between spending and results.

This topic is of interest not only to sports analysts and fans, but also to decision-makers concerned with resource allocation, efficiency, and team success evaluation. By relying on long-term data, the project offers an evidence-based view of how spending relates to results, helping to inform more effective resource allocation within a professional sports organization.

# 2. Data and Methodology

## 2.1 Data Sources

This project uses three publicly available datasets obtained from the Kaggle platform. All dataset links are provided in the reference section at the end of the report. The datasets are:

1. **Team Payroll:** This dataset contains season-by-season payroll information for NBA teams, including both nominal payroll values and inflation-adjusted payroll figures.
2. **Team Histories:** This dataset includes information on all franchises that have ever participated in the NBA. It records the seasons in which each franchise became active and, if applicable, the season in which it ceased operations. For franchises that are still active, the active-until year is recorded

as 2100. In addition, this dataset documents franchise evolution, including team relocations and name changes over time.

3. **Team Summaries:** This is a comprehensive dataset containing team-level performance indicators for each season, such as wins, losses, net rating, margin of victory, and playoff qualification.

The main objective was to clean these datasets individually, restrict them to NBA teams over the 1990–2020 period, and then merge them into a single team–season dataset suitable for analysis.

## 2.2 Data Cleaning and Integration

Several challenges arose during the data preparation process, primarily related to franchise identification and team relocations.

A key issue concerned the Team Payroll dataset, which uses only the current city name of franchises rather than historical names. For example, the Brooklyn Nets are labeled as “Brooklyn” even for seasons when the team was known as the New Jersey Nets. This created inconsistencies when joining datasets across different historical periods. To address this issue, a new variable representing the historic team city was created, allowing teams to be correctly matched across time despite relocations or name changes.

A specific complication arose with Los Angeles teams. Although the Lakers and Clippers are distinct franchises, they share the same city. Using city names alone would therefore lead to incorrect matches when merging datasets. To resolve this, an additional identifier was created to distinguish between the two Los Angeles franchises.

In the Team Histories dataset, another issue was the presence of non-franchise teams, such as All-Star teams, which do not participate in regular NBA seasons. These observations were removed. The dataset was then used to ensure that each team–season observation corresponded to a period during which the franchise was officially active.

After cleaning, the Team Payroll and Team Histories datasets were merged first, followed by a final merge with the Team Summaries dataset. Throughout the process, common steps included:

- Filtering observations to NBA teams only
- Restricting the time horizon to 1990–2020
- Retaining only variables relevant to the analysis

## 2.3 Final Dataset Construction

From the merged dataset, a final analytical dataset was constructed by selecting and, in some cases, renaming key variables. The main variables included could be found in the table below:

Season start year	Showing the year that season has started in
Team name and abbreviation	Complete team names and their 3-letter abbreviation
Playoff qualification	Representing a team has been qualified for playoff in the season
Average team age	Average age of team players in the season
Payroll (nominal and inflation-adjusted)	The total amount a team is paying to its players for the season as salaries and inflation-adjusted version of it
Wins and losses	The number of wins and losses of a team during the season
Margin of victory	The average difference between the points scored by a team and the point scored against the team
Simple Rating System (SRS)	A rating that takes into account average point differential and strength of schedule
Net rating	An estimate of point differential per 100 possessions
Total and average attendance	Total number of people attended to a game and its average

In addition to these variables, several measures were created:

- Win percentage, is the percentage of wins of a team out of total games during a season
- Payroll ratio, defined as a team's inflation-adjusted payroll relative to the league average payroll in the same season
- Payroll in \$10 million units, used to improve interpretability in graphical analysis

All analyses in this project rely on inflation-adjusted payroll values, which allows meaningful comparison of spending levels across different seasons by removing the effects of inflation.

### 3. Results

Before presenting the main results, a validation step was conducted to ensure that the number of teams per season in the final dataset matches the historical structure of the NBA. This step is important because the number of teams competing in the league has changed over time.

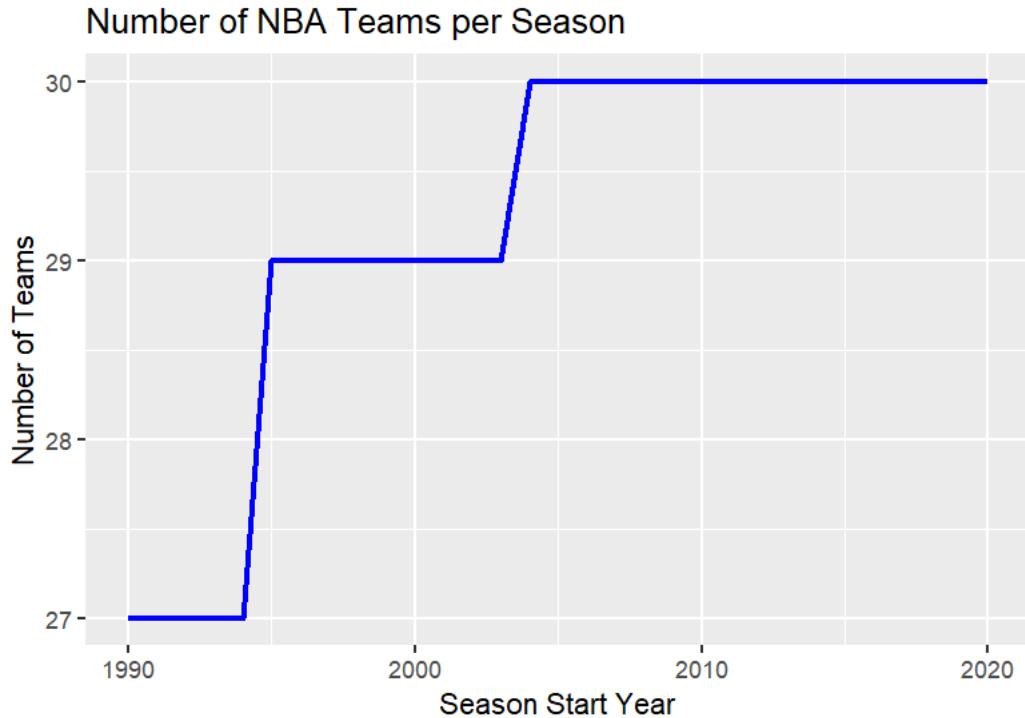
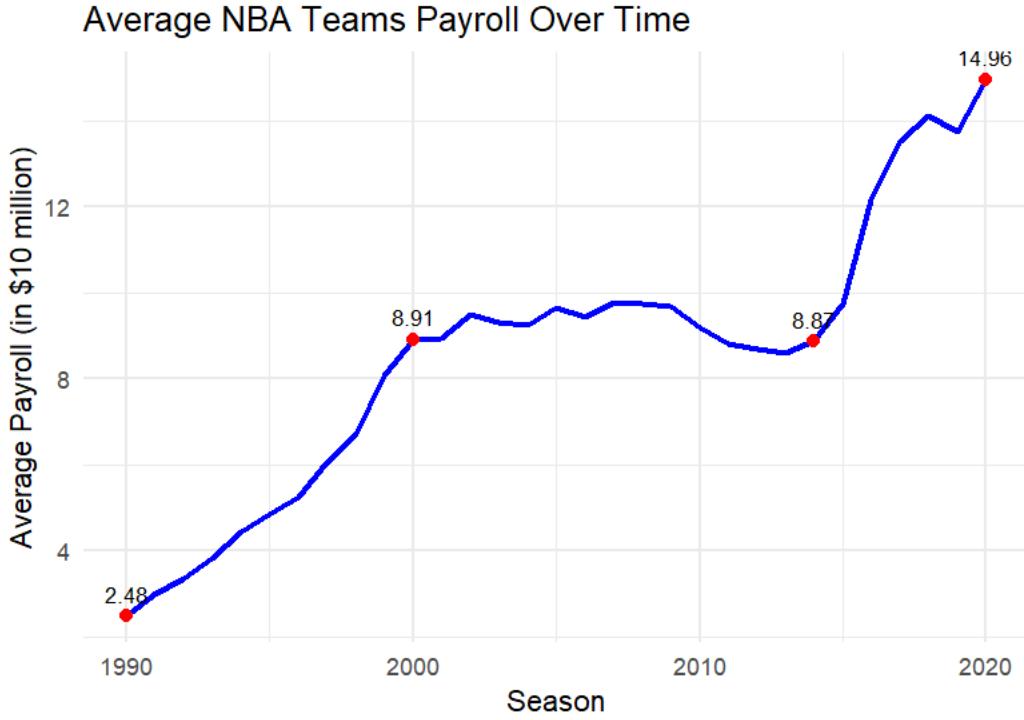


Figure 1. Number of NBA teams per season between 1990 and 2020

As shown in Figure 1, the number of NBA teams increases over time. Between 1990 and 1994, the NBA consisted of 27 teams. From 1995 to 2003, the league expanded to 29 teams, and from 2004 onward, 30 teams have competed in each season. The validation confirms that the final dataset accurately reflects the correct number of team–season observations.

#### 3.1 Evolution of NBA Team Payrolls Over Time

Figure 2 illustrates the evolution of average NBA team payrolls over the 1990–2020 period, using inflation-adjusted values. The trend reveals substantial growth over time, with three distinct phases, reflecting revenue growth and broader changes in the league’s economic structure.



*Figure 2. Average NBA team payroll over time (inflation-adjusted)*

From 1990 to 2000, average team payroll increased sharply, rising from approximately \$25 million to nearly \$90 million. Between 2000 and 2014, payroll levels remained relatively stable, fluctuating within a narrower range between \$90 million and \$100 million. Starting in 2014, however, average payrolls experienced a dramatic increase, climbing from around \$90 million to approximately \$150 million by 2020.

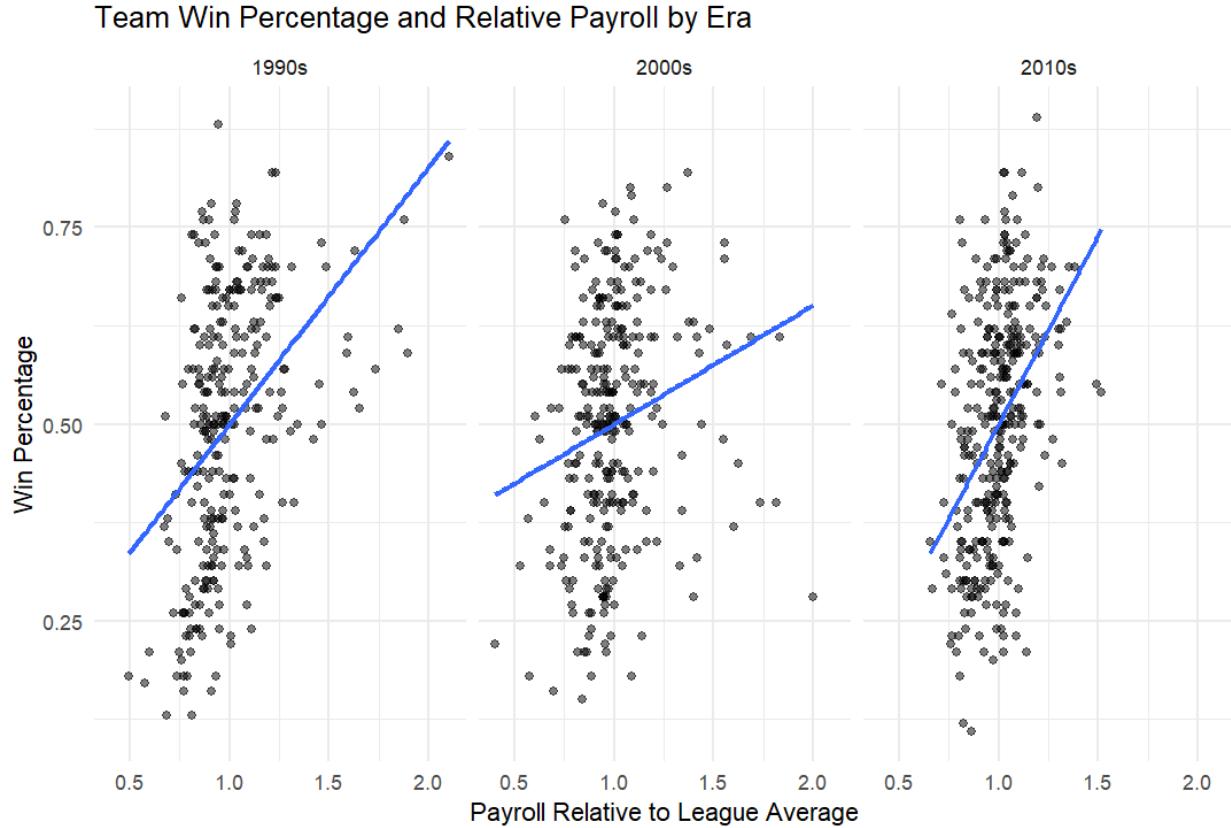
Overall, Figure 2 highlights the scale of financial growth in the NBA across the sample period, with average team payrolls increasing roughly five times from the beginning to the end of the analysis window.

### 3.2 Payroll dispersion and performance across eras

Figure 3 presents the relationship between team win percentage and payroll relative to the league average, examined separately for the 1990s, 2000s, and 2010s. Splitting the analysis by decade allows for meaningful within-era comparisons, avoiding distortions caused by long-term changes in league revenues, salary structures, and financial regulations.

A clear difference across eras emerges in the distribution of relative payroll. In the 1990s and 2000s, payroll ratios are widely spread, with several teams spending more than 150% of the league average and others operating substantially below it. In contrast, the 2010s display a much narrower payroll distribution, with most teams clustered close to the league average and very few extreme spenders or under-spenders. This pattern indicates a reduction in financial dispersion across teams over time. At the same time, win percentage remains widely dispersed within each era. Teams with similar payroll ratios often achieve very

different competitive outcomes, suggesting that payroll alone cannot account for observed differences in performance.



*Figure 3. Relationship between team win percentage and payroll relative to the league average, shown separately for the 1990s, 2000s, and 2010s.*

Overall, Figure 3 serves a descriptive purpose. It shows that absolute payroll levels are not comparable across eras, making pooled analyses using raw payroll values problematic. It also motivates a shift away from absolute payroll levels toward rank-based comparisons in the following analysis, which directly evaluates how teams perform relative to their contemporaries within the same financial context.

It is also important to note that during the 1998 and 2011 seasons, the NBA regular season was shortened to 50 and 66 games respectively due to lockouts. For this reason, win percentage is used as the primary measure of team success rather than total wins, as it provides a more reliable and comparable indicator of performance across seasons with different numbers of games.

### 3.3 Relative Payroll Position and Regular-Season Performance

Figure 4 uses within-season ranks to compare team payroll and on-court performance. For each season, teams are ranked relative to one another on two dimensions: payroll and win percentage (regular-season performance). A rank of 1 represents the highest payroll or best win percentage in that specific season. Both axes are reversed so that teams with higher payroll and stronger performance appear closer to the top-right corner, facilitating interpretation.

The purpose of using ranks rather than raw values is to isolate relative position within a season. Figure 4 therefore addresses a simple but central question: do teams that rank higher in payroll also tend to rank higher in performance within the same season?

To explore how this relationship behaves across different competitive environments, the figure presents three representative seasons: 1992, 2001, and 2017.

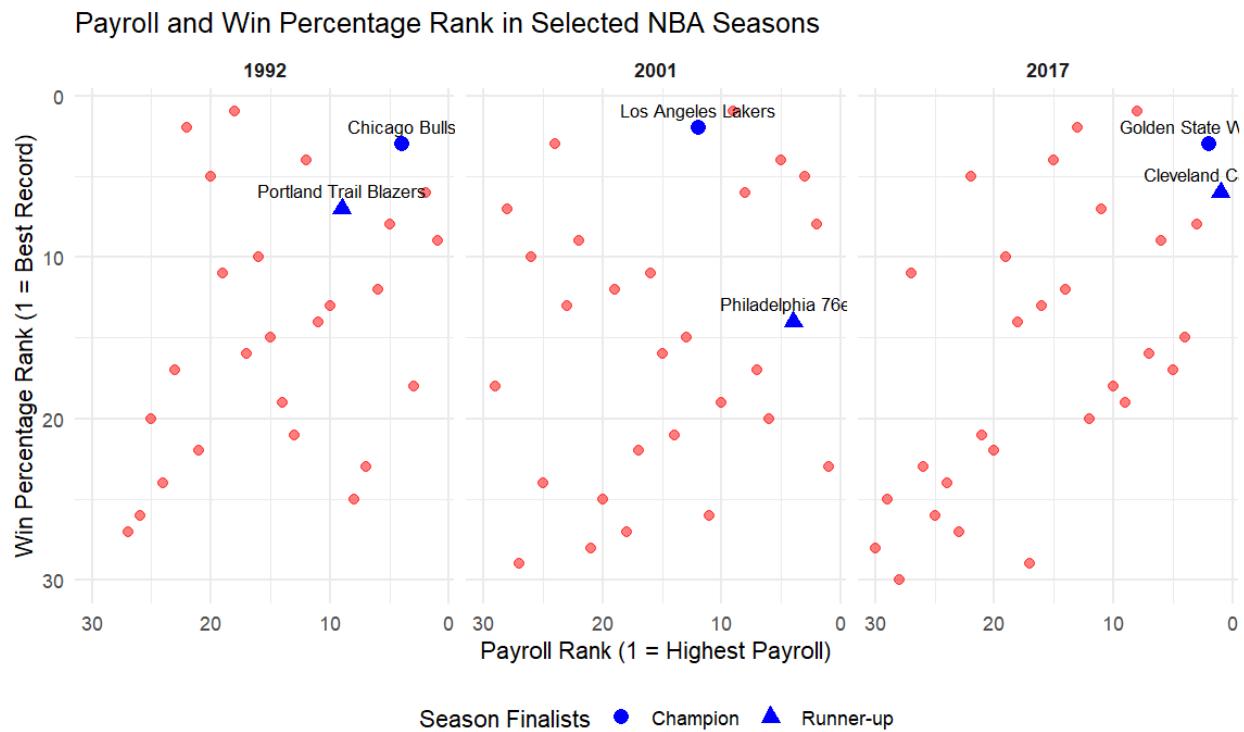


Figure 4. Within-season ranks of team payroll and regular-season win percentage for selected NBA seasons. Champions and runners-up are highlighted.

In 1992, the relationship between payroll rank and win-percentage rank appears weak and uneven. The champion, the Chicago Bulls, ranked 4th in payroll and 3rd in win percentage, while the runner-up, the Portland Trail Blazers, ranked 9th in payroll and 7th in win percentage. These outcomes suggest that high spending was not that a necessary condition for reaching the Finals in this period.

Shockingly, several teams achieved top win-percentage ranks despite relatively low payroll ranks (around 18th–22nd), while some higher-payroll teams ranked poorly in performance. This dispersion indicates that financial investment alone explains little of the variation in outcomes during this era, and that organizational, tactical, or player-specific factors likely played a larger role.

The 2001 season again shows substantial deviation from a monotonic payroll–performance relationship. The Los Angeles Lakers won the championship despite ranking only 12th in payroll, while achieving the second-best win percentage. The runner-up, the Philadelphia 76ers, ranked 4th in payroll but only 14th in win percentage.

Notably, several teams clustered in the top-right region—ranking highly in both payroll and win percentage—did not reach the Finals. At the same time, the team with the highest payroll ranked near the bottom in win percentage, while a top-three performance team ranked 24th in payroll. These contrasts reinforce the idea that high payroll increased the opportunity set for success but did not reliably translate into elite outcomes.

By 2017, the relationship between payroll rank and performance rank becomes visibly tighter. The champion (Golden State Warriors) and runner-up (Cleveland Cavaliers) ranked second and first in payroll, and both ranked within the top six in win percentage. Moreover, teams with low payroll ranks are concentrated toward the bottom-left of the panel, indicating consistently weaker performance.

While high payroll still does not perfectly predict win percentage, the dispersion observed in earlier seasons is reduced. This suggests that, in more recent competitive environments, relative financial position within a season has become more closely aligned with regular-season success, even if it remains insufficient to guarantee championship outcomes.

### 3.4 Payroll Differences Between Playoff and Non-Playoff Teams

To assess whether teams that qualified for the playoffs differed systematically in payroll size from those that did not, a two-sample comparison of inflation-adjusted payrolls was conducted. The analysis compares average payroll levels between playoff and non-playoff teams across all seasons in the sample.

Playoff Status	Mean Payroll (USD)
Qualified	89.3m
Non-qualified	82.7m

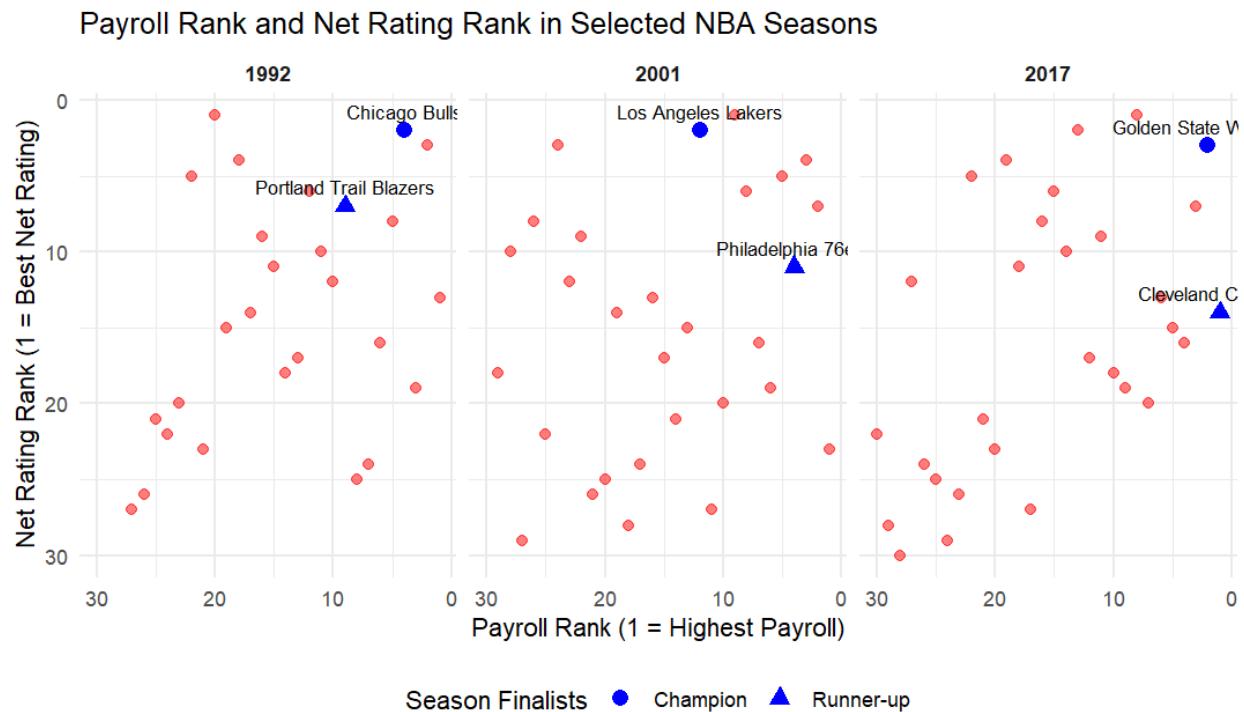
The results indicate that teams qualifying for the playoffs had, on average, higher inflation-adjusted payrolls than teams that failed to qualify. The difference in mean payrolls is statistically significant at the 5% level (Welch t-test,  $p = 0.005$ ), with playoff teams spending approximately \$2.0 to \$11.2 million more on average, as indicated by the 95% confidence interval. While this finding suggests a positive association between payroll size and playoff qualification, the magnitude of the difference is still moderate, implying substantial

overlap between the two groups. Consequently, higher payrolls appear to increase the likelihood of reaching the playoffs but do not guarantee postseason participation.

### 3.5 Payroll Position and Team Efficiency in Selected NBA Seasons

Before interpreting the results, it is important to clarify the meaning of net rating and its ranking. Net rating measures a team's point differential per 100 possessions, calculated as points scored minus points conceded. It provides an efficiency-based assessment of team quality that goes beyond simple win–loss outcomes. Ranking teams by net rating therefore allows comparison of underlying performance strength within a given season, with rank 1 indicating the best net rating.

As in the previous figure, both axes are reversed. Teams appearing toward the top-right of the graph are those that rank highly both in payroll and in net rating, while teams in the bottom-left are low spenders with weak efficiency. This visual structure mirrors the win percentage rank figure (Figure 4), allowing direct comparison between outcome-based performance (wins) and efficiency-based performance (net rating).



*Figure 5. Relationship between team payroll rank and net rating rank for selected NBA seasons. Lower ranks indicate higher payroll or stronger efficiency.*

Overall, the structure of Figure 5 closely mirrors the win percentage rank comparison, indicating a strong alignment between efficiency-based performance and season outcomes. Differences between the two

figures highlight cases where efficiency did not fully translate into wins, providing additional insight into team performance beyond win-loss records.

In the 1992 season, the overall pattern remains similar to the win percentage comparison. The Chicago Bulls, who won the championship, ranked second in net rating with a value of 6.8, while the Portland Trail Blazers ranked seventh at 3.1. The highest net rating that season was 7.4, indicating that the Bulls were very close to the league's efficiency peak. Notable discrepancies appear among other teams: the highest-payroll team ranked thirteenth in net rating, while a low-payroll team ranked twentieth in payroll achieved the best net rating in the league. These cases illustrate that elite efficiency could emerge independently of payroll position.

The 2001 season displays a similarly consistent structure. The Los Angeles Lakers, champions that year, ranked second in net rating at 7.7, just below the league-best value of 7.9. The Philadelphia 76ers, runners-up, ranked eleventh with a net rating of 1.8, reflecting a much larger efficiency gap between finalists than in 1992. Most teams maintain net rating ranks close to their win percentage ranks, reinforcing the close relationship between efficiency and outcomes during this period.

In 2017, while broad patterns persist, differences between net rating and win percentage become more pronounced. The Golden State Warriors, champions that season, ranked third in net rating at 5.9, whereas the Cleveland Cavaliers ranked fourteenth with a value of 1.0. The league's highest net rating that year was 8.6, substantially above both finalists. A large concentration of teams remains in the bottom-left region of the graph, with nine teams ranked among the lowest ten in both payroll-win percentage and payroll-net rating comparison, indicating consistent underperformance among low spenders. Differences emerge at the top of the distribution. While five teams occupied the top-right of the win percentage figure, only three appear here in the net rating comparison. Several mid-payroll teams perform notably better in net rating than in win percentage, suggesting strong efficiency that did not fully translate into regular-season results.

Taken together, Figure 5 reinforces the findings from the win percentage analysis while adding depth. Net rating confirms that financial resources are associated with performance, but it also shows that efficiency varies substantially among teams with similar payroll positions. This supports the view that while financial resources matter, performance is shaped by how effectively those resources are converted into on-court efficiency rather than by spending alone.

## 4. Conclusion and Discussion

This project examined the relationship between team payroll and on-court success in the NBA between 1990 and 2020, using multiple complementary approaches: descriptive trends, relative payroll comparisons, rank-based analyses, and a statistical test of playoff qualification. Taken together, the results suggest that while payroll is related to team success, it is neither sufficient nor deterministic. Instead, how payroll is allocated appears to matter more than its absolute level, particularly in more recent seasons.

At a broad level, the evolution of payroll over time shows a substantial increase in nominal and inflation-adjusted spending. However, this growth did not translate into a proportional increase in competitive separation. The era-based payroll ratio analysis highlights a clear compression of payroll dispersion in the 2010s compared to the 1990s and early 2000s. Extreme spending relative to the league average became less common, suggesting a financially more balanced league environment.

Despite this increased financial equality, the relationship between payroll and success did not disappear. In the 2017 season, both the champion and runner-up ranked at the very top of the payroll distribution while also achieving high win percentages. At the same time, a large share of the lowest-payroll teams occupied the bottom of the performance rankings. This indicates that even in a compressed payroll environment, relative financial position within a season still matters. What changed over time is not the existence of a relationship, but its nature: large payroll advantages became harder to obtain, while efficient use of payroll became more critical.

This interpretation is reinforced by the rank-based analyses comparing payroll rank with win percentage rank and net rating rank. Using ranks rather than raw values allows meaningful comparisons within each season, avoiding distortions caused by inflation, league expansion, and structural changes over time. Across all three selected seasons (1992, 2001, and 2017), high payroll rank did not guarantee top performance, and several teams achieved strong competitive outcomes despite relatively modest payroll positions. These cases illustrate what can be described as payroll efficiency: the ability to convert financial resources into wins and point differentials more effectively than competitors. Conversely, several high-spending teams consistently underperformed, illustrating that misallocation matters—spending more without efficient roster construction does not ensure success.

The net rating analysis complements the win percentage results by focusing on underlying performance quality rather than outcomes alone. Champions in all three selected seasons ranked near the top in net rating but were not always the absolute best in the league. This indicates that championship teams generally exhibit strong team quality, as reflected by high net ratings, but do not necessarily dominate the league in regular-season performance metrics. The similarity between the win percentage and net rating rankings also supports the idea that payroll affects performance primarily through team quality, not random variation.

The statistical results further support these conclusions. The t-test comparing inflation-adjusted payrolls of playoff and non-playoff teams shows a statistically significant difference at the 5% level, with playoff teams spending more on average. However, the magnitude of this difference is moderate, and the

overlap between the two groups is substantial. This confirms that higher payroll increases the probability of reaching the playoffs, but does not guarantee qualification.

Overall, the findings suggest that payroll plays an important but limited role in explaining NBA success. Financial resources provide opportunities, but competitive outcomes ultimately depend on a combination of roster construction, player performance, and how effectively financial investments are translated into on-court production. As the league has become more financially balanced over time, efficiency has increasingly dominated magnitude: relative payroll position and roster construction decisions matter more than spending power.

## Future Research

This study focuses primarily on payroll as a single financial indicator. Future research could extend the analysis by incorporating additional financial and institutional variables such as salary cap levels, luxury tax payments, tax aprons and contract structures. It could also examine governance factors that may have influenced financial dynamics in the league, such as the timing of Adam Silver's appointment as NBA Commissioner in 2014, which coincides with a noticeable acceleration in average team payrolls.

Moreover, integrating player-level data could help distinguish between efficient spending on star talent versus depth and role players. Future research could extend this analysis by incorporating additional team-level performance indicators—such as offensive and defensive ratings, player availability, or roster stability—to better explain why teams with similar payroll levels often achieve very different outcomes.

An additional research idea could be a focused investigation of outlier teams identified in this analysis. Teams that achieved high win percentages or net ratings despite relatively low payroll ranks—and conversely, teams that underperformed despite high spending—could be examined in detail. Case-based analysis of these teams may reveal structural, strategic, or organizational factors that contribute to exceptional payroll efficiency or inefficiency.

In conclusion, payroll alone is an insufficient predictor of NBA success. While financial resources influence the range of competitive possibilities available to teams, on-court outcomes ultimately reflect a broader set of factors, including player performance, tactical execution, health, and organizational decision-making. Payroll shapes opportunity, but it does not determine results.

## 5. Data Sources and References

- NBA Team Payroll dataset [\[link\]](#)
- NBA Team Summaries dataset [\[link\]](#)
- NBA Team Histories dataset [\[link\]](#)
- Basketball Glossary [\[link\]](#)
- Data transformation cheatsheet [\[link\]](#)
- Data visualization cheatsheet [\[link\]](#)