Do Superteams Work? Measuring Playing Time and Scoring Concentration in the Super-team era of the NBA

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Abstract

We pose the hypothesis that more balanced roster construction exhibited through low scoring and minute concentrations in rotations will lead to better performance in the NBA, evidenced through more wins. The Herfindahl-Hirschman Index is a metric used to evaluate industry concentration and compare concentration levels across industries. We apply this metric to both scoring, minutes played, and our own metric called point capitalization to assess levels of balance in roster construction. We conclude that higher scoring and capitalization concentrations leads to more regular season wins. The GitHub for this paper can be accessed here.

Keywords: Herfindahl-Hirschman Index, Competitive Balance, Rotation Depth, NBA, Roster Construction

1 Introduction

The NBA is gravitating towards a mentality where super-teams, teams where multiple superstars team up, are the way to win. Star-studded rosters have existed in the past, but we can confidently say that the 2011 Miami Heat were the first example of a super-team in the modern NBA. Three NBA stars all in their prime teamed up together to make the most talented roster in basketball. The "Miami Heatles" as they were known infamously hosted a press conference prior to their first season together promising north of seven championships as a roster. Those who know understand the embarrassment of this press conference in retrospect. After a impressive 4 straight NBA finals but a mediocre 2-2 record, this team split up with LeBron James leaving back for Cleveland. The 2011 Heat walked so the rest of the NBA could run wild with super-teams.

The days of franchise loyalty have all but practically become a joke. A select few superstars remain on the team that drafted them and have yet to be the beneficiary of another superstar deciding to join their franchise. Teams like the 2017-2019 Warriors, the 2020-2023 Nets, and the 2020-present Clippers are all recent examples of super-teams. The race for NBA teams to arm up with superstar talent is strong, but the success of this approach is mixed. Outside of the Kevin Durant Warriors teams from 2017-2019, there's little consensus that the super-teams of the past decade were the best teams in the NBA. And with super-team implosions due to competing egos or incompatible playing styles, the super-team model seems like a weak approach to winning.

All the aforementioned flaws with super-teams in the NBA can be extrapolated to suggest that maybe there is a premium for teams with balanced talent on the roster. When a team goes all in to become a super team, they're often stripped of all draft capital and role player assets in pursuit of adding that new all-NBA player. Consequentially, that same team's roster becomes increasingly top-heavy, where one or a few players are then responsible for the lion's share of scoring, playmaking, and defensive responsibilities. When talent is concentrated in a few players, a team's rotation (number of players on the roster who get playing time in a game) becomes smaller as the talent on the bench is worse and players outside of the superstars offer comparably less. Given the track record of super-teams in the past decade, we posit the hypothesis that balanced rosters are better for winning, as observed through teams with less talent concentration having performed better in comparison to the most highly concentrated teams. We explore and test our hypothesis applying the Herfindal-Hirschman Index (HHI) to NBA rosters from the 2021-2022 NBA season.

The Herfindal-Hirschman Index (HHI) is a commonly used metric to evaluate the competitiveness and/or state of competition in a market. The metric is advantageous due to its simplicity to calculate and ease of general understanding. It is a product of the 1945 work from German economist Albert Hirschman and later modified in 1950 by American economist Orris Herfindahl.

$$HHI = s_1^2 + s_2^2 + s_3^2 + ... + s_n^2 \tag{1}$$

Equation (1) above displays how the HHI is the sum of the squared market share of each firm in the market, containing a total of n firms. Typically, the market share is represented as a whole number and not as a decimal. In other words, if a firm has 25% market share, this would be captured in the equation as 25^2 and not as $.25^2$. The difference is important in scaling the final result as HHI indices are typically evaluated relative to their place in the range of 1,500 to 2,500. Similarly, in an act to protect industry competitiveness, the FCC takes heightened concern with M&A activity in an industry where an acquisition can increase the total HHI by 200 points.

2 Metrics

Our analysis relies on quantifying roster balance and rotational depth. We consider balance in the rotation to be a mix of how much playing time different players on the roster receive as well as how much of a contribution to the total points scored does each player produce. This can be simplified into considering a team's competitive balance as made up of two components: minutes played and points scored. This is a very simplistic view of rotation balance as it excludes non-scoring contributions such as assists, rebounds, blocks, or steals.

2.1 Metric Overview

We define two indices in isolation as sums of minutes-played shares and sums of points-scored shares. These are represented in equations (3) and (4). Minutes-played and points-scored shares represent the percentage of a player's minutes or points over the total minutes played or points scored. Total minutes will be 240 in almost all cases as a team runs a lineup of five players across four 12-minute quarters. The edge cases exist where a team goes to some degree of overtime (one period, two periods, etc.). These cases add 25 minutes to the total for each additional period of overtime played.

While both minutes played and points scored have use when studied in isolation, the two terms have an interaction effect that we capture through the creation of a "point capitalization" metric. Logically, the more minutes a player plays, the more chances they have to score points. A team that uses a superstar for roughly 40 minutes a game to score 25 plus percent of their total points would be considered very top heavy when compared to a team that plays no player over 35 minutes and does not receive a scoring contribution over 20 percent from anyone in their rotation. Evaluating the competitive balance while only looking at scoring disregards the imbalance that may exist in minutes-played and similarly the number of possessions a player could use to score. Conversely, evaluating the competitive balance while only looking at minutes played disregards the impact on scoring which is the means to eventually winning the game (outscoring the other team).

As mentioned above, we create a metric that we call point capitalization to capture the interaction between points scored and minutes played. This metric is inspired by the financial concept of market capitalization. Market capitalization is a measure of the value of a company's outstanding shares of stock. The calculation is simply the number of shares outstanding multiplied by the current share price. We translate this math over to basketball to make a player's point capitalization the product of the number of minutes played times the number of points scored. This metric exists at the individual player and individual game level, meaning there is a unique value for point capitalization for each player in each game of the season.

$$\text{Point Capitalization} = C = MP \times PTS \tag{2}$$

2.2 Formulas

We then take each of the three statistics of minutes played, points scored, and point capitalization and apply them to the base HHI formula to create indices that represent competitive balance in each of the aforementioned stats.

$$\text{Minutes Balance} = HHI_g^M = \sum_i^I \left(\frac{m_{i,g}}{M_g}\right)^2 \tag{3}$$

$$\text{Points Balance} = HHI_g^P = \sum_i^I \left(\frac{p_{i,g}}{P_g}\right)^2 \tag{4}$$

$$\text{Capitalization Balance} = HHI_g^C = \sum_i^I \left(\frac{c_{i,g}}{C_g}\right)^2 \tag{5}$$

Each HHI metric exists at the game level for a team. A team will therefore have 82 unique HHI values across a season, as g exists in the set of G games. The HHI value at the individual game level is driven by the set of players I that play during that game g.

$$i \in I$$

$$g \in G \quad G = \{1, 2, ..., 82\}$$

2.3 Example Scenario Applying the Metrics

Here we apply the math discussed above to the Golden State Warriors versus the Denver Nuggets in their first game of the 2022 NBA playoffs. This game took place on April 16, 2022 and the Warriors won with a final score of 123 - 107. The box score data for this game can be found in the appendix in section C.

In table 1 we explore the raw values and share values (express as a percentage of the total) for the three indices on the Golden State Warriors. The share values are then squared and summed together to compute the respective HHI indices.

	Raw Values			Share of Team Total		
Player	Minutes	Points	Points Cap	Minutes	Points	Points Cap
Jordan Poole	30.10	30.00	903.00	0.13	0.24	0.30
Andrew Wiggins	29.48	16.00	471.73	0.12	0.13	0.15
Klay Thompson	29.08	19.00	552.58	0.12	0.15	0.18
Draymond Green	28.92	12.00	347.00	0.12	0.10	0.11
Kevon Looney	13.15	6.00	78.90	0.05	0.05	0.03
Otto Porter Jr.	25.08	4.00	100.33	0.10	0.03	0.03
Stephen Curry	21.68	16.00	346.93	0.09	0.13	0.11
Gary Payton II	19.67	5.00	98.33	0.08	0.04	0.03
Nemanja Bjelica	14.95	8.00	119.60	0.06	0.07	0.04
Andre Iguodala	13.42	0.00	0.00	0.06	0.00	0.00
Juan Toscano-Anderson	3.62	3.00	10.85	0.02	0.02	0.00
Damion Lee	3.62	2.00	7.23	0.02	0.02	0.00
Jonathan Kuminga	3.62	1.00	3.62	0.02	0.01	0.00
Moses Moody	3.62	1.00	3.62	0.02	0.01	0.00

Table 1 Raw values and shares for the Warriors on April 16th, 2022

Before moving into computing any HHI indices, we call attention to a few traits of how raw values translate over to percentages of totals. Jordan Poole is both the minutes and points leader for the team. Poole plays 30.10 minutes during the game which represent 13% of the team's total minutes, whereas his 30 points represent 24% of the team's total points. Total minutes are capped at 20 percent since a player cannot play more than 48 minutes. When we combine these two facets being his minutes and points, his point capitalization is 903 at 30% of the team total. This is an important call out as point capitalization will tend to skew to the tails. In other words, players who get more playing time and score more points will be pulled further to one end whereas those who get little playing time and rarely score are pulled to the bottom.

Kevon Looney is an excellent example of the polarity in the metric and how it behaves differently compared to standard minute and point shares. Looney played about 13 minutes in this game which is only 5% of the total, and scored six points at another 5% of the total. Looney's point capitalization is then 78.90, which only represents about 3% of the total. This metric pulls Looney's share down relative to what it is in the other categories and helps show how the team had a more "top-heavy" performance this time. Looney played fewer minutes than several other players and scored similarly few points. It might not be as evident on their own, but when combined into the point capitalization metric, it shows that his contributions in playing time and minutes are less influential on the team total. Granted, Looney is not a scorer on the roster and makes invaluable contributions on the defensive and rebounding end of the team.

Finally, onto computing the HHI values for minutes, points, and point capitalization for the Warriors in this game. Using the formulas outlined in section 2.2, we calculated the following HHI values for both the Warriors and the Nuggets as shown in table 2.

Team	HHI^M	HHI^P	HHI^C
GSW	0.097	0.137	0.175
DEN	0.107	0.142	0.203
Difference	(0.011)	(0.005)	(0.027)

Table 2 GSW vs. DEN index values

The index values for the Warriors can easily be calculated by hand if we take the share values from Table 1 and square and sum them all together. The calculation is the same for Denver, except the share values come from the Nuggets' box score data. This is how we calculate the index values for an individual game. Each team will have its own index values for each game, but the aggregate index values, which are shown in Table 5, are the season-wide average of each individual game index value. The aggregate value more accurately represents playing time and scoring concentration for a team as the 82-game season will smooth out edge cases where one player might take over for a game or two (e.g., Cam Thomas scoring 40+ points in three straight games).

The additional row comparing the game-level index values between the Warriors and the Nuggets is done to illustrate what a difference in values means. The Warriors have lower index values for all three metrics in this game. This means that their playing time, scoring, and point capitalization were all less concentrated amongst their team players than the Nuggets roster. The 2022 post-season Denver Nuggets were a more top-heavy team than the rest of the Western Conference, as the absence of Jamal Murray left Nikola Jokic with much more of the scoring and playmaking burden. Compared to the Warriors (known for playing excellent team basketball), their playing time and scoring seem much more concentrated. We can already arrive at this conclusion by simply being NBA fans and having some knowledge of the league. However, these metrics are engineered to provide a simple but holistic way to quantify these qualitative assessments.

3 Applying the HHI to the 2021-2022 NBA Season

In this section we explore distribution statistics for the three index measures and evaluate the relationship between each measure towards winning. We provide tables for the individual metric values for each team across the season as well as summary tables and figures evaluating the metrics at the aggregate, league-wide, level.

	Mean	Median	S Deviation	Skew	Kurtosis
HHI^M	0.115	0.116	0.012	(0.061)	0.897
HHI^P	0.156	0.153	0.029	0.869	1.704
HHI^C	0.187	0.184	0.037	0.731	1.175

Table 3 Distribution statistics for the three different indices

Table 3 shows us the first four degrees of distribution statistics for the three index measures. To first understand the scope of a metric such as the HHI^M, we consider the two most extreme scenarios of how playing time is allocated. In terms of minutes, a completely unbalanced rotation has all five starters playing 48 minutes, making the HHI_M for the team .20. A team that goes through an entire 14-man rotation with evenly distributed playing time would have each player playing roughly 17 minutes in a game. If we assume each player plays 17 out of the 240 minutes, then each player has a minute share of 7.14%, and when squaring all the values and summing them together, the HHI^M becomes 0.0714.

	Min	Q1	Median	Q3	Max
HHI^M	0.072	0.108	0.116	0.123	0.181
HHI^P	0.090	0.136	0.153	0.172	0.316
HHI^C	0.098	0.162	0.184	0.209	0.394

Table 4 Range statistics for the three different indices

One essential but high-level takeaway from these distribution statistics is the larger variance in HHI^P and HHI^C values in comparison to the minute index HHI^M. The variance is 484% greater for the points index compared to the minutes index and 850% greater for the capitalization index compared to the minutes index. Table 3 shows the range statistics for each of the index distributions. In line with the greater variation in the point and capitalization indices, the two also have much greater ranges. The IQR for the minutes, points, and capitalization indices are 0.015, 0.036, and 0.047, respectively. We see this call out as important when analyzing teams and their respective index values, as extreme values in the minute indices are "rarer" given the tightness of the distribution.

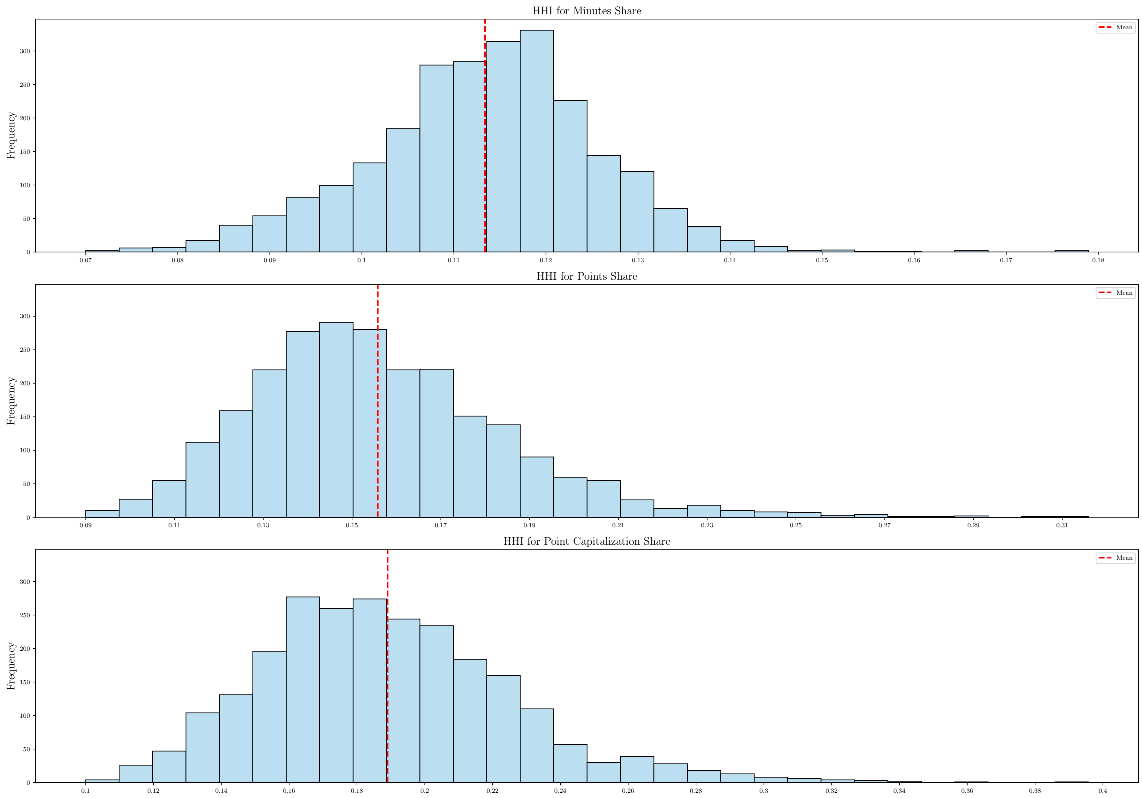

Fig. 1 Histogram distributions for each index

Figure 1 provides visual representations of the distributions, which allows us to see how the metrics behave. The HHI^M distribution is the closest to a normal distribution out of the three indices, but this does not come at much of a surprise. Given that there is a hard cap to how many minutes a player can play in a game, the range of possible values is limited. Additionally, without injury concerns, players typically have a set amount of playing time they expect on a nightly basis. Given total playing time constraints, it subsequently ensures that other players will also have consistent minutes per game. Points are subject to several additional factors that playing time is not exposed to, and therefore, it is reasonable to expect greater variability with this metric. The distributions for points and point capitalization are right-skewed.

4 Connecting the Metrics to Regular Season Winning

This section explores the connection between values and rankings across the three metrics for the 30 NBA teams. Returning to the original hypothesis, we posit that more balanced teams will perform better. In terms of the actual metrics, teams with lower values across all three indices (HHI^M, HHI^P, HHI^C) will perform better. Our hypothesis is focused on playoff performance, and therefore our definition of better is specifically concerned with the ability to go deeper into the playoffs. However, before even concerning ourselves with playoffs, we explore how the metrics behave across the 82-game regular season for the scope of all 30 NBA teams.

4.1 Analyzing Team Records and Metric Rankings

In this section we take a look at the rankings of team's HHI values and how that compares to where they ranked at the end of the 2021-2022 NBA season in terms of total wins.

	Raw Values				Rankings			
Team	HHI^C	HHI^P	HHI^M	W PCT	HHI^C	HHI^P	HHI^M	W PCT
Atlanta Hawks	0.1926	0.1597	0.1151	0.5240	11	10	16	16
Boston Celtics	0.2025	0.1681	0.1192	0.6220	5	5	6	6
Brooklyn Nets	0.2150	0.1712	0.1167	0.5370	1	3	11	14
Charlotte Hornets	0.1850	0.1577	0.1207	0.5240	16	13	4	16
Chicago Bulls	0.2099	0.1756	0.1220	0.5610	3	1	2	12
Cleveland Cavaliers	0.1798	0.1547	0.1194	0.5370	22	15	5	14
Dallas Mavericks	0.1985	0.1629	0.1152	0.6340	8	9	15	5
Denver Nuggets	0.1844	0.1511	0.1108	0.5850	17	20	25	10
Detroit Pistons	0.1789	0.1481	0.1121	0.2800	23	24	23	28
Golden State Warriors	0.1992	0.1588	0.1087	0.6460	7	11	29	3
Houston Rockets	0.1642	0.1393	0.1106	0.2440	29	30	27	30
Indiana Pacers	0.1732	0.1466	0.1175	0.3050	27	25	10	26
Los Angeles Clippers	0.1740	0.1460	0.1122	0.5120	25	26	21	18
Los Angeles Lakers	0.2107	0.1708	0.1153	0.4020	2	4	14	23
Memphis Grizzlies	0.1819	0.1506	0.1048	0.6830	19	22	30	2
Miami Heat	0.1853	0.1580	0.1186	0.6460	15	12	7	3
Milwaukee Bucks	0.1938	0.1666	0.1138	0.6220	10	6	18	6
Minnesota Timberwolves	0.1907	0.1544	0.1113	0.5610	12	16	24	12
New Orleans Pelicans	0.1831	0.1515	0.1128	0.4390	18	18	20	20
New York Knicks	0.1971	0.1637	0.1182	0.4510	9	8	8	19
Oklahoma City Thunder	0.1873	0.1501	0.1135	0.2930	14	23	19	27
Orlando Magic	0.1616	0.1407	0.1122	0.2680	30	28	22	29
Philadelphia 76ers	0.2042	0.1736	0.1211	0.6220	4	2	3	6
Phoenix Suns	0.1802	0.1511	0.1160	0.7800	21	19	12	1
Portland Trail Blazers	0.1878	0.1566	0.1159	0.3290	13	14	13	25
Sacramento Kings	0.1815	0.1507	0.1178	0.3660	20	21	9	24
San Antonio Spurs	0.1671	0.1407	0.1104	0.4150	28	29	28	22
Toronto Raptors	0.1997	0.1657	0.1266	0.5850	6	7	1	10
Utah Jazz	0.1778	0.1533	0.1144	0.5980	24	17	17	9
Washington Wizards	0.1735	0.1434	0.1108	0.4270	26	27	26	21

Table 5 HHI values, winning percentage, and rankings for NBA teams in the 2021-2022 season

Table five shows the teams ranked from 1-30 for each of the three indices, the team name, the index value, and how many games the team won during the regular season expressed as their winning percentage. All the rankings are expressed in descending order, meaning higher index values will receive lower rankings. This contradicts our hypothesis that lower index values (and therefore less concentration in minutes or scoring) leads to wins. The descending ranking order makes it easy to cross-check the index rank with the team's actual winning as this is ranked in descending order. This table is helpful insofar as it shows the incremental differences in the index values between each rank. The table shows the pure ranking comparison across all 30 teams with their end-of-season rank as the ranking column for W PCT and then their ranking across each of the three indices in the remaining columns.

An immediate takeaway from Table 5 would be the performance in the metrics from teams with the worst end-of-season rankings. The bottom three teams from the 2021-2022 NBA season

(Houston, Orlando, and Detroit) all have rankings greater than 20 for each of the three metrics. In this case, low rankings indicate that these teams have very low HHI values, which can be interpreted as these teams have very balanced rotations in both playing time and scoring. These are teams with no clear superstar to do all the heavy lifting. Teams at the bottom of the NBA standings are likely trying to figure out a proper rotation as they rebuild rosters. As such, it seems appropriate that poor-performing NBA teams will have very balanced rotations as they are not investing heavily in the performance of one singular player. Instead, they try to develop multiple equally-talented scorers by equitably distributing minutes.

There is less consistency in our metrics' behavior when looking at the top regular season teams. The regular-season standout during the 2021-2022 season were the Phoenix Suns, who won 64 out of 82 games. The Suns do not rank low in any of the metrics, but their HHI^P and HHI^C rankings are in the upper half of the distribution (i.e., above 15). On the other hand, the Grizzlies and the Warriors are ranked 30 and 29, respectively, for their HHI^M values. The superiority of these two teams for this metric supports the idea that both Memphis and Golden State run deep rotations that they trust with serious playing time compared to most of the league. This logic tracks with a general understanding of how these two teams played during the season. Memphis has a superstar in Ja, but they also ran a very talented young core of role players. Golden State already has a deep starting lineup with three future hall-of-famers in Stephen Curry, Klay Thompson, and Draymond Green. Beyond this core, the Warriors ran nearly a 10+ man rotation with key playing time given to bench players such as Otto Porter Jr., Gary Payton II, Jordan Poole, Davis Bertans, Moses Moody, Jonathon Kuminga, etc.

4.2 Metric Correlation to Winning

In this section me move into a more quantitative look at the relationship between the index values and winning. Table 6 displays the correlation coefficients (r) between the three indices and the winning percentage of teams during the 2021-2022 NBA season.

	HHI^C	HHI^P	HHI^M	W
HHI^C	1.00			
HHI^P	0.95	1.00		
HHI^M	0.45	0.60	1.00	
W	0.43	0.48	0.14	1.00

Table 6 Correlation coefficients between indices and winning percentage

There is clear multicollinearity between the capitalization index and the points index, which is evident given that points are a capitalization component. The lack of correlation between the capitalization index and the minutes index is more surprising; this suggests that points influence variance in capitalization more heavily than playing time does. Capitalization and point concentration have a modest correlation to a team's ability to win, but the playing time concentration has much less of a relationship. A weak correlation exists between playing time concentration and a team's ability to win.

4.3 Graphical Analysis of the Metrics Connection to Winning

In this section we present three charts that show the relationship between each index and a team's winning percentage. Each chart has an estimated regression line overlaid onto the scatter plot but we actually decompose the regression in the next section.

The relationship between the HHI^M and winning is much weaker when compared to the relationships between winning and the HHI^P and HHI^C. These charts visualize what we already discussed from analyzing Table 5. We can see that the worst teams in the league also have very low concentration indices for playing time, points, and capitalization. However, the best team in the league, Phoenix, is typically in the middle to the lower end when looking at concentration levels. These graphs illustrate that the relationship could be better, as teams with the highest concentration indices are not the ones that dominated their conferences throughout the regular season.

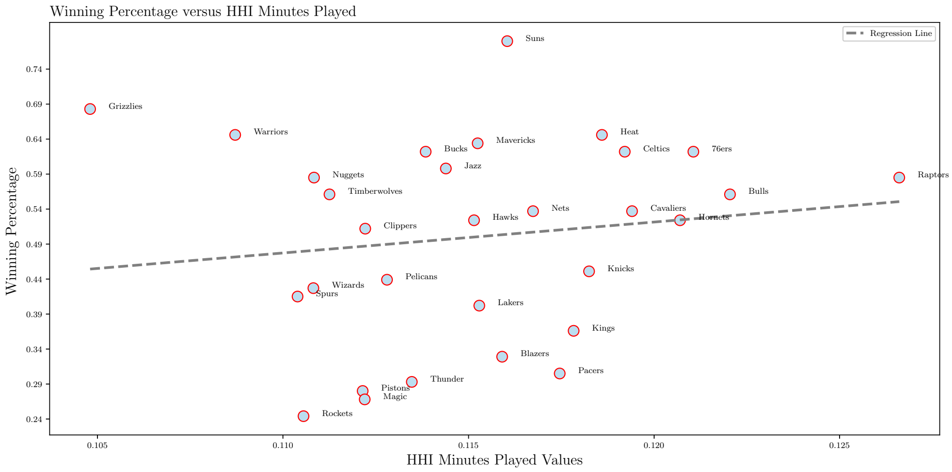

Fig. 2 Relationship between minutes played concentration index and win percentage with a regression line overlay

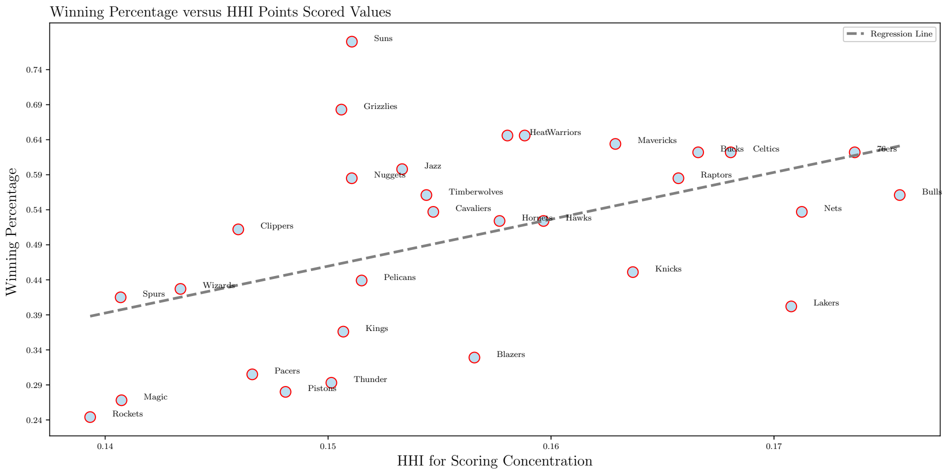

Fig. 3 Relationship between points scored concentration index and win percentage with a regression line overlay

4.4 Simple Linear Regression for Indices Onto Winning

In this section, we perform and analyze a series of three simple linear regressions where we regress each aggregate index value (can be found in Table 5) onto the team's winning percentage. These regressions give us a better understanding of the relationship between each index measure and a team's regular season winning percentage. They also allow us to test for the reliability of each index measure in its ability to indicate how winning a team might be. The equation below is the default form of the regression equation used in the three regressions, with the respective measure being used instead of the placeholder.

$$\text{Winning Percentage} = \text{Intercept} + \beta \times \text{Concentration Index} + \text{Error} \tag{6}$$

	Intercept	β	SE	t Stat	P-value	Lower 95%	Upper 95%	R^2
HHI^M	(0.0090)	4.4205	5.8053	0.7615	0.4527	(7.4711)	16.3122	0.0203
HHI^P	(0.5446)	6.6939	2.3137	2.8932	0.0073	1.9545	11.4333	0.2301
HHI^C	(0.3283)	4.4208	1.7498	2.5264	0.0175	0.8365	8.0051	0.1856

Table 7 Regression summary output from three single variable linear regressions

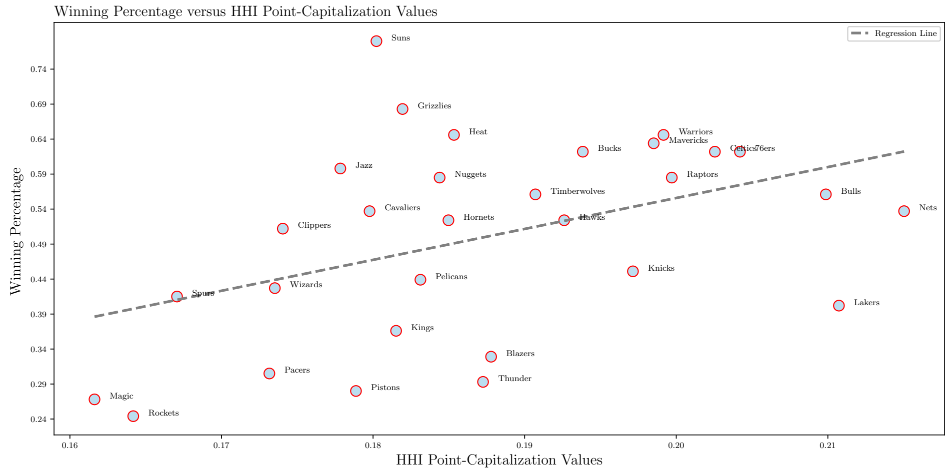

Fig. 4 Relationship between point capitalization index and win percentage with a regression line overlay

The output summary table shows us that the playing time concentration index HHI^M is not a statistically significant indicator of a team's winning percentage from the sample data used. The index value has nearly the same β as the point capitalization index but the test statistic and corresponding p-value are not statistically significant; the regression also has an r-squared value of roughly 2%.

These individual regression tests give credence to the idea that point capitalization and scoring concentration are statistically significant indicators of winning. The scoring concentration index HHI^P has a regression coefficient of 6.69 at a p-value less than 1%. The point capitalization index HHI^C has a regression coefficient at 4.42 at a p-value of roughly 1.75%. Both these coefficients are statistically significant per the regression test and each of these two regressions have r-squared values at 23% and 18.5%, respectively.

The critical discussion to come with the results is how these metrics relate to winning. Noteworthy, all three metrics have positive regression coefficients (β), meaning that larger values or increases in the metric will produce a more significant winning percentage. We are only concerned with the coefficients on scoring concentration and point capitalization since these two were proven to be statistically significant. The results suggest that an increase in a team's scoring concentration index by one hundredth will produce a 6.69 percent increase in their end-of-season winning percentage. For point capitalization, an increase in the index by one hundredth will increase the team's end-of-season winning percentage by 4.42 percent. In an 82-game regular season, each game represents 1.2% of the total games played. Therefore, in the two results scenarios discussed above, a 6.69% increase in the end-of-season winning percentage means that the team would have won an additional 5.49 games. In the scenario where the winning percentage increases by 4.42%, a team is expected to have won an additional 3.62 games.

How realistic of an expectation is it that a team can increase their scoring concentration index or point capitalization index by one hundredth? Returning to the distribution statistics analyzed in section 3, the ranges for these two metrics are .226 and .296, respectively. The IQR for these two indices are .036 and .047, respectively. The total ranges suggest a much greater opportunity to increase one's index value by one hundredth, realistically. However, the IQR is much tighter at 6.27 and 6.30 times smaller than the total range. Therefore, we can conclude that it is realistically quiet difficult to increase a season-wide average value for the HHI^P or HHI^C by one hundredth. Doing so would most likely require roster changes, coaching changes, and generally an overhaul of a team's playing style to favor scoring and playing time concentration in a hands of a few players.

We also performed a multiple regression analysis on the three indices but have included this in the appendix. The multicollinearity between predictors and heteroskedasticity observed in the errors suggests that the analysis is invalid and doesn't provide us with anything statistically significant.

5 Hypothesis Analysis and Counter Arguments

In this section, we ask ourselves and answer the following question: Why do teams with higher point and capitalization concentrations win more games? The qualitative tabular analysis and the regression analysis support the question mentioned earlier; therefore, we fail to reject the null hypothesis in our assessment. As a reminder, we initially proposed the hypothesis that teams with lower playing time, scoring, and capitalization concentrations would tend to win more games, as this is a sign of a balanced roster. This hypothesis assumes that deep rotations are crucial to winning in the NBA. However, the data supports the opposite conclusion that the more top-heavy a team is with its scoring and capitalization, the more games it will win.

This conclusion precipitates a theory that there is less variance in output from role players, and these players have much more defined production ceilings when compared to superstar players. In simple terms, there is a limit to how many points a role player can score compared to a superstar. The variability between role players in their ability to score is much smaller compared to superstars, and this is why even so-called "bad" role players can still come close to the same scoring output as "good" role players. We outline the following scenario in Table 8 to provide hypothetical box score data to show how higher scoring concentration can lead to more wins.

	Team A	Team B	Team A	Team B
Point Guard	10	10	9.35%	8.00%
Shooting Guard	20	30	18.69%	24.00%
Small Forward	22	30	20.56%	24.00%
Power Forward	7	7	6.54%	5.60%
Center	12	12	11.21%	9.60%
Bench 1	15	15	14.02%	12.00%
Bench 2	5	5	4.67%	4.00%
Bench 3	4	4	3.74%	3.20%
Bench 4	4	4	3.74%	3.20%
Bench 5	8	8	7.48%	6.40%
Bench 6	0	0	0.00%	0.00%
Bench 7	0	0	0.00%	0.00%
Bench 8	0	0	0.00%	0.00%
Total	107	125	100.00%	100.00%
HHI^P			0.1330	0.1561

Table 8 Example box score between two teams with different HHI^P

In this example, Team B's shooting guard and small forward each score 30 points but Team A's shooting guard and small forward score 20 and 22, respectively. All other players in the example score the same amount of points. This leads to Team B scoring 18 more points than Team A. In a hypothetical matchup between these two teams, Team B would win simply because their top two scorers outscored the top two scorers on Team A. Let us consider these players to be the superstar talent on the respective teams. In the example, we assumed the role player output would be the same across both teams, but the superstar output varies. We then compute scoring shares for each player on each team to show that every player on Team B has contributed a lower proportion of points than Team A, except for the two superstars. This is another way of saying that the superstars carry a greater scoring concentration on Team B than on Team B despite the total amount of points scored on Team B being larger. This eventually shows up in the HHI^P where Team B has a value of .1561 and Team A at .1330, a Δ of .0231.

Continuing from the example above, we see that Team B wins and has a higher HHI^P. They get a more substantial proportion of their offense from two players compared to Team A. Team B's role players contribute less to the total offensive output. However, the important call out is that despite their lower proportion to the total, all these players scored the same points as those on Team A. On good teams that score many points, role-player contributions that might be equal across any team are drowned out by the scoring from top talent.

6 Evaluating Regular Season Index Values with Respect to Post-Season Success

In this section, we extrapolate our analysis from the regular season and look at how it holds up for the 2021-2022 NBA Playoffs. We consider the playoffs deserving of their own analysis: post-season basketball is more intense, demanding, and stressful. The highest priority for any NBA player is winning a championship, and making it to the post-season is one part of the process, but executing consistently throughout the post-season is an entirely challenge. Since 2000, 8 of the 24 titles have been won by the #1 seed. The best regular season performer has only won 33% of the titles this century. Seeding makes the draw easier for the better teams, but this shows that getting the job done in the post-season is different than getting it done in the regular season.

6.1 Regular season index values and post-season results

Team	EOS Rank	HHI^M Rank	HHI^P Rank	HHI^C Rank	Post-Season Result
Phoenix Suns	1	12	19	21	WC Semis
Memphis Grizzlies	2	30	22	19	WC Semis
Golden State Warriors	3	29	11	7	Champion
Miami Heat	4	7	12	15	EC Finals
Dallas Mavericks	5	15	9	8	WC Finals
Boston Celtics	6	6	5	5	Runner-Up
Milwaukee Bucks	7	18	6	10	EC Semis
Philadelphia 76ers	8	3	2	4	EC Semis
Utah Jazz	9	17	17	24	WC First
Denver Nuggets	10	25	20	17	WC First
Toronto Raptors	11	1	7	6	EC First
Chicago Bulls	12	2	1	3	EC First
Minnesota Timberwolves	13	24	16	12	WC First
Brooklyn Nets	14	11	3	1	EC First
Cleveland Cavaliers	15	5	15	22	Play-In
Atlanta Hawks	16	16	10	11	EC First
Charlotte Hornets	17	4	13	16	Play-In
Los Angeles Clippers	18	21	26	25	Play-In
New York Knicks	19	8	8	9	Eliminated
New Orleans Pelicans	20	20	18	18	WC First
Washington Wizards	21	26	27	26	Eliminated
San Antonio Spurs	22	28	29	28	Eliminated
Los Angeles Lakers	23	14	4	2	Eliminated
Sacramento Kings	24	9	21	20	Eliminated
Portland Trail Blazers	25	13	14	13	Eliminated
Indiana Pacers	26	10	25	27	Eliminated
Oklahoma City Thunder	27	19	23	14	Eliminated
Detroit Pistons	28	23	24	23	Eliminated
Orlando Magic	29	22	28	30	Eliminated
Houston Rockets	30	27	30	29	Eliminated

Table 9 End of season rankings and playoff outcomes for the 2021-2022 NBA season; HHI values ranked in descending order

Table 10 shows the team respective rankings for their end-of-season (EOS) record and each of the three indices. The rankings are all in descending order, meaning that the number 1 ranking for EOS rank is the best team in the NBA. For all the index rankings, the lower the number (i.e., being ranked 1), the higher the index value. We interpret this as the lower the ranking, the less concentration there is for minutes, scoring, or capitalization. High ranked teams have the highest index values.

The Golden State Warriors defeated the Boston Celtics in the championship this year, and the two teams have very different ranking profiles. The Warriors are one of the least concentrated teams regarding playing time, but for scoring and capitalization, they rank just outside of and in the top third. This suggests that the Warriors spread minutes around very well but rely more heavily on scoring from certain players than other teams. The Celtics are among the most concentrated teams across all the indices. The Celtics are in the top 20% of teams when it comes to concentrating playing time and are in the top 16.67% of teams in scoring and capitalization concentration. The numbers tell that Boston is a top-heavy time; their regular season performance was driven by playing a select handful of players and relying on them to generate points.

The Warriors defeated the Celtics this year by four games to two, but they also made much quicker work of their Western Conference opponents en route to the finals. The Warriors played 15 games before the finals, whereas the Celtics played 18. It is a slight difference, but Boston faced two elimination game-seven situations before defeating the Bucks and the Heat. The analysis then asks if the Celtics had more difficulty handling their Eastern Conference opponents because of their top-heavy roster.

We can look at actual playoff game log data and compute index values for each time in each of their playoff games. However, this analysis aims to determine how the regular season roster balance and rotation depth indicate a team's ability for success in the playoffs. This analysis is designed to predict a team's ability to win in a different, higher-stakes setting. The initial hypothesis is motivated by the idea that the high-pressure nature of the playoffs can force superstars to shut down. Therefore having a deep rotation is more important because teams are less reliant on one or two players to deliver consistent wins and can instead go to the bench to help contribute.

6.2 Post-season data and analysis

In this section we actually go into the data for the post-season and look at how team's indices behave and rank amongst the 16 teams that actually made the playoffs.

	Raw Values			Rankings				
Team	HHI^C	HHI^P	HHI^M	HHI^C	HHI^P	HHI^M	Win Pct.	Results
Atlanta Hawks	0.1958	0.1589	0.1181	16	15	14	13	EC First
Boston Celtics	0.2245	0.1873	0.1362	4	4	2	2	Runner-Up
Brooklyn Nets	0.2345	0.1876	0.1366	1	3	1	16	EC First
Chicago Bulls	0.2187	0.1817	0.1255	7	6	6	14	EC First
Dallas Mavericks	0.2316	0.1930	0.1299	3	2	5	6	WC Finals
Denver Nuggets	0.2099	0.1629	0.1118	12	13	16	15	WC First
Golden State Warriors	0.2025	0.1712	0.1223	13	9	11	1	Champion
Memphis Grizzlies	0.2118	0.1692	0.1170	11	11	15	8	WC Semis
Miami Heat	0.2236	0.1768	0.1200	5	8	13	3	EC Finals
Milwaukee Bucks	0.2334	0.1997	0.1242	2	1	8	4	EC Semis
Minnesota Timberwolves	0.2010	0.1626	0.1225	14	14	10	9	WC First
New Orleans Pelicans	0.2170	0.1640	0.1229	8	12	9	10	WC First
Philadelphia 76ers	0.2137	0.1701	0.1324	10	10	4	7	EC Semis
Phoenix Suns	0.1965	0.1553	0.1218	15	16	12	5	WC Semis
Toronto Raptors	0.2155	0.1776	0.1330	9	7	3	11	EC First
Utah Jazz	0.2194	0.1835	0.1250	6	5	7	12	WC First

Table 10 2022 NBA Playoff HHI index values and rankings in descending order

There is not a clear picture to take away from the data in Table 10. The NBA champion Warriors team generally ranks low across all three indices, but the runner-up Celtics rank highly in all three categories. This is consistent with the regular season analysis, which suggests that there could be a better degree of variation from the regular season to the playoffs. Phoenix, the number 1 seed and the best record in the NBA this season, ranks amongst the lowest across all three indices. The Suns had the least concentrated scoring amongst all teams in the 2022 Playoffs, but they are remembered for a catastrophic meltdown in game seven against the Mavericks. A team many put as the title favorite collapsed in the second round despite looking very strong to start the series. Phoenix's lack of concentration in playing time and points could have been responsible for their poor playoff performance, but given a similar profile from the Warriors, it is unlikely that this is the cause. Instead, poor coaching adjustments favoring a balanced approach when heavier minutes needed to go to their stars could be at the root of their second-round exit.

While there is no conclusive evidence to support the idea that rotation balance and depth impact winning, the metrics created for this analysis engineer new statistics to explain both coaching and playing decisions. In Appendix B, we provide more analysis from the playoffs focused on variance in the indices and graphs to visualize the relationships between variance and averages.

7 Conclusion

We approached this project hypothesizing that teams with balanced rosters and deep rotations would win more games. Teams are crowding their cap space with the contracts of one or two superstars and going cheap to fill out the rest of their roster, hoping that stacking a top-heavy lineup can win them a title. However, the super-team era of the NBA has seen mixed results regarding teams' abilities to win championships. Thus we propose that roster balance is more important than star power.

We define a quantitative framework and set of metrics for evaluating how concentrated teams are regarding playing time, scoring, and an interactive metric we created called point capitalization. These metrics are calculated in the same method as the Herfindahl-Hirschman Index, a measure used in business to assess the state of industry concentration by firms. We applied these metrics in different analyses to test our hypothesis and ultimately conclude against our initial hypothesis. In favor of the opposite: teams with higher scoring and capitalization concentrations tend to win more games in the regular season.

This analysis is deliberately simple. First, the analysis does not include other box score or advanced statistics, which heavily discounts how we evaluate contributions from non-scoring players. Playmaking, rebounding, defense, and more are absent in this analysis. This analysis strictly looks at scoring and points as this is at the root of winning; in the end, winning means a team needs to score more points than their opponents. Secondly, keeping the analysis simple makes the metrics easier to apply and understand. A goal in performing the analysis was to engineer quantitative metrics that easily allow fans of the NBA to understand roster balance and depth, which is typically very qualitative. Future iterations of this research will attempt to be more robust by including more parameters and capturing more forms of contributions from players.

All the data for this project was acquired through the python NBA API. The analysis file and data retrieval file are both accessible through the GitHub repository for this project.

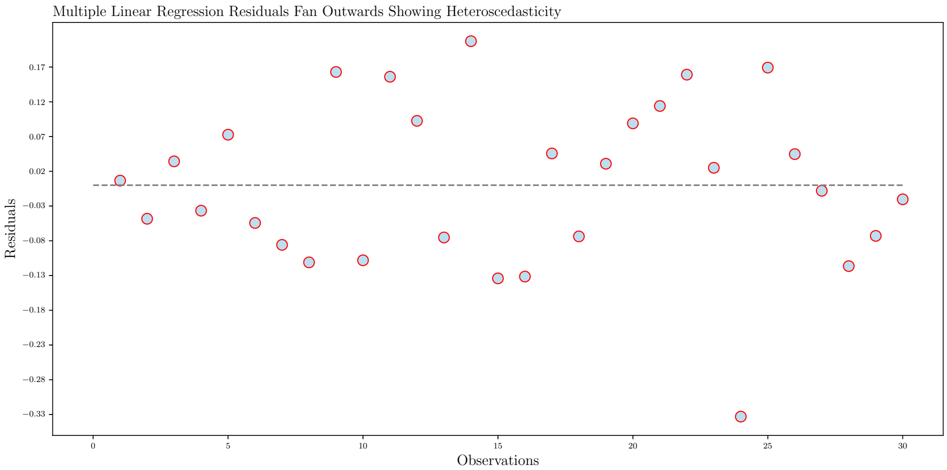

Fig. A1 Multiple linear regression error plot

Appendix A Multiple Linear Regression

The one issue with analyzing these features together is the auto-correlation they present. We have already established a direct link between playing time and points scored, as players who play more minutes will simply have more opportunities to score. Adding the point capitalization index into the mix creates more auto-correlation, as this metric is the interaction between points and minutes. The individual regression tests from section 4.2 are more accurate representations of the connection between the metrics and winning. However, we nonetheless explore what a multiple linear regression with all three of these terms would look like. The equation for the multiple linear regression is outlined below.

$$\text{Win Percentage} = \beta_0 + \beta_M HHI^M + \beta_P HHI^P + \beta_C HHI^C + \epsilon \tag{A1}$$

	β	SE	t Stat	P-value	Lower 95%	Upper 95%
Intercept	0.1524	0.6081	0.2506	0.8041	(1.0975)	1.4023
HHI^C	(7.2124)	6.2028	(1.1628)	0.2555	(19.9626)	5.5377
HHI^P	18.9795	9.3880	2.0217	0.0536	(0.3178)	38.2768
HHI^M	(10.9680)	7.2144	(1.5203)	0.1405	(25.7974)	3.8613

Table A1 Multiple linear regression output summary

When combined together, the three indices produce no statistically significant evidence of an effect on winning at the $\alpha = 5\%$ level. The closest coefficient to being statistically significant under a lower threshold is the HHI^P, which has a β of 18.975 and a p-value of just over 5%. The coefficient on this variable is suspiciously high. In the individual regression section, we identified a coefficient of 6.69 for the same variable; the coefficient in the multiple regression is now nearly three times greater than in the individual setting. Put another way, if a team increases their HHI^P by one hundredth, then they can expect a 19% increase in their overall winning percentage. This jump represents winning an additional 15.5 games during the season.

Once again, this section was mainly for illustrative purposes of what it would look like we regressed all three index values together on winning percentage and not meant to draw conclusions. There is serious multicollinearity in this regression that will alter the outcome away from something trustworthy. Figure 5 is a plot of the regression residuals to show the heteroscedasticity observed from the outward-fanning pattern of the errors.

Appendix B Playoff Variance Analysis

We've included a section in the appendix that presents some of the data on index variance amongst the playoff teams in the 2022 post-season. This section is mainly devoted to providing the data that we collected and a few thoughts and insights. This paper doesn't cover the significance or implications of high variability in these metrics and thus this falls out of the scope of the main body.

	Regular Season			Post-Season			Δ (Post - Regular)		
Team	HHI^C	HHI^P	HHI^M	HHI^C	HHI^P	HHI^M	HHI^C	HHI^P	HHI^M
Atlanta Hawks	0.1926	0.1597	0.1151	0.1958	0.1589	0.1181	0.0032	(0.0008)	0.0029
Boston Celtics	0.2025	0.1681	0.1192	0.2245	0.1873	0.1362	0.0219	0.0193	0.0170
Brooklyn Nets	0.2150	0.1712	0.1167	0.2345	0.1876	0.1366	0.0195	0.0164	0.0199
Chicago Bulls	0.2099	0.1756	0.1220	0.2187	0.1817	0.1255	0.0088	0.0060	0.0035
Dallas Mavericks	0.1985	0.1629	0.1152	0.2316	0.1930	0.1299	0.0331	0.0301	0.0146
Denver Nuggets	0.1844	0.1511	0.1108	0.2099	0.1629	0.1118	0.0255	0.0118	0.0010
Golden State Warriors	0.1992	0.1588	0.1087	0.2025	0.1712	0.1223	0.0033	0.0123	0.0136
Memphis Grizzlies	0.1819	0.1506	0.1048	0.2118	0.1692	0.1170	0.0298	0.0186	0.0122
Miami Heat	0.1853	0.1580	0.1186	0.2236	0.1768	0.1200	0.0382	0.0187	0.0014
Milwaukee Bucks	0.1938	0.1666	0.1138	0.2334	0.1997	0.1242	0.0395	0.0331	0.0103
Minnesota Timberwolves	0.1907	0.1544	0.1113	0.2010	0.1626	0.1225	0.0103	0.0082	0.0113
New Orleans Pelicans	0.1831	0.1515	0.1128	0.2170	0.1640	0.1229	0.0338	0.0125	0.0101
Philadelphia 76ers	0.2042	0.1736	0.1211	0.2137	0.1701	0.1324	0.0095	(0.0035)	0.0113
Phoenix Suns	0.1802	0.1511	0.1160	0.1965	0.1553	0.1218	0.0163	0.0042	0.0057
Toronto Raptors	0.1997	0.1657	0.1266	0.2155	0.1776	0.1330	0.0157	0.0119	0.0063
Utah Jazz	0.1778	0.1533	0.1144	0.2194	0.1835	0.1250	0.0416	0.0302	0.0106

Table B2 Regular season versus post-season index values and their respective differences

Figure B2 shows that teams tend to have much greater variation in the distribution of playing time comparing to capitalization values. Most of the points on the scatter plot for the mean and standard deviation for the HHI^M are shifted to the right with somewhat uniform distribution along the Y-axis. In comparison, standard deviation values for the HHI^C index are clustered towards the left of the X-axis for the respective plot. The charts do not share axis so this may distort the understanding of what is visually represented, but the axis are dynamically created with the distribution of points already in mind. Therefore, we do see values and teams with very high standard deviations of their HHI^C, such as the Grizzlies or the Heat, but these teams are outliers compared to the majority of the field.

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	Index Standard Deviations σ			Index σ Rankings		
Team	HHI^C	HHI^P	HHI^M	HHI^C	HHI^P	HHI^M
Atlanta Hawks	0.0441	0.0368	0.0170	4	4	1
Boston Celtics	0.0373	0.0304	0.0122	6	7	9
Brooklyn Nets	0.0365	0.0272	0.0038	7	11	16
Chicago Bulls	0.0360	0.0311	0.0145	8	6	6
Dallas Mavericks	0.0377	0.0356	0.0161	5	5	2
Denver Nuggets	0.0337	0.0284	0.0119	11	10	10
Golden State Warriors	0.0350	0.0285	0.0159	10	8	4
Memphis Grizzlies	0.0591	0.0371	0.0159	1	3	3
Miami Heat	0.0542	0.0390	0.0148	2	2	5
Milwaukee Bucks	0.0534	0.0407	0.0117	3	1	11
Minnesota Timberwolves	0.0264	0.0223	0.0134	15	14	8
New Orleans Pelicans	0.0331	0.0214	0.0051	12	15	15
Philadelphia 76ers	0.0286	0.0203	0.0142	14	16	7
Phoenix Suns	0.0358	0.0271	0.0105	9	12	14
Toronto Raptors	0.0251	0.0260	0.0106	16	13	13
Utah Jazz	0.0321	0.0285	0.0117	13	9	12

Table B3 Index standard deviation values from post-season data and descending rankings

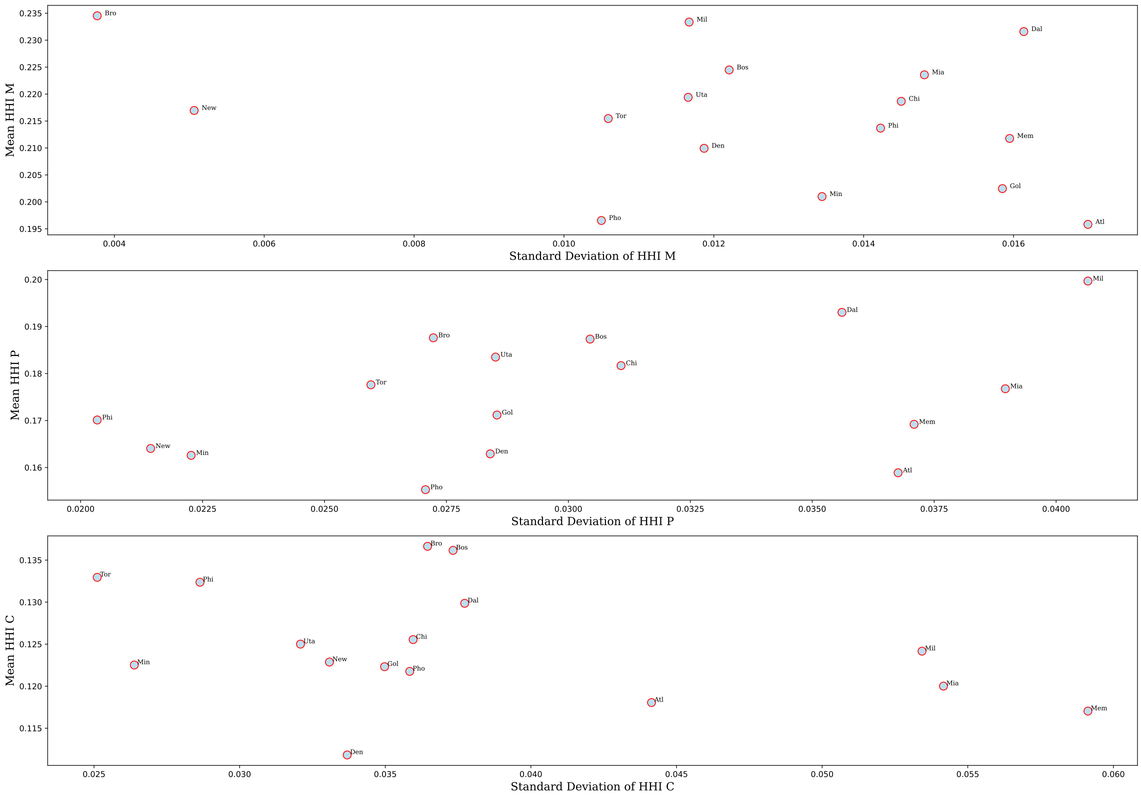

Fig. B2 Efficient frontier plots comparing team standard deviation and mean values for indices in the 2022 NBA Playoffs

Appendix C Additional Data

This section of the appendix includes two tables, one displaying aggregate values for all different indices and respective games won and another with the box score data from the example in section 2.3.

	HHI^C			HHI^P			HHI^M		
Rank	Team	Value	Games W	Team	Value	Games W	Team	Value	Games W
1	Brooklyn Nets	0.215031	44	Chicago Bulls	0.17564	46	Toronto Raptors	48	0.126608
2	Los Angeles Lakers	0.210731	33	Philadelphia 76ers	0.17362	51	Chicago Bulls	46	0.122046
3	Chicago Bulls	0.209869	46	Brooklyn Nets	0.171247	44	Philadelphia 76ers	51	0.121059
4	Philadelphia 76ers	0.204202	51	Los Angeles Lakers	0.170774	33	Charlotte Hornets	43	0.120699
5	Boston Celtics	0.202548	51	Boston Celtics	0.168058	51	Cleveland Cavaliers	44	0.119407
6	Toronto Raptors	0.199707	48	Milwaukee Bucks	0.166598	51	Boston Celtics	51	0.11921
7	Golden State Warriors	0.19916	53	Toronto Raptors	0.165713	48	Miami Heat	53	0.118595
8	Dallas Mavericks	0.198512	52	New York Knicks	0.16367	37	New York Knicks	37	0.118248
9	New York Knicks	0.197142	37	Dallas Mavericks	0.162885	52	Sacramento Kings	30	0.117832
10	Milwaukee Bucks	0.193837	51	Atlanta Hawks	0.159661	43	Indiana Pacers	25	0.117457
11	Atlanta Hawks	0.192608	43	Golden State Warriors	0.158817	53	Brooklyn Nets	44	0.116738
12	Minnesota Timberwolves	0.190708	46	Miami Heat	0.158042	53	Phoenix Suns	64	0.116043
13	Portland Trail Blazers	0.187786	27	Charlotte Hornets	0.157689	43	Portland Trail Blazers	27	0.115906
14	Oklahoma City Thunder	0.187254	24	Portland Trail Blazers	0.156561	27	Los Angeles Lakers	33	0.11529
15	Miami Heat	0.185337	53	Cleveland Cavaliers	0.154717	44	Dallas Mavericks	52	0.115246
16	Charlotte Hornets	0.184972	43	Minnesota Timberwolves	0.154408	46	Atlanta Hawks	43	0.115148
17	Denver Nuggets	0.18439	48	Utah Jazz	0.153319	49	Utah Jazz	49	0.114389
18	New Orleans Pelicans	0.183124	36	New Orleans Pelicans	0.151502	36	Milwaukee Bucks	51	0.113845
19	Memphis Grizzlies	0.181943	56	Phoenix Suns	0.151065	64	Oklahoma City Thunder	24	0.113471
20	Sacramento Kings	0.181519	30	Denver Nuggets	0.15106	48	New Orleans Pelicans	36	0.112803
21	Phoenix Suns	0.180221	64	Sacramento Kings	0.150682	30	Los Angeles Clippers	42	0.112216
22	Cleveland Cavaliers	0.179769	44	Memphis Grizzlies	0.150595	56	Orlando Magic	22	0.112202
23	Detroit Pistons	0.178871	23	Oklahoma City Thunder	0.150146	24	Detroit Pistons	23	0.112147
24	Utah Jazz	0.177841	49	Detroit Pistons	0.14809	23	Minnesota Timberwolves	46	0.111253
25	Los Angeles Clippers	0.174046	42	Indiana Pacers	0.146597	25	Denver Nuggets	48	0.110836
26	Washington Wizards	0.173519	35	Los Angeles Clippers	0.145969	42	Washington Wizards	35	0.110819
27	Indiana Pacers	0.173158	25	Washington Wizards	0.143376	35	Houston Rockets	20	0.110553
28	San Antonio Spurs	0.167067	34	Orlando Magic	0.140731	22	San Antonio Spurs	34	0.110393
29	Houston Rockets	0.16418	20	San Antonio Spurs	0.140692	34	Golden State Warriors	53	0.108711
30	Orlando Magic	0.161624	22	Houston Rockets	0.139325	20	Memphis Grizzlies	56	0.104802

Table C4 Team specific index values, corresponding rank in descending order, and respective games won from the 2021-2022 NBA Season.

Golden State Warriors									Basic Box Score Stats											
Starters	MP	FG	FGA	FG%	3P	3PA	3P%	FT	FTA	FT%	ORB	DRB	TRB	AST	STL	BLK	TOV	PF	PTS	+/-
Jordan Poole	30:06:00	9	13	0.692	5	7	0.714	7	8	0.875	0	1	1	3	0	0	3	3	30	7
Andrew Wiggins	29:29:00	6	11	0.545	1	2	0.5	3	4	0.75	1	8	9	2	1	0	1	2	16	16
Klay Thompson	29:05:00	7	15	0.467	5	10	0.5	0	0		0	3	3	2	0	0	3	2	19	5
Draymond Green	28:55:00	5	7	0.714	1	2	0.5	1	1	1	1	5	6	9	0	3	0	2	12	21
Kevon Looney	13:09	2	3	0.667	0	0		2	2	1	3	4	7	0	0	0	0	2	6	-7
Otto Porter Jr.	25:05:00	2	6	0.333	0	3	0	0	0		0	1	1	4	1	1	1	4	4	21
Stephen Curry	21:41	5	13	0.385	3	6	0.5	3	3	1	2	1	3	4	1	0	1	1	16	17
Gary Payton II	19:40	2	3	0.667	0	0		1	2	0.5	2	1	3	2	0	1	0	0	5	12
Nemanja Bjelica	14:57	3	6	0.5	0	2	0	2	5	0.4	1	2	3	1	1	1	2	3	8	1
Andre Iguodala	13:25	0	1	0	0	1	0	0	0		0	2	2	4	0	1	0	2	0	11
Juan Toscano-Anderson	3:37	1	1	1	1	1	1	0	0		0	1	1	0	0	0	0	0	3	-6
Damion Lee	3:37	1	2	0.5	0	0		0	0		0	2	2	0	0	0	0	1	2	-6
Jonathan Kuminga	3:37	0	0		0	0		1	2	0.5	0	0	0	1	0	1	1	0	1	-6
Moses Moody	3:37	0	1	0	0	1	0	1	2	0.5	0	0	0	1	1	0	0	0	1	-6
Team Totals	240	43	82	0.524	16	35	0.457	21	29	0.724	10	31	41	33	5	8	12	22	123	
Denver Nuggets									Basic Box Score Stats											
Starters	MP	FG	FGA	FG%	3P	3PA	3P%	FT	FTA	FT%	ORB	DRB	TRB	AST	STL	BLK	TOV	PF	PTS	+/-
Will Barton	35:34:00	10	18	0.556	2	6	0.333	2	2	1	0	6	6	5	0	1	3	1	24	-14
Nikola Jokić	34:34:00	12	25	0.48	0	4	0	1	2	0.5	4	6	10	6	3	1	3	4	25	-19
Monte Morris	31:23:00	4	9	0.444	1	5	0.2	1	1	1	0	0	0	6	3	0	1	3	10	-13
Aaron Gordon	26:21:00	3	10	0.3	0	3	0	2	3	0.667	3	2	5	0	0	0	0	2	8	-11
Jeff Green	23:11	2	3	0.667	2	2	1	1	2	0.5	1	3	4	1	1	0	0	1	7	-7
Austin Rivers	26:06:00	2	5	0.4	0	3	0	1	1	1	0	1	1	1	0	0	1	2	5	-7
Bones Hyland	17:07	4	10	0.4	2	7	0.286	0	0		0	2	2	3	0	0	1	4	10	-3
JaMychal Green	14:44	1	3	0.333	1	1	1	0	0		1	3	4	1	0	0	0	3	3	-13
Bryn Forbes	13:47	2	4	0.5	1	2	0.5	0	0		0	0	0	0	1	0	0	1	5	0
DeMarcus Cousins	9:39	2	5	0.4	1	1	1	2	2	1	0	2	2	2	0	1	0	0	7	-1
Zeke Nnaji	3:47	1	1	1	1	1	1	0	0		0	0	0	0	0	0	0	1	3	4
Vlatko Čančar	3:47	0	0		0	0		0	0		0	1	1	1	0	0	1	0	0	4
Facundo Campazzo																				
Team Totals	240	43	93	0.462	11	35	0.314	10	13	0.769	9	26	35	26	8	3	10	22	107	

Table C5 Box score data from game 1 of the GSW vs DEN series in the 2022 Western Coference Playoffs