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Examining the NBA Three-Point Shot

Introduction

Since its inception in 1950, the NBA game has undergone a remarkable evolution in playing style, with recent years witnessing a notable surge in the prominence of three-point shooting. In this paper, I aim to explore how the role of the three-point shot in the NBA has evolved since its official introduction in 1980, delving into comprehensive data collected from [basketball-reference.com](https://www.basketball-reference.com).

Data

The data collected that was used for this project are from [basketball-reference.com](https://www.basketball-reference.com). The data contains regular season and playoff team data from 1980-2024. The dataset contains three different kinds of data, the first of which are counting statistics. Counting Statistics consist of statistics that can be found in the box score of any NBA game. These include but are not limited to points per game, field goal percentage (success rate of any shot taken during a game), three-point percentage (success rate of a 3 pointer), and so on. The second type of data collected is shooting statistics. Shooting statistics consist of specific data collected surrounding shots taken during a game. These include but are not limited to percent of total shot attempts taken from different distances, the success rate of those shot attempts, and so on. The final type of data collected is a team's opponent statistics. A team's opponent statistics consist of the averages of counting stats for the opponents they face throughout a season. These include but are not limited to opponent points per game, opponent field goal percentage, and so on.

How Has The 3 Pointer Changed?

Since 2010, have significantly increased the quantity of three pointers they take throughout the course of a single game. Since then, the percentage of total shots taken from three has nearly doubled from 22.2% to 39.2% so far this NBA season [Figure 1].

But why has this percentage seen such a significant increase? What has contributed to this shift in style of play? At first, I looked at the success rate of shots taken from 3 thinking that a success rate increase is what has led to the higher volume. But as seen in Figure 2, the league average success rate has seen no significant increase. The league average success rate has remained at around 36% since 2009. If an increase in three-point success rate is not the reason for the increase in the volume of three pointers taken, what is? Next, I decided to take a closer look at the type of shots being taken. If the percentage of total shots taken from behind the three-point line has increased, that means the percentage of total shots from a different distance must have seen a decrease. As seen in figure 3, while the percentage of total shots taken from 0-3 ft, 3-10 ft, and 10-16 ft have seen relatively no change, the percentage of total shots taken from 16 ft – 3P has seen a significant decrease going from 21.8% in 2010 down to 6.1% this season so far. But why has this been the case?

The data illustrates a clear story: since 2010, teams have been gradually exchanging shots taken from 16 ft – 3P with shots taken from behind the three-point line. Now, players are shooting three-point field goals at a historically high rate with almost 40% of all field goals attempted from beyond the three-point line. But the question remains: what has caused the increase in three-pointers taken? Next, I decided to take a closer look at the expected points per shot from different areas on the court [Figure 4]. The expected point per shot for each zone (Restricted Area: 0-3 ft, Paint: 3-16 ft, Mid-Range: 16 ft-3P, Three: Behind Three-point Line) can

be calculated by multiplying the success rate of the shot taken and the value of the shot taken (either 2 or 3 points). As seen in the table, the expected points per shot for three-pointers has only gone from 1.065 points/shot in 2010 to 1.083 points/shot this season so far. In fact, none of the areas has seen a significant change since 2010. The marginal difference for three-pointers is surprising given how much three-point shooting has increased. But it is no surprise that the three-point shot is so popular given that the expected value of a three is roughly 0.25 points higher than that of a mid-range or paint shot. For a team's expected points per shot to be 1, they would either have a success rate of 50% from the mid-range zone, which is significantly higher than the league average of around 40%, or 33% from behind the three-point line, which is a bit lower than the league average of about 35%. Since the three-pointer is seen as a more efficient shot, it makes sense that teams have begun to shift to a more three-pointer dominated offensive style.

How Has the Three-Pointer Impacted Winning?

In the NBA, the goal of every game is to score more points than your opponent. Whether this is done by scoring a lot or preventing the opponent from scoring, the objective remains the same. Since the three-point shot has a higher point value, it would make sense that to win, teams may rely on three-pointers. But how does it correlate with winning? I hypothesized that there would be a positive correlation between winning metrics, like points per game and win percentage, and three-point percentage. To take a closer look at this relationship, I first created and analyzed a scatter plot, plotting three-point percentage against points per game, and plotting a single point for every team from 1980-2023 [Figure 5]. Interestingly, there seems to be a negative correlation between points per game and three-point percentage which goes against my initial thoughts. So, I decided to change the range of seasons used to make the plot to 2010-2023

[Figure 6]. With this scatter plot, there seems to be a strong positive correlation between three-point percentage and points per game. The issue with the previous scatterplot may be attributed to the low three-point percentage and high points per game averages for earlier seasons.

The next variable I wanted to examine with three-point percentage was win percentage. As aforementioned, I hypothesized that three-point percentage would have a positive correlation with different winning metrics like win percentage. I created a scatterplot, like the ones before, but using win percentage instead of points per game. As evident in figure 7, there seems to be a strong positive correlation between win-percentage and three-point percentage in the regular season. Next, I wanted to examine the correlation between win percentage and opponent three-point percentage [Figure 8]. I did so by plotting a similar scatterplot to figure 7 but replacing three-point percentage with opponent three-point percentage. As evident there is a strong negative correlation between win percentage and opponent three-point percentage in the regular season. In other words, the worse the opponent shoots from three (whether that be due to inability to shoot well from behind the three-point line or good defense), the more likely a team is to win a game.

Next, I wanted to investigate the relationships examined before (win percentage vs three-point percentage and opponent three-point percentage) but in the playoffs instead of the regular season. I wanted to do so to see if there were any differences between the regular season and playoffs. I made the same scatterplots before, replacing the regular season data used with similar playoff data [Figure 9 & Figure 10]. As evident in the plots, the results are consistent with the regular season data: that is there is a positive correlation between playoff win percentage and playoff three-point percentage as well as playoff win percentage and playoff opponent three-

point percentage. However, there doesn't seem to be as strong of a correlation with both playoff plots as there was in both regular season plots.

Do Teams Take More Threes if They Shoot Well from Three?

The final thing I wanted to examine is the relationship between three-point percentage and three-point attempt rate. In other words, if a team shoots well from behind the three-point line, is it likely that they will shoot more threes than other teams who don't shoot as well. I investigated this by creating a scatter plot, plotting three-point percentage and three-point attempt rate with a point for every team from 1980-2023 [Figure 11]. As seen in the plot, there doesn't seem to be a strong correlation between three-point percentage and three-point attempt rate. Like figure 5, this can be due to the low attempt rate and low three-point percentage for the teams in the earlier years of the range used, therefore, I changed the range of seasons to 2010-2023 [Figure 12]. As seen in the scatterplot, there seems to be a slight correlation between three-point percentage and three-point attempt rate, but not a strong one. In other words, regardless of how well a team shoots from three, they maintain a relatively constant three-point attempt rate.

Conclusion

In the future, one of the things I wish to examine further are other things that have changed the style of play in the NBA. From rule changes to individual players, I want to investigate the differences from the style of play since the NBA's inception in 1950 to more recent years. Another thing I wish to examine is the shift to "position-less basketball". In more recent years, teams have become more reliant on "jack of all trades" type players, or players who

are good at many things rather than players who are good at one or two things. Because of this, the traditional positions of basketball have seemed to have gone nearly extinct.

In summary, the shift in style of play to offenses that are heavily reliant on the three-point shot can be attributed to the analytical approach teams have taken throughout the past few years. The three-point is seen as a more efficient shot than the types of shots relied on in earlier years of the league's history. Furthermore, there seems to be a correlation between winning and three-point percentage whether it is a team's own percentage or their opponent's percentage. Teams that shoot well from three and defend the three well seem to win at higher rates than teams who don't do either well.

Appendix

Figure 1:

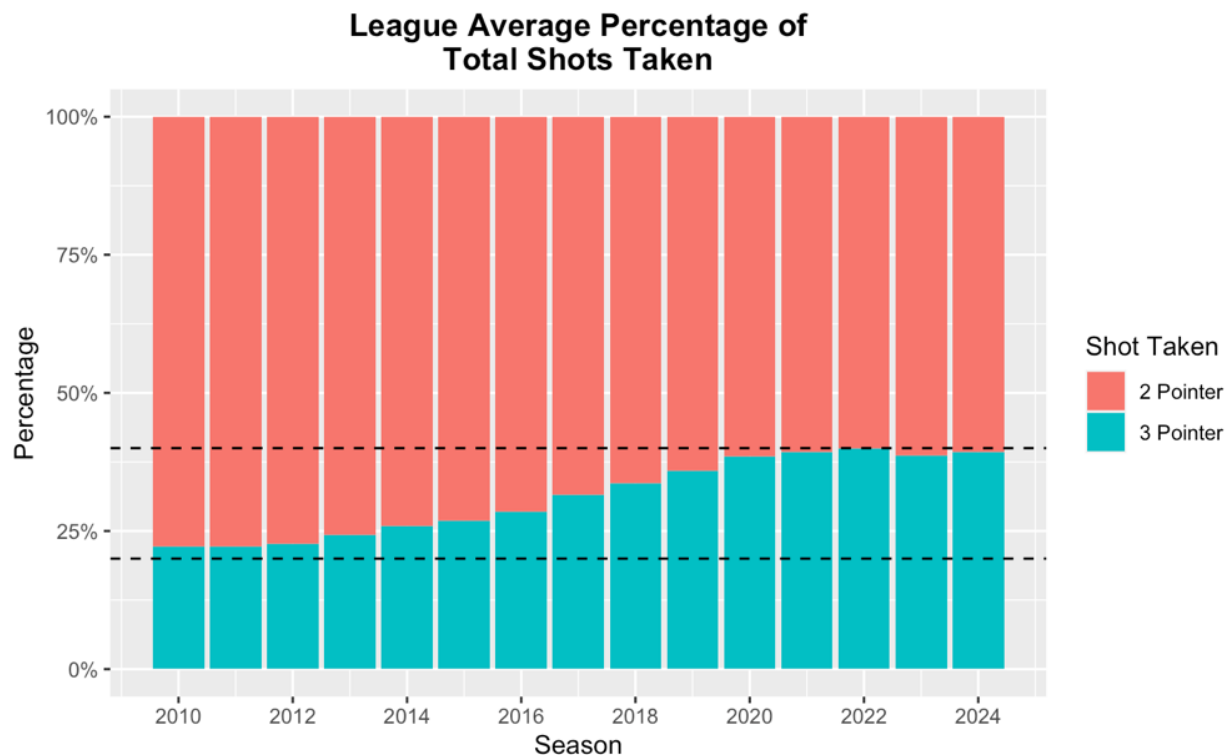


Figure 2:

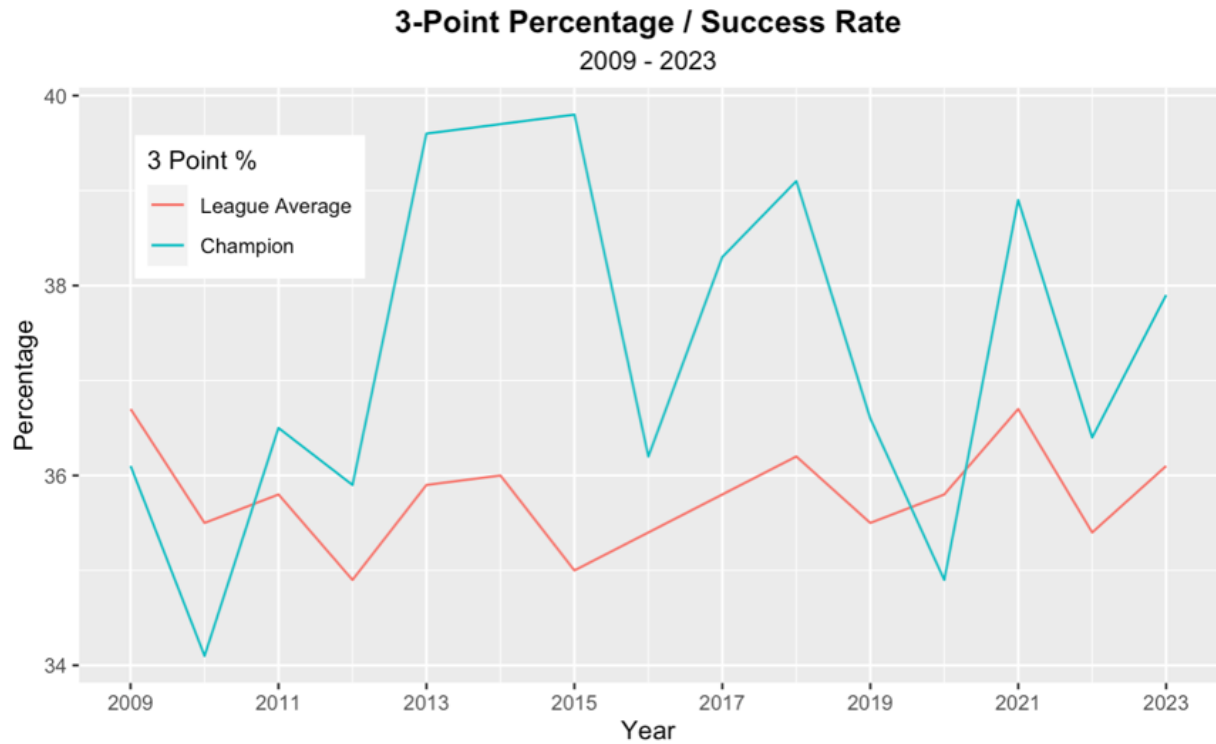


Figure 3:

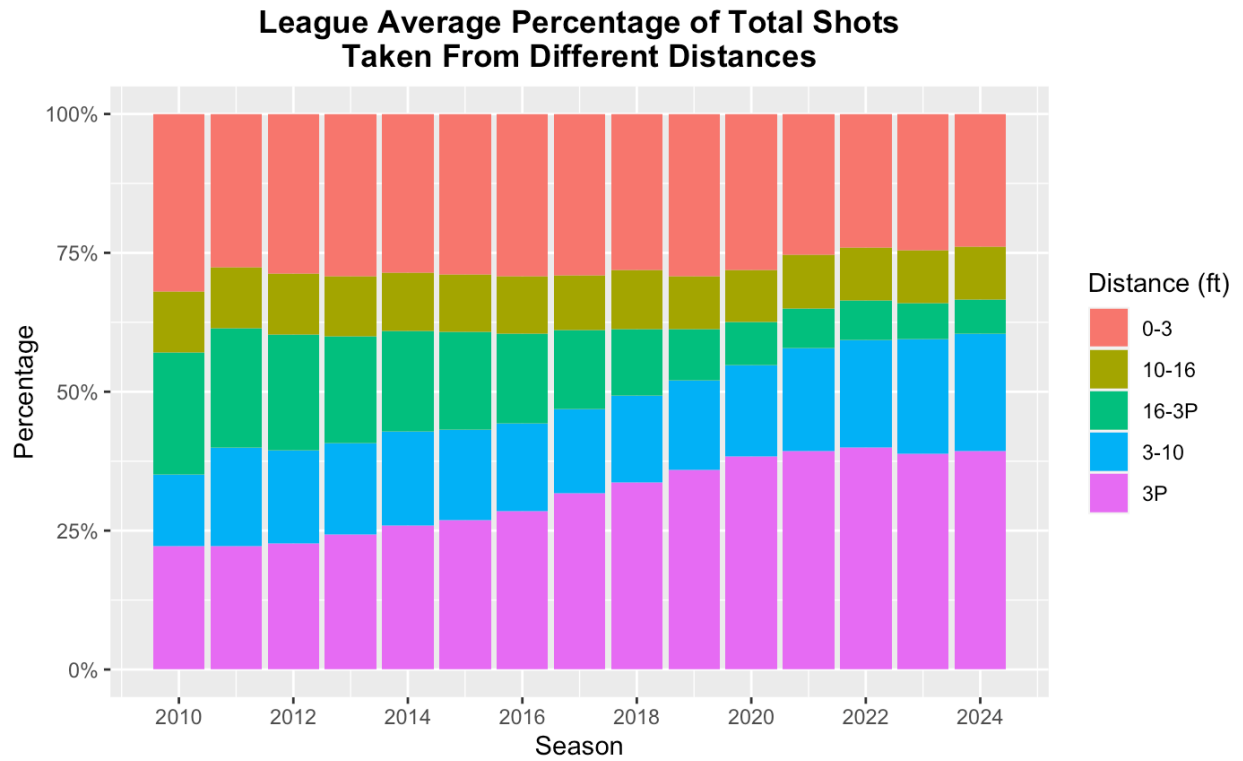


Figure 4:

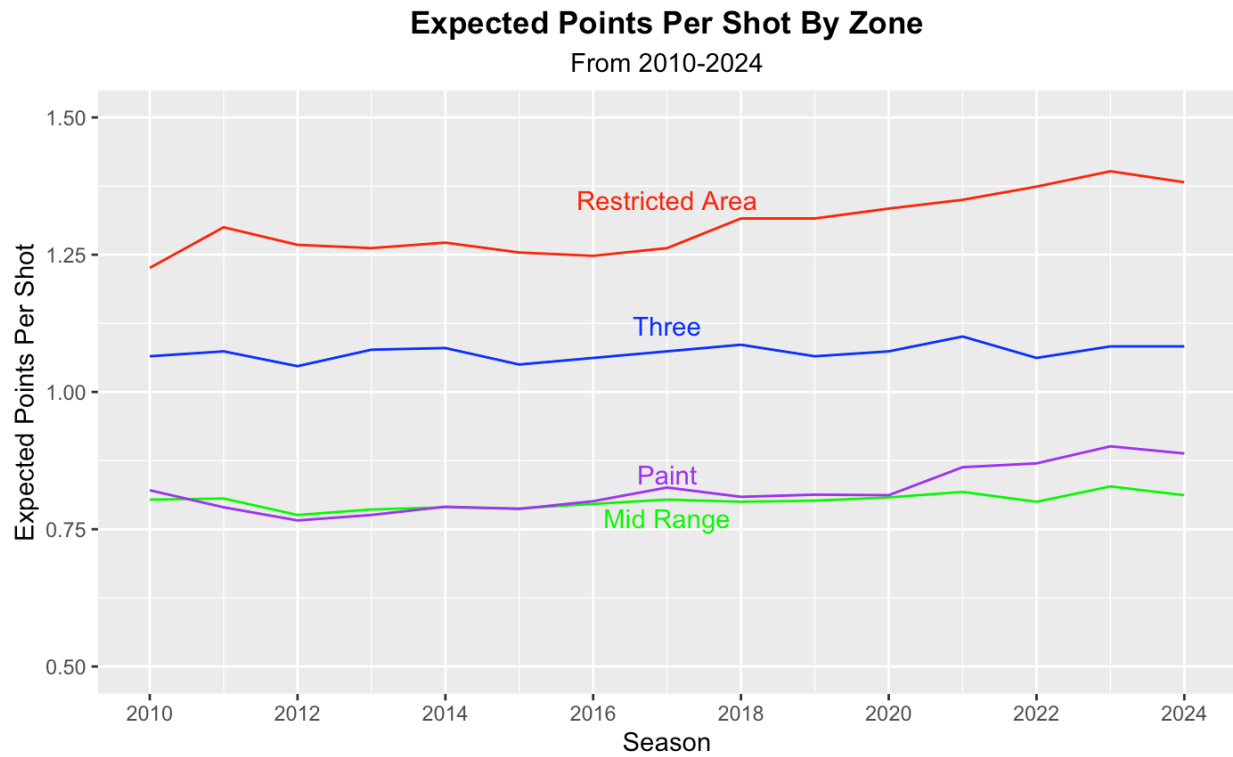


Figure 5:

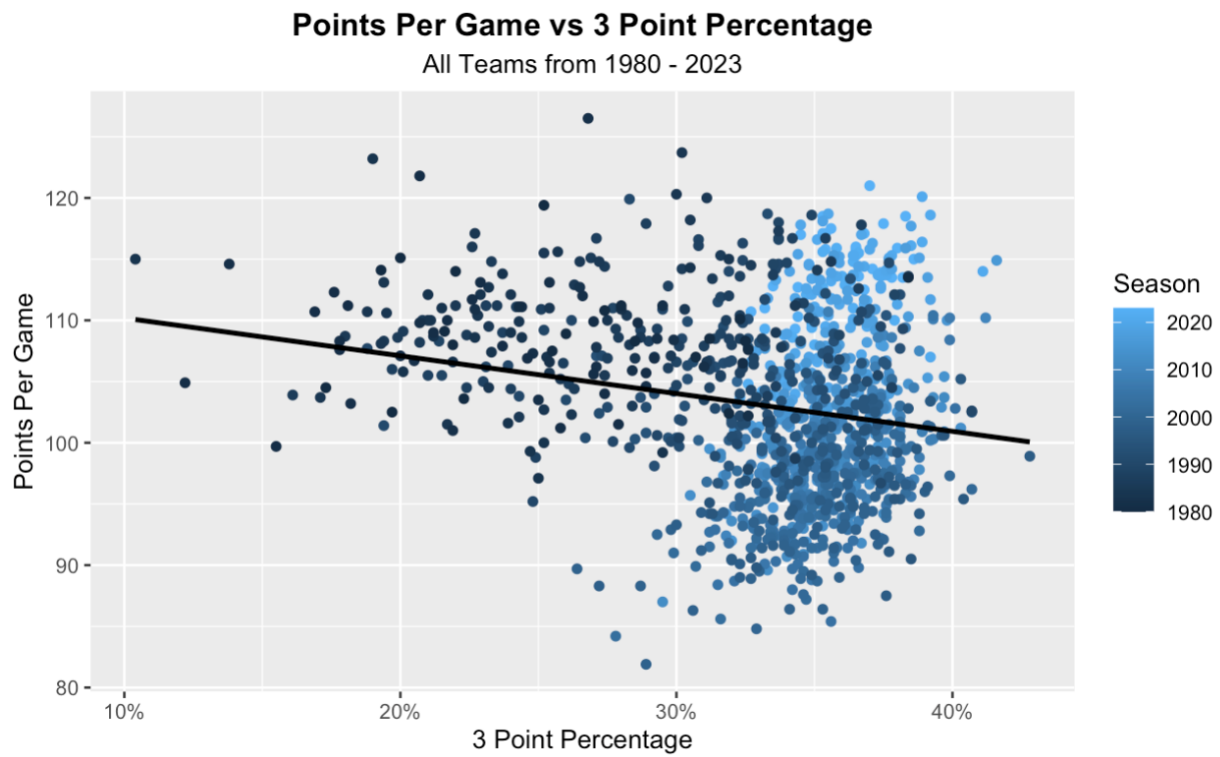


Figure 6:

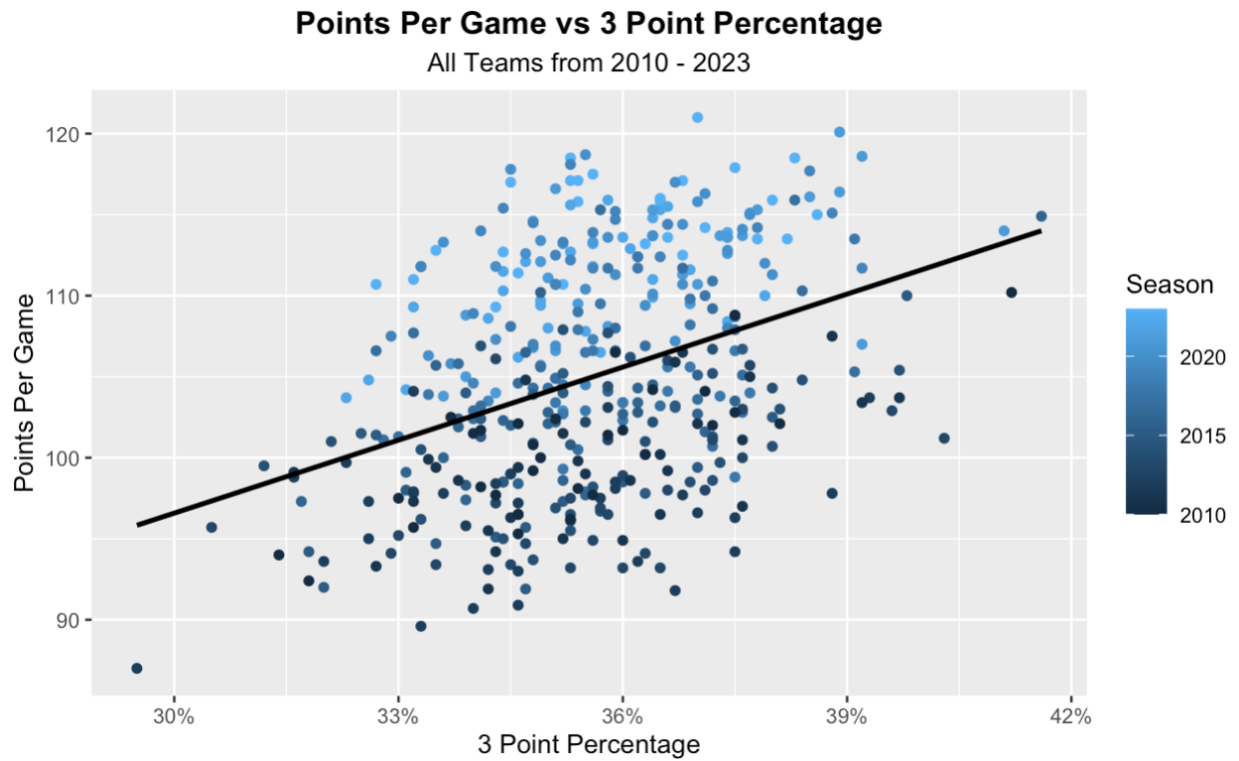


Figure 7:

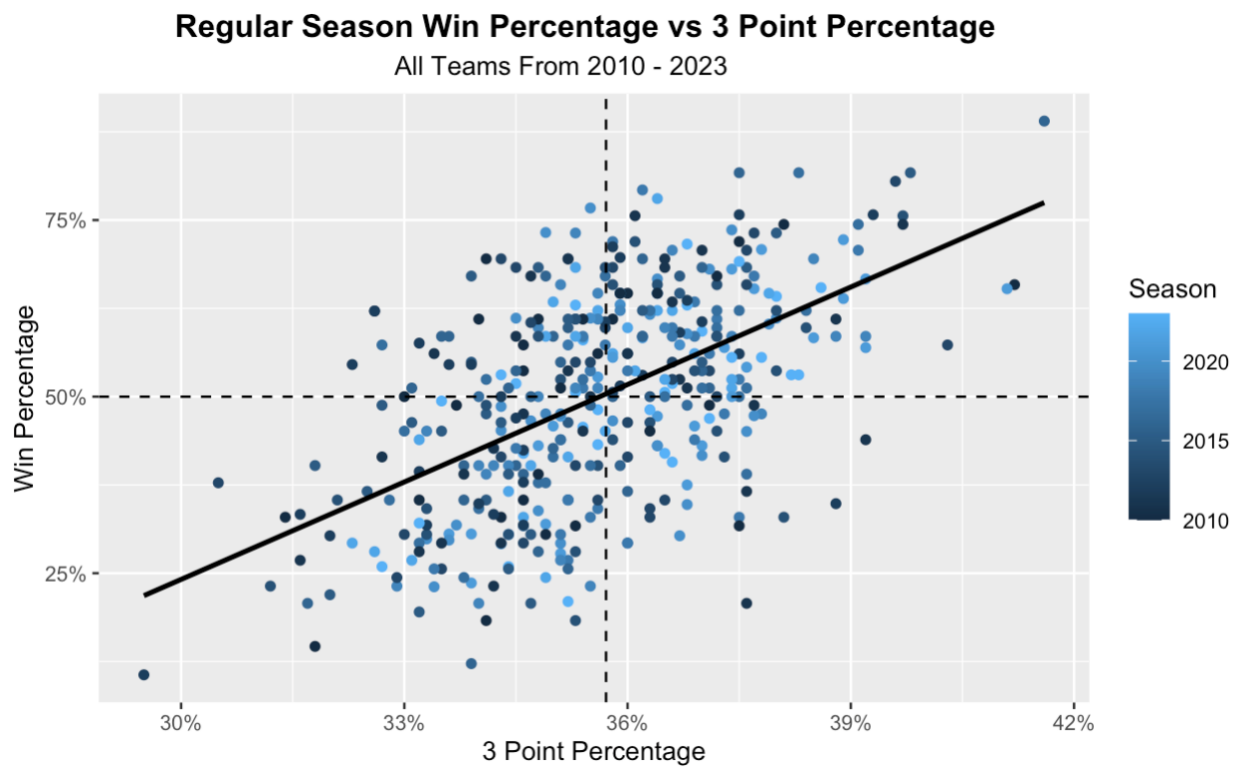


Figure 8:

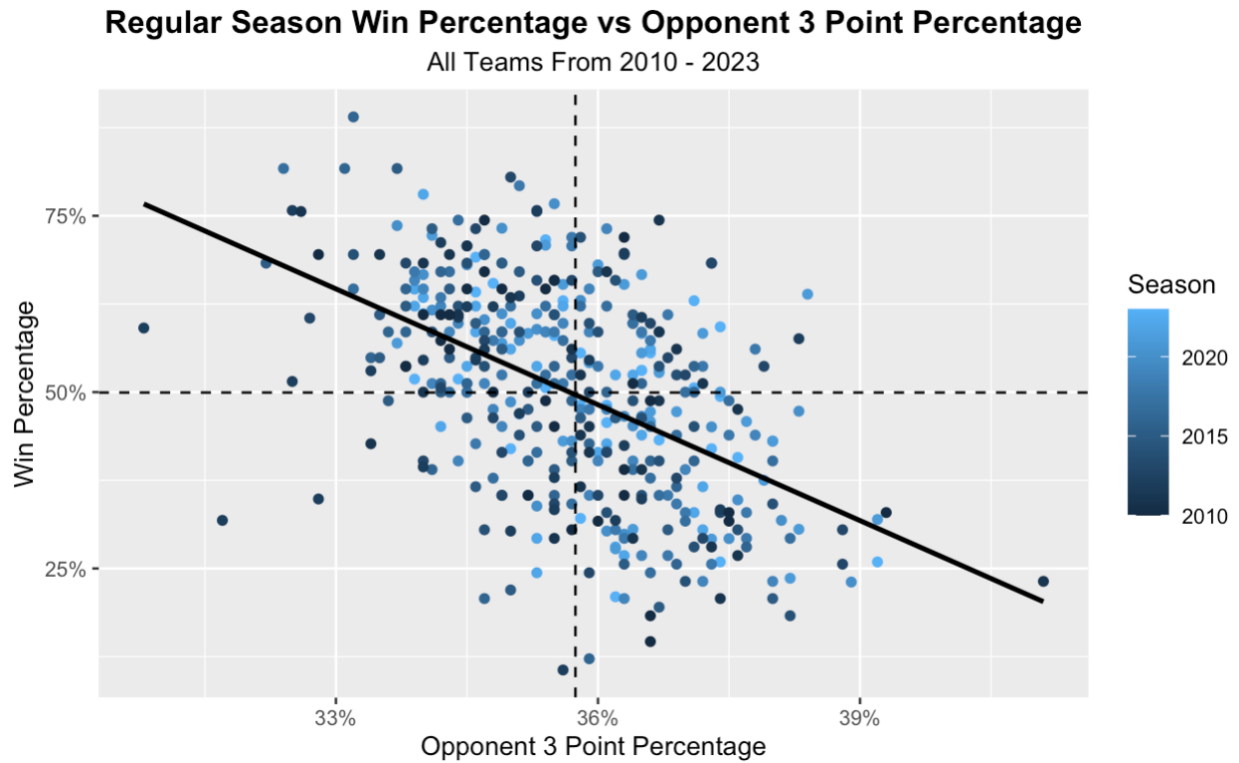


Figure 9:

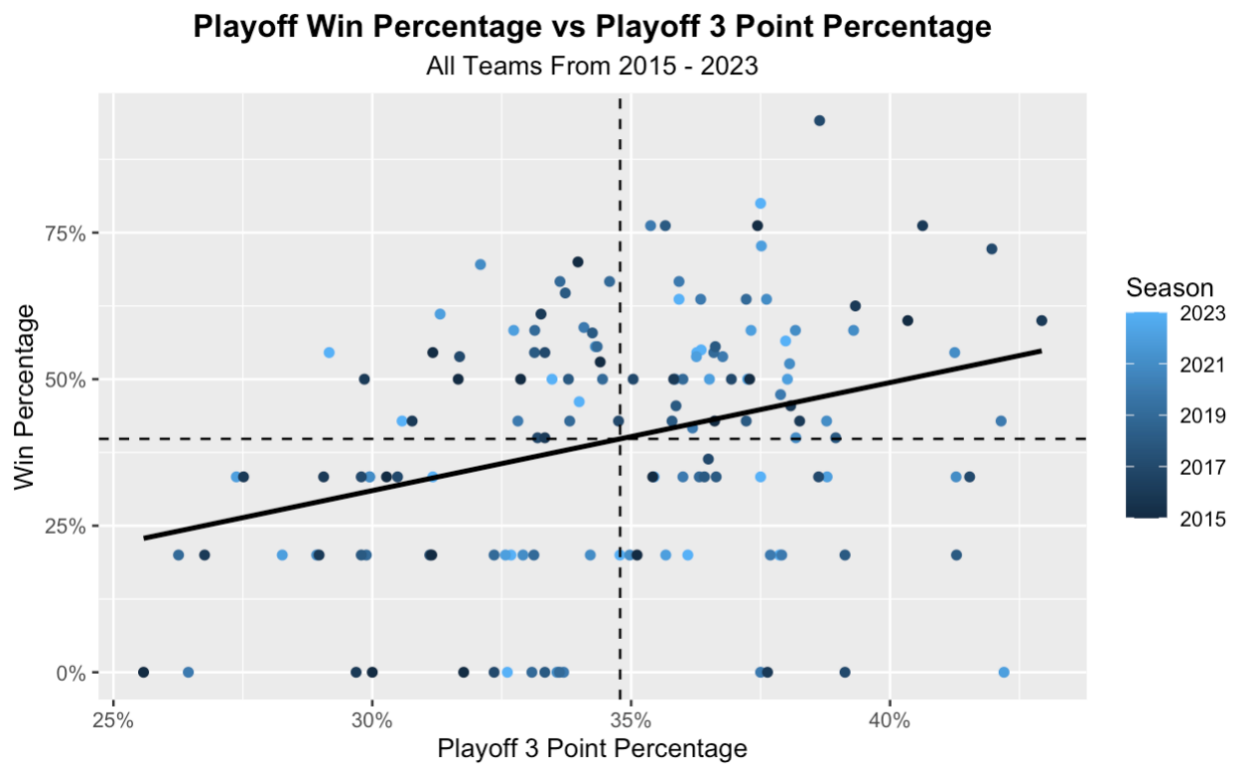


Figure 10:

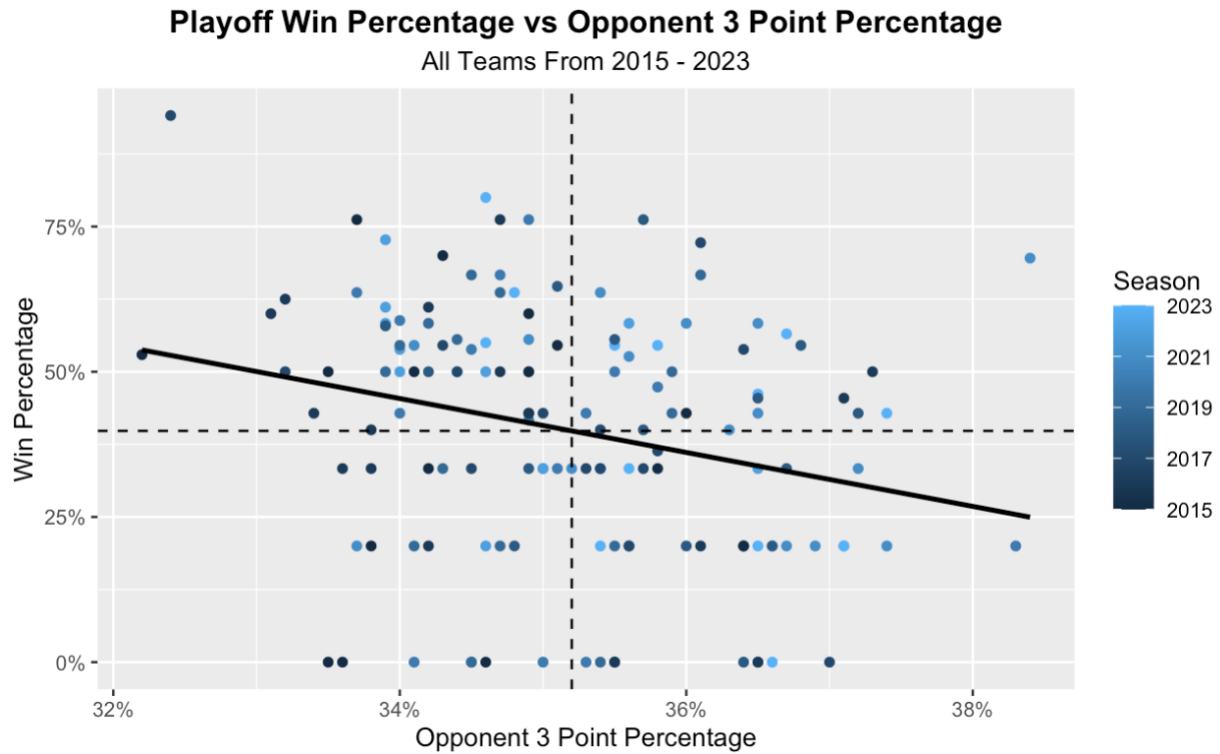


Figure 11:

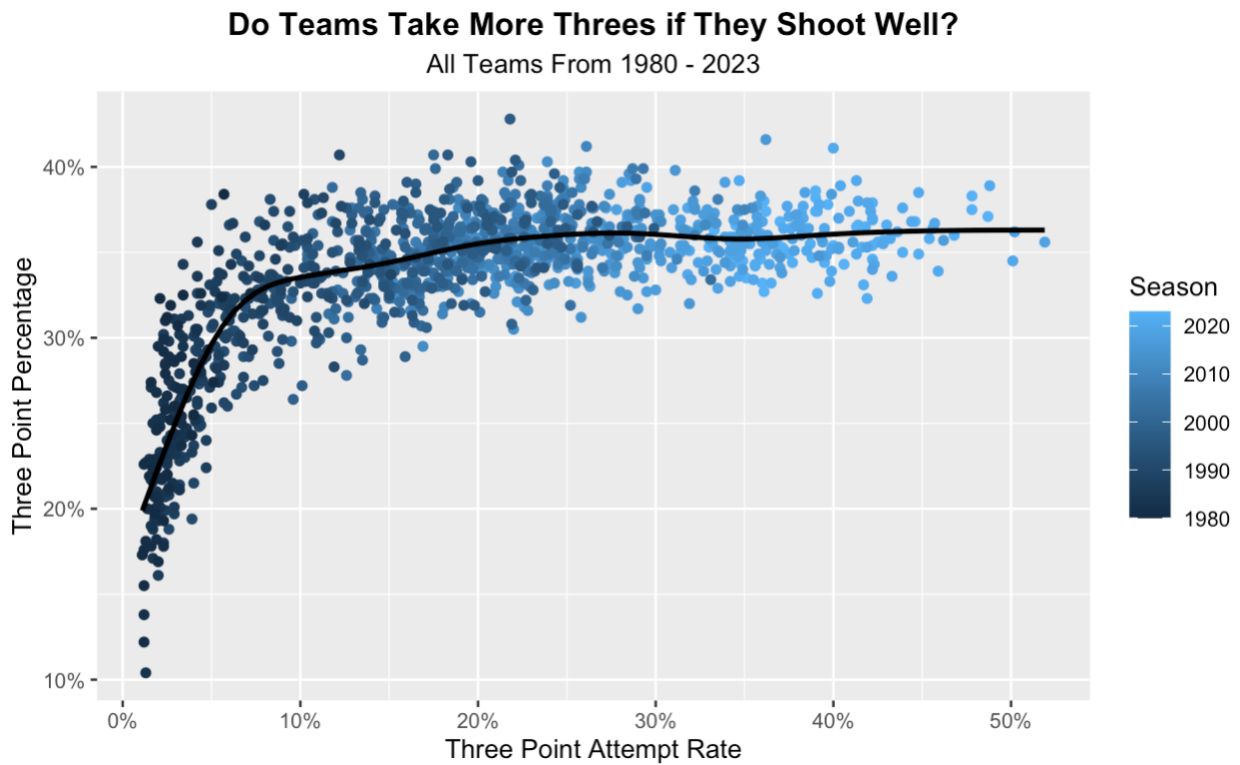


Figure 12:

Do Teams Take More Threes if They Shoot Well?

All Teams From 2010 - 2023

