

# The Problem with the Empty Stands at the NBA Bubble

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## Introduction

- Many studies have already found evidence of home court advantage, but it is not clear what causes it.
- If due to fan attendance, it would mean this year's results could have been different under normal circumstances.
- Our goal is to not only prove that home court advantage exists, but that fan attendance benefits the home team and harms the visiting team.

## Data

We are using a dataset that contains all NBA regular season games from the past five seasons, up to the 2020 hiatus (Basketball Reference, ESPN). There are 5,877 observations:

- Home team
- Away team
- Points scored by home team
- Points scored by away team
- Total points (Points scored by home team plus points scored by away team)
- Attendance
- Capacity percentage
- Capacity Percentage group (100% or more: Sellout, 99%-95%: High, 94%-86%: Medium, 85% or less: Low)

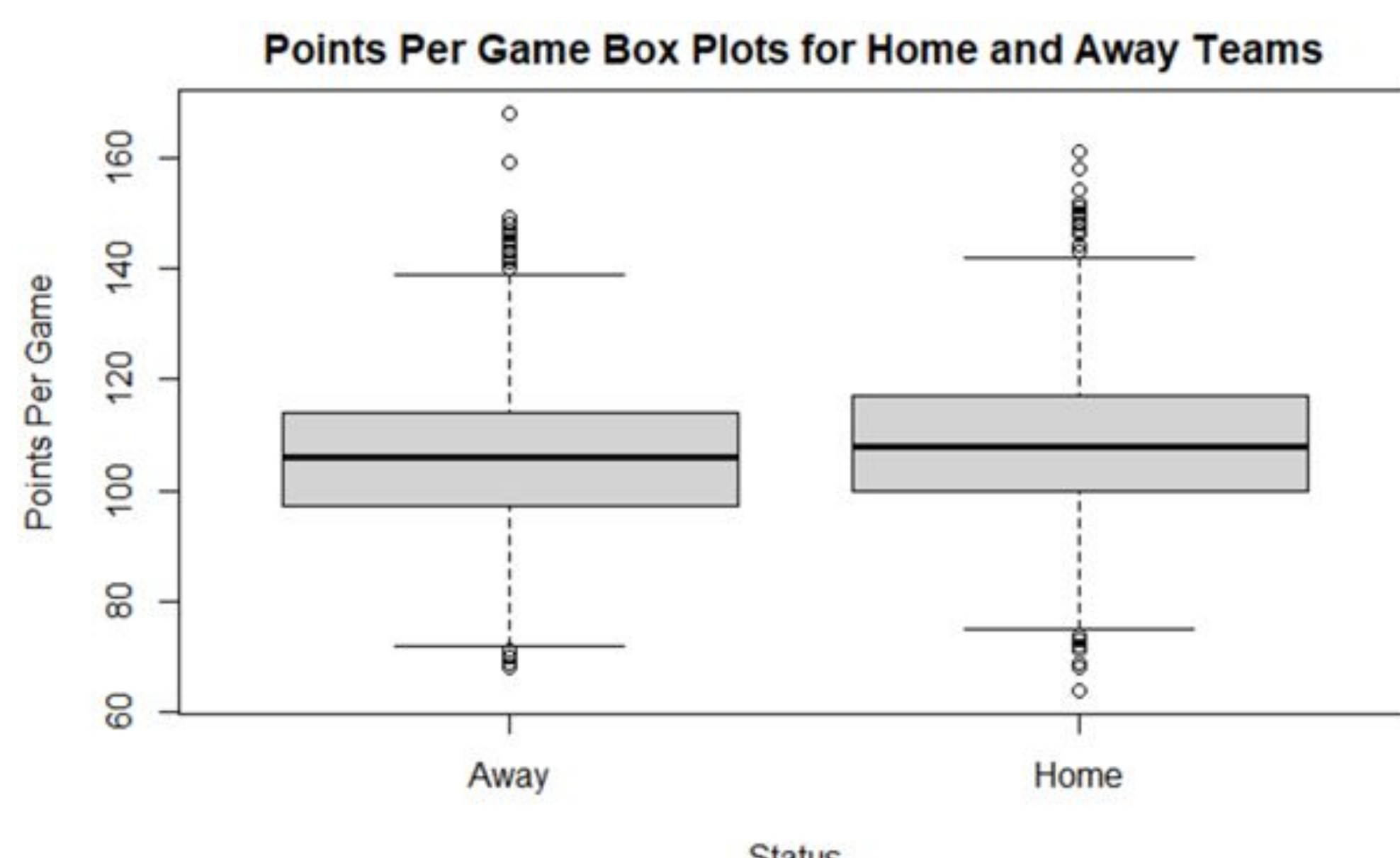


Figure 1: Box plots for points scored by the Home and Away teams.

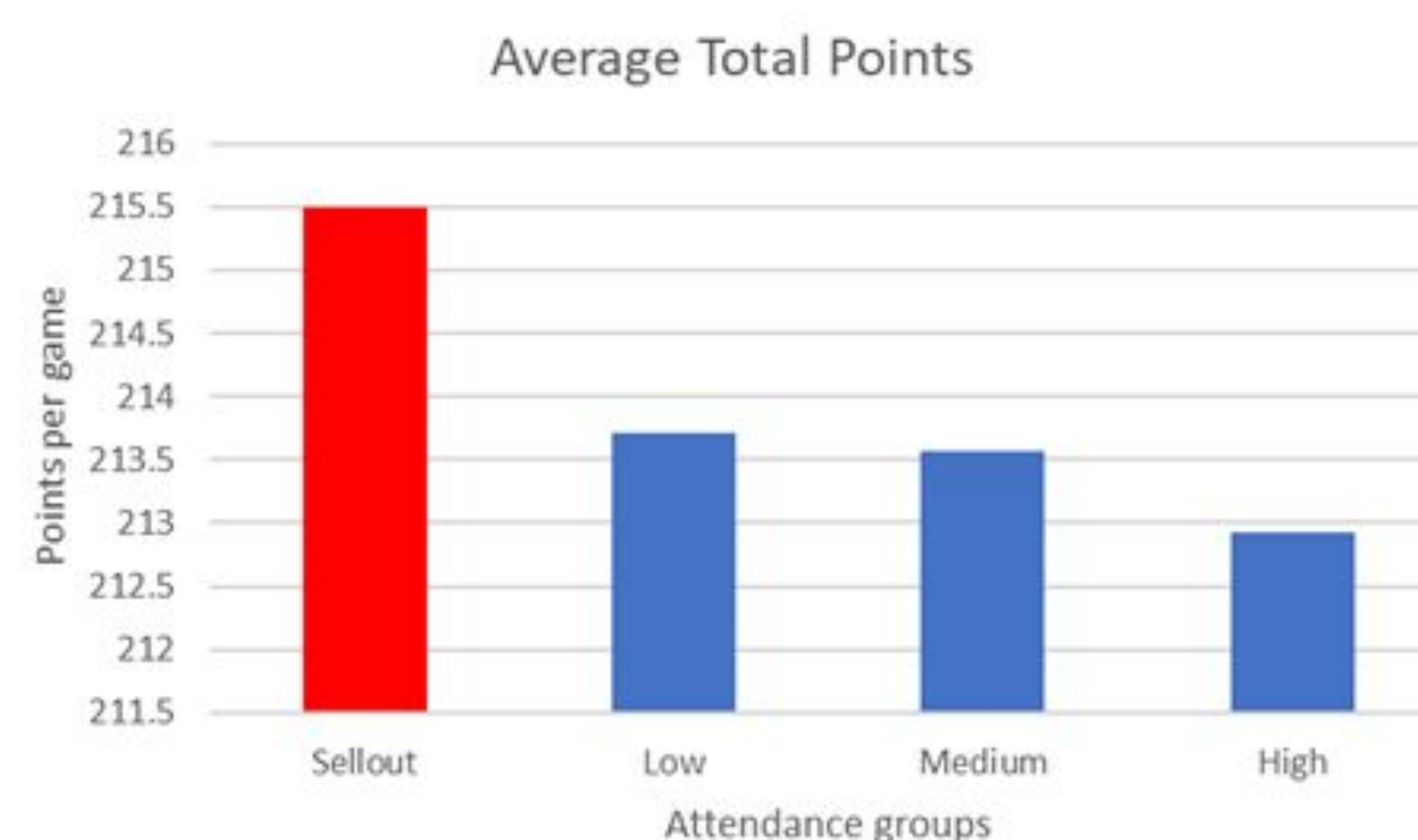


Figure 2: Average total points scored in a game, grouped by attendance group.

## Methods and Results

- We used an ANOVA test to confirm home court advantage existed in our dataset, as proved by the positive difference between points per game for the home team and points per game for the away team.

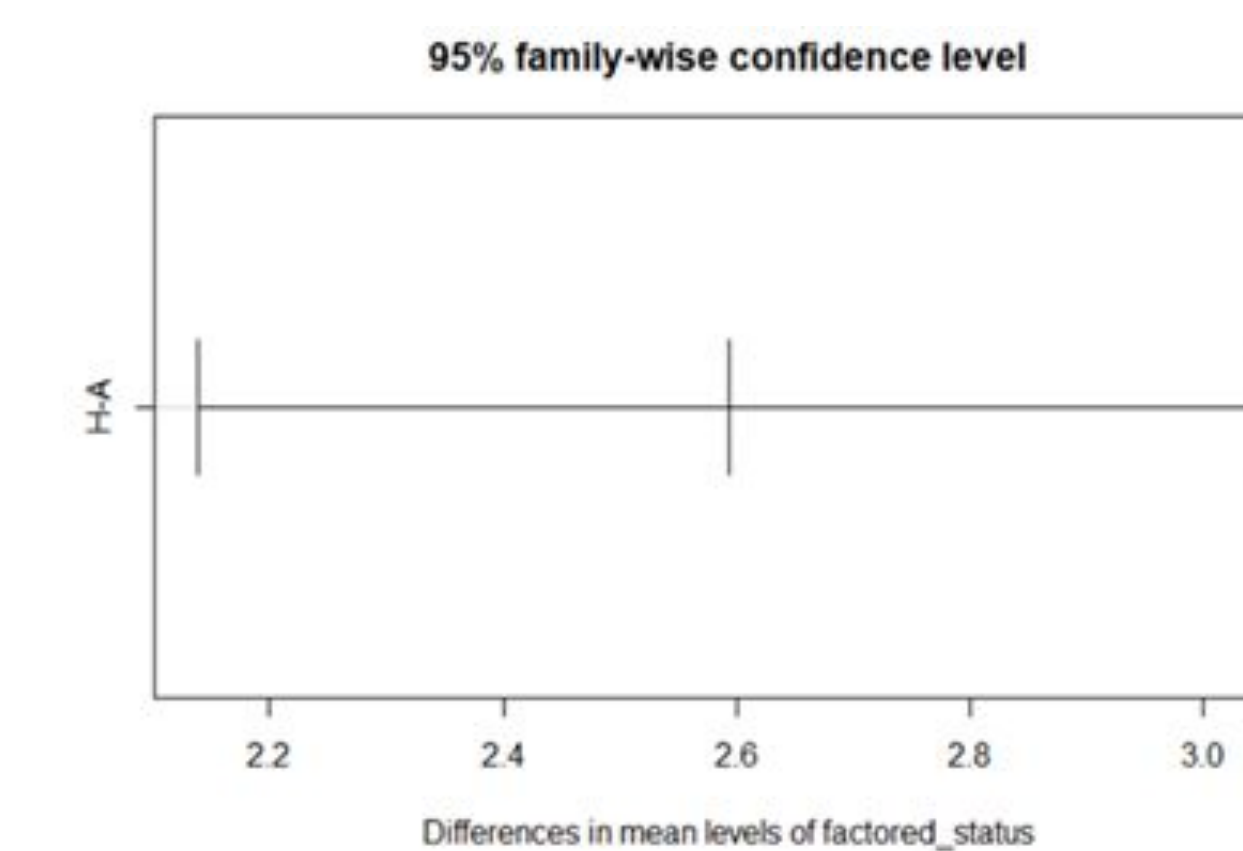


Figure 3: Home-Away model Tukey mean-difference plot.

- We also used ANOVA tests on various subsets of the NBA (teams, divisions, conferences, league) and tested whether there was a difference in points per game average between attendance groups.

Test with Significant Result	Tukey Plot Observations
NBA Home	"Sellout" is significantly greater than "High" (2.01), "Medium" (2.40) and "Low" (2.27).
Eastern Home	"Sellout" is significantly greater than "Medium" (2.21) and "Low" (1.59).
Eastern Away	No significance.
Western Home	"Sellout" is significantly greater than "High" (2.65), "Medium" (2.31) and "Low" (2.51).
Atlantic Home	"Sellout" is significantly greater than "Low" (6.47).
Northwest Home	"Sellout" is significantly greater than "High" (4.46), "Medium" (3.92) and "Low" (2.64).
Southeast Home	"Low" is significantly greater than "Medium" (3.02).
Southwest Home	"Sellout" is significantly greater than "High" (3.06) and "Low" (4.13).
Charlotte Hornets Home	"Low" is significantly greater than "Sellout" (6.15).
Charlotte Hornets Away	No significance.
Milwaukee Bucks Home	"Sellout" is significantly greater than "Medium" (13.12) and "Low" (12.77).
Philadelphia 76ers Home	"Sellout" is significantly greater than "Medium" (8.98) and "Low" (15.01).
Phoenix Suns Home	No significance.
Sacramento Kings Home	No significance.
Utah Jazz Home	"Sellout" significantly greater than "High" (9.40).

Table 1: Tukey plot results from models with significant test results. The number in parenthesis is the difference in points per game average between the two groups. (Models made from team-specific subsets had less than 30 observations and should be analyzed with precaution.)

## Conclusion

- Using ANOVA tests, we found evidence that home court advantage exists. We also found evidence to the idea that the percent of arena capacity filled by fans benefits the home team. However, there is little to no evidence that supports our hypothesis that the percent of arena capacity filled by fans harms the visitors.
- Our findings are also important because they show the importance of fully selling out your arena and how that may translate to wins.
- We also found evidence for the obvious: team quality is a better predictor for success than home court advantage or fan attendance.

## References

1. Basketball Reference. NBA and ABA League Index. Retrieved from: <https://www.basketball-reference.com/leagues/>
2. ESPN. "NBA Attendance Report." Retrieved from: <http://www.espn.com/nba/attendance>
3. For more information, email [ggarciaf@andrew.cmu.edu](mailto:ggarciaf@andrew.cmu.edu)