2018

# Luxury Tax and Competitive Balance in the NBA

Benjamin Louchheim
*Skidmore College*, blouchhe@skidmore.edu

# Luxury Tax and Competitive Balance in the NBA

By

Benny Louchheim

A Thesis Submitted to

Department of Economics

Skidmore College

In Partial Fulfillment of the Requirement for the B.A Degree

Thesis Advisor: Qi Ge

May 1, 2018

# Abstract

The NBA is widely known as the least competitively balanced professional sports league in North America. Past literature has shown that as competitive balance declines, so does fan interest and revenues for both individual teams and the league as a whole. In 2003, the NBA implemented a luxury tax,a penalty mechanism that taxes teams who spend above the salary cap, in order to improve competitive balance. Using luxury tax and league level production data from the 1998 to 2016 NBA seasons, and a model that estimates competitive balance, this paper investigates whether the implementation of the luxury tax in 2003 positively affected competitive balance in the NBA. The results indicate that competitive balance significantly improved from 2003 to 2012 compared to the seasons prior to the implementation of the luxury tax. Additionally, I find that the more teams pay in luxury tax, the worse competitive balance becomes, suggesting that as teams stockpile more talent, the league becomes competitively imbalanced as a result.

# Acknowledgement

I would like to thank Professor Qi Ge for his constant guidance and support through the entire thesis process, and for his ability to instill a passion for economics in myself and other students. I would also like to thank Jiebei Luo for her help with STATA and data management.

# 1 Introduction

In 2010, LeBron James, widely considered to be the best basketball player in the world, decided to team up with two perennialall-stars: Dwyane Wade and Chris Bosh. This was the first time in NBA history that three of the most talented players in the world decided to leave their respective franchises, team up with other all-stars, and compete for an NBA championship. With their extraordinary success, winning two NBA championships in four seasons, a new era in basketball was created: the super team era. Since then, all-stars like Kevin Durant, Jimmy Butler, Paul George, and Carmelo Anthony have left their franchises in order to compete for championships with other all-stars(Bontemps, 2017). As a result of the new super team era, a few teams with an extraordinary amount of talent compete for NBA championships, while the rest of the league is lost without a franchise player. This created a competitive balance issue that the NBA had never seen before.

Competitive balance is the degree of parity or equality among teams in a sports league (Leeds, 2016). It is essential to both individual franchises and the league as a whole to be somewhat competitively balanced. Both El-Hodiri and Quirk (1971) and Coates and Humphreys (2012) find that fan attendance drops when a league is less competitively balanced. Consequently, there is less money to be made by both individual franchises and the league as a whole when fan interest declines. Because of the NBA’s awareness of the importance of competitive balance, they implemented policies including a salary cap and luxury tax meant to evenly disperse talent throughout the NBA and improve competitive balance. The salary cap is the maximum amount of money a team can spend on player salaries, while the luxury tax is a penalty mechanism that taxes teams for overspending above the salary cap (Coon, 2017). Although the NBA has several policies that attempt to control fluctuations in competitive balance, the salary cap and specifically the luxury tax may be the NBA's greatest mechanism of defense in controlling competitive balance. With the super team era considerably affecting the NBA's competitive balance, those policies have recently come into question.

As recently as 2013, the NBA increased the tax rate of the luxury tax in order to further incentivize teams to not over spend on player talent, but it is unknown whether competitive balance has improved.While there is a great deal of literature involving competitive balance in the world of sports, no paper has utilized data from the NBA toanalyze the potential effect of the NBA luxury tax on competitive balance. I attempt to fill the gap in literature by examining the effectiveness of combating competitive balance issues with a luxury tax. I investigate whether the implementation of the luxury tax in 2003 positively affected competitive balance in the NBA. Additionally, because the luxury tax was implemented in 2003 and reconstructed in 2013, I establish three eras of the luxury tax: pre-luxury tax (1998–2002), original luxury tax (2003–2012), and new luxury tax (2013–2016), and determine which era produced the most competitively balanced NBA.I create a model that estimates competitive balance from 1998 to 2016 by using luxury tax and league level production data.

My findings provide evidence that since the implementation of the luxury tax in 2003, competitive balance has improved in the NBA. Specifically, from 2003 to 2012, competitive balance significantly improved from the 1998 to 2002 seasons in two of the three competitive balance measures that I analyze. Additionally, I find that the more teams pay in luxury tax, the worse competitive balance becomes, suggesting that as teams stockpile more talent, the league becomes competitively imbalanced as a result.

The remainder of the paper is organized as follows: section 2 will discuss the background and relevance of the luxury tax in the NBA. Section 3 is an in-depth review of literature on competitive balance and the validity of a luxury tax. Section 4 describes the data I use, while section 5 details the model I created to measure the affect of the luxury tax on competitive balance in the NBA. Section 6 interprets the results and section 7 discusses policy implications, errors in my research, and pathways for future research on this topic.

## 2 Background

As polarizing and exciting as the NBA can be, it has been criticized for being the least competitive of the four major sports in North America (Kilgore, 2017). More often than in football, baseball, and hockey, basketball fans and professional analysts seem to think that season outcomes are somewhat predictable because of the lack of competitive balance in the NBA. In other words, the league is so bottom heavy that only a few teams have a legitimate chance of winning the championship at the end of the season. For example: in the last 18 NBA seasons, only 8 out of the 30 NBA teams have won the championship, which means a small number of teams consistently contend for the NBA title, while the other 22 seem to never be competitive (Basketball Reference, 2017). In order to combat competitive balance issues, in the 1999 Collective Bargaining Agreement, the NBA Player's Association and owners agreed on implementing multiple policies including the luxury tax. The luxury tax is a penalty mechanism that taxes teams for exceeding the maximum team salary cap and redistributes that money to non-offenders. By doing so, the NBA is incentivizing teams not to over-spend on player talent which they hope will evenly distribute talent throughout the 30 teams.

As a result of the past collective bargaining agreements, the NBA has created and implemented several policies to attempt to improve competitive balance. This review focuses on the luxury tax because there is a lack of literature on how it could affect competitive balance in professional sports. The luxury tax is a mechanism that controls team spending (Coon, 2017). It is a tax that the league imposes on teams who exceed the salary cap, which is a maximum amount of money a franchise can spend on player salaries. Therefore, the luxury tax is essentially an extension of the salary cap. The NBA salary cap is unique in that it is a soft cap in which teams can exceed the predetermined amount that teams are allowed to spend on player salaries. The punishment for exceeding the soft cap is the luxury tax. In contrast, the NFL and NHL have a hard cap which is a non-negotiable maximum amount of money to spend on player salaries (Leeds, 2016). Additionally, the MLB has no salary cap but rather just a luxury tax that penalizes teams for spending over the set threshold.

With regards to competitive balance, the NFL, NHL, and MLB are recognized as more balanced leagues than the NBA. This can be proven by looking at the ratio of standard deviation of winning percentage to the ideal standard deviation in the league. Standard deviation of winning percentage is heavily skewed based on the number of games in a season, so the ideal standard deviation takes that into account. Because each team has a 0.5 probability to win a game, the ideal standard deviation can be calculated by:

$$\text{Ideal Standard Deviation of Winning Percentage} = \frac{0.5}{\sqrt{G}}$$

where *G* is the number of games in a season. The closer the actual standard deviation of winning percentage is to the ideal, the more competitively balanced a league is. Table 1 presents the actual, ideal, and ratio of standard deviation of winning percentages in 2011 for the four major sports in North America. It is no surprise that the NHL and NFL are the most competitively balanced leagues because they are the only leagues with a hard salary cap. Based on the ratio, the NBA is the least competitively balanced league.

**Table 1**: **Dispersion of Winning Percentages 2011 (Leeds, 2016)**

| League | Actual | Ideal | Ratio |
|---|---|---|---|
| NHL | 0.080 | 0.056 | 1.43 |
| NFL | 0.201 | 0.125 | 1.61 |
| MLB | 0.069 | 0.039 | 1.77 |
| NBA | 0.158 | 0.056 | 2.82 |

There are many factors that could have led to the NBA becoming the least competitively balanced league, but the structure of the soft salary cap may be a driving force. It is clear that the NBA does not want to inhibit a team's ability to stack talent based on their salary cap policies. In addition to the soft cap, there are three contract exceptions that allow teams to further exceed the salary cap with no penalty: Rookie, Midlevel, and Larry Bird Exceptions. The Rookie Exception allows a team to sign a rookie to his first contract even if it puts the team over the cap (Leeds, 2016). The Midlevel Exception allows a team to sign one player to the average NBA salary when the team is over the cap (Leeds, 2016). Lastly, the Larry Bird Exception allows teams to re-sign players who were already on their roster even if the team is over the cap (Leeds, 2016). An example of a team utilizing the opportunity to sign extra talent without exceeding the luxury tax is the 2018 Houston Rockets. The Rockets were competing for a championship and were already at the $99 million salary cap threshold, but wanted to add more talent in order to compete with the Golden State Warriors. They were able to sign veteran PJ Tucker to a Mid Level Exceptioncontract of $7.5 million without being penalized (Mahoney, 2017). Otherwise if the three exception slots are filled and the team is over the soft cap, they are taxed. The luxury tax forces teams to pay an increasing tax rate for every additional $5 million they are over the cap (Coon, 2017) (Table 1).

**Table 2: The increasing luxury tax rate that teams must pay for exceeding the soft salary cap in the NBA (Coon, 2017)**

| Team salary above tax level | | Non-repeater | | Repeater | |
|---|---|---|---|---|---|
| Lower | Upper | Tax rate | Incremental maximum | Tax rate | Incremental maximum |
| $0 | $4,999,999 | $1.50 | $7.5 million | $2.50 | $12.5 million |
| $5,000,000 | $9,999,999 | $1.75 | $8.75 million | $2.75 | $13.75 million |
| $10,000,000 | $14,999,999 | $2.50 | $12.5 million | $3.50 | $17.5 million |
| $15,000,000 | $19,999,999 | $3.25 | $16.25 million | $4.25 | $21.25 million |
| $20,000,000 | N/A | $3.75, and increasing $.50 for each additional $5 million. | N/A | $4.75, and increasing $.50 for each additional $5 million. | N/A |

For example, if a team is $8 million over the salary cap, they would pay $5 million plus the tax rate of 1.5, and an additional $3 million plus the tax rate of 1.75. So in total, a team over the salary cap by $8 million will pay $12.75 million. Once all the luxury tax money is collected by the league office, 50 percent is redistributed to teams who did not exceed the salary, which gives teams incentives to not over spend, while the other 50 percent is used for "league purposes" (Coon, 2017). Additionally, the NBA created a repeat offender clause to the luxury tax that raises the tax rate for perennial over spenders, thus further incentivizing teams to not over spend. No team has ever paid the "repeat offender" tax because it was implemented in 2013 (Coon, 2017).

In theory, the luxury tax could be an effective way to stop owners from overspending on player talent and going over the cap, but in the end, it might not be the most effective method. The problem that arises from a luxury tax is the distinction between two types of owners: profit and win maximizers. If an owner believes wins are more important than profit, then the luxury tax might not make a difference to them and they would be willing to pay the tax anyway. Team owners have so much money that if the difference between winning and losing is paying an extra $12.5 million for a talented player, then win maximizing owners will always invest in extra talent. This is especially problematic because spending over the salary cap in order to sing extra talent has proven to be a successful method to win more games. Table 3 shows that since 2003, teams that pay the luxury tax in a given year have significantly higher winning percentages compared to seasons when they do not pay the luxury tax ($p<0.05$). Additionally, since 2003 eleven out of the 14 NBA champions (79%) paid some amount of luxury tax the year they won the championship (Basketball Reference, 2017).

**Table 3:** Average winning percentage for teams when they pay luxury tax and when they do not. (*=p<0.05)

| | Paying Luxury Tax | Not Paying Luxury Tax |
|---|---|---|
| Atlanta | 0.52 | 0.47 |
| Boston | 0.63 | 0.45 |
| Brooklyn/ NJ | 0.55 | 0.40 |
| Charlotte | n/a | 0.44 |
| Chicago | 0.53 | 0.48 |
| Cleveland | 0.69 | 0.41 |
| Dallas | 0.68 | 0.52 |
| Denver | 0.60 | 0.46 |
| Detroit | 0.66 | 0.50 |
| Golden State | 0.89 | 0.43 |
| Houston | 0.51 | 0.55 |
| Indiana | 0.59 | 0.54 |
| LA Clippers | 0.68 | 0.38 |
| LA Lakers | 0.63 | 0.57 |
| Memphis/VAN | 0.47 | 0.43 |
| Miami | 0.60 | 0.56 |
| Milwaukee | 0.51 | 0.45 |
| Minnesota | 0.57 | 0.40 |
| New Orleans | n/a | 0.47 |
| New York | 0.40 | 0.51 |
| Oklahoma City/ SEA | 0.61 | 0.54 |
| Orlando | 0.60 | 0.48 |
| Philadelphia | 0.50 | 0.44 |
| Phoenix | 0.61 | 0.54 |
| Portland | 0.59 | 0.54 |
| Sacramento | 0.70 | 0.43 |
| San Antonio | 0.73 | 0.70 |

| | | |
|---|---|---|
| Toronto | 0.35 | 0.47 |
| Utah | 0.57 | 0.56 |
| Washington | n/a | 0.41 |
| **League Average** | **0.59*** | **0.48** |

Charlotte, New Orleans, and Washington have never paid luxury tax.
*=p<0.05

This creates a problem for profit maximizing owners as the luxury tax could impede them from signing extra talent in fear of paying the luxury tax. As a result, in an effort to improve competitive balance, the luxury tax could in theory give win maximizing owners an even greater advantage than they had before. Based on these theories, the effectiveness of a salary cap and luxury tax has been heavily covered by sports economists.

# 3 Literature Review

The goal of this section is to examine the potential effectiveness of combating competitive balance issues with a luxury tax by using evidence from past literature and sports economic theories. The review will consist of four sections: the history of competitive balance, measures of competitive balance, theories behind the NBA's lack of competitiveness, and a discussion onthe current landscape of salary cap.

## 3.1 Historyof Competitive Balance

This section will offer a history of the discourse on competitive balance and its significance in professional sports. In most industries, competing firms try to maximize profits and outlast competitors so they can gain a larger share of the market. Hypothetically,if a firm outperforms the competition, they can increase market power, raise prices, and earn more profit. In contrast, this is not the case in professional sports. Competing sports teams rely on the economic success of their rivals because a more profitable league as a whole translates to more revenue for individual teams. This meansthat a league can be more profitable if the majority of the teams are successful rather than just a few. Additionally, it isin the best interest of an individual city for their team to be prosperous as Davis(2010) found that a successful NFL franchise can raise a city's real per capita personal income by enhancing productivity in the workplace. Although his findings may be controversial as the relationship between team success and real per capita personal income could be correlation and not causation, it does raise the idea that a team's success on the court could improve the well being of an entire city.

Not only does economic competitive balance help the league overall, but competitive balance on the playing field is just as important. The reason why fans watch sports is because they like watching an event in which the outcome is unknown. This desire for competition is called the Uncertainty of Outcome Hypothesis (Leeds, 2016). Essentially, the theory states that fans will buy tickets or watch games on television more frequently if the outcome of a game is not obvious (Leeds, 2016).Because of this phenomenon, there have been several economic studies on how to measure competitive balance and why it is important for a league's overall success.

The first study on competitive balance was conducted by Rottenberg (1956) as he discussed many new concepts involving the economics of professional sports. He stated, "The nature of the industry is such that competitors must be of approximately equal 'size' if any are to be successful. This seems to be a unique attribute of professional competitive sports." He was the first to suggest that not only is professional sports a unique industry, but also that leagues need to be competitive to succeed. Additionally, El-Hodiri and Quirk (1971) created the first model considering competitive balance and found that less competitive leagues have lower fan attendance overall. In their model, they derived gate receipts as a function of the stock of player talent on teams, the amount of player talent purchased through free agency, the amount of player talent acquired through the draft, the wages of existing players on the roster, and the added costs of signing players via draft and free agency. The shortcoming of their model comes in the definition of player talent. The authors assumed that a player being added to an existing roster will increase the overall talent pool of the team, when in reality that may not be the case. The authors failed to use efficiency statistics like batting average or on base percentage to evaluate talent. With that in mind, the main takeaway from their study suggests that although it is in a team's best interest to be superior to the rest of the league, teams should avoid becoming "too" superior because game attendance will drop as a result of a violation in the Uncertainty of Outcome Hypothesis. An example of this phenomenon is when the New York Yankees won 8 World Series championships in a span of 12 years in the late 1950's and early 1960's. When the Yankees won in 1949, a total of 2.3 million people attended Yankees' home games, while after their 5$^{th}$ world series title in 1953, attendance dropped to 1.5 million (Baseball Reference, 2017). As a result of utter dominance in their sport, game attendance plummeted because the fans knew who was going to win.

In contrast toEl-Hodiri and Quirk's (1971) results, Coates and Humphreys (2012) questioned the Uncertainty of Outcome Hypothesis and found evidence that suggested it is not an uncertain outcome that fans want, but rather an increased chance that the home team wins. Unlike El-Hodiri and Quirk (1971), the authors take consumer decision making and loss aversion into consideration because of their anticipation of the Prospect Theory: the idea that expected losses are treated differently than expected gains. Essentially, the Prospect Theory suggests that consumers are driven by the potential value of losses and gains rather than just the final outcome of a situation. In other words, because people are generally loss averse, they value gains much higher than losses. In the context of sports, because fans are usually loss averse, they are more likely to attend games that they perceive their team has a good chance of winning because the utility gained if their team wins is much higher than the utility lost if their team loses. Therefore, the authors believe fan attendance is driven by the individual fan's evaluations of expected gained or lost utility, rather than the uncertainty of the outcome of the game.

The assumption that the Prospect Theory had influence on consumer's decision making to attend games was a revolutionary idea. The main findings were that fans are more likely to attend games in which the home team is predicted to win and less likely to attend closely predicted games. This suggests that fans value a win from the home team over the thrill of watching their team lose a close game. These results further imply the importance of competitive balance because if there are only a few superior teams, the worst teams will rarely have a chance to win home games, resulting in decreased attendance for several franchises.Regardless of whether the Coates and Humphreys hypothesis using Prospect Theory or the Uncertainty of Outcome Hypothesis is the main driving force for game attendance, both of their results suggest that it is in a league's best interest to be competitively balanced.

## 3.2 Measures of Competitive Balance

In this section, the creation, evolution, and validity of different competitive balance measurements will be discussed. Although it is clear that competitive balance is an important factor in a thriving sports league, past literature has disagreed upon which measure of competitive balance is most effective. The disagreement from contributing authors does not necessarily stem from theories being flawed, but rather from the existence of a plethora of feasible ways to measure competitive balance. Competitive balance can be investigated at theseason and championship level. For example, some believe that leagues are the most balanced when every team has the same chance to win any given game, thusthe difference between the winning percentages of the best and worst teams would be relatively small. Others believe that the turnover of champions defines a competitively balanced league. An example of a competitively balanced league at the championship level would be the NFL in the early 2010s when from 2009 to 2016, eight different teams won the Super Bowl (Pro-Football Reference, 2017). In other words, there are several ways to measure competitive balance and one is not necessarily better than another.

In order to describe the state of competitive balance in professional sports, Fort and Quirk (1995) used the most common measure of competitive balance which is within season variation measured by standard deviation of winning percentages. This measure shows how far from or close to the league's average a team's winning percentage is. If there are teams with large standard deviations, then the league is not very competitive. This method has its limitations as it is simplistic and may not capture the distribution of competitiveness within a league. Therefore, Humphreys (2002) created his own measure that shows competitive balance between seasons. Humphreys derives a new way to measure competitive balance called the *Competitive Balance Ratio*(CBR). This variable differs from the traditional standard deviation approach as it observes the variation of the win-loss ratio of teams over several seasons. Traditional competitive balance measures failto capture changes in the relative standings of sports teams over time, and CBR is considered a more accurate measure of parity in a league across seasons (Humphreys, 2002).This measure is a useful tool because although it is effective to analyze how competitive a league is based on one season's results, evaluating several seasons could capture the bigger picture and truly define how competitive a league actually is. Humphreys (2002) derives CBR using five equations:

$$\sigma_{T,i} = \sqrt{\sum_i \left(\frac{WPCT_{i,t} - \overline{WPCT_i}}{T}\right)^2} \quad (1)$$

$$\sigma_{N,i} = \sqrt{\sum_i \left(\frac{WPCT_{i,t} - \overline{0.500_i}}{N}\right)^2} \quad (2)$$

$$\bar{\sigma}_T = \frac{\sum_i \sigma_{T,i}}{N} \quad (3)$$

$$\bar{\sigma}_N = \frac{\sum_i \sigma_{T,i}}{T} \quad (4)$$

$$\text{CBR} = \frac{\overline{\sigma_T}}{\overline{\sigma_N}} \quad (5)$$

In equation 1, $\sigma_T$ is defined as the difference between team$_i$'s winning percentage in season$_t$ and the team's average winning percentage over *T* seasons. This means the larger $\sigma_T$ becomes, the more a team's fortunes change from year to year. In other words, if $\sigma_T$ was 0 then the team's record would be the same every year. In equation 2, $\sigma_N$ is a vector for within-season variation in winning percentages measured by the standard deviation of the winning percentage in each season across all teams in the league. Equations 4 and 5 translate team-level values of $\sigma_T$ and $\sigma_N$ into league level data by summing $\sigma_T$ and $\sigma_N$ values of all 30 teams and dividing by number of teams for $\sigma_T$ and by number of seasons for $\sigma_N$. In equation 5, CBR is defined as a ratio of the sum $\sigma_T$ and the sum of $\sigma_N$.

Like all competitive balance measures, CBR has limitations. When examining variation between seasons, the measure is meant to capture how a team's performance varies over a time period. The measure does just this, but there is no one standard against which to judge variation between seasons. In other words, one team's variation in winning percentage is not necessarily better than that of another. It is impossible to say whether owners and fans care more about how much their team's winning percentage varies, or how the team's position changes relative to other teams. For example, a team could have large variation in winning from year to year by winning the championship one year, and having the worst winning percentage the next year. On the other hand, a team could be consistently performing at the same level and finish at the top of the league without winning the championship in the end. Therefore, it is the owner's and fan's personal perspective of which situation is preferable.

Dorian (2007) used the Herfindhal-Hirschman Index (HHI) to measure competitive balance by counting the number of teams that won a championship in a given period of time. HHI can be calculated using one simple equation:

$$\text{HHI} = \sum_i \left(\frac{c_i}{T}\right)^2$$

where the number of championships team *i* won in a given period ($c_1$), is divided by the number of years in that period *(T*) and squared.The HHI is a useful measure in determining the turnover of champions in a given sport and was derived from Rottenberg's (1956) analysis of counting the amount of times an MLB team won the pennant. The issue with HHI is that the measure only uses championship as a measuring stick for success and ignores other variables of success. Additionally, it can be heavily influenced by the number of teams in a league. With this in mind,Depken (1999) expanded upon HHI to create dHHI, a measure which controls for the growing or shrinking number of teams within a league. dHHI also does not take championships into account because (Depken 1999) did not believe winning a championship was the only measure of success in a league. dHHI can be written as:

$$\text{dHHI} = \frac{4}{N^2G^2}\sum_{i=1}^{N}[wins_i]^2 - \frac{1}{N}$$

where *N* is the number of teams in the league, and *G* is the numbers of games played in a season.

In summary, there is no right or wrong way to measure competitive balance as each measure focuses on a different aspect of competitiveness in a league. Measurements of within season variation, between season variation, and championship turnover rates are all valid ways in describing competitive balance and can be effective in their own way. After having discussed the history and evolution of competitive balance measures, the next section will be focused on theories that attempt to explain why the NBA specifically is the least balanced major sport.

## 3.3 Competitive Balance in the NBA

In an effort to describe why competitive balance differs in major sports, Zimbalist (2002) explains that distinctive fan pressure, technology, demographic, playing rules and field conditions all affect a sport's competitive balance differently. He essentially states that there may be exogenous sport specific reasons that cause differences in competitive balance among leagues. On that note, basketball is a unique sport that gives certain athletes advantages that may not be seen in other sports. A natural competitive imbalance may be created because of this. Berri et al (2005) rationalize that the reason competitive imbalance still persists in the NBA is because of a short supply of tall people. In basketball, height gives an advantage not applicable in other sports and players who are both tall and particularly talented are extremely rare. Teams that can attainthese tall, talented players gaina competitive edge. This conclusion suggests that no matter what policies the NBA creates to improve competitive balance, there will always be a degree of competitive imbalance because of the natural advantages the sport gives to a very small population of players. Additionally, the rules of basketball may also give advantages to teams that are not seen in other major sports. Rockerbie (2014) claims that the rules of basketball give a considerable advantage to teams with more stacked talent. This is because there are more scoring attemptsin basketball than in any other sport, which allows star players to have a bigger impact on any given game. This makes sense because at any given time, there are only five players on the court for each team, which means a star playernot only has the most time with the ball, but they also have the greatest chance to score compared to other sports. Therefore, with the combination of the most scoring attempts in any sport, and star players having the ability to affect the game more dramatically, the rules of basketball give natural advantages to teams who are able to stockpile talent. Rockerbie (2014) backs this claim byprovingthe NBA is indeed the least competitive major sport by using a standard deviation measure for league parity. Clearly, if a team has more talent they have a greater chance to win in any sport, but because of the high amount of scoring opportunities in basketball, stars can have a much greater impact on individual games. Therefore, the role of the luxury tax in the NBA is pertinent to mitigating how teams stack talent and ultimately shift the competitive balance.

## 3.4 Salary Cap and Luxury Tax Models and Theories

This section will discuss how current literature views the introduction and validity of both a salary cap and luxury tax. Kesenne (2000) created a “two-club” model and showed the potential effect of the introduction of the salary cap in a large and small market team. He found that overall competitive balance improved with the implementation of a salary cap because large market teams would not be able to sign the most talented players and overall, player talent wouldbe more evenly distributed throughout the league. The author also found that profit margins of small market and large market teams even out, as small market teams made a larger profit as a result of a salary cap. Fort and Quirk (1995) found similar results as they discovered large market teams have unfair advantages that create higher revenue streams in comparison to small markets and can therefore spend more money on player salaries. They conclude that an implementation of a salary cap would even the playing field so large firms could not spend more on talent, thus improving competitive balance. Although both Kesenne (2000) and Fort and Quirk (1995) come to the same conclusion, neither paper used data from an actual sports league as they created completely theoretical models. Still, these papers are relevant concluding that an introduction of a salary cap could improve competitive balance.

Giocoli (2007) is the first paper to account for whether an owner is a profit maximizer or win maximizer and created a model that makes this distinction. He discovered that with the assumption that only some owners are truly trying to win, parity is decreased in a league because win maximizers simply win more. Therefore, he concluded that the addition of a salary cap would impact the spending habits of win maximizers and improve overall competitive balance. Unfortunately, because the paper is about a salary cap and not a luxury tax, it does not discuss the potential increasing win gap between win and profit maximizing owners that might arise as an outcome of a luxury tax.

Additionally, Hastings (2015) studied the effect of the maximum player salary implemented in the 1999 CBA. The maximum player salary is essentially a salary cap on the individual player level, where players of certain years of experience in the NBA cannot earn more than a league defined threshold. He found that controlling for productivity and other factors related to player salaries, the second and third best players on NBA rosters received more money as a result of the maximum player salary. This conclusion could have implications on competitive balance as stars on talented teams will not want to make less money so they may relocate through free agency and receive the money they think they deserve, thus balancing out the talent dispersion in the NBA. Unfortunately, these results may not apply to the NBA anymore as the league has recently implemented the Designated Veteran Player Extension rule that allows players to make more money by signing back with their current team rather thanswitching teams during free agency in an effort to combat the creation of "super teams" (Windhorst, 2016). All in all, Kesenne (2000), Fort and Quirk (1995), Giocoli (2007), and Hastings (2015) all agree that the implementation of a salary cap should have a positive impact on competitive balance. Although, it is essential to discuss the validity of a salary cap, ultimately, the goal of this paper it to examine the effectiveness of a luxury tax.

The past literature shows that in theory, the salary cap should be enough to improve competitive balance in the NBA, but the league clearly thought it needed to continue to work on the problem. It is easy for teams to exceed the soft cap especially with the three exceptions unique to the NBA: Rookie, Midlevel, and Larry Bird Exceptions. Not only does the luxury tax punish over spenders, but it incentivizes teams who are not over the cap. Dietl et al. (2010) analyzed the effect of a luxury tax on competitive balance, club profits, and social welfare in a closed sports league under the assumptions that supply of talent is elastic and clubs maximize profits. The authors used a model similar to Kesenne' (2000) two-club model in which they analyzed a large and small market team with profit maximizing owners. Additionally, Dietl et al's. (2010) model differed from Berri et al's. (2005) in that they assumed elasticity of supply of player talent is different. The authors foundthat a luxury tax will produce a more balanced league by incentivizing small market teams to increase player salaries and large market teams to decrease player salaries.Additionally, the results suggest that a more competitively balanced league will increase social welfare as a result of a higher quality league in general. The problem with Dietl et al's. (2010) model is that it does not explore the impact of a win maximizing owner which is particularly relevant in today's NBA.

In contrast Kaplan (2004) finds different results fromthe implementation of a luxury tax, and although he never mentioned win maximizing owners specifically, his results suggest that the behavior that win maximizers display will give them an advantage in a luxury tax system. Kaplan explored the implications of the NBA luxury tax model by identifying two "threats" to teams that hurt the franchises competitively as a result of the luxury tax. These threats include an inefficiency in the tax because of a lack of information due to escrow and penalty situations being calculated in the post-season, and more importantly,an overall decline in competitive balance because most teams will not sign extra talent due to fear of paying the tax. The idea that some teams will not sign extra talent in order to not pay the luxury tax is in line with the concepts explored in Giocoli (2007). If a luxury tax does indeed promote win maximizers to sign additional talent over the cap and thwart profit maximizers to not sign talent to stay under the cap, there could be detrimental consequences to a leagues overall competitive balance. It is difficult to say whether Dietl's or Kaplan's prediction of the outcome of competitive balance is true because there is not enough literature on the sole effect of the luxury tax in the NBA, so it is clear that more research needs to be done.

The current literature on the validity of combating competitive balance issues with a luxury tax is thin. Both Dietl et al. (2010) and Kaplan's (2004) results are based off of theoretical models and ideas but fail to utilize real data in their discussion of the luxury tax. This paper is the first to use NBA team and league level data in order to determine if the luxury tax has improved competitive balance over time.

# 4 Data

This section will discuss the collection and utilization of data used in the OLS regressions. This paper analyzes 19 NBA seasons from 1998 to 2016 and includes team and league level data. All of the data were collected from Basketballreference.com, and Larry Coon's Salary Cap Faq website: cbafaq.com. Table 4 presents the summary statistics of the variables pertinent to my analysis. Every variable has 19 observations except for ALLSTAR because the all-star game was canceled in 1999 due to the lockout. The average standard deviation of winning percentage across the 19 NBA seasons was 0.16 suggesting that 68% of NBA teams had winning percentages between 0.34 and 0.66 during that span. Additionally, the large standard deviation of LUXTOTAL was $138.25 million compared to a mean of $171.70 million because of the simulated luxury tax values from 1998 to 2002. This will be further discussed in Section 6. The description of the rest of the variables can be found in Section 5. Team level data of winning percentages, luxury tax payments and talent measurements were collected for each of the 30 NBA teams and condensed into league level data.

**Table 4: Summary Statistics**

| VARIABLES | Observations | Mean | Standard Deviation |
|---|---|---|---|
| TEAMS | 19 | 29.58 | 0.51 |
| TALENT | 19 | 0.67 | 0.02 |
| dHHI | 19 | 0.003 | 0.001 |
| SDWP | 19 | 0.16 | 0.15 |

| | | | |
|---|---|---|---|
| CBR | 19 | 0.76 | 0.08 |
| ALLSTAR | 18 | 4.64 | 0.46 |
| ALLNBA | 19 | 6.91 | 0.53 |
| LUXTOTAL | 19 | 171.70 | 138.25 |
| LUXDIS | 19 | 46.94 | 18.95 |

## 4.1 Team Data

All of the productivity data at the team level was collected from Basketballreference.com. The data collected includes: winning percentage, points scored, points allowed, number of all stars, and number of All NBA team members. Using these data, I am able to construct the three dependent variables of competitive balance including: standard deviation of winning percentage (SDWP), dHHI, and CBR. I chose SDWP because it is the most basic and commonly used variable to measure competitive balance. I also chose dHHI because it is generally a better indicator of within season variation in competitive balance because of the intuitive flaws of SDWP. Lastly, I chose to use CBR because both SDWP and dHHI only measure competitive balance on a one-year scale while CBR measures competitive balance over several seasons. Figures 1, 2 and 3 display these measures over time. Figures 1 and 2 show that the league was more competitively balanced in the early 2000s and has gotten worse since. In contrast, Figure 3 shows the exact opposite as the league was competitively unbalanced in the early 2000s and has since improved. The drastic increase in standard deviation of winning percentage and dHHI in 2008 could be explained by the NBAs entrance into the super team era. In 2008, all-stars Kevin Garnett and Ray Allen were traded to the Boston Celtics and won a championship in their first year (Stein, 2007). Their three-year dominance of the NBA led to the domino effect of all-stars leaving their franchises in order to compete for championships including LeBron James in 2010.

Figures 1 and 2 show competitive balance has since improved since 2009, but the super team era's competitive balance is much worse than the previous five seasons.

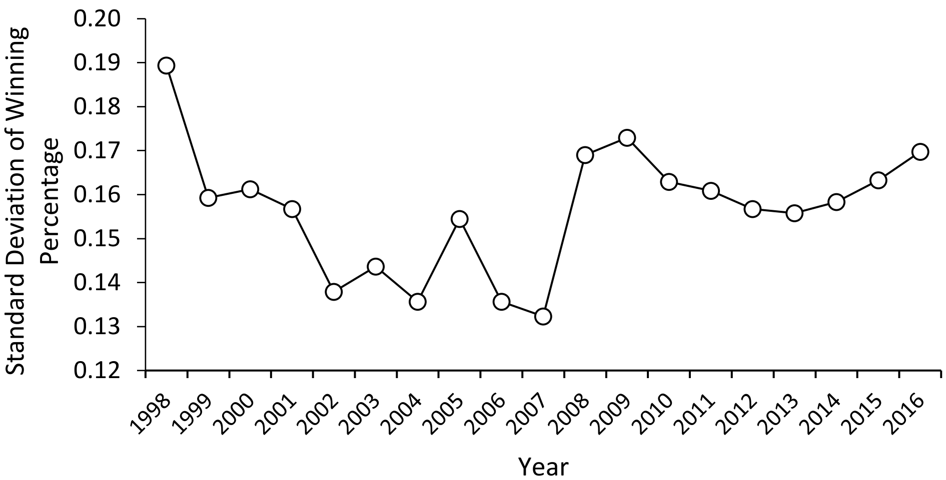


**Figure 1**: Standard Deviation of Winning Percentage over 19 NBA seasons.

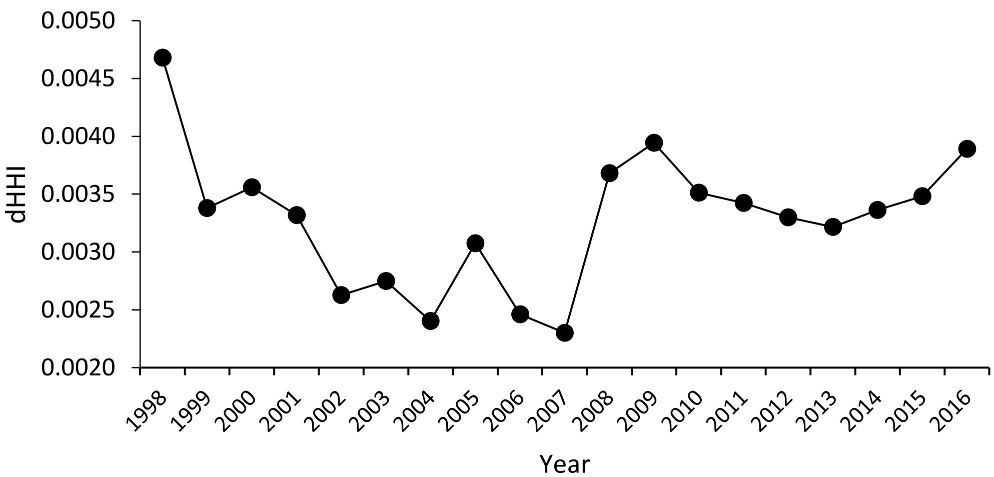


**Figure 2**: dHHI over 19 NBA seasons

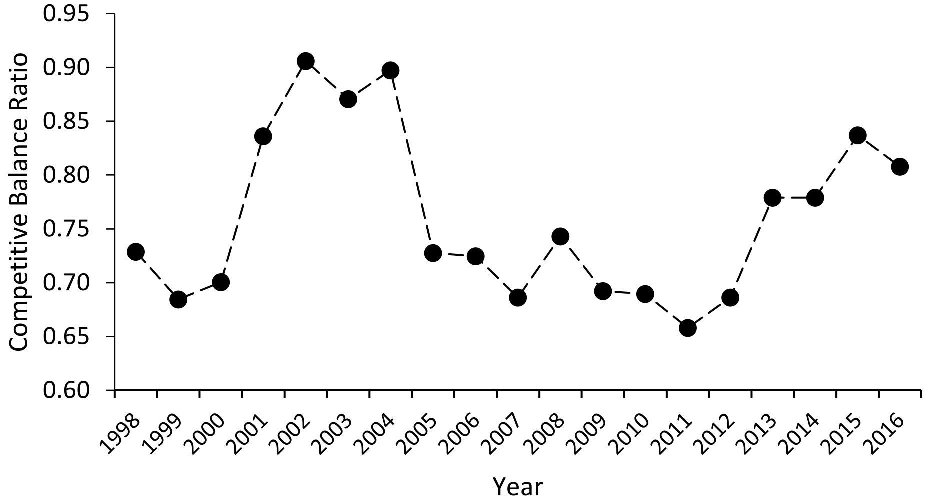


**Figure 3**: Competitive Balance Ratio over 19 NBA seasons.

Additionally, all of the luxury tax data for individual teams were retrieved from Larry Coon's Salary Cap Faq website: cbafaq.com. This included the single season amount of luxury tax paid per season, and the total amount of luxury tax paid by every NBA franchise from 2003 to 2016. These data were used to create independent variables of total luxury tax payments and distribution of luxury tax payments in order to attempt to explain the competitive balance measures. The total amount of luxury tax paid by each franchise can be seen in Figure 4. It is clear that most of the league's franchises pay close to the same amount of taxes while a few franchises pay a significantly more. The teams that pay the highest amount of luxury taxes tend to either be in a big market, for example New York and Los Angeles, or have a win maximizing owner like Mark Cuban from the Dallas Mavericks. As seen in Table 3, paying more luxury tax generally is correlated with a higher winning percentage as the Dallas Mavericks win 0.52% of their games without paying the luxury tax and 0.68% of their games while paying the luxury tax. Unfortunately for the New York Knicks, this is not always the case. New York has paid the most luxury tax in the NBA but actually has a lower winning percentage when they pay the tax compared to when they do not. This rare circumstance is most likely caused by poor ownership, managing, and coaching decisions.

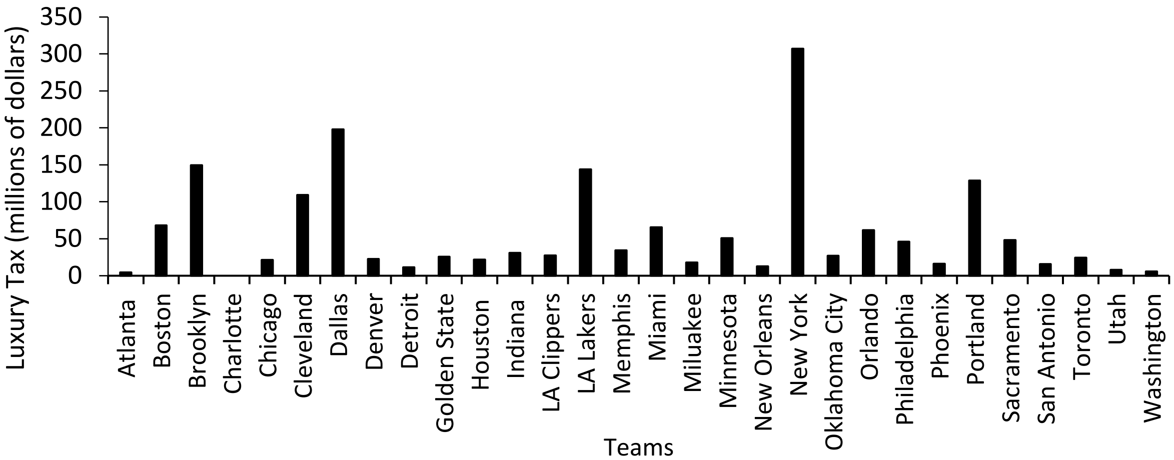


**Figure 4:** Total amount of luxury tax payments by every NBA team from 2003 to 2016

## 4.2 League Data

The league level data was created by condensing all of the team level data into one number per year. For example: each team in a given year has its own dHHI value, so in order to get a league wide measure for dHHI, the individual measures of each of the 30 NBA teams are summed into one number. The league level luxury tax data are presented in Figures 5 and 6. Figure 5 shows the total amount of luxury tax paid by all 30 NBA teams from 1998-2016 and Figure 6 shows the percent of teams that paid the luxury tax in every season. Although it is true the luxury tax was introduced in 2003, in this analysis I make the assumption that in the seasons from 1998-2002, any dollar above the salary cap in a given season would have been luxury tax payments. In this assumption I use the luxury tax policy from 2003 to 2012 in which $1 over the salary cap equates to $1 in luxury tax payment. For example: in 1998 the salary cap was set at $26.9 million. In that season the New York Knicks paid $53.9 million for player salaries, so in my analysis I would have the Knicks paying $27 million in luxury tax. Unfortunately, I was not able to find data on which players signed Rookie, Midlevel, and Larry Bird exceptions for the 1998 to 2002 seasons, so the luxury tax values may be too high.

In addition to the three dependent variables of competitive balance previously mentioned, I calculated HHI which is the dispersion of championships won in a given period of time. HHI is presented in Table 5 and calculated in accordance to the three eras of the luxury tax, which will be further explained in Section 5. The NBA is more competitively balanced when HHI is lower because a variety of teams are winning the championship in a given period of time rather than just a few. HHI is lower in the seasons following the implementation of the luxury tax suggesting the NBA is more competitively balanced. The reason why HHI from 1998 to 2002 is almost double the two other eras, is because the Los Angeles Lakers won three out of the five championships in that time period, while in the following 15 years, eight different teams won the NBA championship (Springer, 2002).

**Table 5:**HHI in the NBA over the three eras of luxury tax

| **Seasons** | **HHI** |
|---|---|
| 1998-2002 | 0.44 |
| 2003-2012 | 0.2 |
| 20013-2016 | 0.25 |

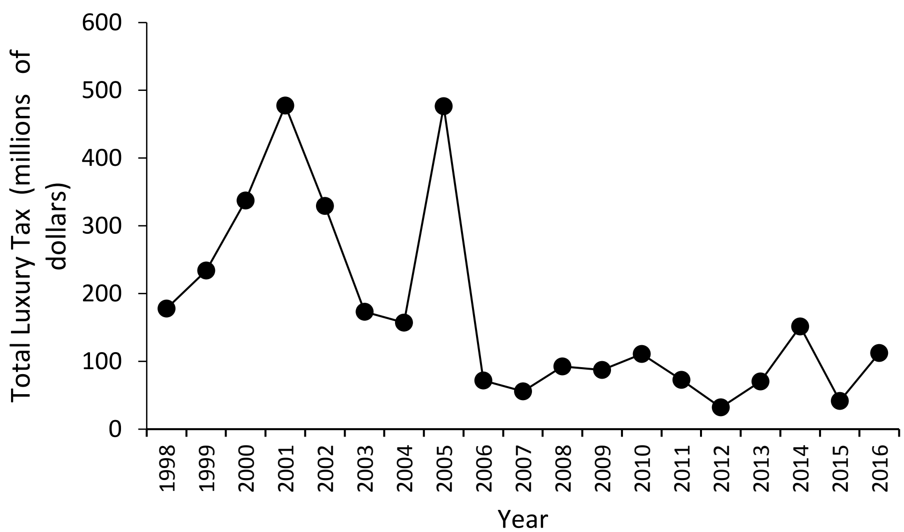


**Figure 5**: Sum of luxury tax payments made by NBA teams over 19 seasons

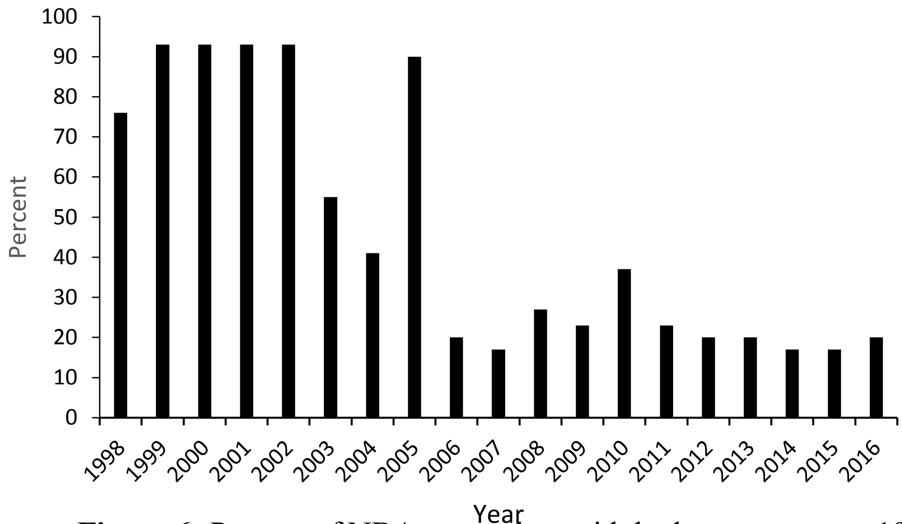


**Figure 6:** Percent of NBA teams that paid the luxury tax over 19 NBA seasons.
#The luxury tax was implemented in 2003 so before 2003, NBA teams did not pay luxury tax but the bar graph representssimulated luxury tax in that given year.

# 5 Model

This section describes the model used in this paper along with a description of variables used in the regressions.The regression I use is similar to the methodology used in Larsen et al. (2006) as well as Couture (2016). Both Larsen et al. (2006) and Couture (2016) use the same TALENT measure that I do, while Couture (2016) also analyses SDWP and dHHI. I have added several independent variables and one dependent variable to my model in order to attempt to predict competitive balance more accurately.  I use three equations in my regression at the league level:

$$\mathbf{SDWP} = \beta_0 + \beta_1 TEAMS_t + \beta_2 TALENT_t + \beta_3 ALLSTAR_t + \beta_4 ALLNBA_t$$
$$\beta_5 LUXTOT_t + \beta_6 LUXDIS_t + \beta_7 \mathrm{ERA98} + \beta_8 \mathrm{ERA03} + \beta_9 \mathrm{ERA13} + \varepsilon_t \qquad (1)$$

$$\mathbf{dHHI} = \beta_0 + \beta_1 TEAMS_t + \beta_2 TALENT_t + \beta_3 ALLSTAR_t + \beta_4 ALLNBA_t$$
$$\beta_5 LUXTOT_t + \beta_6 LUXDIS_t + \beta_7 \mathrm{ERA98} + \beta_8 \mathrm{ERA03} + \beta_{9t} \mathrm{ERA13} + \varepsilon_t \qquad (2)$$

$$\mathbf{CBR} = \beta_0 + \beta_1 TEAMS_t + \beta_2 TALENT_t + \beta_3 ALLSTAR_t + \beta_4 ALLNBA_t$$
$$\beta_5 LUXTOT_t + \beta_6 LUXDIS_t + \beta_7 \mathrm{ERA98} + \beta_8 \mathrm{ERA03} + \beta_9 \mathrm{ERA13} + \varepsilon_t \quad (3)$$

Where:

| | |
|---|---|
| **SDWP** | The league wide standard deviation of winning percentage in a given year. |
| **dHHI** | A single season measure of competitive balance |
| **CBR** | A measure of competitive balance over several seasons |
| **TEAMS** | The number of teams in the NBA in a given season. |
| **TALENT** | A measure of player talent. |
| **ALLSTAR** | A measure of team talent defined by the distribution of all stars per team. |
| **ALLNBA** | A measure of team talent defined by the distribution of post-season All NBA award winners per team. |
| **LUXTOT** | The total amount of luxury tax paid by NBA teams in a given year. |
| **LUXDIS** | The dispersion of luxury tax payments between NBA teams in a given year |
| **ERA98** | 1 if the seasons were from 1998 to 2002, 0 if otherwise |
| **ERA03** | 1 if the seasons were from 2003 to 2012, 0 if otherwise |
| **ERA13** | 1 if the seasons were from 2013 to 2016, 0 if otherwise |

The primary goal of this paper is to analyze if the introduction of a luxury tax affected competitive balance in the NBA. In order to fully investigate that inquiry, I looked at the dispersion of talent in the NBA to see if that affected competitive balance in any way. The first measure of talent is taken from Larsen (2006). It is a broad assumption of talent, but is designed to take into account the quality of the players, coaching staff, training staff and front office, and is defined as:

TALENT = HHIPF + HHIPA

Where HHIPF, the measure of offensive talent, is defined as:

$$\text{HHIPPF}_t = \sum_{i=1}^{N} \left(\frac{Points\ Scored_i}{Total\ Points\ Scored\ in\ the\ League}\right)^2$$

and HHIPA, the measure of defensive talent is defined as:

$$\text{HHIPPA}_t = \sum_{i=1}^{N} \left(\frac{Points\ Allowed_i}{Total\ Points\ Allowed\ in\ the\ League}\right)^2$$

This measure of talent attempts to capture both the offensive and defensive talent of a team by calculating where a team ranks among points scored and points allowed in a given season compared to the rest of the NBA. Although this measure is able to capture some of the talent on an NBA team, it is too broad and may not fully capture how much talent is on a given NBA roster. In order to combat this, I created the measures ALLSTAR and ALLNBA to capture the true dispersion of talent in the NBA which are similar to standard deviation measures. In the NBA, an "all star" is usually the best player on a team and is voted in by fans to play in the annual all star game. These elite group of players perform at a much higher level than the average NBA player and because of that have a greater impact on games. Depending on injuries or other factors that would lead to a player getting replaced in the all star game, there are 24 total players selected to the all star team. A perfectly competitive league may have 1 all star from 12 teams in the Eastern Conference, and 12 teams in the Western Conference but that is not always the case. For example: in 2011 the Boston Celtics had four players selected from their team to play in the all star game while 14 different teams had zero all stars selected. The ALLSTAR variable is defined as:

$$\sqrt{\sum All\ Star_i - \left(\frac{Total\ All\ Star}{N}\right)^2}$$

where *All Stars* is the number of all-stars on team *i*, *Total All Stars* is the total amount of all-stars in the NBA, and *N* is the number of teams in a given year.

For the same reasons that the TALENT measure may not capture a team's total amount of talent, the ALLSTAR variable is not enough to capture how much talent is on a given team. The last Talent measure ALLNBA is similar to ALLSTAR. At the end of the NBA season, the 15 best offensive and 10 best defensive players are placed on an "all-NBA team". The five best players are awarded to the first team All-NBA, the next five best players are awarded to the second team All-NBA, and the next five best players are awarded to the third team All-NBA. The same process is done for ALL-NBA defensive teams, and ALL-NBA teams are a great indicator of how much talent is or is not stacked on a roster. In order to be considered for the ALLNBA variable, a player must have won the Most Valuable Player award, the Defensive Player of the Year award, or been placed on the first, second, or third all offensive or defensive NBA teams. This adds up to 27 possible slots to be filled by players every year. Uniquely for this variable, one player could "earn" more than one of the 27 possible All NBA slots in this analysis. For example: in 2012 LeBron James won the MVP award and was placed on both 1st team all-NBA and 1st team all-defense, which would amount three points for the Miami Heat in ALLNBA (Basketball Reference, 2017). The ALLNBA variable is defined as:

$$\sqrt{\sum All\ NBA_i - \left(\frac{Total\ All\ NBA}{N}\right)^2}$$

Where *All NBA* is the number of All NBA players on team *i*, *Total ALL NBA* is the total number of ALL-NBA players in the NBA, and *N* is the number of teams.

Lastly, the three ERA variables are meant to capture the three eras of the luxury tax in the NBA. This paper examines NBA season from 1998 to 2016. ERA98 examines the seasons from 1998 to 2002 because the luxury tax was implemented in 2003 and this era acts a control or comparison group. From 2003 to 2012 a luxury tax was implemented, but the tax was set up so that a team over the salary cap paid $1 in luxury tax for every $1 they were over the cap. However, in 2013 the luxury tax policy changed so into an increasing tax rate to try to stop teams from over spending as seen in 2.

I would expect the coefficient for TEAM, TALENT, ALLSTAR, and ALLNBA to all be positive because the more concentrated talent is on a given team, the less competitively balanced the league will be. I hypothesize this based on the results of (Rockerbie, 2014) that suggested stars in the NBA have greater impacts on individual games more than any other sport. Therefore, asthe TALENT, ALLSTAR, and ALLNBA measures become higher, competitive balance declines.Additionally, I would expect LUXTOT and LUXDIS to be positive. The more luxury tax money spent, the more teams are attempting to stack talent and increase their winning percentage.This is based on the findings displayed in Table 3 that show in most cases, winning percentages of teams increase when they pay the luxury tax. Similar to the variables that measure the dispersion of talent, competitive balance should decrease if the luxury tax is dispersed unevenly. For example, if only two teams pay a high amount of luxury tax in one season, then LUXDIS will be high and competitive balance should be lower compared to a season where every team is paying the luxury tax. Lastly, I expect the ERA03 and ERA13 to be negative because they are dummy variables being compared to ERA98 and I predict competitive balance will be improved after 2003. I hypothesize that in the years after the luxury was implemented in the NBA, competitive balance will improve simply because I believe the luxury tax is an effective way to improve competitive balance. This hypothesis also matches the results from Dietl et al.(2010) that found the implementation of a luxury tax will produce a more balanced league.

In this analysis I run two separate regressions. The first having the assumption of simulated luxury tax for the 1998 to 2002 seasons. As mentioned earlier, this assumption calculates what teams would be paying in luxury tax if it had been established in those seasons. This will be regression one. Regression two will assume zero luxury tax payments until the 2003 NBA season.

# 6 Results

## 6.1 Simulated Luxury Tax

The results from regression one are presented in Table 6. The only statistically significant finding was the effect of ERA03 on dHHI ($p<0.1$), but the signs and magnitudes of the other coefficients might suggest trends in competitive balance. Because the three ERA variables are dummies, ERA03 and ERA13 are being compared to ERA98. Thus, the significance and negativity of ERA03 in equation 2 means that competitive balance was significantly improved in the 2003 to 2012 seasons compared to the 1998 to 2002 seasons. Additionally, the signs of the coefficients for equation 1 and 2 are identical suggesting that SDWP and dHHI are similarly affected by the independent variables, although their scales and interpretations are different. On the other hand, the coefficients for TALENT, ALLSTAR, LUXDIS, ERA03, and ERA13 in equation 3 were different from equations 1 and 2 (Table 6). A negative coefficient in this regression means the independent variable positively affects or improves competitive balance.

**Table 6: Regression OneResults**

| VARIABLES | (1)<br>SDWP | (2)<br>dHHI | (3)<br>CBR |
|---|---|---|---|
| TEAMS | -0.00527 | -0.000238 | -0.0840 |
| | (0.0204) | (0.000812) | (0.0855) |
| TALENT | -5.347 | -0.232 | 21.63 |
| | (4.842) | (0.192) | (20.24) |
| ALLSTAR | 0.00534 | 0.000160 | -0.0286 |
| | (0.0119) | (0.000473) | (0.0498) |
| ALLNBA | 0.01000 | 0.000385 | 0.0119 |
| | (0.00996) | (0.000396) | (0.0417) |
| LUXTOTAL | -4.25e-05 | -2.12e-06 | -2.07e-06 |
| | (6.18e-05) | (2.45e-06) | (0.000258) |
| LUXDIS | 0.000151 | 7.01e-06 | -0.000336 |
| | (0.000358) | (1.42e-05) | (0.00150) |
| ERA03 | -0.0252 | -0.00119* | 0.0712 |
| | (0.0145) | (0.000576) | (0.0606) |
| ERA13 | -0.0230 | -0.00108 | 0.151 |
| | (0.0212) | (0.000841) | (0.0885) |
| Constant | 0.597 | 0.0234 | 1.792 |
| | (0.913) | (0.0362) | (3.814) |
| Observations | 18 | 18 | 18 |
| R-squared | 0.443 | 0.471 | 0.648 |

se in parentheses
*** p<0.01, ** p<0.05, * p<0.1

I will first discuss the results for SDWP and dHHI because they have identical coefficient signs, and discuss CBR after for each variable.Surprisingly all three equations produced a negative coefficient for the total amount of luxury tax payments. This result suggests that the more luxury tax being paid at the league level, the more competitively balanced the league becomes. For every one-dollar increase in luxury tax payments, competitive balance increases by 4.25e-05, 2.12e-06, and 2.07e-06 for SDWP, dHHI and CBR respectively. Although the results provide a different conclusion from my hypothesis, there are a couple theories that could explain this. First, I assumed that the more luxury taxes being paid equated to more talent being stacked. Although this could be true, the dispersion of luxury tax will define if the league is more competitive or not. In other words, even if the total amount of luxury tax paid is increasing every year, as long as the dispersion of payments stays constant between the teams, then talent is being stacked somewhat evenly. Another possibility is my assumption of luxury tax payments before 2003 may have skewed the data. For example: in this regression, the average amount of assumed luxury tax paid per year before 2003 was $338 million while the average amount of luxury tax paid per year after 2003 was $94.6 million. This is a stark difference which shows the potential of skewed data. All in all, the assumption of pre-2003 luxury tax may not be an accurate representation as it does not take contract exceptions into account for any of the 29 NBA teams.

As mentioned above, the distribution of luxury tax payments may be a better indicator of competitive balance than just the total amount of luxury tax paid. Equations 1 and 2, as expected, produce a positive coefficient suggesting the more evenly distributed the luxury tax payments are between the 30 NBA teams, the more competitive balance improves. Equation 3 on the other hand produces a negative coefficient. The regression suggests a one-unit increase in luxury tax dispersion increases SDWP by 0.0000151 and dHHI by 7.01e-06, and decreases CBR by

0.000336. Again, none of the LUXDIS coefficients are statistically significant but the distribution of tax payments could have been skewed by the assumptions made for regression one.

The measure for concentration of talent is insignificant and unexpectedly negative in equations 1 and 2. A one-unit increase in talent dispersion increases SDWP by 5.347 and dHHI by 0.232. The regression suggests that as the concentration of talent increases, competitive balance improves. In other words, if a few teams have more stacked talent than the rest of the league, competitive balance is improved. On the other hand, equation 3 suggests the opposite as a one-unit increase in talent dispersion increases CBR by 21.63. This implies that as the concentration of talent decreases, the more competitive balance improves which intuitively makes more sense.

As expected, the coefficients of dispersion of all-stars and All-NBA players are positive in equations 1 and 2. A one-unit increase in all-star dispersion increases SDWP by 0.00534and dHHI by 0.000160, while a one-unit increase in All-NBA dispersion increases SDWP by0.01000 and dHHI by 0.000385. This suggests the more dispersed all-stars and All-NBA players are throughout the league, the more competitively balanced the league becomes. On the other hand, equation 3 produced a negative coefficient for all star dispersion but none of the variables were significant.

Additionally, equation 1 and 2 suggest that as the number of teams increases, competitive balance improves, although this coefficient is insignificant. This can be seen in Figure 1 and 2 when a $30^{th}$ team was added to the NBA in 2003, both SDWP and dHHI slightly decreased until 2007 thus improving competitive balance. CBR displayed a positive coefficient even though Figure 3 shows competitive balance increasing after 2003. Intuitively, an argument could be madeto either improve or worsen competitive balance with an addition of a new team. When a new team is added to the NBA, they take part in an expansion draft in which the new team picks designated players from the other NBA teams. This could improve competitive balance if the players chosen are talented and work well together, thus making the expansion team competitive. On the other hand, if the players chosen do not have good chemistry on the court, they will be a losing team, thus making the league less competitive. Additionally, according to Berri et al. (2005), there is a short supply of tall players in the NBA, specifically tall players that are talented as well. If a new team is added to the league, talent could be dispersed too thin and create a non-competitive team.

The last variables in regression one are the two time dummy variables comparing ERA03 and ERA13 to ERA98. Like most of the results, equations 1 and 2 have differing signs of coefficients than equation 3. Both ERA03 and ERA13 are negative suggesting that competitive balanced has improved since the 1998 to 2002 seasons. In equation 2, ERA03 supplies the only statistically significant finding in regression one, further suggesting that ERA98 was the least competitively balanced ERA being analyzed. With regards to equation 3, CBR does not necessarily measure competitive balance on a year to year basis but rather how team's performance differs over time. Therefore, the positive coefficient for both ERA03 and ERA13 may suggest that team performance varies more often than in ERA98.

## 6.2 Non-simulated Luxury Tax Payments

The results from regression two are presented in Table 7. Regression two uses the same three equations as regression one but does not assume any luxury tax payments before the 2003 NBA season. Therefore, in this regression, all luxury tax payments before 2003 are considered to be 0. As a result, in comparison to regression one, there is much more statistical significance found in the results of regression two. There was no significance found in equation 3, but TALENT, LUXTOTAL, and ERA03 were significant in equation1 while TALENT, LUXTOTAL, ERA03, and ERA13 were significant in equation 2.

**Table 7: Regression TwoResults**

| VARIABLES | (1)<br>SDWP | (2)<br>dHHI | (3)<br>CBR |
|---|---|---|---|
| TEAMS | 0.00245 | 0.000140 | -0.0692 |
| | (0.0114) | (0.000454) | (0.0559) |
| TALENT | -6.891* | -0.283* | 17.71 |
| | (3.610) | (0.144) | (17.67) |
| ALLSTAR | 0.0119 | 0.000455 | -0.0129 |
| | (0.00959) | (0.000381) | (0.0470) |
| ALLNBA | 0.0101 | 0.000409 | 0.0221 |
| | (0.00854) | (0.000340) | (0.0418) |
| LUXTOTAL | 0.000330* | 1.32e-05* | 0.000598 |
| | (0.000166) | (6.62e-06) | (0.000814) |
| LUXDIS | -0.000387 | -1.41e-05 | -0.000635 |
| | (0.000401) | (1.60e-05) | (0.00196) |
| ERA03 | -0.0457** | -0.00202** | 0.0219 |
| | (0.0162) | (0.000646) | (0.0796) |
| ERA13 | -0.0387 | -0.00175* | 0.0929 |
| | (0.0212) | (0.000844) | (0.104) |
| Constant | 0.445 | 0.0143 | 1.478 |
| | (0.502) | (0.0200) | (2.458) |
| Observations | 18 | 18 | 18 |
| R-squared | 0.621 | 0.639 | 0.672 |

se in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Not surprisingly, regression two produced completely different results with regards to the impact of total luxury tax payments in the league. Not only did the signs change in all three equations from negative to positive, but there was significance found in equations 1 and 2. For every one-dollar increase in luxury tax payments, competitive balance increases by0.000330, 1.32e-05, and0.000598 for SDWP, dHHI and CBR respectively.The positive coefficient suggests as the total amount of luxury taxes being paid increases, competitive balance decreases. These results suggest that the total amount of luxury tax paid had significant impacts on both SDWP and dHHI. This affirms my original hypothesis that the more teams spend in the luxury tax, the more talent is being stacked around the league and thus the less competitively balanced the league becomes. Additionally, the dispersion of luxury tax payments between teams again was not significant but the signs did change from positive to negative in regression two. The regression suggests that a one-unit increase in luxury tax dispersion decreases SDWP by0.000387,dHHI by 1.41e-05, and CBR by 0.000635. The negative signs suggest, as the luxury tax payments are more equally dispersed between the 30 NBA teams, the more competitively balanced the league becomes.

In comparison to regression one, the dummy time variable's coefficients stayed consistent in all three equations but gained significance in regression two. There was no significance found in equation 3 but ERA03 was significant in both equation 1 and 2 while ERA13 was only significant in equation 1. The negative coefficient of ERA 03 coupled with significance in both equations 1 and 2 suggest that competitive balance significantly improved in comparison to ERA98. The same could be said with equation 2 and ERA13. As mentioned above, CBR measures how a team's performance differs over time. The coefficient may be positive because team's performances may have varied less in ERA98 than in ERA03 and

ERA13. Overall with the significant improvement in the eras following the 1998 to 2002 seasons it seems that Dietl et al's. (2010) prediction of improved competitive balance after the implementation of a luxury tax was correct.

The dispersion of all-stars between NBA teams did not change signs or significance from regression one to regression two. The coefficients were positive for equations 1 and 2, and negative for equation 3. The regression suggests a one-unit increase in all star dispersion decreases SDWP by 0.0119 and dHHI by0.000455, and decreases CBR by 0.0129.As mentioned before, the positive coefficient for ALLSTAR suggests that as dispersion of all stars decreases amongst the teams, competitive balance worsens. Additionally, in comparison of regression one to regression two, the coefficients and significance of ALLNBA did not change in all three equations.

The coefficients for the number of teams in the NBA switched from negative to positive in equations 1 and 2, suggesting that as more teams join the NBA, the league's competitive balance worsens. With regards to the concentration of talent in the league, none of the coefficients changed signs within the three equations, but TALENT became significant in equations 1 and 2. That means that the concentration of talent significantly decreases SDWP and dHHI thus improving competitive balance.

# 7 Discussion

The goal of this paper was to determine if the NBA luxury tax had improved competitive balance since its implementation in 2003. There is a large gap in luxury tax research as no paper has used NBA data to analyze the impact of the luxury tax on competitive balance. To this date, only theoretical models and analysis of the NBA luxury tax have been examined. For that reason, this investigation and analysis of the NBA luxury tax has made a significant contribution to sports economic literature. Regression one with a simulated luxury tax from 1998 to 2002 had significantly different results from regression two which set luxury tax payments before 2003 at zero. Based on the results of regression two, the total amount of luxury tax payments made by all teams in a given year, had a significant effect on both standard deviation of winning percentage and dHHI. Additionally, the seasons from 2003 to 2012 when the luxury tax was first implemented, had significantly lower standard deviation of winning percentages and dHHI compared to the seasons with no luxury tax penalty. The differences in significance from regression one to regression two suggest that with the introduction of a luxury tax, talent became more expensive. Before the luxury tax, teams could exceed the salary cap and stack as much talent as they wanted with no penalty mechanism in place, but the luxury tax made talent costlier. Therefore, a team wanting to sign an all-star, free-agent in order to compete for a championship in 2010 would be more expensive compared to 2000. For this reason, competitive balance was significantly improved after the implementation of the luxury tax because NBA teams who were over the salary cap would chose not to sign extra talent, therefore dispersing talent to a team who is comfortably under the salary cap.

To clarify, the implementation of the luxury tax is not the sole reason for improved competitive balance in the NBA. Other policies like free agency, revenue sharing, and the reverse-order entry draft could have also improved competitive balance over time.Although the luxury tax cannot take full credit for the improvement in competitive balance, it is certainly part of the reason for improvements.

## 7.1 Policy Implications

It is clear that the luxury tax has helped in improving competitive balance in the NBA over the last 13 seasons. Although true in most economics of sports studies, the increased tax bracket component of the luxury tax was only implemented in 2013, making the sample size of this study too small. Therefore, the regressions may not have been able to capture its true effects. As a result, it is difficult to say which luxury tax policy was more effective in improving competitive balance. With that being said, the results of this analysis suggest the luxury tax has improved competitive balance over time and should not be changed if the NBA is satisfied with the current state of competitive balance. On the other hand, if the NBA league office was truly concerned with the current state of competitive balance, they would follow suit of the NFL and NHL and implement a hard salary cap which has been shown to improve competitive balance.With the soft salary cap being such an integral part of how the NBA functions, it may be difficult to simply shift the soft salary cap into a hard salary cap. Therefore, if the NBA feels teams are still stacking talent too easily, they could consider removing the Rookie, Mid-level, and Larry Bird contract exceptions that further allow teams to exceed the soft salary cap. This is a more realistic and obtainable goal for the NBA in inhibiting a teams' ability to stack talent.

## 7.2 Limitations of Research

It is worth noting the limitations of this study in order to improve potential future research topics. The first limitation is the lack of contract information in the 1998 to 2002 seasons. As mentioned earlier in the paper, the luxury tax payments of the 1998 to 2002 seasons were estimated based on amount of money above the given year's salary cap. This analysis did not take into account any contracts that would have exempted teams from paying the luxury tax.

Therefore, in most cases my estimation of luxury tax payments were too high. Additionally, salary cap and luxury tax data has not been released for the 2017 or 2018 seasons which limited my data set to only four years of analysis in my ERA13 variable. This did not leave enough room to fully estimate the effect of the increasing luxury tax bracket and repeater offense policies implemented in 2013. Moreover, in my analysis I assume that any luxury tax payment equates to an addition of talent. In other words, the team is automatically better off after paying the luxury than before adding talent and paying the luxury tax. Although this is mostly true, this assumption is not always the case. An example of a team who paid the luxury tax and did not improve performance was the 2014 Brooklyn Nets who paid a record $90.6 million and lost in the second round of the playoffs (Basketball Reference, 2017). In the previous year they only paid $12.9 million in luxury tax and similarly made it to the first round of the playoffs. If my assumption was correct, the team who paid the most luxury tax in NBA history should be the best team as well, which is clearly not the case.

## 7.3 Future Research

My paper opens up several opportunities for future research in the NBA. Other papers can attempt to fill the gaps of omitted variables in my model to try to better explain change in competitive balance. Additionally, all measures of competitive balance have fundamental flaws so an analysis of different measures of competitive balance would be an interesting addition. Moreover, an addition to this topic would be the implementation of the distinction between profit and win maximizing owners into the model as this could have an impact on which teams pay the luxury tax. Lastly, future research could attempt to increase the sample size of the pre-luxury tax era along with the most recent NBA seasons in order to capture and more clear snapshot of competitive balance in the NBA.

## 7.4 Conclusion

Competitive balance has been an issue in the NBA for years. This problem has only been exacerbated with the introduction of the new super team era in 2010. Past literature has proven that if the talent level between teams is too uneven, and game outcomes are too predictable, then spectators will not watch. The NBA has created several policies including the salary cap and luxury tax in order to combat competitive imbalance within the league. Although most economists suggest these policies should improve competitive balance, the NBA is still the least competitive major sport in North America even 14 years after the implementation of the luxury tax. This paper provides evidence that the luxury tax has improved competitive balance in the last 19 years, but has clearly not had enough of a substantial effect. Although there is an abundance of literature on the effect of a salary cap on competitive balance in sports leagues, this is the first paper that implements economic theory and available data on how the luxury tax has affected competitive balance in the NBA. More research needs to be completed in order to truly gauge the effectiveness of a luxury tax, but the results of this analysis provide an insight to its potential.

## References


1. Baseball Reference. (2017). New York Yankees attendance, stadiums, and park factors. Retrieved from https://www.baseball-reference.com/teams/NYY/attend.shtml

2. Basketball Reference. (2017). NBA and ABA champions. Retrieved from https://www.basketball-reference.com/playoffs/

3. Bender, P. 1998-2016 NBA Salaries. (2016) Retrieved from: https://www.eskimo.com/~pbender/misc/salaries10.txt

4. Berri, D. J., Brook, S. L., Bernd Frick, a., Fenn, A. J., & Roberto Vicente-Mayoral, R. (2005). The short supply of tall people: Competitive imbalance and the National Basketball Association. *Journal of Economic Issues,* (4), 1029.

5. Bontemps, T. Go west, young men: (2017). For NBA stars, migration is leaving Eastern Conference in dust. The *Washington Post.* Retrieved from: https://www.washingtonpost.com/sports/wizards/go-west-young-men-for-nba-stars-migration-is-leaving-eastern-conference-in-dust/2017/07/01/bd0a0fb8-5ded-11e7-a9f6-7c3296387341_story.html?utm_term=.0f9abe338e12

6. Coates, D., and Humphreys, B. R. (2012). Game attendance and outcome uncertainty in the National Hockey League.*Journal of Sports Economics*, 13 (4), 364 – 377.

7. Coon, L. (2017). Larry coon's salary cap faq. Retrieved from http://www.cbafaq.com/salarycap99.htm#15

8. Couture, C. (2016). Salary caps and competitive balance in the NBA. *Working Paper*.

9. Davis, M. C., & End, C. M. (2010). A winning proposition: The economic impact of successful National Football League franchises. *Economic Inquiry, 48*(1), 39-50.

10. Depken, I., Craig A. (1999). Free-agency and the competitiveness of Major League Baseball. *Review of Industrial Organization*, 14 (3), 205 – 217.

11. Dietl, H. M., Lang, M., & Werner, S. (2010). The effect of luxury taxes on competitive balance, club profits, and social welfare in sports leagues. *International Journal of Sport Finance, 5*(1), 41-51

12. Dorian Owen, P., Ryan, M., &Weatherston, C. R. (2007). Measuring competitive balance in professional team sports using the Herfindahl-Hirschman Index. *Review of Industrial Organization,* (4), 289.

13. El-Hodiri, M., and Quirk, J. (1971). An economic model of a professional sports league.*Journal of Political Economy*, 79 (6), 1302 – 1319

14. Fort, R., and Quirk, J. (1995). Cross-subsidization, incentives, and outcomes in professional team sports leagues. *Journal of Economic Literature*, 33 (3), 1265 – 1299.

15. Giocoli, N. (2007). Competitive balance in football leagues when teams have different goals.*International Review of Economics*, 54 (3), 345 – 370.

16. Hastings, K. M., and Stephenson, F. (2015). The NBA's maximum player salary and the distribution of player rents.*International Journal of Financial Studies*, 3 (2), 75.

17. Humphreys, B. R. (2002). Alternative measures of competitive balance in sports leagues. *Journal of Sports Economics*, 3 (2), 133 – 148

18. Kaplan, R. A. (2004). The NBA luxury tax model: A misguided regulatory regime. *Columbia Law Review,* (6), 1615.

19. Kesenne, S. (2000). The impact of salary caps in professional team sports. *Scottish Journal of Political Economy*, 47 (4), 422 – 430.

20. Kilgore, A. (2017). The Warriors are making the NBA Finals noncompetitive. That's scary for the league. *The Washington Post.* Retrieved from: https://www.washingtonpost.com/news/sports/wp/2017/06/05/the-warriors-are-making-the-nba-finals-non-competitive-thats-scary-for-the-league/?utm_term=.43a93fe5ad69

21. Leeds, M., Von Allmen, P. 2016. *The Economics of Sports.* New York, NY: Routledge

22. Mahoney, R. (2017) Grades: Rockets ensure defense with PJ Tucker. *Sports Illustrated.* Retrieved from: https://www.si.com/nba/2017/07/02/nba-free-agency-pj-tucker-nene-houston-rockets-grades

23. Pro-Football Reference. (2017). Super Bowl History. Retrieved from: https://www.pro-football-reference.com/super-bowl

24. Rockerbie, D. W. (2014). Exploring interleague parity in North America the NBA anomaly.*Journal of Sports Economics*, 1 – 16.

25. Rottenberg, S. (1956). The baseball players' labor market.*Journal of Political Economy*, 64 (3), 242–258.

26. Springer, S. (2002). Lakers make it a three-peat; Fans go wild. *Los Angeles Times.* Retrieved from: http://articles.latimes.com/2002/jun/13/local/me-celebrate13

27. Stein, M. (2007). Celtics, Wolves agree to Garnett megadeal. *ESPN.* Retrieved from: http://www.espn.com/nba/news/story?id=2954127

28. Windhorst, B. (2016). Answering your questions about the new Collective Bargaining Agreement. *EPSN.* Retrieved from: http://www.espn.com/nba/story/_/id/18317693/nba-answering-your-questions-new-nba-collective-bargaining-agreement