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Salary Caps and Competitive Balance in the NBA

By

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A Thesis Submitted to

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Abstract

Following the 1998-99 NBA lockout, the league instituted a new collective bargaining agreement (CBA) that, among other things, set a cap on individual player salaries for the first time in a professional sports league. This paper examines how these changes affected competitive balance within the league. I find that, contrary to previous results, the 1999 CBA had no effect on parity within the NBA. Furthermore, I find evidence that as the NBA has opened its doors to international players, competition within the league has become more balanced.

Keywords: National Basketball Association; competitive balance; salary cap; collective bargaining agreement

JEL Classification Numbers: L83 Z210.

1 Introduction

In 2010, LeBron James and Chris Bosh joined Dwayne Wade on the Miami Heat to form what many fans worried would become a super-team. These apprehensions proved warranted as the team made the National Basketball Association (NBA) finals during each of the four years that the trio were together. While some fans, particularly those in Miami, were ecstatic about the formation of this super-team, most fans were unhappy with the newly created imbalance. In particular, they were angry that these players had decided to take a pay cut to play, and win, together. However, these fans failed to notice that the policies instituted by the NBA are as much to blame as the players. When the NBA instituted a maximum salary for individual players as part of the 1999 Collective Bargaining Agreement (CBA), the league prevented teams from paying star players their fair market value. Therefore, players like LeBron James only forgo a few million dollars when they take a pay cut rather than the tens of millions of dollars that they would have to sacrifice if the cap did not exist. As long as such measures are in place, it is likely that super-teams like the Miami Heat will continue to form and completely redefine the competitive landscape within the NBA.

While there is a great deal of literature that examines the relationship between competitive balance and salary caps at the team level, there is little consideration in the literature of the effect of maximum individual salaries on competitive balance. Kesenne (2000) creates a theoretical framework to study this phenomenon while Maxcy and Mondello (2006) uses an empirical model, which captures the first few years that the individual salary cap is implemented in the NBA. Both studies find that individual player salary caps reduce competitive balance within a league. I extend this line of study by examining the effects that individual salary caps have had on competitive balance in the NBA since their introduction following the 1999 CBA. Unlike previous literature, I find that the changes enacted in the 1999 CBA do not appear to be a determining factor in competitive balance. While there does appear to be an improvement in competitive balance around the turn of the century, my results suggest

that this improvement was not caused by collective bargaining agreement. Moreover, I also try to capture the effects that the increase in international players has had on competitive balance in the NBA. My results, which agree with previous studies, suggest that the influx of foreign players has increased parity with the NBA.

Section 2 discusses the NBA's collective bargaining agreement and the structure of the league's salary cap. Subject 3 reviews the literature on the subject. Section 4 discusses the data. Section 5 explains the specification of the model. Section 6 interprets the results and considers policy recommendations. Section 7 details the robustness checks. Section 8 concludes.

2 Background

2.1 Salary Cap

With the exception of Major League Baseball (MLB), every major North American sports league implements some form of salary cap. A team level salary cap is a limit that the league sets as a maximum level of spending and is identical for each team. Owners argue that the team level salary cap limits team payrolls to manageable levels and improves competitive balance within the league. Unsurprisingly, players tend to be dissatisfied with salary caps as they reduce overall spending on player salaries without providing any obvious compensation in return. The details of the salary cap, however, vary across leagues. The National Hockey League (NHL) and National Football League (NFL) use a hard salary cap, meaning that teams are unable to go above the threshold set by the league each year. The NBA, on the other hand, implements a soft salary cap. A soft cap allows teams to spend more than the threshold under a variety of conditions and, therefore, is less binding than a hard salary cap. In addition to the salary cap at the team level, both the NBA and NHL have a limit on the salaries of individual players.

The modern NBA first instituted a team level salary cap in 1984, but the particulars

of this agreement are updated periodically (Coon, 2005a).[1] The salary cap stipulates that the players are entitled to earn at least a specified percentage of Basketball Related Income (BRI), which has historically hovered around 50%, while the owners are entitled to the rest. Table 1 shows how the players' share of BRI has varied across different CBAs.[2] If the teams do not spend enough to reach this threshold, the league is required to pay the difference to the players union (Coon, 2012).

Table 1: Players' Share of Revenue

1984	1995	1999	2005	2011
53.00%	48.04%	48.04%	50.00%	44.74%

While the salary cap is intended to limit spending, there are many loopholes that make it easy for teams to exceed the cap. For instance, the Larry Bird Exception allows a team to exceed the cap to sign its own free agents, provided that the players have been with the team for a sufficient period of time.[3] Another example is the Mid-Level exception, which allows teams to spend up to the average NBA salary on free agents; the amount may be used on a single free agent or split over multiple players. Similarly, the Bi-Annual exception permits teams to sign free agents to a small contract every other year. Finally, teams may also sign rookies or free agents to the minimum salary, even if it takes them over the cap (Coon, 2012). Because it is so easy for teams to exceed the cap, another important factor in the NBA's soft cap is the luxury tax, which is applied to any teams whose spending exceeds the cap. Historically, teams have had to pay an extra dollar for every dollar that they were over the cap. That is, if a team exceeded the cap by five million dollars, it would have to pay that five million dollars as well as an additional five million dollars in tax (Coon, 2005a). Recent changes to the CBA specifies that teams that pay the luxury tax are charged an

[1]The CBA has gone through revisions in 1995, 1999, 2005, and 2011.

[2]The actual payout to players may vary because the player's share of BRI is based on projected revenue. The deviations are not significant, but they are also not negligible.

[3]This period has typically been three years. Because the exact details of the Larry Bird Exception as well as those of other exceptions tend to be rather complicated, the full specifics will not be discussed here. More detailed information can be found on Larry Coon's NBA Salary Cap FAQ.

additional and increasing fee for every dollar that they spend above the cap (Coon, 2012). These funds are then redistributed equally to all teams that did not exceed the luxury tax. In short, there are quite a few ways for teams to go over the salary, but it usually costs a team to do so.

The 1995 CBA was notable for its introduction of scaled rookie salaries. Essentially, the league set a specific salary for each draft spot, which was non-negotiable by both the player and the team involved. This convention was adopted for two reasons. First, players often disagreed with teams about the salary that they should earn; in fact, many rookies refused to play until they were granted a contract they felt was justified. Second, conflict arose between veteran players and rookies because many of the veterans were earning less than the rookies despite the difference in experience (Coon, 2005b). This measure is particularly important because the NBA has instituted a lottery for the draft where the worst teams are the most likely to obtain the highest draft picks. Under this system, they are guaranteed that the talented young players they draft will sign with them at a reasonable price.

The 1999 CBA saw the implementation of the first cap on individual player salaries in professional sports. The maximum salary is based upon the number of years that an individual has played in the NBA. Players with less than seven years of experience can earn up to 25% of the team salary cap, players with seven to nine years of experience can earn up to 30% of the team salary cap, and players who have more than ten years of experience can earn up to 35% of the salary cap. The one exception to this rule is that players may earn up to 105% of the last year of their previous contact. One should note that only the first year of a contract is subject to these restrictions. Subsequent years may rise above these thresholds, but only by the maximum raise allowed by the CBA (Coon, 2005a).[4]

The implementation of the individual player maximum salary arose from owners' concerns regarding the skyrocketing salaries of the leagues' top players. Players, even those with relatively little experience, were earning salaries far above what they had earned just a few

[4]The allowable maximum raise is dependent on the type of signing. The current CBA usually keeps this number at 4.5% or 7.5% per year, but previous CBAs have allowed for higher raises.

years ago, and the process seemed to show little sign of slowing (Staudohar, 1999). From the owners' perspective, the only way to stop these rising costs was to change the league's policies. As Table 2 shows, while the salaries of top players have increased, they have not increased as quickly as the salary cap. Moreover, Table 2 shows that Michael Jordan's contract during the 1990s singlehandedly put his team over the salary cap, while the contracts of several other players came close. Given that none of the contracts in Table 2 were signed after the institution of the individual player salary cap, it appears clear that the change has been effective in controlling player costs.

Table 2: Highest NBA Salaries (As Percentage of Team Salary Cap)

Player	Year	Salary	Ratio to Cap
Michael Jordan	1997	$30,140,000	1.24
Michael Jordan	1998	$33,140,000	1.23
Earvin Johnson	1995	$14,660,000	0.92
Patrick Ewing	1996	$18,724,000	0.81
Patrick Ewing	1998	$20,500,000	0.76
Kevin Garnett	2004	$28,000,000	0.64
Shaquille O'Neal	2005	$27,696,430	0.63
Kevin Garnett	2003	$25,200,000	0.63
Patrick Ewing	1993	$18,500,000	0.62
Horace Grant	1997	$14,857,000	0.61
Shaquille O'Neal	2003	$23,571,429	0.59
Larry Bird	1992	$7,070,000	0.57
Shaquille O'Neal	2004	$24,749,999	0.56
Kevin Garnett	2001	$19,610,000	0.55
Shaquille O'Neal	2001	$19,285,715	0.54

In addition to the institution of individual player salary caps, the 1999 CBA also implemented several other changes which are presented here for the sake of completeness. The owners also benefitted from a change in the structure of rookie contracts, which gave teams the option to extend the contract into a fourth year at a slight premium. Furthermore, the league capped the amount that contracts may rise each year; for players who qualify for a Larry Bird extension, the raise was capped at 12% and for all other players, the raise was capped at 10%. As a small consolation, the league increased the minimum salary for players.

Additionally, the league added marijuana and several steroids to the illegal substance list and increased the fines for players who test positive.

2.2 Free Agency

Another important factor in the NBA's salary cap structure is free agency, which was introduced in 1988 (Coon, 2012). This change allowed players to have more control over where they played while also increasing their bargaining power. There are two types of free agents: restricted free agents and unrestricted free agents. Historically, players have become restricted free agents following their rookie contract and unrestricted free agents following any subsequent contract. Unrestricted free agents are the more common and intuitive of the two. They can sign with any team that they would like, so long as the agreement fits in the league's rules. For instance, these free agents can sign a less lucrative contract to play in a more preferable location. Restricted free agents, on the other hand, lack the same degree of freedom. They may only sign a contract if the team that currently owns their rights is outbid (Coon, 2012). Unsurprisingly, restricted free agents tend to be underpaid relative to unrestricted free agents (Krautmann et al., 2009).

2.3 Reverse Order Draft

Another important component of the NBA's CBA is the reverse order lottery draft, which was instituted in 1985 to promote balance within the league. Based upon their record, teams are given a specific number of lottery balls. The team with the worst record gets the most lottery balls, an amount that corresponds to a 25% chance of getting the first pick in the draft. Similarly, the team with the second worst record gets the second most lottery balls. This continues in a similar manner until all teams that missed the playoffs have some number of lottery balls. The specifics are somewhat complicated, but essentially, the worse the record of the team, the better their pick in the draft. While this still puts the onus on the team to make the correct selection, high picks tend to represent better talent. Unfortunately, the

reverse order draft creates a perverse incentive for teams, especially those who are unlikely to make the playoffs, to lose. While losing this season may create undesirable outcomes in the short term, the long run benefits of the top draft picks can be substantial. This phenomenon, which is more commonly referred to as tanking, has been a problem in the league since the institution of the reverse order draft and should be considered when examining a team's win-loss percentage.

3 Literature Review

Competition within sports is drastically different than competition in other industries. Unlike most industries, competitors in sports (i.e. rival teams) must rely upon one another to make a profit. The intuition behind this is simple: one of the main reasons that fans enjoy watching sports is that any team can win.[5] This desire for competition is formalized by economists in the uncertainty of outcome hypothesis (UOH). In other words, if the talent level between the teams is too uneven, spectators will not watch. Given the importance of competitive balance within sports, it is unsurprising that a great deal of literature exists on the subject.

3.1 Competitive Balance

The study of competitive balance began with Rottenberg (1956), who, in anticipation of the Coase theorem,[6] suggests that free agency would have no affect on the distribution of talent, and therefore, the parity within a league. In the first formal model considering competitive balance, El-Hodiri and Quirk (1971) find that competitive balance is directly related to game attendance. That is, less competitive leagues have lower attendance. A classic example of this is the Cleveland Browns, who were so dominant in the late 1940's that

[5]This phenomenon is best shown by the popularity of March Madness.

[6]The Coase theorem states that given a sufficiently low transaction cost the initial distribution of resources does not impact the final outcome.

their attendance was nearly cut in half (Quirk and Fort, 1992). More recent findings on the benefits of competitive balance are divided. Peel and Thomas (1997) find that greater uncertainty as measured by point spreads leads to higher attendances in British rugby matches. Similarly, Forrest and Simmons (2002) find that attendance increases in the English Football League when competing teams are more equally balanced. On the other hand, Coates and Humphreys (2012) find evidence in the NHL that attendance increases when the home team is a significant favorite. Lemke et al. (2010) find similar results when examining the 2007 MLB season.

In addition to the discussion about the importance of competitive balance, there is also disagreement about how it should be measured. Much of the disagreement stems from the fact that competitive balance is a broad term that can refer to the dispersion of wins in a given season, dispersion of wins across seasons, the dispersion of championships, or a variety of other measures. Obviously, different measures capture different imbalances within a league. Historically, the most common measure of competitive balance has been the standard deviation of winning percentage (e.g. Fort and Quirk 1995). Although the measure is intuitive and simple to compute, it has several flaws. Depken (1999) introduces an adjusted measure of the Herfindahl-Hirschman Index (HHI), which he calls dHHI, to measure concentration within a sports league. Depken's new measure can be written as:

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

where N is the number of teams in a league, G is the number of games each team plays in a season, and $wins_i$ is the number of wins for team i. He suggests that this measure is superior to the dispersion of win percentage because it can be affected by exogenous variables. Humphreys (2002) offers a measure called the Competitive Balance Ratio intended to more accurately measure the parity of a league across seasons. While the traditional measure can fail to account for relative changes between teams, Humphreys' measure captures these

differences. Schmidt (2001) adapts the Gini coefficient to measure competitive imbalances in the MLB. While the measure may offer advantages in relating competitive balance to more traditional measures of inequality, it offers little in the way of new insights.[7]

3.2 Competitive Balance within the NBA

The National Basketball Association has a variety of particular features that differentiates it from other sports leagues. One of the more interesting of these particularities is the lack of competitive balance in the NBA relative to other leagues. Indeed, Rockerbie (2014) shows that the competitive imbalances in the NBA have significantly exceeded those of other leagues since at least 1980. One explanation for this imbalance lies in one of the league's most notable features – the extraordinary height of its players. Berri et al. (2005) claims that there is a relatively small number of individuals who are tall enough to fulfill certain roles within the NBA and that these players are highly coveted. Because there are only a handful of skilled tall players, the teams who possess these players will tend to have an unfair advantage. Rockerbie (2014) acknowledges this as a possible explanation for some of the National Basketball Association's lack of parity, but instead places an emphasis on the league's abundance of scoring opportunities. More scoring opportunities would eliminate much of the randomness involved in sporting events so that the team's true skill level are more accurately displayed. He runs a Monte Carlo simulation using NBA and NHL statistics and determines that less scoring opportunities would result in a more competitive NBA. While there is likely some truth in his findings, Rockerbie fails to account for the skill involved in non-scoring interactions; these moments, which occur to varying degrees in both sports, also have a significant impact on the outcome of sporting events. Schmidt and Berri (2003) examine the effect that the opening of MLB's labor market, first to those of other ethnicities and later to those from foreign countries, has had on competitive balance within the league. They find that an expanded labor supply results in improved competitive balance. The

[7]For a more detailed discussion of competitive balance see Zimbalist (2002) and Sanderson and Siegfried (2003).

theory behind these findings would also apply to the NBA, perhaps even more so given the scarcity of extremely tall individuals.

One interesting ramification of the introduction of individual salary caps has been a redistribution of income amongst NBA players. Obviously, if star players are earning less than their fair market wage and teams are required to maintain their spending above a salary floor, overall spending on salaries is unlikely to decrease significantly, just be reallocated. Hastings and Stephenson (2015) shows that not only is this true, but that the players most likely to benefit are the players who are just below the stars in terms of talent. Furthermore, Hastings and Stephenson find that the 1999 CBA reduced player's early career earnings, primarily through changes to rookie contracts.

Another interesting feature that is rather peculiar to the NBA is the impact of superstars. While great players have a disproportionate effect on the result of games in all sports, this effect is magnified for superstars in the NBA. This is likely the result of the fact that NBA teams start only 5 players, the least amongst all major North American sport leagues, as well as the fact that starters in the NBA tend to play a higher portion of minutes than their counterparts in the NBA, NFL, and NHL. Therefore, it should come as no surprise that these superstars are also important in generating revenue.[8] As such, superstars tend to earn significantly higher salaries than their teammates. Perhaps surprisingly, Simmons and Berri (2011) find that income disparities, when driven by differences in player talent, actually improves the overall performance of the team. One explanation is that these salary differences reinforce important team hierarchies. They find that these effects disappear when the income disparities are not justified.

3.3 Salary Caps and Competitive Balance

One of the major tools that sports leagues use to improve competitive balance is the implementation of a team level salary cap. Fort and Quirk (1995) are the first to consider the

[8]Interestingly, Berri and Schmidt (2006) found that superstars tend to increase revenue for road games, implying that the "superstar externality" predominately benefits the other teams in the NBA.

effects of team level salary caps on competitive balance. They suggest that because teams in larger cities tend to draw more fans than smaller cities, they have a higher marginal revenue curve and, therefore, will spend more than their smaller counterparts. However, if large market teams are unable to spend more, then competitive imbalances should be less likely to develop. Thus, salary caps at the team level should improve competitive balance. Surprisingly though, when Fort and Quirk examined the NBA in the years following the implementation of the salary cap in 1984, they found that competitive balance did not improve. One possible suggestion for this surprise is that the flexibility of the NBA's soft cap and the difficulty of enforcing the salary cap proved inadequate in removing spending imbalances. Another possibility is that improvements might require several years to take effect; this is particularly likely given the exemption granted to several of the highest-spending teams in the NBA prior to the establishment of the salary cap.

Vrooman (1995) adopts a more cynical view by focusing more closely on the cost effects of implementing a salary cap. By definition, a salary cap limits the total amount that is spent on player salaries. This can result in a reduction in costs, particularly considering that players are the most significant expenditure for sports teams. Given this incentive, instead of having any objective to improve competitive balance, the salary cap could be an attempt at collusion by the NBA. Vrooman also disagrees with the economic theory put forward by Fort and Quirk that salary caps improve competitive balance. Instead, he argues, competitive balance will be reduced as a salary cap magnifies the inherent advantages of being located in a larger city.

Kesenne (2000) expands upon the earlier theoretical framework established by Fort and Quirk (1995) by adjusting for differences in player talent; in his simple model, there are two types of players: stars and regular players. Kesenne, however, does not include any form of a salary floor in his model; he considers a league without minimum salaries or revenue sharing. Despite the difference in assumptions, Kesenne comes to the same conclusion as Fort and Quirk, that team level salary caps improve competitive balance. Furthermore,

Kesenne concludes that the profits of all teams in the league will improve, a result that differs from Fort and Quirk largely due to their consideration of revenue sharing. The cost of this improvement is a reduction of total league revenues as players leave for markets that are unable to fully monetize their skills. Therefore the increase in equity results in a movement away from the Pareto optimal point.

Kesenne also briefly discusses the issue of individual player salary caps, which were implemented in the NBA for the first time following the 1998-1999 lockout. He argues that individual player salary caps actually reduce competitive balance. By limiting the amount that teams can offer star players, the benefits of a large market like endorsements and lifestyle opportunities are magnified. Therefore, the larger teams will be more likely to acquire players who earn salaries near the individual limit. The cap also serves to reduce inequality among teammates, for better or worse. Sanderson and Siegfried (2003) second this conjecture. They suggest that individual player salary caps will decrease competitive balance by incentivizing top players to sign with winning teams because there is unlikely to be a difference in the salary.

Giocoli (2007), unlike many of the previous papers in the field, allows for owners to have different goals. Most of the literature prior to his work has assumed that teams are either all profit-maximizing or all win-maximizing. However, in reality, some teams maximize profits and others maximize wins. More specifically, larger teams often chase wins while owners of smaller teams are unable to compete and instead maximize profits. Famous examples of this win-maximizing behavior include former Yankees owner George Steinbrenner and current Dallas Mavericks owner Mark Cuban, who were both willing to spend millions of dollars to acquire and keep superstar players. Giocoli updates the seminal model from Fort and Quirk (1995) to account for this change in assumptions. When this restriction is relaxed, he finds that competitive balance is reduced relative to the situation where all owners were profit maximizing. In other words, the larger, win-maximizing teams do just that: win. However, salary caps – both in the form of a general cap or a team-specific cap – can help remedy

this issue. A league-wide salary cap would likely only impact high spending teams, thereby reducing the amount of talent that they can acquire. Team-specific caps would work in a similar way, but are likely easier to introduce because they are independent of the large variation in team revenues.

Larsen et al. (2006) examine the affect of free agency and the salary cap on competitive balance in the National Football League. Because both free agency and the salary cap were implemented as a result of changes to the CBA following the 1993 season, it is difficult to disentangle the two. Nevertheless, they use a regression model in an attempt to estimate the combined effect. Looking at the period 1970-2002, they find that the introduction of these institutions has improved competitive balance, which is consistent with the theoretical framework exposed by Fort and Quirk and later Kesenne.

Overall, their model is similar to the one used in Fort and Quirk (1995), except for two major differences. First, they add independent variables that measure new stadiums, team relocation, season length, playoff spots, strikes, and player talent. While several of these such as season length and playoff spots are intuitive, it is not immediately clear why all of these variables are important. The motivation behind having a variable for new stadiums is that an energized crowd may provide a team with a superior home field advantage. Interestingly, Larsen, Fenn, and Spenner find that the construction of new stadiums has actually improved competitive balance within the NFL. Player talent, measured by points a team scored and allowed, is meant to account for the dispersion of talent within the league; unsurprisingly, this measure is significant and positively related to competitive balance. Strikes are included because they often result in shortened season and in one case, the strikes even resulted in the acquisition and use of substitute players. The second difference from Fort and Quirk's model is that when they calculate competitive balance, they use two separate measures – Gini coefficients and dHHI – instead of the standard deviation of winning percentage. The conclusions of the model are robust to both measures.

Maxcy and Mondello (2006) examines free agency in the NFL, NBA, and NHL. They use

the standard deviation of win percentage as well as Spearman's rank correlation coefficient as their measure of competitive balance. They determine that while free agency improved competitive balance in both the NFL and NHL, free agency actually had a negative impact on competitive balance in the NBA. Maxcy and Mondello conclude that the effects of free agency on competitive balance are not independent. Instead, the outcome is the influenced by the league's bargaining agreement. In addition, Maxcy and Mondello determine that the NBA's implementation of a team salary cap as well as both a team and player salary cap reduced competitive balance. Their model, however, only considers a few years after the implementation of the 1999 CBA. Similar to the discussion regarding Fort and Quirk (1995), many of these changes may require more than a few years to fully take effect. Additionally, Maxcy and Mondello fail to account for several important variables such as the expanding pool of international players. My analysis will more accurately determine the long-term effects of the new collective bargaining agreement.

4 Data

The models in this paper use three types of data: statistics that the National Basketball Association collects about productivity at the team level, data detailing the country of origin for each individual player, and salary information for every player in a given year. Table 3 shows the summary statistics for the most important variables used in my analysis; a description of these variables can be found in Section 5. The mean for the standard deviation of win percentage (SDWP) is 0.16, meaning that in an average season in this time frame, 68% of the teams would have winning percentages between 0.34 and 0.66. The variable FOREIGN has a mean of 0.14, indicating that, on average, 14% of the players in the sample did not originate from the United States.

Table 3: Summary Statistics

	Mean	SD	Min	Max
SDWP	0.16	0.015	0.13	0.19
dHHI	0.0034	0.00066	0.0023	0.0049
1999CBA	0.68	0.48	0	1
LOCKOUT1	0.04	0.2	0	1
LOCKOUT2	0.04	0.2	0	1
EXPANSION	0.08	0.28	0	1
TEAMS	29.04	1.14	27	30
TALENT	0.07	0.003	0.067	0.74
FOREIGN	0.14	0.066	0.052	0.226

4.1 Team Data

All of the productivity data at the team level is from Basketball Reference (`http://www.basketball-reference.com`). It includes a variety of statistics such as wins, losses, points, and assists. Using this data, I am able to construct many of the measures of competitive balance that I previously discussed. I focus on two measures: standard deviation of win percentage and dHHI. I chose the standard deviation of win percentage because it is intuitive and has historically been the most widely chosen measure, making it a good baseline. I have also decided to use dHHI because it is generally viewed as a more accurate measure of competitive balance. Figures 1 and 2 show these two measures over time. The graphs clearly show that the NBA was more competitively balanced during the early 2000s though the league grew less balanced towards the end of that decade. It is not obvious from the graph whether the 1999 CBA had any effect on competitive balance. What is clear is that the graphs depicting the standard deviation of win percentage and dHHI are quite similar. This makes sense because the two measures are related mathematically; however, even with this relationship, there are a few important differences between the two measures.

Figure 1: Standard Deviation of Win Percentage

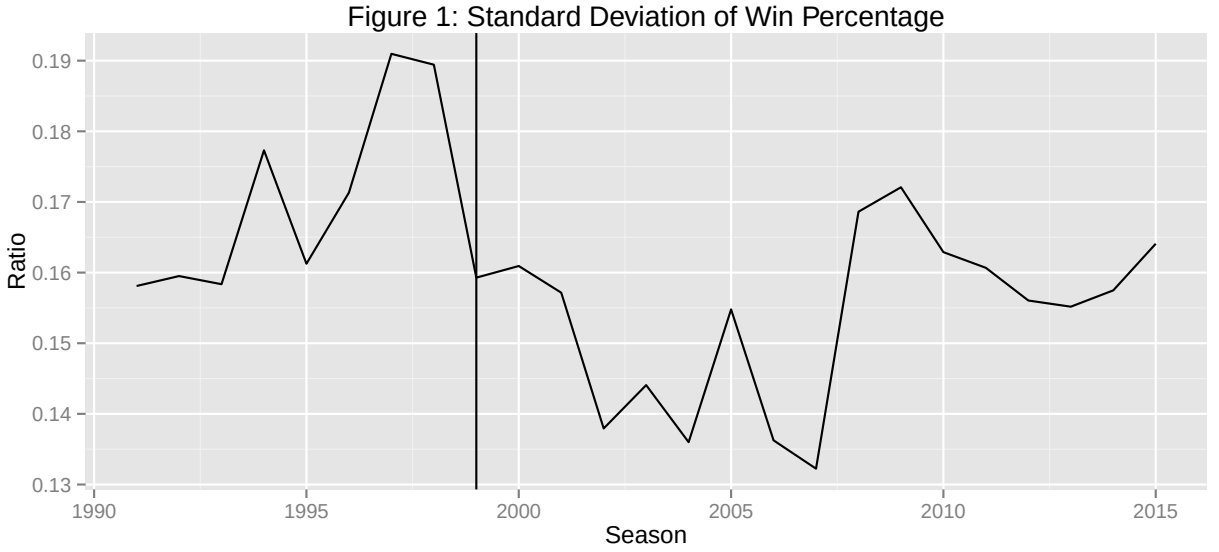
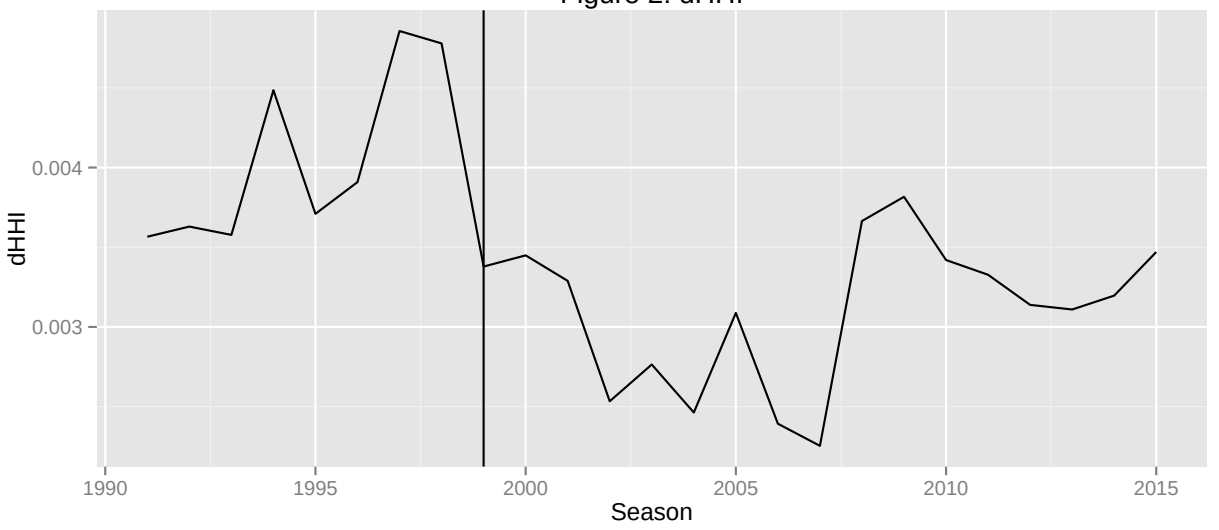


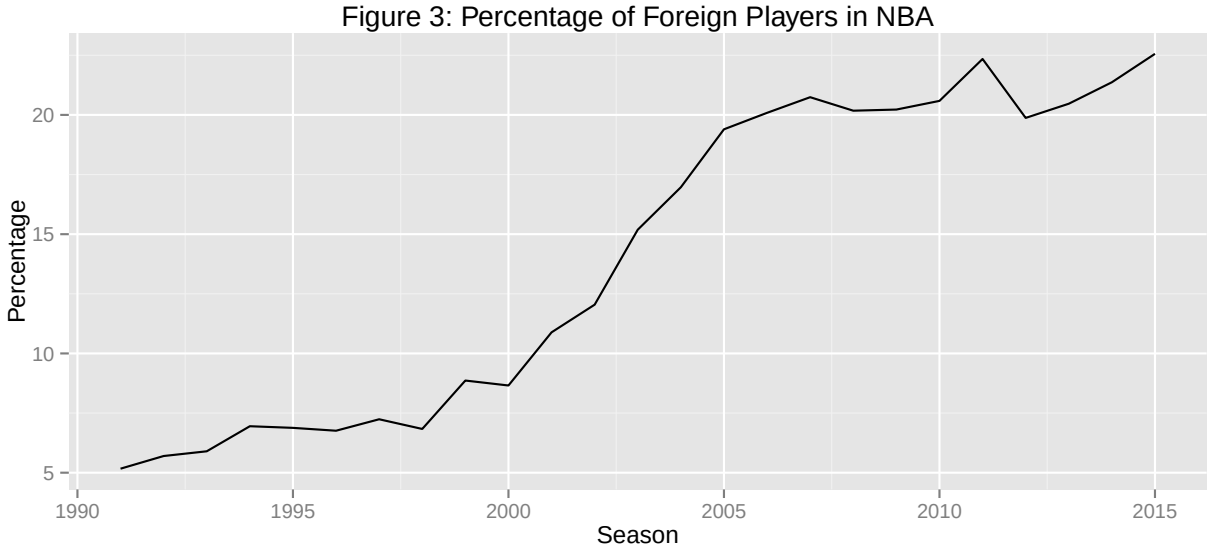
Figure 2: dHHI



4.2 Player Data

Information regarding the country of origin for NBA players, which is obtained from RealGM (`http://basketball.realgm.com/nba/players`), is displayed below in Figure 3. It is clear that the number of foreign players has increased dramatically since the turn of the century, rising from about 8% to over 22% of total players. This increase in foreign players should represent a growing supply of labor and therefore, a more balanced league.

Figure 3: Percentage of Foreign Players in NBA



4.3 Salary Data

All of the data regarding player salary comes from Bender (n.d.). This data contains salary information at both the team and player level as well as information about the salary cap for each year. As Figure 4 shows, the average salary of an NBA player has increased dramatically over the past several decades. The drop and later stagnation in wages beginning in the mid 2000s is the result of an increase in the total number of players in the NBA. That is, while the overall amount that the players earn continues to rise, it must be shared amongst a growing number of players. Figure 5 displays the real salary of players over time; it shows a similar, though less dramatic rise in the average salary. The increase in player salaries is mirrored by the increase in the salary cap, which is shown in Figure 6.

Figure 4: NBA Average Salary

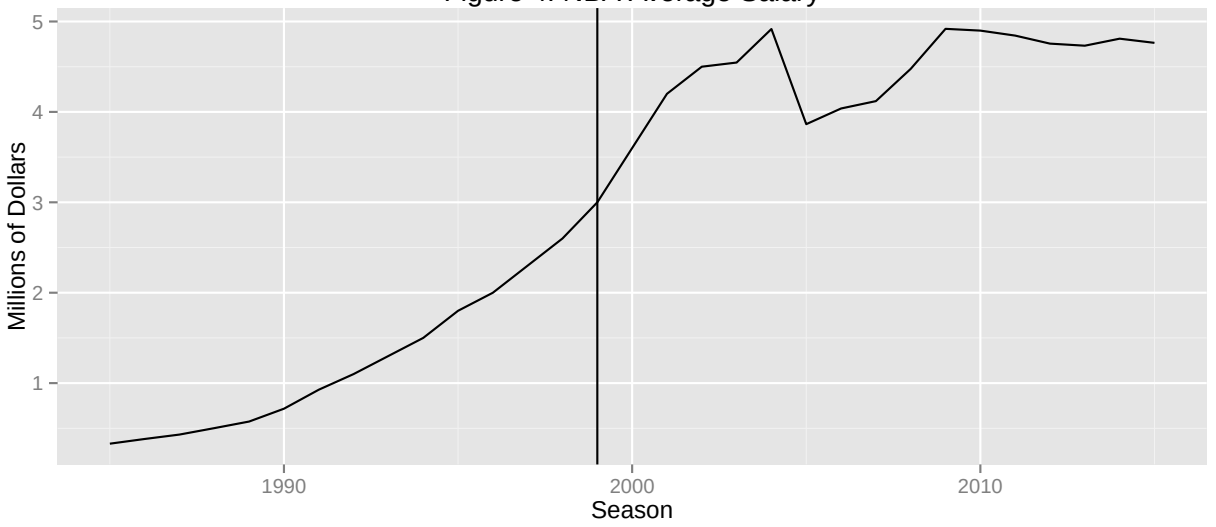


Figure 5: Real NBA Average Salary

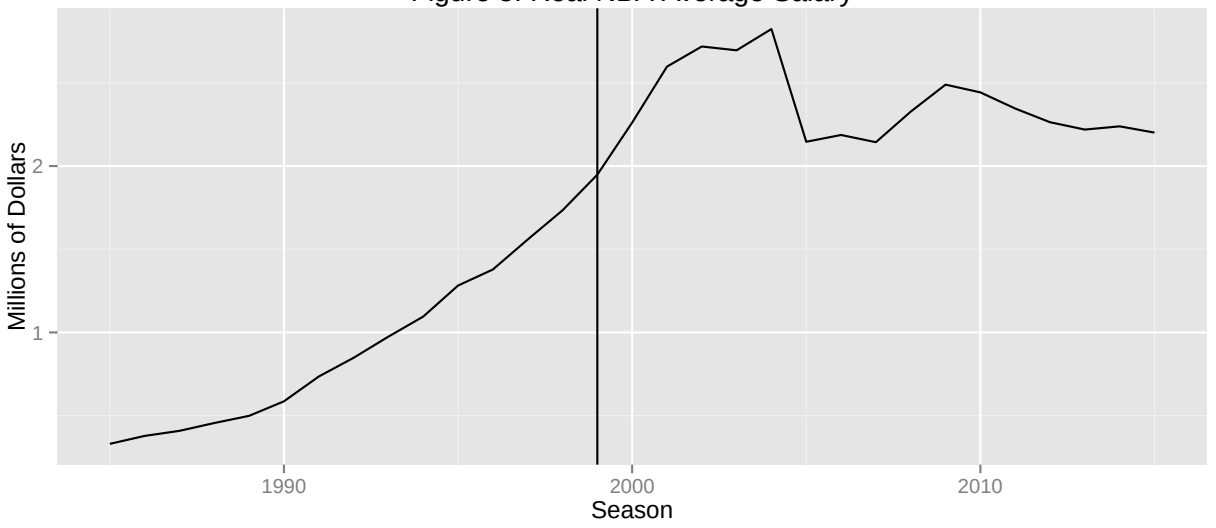
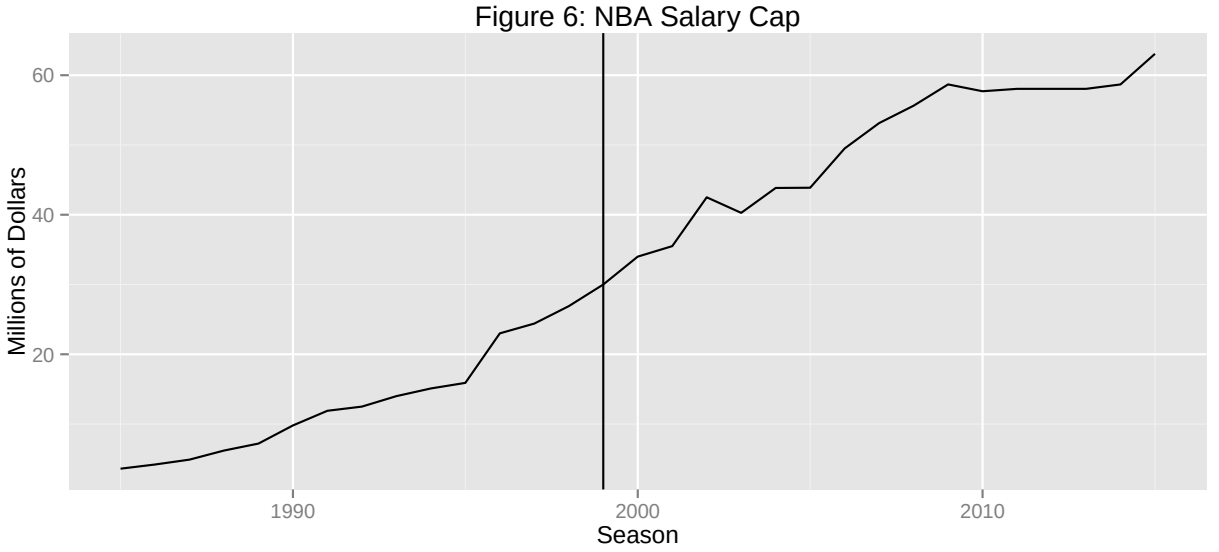


Figure 6: NBA Salary Cap



5 Model

The model is similar to the methodology used in Larsen et al. (2006) as well as Maxcy and Mondello (2006). I use the equations:

$$SDWP = \beta_0 + \beta_1 TEAMS + \beta_2 TALENT + \beta_3 FOREIGN + \beta_4 1999CBA + \beta_5 LOCKOUT1 + \beta_6 LOCKOUT2 + \beta_7 EXPANSION + \epsilon \quad (1)$$

$$dHHI = \gamma_0 + \gamma_1 TEAMS + \gamma_2 TALENT + \gamma_3 FOREIGN + \gamma_4 1999CBA + \gamma_5 LOCKOUT1 + \gamma_6 LOCKOUT2 + \gamma_7 EXPANSION + \epsilon \quad (2)$$

Where:

SDWP The standard deviation of the winning percentages in a given year.

dHHI A measure of competitive balance as first suggested in Depken (1999).

TEAMS The number of teams in the league in a given season.

TALENT A measure of player talent, similar to that in Larsen et al. (2006).

FOREIGN The percentage of players in the NBA who are not from the United States.[9]

1999CBA A dummy variable for seasons after the 1999 CBA was implemented.

LOCKOUT1 1 if the season was 1999, 0 otherwise.

LOCKOUT2 1 if the season was 2012, 0 otherwise.

EXPANSION 1 if the season involved an expansion, 0 otherwise.[10]

The measure of talent is designed to account not only for player talent, but also coaching talent, training staff, and a host of other measures. The measure is defined as

$$Talent = HHIPF + HHIPA$$

where the measure of offensive talent, $HHIPF_t$ is defined as:

$$HHIPF_t = \sum_{i=1}^{N} \left[\frac{\text{Points Scored}_i}{\text{Total Points Scored in the League}} \right]^2$$

and the measure of defensive talent, $HHIPA_t$ is defined as:

$$HHIPF_t = \sum_{i=1}^{N} \left[\frac{\text{Points Allowed}_i}{\text{Total Points Allowed in the League}} \right]^2$$

The two measures are then summed to form an overall measure of talent because offensive and defensive talent interact with one other. For example, a player may steal the ball on defense, which typically leads to an easy score on offense. Similarly, if a team is able to score during their offensive possession, they will have more time to set up their defense and therefore, will likely allow fewer points.

I have added the measure of foreign players in the NBA based upon the findings of Schmidt and Berri (2003). As Figure 3 shows, the percentage of foreign born players rose

[9]Players who are from the United States as well as another country are not considered to be from the United States. Also, it is worth noting that this data is based upon a player's formative years, not where they played college basketball.

[10]The NBA expanded from 27 teams to 29 teams in the 1995-96 season and added its 30th and final team in the 2004-05 season.

substantially around the turn of the century. Therefore, if this effect does exist, it would have a sizable impact on competitive balance in the NBA.

I would expect the variable measuring the effects of the 1999 CBA to be negative as suggested by Kesenne (2000) as well as the observations by Maxcy and Mondello (2006). The variable measuring the percentage of foreign players in the NBA, FOREIGN, is expected to be negative as it should signify a growing supply of players. The measure of talent, TALENT, is expected to be positive because a concentration of talent on a given team would exacerbate competitive balance issues.

6 Results

The results from the models described in the previous section are listed below in Table 4. The signs of the coefficients are the same across all models suggesting that the results do not vary based upon the measure of competitive balance selected. The coefficient for the variable of interest, the 1999 collective bargaining agreement, is significant and negative, indicating that the changes improved competitive balance. However, the robustness checks in Section 7 suggest that attributing this effect to the 1999 CBA is misleading. Instead, it appears that the changes brought about by the 1999 CBA had no effect on competitive balance. This result contradicts both the theoretical findings by Kesenne (2000) as well as the observations by Maxcy and Mondello (2006). Part of the difference between my findings and Kesenne (2000) could be explained by the specific interactions between the individual player salary cap and the other specifications in the NBA's CBA as well as the fact that the 1999 CBA brought additional changes beyond just the addition of the individual player salary cap. Similarly, Maxcy and Mondello only consider a few years following the implementation of the new CBA. Competitive imbalances might have arose in the short term as some teams were able to adapt more quickly to the new rules due to better management or more flexible balance sheets. Furthermore, the rule changes would have no effect on existing contracts,

Table 4: Regression Results

	Dependent variable:		
	dHHI	SDWP	dHHI
	(1)	(2)	(3)
TEAMS	0.010**	0.093	0.003
	(0.004)	(0.120)	(0.005)
TALENT	3.936**	31.176	1.103
	(1.735)	(47.188)	(1.918)
FOREIGN	−0.015***	−0.146	−0.006
	(0.004)	(0.144)	(0.006)
1999CBA		−0.031**	−0.001**
		(0.012)	(0.001)
LOCKOUT1		0.005	0.0002
		(0.014)	(0.001)
LOCKOUT2		−0.002	−0.0001
		(0.012)	(0.0005)
EXPANSION		−0.010	−0.0005
		(0.009)	(0.0004)
Constant	−0.565**	−4.651	−0.167
	(0.249)	(6.742)	(0.274)
Observations	25	25	25
R^2	0.447	0.568	0.648
Note:			*p<0.1; **p<0.05; ***p<0.01

meaning that many players would be unaffected by this change until their contract expired, which may have taken several years to occur.

The model also suggests that as the number of teams in the league increase, so do competitive imbalances, though this result is only significant in the base model. Intuitively, this makes sense because, particularly in a star driven league like the NBA, more teams just means more teams without a superstar. Moreover, if, as suggested in Berri et al. (2005), the lack of parity in the NBA is caused by a short supply of tall people, then stretching this supply further would only exacerbate competitive balance problems.

The measure of concentration of talent in the league is positive, as expected, though once again, the result is only significant in the base model. Such a result is consistent with Larsen et al.'s finding of competitive balance in the NFL. Naturally, when a handful of teams are more talented than the rest of the league, these teams are more likely to win, indicating competitive balance issues. Interestingly, as Schmidt and Berri (2003) suggests, the coefficient of the percentage of foreign players is negative. In other words, as the league has become more global, it has also become more balanced.

Though the model suggests that the changes involved in the 1999 CBA did not have a significant impact on competitive balance within the NBA, the exact reasons why this result differs from the model suggested in Kesenne (2000) is unclear. It is possible that the institution of the cap on individual player salaries did reduce competitive balance within the NBA, but this effect was balanced out by other rule changes in the 1999 CBA. While the players' share of revenue has varied since the 1999 season, one would expect this change to have little affect on competitive balance. Likewise, the increase in the minimum salary and changes to the drug testing policy are of little consequence with regard to competitive balance. The 1999 CBA gave teams the option to retain their rookie players for an additional year; this change would appear to have a positive effect on competitive balance, though the change involved is likely to be minimal because it only affects relatively inexperienced players and even these players are only affected for a single season (Coon, 2005a). Therefore, while

it is possible that other changes in the 1999 CBA may have counteracted the effects that individual player salary caps have had on competitive balance, it is rather unlikely.

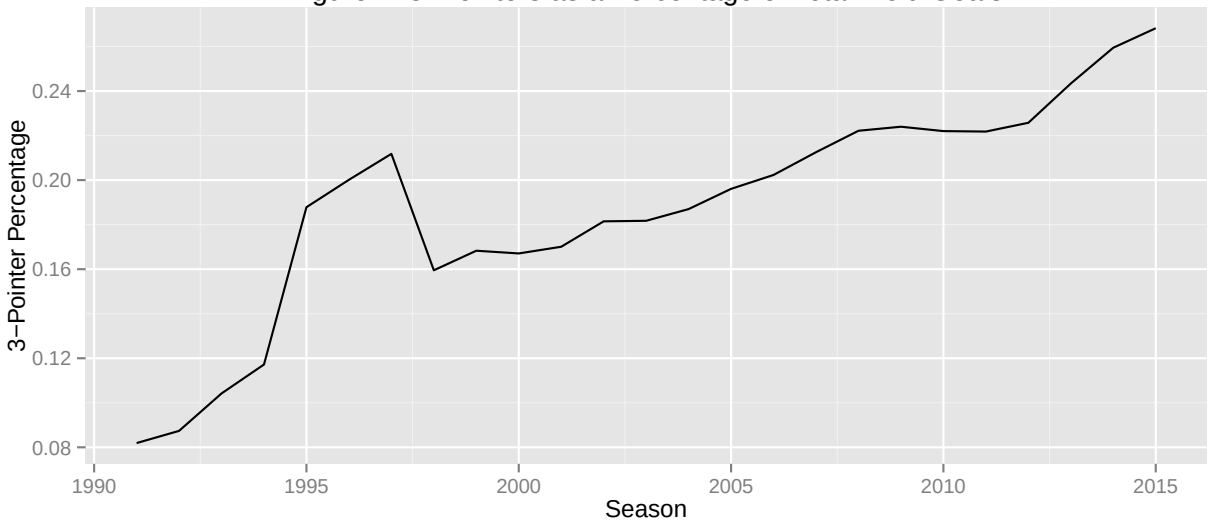
A more likely explanation is that the specific structure of the NBA's collective bargaining agreement offers an advantage to incumbent teams that neutralizes the competitive balance effects suggested by Kesenne. First, incumbent teams can typically offer their players a higher year-to-year raise. Since only the first year of a contract is subject to the maximum salary cap, players can actually earn more in the subsequent years of a multi-year contract. Therefore, incumbent teams, can usually offer a slightly higher salary than other teams. Similarly, in some cases, incumbent teams have the ability to use the Larry Bird Exception to exceed the team level salary cap. This additional financial flexibility allows incumbent teams to offer more lucrative contracts than other teams in the same circumstances. Second, incumbent teams offer a sense of continuity in both the player's professional and personal life. Because teams who have a greater sense of continuity tend to have better team chemistry, they are more likely to win, which can translate into a more lucrative contract or endorsement deal. Similarly, changing teams usually means uprooting one's family. This can be difficult for those who have become accustomed to life in a particular community. Another possible explanation is that the rising salaries of the second and third most talented players on a roster counteracted any reduction in cost of the league's best players. Along this line of thinking, it is also possible that the reduction in salaries disparity disrupted some team hierarchies. Thus, while it may be easier to assemble a roster with a superstar or two, it is harder to surround those players with the necessary talent to win.

Furthermore, the cap is not binding for all players. For instance, players can occasionally prioritize other factors above money. Veteran players, in particular, are often willing to take below market offers to improve their chances of winning though this trend would likely be limited to players who have earned a significant amount over the course of their career. Younger players would certainly be less likely to engage in similar behavior. Additionally, the so called grandfather clause, which allows players to exceed the individual player cap as

long as the salary is 105% or less of their previous year's salary, reduces the true effect of rule changes. While most of the players in the NBA were signed before the rule was put into effect, some were not. In particular there are a number of superstars who have spent the majority of their career free of the restriction. Kobe Bryant, for instance, earned $30,453,805 during the 2013-2014 season despite the fact that without the grandfather clause, players with his experience would only be able to earn $20,644,400.

One drawback of the analysis is that it does not account for changes in play style. A number of rule changes instituted by the league have altered both the offensive and defensive landscape of the NBA. The NBA, once driven by isolation plays, is now more dependent on ball movement and teamwork. Moreover, the three point shot has become increasingly important in the modern NBA. Figure 7 shows how the three pointer has grown in popularity over the past two decades.[11] If, as suggested by Berri et al. (2005), tall players are the cause of the NBA's lack of parity, then the transition toward rules that are more favorable to shorter players would improve parity.

Figure 7: 3−Pointers as a Percentage of Total Field Goals



Beyond the concerns about competitive balance, there are also concerns about the equity

[11]The sudden rise in the graph during the mid-90's is caused by the decision of the NBA to shorten the three-point line. The graph falls back to trend levels when the NBA restored the three-point line to its original dimensions.

of the current situation. By definition, the individual player cap prevents some players from being paid their fair market value. In that respect, the situation is highly bizarre. It is difficult to imagine a situation in which a similar cap would be imposed on lawyers or musicians, for instance. But in the world of sports, such a restriction is accepted. Experts suggest that some of the NBA's best players would earn more than double their current salary if the league repealed the individual salary cap (Lowe, 2014). Is it fair that these players take a pay cut so that other players, more specifically the next tier of players, according to Hastings and Stephenson (2015), may make money? The question is not just limited to fairness. If players' concerns about equity influences their play, it could have consequences for the NBA's overall product quality.

The policy recommendations for the NBA with regards to individual player caps appear clear. The NBA enjoys the lower costs that are associated with individual maximum salary caps without having to suffer any reduction in competitive balance. As such, the league should keep individual salary caps in place. The policy recommendations for the overall salary cap, however, are less clear. One move that the league could make is to employ a stricter salary cap. This would have the dual benefit of reducing costs and improving competitive balance. However, it seems unlikely that owners would pass such a bill because owners that spend over the cap are, at least to some extent, win-maximizing and are less interested in reducing their costs than increasing their wins. Meanwhile, owners who are profit-maximizing benefit from other owners going over the cap, as they may be entitled to a share of the excess spending, particularly because spending more money does not necessarily lead to more wins (Coon, 2012). In fact, the 2005-2006 New York Knicks, who have the highest team salary in NBA history, actually had a losing record. It may just be that the only contracts that really matter are those of superstars.

7 Robustness Checks

7.1 Dummy Variable

One important robustness check is to ensure that the results vary if I chose a different starting year for the CBA dummy variable. To do this, I run a similar regression but replace the 1999 CBA dummy variable with a dummy variable beginning in 2000 or 2001 instead. The results, which are shown below in Table 5, remain negative and significant. This suggests that the reduction in competitive balance did not stem from the 1999 CBA.

7.2 Time Window

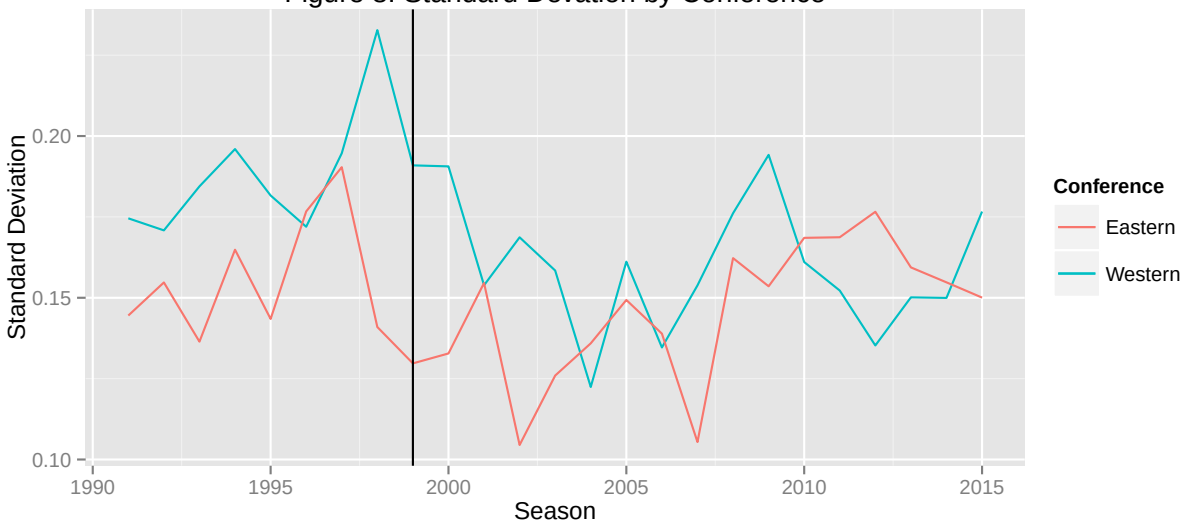
Another robustness check that I can perform is to vary the window of time that I consider. It is possible that a smaller window might more accurately capture the changes enacted by the CBA. This is particularly true when one considers that the number of complicating factors, whether in the form of rule changes or changes to the collective bargaining agreement, increases as the time period lengthens. Table 6 shows the results when I only consider a five-year window before and after the implementation of the 1999 CBA and Table 7 shows the results for a three-year window. Both tables reinforce the results in Section 7.1 that the 1999 CBA had no effect on competitive balance.

7.3 Conferences

As Figure 8 below shows, the two conferences of the NBA do not have the same level of competitive balance. Historically, the Western Conference has had more imbalances between its teams than the Eastern Conference. Given the imbalance between conferences, it is natural to wonder if the 1999 CBA might have had an effect on the respective conferences. To test this, I run the earlier regression for each conference, the results once again suggest

that the 1999 CBA had no effect on competitive balance for either conference.[12]

Figure 8: Standard Devation by Conference



8 Conclusion

The decision of the NBA to limit player salaries as part of the 1999 collective bargaining agreement was most certainly done in light of skyrocketing costs. The decision, however, had the potential to cause serious ramifications across the league, particularly with respect to the level of competitive balance. My analysis suggests that, contrary to earlier studies, the changes associated with the 1999 collective bargaining agreement did not have any impact on competitive balance within the NBA. Furthermore, the analysis indicates that the globalization of the NBA has improved the league's competitive balance.

Future studies may wish to vary the measure of competitive balance that is used. While it appears that measures involving winning percentage do not support the idea that competitive balance has changed with the implementation of the 1999 CBA, measures that address the dispersion of championships, which may be more important to some NBA fans, might generate different results. Furthermore, it would be interesting to see if the results vary when

[12] Although Table 8 suggests that the 1999 CBA may have had a slight affect on competitive balance within the Eastern Conference, repeating the methods used in Section 7.1 show that this is not the case.

looking at the NHL, the other professional North American sports league that has limits on individual player salaries. Though it would be natural for the results to be similar across leagues, it is also clear that the results of such measures are dependent upon the entirety of a collective bargaining agreement.

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9 Appendix

Table 5: Robustness Check

	Dependent variable:	
	dHHI	
	(1)	(2)
TEAMS	0.003	0.005
	(0.005)	(0.005)
TALENT	1.103	1.859
	(1.918)	(2.110)
FOREIGN	−0.006	−0.005
	(0.006)	(0.008)
Robust2000	−0.001**	
	(0.001)	
Robust2001		−0.001*
		(0.001)
LOCKOUT1	−0.001**	−0.001
	(0.001)	(0.001)
LOCKOUT2	−0.0001	−0.0001
	(0.0005)	(0.001)
EXPANSION	−0.0005	−0.0003
	(0.0004)	(0.0004)
Constant	−0.167	−0.271
	(0.274)	(0.302)
Observations	25	25
R^2	0.648	0.577
Note:	*p<0.1; **p<0.05; ***p<0.01	

Table 6: Five-Year Window

	Dependent variable:	
	SDWP	dHHI
	(1)	(2)
TEAMS	0.357	0.015
	(0.529)	(0.021)
TALENT	133.758	5.773
	(206.466)	(8.024)
FOREIGN	−0.347	−0.014*
	(0.152)	(0.006)
1999CBA	−0.020	−0.001
	(0.014)	(0.001)
LOCKOUT1	−0.005	−0.0002
	(0.013)	(0.001)
EXPANSION	−0.017	−0.001
	(0.009)	(0.0004)
Constant	−19.396	−0.838
	(29.606)	(1.151)
Observations	10	10
R^2	0.954	0.964
Note:	*p<0.1; **p<0.05; ***p<0.01	

Table 7: Three-Year Window

	Dependent variable:	
	SDWP	dHHI
	(1)	(2)
TALENT	64.418	3.209
	(469.864)	(18.417)
FOREIGN	−0.578	−0.023
	(0.408)	(0.016)
1999CBA	−0.016	−0.001
	(0.020)	(0.001)
LOCKOUT1	−0.005	−0.0002
	(0.021)	(0.001)
Constant	−4.221	−0.215
	(32.482)	(1.273)
Observations	6	6
R^2	0.958	0.967
Note:	*p<0.1; **p<0.05; ***p<0.01	

Table 8: Competitive Balance by Conferences

	Dependent variable:	
	SDWPEast	SDWPWest
	(1)	(2)
1999CBA	−0.050*	0.016
	(0.025)	(0.020)
LOCKOUT1	−0.042*	0.013
	(0.024)	(0.019)
LOCKOUT2	0.030	−0.031*
	(0.020)	(0.018)
EXPANSION	0.006	−0.006
	(0.016)	(0.014)
TEAMSEAST	0.040	
	(0.082)	
TALENTEAST	2.688	
	(7.481)	
TEAMSWEST		0.162***
		(0.055)
TALENTWEST		14.894**
		(5.673)
FOREIGN	0.207*	−0.296*
	(0.117)	(0.147)
Constant	−0.810	−4.193**
	(2.212)	(1.574)
Observations	25	25
R^2	0.384	0.652
Note:	*p<0.1; **p<0.05; ***p<0.01	