NBA Collective Bargaining: The Distribution of Salaries from 1993-2010

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Abstract

During the 17-year time span from 1993-2010 the National Basketball Association's owners and players were able to successfully negotiate three collective bargaining agreements. This paper aims to look at the relationship between these labor contracts and the allocation of player wages. This distribution of salaries was determined through the use of descriptive statistics, kernel density examinations and Lorenz curves analyses. A fixed-effects model was also used to expand on the influence of each individual collective bargaining agreement. The analysis showed that after the 1995 CBA, the disparity in salaries became increasingly skewed. But, with the major changes in the 1999 CBA and the adjustments made in 2005, the distribution of salaries gradually became more balanced and stable. This showed evidence that changes to the salary cap, free agency exceptions and a minimum and maximum pay scale provided the greatest impact on player wages after each labor contract negotiation. [1]

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1 Introduction

The National Basketball Association (NBA) is one of the four major professional sports leagues in North America, including Major League Baseball (MLB), the National Football League (NFL) and the National Hockey League (NHL). In the past 74 years since its inception, the NBA has grown to become the premier league for competitive basketball. Along with this rising popularity the NBA has gained a great mass of riches derived from areas such as game revenues, broadcast rights and merchandise sales. The combination of high revenues and relatively low overhead costs for staging basketball games pushed the NBA salary up to the lofty average of $4.75 million in 2010.[2]

There have been numerous collective bargaining agreements (CBAs) throughout the history of the NBA. Each contract was adjusted appropriately to the changing times. Acting as a labor contract between the owners and the players, these CBAs provided a foundation for handling the rights and the duties of its employees.

This paper will focus on the effects of these CBAs over the 17-year time span of 1993-2010. More specifically, how do the CBAs effect salary distribution across the league? Also, how does the disparity of income among teammates change with the establishment of each CBA?

2 Background

In order to manage the distribution of NBA revenue for players salaries, the National Basketball Players Association (NBPA) was established in 1954 as the labor union to ensure players rights. Prior to the establishment of the NBPA, there was no pension plan, no minimum wage, no health benefits and the average salary for players was $8,000 (NBPA.org). Through active negotiations the NBPA has been vital in formulating the CBAs between the players and the owners.

One of the landmark achievements of the NBPA was in 1970; the case of Robertson v. National Basketball Association (556 F.2d 682), Oscar Robertson the head of the NBPA at the time filed an anti-trust lawsuit against the NBA. This case effectively ended the option clause that bound a player to a single team in perpetuity. The settlement for this case opened up the window to free agency for players.

The victory for free agency proved to increase competitive bidding in the NBA, pitting teams against each other to buy players of high caliber. As a result, higher salaries and more freedom of choice for location were made available. The addition of free agency rights comes with it a need to limit payouts. Otherwise, teams with deeper pockets can purchase the best players, affecting the competitive balance of the league.

The goal of collective bargaining is to reach an agreement regarding the rights and the duties of the employees at work. In the case of the NBA, some of the main issues negotiated in the collective bargaining agreements include: the salary cap, free agency exceptions, the rookie pay scale, minimum and maximum salaries and aberrant behavior by players, among other things.

The NBA has a soft salary cap. This means that there are exceptions where teams are allowed

[2]Table 1 provides a list of the average NBA salary each year as seen in the data.

to go over the cap. A hard cap on the other hand has no exceptions and the cap is definite. It is clear why the owners would favor a hard cap since it would provide a clear limit to their greatest cost, player salaries.

During the 1997-1998 season, the top 9 players earned 15% of player salaries, while 20% of players earned the league minimum (Staudohar, 1999, p.5). These multi-million dollar contracts clearly show that although the salary cap was designed to contain salaries, the numerous exceptions and the high demand for top tier talent, resulted in large payouts to the select few. It is apparent that these large contracts caused great disparity for player salaries. As a result, the CBAs of 1999 and the adjustments in 2005 were made in order to help mitigate some of these issues.

In the 1995 CBA, the salary cap was set at 48.04% of BRI (National Basketball Association, 1995). This figure remained 48.04% in the 1999 CBA, but was increased in the 2005 CBA to 49.5% for the 2005-2006 season, then 51% thereafter.

Basketball related income or BRI consists of any income received by the NBA, the NBA properties or the NBA media ventures. For example, ventures such as television contracts are a large portion of BRI.

In the 1994-1995 season the NBA signed a $1.289 billion four-year contract with NBC, which was renewed at $2.456 billion for four years in the 1998-1999 season. In the 2002-2003 season, the NBA signed a new contract with ABC/ESPN for six years at $4.6 billion. These contracts provided a large boost in revenue. The 1998-1999 NBC contract renewal increased each teams annual income from $9 million to $22 million (Staudohar, 1999, p.4).

The increasingly lucrative television contracts and revenues from the growing popularity of the NBA continually pushed the salary cap upward year on year. In the 1993-1994 season, the cap was $15.175 million, which nearly doubled by the 1998-1999 season reaching $30 million. In the 2004-2005 season, this number increased further, reaching $43.87 million and eventually meeting the current value of $57.7 million in the 2009-2010 season.

The basic premise of a salary cap exception is that teams are allowed to go over the salary cap under special circumstances. The most well known exception is named after Larry Bird who was the first player allowed to use the clause while playing for the Boston Celtics in 1983. In the case of the Larry Bird exception, a team could go over the cap for any player that played with the same team for three consecutive seasons, up to the players maximum salary (Coon, 2010).

In the 1999 CBA some restrictions were added to this exception to limit excessive salary growth, which also provided some benefit to smaller market teams. This restriction was that a player could only receive raises for up to 12.5% of the salary in the first season of their contract, which was adjusted down to 10.5% in the 2005 CBA (Coon, 2010). Also, the maximum number of years for contracts under this exception was adjusted down from 7 years in the 1999 CBA to 6 years in the 2005 CBA (Coon, 2010).

An important change in the CBAs that had a large impact on disparity was the introduction of a pay scale for maximum and minimum wages in 1999, the first ever in sports (Staudohar, 1999, p.8). In the 1995 CBA there was only a minimum wage of $150,000. But, after the lockout of 1999, the owners were able to gain this concession, setting a pay scale dependent on years of seniority from 0 to 10+ years, with the minimum wage ranging from $287,500 to $1 million respectively. This

minimum wage rose yearly to range from $457,588 to $1,306,455 by 2010.

The maximum salary was also scaled by years of seniority, ranging from 0 to 10+ years in the league. The maximum salary range started at $9 million or 25% of the total salary cap for 0 years of experience to $14 million or 35% of the total salary cap for 10+ years, increasing to $13.5 million and $19 million respectively for the 2010 season (Coon, 2010). There was also a grandfather clause incorporated into this pay scale to protect players already over the maximum salary.

In the 1999 CBA, the escrow and luxury taxes were also added to provide more incentive to remain below the salary cap. The escrow system worked by withholding 10% of total player salaries prior to the start of the season. The wages were then returned if salaries remained below the designated BRI for the year, 55% in 1999. This was adjusted down to an 8% tax and a 57% BRI bar by 2010 . This escrow system worked to ensure that player salaries remained under a specific amount of league revenue.

The luxury tax added in 1999 came into effect for the first time during the 2002-2003 season, effectively issuing a penalty to teams that exceeded the salary cap. The rate was adjusted before every season, "computed by taking 61% of projected BRI, subtracting projected benefits ($112 million in 2005-06), and adjusting for whether the previous season's BRI was above or below projections" (Coon, 2010).

Some or all the money that was taken from these taxes were reserved for league purposes. Any remaining amount was redistributed to the teams in equal shares.

The numerous adjustments added in the 1999 CBA, which were further readjusted in the 2005 CBA, were used to contain the explosive growth of salaries. These changes were expected to have a large impact on the distribution of salaries from 1993-2010.

3 Literature Review

The evolution of income concentration in Japan, 1886-2005: evidence from income tax statistics, by Chiaki Moriguchi and Emmanuel Saez was a paper that analyzed income distribution through a series of long-run income statistics. This paper concluded that changes in tax policies alone could not account for the comparative experience of Japan and the United States. Instead, institutional factors such as internal labor markets and union structure were more important in determining wage income concentration (Moriguchi & Saez, p.713). This analysis of income distributions provided insight into the factors effecting salary fluctuations. Although, NBA salary distribution was a more firm specific case, this type of study on income distribution could be used to explain a more expansive array of economic phenomena.

The New NBA Collective Bargaining Agreement, the Median Voter Model, and a Robin Hood Rent Redistribution, by Richard J. Hill and Peter A. Groothius was one of the papers that inspired this analysis of salary distribution. In their work, Hill and Groothius used descriptive statistics and a Lorenz curve analysis to defend their arguments. They argued that in the 1999 CBA, "the median voters, motivated by rational self-interest and egalitarianism, shift rents from superstars to everybody else" (Hill & Groothius, 2001, p.142). They found that the provisions for raising the minimum wages and setting a hard cap on superstar salaries through maximum wages explained

some of the shift in skewness.

This paper will expand on their arguments in a variety of ways. In Hill and Groothius' paper they only have data up to 2001, which is only two years after the inception of the 1999 CBA. In order to expand on their findings, this paper will look at eight more years of data. Also, by adding an analysis of the kernel density graphs and some additional descriptive statistics, this paper will look to see if their arguments hold. Furthermore, the analysis will be used to help understand the underlying factors that affected the distribution of salaries.

Wage Inequality and Firm Performance: Professional Basketball's Natural Experiment by David J. Berri and R. Todd Jewell was another paper that inspired the methodology for analyzing the distribution of salary for the NBA among teams. In their paper, Berri and Jewell used a fixed effects regression to understand how wage inequality impacts the productivity of the firm. They found that salary dispersion was not a significant determinant of firm productivity in their model.

Fund Managers Who Take Big Bets: Skilled or Overconfident, by Klass P. Baks, Jeffrey A. Busse and T. Clifton Green was one more paper that inspired the methodology for analyzing salary distribution. In this paper, the authors used a variety of statistical measures for portfolio weight distribution including the coefficient of variation, the Herfindahl Hirschman Index (HHI), the normalized Herfindahl Hirschman Index (NHHI) and the gini coefficient to compare concentrated fund manager performance against their diversified counterparts. They found that the concentrated fund managers outperformed diversified fund managers.

The methodology for analyzing salary disparity at the team level used the combination of the fixed effects model in the Berri and Jewell paper, with the distribution measures in the Baks, Busse and Green paper. This model will be explained further in the methodology section.

4 Data

The data for this paper was gathered from two main sources. The first source was www.basketball-reference.com. The second source was from Patricia Bender's website, which compiled a vast amount of data related to the NBA.

The individual player data consists of 6747 observations. This data included information on player characteristics, player salary and other player productivity numbers. The individual player data included only players that earn above the minimum wage. As a result, a number of players were dropped. For example, a player who was released from a team, which had a pro-rated salary that would skew the results, was removed. Also, players with 10-day contracts or unrenounced free agents that were yet to sign a new contract were also dropped. The reasoning behind this was to include full salary players that count against the salary caps. [3]

The individual player salary data also accounts for bonuses. These numbers were incorporated into the salary numbers at the beginning of each season for whether they were likely to achieve the

[3]The sample sizes differ year-to-year. This problem was analyzed and did not bias the results. A majority of the difference was due to the addition of teams into the NBA. Also, the NBA does not officially publish salary data for its players. Therefore, the list may not be 100% accurate.

bonus or not. Furthermore, in the case of trades, salary numbers for traded players were shifted over to the new team. As a result, these player salaries were not double counted.

The team data was derived directly from the individual player data. There were a total of 495 observations for teams in the 17-year window. The coefficient of variation, the Herfindahl Hirschman Index (HHI), the Normalized Herfindahl Hirschman Index (NHHI) and the gini coefficient were calculated for each teams salary distribution. Each of these statistics measured the extent to which a sample constitution, diverged from an equal weighting (Baks, Busse and Green, 2006, p. 6). Since, each measure had a slightly different interpretation for salary distribution among teams, there was no reason to choose one over the other.

In order to compare the disparity of salaries between teams, the coefficient of variation was used instead of the standard deviation to get a comparable normalized measure of distribution. This measure was calculated using the following equation:

$$CV_p = \frac{\sigma(w_{pi})}{\mu(w_{pi})} \tag{1}$$

The HHI was calculated using the following equation:

$$H_p = \sum_{i=1}^{N_p} w_{pi}^2 \tag{2}$$

The HHI was the sum of the squared player salary weights for each team. This measure was frequently used to measure industry concentration. The interpretation ranges from 1/N to 1, where a smaller number indicated a more competitive environment versus a larger number, which indicated more of a monopoly.

The normalized HHI (NHHI) was calculated using the following equation:

$$H_p^* = \frac{H_p - \frac{1}{N_p}}{1 - \frac{1}{N_p}} \tag{3}$$

The NHHI was different in that it ranged from from 0 to 1 instead of 1/N to 1. This measure was invariant to the number of players on a team.

The gini coefficient was calculated in the following manner:

$$G_p = \frac{\sum_{i=1}^{N_p} \sum_{j=1}^{N_p} |w_{pi} - w_{pj}|}{2N_p^2 \mu(w_{pi})} \tag{4}$$

The gini coefficient was often used to measure income inequality. Therefore, it was a useful statistic to determine the distribution of salaries at the team level. This measure was interpreted through the range of 0 to 1, where 0 corresponded to complete equality as opposed to 1, which represented complete inequality. This statistic was also useful because it represented the area under the Lorenz curve, which was another technique utilized to understand the distribution of income.

The use of these four different measures of salary distribution and the extent to which they provide similar inferences, may provide some indication as to the robustness of the results.

5 Methodology

The methodology used when analyzing the distribution of salaries at the individual level included an analysis of the descriptive statistics for the data. Kernel density estimates were also applied to non-parametrically estimate the probability density function of the player salaries. A Lorenz curve analysis was another income distribution analysis that was utilized. This Lorenz curve analysis was useful in providing a clear indication of salary distribution, showing the percentage each quantile of players received out of the total salaries.

The next part of the analysis used four fixed-effects regressions to determine the effect of the CBAs on the distribution of salaries at the team level. This regression was specified as follows:

$$Y = \alpha_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \epsilon \tag{5}$$

The dependent variables were the four different disparity measures, including the coefficient of variation, the gini coefficient, the Herfindahl Hirschman index and the normalized Herfindahl Hirschman index.

The X_1 vector included dummies to control for the effects of the pre-1995, 1995, 1999 and the 2005 CBAs. The X_2 vector included dummies for the NBC and ESPN television contracts that were made throughout the 17-year time span. The X_3 vector controlled for the disparity between player characteristics among teammates, such as the coefficient of variation for height, weight and age.

The vector X_4 controlled for the difference in talent between players. This last vector included measures such as the coefficient of variation for shooting percentages, assists, steals, blocks, points, turnovers and usage percentage. The usage percentage was drawn from "www.basketball-reference.com" and was calculated as follows:

$$100*((FGA+0.44*FTA+TOV)*(TmMP/5))/(MP*(TmFGA+0.44*TmFTA+TmTOV)) \tag{6}$$

This measure was an estimate of the percentage of team plays used by a player while he was on the floor. [4]

6 Results

In table 1, the descriptive statistics were used to analyze the effects of the CBAs on the distribution of salaries. In order to get an idea of the unequal distribution of the salaries it was useful to compare the growth of the mean salary to the median. Between the 1995 CBA to 1999 CBA seasons, the mean salary grew by nearly 70%, while the median salary grew by only 20.7%. During the span between the 1999 CBA and the 2005 CBA it seemed that the new rules were providing more balance to the league as mean salary grew by 52% compared to a 49.4% increase in the median salary. The last 6 years under the 2005 CBA seemed to continue the trend from the 1999 CBA. During this time, the change in median salary outstripped that of the mean, growing 36.4% and 24.9% respectively.

[4] For the usage percentage equation, FGA = field goal attempts, FTA = free throw attempts, TOV = turnovers, MP = minutes played, Tm MP = team minutes played, Tm FGA = team field goal attempts, Tm FTA = team free throw attempts and Tm TOV = team turnovers.

Skewness measures the dispersion of salaries above the mean in comparison to those below the average. This means that a higher skewness would represent a larger share of salaries at the upper end of the distribution. Looking at the change over time as seen in figure 1, the measure of skewness peaks around the end of the 1997-1998 season and falls dramatically after the 1998-1999 season. Also, it rises a little around 2002-2003, most likely due to the new ESPN television contract signed during the season. But, skewness continues to drop with the signing of the new 2005 CBA. This result can be interpreted to show that the 1999 and 2005 CBAs are having a strong effect on larger contracts.

Looking at the top salaries in 1999 and 2005, there were a number of players that fell under the grandfather clause for the maximum pay scale, as seen in tables 2 and 3. In table 2, there were over nine players that exceeded the maximum. For example, Patrick Ewing was the top salary earner in 1999 making $18.5 million. This was $4.5 million over the maximum pay scale for players with 10+ years of experience. By the inception of the 2005 CBA only one player exceeded the maximum cap. This player was Shaquille O'Neal who made $27,696,430, which was much higher than the $17,437,000 maximum for new contracts. This provided some more evidence to the decreased skewness after the 1999 and 2005 CBAs.

Kurtosis measures the peakedness of a distribution. This means that the variance was more a result of infrequent extreme deviations. For example, a high kurtosis would result in fatter tails and a low, even distribution, whereas a low kurtosis would result in smaller tails and a distribution more concentrated toward the mean. Looking at the graph in figure 2 for kurtosis, it seems that it follows the same pattern as that of the skewness. This pattern of increase and decrease with the inception of each CBA showed that the distribution was gathering more around the mean after the 1999 and 2005 CBAs.

The coefficient of variation also followed a similar pattern to that of the skewness and kurtosis. Looking at the graph in figure 3, the coefficient of variation rises after the 1995 CBA and drops gradually after the 1999 CBA. Furthermore, you can see the deviation of salaries increase once again due to the new television contract and fall after the 2005 CBA. This further showed the effect that these past two CBAs had on the distribution of income, decreasing the amount of volatility after each agreement.

These measures lead into the next discussion of the kernel density functions. As previously noted the kernel density graphs depicted in figures 5 through 10 presented a visual representation of the probability density functions.

The one-year interval graphs shown in figures 5, 7 and 9 provide some insight into the shifts in salary distribution directly after the ratification of each collective bargaining agreement. These are the periods where the shifts in income disparity are most pronounced. Looking at figure 5, after the 1995 CBA there was a visible shift in skewness as the tail end of the distribution became longer. In figure 7, the graphs for the 1998-1999 and the 1999-2000 seasons, indicated the most pronounced changes from the 1999 CBA, seeing a visible shift in the distribution back toward the mean. This trend continued in figure 9 for the 2005 CBA.

The five-year interval graphs shown in figures 6, 8 and 10 revealed a little more about the change over time of salaries after each CBA. These graphs provided a more distinct visualization of the shifts seen from the 1-year interval graphs. This provided more evidence of the negative effects

of the 1995 CBA, as well as the counterbalancing positive effects of the 1999 and 2005 CBAs.

The following Lorenz curve analysis was used to further emphasize the impact of the CBAs on the distribution of salaries. Table 4 and 5 showed the full estimates for each decile group share, and cumulative shares, respectively, of players relative to their percentage of total salaries. In order to better grasp this large amount of data, it was useful to narrow down the amount of information as seen in Table 6. Looking at the top 5% of salary earners, there was a definite increase in their share prior to the 1999 CBA. This percentage of salary share increased from 14.3% in the 1993-1994 season to a high of 24.7% in the 1997-1998 season. After the 1999 CBA, there was a visible effect on the distribution of salaries to the top earners. This was because the group share percentage goes down and hits a low in the 2002-2003 season of 12.2%. From here, once again there was a jump in salaries most likely due to the lucrative ESPN television contract. This effect gradually wore off as contracts under the new 2005 CBA took effect, revealing a decrease in the top 5%s share from 20% in the 2004-2005 season to 16.45% by 2010.

The Lorenz curve estimates in Table 6 also provided some insight into the median voter model that was defended by Hill and Groothius. This insight was that in their 2001 paper, Hill and Groothius stated, median voters and players in the lower end of the wage distribution gain rents, whereas those in the top end of the wage distribution lose rent (142). Looking at the share of salary distribution for the middle 20%, there was a definite decrease from 16.9% in 1993-1994, down to 11.5% in 1998-1999. After this year the middle 20% increased their share slightly rising to 13.3% by the 2001-2002 season. Then this share fell again during the 2002-2003 season, most likely due to the distribution of the ESPN contract. But, after the 2005 CBA the share for the middle 20% stabilized around 12.5% of salary. Although they were not able to reach the old high from the 1993-1994 season, it was possible to see the effect of the minimum and maximum wages, smoothing out some of the extreme deviations to the top earners.

The gini coefficients corresponding to these Lorenz curves provided some more information on the distribution of salaries after these CBAs. For the seasons prior to the 1999 CBA the gini coefficient was increasing, rising from a low of 0.4 in 1993-1994 up to a high of 0.52 in the 1997-1998 season, as seen in figure 4. This showed that prior to the 1999 CBA, inequality increased. But, after the 1999 CBA, the fluctuation of the gini coefficient slowly faded, becoming more flat. The reason for this was most likely due to the addition of the pay scale. It could be seen that although the gini coefficient did not go back down to its previous low from the data, the installation of a pay scale provided limiters to the amount of growth and deviations for player salaries, resulting in a more stable distribution after the 1999 CBA and especially after the adjustments made in the 2005 CBA.

The regressions at the team level were used in order to provide another indicator for the effects of these CBAs on the distribution of income. The resulting analysis took each team as an individual firm, regressing dummies for the CBAs, player talent distribution measures and television contract controls on the four disparity measures. The 2005 CBA was left out in order to provide a point of comparison.

Table 7 in the appendix shows the regression, which used the coefficient of variation as the dependent variable. The results showed that the pre-95 CBA and the 1995 CBA both had negative effects on the coefficient of variation in comparison to the 2005 CBA. The pre-95 CBA was significant at the 99% confidence interval even after removing the controls. The 1999 CBA on the other

provided a positive but insignificant effect on the coefficient of variation in comparison to the 2005 CBA. This result showed that the CBAs prior to the 1999 CBA had a negative effect on the distribution as opposed to the 1999 CBA and the 2005 CBA. These results helped to reinforce the findings determined through the analysis of the individual level descriptive statistics.

Table 8 had the gini coefficient as the explained variable for the regression. The effects of the CBAs showed that all three dummy variables provided a negative effect on the gini coefficient in comparison to the 2005 CBA. The pre-95 CBA and the 1999 CBA were both significant at the 95% confidence level. This result once again helped to provide some more evidence to the previous findings.

As seen in figure 4, the previous findings showed the gini coefficient from the 2005 CBA providing a more stable and very slight negative effect on this measure. This reveals that salary distributions were becoming more stable after each CBA. This helps to reinforce the argument that adjustments made in the 2005 CBA, such as the changes to the free agency exceptions, helped to provide more balance in the league for salaries compared to the other CBAs.

The last two regressions use the HHI and NHHI as their observed variables, shown in tables 9 and 10 of the appendix, respectively. Both of these measures helped to describe the competitive environment within teams, where a higher HHI or NHHI would reveal that some players hold more of a monopoly share on salaries. The pre-95 CBA showed a negative and significant effect on the HHI and NHHI. The 1995 CBA and the 1999 CBA on the other hand both showed positive effects on the measures of share distribution at the team level. This can be interpreted to show that the period under the 2005 CBA provided a more competitive environment for salaries in comparison to the previous years. These results provided additional evidence that there was a more stable distribution of salaries to players after the 1999 and 2005 CBAs.

7 Conclusions

From the analysis in this paper, it could be seen that the distribution of salaries appeared most volatile prior to the 1999 CBA. After a lockout that resulted in a 50 game condensed season, the owners and the players association resolved on the 1999 CBA, producing a number of historic changes for this and future labor contracts. The results from the variety of tests including the descriptive statistics, the kernel density estimates, the lorenz curve analysis and the fixed effects regressions support the claim that these negotiations reached a turning point in 1999.

During this time, an escrow tax and a luxury tax were added to encourage compliance with the salary cap. This move provided gains for the competitive balance of the league as larger teams would have less freedom to buy talent.

More restrictions on free agency exceptions provided another significant change in the salary distribution. These changes, which were modified downward, helped limit the upward spiral of salaries to the top players. In effect, this measure aided in controlling the skewed distribution of salaries. Furthermore, by keeping the free agency exceptions and only making adjustments in 2005, the league protected the ability of teams to reward highly skilled labor.

The most radical change was the inclusion of both a minimum and maximum pay scale, de-

pendent on seniority. This pay scale, the first ever in sports, provided much more stability in the distribution of salaries. This was because a backbone was provided to control the amount of pay-outs to players. After the 1999 CBA, where this clause was initiated, the results showed that there was definitely a more stable distribution of salaries among players. The lower quantiles and the median voters were rewarded more income and a stable reference for future income distributions was established.

Furthermore, due to the grandfather clause, there were still players that maintained some of their earnings from the years prior to the 1999 CBA. But, in the future, as more players fell into the limits of this pay scale, and the high salaried gems from the pre-1999 era retire, the distribution of income became much more stable, with fewer large deviations.

It is clear from the data that the many provisions created in the 1999 and 2005 CBAs provided a steadier distribution of salaries among its talent at both the individual and team level. These trends granted much more balance in salary distribution within this 17-year time span. The groundwork set in 1999 provided a strong foundation for future CBAs. It would be interesting to see if more provisions are added to further improve the salary disparity between players in the NBA.

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Table 1: Descriptive Statistics

Year	Obs	Minimum	Maximum	Mean	Median	Standard Deviation	CV	Skewness	Kurtosis	Gini
1994	342	150000	5740000	1322852	1105000	973355.27	0.881	1.085	1.305	0.400
1995*	346	150000	7300000	1474002	1220000	1159175.46	0.950	1.183	2.090	0.425
1996	363	200000	18724000	1714234	1300000	1677340.17	1.290	3.798	30.236	0.458
1997	379	220000	30140000	2037530	1300000	2534796.93	1.950	4.850	42.155	0.524
1998	392	242000	33140000	2275873	1432020	2883453.86	2.014	4.759	38.475	0.528
1999*	393	287500	18500000	2504319	1472640	2778993.33	1.887	2.313	6.534	0.521
2000	393	301875	17142858	3070448	2000000	3216678.01	1.608	1.871	3.555	0.513
2001	414	316969	19610000	3409397	2200000	3540535.01	1.609	1.819	3.436	0.513
2002	408	332817	22400000	3490320	2400000	3713110.02	1.547	1.995	4.694	0.519
2003	393	349458	25200000	3795116	2400000	4028897.54	1.679	1.959	4.743	0.521
2004	400	366931	28000000	3800858	2152380	4052020.58	1.883	1.943	5.024	0.524
2005 *	427	385277	27696430	3805854	2200000	4024811.63	1.829	1.851	3.970	0.520
2006	425	398762	20000000	3991644	2500000	4009023.76	1.604	1.616	2.234	0.506
2007	428	412718	21000000	4140692	2557064	4197601.38	1.642	1.641	2.325	0.509
2008	420	427163	23750000	4446278	2770130	4460720.19	1.610	1.620	2.319	0.505
2009	415	442114	24751934	4814647	3100000	4732864.81	1.527	1.561	2.161	0.500
2010	409	457588	23239562	4752658	3000000	4713650.03	1.571	1.604	2.275	0.500

* Denote year of collective bargaining agreement

CV = Coefficient of Variation

Table 2: Players Earning Salaries Above 1999 Maximum Cap

Player	Date Contract Signed	1998-1999 Salary	Maximum for New Contract Under 1999 CBA[a]
Patrick Ewing	7/27/97	$18,500,000	$14,000,000
Shaquille O'Neal	7/18/96	$15,000,000	$9,000,000
David Robinson	12/6/95 extension	$14,841,000	$11,000,000
Kevin Garnett	10/1/97	$14,000,000	$9,000,000
Alonzo Mourning	8/10/96	$13,130,000	$9,000,000
Juwan Howard	8/5/96	$13,125,000	$9,000,000
Dikembe Mutombo	7/15/96	$11,218,000	$11,000,000
Chris Webber	10/9/95	$10,000,000	$9,000,000

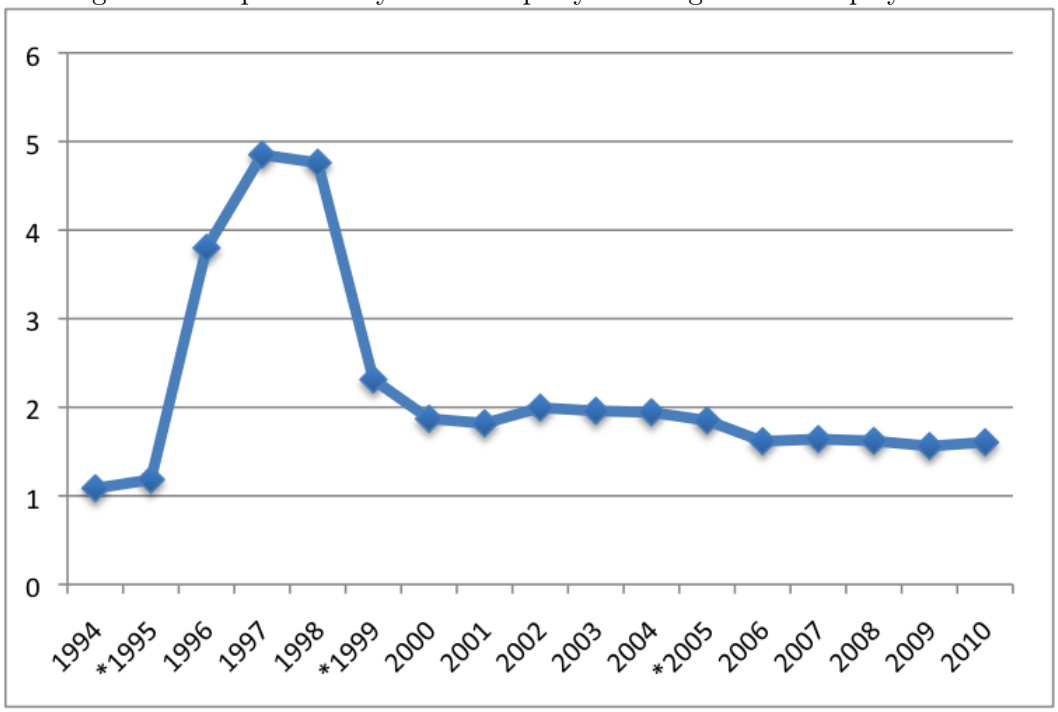
Source: [1](Bender, 2010) [8](Hill & Groothius, 2001)
a. These figures represent the maximums for players who would be negotiating new contracts at substantially higher salaries than they were previously earning. Players can earn the maximum amount listed or 105% of their previous years salaries in the last year of their contracts.
b. Shaquille O'Neal is the only player far above the maximum cap in 2005

Table 3: Players Earning Salaries Above 2005 Maximum Cap

Player	Date Contract Signed	2004-2005 Salary	Maximum for New Contract Under 2005 CBA[a]
Shaquille O'Neal[b]	7/18/96 extension	$27,696,430	$17,437,000

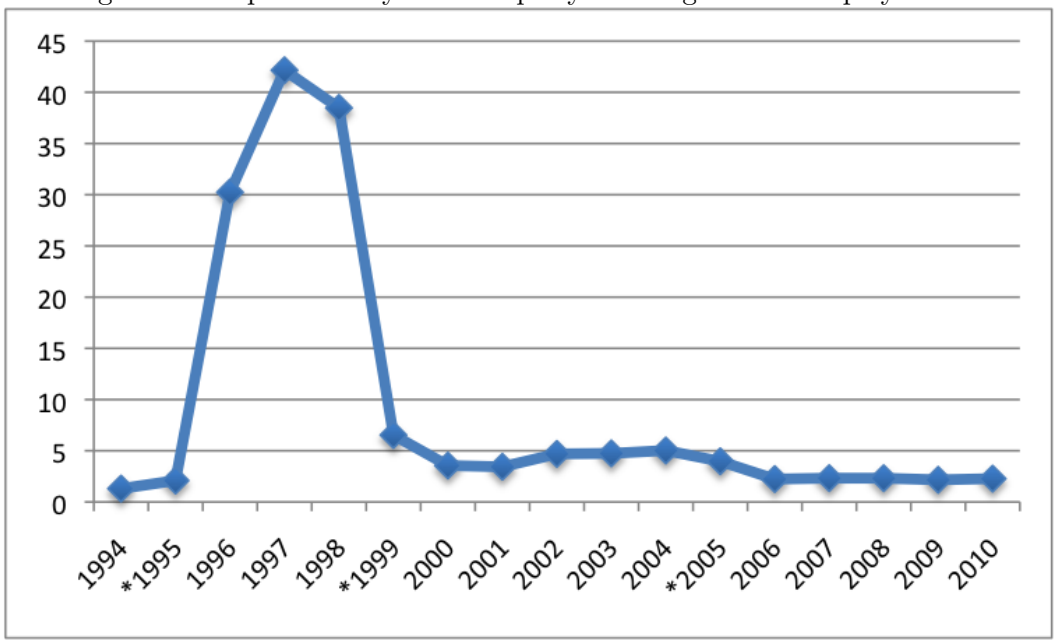
Source: [1](Bender, 2010) [8](Hill & Groothius, 2001)
a. These figures represent the maximums for players who would be negotiating new contracts at substantially higher salaries than they were previously earning. Players can earn the maximum amount listed or 105% of their previous years salaries in the last year of their contracts.
b. Shaquille O'Neal is the only player far above the maximum cap in 2005

Figure 1: Graph of salary skewness per year using individual player data



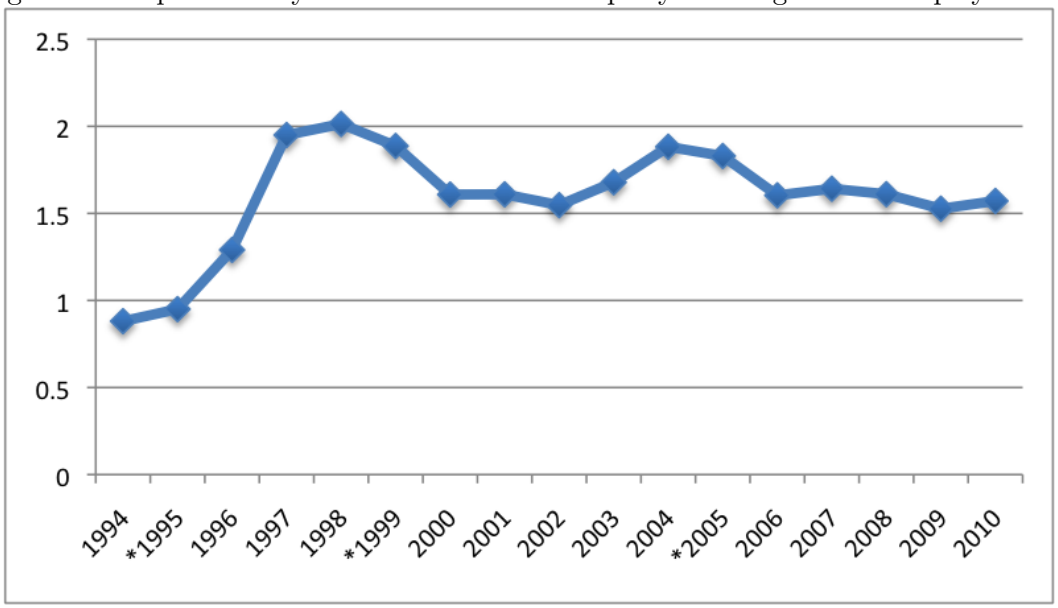
∗ denotes year of collective bargaining agreement

Figure 2: Graph of salary kurtosis per year using individual player data



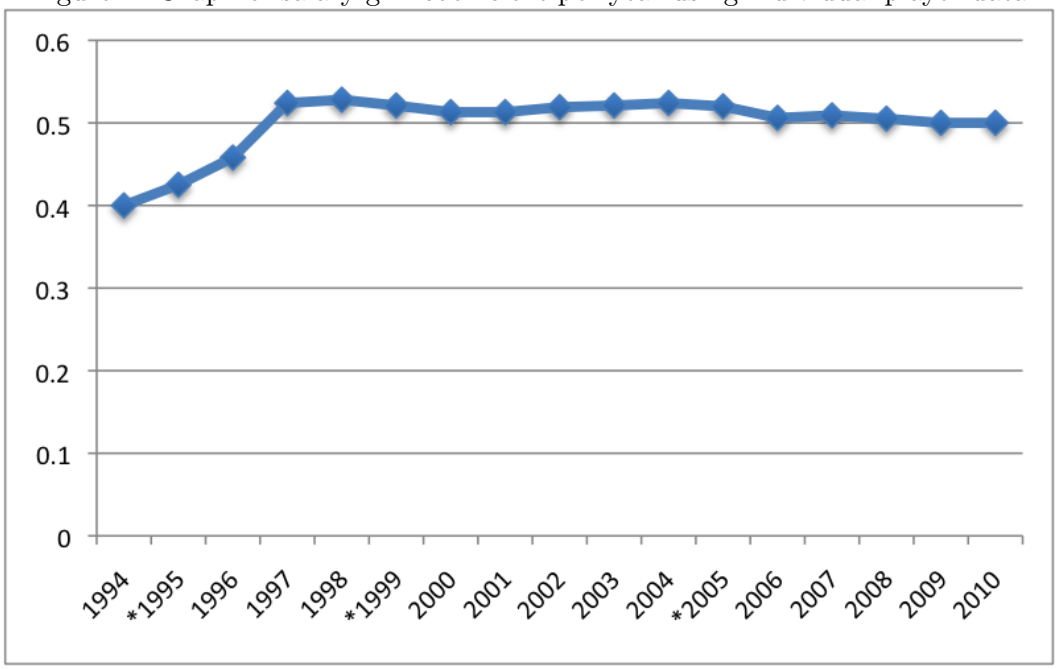
∗ denotes year of collective bargaining agreement

Figure 3: Graph of salary coefficient of variation per year using individual player data



∗ denotes year of collective bargaining agreement

Figure 4: Graph of salary gini coefficient per year using individual player data



∗ denotes year of collective bargaining agreement

Figure 5: Kernel Estimates of Density after the 1995 Collective Bargaining Agreement
1-year interval

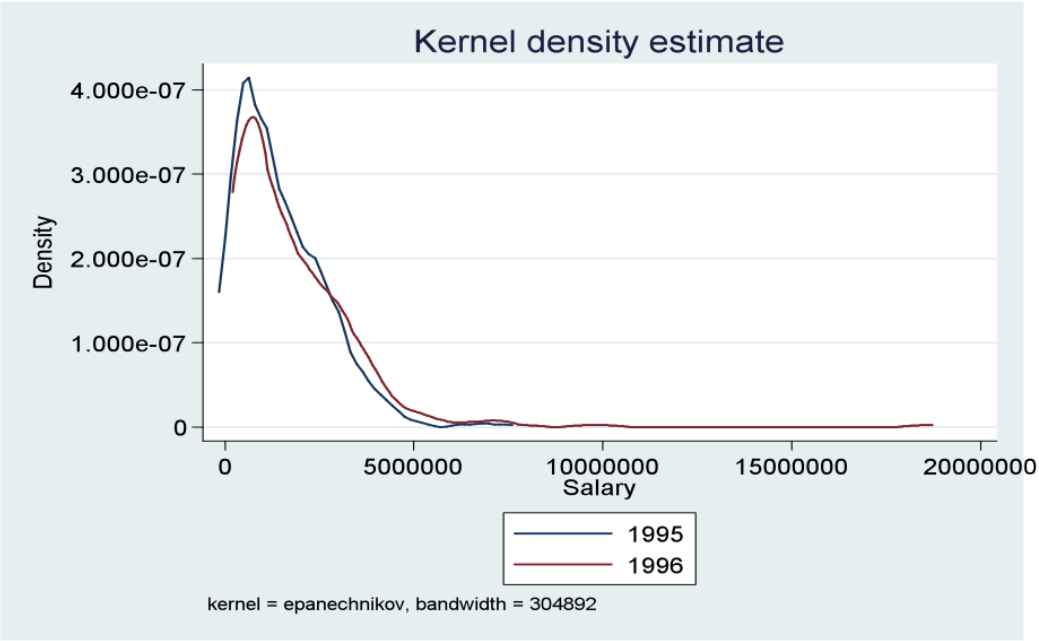


Figure 6: Kernel Estimates of Density after the 1995 Collective Bargaining Agreement
5-year interval

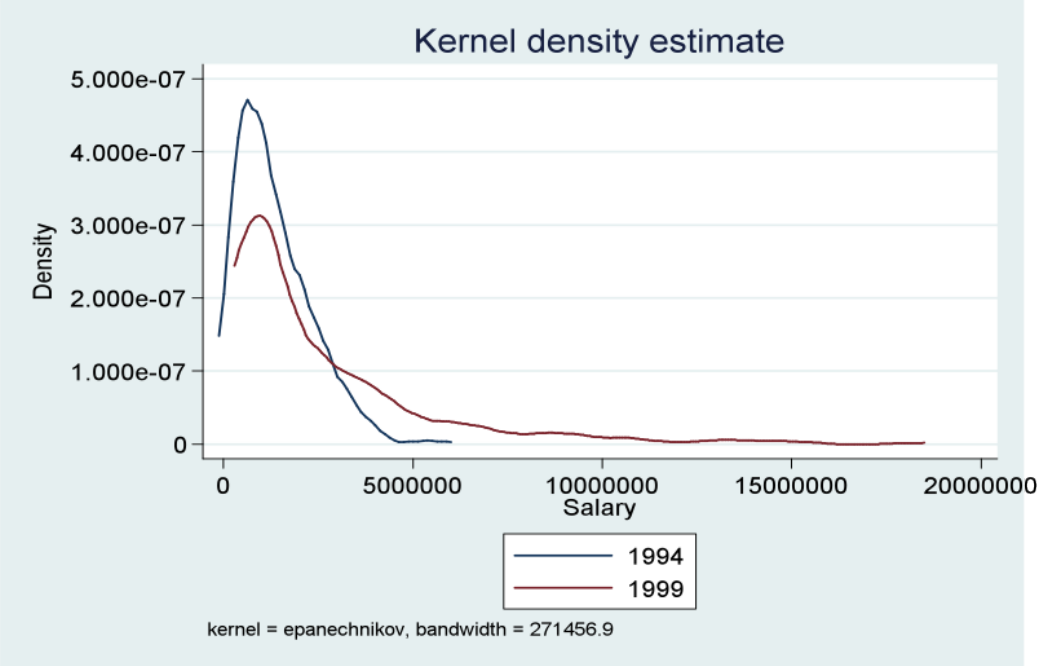


Figure 7: Kernel Estimates of Density after the 1999 Collective Bargaining Agreement
1-year interval

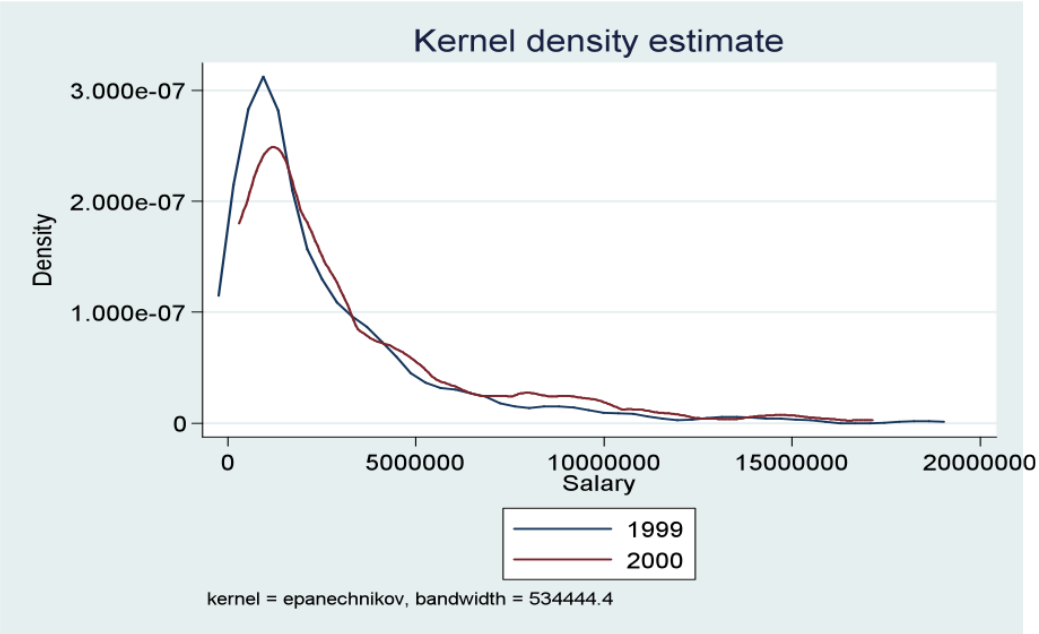


Figure 8: Kernel Estimates of Density after the 1999 Collective Bargaining Agreement
5-year interval

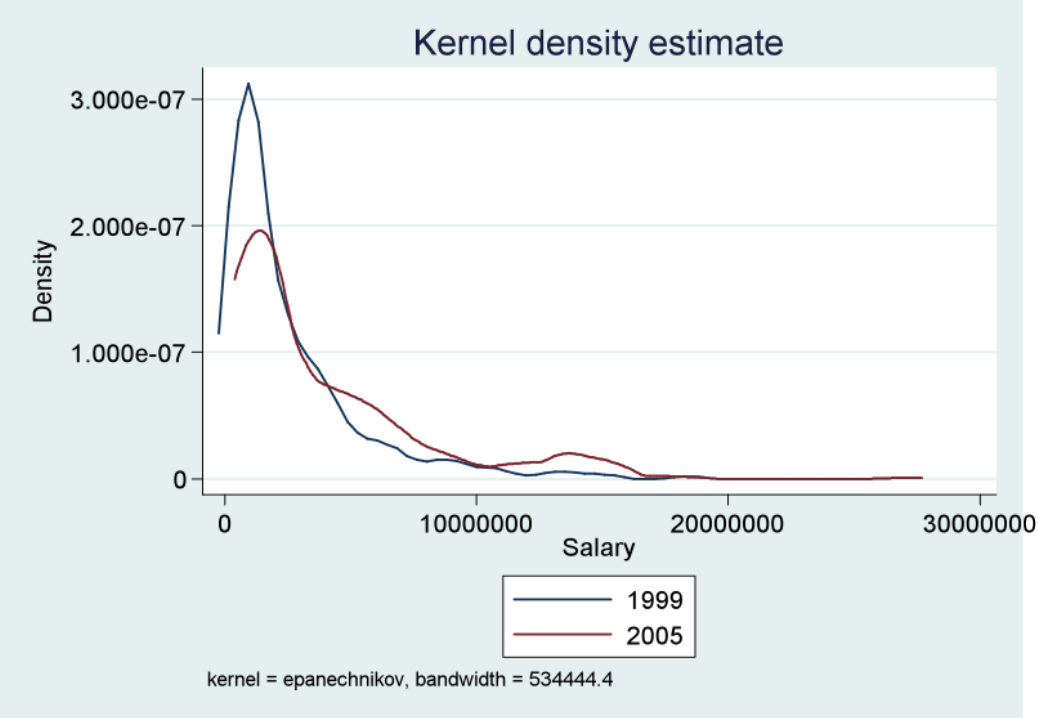


Figure 9: Kernel Estimates of Density after the 2005 Collective Bargaining Agreement
1-year interval

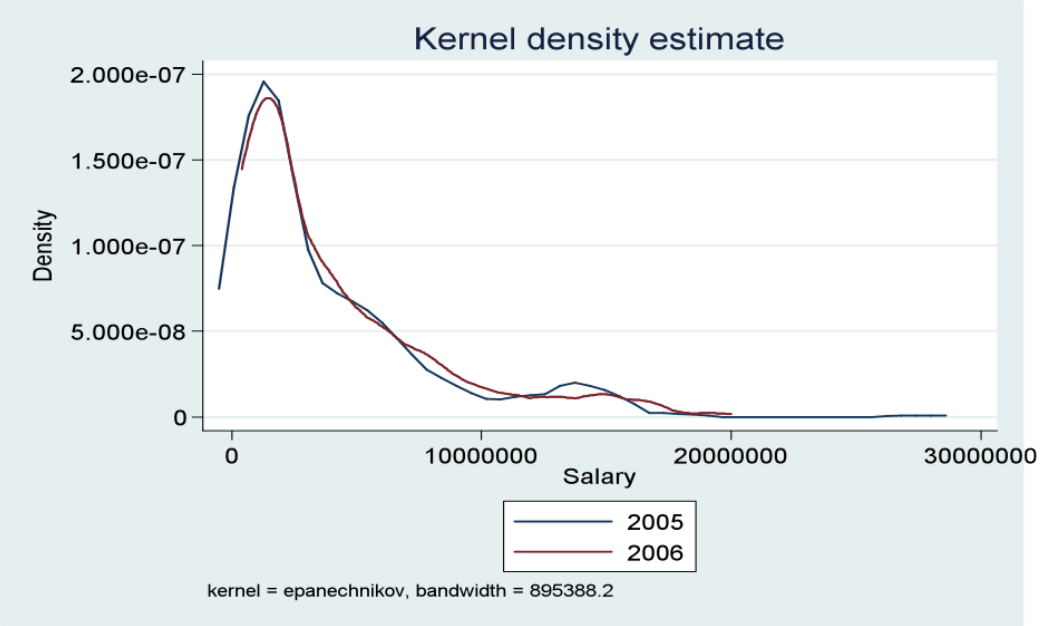


Figure 10: Kernel Estimates of Density after the 2005 Collective Bargaining Agreement
5-year interval

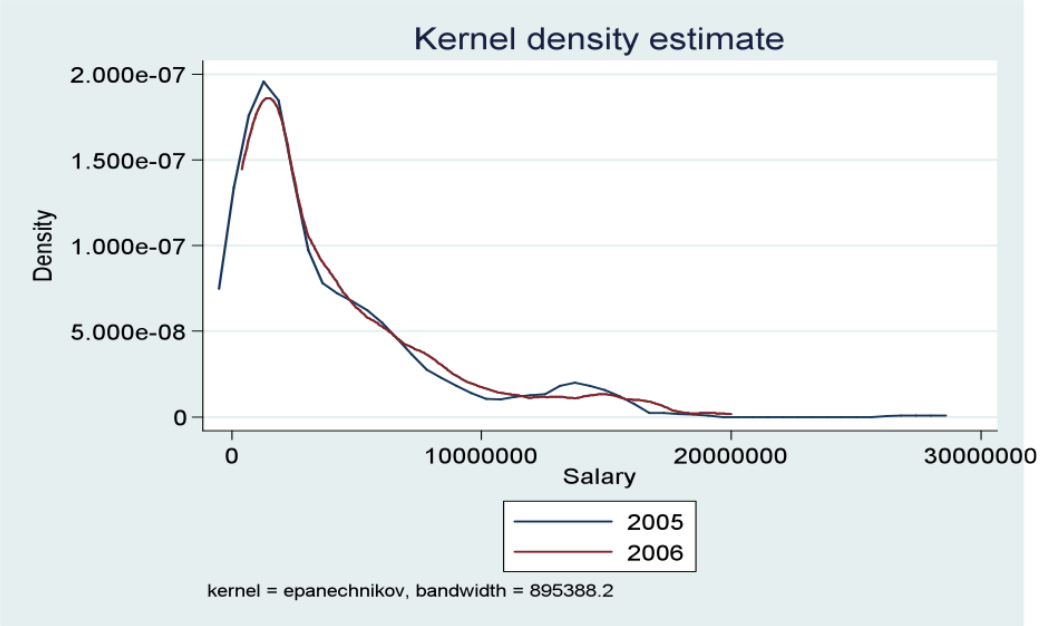


Table 4: Lorenz Curve Decile Group Shares

Year	Obs	1	2	3	4	5	6	7	8	9	10	Gini
1994	342	1.23%	2.67%	5.38%	4.75%	7.48%	9.42%	11.51%	14.72%	17.44%	25.38%	0.400
1995*	346	1.09%	1.77%	4.68%	4.75%	6.95%	9.51%	12.06%	15.60%	17.75%	25.83%	0.425
1996	363	1.42%	1.65%	3.02%	5.82%	5.99%	8.42%	11.60%	14.48%	18.17%	29.44%	0.458
1997	379	2.25%	0.14%	2.21%	4.31%	5.70%	7.59%	10.15%	13.43%	18.43%	35.79%	0.524
1998	392	1.71%	0.74%	2.38%	3.87%	5.50%	7.66%	10.04%	14.19%	16.94%	36.97%	0.528
1999 *	393	1.50%	1.62%	3.06%	4.10%	4.40%	7.14%	9.46%	13.25%	18.71%	36.75%	0.521
2000	393	1.19%	1.64%	2.71%	4.08%	9.02%	3.66%	9.51%	13.34%	19.67%	35.18%	0.513
2001	414	1.01%	1.74%	2.75%	3.80%	6.61%	6.49%	9.42%	13.82%	19.88%	34.48%	0.513
2002	408	1.27%	1.70%	2.50%	3.47%	6.94%	6.38%	9.53%	13.38%	19.67%	35.17%	0.519
2003	393	1.11%	1.73%	2.53%	3.35%	5.14%	7.23%	11.53%	12.52%	21.92%	32.93%	0.521
2004	400	1.19%	2.00%	3.01%	2.83%	4.27%	6.95%	10.51%	13.89%	19.86%	35.48%	0.524
2005 *	427	1.82%	1.49%	2.95%	2.95%	4.67%	6.95%	10.03%	14.09%	19.65%	35.39%	0.520
2006	425	1.27%	1.84%	2.64%	3.85%	5.52%	6.97%	10.35%	13.80%	19.90%	33.85%	0.506
2007	428	1.57%	1.53%	2.59%	3.88%	5.05%	7.46%	11.13%	12.91%	19.86%	34.02%	0.509
2008	420	1.28%	1.87%	2.70%	3.74%	5.37%	7.16%	9.94%	13.71%	20.53%	33.70%	0.505
2009	415	1.48%	1.77%	2.72%	3.64%	5.54%	7.30%	10.42%	13.80%	20.72%	32.63%	0.500
2010	409	1.38%	2.05%	2.69%	3.82%	5.99%	6.62%	10.05%	13.86%	20.89%	32.66%	0.500

Displays players in 10% group intervals and their share of total salaries

* Denote year of collective bargaining agreement

Table 5: Lorenz Curve Decile Cumulative Shares

Year	Obs	1	2	3	4	5	6	7	8	9	10
1994	342	1.23%	3.91%	9.29%	14.04%	21.52%	30.94%	42.45%	57.17%	74.62%	100.00%
1995 *	346	1.09%	2.86%	7.54%	12.29%	19.25%	28.76%	40.82%	56.42%	74.17%	100.00%
1996	363	1.42%	3.06%	6.08%	11.90%	17.89%	26.31%	37.91%	52.39%	70.56%	100.00%
1997	379	2.25%	2.38%	4.59%	8.90%	14.61%	22.20%	32.35%	45.78%	64.21%	100.00%
1998	392	1.71%	2.45%	4.83%	8.70%	14.20%	21.86%	31.90%	46.09%	63.03%	100.00%
1999 *	393	1.50%	3.12%	6.18%	10.28%	14.68%	21.82%	31.28%	44.53%	63.25%	100.00%
2000	393	1.19%	2.83%	5.54%	9.62%	18.64%	22.30%	31.81%	45.15%	64.82%	100.00%
2001	414	1.01%	2.75%	5.50%	9.30%	15.91%	22.40%	31.82%	45.64%	65.52%	100.00%
2002	408	1.27%	2.97%	5.47%	8.94%	15.88%	22.26%	31.78%	45.16%	64.83%	100.00%
2003	393	1.11%	2.84%	5.37%	8.72%	13.87%	21.10%	32.62%	45.15%	67.07%	100.00%
2004	400	1.19%	3.19%	6.20%	9.03%	13.30%	20.26%	30.77%	44.66%	64.52%	100.00%
2005 *	427	1.82%	3.31%	6.26%	9.21%	13.88%	20.84%	30.87%	44.96%	64.61%	100.00%
2006	425	1.27%	3.10%	5.75%	9.60%	15.12%	22.09%	32.44%	46.24%	66.15%	100.00 %
2007	428	1.57%	3.10%	5.69%	9.57%	14.63%	22.09%	33.22%	46.13%	65.98%	100.00 %
2008	420	1.28%	3.15%	5.85%	9.60%	14.97%	22.12%	32.07%	45.78%	66.30%	100.00 %
2009	415	1.48%	3.24%	5.96%	9.60%	15.14%	22.44%	32.85%	46.65%	67.37%	100.00 %
2010	409	1.38%	3.42%	6.11%	9.93%	15.92%	22.54%	32.59%	46.45%	67.34%	100.00%

Displays players in 10% group intervals and their share of total salaries as they sum up to the top 10%
* Denote year of collective bargaining agreement

Table 6: Lorenz Curve - Group Share Concentrated Quantiles

Year	Observations	Top 1%	Top 2%	Top 5%	Middle 20%	Bottom 20%
1994	342	3.30%	5.93%	14.30%	16.91%	3.91%
1995 *	346	3.68%	6.35%	14.84%	16.47%	2.86%
1996	363	5.82%	10.07%	18.48%	14.41%	3.06%
1997	379	7.28%	12.55%	23.63%	13.30%	2.38%
1998	392	7.61%	12.97%	24.71%	13.16%	2.45%
1999 *	393	4.91%	10.32%	22.31%	11.54%	3.12%
2000	393	4.06%	8.95%	19.50%	12.68%	2.83%
2001	414	5.15%	9.51%	19.68%	13.10%	2.75%
2002	408	5.71%	10.23%	16.35%	13.32%	2.97%
2003	393	4.65%	9.43%	12.20%	12.37%	2.84%
2004	400	4.59%	6.68%	19.95%	11.22%	3.19%
2005 *	427	4.85%	6.67%	20.08%	11.63%	3.31%
2006	425	3.37%	8.19%	19.52%	12.49%	3.10%
2007	428	4.35%	7.33%	19.70%	12.52%	3.10%
2008	420	4.46%	7.54%	19.52%	12.53%	3.15%
2009	415	4.44%	8.59%	18.33%	12.84%	3.24%
2010	409	4.71%	8.74%	16.46%	12.61%	3.42%

Displays players in more concentrated group intervals and their share of total salaries
* Denote year of collective bargaining agreement

Table 7
Fixed Effects Regression: Dependent Variable - Coefficient of Variation

	(1)	(2)	(3)	(4)
Intercept	0.735	1.053	0.982	0.982
	(0.128)***	(0.092)***	(0.017)***	(0.017)***
Pre 1995 CBA	-0.219	-0.210	-0.252	-0.252
	(0.047)***	(0.047)***	(0.047)***	(0.048)***
1995 CBA	-0.036	-0.020	-0.046	-0.067
	(0.030)	(0.030)	(0.030)	(0.028)**
1999 CBA	0.016	0.016	0.011	0.028
	(0.026)	(0.027)	(0.027)	(0.024)
1995 NBC Contract	-0.088	-0.089	-0.082	
	(0.047)*	(0.048)*	(0.049)*	
1999 NBC Contract	0.063	0.078	0.066	
	(0.048)	(0.047)*	(0.048)	
2003 ESPN Contract	0.020	0.027	0.038	
	(0.046)	(0.047)*	(0.048)	
Height CV	-5.655	-6.502		
	(1.401)***	(1.407)***		
Weight CV	0.445	0.810		
	(0.509)	(0.508)		
Age CV	0.969	0.840		
	(0.346)***	(0.352)**		
Points CV	0.229			
	(0.121)*			
Field Goal Percent CV	-0.254			
	(0.143)*			
3 Point Percent CV	-0.030			
	(0.056)			
Free Throw Percent CV	-0.072			
	(0.113)			
Rebounds CV	0.300			
	(0.097)***			
Assists CV	-0.084			
	(0.056)			
Steals CV	0.123			
	(0.088)			
Blocks CV	-0.010			
	(0.039)			
Turnovers CV	-0.036			
	(0.113)			
Usage Percent CV	0.216			
	(0.160)			
Player Talent Controls		X	X	X
Player Characteristics Controls			X	X
Television Contract Controls				X
Observations	495	495	495	495
R-Squared	0.21	0.14	0.09	0.08

*,**,*** Denote significance at the 90%, 95% and 99% respectively
Robust standard errors in parentheses
CV denote Coefficient of Variation, CBA denote collective bargaining agreement

Table 8
Fixed Effects Regression: Dependent Variable - Gini Coefficient

	(1)	(2)	(3)	(4)
Intercept	0.543	0.568	0.484	0.484
	(0.043)***	(0.030)***	(0.006)***	(0.006)***
Pre 1995 CBA	-0.072	-0.073	-0.086	-0.086
	(0.016)***	(0.015)***	(0.016)***	(0.016)***
1995 CBA	-0.027	-0.027	-0.035	-0.040
	(0.010)***	(0.010)***	(0.010)***	(0.009)**
1999 CBA	-0.005	-0.004	-0.008	-0.009
	(0.009)	(0.009)	(0.009)	(0.008)
1995 NBC Contract	-0.021	-0.021	-0.018	
	(0.016)	(0.016)	(0.016)	
1999 NBC Contract	-0.010	-0.013	-0.016	
	(0.016)	(0.015)	(0.016)	
2003 ESPN Contract	-0.001	0.003	0.007	
	(0.015)*	(0.015)	(0.016)	
Height CV	-2.126	-2.314		
	(0.468)***	(0.461)***		
Weight CV	-0.070	0.042		
	(0.170)	(0.166)		
Age CV	0.153	0.122		
	(0.116)	(0.115)		
Points CV	0.049			
	(0.041)*			
Field Goal Percent CV	-0.084			
	(0.048)*			
3 Point Percent CV	-0.013			
	(0.019)			
Free Throw Percent CV	-0.027			
	(0.038)			
Rebounds CV	-0.015			
	(0.032)			
Assists CV	-0.027			
	(0.019)			
Steals CV	0.021			
	(0.029)			
Blocks CV	0.016			
	(0.013)			
Turnovers CV	-0.004			
	(0.038)			
Usage Percent CV	0.107			
	(0.053)**			
Player Talent Controls		X	X	X
Player Characteristics Controls			X	X
Television Contract Controls				X
Observations	495	495	495	495
R-Squared	0.18	0.14	0.09	0.08

*,**,*** denote significance at the 90%, 95% and 99% respectively
Robust standard errors in parentheses
CV denote Coefficient of Variation, CBA denote collective bargaining agreement

Table 9
Fixed Effects Regression: Dependent Variable - Herfindahl Hirschman Index

	(1)	(2)	(3)	(4)
Intercept	0.122	0.154	0.138	0.138
	(0.020)***	(0.014)***	(0.003)***	(0.003)***
Pre 1995 CBA	-0.017	-0.014	-0.019	-0.019
	(0.007)**	(0.007)*	(0.007)***	(0.007)***
1995 CBA	0.006	0.008	0.005	0.005
	(0.005)	(0.005)*	(0.005)	(0.004)
1999 CBA	0.005	0.004	0.003	0.008
	(0.004)	(0.004)	(0.004)	(0.004)**
1995 NBC Contract	-0.006	-0.004	-0.003	
	(0.007)	(0.008)	(0.008)	
1999 NBC Contract	0.020	0.019	-0.018	
	(0.008)***	(0.007)***	(0.007)**	
2003 ESPN Contract	0.008	0.010	0.012	
	(0.007)	(0.007)	(0.007)	
Height CV	-0.859	-0.940		
	(0.219)***	(0.221)***		
Weight CV	0.097	0.133		
	(0.080)	(0.080)*		
Age CV	0.110	0.076		
	(0.054)**	(0.055)		
Points CV	0.010			
	(0.019)			
Field Goal Percent CV	-0.050			
	(0.022)**			
3 Point Percent CV	-0.014			
	(0.009)			
Free Throw Percent CV	-0.024			
	(0.018)			
Rebounds CV	0.054			
	(0.015)***			
Assists CV	-0.014			
	(0.009)			
Steals CV	0.016			
	(0.014)			
Blocks CV	-0.001			
	(0.006)			
Turnovers CV	-0.008			
	(0.018)			
Usage Percent CV	0.034			
	(0.025)			
Player Talent Controls		X	X	X
Player Characteristics Controls			X	X
Television Contract Controls				X
Observations	495	495	495	495
R-Squared	0.16	0.08	0.04	0.03

*,**,*** denote significance at the 90%, 95% and 99% respectively
Robust standard errors in parentheses
CV denote Coefficient of Variation, CBA denote collective bargaining agreement

Table 10
Fixed Effects Regression: Dependent Variable - Normalized Herfindahl Hirschman Index

	(1)	(2)	(3)	(4)
Intercept	0.045	0.084	0.072	0.072
	(0.021)**	(0.015)***	(0.003)***	(0.003)***
Pre 1995 CBA	-0.025	-0.023	-0.028	-0.028
	(0.008)***	(0.008)***	(0.008)***	(0.008)***
1995 CBA	0.002	-0.004	0.001	-0.001
	(0.005)	(0.005)	(0.005)	(0.004)
1999 CBA	0.005	0.004	0.003	0.008
	(0.004)	(0.004)	(0.004)	(0.004)*
1995 NBC Contract	-0.010	-0.009	-0.008	
	(0.008)	(0.008)	(0.008)	
1999 NBC Contract	0.017	0.018	0.017	
	(0.008)**	(0.008)**	(0.008)**	
2003 ESPN Contract	0.007	0.009	0.011	
	(0.007)	(0.008)	(0.008)	
Height CV	-0.912	-1.015		
	(0.228)***	(0.229)***		
Weight CV	0.101	0.148		
	(0.083)	(0.083)*		
Age CV	0.132	0.102		
	(0.056)**	(0.057)*		
Points CV	0.017			
	(0.020)			
Field Goal Percent CV	-0.048			
	(0.023)**			
3 Point Percent CV	-0.010			
	(0.009)			
Free Throw Percent CV	-0.018			
	(0.018)			
Rebounds CV	0.058			
	(0.016)***			
Assists CV	-0.016			
	(0.009)*			
Steals CV	0.019			
	(0.014)			
Blocks CV	-0.003			
	(0.006)			
Turnovers CV	0.002			
	(0.018)			
Usage Percent CV	0.037			
	(0.026)			
Player Talent Controls		X	X	X
Player Characteristics Controls			X	X
Television Contract Controls				X
Observations	495	495	495	495
R-Squared	0.18	0.10	0.06	0.04

*,**,*** denote significance at the 90%, 95% and 99% respectively
Robust standard errors in parentheses
CV denote Coefficient of Variation, CBA denote collective bargaining agreement