

Empirical Analysis of NBA 2011 CBA Changes and Their Effects on Competitive Balance.

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Abstract:

This paper investigates the effects of the 2011 collective bargaining agreement on the competitive balance in the National Basketball Association. It illustrates how the different rules and regulations affected various factors within the sport, and in turn how these alterations affected the competitive balance of the NBA. The goal is to exemplify the importance of NBA factors in the competitive balance of the sport and prevent incorrect manipulation of the industry. The results showed that the 2011 CBA did little to none in terms of improving the level of competitive balance within the NBA. All of the factors that were changed by the 2011 CBA countered one another in the efforts to increase competitive balance, however all of these factors showed to be statistically significant towards affecting competitive balance.

JEL Classification: L83

Keywords: Competitive Balance, Regression, Gini, Significance, Coefficient, Standard Deviation

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1.0 INTRODUCTION

The National Basketball Association is one of the more world renowned professional sports leagues. The NBA attracts fans from across the globe to watch their favorite players play, and their favorite teams compete for national championships. The concept of competitive balance within sports is measured as the degree in which teams have an equal chance of winning. Competitive balance plays an important role in the success of sports leagues, because without it fans are not as intrigued to watch. The ratification of the new NBA Collective Bargaining Agreement in 2011 was set to increase the luxury tax threshold and rate. The luxury tax threshold is the amount of money that teams can pay players over the salary cap without getting a luxury tax penalty. The rate is the per dollar amount that teams will get penalized if they were to surpass the luxury tax threshold. The agreement decreases the maximum contract length that players can sign from 7 years to 5 years and decreased the percent revenue share between the players and owners to 50%. In the 2011 season alone, there were over two-thirds of the teams in the NBA that were losing money although the league combined was making over four billion dollars in annual revenue. The agreement set out to make teams money again, while increasing competitive balance.

This study aims to enhance understanding of the effects of the 2011 CBA changes in the NBA on competitive balance by providing an empirical analysis of the competitive balance before and after the CBA changes. By conducting this analysis, the study seeks to illustrate the factors that contributed to the changes in competitive balance, and the extent to which the CBA changes in 2011 effected these values. From a policy perspective, this analysis is important because it can evaluate the decisions made in past NBA collective bargaining agreements, in hopes of being more productive in future policies. The findings of this analysis can provide a sort of guidance in evaluating the areas of change that were successful towards competitive balance and areas that could use further improvement.

This paper was guided by the research objective of analyzing all of the given changes that the 2011 CBA implemented into the NBA. The empirical analysis that have been researched offers information on individual variables such as revenue sharing or

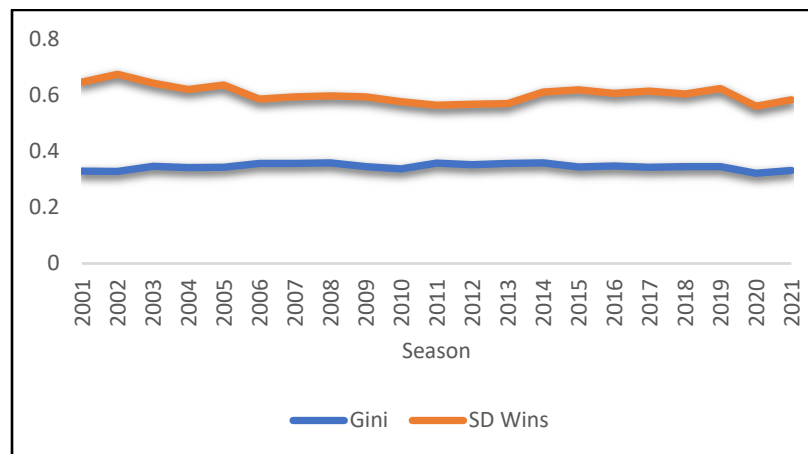
salary cap and how they affect competitive balance. This paper offers the full layout to illustrate how all variables interact with each other and what variables should be more focused on.

The rest of the paper is organized as follows: Section 2 is the trend of the given topic. Section 3 is the literature review. Section 4 is the data and empirical methodology. Section 5 is the results and section 6 is the conclusion.

2.0 TREND

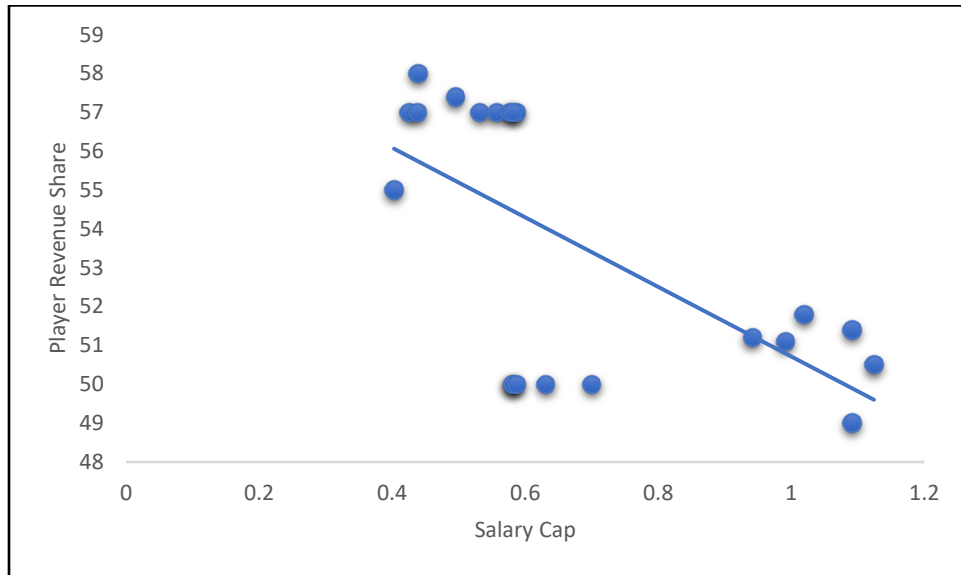
There are multiple ways in which competitive balance can be measured in sports. The Gini Coefficient of wins and the Standard Deviation of wins were the two that I used in my models to assess the effects of the 2011 CBA changes on competitive balance. Figure 1 shows the values of these two measurements over the past 20 years in the NBA.

Figure 1: Measures of Competitive Balance



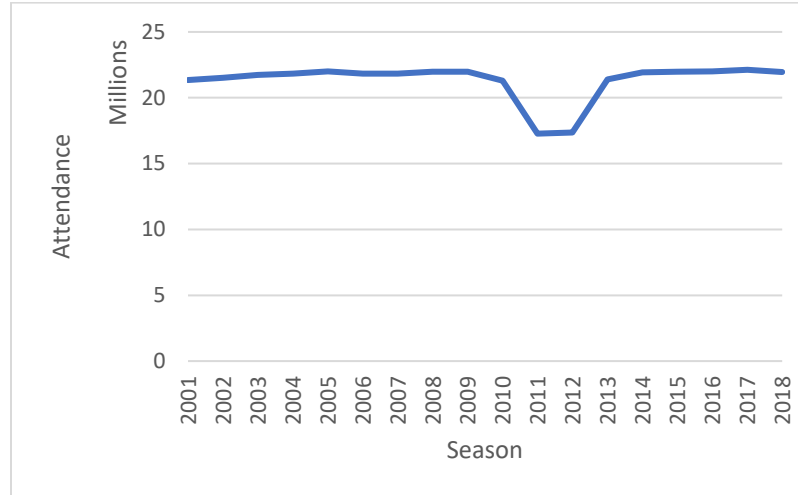
As shown in Figure 1, there has been no significant change in the level of competitive balance from 10 years before the 2011 CBA changes and 10 years after. The standard deviation of wins was slightly decreasing before 2011 then began to slightly increase after 2011. The Gini coefficient of the wins stayed relatively the same over the past 20 years in the NBA.

Figure 2: Salary Cap and Player Revenue Share



In Figure 2, there is a clear trend between Player Revenue Share and Salary Cap. When the NBA Players Association and the team owners come together to create Collective Bargaining Agreements, the primary goal is to ensure the league is an efficient and healthy industry. The negative trend line between Salary Cap and Player Revenue Share tells a slightly different story. The Salary Cap variable naturally increases as teams make more money. The more money teams have, the more capable they are of paying their players. As shown, when the Salary Cap increases, the Player Revenue Share decreases. This means that owners are taking advantage of the changes in the CBA agreements and taking a higher percentage of the revenue as more money flows in.

Figure 3: NBA Attendance



Source: HoopHype Website

Figure 3 illustrates the total NBA game attendance from the year 2001-2018. The years 2018 to 2021 were taken out of consideration due to the COVID-19 pandemic. As shown, there has not been a significant increase or decrease in NBA attendance over the past 20 years. There was a decrease in attendance for a minimum amount of time from 2011 to 2013, around the time where the 2011 CBA was put into place. The per yer attendance behaves similarly to that of the levels of competitive balance. There has been little to no change in either. This suggests that they move in the same way, and if competitive balance were to change, the fans would become more or less interested in watching the NBA depending on the level in which the competitive balance changes, and the attendance numbers would reflect that.

3.0 LITERATURE REVIEW

The National Basketball Association is a world renown competitive sports league that takes place in the United States. The stability and structure of the financials within the sport, along with the relations with the players, is built upon the Collective Bargaining Agreement (CBA). The CBA pairs with the National Basketball Association (NBPA) to cover the terms and conditions for the overall employment and well-being of the players. Every few years, the CBA is refreshed to keep up with problems that may

arise within the sport. In 2011, there were significant changes in the CBA that would primarily target the concerns on competitive balance. There have been various empirical studies that illustrate the effectiveness of different variables on competitive balance.

Colby and Jenkins (2016) found that revenue sharing within a league can increase the amount of resources that small market teams have, and therefore decrease the amount of competitive imbalance between sports. They found that when revenue disparities in Major League Baseball were solved, the competitive balance was more equal. Looking at other sports like the MLB, Kesenne (2004) looked at three different sports when analyzing revenue sharing. Kesenne (2004) found that up to a certain point, revenue sharing increases competitive balance. After that point, it starts to negatively affect the sport and decrease competitive balance.

There are a wide range of variables that the 2011 CBA looked to alter in hopes of increasing competitive balance other than revenue sharing. The 2011 CBA had completely revamped the way in which teams were to pay for their luxury tax, almost disincentivizing teams to go over this tax and therefore wouldn't spend more money on players. Grant and Shorin (2017) studied the impact of the NBA luxury tax and found no significant effect on competitive balance, showing that it is perhaps an ineffective tool when trying to increase the competitive balance within a sport.

Like this empirical analysis, Totty and Owens (2011) examined the effects of salary caps on competitive balance and found that it may not only be ineffective but may negatively impact competitive balance within sports. They used the standard deviation of wins as the independent variable, similar to that of this analysis. Couture (2016) also analyzed the effects of salary cap and competitive balance, specifically in the NBA. This analysis used the 1998 CBA to analyze the changes in competitive balance, and it was found to be a big impact on the increase in such. All empirical papers studied, including Totty and Owens (2011), Couture (2016) and also Alwell (2020) used Standard Deviation of Wins as their dependent variable and their form of measurement for competitive balance.

4.0 DATA AND EMPIRICAL METHODOLOGY

4.1 Data

The study uses annual time series data. Data was obtained from the HoopsHype and TeamRankings websites, as well as other articles such as NBA revenue statistics (2001-2022) by Dimitrije Curcic. Summary statistics for the data are provided in Table 1.

Table 1: Summary Statistics

	Gini	SDW	Minimum Salary	% Revenue Share	Salary Cap	Luxury Tax Threshold	Max Contract Length	Luxury Tax Rate
Mean	0.345357711	0.604933227	0.53056514	0.532798092	68.46011129	83.88022258	5.712241653	1.262321145
Standard Error	0.000421638	0.001171839	0.005387632	0.001388426	0.956077498	1.109242457	0.032875013	0.009963963
Median	0.346	0.605	0.507336	0.5	58.044	70.31	5	1.5
Mode	0.357	0.675	0.473604	0.5	58.044	70.31	5	1.5
Standard Deviation	0.010574615	0.029389575	0.135121132	0.03482155	23.97830166	27.81965929	0.824501142	0.249894918
Sample Variance	0.000111822	0.000863747	0.01825772	0.00121254	574.9589506	773.9334433	0.679802133	0.06244747
Kurtosis	-0.58037487	-0.342825089	3.364349772	-1.930567015	-0.993197149	-0.880591532	-1.289942997	-1.996572374
Skewness	-0.500899667	0.459594945	1.957542919	0.150206925	0.744703621	0.895598496	0.577226542	-0.098925154
Range	0.037	0.114	0.566258	0.08	72.143	83.47	2	0.5
Minimum	0.322	0.561	0.359	0.5	40.271	53.14	5	1
Maximum	0.359	0.675	0.925258	0.58	112.414	136.61	7	1.5
Sum	217.23	380.503	333.725473	335.13	43061.41	52760.66	3593	794
Count	629	629	629	629	629	629	629	629

The Gini Coefficient was one of the two independent variables that I used for the measurements of competitive balance. The Gini Coefficient considers the equality of the distribution of wins amongst NBA teams. I used the equation $G = (2 / n(n-1) * \mu) * \sum[i=1 \text{ to } n](i * x_i) - (n + 1) / (n - 1)$ to calculate the observed values for each year in the NBA 10 years before and after the 2011 CBA. The n equals the number of teams in the NBA, μ is the mean number of wins per team, x_i is the number of wins for team 1 and the Greek uppercase letter sigma means the sum of all the values of i multiplied by x_i ranging from team 1 to n.

The other independent variable used for measuring competitive balance is the standard deviation of wins, which considers the amount of variation between wins amongst the NBA teams for every season from 2001-2021. The equation used was $\sigma = \sqrt{\sum(x_i - \mu)^2 / (n - 1)}$. The square root of the variance of the residuals was taken for both regression models to indicate the absolute fit of the models to the data.

Table 2: Correlation Coefficient

	<i>Gini</i>	<i>SDW</i>	<i>Minimum Salary</i>	<i>% Revenue Share</i>	<i>Salary Cap</i>	<i>Luxury Tax Threshold</i>	<i>Max Contract Length</i>	<i>Luxury Tax Rate</i>
Gini	1							
SDW	-0.29274167	1						
Minimum Salary	-0.363289259	-0.480287174	1					
% Revenue Share	-0.02218241	0.355595661	-0.478947972	1				
Salary Cap	-0.251972165	-0.308432422	0.80775361	-0.701758268	1			
Luxury Tax Thresh	-0.277324201	-0.282628698	0.807993958	-0.653251026	0.988800188	1		
Max Contract Length	-0.237472249	0.635182787	-0.545591251	0.89108892	-0.729782388	-0.664627025	1	
Luxury Tax Rate	0.063860607	-0.404139647	0.505624895	-0.990301312	0.71978175	0.668864676	-0.908244933	1

Table 2 shows the correlation coefficient of the data used. There were only a few significant correlations between all the variables. There was a high correlation between Salary Cap and Luxury Tax Threshold at .988. As the Salary Cap increases, there is naturally an increase in the threshold of the Luxury Tax. There was also a high correlation between Max Contract Length and Luxury Tax Rate. There were a few others, but most were not significantly correlated, eliminating the risk of multicollinearity. This allowed the individual variables to be interpreted as contributing in their own ways.

4.2 Empirical Model

The models could be written as follows:

Model 1:

$$Gini = \beta_0 + \beta_1 MinimumSalary + \beta_2 \%RevenueShare + \beta_3 SalaryCap + \beta_4 LuxuryTaxThreshold + \beta_5 MaxContractLength + \beta_6 LuxuryTaxRate + \varepsilon_i$$

Model 2:

$$SDW = \beta_0 + \beta_1 MinimumSalary + \beta_2 \%RevenueShare + \beta_3 SalaryCap + \beta_4 LuxuryTaxThreshold + \beta_5 MaxContractLength + \beta_6 LuxuryTaxRate + \varepsilon_i$$

The models are almost completely identical other than the dependent variables of Gini and SDW. These differences were to illustrate how the independent variables affected various measures of competitive balance.

Independent variables consist of seven variables obtained from various sources. Appendix A provide data source, acronyms, descriptions, expected signs, and justifications for using the variables. First, *MinimumSalary* represents the minimum amount of money a player can sign for each year. *%RevenueShare* is the percentage of revenue that the individual team makes that is shared with the players that formulate the team. *SalaryCap* is the total amount of money that teams can sign players for in each season. *LuxuryTaxThreshold* is the amount of money that teams can exceed the Salary Cap by before enduring a luxury tax penalty. *MaxContractLength* is the maximum number of years that a player can sign for in a contract. *LuxuryTaxRate* is the per dollar amount that teams will be penalized once exceeding the luxury tax threshold. The independent variables differed in whether or not they were directly changed by the 2011 CBA. For example, *SalaryCap* and *MinimumSalary* are variables that were not changed by the CBA. These variables are progressively changing due to the environment of the economy. Variables such as either or the luxury tax variables, or *MaxContractLength*, were directly affected. The combination of both types of independent variables allowed for the results to show which factors truly are significant towards affecting the level of competitive balance.

5.0 EMPIRICAL RESULTS

The empirical estimation results are presented in Table 2. The empirical estimation shows that all seven of the independent variables used were statistically significant towards determining the level of competitive balance in the NBA at the 1%, 5% and 10% levels. The signs of the coefficients for every variable except for minimum salary were the opposite between the two models. This is expected due to the nature in which both independent variables are calculated. The key commonality between both models was the differing signs of the coefficients within the respected models. Both models have all of the independent variables opposing one another in regard to how each variable individually affected the value of the competitive balance.

Model 1 and 2 both had high R² values, indicating that both fit the model well. The root mean squared error was tested to ensure the high performance of the models by comparing the observed vs. predicted values.

Table 2: Regression results for the ASEAN-5

Competitive Balance		
	I Gini	II SDW
CONSTANT	-.0132 (.0339)	1.082 (.0695)
MinimumSalary	-.042*** (.002)	-.134*** (.005)
%RevenueShare	.775*** (.046)	-1.34*** (.095)
SalaryCap	-.001*** (.000008)	.003*** (.0001)
LuxuryTaxThreshol d	.0008*** (.000006)	-.0002*** (.0001)
MaxContractLength	-.020*** (.0007)	.0635*** (.0014)
LuxuyTaxRate	.079*** (.007)	-.098*** (.0143)
R ²	0.733	0.855
F-statistics	285.7***	613.97***
Number of obs.	628	628

Note: ***, **, and * denotes significance at the 1%, 5%, and 10% respectively. Standard errors in parentheses

A couple of findings were consistent to the major empirical studies that were analyzed to inspire the models created. Like that of Louchheim (2018), luxury tax rate was significant towards affecting the level of competitive balance. Paultor (2010), although studying the NFL and MLB, found similarities in that the revenue affects the level of competitive balance of a sport. The variable %RevenueShare was found to be statistically significant for both models, as well as MinimumSalary and SalaryCap. These findings are consistent with Totty and Owens (2011).

Interpreting these results begins with recognizing that all of the explanatory variables interacted in opposite directions of one another. This indicates that while some of the factors that were changed in the 2011 Collective Bargaining Agreement positively affected competitive balance, others did not. The policymakers tried to change too many different factors, and this resulted in multiple affects countering one another and the efficiency towards higher competitive balance was limited.

6.0 CONCLUSION

In summary, the changes made in the 2011 Collective Bargaining Agreement, which included increased luxury tax threshold and rate as well as decreased maximum contract length and percent revenue share, made no significant change to the competitive balance of the NBA. In studying multiple methodologies towards measuring competitive balance, through empirical modeling I was able to determine that all explanatory variables used are statistically significant towards affecting competitive balance. Furthermore, I was able to determine that many of these factors countered one another.

The policy implications of the study are that policy makers, in this case NBA owners and the Players' Association, need to carefully evaluate the potential effects that certain changes may have. Specifically, they should focus more of their attention on factors that positively affect competitive balance, like minimum salary and salary cap. One limitation of the study was not accounting for other factors such as coaching and team strategy, that may also influence competitive balance.

This study contributed to the extant literature by empirically analyzing the links between multiple factors that were changed by the 2011 CBA and competitive balance. Using two alternative measures of competitive balance, I empirically accessed the effects that the 2011 CBA changes made to competitive balance. The results showed that there are an extensive number of variables that are significant towards competitive balance, and the different affects that the individual factor changes had led to little to no progress in the level of competitive balance in the NBA.

Appendix A: Variable Description

Acronym	Description
MinimumSalary	The minimum amount of money that a player can sign for on a per year salary
%RevenueShare	The percent of the revenue that NBA teams are required to share with their players
SalaryCap	The maximum amount of money a team can spend on players in each season
LuxuryTaxThreshold	Distance as crow fly from Washington DC to the host country capital city
MaxContractLength	The maximum number of years a player can sign for in a given contract

LuxuryTaxRate	The per dollar amount that teams are taxed once they surpass the luxury tax threshold.
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