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Evaluating Market Inefficiencies of the National Basketball Association Through the Lens of the League's New Collective Bargaining Agreement

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ABSTRACT

With an average tenure length of approximately three seasons for a National Basketball Association (NBA) coach and general manager (GM) the pursuit to win and win fast is imperative. An industry worth billions of dollars offers an environment for the greatest minds available in the fields of advanced metrics and scouting to rise to the top. How is it that in an industry such as this there could be a market inefficiency stemming from these experts? In 2016, a new Collective Bargaining Agreement (CBA) ratified by both players and owners brought a whirlwind of change to the economic landscape of the league. With a new revenue sharing model, contract specifications and dynamic salary cap there was a plethora of influential factors that could cause a market inefficiency to arise. The 2017 Golden State Warriors and Cleveland Cavaliers swept through the NBA playoffs, only losing one game collectively up until the final round. With fewer playoff games than anticipated came a decrease in projected Basketball Related Income (BRI) which reduced the projected cap by millions of dollars. This in conjunction with the uncharted territory for decision makers in this new era of free agency resulted in players who were signed in the 2016 and 2017 off-seasons to be massively overpaid above their marginal product of revenue. Salary cap space for the 2018 off-season is a hot commodity as the cap has not increased nearly as much as was projected and cap hits are being taken left and right from ill-advised contracts. A market correction very well may be looming in the years to come which will allow for a retrospective study to be completed in conjunction with this paper.

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Decision making is behind every successful person and entity. I would like to thank all who helped me realize the importance of judgement and analytical thinking.

Chapter 1

Introduction

David and Goliath is a proverb that stands the test of time, a loveable underdog defeats the odds and slays his foe with seemingly courage and a lot of luck. I believe there is more to learn from this old story than what has been recreated in film, stories and theatre. How is it that the underdog was able to win and emerge victorious? Smarter decision making, rational thinking and analytical exploitation of data is what I believe is the true lesson from this story (Gladwell, 2013).

In 2002, an overwhelming underdog was able to beat the odds and overcome exceedingly low expectations in the eyes of their peers and the media. This underdog would not be one person, but the Oakland Athletics who employed a cutting edge and controversial set of concepts to build a team by exploiting market inefficiencies and outthinking their opponents. While conventional wisdom invented the wheel, it did not improve it, and in a capitalistic world that is what it's all about, improving and advancing faster than others. For this reason, throwing conventional wisdom out the window and embarking on a quest of data driven, rational decision making can be the best course.

With a foundation from previous literature, I implement data driven methods to explore and understand the true marginal revenue product of labor (MRPL) throughout the National Basketball Association (NBA) and how the most recent Collective Bargaining Agreement (CBA) has affected the market. I then collect data on revenue and wins of all NBA teams from 2008-2017. Individual players' statistics are gathered for analysis of their value. I use regression

analysis to estimate player-team specific MRPL's to gain a greater understanding of how individual teams' market size impacts the economics of the NBA. With the newest iteration of the CBA causing a shock in the market and subsequent reactions in free agency signings, an overhaul of decision making and pioneering has never had a better place to start. The regression analysis and data compiled shows that there was and is an inefficiency when it comes to the contacts of mid-tier NBA players signed around and after the most recent CBA.

Mid-tier players in the NBA have been vital to the success of every franchise just as Robert Horry did in the last generation, for the LA Lakers and San Antonio Spurs, and Andre Iguodala has done for the most recent Golden State Warriors' dynasty. The key to creating a team in a league where a salary cap exists is similar to as it is in any sector of the economy, allocate your resources more efficiently and effectively than your competitors. This is more easily said than done and as this paper will illustrate mid-tier players are susceptible to market corrections and reactions more than any other type of player, possibly being overpaid in bull markets and underpaid in bear markets. Because contracts are signed for multiple years at a time and the salary cap is a fixed number, being overpaid in one year can have impacts that extend far into a franchise's future.

As this paper progresses, the concept of market size will be introduced to show the effects it can have on the economics of sports. Large and small market teams act vastly different depending on their current status in the league. The intertwining ideas of profit and win maximization will be shown to be more closely linked than previously thought, especially in basketball. The conflict of profit and win maximization is part of the reason most every team employs the full salary cap each year in an attempt to signal a winning attitude and field a winning team. This fact and assumption is helpful for analysis in portraying that a team should

value a player on the scale of the entire salary cap. In a league where large market size has drastic inflationary effects on profits, motives and decision making can be starkly contrasted to that of their smaller market competitors.

Finally, all these concepts on mid-tier players and market size can be tied together using regression analysis on wins and revenue metrics. This will illustrate the market response to the shock that occurred when the most recent iteration of the CBA went into effect. Just as in any response to a shift in markets, a correction may be coming in the future. Salary cap hits are strong and long lasting which can mean the difference in vast pay days for players as well as a long-lasting dynasty for a team's success.

Chapter 2

Literature Review

Evaluating players through metrics has been a practice engaged in since the dawn of modern sports. Team management has longed for the most accurate representation of a player's value to a team in an effort to maximize winning, revenue, fan interest and many other important factors. The aim of this paper is not to recreate evaluation methods of basketball players from other studies that will be examined throughout this literature review. The goal of this research is to implement evaluation techniques of player worth and to juxtapose them with players' actual salaries in an effort to examine how possible market inefficiencies have arisen due to the construct of the new CBA. This is informative for the economic world and sports economics in particular for a multitude of reasons. Since the new CBA went into effect, research into its possible ripple effects is few and far between. While this is not surprising because of the recent timeframe, it is an important gap to fill due to the complexity and major changes that have been implemented through this iteration of the CBA. Rapid salary cap expansion is something that has not been seen in the NBA until the past few years. The effects of this on player evaluation and market structure has the potential to be impactful which I will build upon through this literature review by examining externalities, player evaluation techniques and finally the construct of the CBA.

Externalities That Effect Player's Value in the Modern NBA

The first section of this literature review will include aspects of evaluating players' worth and the externalities that effect how organizations view their labor supply. This will be examined to introduce the topic and important facets that comprise player analysis. Then, a comprehensive review of methods applied to measuring the MRPL of players will be examined. After being introduced to factors, variables and externalities that can affect the MRPL and how it is viewed by organizations, delving into important methodologies and regression analysis is a seamless transition. Finally, a review of the CBA as a whole will tie the topics together. By examining contracts of players after understanding what is included in regressing and comprehending player worth, context will be provided into how the CBA has lent itself to the creation of an inefficient market.

When quantitatively attempting to compute the worth of a person or piece of capital there are bound to be many externalities influencing the final result, professional athletes being no different. Factors on the supply-side of the labor economics in sports have been discussed in a multitude of research papers and will be instrumental when I conduct my own analysis. Players generate worth, or revenue, through ticket sales of rivaling teams, endorsements, ads and their actual in-game statistics which can be influenced by coaches, teammates and style of play. The most important of these externalities will be reviewed in this section through examining past research.

A paper titled, "Superstars in the National Basketball Association: Economic Value and Policy" (1997) written by Jerry A. Hausman unveils the impact superstar players have on television revenue as well as ticket sales and other factors. This is an extremely insightful piece of literature as the salary cap that has been revamped by the new CBA, which will be discussed

later, is a direct function of TV generated revenue. One of the main findings in this paper was that the impact a superstar has on television ratings and revenues is quite impactful. It was shown that a player such as Michael Jordan can have a $50 million impact on other teams in the league during a season. This effect was also shown to be especially apparent during televised playoffs. The concept of the superstar's externality was illustrated through Hausman's work to not only be real but extremely substantial. The rise of superstars' popularity and the league as a whole has led to the increase of market inequality issues coming to the forefront of the conversation. With the newest iteration of the CBA having revamped parameters on the league's revenue sharing, this concept will be shown to have a profound impact on the role of market size as well as player worth.

A similar article titled, "On the Road with the National Basketball Association's Superstar Externality" (2006) written by David J. Berri and Martin B. Schmidt was composed after Hauseman's paper and builds heavily upon his conclusions. Again, superstars were seen to have impactful revenue effects but this time their research focused more on road game ticket revenues. It was observed that a superstar player has a substantial impact on road ticket sales, for example it was estimated by Berri and Schmidt that in the 1995-96 season Michael Jordan accounted for approximately an additional 23,000 fans attending road games. The concept of increased ticket sales can be seen easily in today's era when examining how the Golden State Warriors affect road games' ticket prices. Berri and Schmidt make meaningful and significant contributions about revenue streams in the NBA which is an important concept seen in the new CBA. League revenue sharing as a whole is what has allowed for the expansion of the salary cap and market inefficiencies to develop in the NBA. These two papers were important in stating the

economic validity of research being completed in this field which this paper will contribute towards.

A paper written by David J. Berri titled, “Does One Simply Need to Score to Score?” (2007) sets out to uncover the impactful aspects in the evaluation of a player and what factors the firm decides upon that contributes to the MRPL. The concept of instrumental rationality is a common theme seen throughout this paper making the argument that the advent of “Moneyball” and the analytical usage of sabermetrics in Major League Baseball has created an efficient market for baseball players following the dictates of instrumental rationality by allowing for more clarity in decision making.

Berri unearths the inefficiency of the NBA when evaluating its players which places a large emphasis on scoring instead of other tangible and intangible attributes that affect a player’s true value. This is an impactful finding on my research because if there is already a slight market inefficiency from certain biases, the construct of the new CBA could have compounded this effect creating a greater systemic problem. The NBA has a possible recency bias, decision makers get enamored by visually ecstatic play, in particular scoring the basketball. Players can be rewarded with a substantial payday by taking a bunch of shots and scoring a bunch of points. When evaluating a player’s MRPL based on metrics a more complex story will be illustrated.

Calculating a Player’s Marginal Product Through Regression Analysis in the Modern NBA

Regression analysis has long been used as a way to determine how dependent variables impact an independent variable. When evaluating sports in particular, where win maximization is the assumed goal of the industry, the quest for an in-depth metric to describe wins is rich with

robust and comprehensive literature. Research throughout the years has always built upon previous work which is especially apparent in regressions of win expectancy.

An article titled, “A Starting Point for Analyzing Basketball Statistics” (2007) written by Justin Kubatko, Dean Oliver, Kevin Pelton and Dan T. Rosenbaum served as an overview when examining how my research would build upon others when creating a win expectancy model. This is where an introduction into terminology, statistics and basketball style of play will finally emerge. Through a peer review styled paper, this research outlines the basis of what foundation modern basketball analysis should be built upon. When examining value in layman’s terminology, the whole idea behind winning a basketball game can be predicated on scoring as many points as possible before time runs out. Simply speaking, a team wants to be as efficient as possible while taking as many shots as possible to increase their point production.

The possession statistic is extremely important when evaluating basketball with the viewpoint described above as it gives a team more chances to produce. Possessions can be viewed as being gained or lost through “giving” the ball over to the other team, or by “obtaining” the ball through a rebound (RBD) or turnover (TO). Using the intuitive description of basketball above, efficiency should be another important portion of evaluation. Efficiency can be calculated through a few statistics but most are predicated upon production per 48 minutes. Since there are 48 minutes in a single game of basketball your production should be calculated on that scale to equalize the value of players’ statistics for analysis. True shooting percentage (TS%) is another common advanced metric that has validity when evaluating players. The calculation of the statistic standardizes the value of each point in an effort to calculate the “net” or true shooting percentage of a player. A free throw is worth one point, a shot taken outside of the three-point line is worth three and every other shot is worth two points. TS% takes shot distributions into

account and calculates a weighted shooting percentage. Again, this is a prime example of efficiency being heavily weighted in the offensive production of a player. This paper determines a multitude of metrics for analysis on team winning while the next piece of literature I look at develops a comprehensive model to determine individual team worth which is what the foundation of my model is based on.

Another paper written by David J. Berri, a prominent sports economist, and Young Hoon Lee titled "Re-examination of Production Functions and Efficiency Estimates for the National Basketball Association" (2008) is the preamble to the most impactful piece of literature on my research. This paper was able to identify key variables in players' worth, while at the same time controlling for externalities that have befuddled me as I have started my own research. Some of these externalities include: teammates, teammates' defense, coaching and position played. For example, by using past player efficiency ratings, a team's level of productivity at each position, guard, forward and center, can be calculated.

With these foundational ideas described above, Lee and Berri were able to move forward with individual player metrics. Berri also coins the term, "possessions acquired" for added possessions a team is given, which as explained previously is vital to winning in the NBA. This statistic moving forward will be the foundation of an important metric in player analysis, for example an offensive rebound (ORB) is more than just a number in the box score as it also gives the team and the player a second chance to score on an offensive possession. Juxtaposing this statistic is "possessions employed", which shows what a team can do with the ball itself: attempt a field goal (FGA), turn it over (TO), shoot a free throw (FT) or miss a shot and lose the ball on a rebound. This paper was ahead of its time for basketball as the NBA had lacked quantitative analysis on variables, unlike the world of baseball which was starting to employ statistics not

only used by economists and mathematicians to predict wins, but front offices of organizations themselves superseding old-school thought during decision making.

With this foundational paper written in 2008, a book would be published by David J. Berri and Martin B. Schmidt in 2010 titled, "*Stumbling On Wins*" (2010) which contains the comprehensive player regression model I base the bulk of my analysis upon. This book not only models winning, but wins produced (WP) by a player. With this technique, a whole team's statistics are not necessary to identify the impact a single player has on the game. Using weighted beta values on dependent variables such as, points (PTS), FGA, ORB and other statistics that are determined to be significant, a player's production value (PROD) can be calculated. Once this production function is produced, the model starts to account for externalities. This is important to my research as when contemplating regression formulas, I constantly hit roadblocks as to how to account for the pace of a team, teammates and the coach of a player.

Berri and Schmidt adjust for players' teammates in an intuitive and interesting way. By accounting for teammates' share of defensive stats allocated using a central database, as well as teammates' blocked shots (BS), assists (AST), and other possessions employing statistics, a teammate score is calculated and subtracted from the player's PROD score. The next step in this method, which I employ when creating my regression analysis, is to control for position played. This was described above in a previous paper where each position has a calculated production adjuster (ADJP48) and is thus applied to the individual player's PROD. Finally, this PROD is used to simply calculate a win produced per 48 metric (WP48) which is a function derived from the steps described above. For example, during the entire 2008-09 NBA season, Chris Paul's WP48 was equivalent to 28.2, meaning Paul accounted for over 57% of the Hornets wins that

year. This intuitively makes sense as Paul led the league in assists, steals and was placed on the All-Defensive 1st team as well as the All-NBA 2nd team. This model from Berri and Schmidt had a profound effect on the start of my research and will continue to be employed as I run my regression analysis later in this paper.

How Has the Newest CBA Impacted the Internal Labor Market of the NBA

Finally, a look at the CBA and how the labor market of the NBA is constructed can be used as an insightful way in determining how inefficiencies arose throughout the league. A paper titled, "The NBA Salary Cap: Controlling Labor Costs Through Collective Bargaining" (1994) written by Johnathan C. Latimer conducts a comprehensive review of collective bargaining seen throughout the NBA. With declining revenues of the league as a whole, in 1983 a CBA was reached which instituted a salary cap. While the goal of this was to return competitive balance to the league, it also laid the foundation for issues to arise that we are starting to see today. For the league to be a success, as discussed above and again in this literature, revenue sharing of teams throughout the league was implemented. This would allow a small market team such as Milwaukee to be able to succeed in the long-run against a team based, for example, in New York. The institution of the CBA, free agency and the rise in popularity of basketball in America allowed for revenue sharing and the league to be more successful and to ultimately grow into the multi-billion-dollar industry it is today.

In a paper titled, "Did the Players Give Up Money to Make the NBA Better? Exploring the 2011 Collective Bargaining Agreement in the National Basketball Association" (2012) Berri examines how during the 2011 iteration of the CBA, players received a lower portion of the BRI than they had seen in the past. Along with this, max-contracts were only allowed to be extended

to 5 years and the salary cap did not increase from 2010. Berri details how the 2011 CBA kept the league at a status quo on an organizational resource level, creating a stable salary cap of around $60 million.

Collective bargaining agreements have the ability to level the playing field and the economics of a specific sector of the free market. With this said, they also have the ability to distort the market for a time through unintended consequences and market reactions. A paper written in 2001 by Richard J. Hill and Peter A. Groothuis titled, "The New NBA Collective Bargaining Agreement, the Median Voter Model, and a Robin Hood Rent Distribution" delves into some of the consequences when new CBAs go into effect. This paper discusses the idea of the median voter model and how it plays into the creation of a new agreement. Throughout their analysis Groothuis and Hill discuss how a more egalitarian approach to contracts has raised the salaries of mid-tier players while not expanding superstars' compensation after the CBA was signed in 1999. These ideas relate to the most recent CBA with the added variable of the extreme expansion of the salary cap which has led to the groundwork for unintended consequences to unfold.

The growth of the NBA from 2011-2017 as well as international markets, streaming and other technology the league capitalized on, all helped create the scenario for the most recent CBA (2016) to be constructed with the content it encapsulates. Within the newest iteration of the CBA, the salary cap is a function of BRI which is allocated to that year's salary cap. This means that if the league sees a rampant increase in revenue due to television ratings or any type of revenue, the salary cap will increase and is dynamic instead of static. The calculation of the salary cap in this iteration differs from past CBA's as it allows for the salary cap to increase dramatically each year, something that NBA organizations are not used to. All of these factors

discussed in this paper working together could have a potentially significant impact on the creation of market inefficiencies. If player evaluations are slightly off, and organizations now have 20% more funds to spend each year, projection methods of teams' allocation of their salary cap hits on players and other small mistakes can, and I believe have, resulted in the misallocation of resources in the NBA.

Teams are projecting the salary cap to increase, causing their lucrative contracts to not seem as expensive when adjusting for the inflation of the cap. It is intuitive and logical to surmise that a market fluctuation in the BRI as well as forecasting error can have a monumental impact on teams' resources. In an industry where organizations are estimated to be worth in the billions of dollars, these errors have the potential to be extremely costly in the long and short run. Incentives to win from the new revenue sharing in the NBA will also be examined later in this paper as to how teams react and act in the labor market. Large market teams now have to pay into a pool from which revenue is allocated to smaller markets in an attempt to level the playing field throughout differing sizes of markets.

Now that a comprehensive literature review of my topic has been completed, analysis and research that will add new insight into sports economics and the evaluation of market inefficiencies as a construct of the newest iteration of the CBA can be conducted. By first examining players' value through a holistic view, an introduction of statistics and externalities that can affect the evaluation process is unearthed. With this knowledge, it is possible to delve into the second aspect of the supply of labor in the NBA by evaluating what goes into and how regression analysis is conducted throughout sports economics.

Berri and Schmidt are leaders in the sports economics field, specifically the NBA and basketball as a whole and with their findings in *Stumbling On Wins* I was able to identify how to

go about tackling the difficult obstacles that are associated with regressing such a complex sport. Finally, evaluating the evolution of the construct of the CBA is imperative to tie my topic together. By understanding the constructs of the CBA and how it affects the demand and supply sides of the labor market, conclusions can finally be made about its impact on market inefficiencies seen throughout the NBA.

Chapter 3

Methodology and Data

Through dissecting prior research completed in the sports economics field, specifically bargaining agreements and player evaluation, this paper's area of research is able to be magnified into the three key topics described above in the literature review. I implement regression analysis to show the relationship between winning, revenue and how market size effects both. Analysis of a players' value on specific teams are created from this regression to show the strong impact of market size on the economics of sports and player contracts.

Analyzing the construct of prior CBAs' effects on league owners and players as well as player win modeling techniques from authors such as Berri and Schmidt have enabled advanced metrics to take hold throughout the NBA. For the purpose of this research, data of players' statistics were collected from basketballreference.com, players' contracts and team salaries from spotrac.com and team revenues across the years were combined from various forbes.com sources. In the following section, the methodology this research implements contains regression and data analysis in an effort to answer the null hypothesis that the new CBA has created a market inefficiency throughout the league.

After collecting the necessary data spanning from the 2008 season to the end of the 2017 season, the impact of revenue on winning is examined. The 2012 season is excluded from data collection due to it being a lockout shortened year. Including the 2012 season not only skews win totals and win percentages by not capturing a team's full potential over a long period of time which is vital in sports but also invalidates revenue data points as teams miss out on ticket sales

as well as many other revenue generating aspects of the season. If a correlation could be found between revenue and team success this would be an important first step to take before adding the wrinkle of individual players' values as it relates to wins.

First, I collect every NBA teams' wins and revenue for each year that is under analysis, 2008 to 2017 excluding 2012 due to the lockout shortened season. I then regress revenue on wins to illustrate that there is a positive correlation between them which is depicted in Table 1 below. Next, I incorporate fixed regression analysis of market size on revenue by creating a dummy variable for each individual team. This was used because it is possible, if not probable, that large market teams such as the New York Knicks or Los Angeles Lakers would continue to draw sell-out crowds and sell team apparel during losing or winning seasons, while teams in small markets such as Sacramento or Phoenix would have their revenue be more susceptible to volatility due to the reliance on the direct success of their team more than any other revenue generating method. If revenue and team winning were grouped together without accounting for specific markets or teams, the samples that came from the correlation between a specific type of market's success and their revenue could be missed. It is also possible that a previous year's success could have a significant impact on the following year's revenue, especially for volatile small market teams discussed above. For this reason, two lag variables are created, specified lag1and lag2, to account for the prior two years of a specific team's success. This allows for an understanding of how prior years' outcomes impact revenue seen in the current year as it would be expected that more season tickets and apparel should be sold when the team has previous success, especially for small market teams. Finally, I create an interaction variable of wins and the dummy variable for each team to correct for the market size's impact on winning.

Through STATA a series of regressions are completed which can fully be seen in the appendix. Revenue is used as the dependent variable as I hypothesize that winning would impact the revenue of a team by drawing more fans, selling more apparel, etc. After this simple linear regression, dummy variables as well as the lag variables discussed above are added to the regression outputs.

Table 1: Regression Output of Revenue and Wins from 2008-17 Excluding 2012

Variable	Coefficient	P-Value
Wins	.7136121	.001
Constant	116.2297	.000

Table 1 shows the output of the simple linear regression of only revenue and winning. The low p-value depicts that in the simplest model revenue and winning are positively correlated, the regressions included 270 observations. The coefficient of .714 makes logical sense because only 82 games are played each season in the NBA. Teams will end up anywhere from 20 to 60 wins barring outliers which explains the constant and coefficient values seen above.

Table 2: Regression Output of Revenue and Wins from 2008-17 Excluding 2012

Variable	Coefficient	P-Value
Win	.709761	.001
Lag1	1.536805	.095
Constant	-2974.904	.109

The regression analysis output above, Table 2, includes a lag variable from the n-1 year. The coefficient on lag1 is around 1.5 with a p-value of .095 which again preliminarily confirms the hypothesis that a prior year's success may influence future revenue. The dummy variable portion of this regression computes team by team coefficients, separating the more general regression of revenue and winning seen in Table 1. More complete outputs can be viewed in Appendix B. With these regressions completed, a specific player's WP value can be inserted into the regression formula to produce an estimated revenue value. A player's "revenue gained" metric can be computed by exploring the difference between the estimated revenue from a player's share of WP and a replacement level player's share of revenue from their WP. The data analyzed indicates that in the NBA an average replacement level player will accumulate 2.57 WP across one season. With this revenue gained value obtained, it will be possible to explore the interaction between players' MRPL and revenue and wins. This is illustrated later on within this section of the paper as well as in Appendices A and B.

The second portion of my data analysis is based on player value by using the win produced (WP) method described in the literature review by David Berri. This methodology was formulated by Berri who was able to create a metric that flipped the tables on prior misconceptions of NBA production. Common media outlets like ESPN often overvalued points scored and did not account enough for efficiency, rebounding and other less aesthetic box score values. The PROD values for specific players seen in the raw data files are the evaluations produced from the following formula,

PROD = 3FGM*0.064 + 2FGM*0.032 + FTM*0.017 + FGMS*-0.034 + FTMS*-0.015 + REBO*0.034 + REBD*0.034 + TO*-0.034 + STL*0.033 + FTM(opp.)*-0.017 + BLK*0.020 (Berri, 2007, 2010).

After calculating a player's production through the above formula, their value is converted per 48 minutes to equalize a player who plays a full game and a player who only plays 10 minutes. Later in the analysis this is equalized when creating the WP value as to not favor players who play more minutes with slightly less efficiency than a player who logs less minutes with greater efficiency. After PROD is calculated from the above formula the value is corrected for externalities that aren't incorporated in the formula resulting in the adjusted value of PRODadj. These adjustments are described in the paragraphs below. Boxscoregeeks.com conducts this analysis in a centralized database and is utilized in this research paper.

The first adjustment that takes place to this PROD value to make it more accurate is team rebounding. This adjustment value helps bridge the gap from teammates taking certain

player's rebounds away and a certain player taking rebounds away from his teammates. Players who obtain a lot of rebounds will have their PROD value decrease slightly while those who don't corral copious amounts of rebounds will see a PROD value increase (Berri, 2007, 2010).

The next adjustment that takes place targets the impact of assists. Following similar rational as above, players who assist teammates on points they otherwise might score increases the chance of a team winning but is not accounted for in the formula due to its complexity. Players who compile a multitude of assists will again see their PROD value increase (Berri, 2007, 2010).

The next adjustment is aimed at how team defense impacts a player's worth. While steals and blocks capture part of the impact defense has, players on teams with low field goal percentages and high turn-over to assist ratios will be rewarded for their defensive tenacity with an increase in their PROD value (Berri, 2007, 2010).

Finally, a positional adjustment is added to level the metric from a player manning the center position, a position not usually known for handling the ball much, to a primary ball handler such as a guard. Centers will see their PROD decrease the most with guards having their PROD decrease the least. These adjustments result in a final PRODadj values per 48 which have .099 added to them, the average production of a player over a season, and are divided by 48 and multiplied by the players total minutes logged. This value finally gives us a win produced metric seen in the tables below which captures, through advanced metrics, just how much a player adds to a team throughout a full season (Berri, 2007, 2010).

Once a win produced metric is aggregated for all players spanning the 2017, 2016, 2010 and 2009 seasons, data analysis can begin. Being that the construct of the new CBA is relatively recent, going into effect in 2016, the 2016 and 2017 seasons were implemented to capture the

effect on management decision making throughout the NBA. 2010 and 2009 were used subsequently as both years had a stable salary-cap of 60 million dollars and captured back to back seasons for continuity.

The win produced metric combined with the corresponding salary that a player earned allows for regression analysis on player evaluation to be completed. Salary is the dependent variable as it is assumed that salaries would be awarded based upon the most advanced information available on what impacts winning. In each year discussed above there is a significant positive correlation of salary and the win produced metric. The three figures seen below illustrate the positive correlation between players' salaries and their corresponding WP value. The gray areas are the 95% confidence interval from the regression analysis. When examining these graphs more closely the validity of this research is supported. Figures 1 and 2, after the new CBA went into effect, display a clustering of data points ranging between 0 and 5 WP above the least-squares regression line.

Evidence of Overvaluation of NBA Players

Figure 1: 2017 Player Salaries vs WP

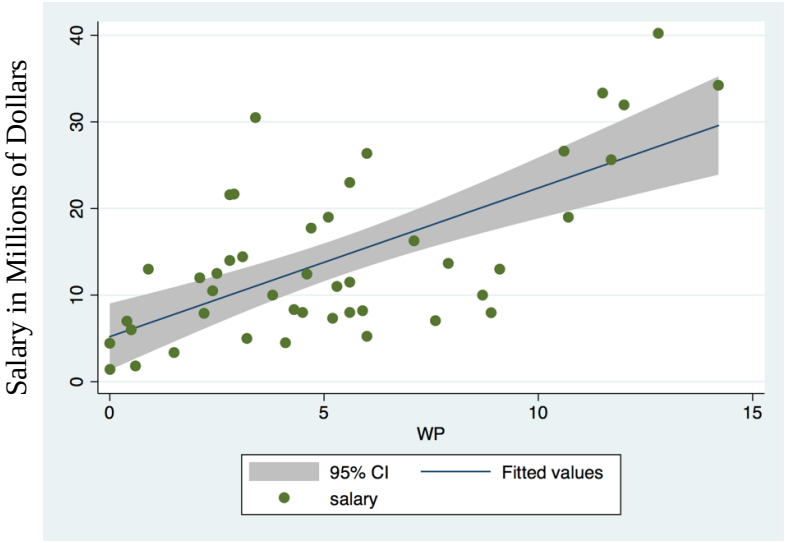


Figure 2: 2016 Player Salaries vs WP

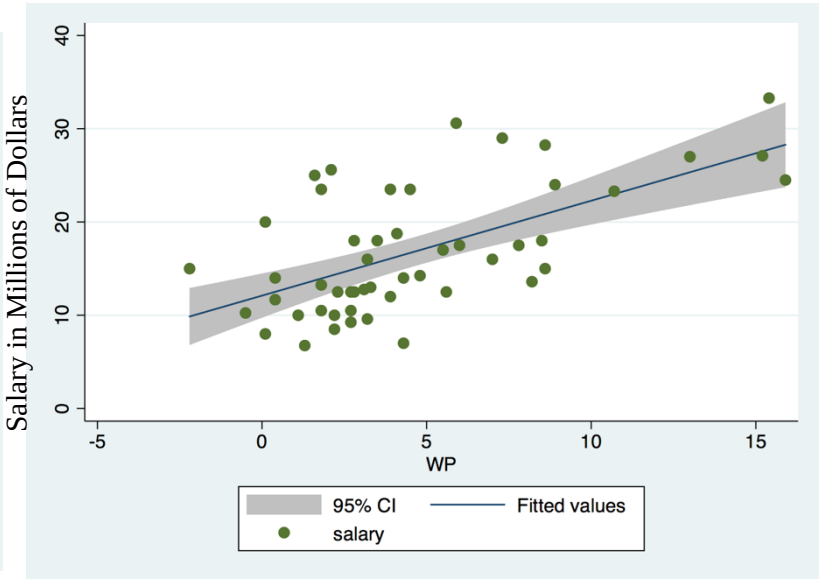
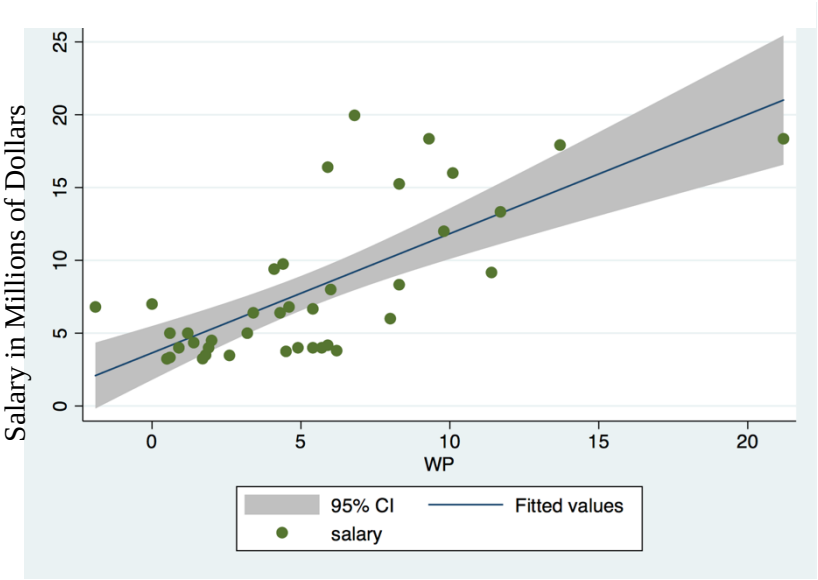


Figure 3: 2010 Player Salaries vs WP



These points represent players who underperform given the level of their compensation. In Figure 3 a similar, smaller clustering is shown above the trend line as well, again depicting that these players underperform given their salary level. The key difference here is that their WP values range from 5 to 10, an acceptable and productive level. The overvalued nature of the NBA will always exist to some extent as it is driven by competitive and sometimes reactionary decision making. This being said, in the years after the new CBA was signed we have seen the clustering of so called “bad contracts” shift to the left and up, as well as increase in number, indicating players who are overpaid and less productive are far more prevalent than before the new CBA went into effect. The output of these regressions contained high r-squared values as well as low p-values. Since only a number of key free agents are signed every off-season each data point is critical for analysis. The results of this preliminary research have given this thesis work validity in attempting to uncover the new CBA’s intricacies which are examined throughout the discussion section of this paper.

By first examining the interaction of revenue and the wins of teams from the year 2008 to 2017, the MRPL values of players can be created when combined with the regression analysis completed on player value, or WP. With the revenue gained, or revenue above replacement, metric serving as the MRPL, a player’s true value in millions of dollars to a certain team can be computed and analyzed. Further breaking down this metric by team and how it relates to a player’s specific salary allows for an understanding of how market size plays into the equation. The building blocks to answer the question if the new CBA has created a market inefficiency for mid-tier NBA players is laid out throughout this section of the paper.

Table 3: 2017 Off-season Free Agent Revenue and WP Analysis

Name	Salary Per Year in Millions of Dollars	WP	Revenue Gained	Revenue Gained/Salary
Andre Roberson	10	8.7	4.37	.44
Stephen Curry	40.23	12.8	7.30	.18
Kevin Durant	25.63	11.7	6.51	.25
Kyle Lowery	33.33	11.5	6.37	.19
Paul Millsap	30.6	3.4	.59	.02

Table 3 depicted above shows a sampling of players from the 2017 off-season and their corresponding metrics. The revenue gained metric shown is an extremely helpful and accurate metric to measure worth. Clearly Stephen Curry throughout the 2016 season impacted the game more than any other player on the table depicted by his WP value. While this is true, as discussed above for the sake of parity within the league the NBA employs a salary cap, teams are not at liberty to spend endless amounts of resources. When taking this into account the revenue gained/salary metric was produced by simply taking the revenue gained from a player and dividing it by their yearly salary. Revenue gained is essentially a player's revenue above replacement, it is calculated by taking the difference of their WP from a replacement level player and multiplying it by the coefficient of wins from the regression of revenue on winning. Stephen Curry's .18 revenue gained/salary depicts that while he does produce at a high level, the amount of compensation he receives waters down his true value by taking up a substantial portion of his team's salary cap. With this taken into consideration, Andre Roberson, the defensive specialist for the Oklahoma City Thunder, has the highest impact on his team per million dollars made as illustrated by his high revenue gained/salary metric of .44. This key statistic helps identify

players who may be under or overvalued in the mold of using data driven, analytical thinking to exploit market inefficiency.

Table 4: Revenue Gained Over Salary Across Teams

Name	Indiana Pacers	Chicago Bulls	Houston Rockets	Cleveland Cavaliers
Andre Roberson	1.194	.439	-.26	.502
Stephen Curry	.495	.182	-.110	.208
Kevin Durant	.693	.255	-.154	.291
Kyle Lowery	.522	.192	-.116	.219
Paul Millsap	.053	.019	-.011	.022

Table 5: Revenue Gained Over Salary Across Teams

Name	Brooklyn Nets	New York Knicks	LA Clippers	LA Lakers
Andre Roberson	1.15	.232	1.076	-1.643
Stephen Curry	.478	.096	.446	-.681
Kevin Durant	.670	.135	.625	-.954
Kyle Lowery	.504	.101	.470	-.718
Paul Millsap	.051	.010	.048	-.073

Tables 4 and 5 incorporate the revenue gained over salary metric with a slight twist. By compiling data of each team's revenue and subsequent success from 2008 to 2017, I estimate teams' beta coefficients. Table 3 uses the league beta value to determine the coefficient on WP to create revenue gained. By running a regression with a dummy variable for each team, with the Atlanta Hawks as the base, a specific coefficient for each team was found. The results are included in Tables 4 and 5 above. As can be seen, there is a clear difference in how teams value players based on a multitude of factors.

The reason some big market teams result in negative value, for example the LA Lakers, is because the Atlanta Hawks was used as the base dummy and are a small market team who rely heavily on winning to generate revenue through ticket sales and TV deals. The disparity between the haves and the have nots can truly be viewed through this analysis. Smaller market teams such as the Indiana Pacers and Brooklyn Nets rely heavily on producing quality winning seasons to generate revenue, while big market teams, such as the NY Knicks and LA Lakers, can fall back on their history, TV deals and tourism attraction to generate revenue regardless of the results they produce. The LA Clippers and Lakers are excellent examples of teams with different qualities that effect what they desire in free agents and team structure to win. Both being located in the same city and playing in the same arena what could be so different about these two teams? One is the older more successful brother and the other is the forgotten child. It is easy to see through this analysis that the Clippers value players above replacement level with much more ferocity than the Lakers. For some teams winning isn't about fielding a championship caliber team but results from the accumulation of past wealth and success.

Chapter 4

Discussion

The analysis conducted above has practical applications in the sports economics field. For example, with slight adjustments to the revenue gained metric, finer analysis on what makes a player valuable to a certain type of team can be conducted. Thinking outside the box to find a solution is the key to economic theory and thinking. With the advent of the newest iteration of the CBA, the NBA entered uncharted territory that would result in rash decision making in an attempt to capitalize on the new rules. Who can blame them, in an industry where the average job tenure of a coach and general manager is less than one term of the U.S. presidency and profits are measured in the hundreds of millions of dollars there is no room for second guessing and error. Throughout the 2016 and 2017 off-seasons, free agent signings resulted in the overvaluation of mid-level players resulting in them being extremely overpaid from their true worth.

Market Sizes Role on Profits and Wins

From this, a model of examining players' true value on differing teams and market size exposed some of the benefits and disadvantages that are analogous to free markets as a whole. Large markets, such as New York and Los Angeles, were found to have advantages over smaller markets in their attempts to earn profits and produce wins. By examining Tables 4 and 5 it was illustrated that larger markets have a smaller coefficient of wins from the regression of revenue

on wins and team dummy variables. A team with a smaller coefficient of wins depicts that the team doesn't need to benefit from winning to be profitable, these large market teams make the bulk of their revenue from tourism, TV deals and other variables that are not impacted by winning. Selling out arenas and TV deals are much more lucrative in large markets which in turn increases the funding of the analytical, draft and basketball operations departments which all serve to continue the cycle of success on and off the court. By examining the model on revenue gained over salary across teams it is clear that high impact players on the court are more valuable to small market teams than large market teams when purely examining their effects on revenue. In sports, there is always a competition between a profit and win maximizing mindset but one thing is clear, small market teams have much less room for error than large markets. Los Angeles and New York will continue to sell out their arenas, sell apparel and sign lucrative TV deals due to their location and market size. The New York Knicks have had multiple consecutive losing seasons but continue to be at the top of the list in revenue. The signing of Joakim Noah in the market boom after the new CBA to a 4 year, $70 million contract was not as burdensome on their profits as it would have been for a small market team such as the Minnesota Timberwolves. Despite having assets that were overpriced and underperforming the franchise as a whole had stable profits. Jobs may have been lost due to performance expectancy of professional teams, but no sleep was lost over profits for large market teams.

Limitations of Revenue Gained Metric and Market Size

With most statistical and economic estimator models come limitations. Since sports statistics and revenue do fluctuate every year due to injury, preferences and the economy's standing as a whole, metrics should be considered with a holistic view of these parameters. The revenue gained model with market size regression was based on data ranging from 2008 to 2017 which captures part of the most recent recession and its recovery. While many coefficient values from the regression correspond to the logic that large market teams do not rely as heavily on player performance for economic success and profit, a few interesting teams' results can be explained logically.

For example, in Tables 4 and 5 above, the market size of the Knicks and Lakers is viewed to have a substantial impact on their economic success. This in conjunction with their less well off, not name brand basketball cohorts, the Nets and Clippers respectively, value players through the revenue gained metric that makes economic sense. The Golden State Warriors have the highest value coefficient for revenue gained. This makes complete sense as before their recent success they had been a smaller market team overshadowed by the LA market. Now, with the right players and system they sell out every night and are even constructing a new stadium to call home in the Bay Area. Their location and combination of decision making resulted in the perfect storm for them to catapult into the upper echelon of the NBA hierarchy.

A team such as the Dallas Mavericks, who have a negative coefficient meaning they will continue to turn a profit regardless of winning initially seems to be a conundrum. When a closer look is taken, we can see that they employ one of the most transcendent talents to ever play the game, Dirk Nowitzki. This combined with their recent championship and shrewd businessman

owner, Mark Cuban, can account for their seemingly outlier statistic. This is just one case where the limitations of a model can begin to be explained using economic principles.

Market Correction

Due to expansion of the clustering of mid-tier players becoming overpaid after the latest CBA, a market correction is more than likely on the way and signs have begun to pop up all across the league. Imprudent decision making has caused teams to become strained when it comes to cap space as many players who were believed to be worth their contract value have not lived up to them due to a combination of events, most significantly the stagnation of the salary cap's rise. A simple but telling example of this is Nerlens Noel, a young center who is gifted with a premier physical tool set and vast potential. Seeing the rapid expansion of the salary cap and big pay days coming in for similar players to himself, Noel's agent decided it was wise to decline a $70 million, 4-year contract extension offered by the Mavericks, opting to test free agency after the 2016-17 season. What happened to this rising young player filled with potential? He ended up signing a one year, $4.1 million deal for the 2017-18 season.

Nerlens Noel is just one of many players that will see a decline in pay due to their unlucky free agency timing and rookie status. Retired NBA players from the eighties often say they wish they played today due to the astronomical pay raise they would've seen, but now only a year or two could mean a difference of tens of millions of dollars to a player. The recent trade of Blake Griffin from the LA Clippers to the Detroit Pistons highlights what is occurring. The Clippers traded Griffin and his high salary to create cap space in an effort to rebuild their team after many winning seasons while Detroit felt the pressure to win from underperforming in recent years. As a result of this trade, Detroit will have over 50% of its cap consumed by two

players into the 2020 season. At a time where cap space is treated as priceless, in the next few years the market should provide data points ripe for analysis due to similar situations teams find themselves in.

Players who found themselves entering free agency when the new CBA went into effect cashed in, with players such as Nerlens Noel missing out on their paydays due to the timing of their free agency or deciding to wait to test the rich market they saw in front of them. For the small market teams discussed these decisions were magnified, setting them back in a race where they were handicapped to begin with due to their limited resources and low revenue rates. Even with revenue sharing which implemented a slightly socialistic economic theory into the laissez faire practice that previously existed can't level the playing field completely. This research serves as a stepping stone in opening the door for much needed analysis in the field of sports that has been gaining momentum over the past few decades. Performance analysis mixed with financial decision making can increase the productivity of the basketball operations of organizations throughout the league, while time will open up a window for a retrospective study of this era to be completed by examining the market's reaction and correction during this era.

Future Applications

An expansion of this model in further research could benefit from a similar technique such as the revenue gained metric by ascertaining specific types and playstyles of players that could best impact a specific team style and play. These types of innovations are vital for teams to compete at the highest level while also facing an unfair playing field that comes with professional sports. By shifting monetary economic analysis of the NBA free agency market and the constraints set by the CBA to performance models combining win production and revenue

gained regressions, interesting studies can be accomplished that fell out of the scope of this specific paper. Profit and win maximization have similar goals in sports due to the passion possessed by owners to field a winning team and can further be studied for teams to create increases in revenue and overall success.

Chapter 5

Conclusion

Economic analysis of any situation is filled with scrutiny and phrases such as, would have, could have and should have. In an effort to maximize profits and earnings, financial institutions during the 2000's exploited the rules of the game resulting in a historically impactful recession. In the game of basketball which has evolved into a billion-dollar industry there are two competing forces that make the situation different than any other economic field, mixing profit maximization with win maximization. With a sector of the economy as large as professional sports is and with outside pressure coming from individual fans not seen in most other industries, decision makers are faced with pressure cooker situations each and every day. With this in mind, teams who were more patient and mindful during the era right after the signing of the new CBA were able to exploit the market by not participating in it. The market inefficiency that occurred during this time resulted in the overvaluation of players and the practice of frequently spending a lot in anticipation that the salary cap would continue to expand.

Mid-level players experienced an overvaluation during this era as salary cap growth forecasting was bullish in its projection. For this reason, we saw a similar event to any market that experiences an inefficiency, exploitation. Just as Billy Bean of the Oakland Athletics was able to use the constraints handed to him to gain an advantage it is very possible that in the coming years we will be able to have a retrospective study that hashes out the "Moneyball" era in basketball for which this paper has helped lay the foundation.

Appendix A

Team Specific Regression Analysis on Wins and Revenue Results

Team Name	Constant	Dummy	Beta on Wins	Beta on Interaction	Agg. Constant	Agg. Beta
Atlanta Hawks*	66.65832	base	1.189691	base	66.65832	1.189691
Boston Celtics*	66.65832	94.10642	1.189691	-1.23069	160.76474	-0.040999
Brooklyn Nets	66.65832	17.40956	1.189691	0.6903795	84.06788	1.8800705
Charlotte Hornets	66.65832	6.483598	1.189691	-0.0450665	73.141918	1.1446245
Chicago Bulls*	66.65832	90.00478	1.189691	-0.4743065	156.6631	0.7153845
Cleveland Cavaliers*	66.65832	62.67665	1.189691	-0.3711218	129.33497	0.8185692
Dallas Mavericks	66.65832	168.1639	1.189691	-2.603996	234.82222	-1.414305
Denver Nuggets	66.65832	116.2205	1.189691	-2.493414	182.87882	-1.303723
Detroit Pistons	66.65832	63.90729	1.189691	-0.5847187	130.56561	0.6049723
Golden State Warriors*	66.65832	-66.71831	1.189691	2.200597	-0.05999	3.390288
Houston Rockets*	66.65832	134.0185	1.189691	-1.623024	200.67682	-0.433333
Indiana Pacers*	66.65832	-28.10536	1.189691	0.7581506	38.55296	1.9478416
Los Angeles Clippers*	66.65832	-10.74787	1.189691	0.5659169	55.91045	1.7556079
Los Angeles Lakers	66.65832	295.2013	1.189691	-3.869447	361.85962	-2.679756
Memphis Grizzlies*	66.65832	-2.101577	1.189691	0.0819625	64.556743	1.2716535
Miami Heat	66.65832	46.16984	1.189691	-0.1689688	112.82816	1.0207222
Milwaukee Bucks*	66.65832	36.11943	1.189691	-1.112018	102.77775	0.077673
Minnesota Timberwolves	66.65832	30.96272	1.189691	-0.4976482	97.62104	0.6920428
New Orleans Pelicans	66.65832	96.54808	1.189691	-2.384916	163.2064	-1.195225
New York Knicks	66.65832	179.0054	1.189691	-0.8117047	245.66372	0.3779863
Oklahoma City Thunder*	66.65832	-12.60724	1.189691	0.4975733	54.05108	1.6872643
Orlando Magic	66.65832	98.40274	1.189691	-2.141906	165.06106	-0.952215
Philadelphia 76ers	66.65832	71.40824	1.189691	-1.822174	138.06656	-0.632483
Phoenix Suns	66.65832	93.19715	1.189691	-1.460045	159.85547	-0.270354
Portland Trail Blazers*	66.65832	5.735021	1.189691	0.1725962	72.393341	1.3622872
Sacramento Kings	66.65832	10.44316	1.189691	0.4262999	77.10148	1.6159909
San Antonio Spurs*	66.65832	-72.09954	1.189691	1.537683	-5.44122	2.727374
Toronto Raptors*	66.65832	28.90874	1.189691	0.061356	95.56706	1.251047
Utah Jazz*	66.65832	112.2441	1.189691	-2.302558	178.90242	-1.112867
Washington Wizards*	66.65832	15.3844	1.189691	0.0398171	82.04272	1.2295081

Appendix B

STATA Output and 2017 Player Metrics Data Sampling

Regression of Revenue on wins, year dummy, team dummy and team win interaction.

Team dummies are alphabetical starting with the Atlanta Hawks as the base.

Variable	Coefficient	P-Value
win	-.1663278	0.788
Year		
2008	8.01128	0.053
2009	10.55722	0.013
2010	12.45159	0.004
2011	16.33132	0.000
2013	34.22905	0.000
2014	40.94803	0.000
2015	53.58466	0.000
2016	77.42051	0.000
Team Dummies		
2	18.11885	0.584
3	-44.5489	0.172

4	-13.00764	0.729
5	36.51962	0.388
6	3.486795	0.914
7	-8.827708	0.849
8	-28.1201	0.463
9	-18.28925	0.591
10	-63.47375	0.054
11	29.28794	0.579
12	-14.25045	0.725
13	-20.72022	0.517
14	181.8767	0.000
15	-16.05622	0.620
16	4.130558	0.902
17	-22.31114	0.517
18	-15.22944	0.646
19	-20.3838	0.583
20	114.8694	0.001
21	-30.94932	0.340
22	-3.340355	0.917
23	-45.5837	0.156
24	-32.88545	0.336

25	-28.93344	0.479
26	-29.15774	0.451
27	47.6851	0.500
28	26.68532	0.459
29	-21.39615	0.581
30	-8.956171	0.793
Team/Win Interaction		
2	.4654367	0.518
3	2.093071	0.008
4	.1705734	0.853
5	.7298947	0.429
6	.9578018	0.172
7	1.022934	0.280
8	.7138363	0.394
9	1.344415	0.089
10	2.189159	0.002
11	.6373281	0.562
12	.277747	0.768
13	.6780662	0.343
14	-1.286218	0.066
15	.2666318	0.715

16	.7855694	0.280
17	.1835671	0.830
18	.2918476	0.748
19	.3722692	0.663
20	.6562196	0.419
21	.9021228	0.205
22	.2330833	0.744
23	1.455218	0.067
24	1.407432	0.064
25	.959211	0.285
26	1.047591	0.345
27	-.2192064	0.864
28	.001827	0.998
29	.73888	0.393
30	.3551358	0.666
Constant	98.90709	0.000

Player Name	Contract Length (Years)	Total Contract in Millions	Per Year Salary in Millions	% cap hit	WP
Stephen Curry	5	201.16	40.232	40.6384	12.8
Kevin Durant	2	51.25	25.625	25.8838	11.7
Kyle Lowry	3	100	33.333	33.6700	11.5
Gordan Hayward	4	127.83	31.958	32.2803	12
Paul Millsap	2	61	30.500	30.8081	3.4
Otto Porter Jr.	4	106.5	26.625	26.8939	10.6
Jrue Holiday	5	131.8	26.360	26.6263	6
Blake Griffin	5	171.17	34.234	34.5798	14.2
J.J. Reddick	1	23	23.000	23.2323	5.6
Serge Ibaka	3	65	21.667	21.8855	2.9
Danilo Gallinari	3	64.76	21.587	21.8047	2.8
George Hill	3	57	19.000	19.1919	5.1
Jeff Teague	3	57	19.000	19.1919	10.7
Tim Hardaway Jr.	4	70.95	17.738	17.9167	4.7
Pau Gasol	3	48.8	16.267	16.4310	7.1
Taj Gibson	2	28	14.000	14.1414	2.8
Mason Plumlee	3	41	13.667	13.8047	7.9
Joe Ingles	4	52	13.000	13.1313	9.1

BIBLIOGRAPHY

Box Score Geeks. Retrieved October 2, 2017, ttps://www.boxscoregeeks.com

Basketball Statistics and History. Retrieved October 2, 2017, from https://www.basketball-reference.com/

Berri, J. D., & Schmidt, B. M. (2010). *Stumbling on Wins* Australia: Pearson

Berri, J. D., & Schmidt, B. M. (2007). *The Wages of Wins* Australia: Pearson

Berri, J. D. (2012). Did the players give up money to make the NBA better? Exploring the 2011 Collective Bargaining Agreement in the National Basketball. Association *International Journal of Sport Finance*, 7, 158-175

Berri, J. D., & Jewell, R. T. (2004). Wage inequality and firm performance: Professional basketball's natural experiments. *Atlantic Economic Journal*, 32, 2; 130

Berri, J. D. (2005). The short supply of tall people: Competitive imbalance and the National Basketball Association. *The Journal of Economic Issues*

Berri, J. D., & Leeds A. M. & Leeds M. E. & Mondello M. (2009). The role of managers in team performance. *International journal of sport finance*

Berri, J. D. (1999). Who is 'most valuable'? Measuring the player's production of wins in the National Basketball Association. *Managerial and Decision Economics*, 20, 411-427

Berri, J. D., & Simmons, R. (2011). Mixing the princes and the paupers: Pay and performance in the National Basketball Association. *Labour Economics* 18, 3, 381-388

Berri, J. D., & Lee, H. Y. (2008). A Re-Examination of production functions and efficiency estimates for the National Basketball Association. *Scottish Journal of Political Economy*, 55, 1

Berri, J. D., & Schmidt, B. M. (2002). Instrumental versus bounded rationality: a comparison of Major League Baseball and the National Basketball Association. *Journal of Socio-Economics* 31, 191-214

Berri, J. D., & Schmidt, B. M. (2006). On the road with the National Basketball Association's superstar externality. *Journal of Sports Economics*, 7, 4, 347–358

Berri, J. D., & Krautmann, C. A. (2006). Shirking on the court: Testing for the incentive effects of guaranteed Pay. *Economic Inquiry* 44, 3, 536–546

Berri, J. D., & Brook, L. S. & Schmidt, B. M. (2007). Does one simply need to score to score? *International Journal of Sport Finance*, 2, 4; 190-205

Collective Bargaining Agreement January 19, 2017

Forbes.com. Retrieved October 2, 2017, https://www.forbes.com/#312282572254

Fort D. R. (2003). *Sports Economics* (2nd Edition)

Groothuis, A. P., & Hill, J. R. (2001). The new NBA collective bargaining agreement, the median voter model, and a robin hood rent distribution. *Journal of Sports Economics*, 2, 2, 131–144

Gladwell, M. (2013). *David and Goliath: Underdogs, misfits, and the art of battling giants* (First edition.). New York: Little, Brown and Company.

Hausman, A. J., & Leonard, K. G. (1997). Superstars in the National Basketball Association: Economic value and policy. *Journal of Labor Economics*, 15, 4

Kahn, M. L. (2000). The sports business as a labor market laboratory. *Journal of Economic Perspectives*, 14, 75-94

Krautmann, C. A. (1999). What's wrong with Scully-estimates of a player's marginal revenue product. *Economic Inquiry*, 37, 2

Kubatko, J., & Oliver, D. & Pelton, K., & Rosenbaum, T. D. (2007). A starting point for analyzing basketball statistics. *Journal of Quantitative Analysis in Sports* 3, 3, 1

Latimer, C. J., (1994). The NBA salary cap: Controlling labor costs through collective bargaining. *Catholic University Law Review*, 44, 1

Sauer, D. R., & Hakes K. J. (2006). An economic evaluation of the *Moneyball* hypothesis. *Journal of Economic Perspectives*, 20, 173-185

Spotrac.com. Retrieved October 02, 2017, from http://www.spotrac.com/

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