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The Contract Year Phenomenon in the National Basketball Association

Name student: Jelmer van Dijken

Student ID number: 433846

Supervisor: Dana Sisak

Second assessor: Aksel Erbahar

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Abstract: The contract year phenomenon is an assumption that athletes perform better in the final year of their contract (contract year) to ensure a better contract for the future. The incentive of future money could be enough extra motivation to play better and be more productive. This assumption is tested with the use of three regressions that compare contract year players with non-contract year players. The dependent variables of these regressions are all advanced statistics that measure efficiency and productivity because previous literature focused on basic statistics. The results show that averages of all three advanced statistics are higher for players not in a contract year.

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Research topic

Introduction

The National Basketball Association (NBA) is one of the biggest sports leagues in the world today. The league generates billions of dollars in revenue each year and its players are being paid more than most athletes and sports players all over the world. The NBA has also become a home for advanced analytics and research in sports because of the wide variety of statistics available and the curiosity of how much impact a single player can have on a team.

The NBA is set up to allow for a lot of parity between teams and special rules to avoid one team dominating the league. For instance, there is a draft each year, where the worst teams get the best draft picks to select young up and coming players out of college and abroad. There is also a salary cap regulating the total amount of money teams are allowed to spend on player salaries each season. This way NBA franchises cannot simply buy their way to success and must compete hard with the other teams to build their rosters.

There are three different methods to improve these rosters and acquire new players: the draft, trading with other teams and free agency. Because of the limit draft picks and the fact that young prospects often cannot impact a team immediately, combined with the insecurity if young players will develop correctly the draft is more so seen as a long-term process to build a team up towards being a contender for the NBA championship. Moreover, trades can be effective if teams with different needs align and help each other, but it is rare to see a team bring in significantly more value than they are giving up to other teams.

This makes the signing of free agents the most effective way to gain an advantage and reduce the skill gap between teams and their rosters. Because of this, the NBA has set special rules in play including a set timeframe in which negotiation is allowed: the free agency period. This period is in between seasons and gives teams the chance to gear up for the next season and find improvements where they desire. This period annually reshapes the league and decides which teams will have the best rosters coming into the new season.

Furthermore, the fans of NBA franchises are demanding and always keeping a close eye on the moves made by the front offices. Fans want their team to be as competitive as possible at every time and are attached to players that have been with the team for a while. This makes signing players a difficult balancing act between short- and long-term success.

Teams could find themselves in bidding wars for the most in demand free agents, or when there is a limited number of free agents available for a certain role or position. But these teams also must

consider the salary cap rule that limits these signings. This salary cap makes teams reconsider every bid they put out and with limited roster spots, every signing matters and should be analyzed and considered carefully.

However, not only franchises are looking for the best fit of players to add to their rosters. Players are putting in a lot of time to determine the next best step for their career and ultimately, they decide which team they will sign for. Multiple factors come into play when considering this free agency decision, like salary, length of contract, quality of team and the location of the city the teams play in. These multiyear deals give athletes a lot of security and financial stability and the opportunity to sign the best contract possible is of upmost importance for pending free agents.

A "contract year" is the last year of a contract before the pertinent player enters free agency after the season ends. At the end of a season, the focus on players in a contract year enhances and their impact on the basketball court is monitored closely by scouts from all different NBA teams. A good final season could result in better offers in free agency, where a drop in performance could lead to fewer offers.

All this combined makes the concept of a contract year an interesting topic for discussion. Where incentives are usually used to motivate and increase performance for the current situation and contract, contract years bring an unexpecting extra incentive for future wealth and salary for NBA players.

Hypotheses

This research will try to evaluate the impact of this "hidden" incentive on the performance of players. The possibility of a looming new contract could be enough motivation to have a significant impact on current performance. The research question of this paper is therefore:

Does being in a "contract year" have a positive effect on the performance of NBA players?

To test this hypothesis, the research is divided into multiple sub questions, each with their own test to determine the possible effect of being in the last year of a contract. The sub questions of this paper are the following:

What is the effect of being in a contract year on productivity? This will test a player's impact in a contract year on the game from an individual perspective. All their on-court contributions will be used to calculate their impact and this impact will be compared among players. The hypothesis that will be tested here is: *Being in a contract year has a positive effect on Player Efficiency Rating.*

What is the effect of a player being in a contract year on their team's success? This will test a player's individual impact in a contract year on the results of the team they play for compared to their teammates. By measuring the impact on winning games, we can more accurately determine whether an increase in individual performance leads to more efficient winning basketball rather than just individual success that is detrimental to the team. The hypothesis being tested is: *Being in a contract year has a positive impact on win shares.*

What is the effect of being in a contract year on shooting efficiency? By looking at shooting efficiency, the player's shot selection is tested. The hypothesis regarding this sub-question is: *Being in a contract year has a positive impact on True Shooting Percentage.* It is expected that players in a contract year want to take more shots to increase their scoring numbers, but this could lead to more inefficient basketball being played. By testing for shooting efficiency, we can test both shot selection and whether a player has put in more work off the court to improve their scoring abilities.

Relevance

Social relevance

This research can help provide insight into the importance of a looming new contract as an incentive. Contracts that are ending happen all the time in day-to-day life and trying to find the best possible deal in the labor market is a common situation for a lot of people. How players compete with other athletes and try to earn better deals will also be discussed. Although the salaries are enormous compared to those of the average person working a 9-5 job, the negotiations and underlying theory in the labor market still affect employees in a similar way.

Besides, this research also reflects on the players and how they can possibly put themselves in a better negotiation position regarding the discussion of new contracts. This paper will highlight the contract structure and give an insight into risk-taking on the employee side of the deal. Besides, research papers concerning sports leagues provide better insights into professional sports economics and how their businesses operate (Gilmore & Gilson, 2007).

Furthermore, Research on professional sports helps inform public and political discussions regarding structure of big sports leagues and the fairness of its rules in effect on all involved parties. This also translates into broader issues like social justice and fairness as to how the NBA tries to remain fair and competitive, with equal chances for everyone involved (Abrams, 2013).

Scientific relevance

This research is scientifically relevant because of the new insight it provides into incentives, and its effect on employee performance. Through analyzing the colossal amount of data collected over the years, patterns and trends can be found to better map effects of incentives and contracts. These results can be translated to other markets as well.

Furthermore, this paper enlightens the theory regarding personnel economics and contract negotiations from an employer's perspective. The results of this paper will provide insight into how the length of contracts impacts the performance of employees. As well as how the performance can change in the final year of the contract.

Finally, the insights of this study can show the effects of decision making and how athletes take risks under circumstances of uncertainty, where the gains could be huge or make someone miss out on millions of dollars. These decisions could also affect multiple franchises and the quality of the entire basketball league (Safir, 2015).

Underlying theory

Personnel economics

Personnel economics focuses on the relationship between employers and employees. This part of economics focuses on the application of economic principles and methods in these negotiations and relationships. The focus is on understanding the behavior of the different participating parties and how they improve their efficiency.

An important aspect of the behavior of employees is shirking. Shirking is an economic term used to describe inefficient behavior while working. Once a contract has been signed, the motivation to work for a new contract disappears. It is up to the employer to properly motivate their staff and increase their efforts.

There are a lot of articles regarding the design of contracts, the impact of rewards and compensation systems and the motivation of employees to name a few examples. One of the major concepts is the inclusion of incentives in contracts and the effects they have on performance, motivation and the relationship between management and its staff.

Incentives are factors or rewards that help motivate employees while under contract. Without incentives, there is no monetary gain for employees to maximize their effort and production once a contract has been signed. This is because the amount of money earned would already be decided and thus independent of effort (Lazear & Oyer, 2007).

By adding incentives to these contracts, employees have more reason to increase their efficiency and are more motivated to meet the goals set by their boss. These incentives can be both positive and negative and can come in different forms. The most obvious is a monetary bonus if certain conditions regarding efficiency are met. Other forms of these bonuses can be non-monetary like praise or recognition. Another form of incentives are the intrinsic ones, focusing on the sense of fulfillment. A negative incentive could be a punishment or termination of the contract.

Sports economics

Sports economics and personnel economics fall hand in hand when it comes to the relationship between management and the athletes competing. This can be the negotiation of a new contract or the inclusion of bonuses in current deals. Here we will study the impact of a looming new contract on the current performance.

For players it is important that they are compensated fairly for the value they bring to the team, often in comparison to players of similar age in similar positions. The NBA even has special rules to make sure the resigning process is fair to all parties involved. For example, players are not allowed to start negotiations until the free agency period starts. Any form of contact between organizations and players before this period is seen as tampering and may lead to fines or invalid contracts that will be terminated.

Literature Review

The concept of a "contract year" has been researched multiple times involving different kinds of sports leagues in the US. There have been different methods to test for productivity changes and to find the best method for this study, these methods will be compared.

One of the first to research the contract year phenomenon in the NBA looking at individual performances is Stiroh (2007). By using a long period of time for the sample size, this is also one of the more extensive research projects on the topic. They find significant evidence of increased effort correlating with a better contract in the next year using cross-sectional data.

White & Sheldon (2013) did a time series study to examine performance in the contract year using mostly basic statistics of players from both the NBA and MLB (Major League Baseball). They compare the season of the expiring contract to the season directly before and directly after the contract year to find results. Moreover, White & Sheldon look at the effects on salary in correlation with changes in the statistics. They conclude that players in a contract year improve in certain statistics but not all, with a decrease in the post-contract signing year. Furthermore, an increase in performance in the contract year led to an increase in salary.

Jean (2010) created a cross-sectional model to measure productivity based on all the basic statistics and put them together to create a new variable for productivity. This is their dependent variable. In their study they look at both the contract year and the year after, to control for shirking behavior. The results show a significant increase in productivity in the contract year, but no significant results of shirking behavior in the following season.

Gaffany (2013) does make use of advanced statistics, but their research is limited due to the small sample size and the very specific restrictions used for both the data selection and the control variables. For example, only 1 season is used to determine possible effects of being in a contract year. Moreover, Gaffany uses career averages as a threshold which could lead to different results depending on the phase of the career the contract year player is in. Their results also differ from the other papers, since there is a significant underperformance of the players whose contract is expiring.

This research will differ from the known literature by combining a couple of key aspects into one new study. First, the use of advanced statistics in cross-sectional studies is very limited. It has only been done with either a small sample size or using a time series test. Advanced statistics are more detailed and cover more assets of the game and are therefore better for measuring performance. Another reason to use advanced statistics is to adjust for playing time. Players that play more usually put more statistics on the board, but by adjusting for playing time we can more easily compare different kinds of players and their performances.

Second, this research will use more recent data than the previous studies. Since these papers were released, the salary cap of the NBA has been increased. This gives teams more flexibility in their roster construction and how much money is allocated to each player. This improves the competition between players fighting for contracts and could lead to different results for players who are in their contract year opposed to players that are not.

Last, advanced statistics are becoming more and more common knowledge for basketball fans/players/coaches et cetera. They are being used for decision making by both coaches to decide playing time and upper management when considering signing new players. They are also regularly brought up during broadcasts or sports talk shows and have become part of the NBA lingo. It would not make sense to use basic statistics when advanced statistics are now considered mainstream.

Data

Data source

Basketball statistics have become a prominent part of the sport and there are many different websites tracking all kinds of different statistics. Basketball Reference is a free to use database that also tracks

advanced statistics and metrics. The data is sorted into both individual statistics as team statistics and provides some general information about every NBA player that has ever played a single game. The data is collected from official sites like the NBA itself and even spans back to the 1940s.

The reason Basketball Reference is used as a source is the number of advanced statistics collected and the accessibility of this data. It is also very easy to customize and select the needed variables for this research while leaving out unnecessary statistics.

By using the data of multiple seasons, the difference of quality in players can be accounted for, since every player will be in a contract year at least once over a multi-year period. This also allows for comparison of a single player's statistics over multiple seasons to determine a possible difference when a player is in a contract year.

Variables

The standard or basic statistics in the NBA are the stats that can easily be tracked every game. Examples are points, rebounds, or assists. These stats can easily be compared between players and teams to give a quick insight into performance. As research into basketball developed, these statistics were used to create more complicated variables to better express performance into numbers, so called advanced statistics.

An advanced statistic is thus a combination of a variety of different numbers combined to give one statistic using algorithms. In studies, the best tools to describe performance and efficiency are through advanced stats and gives a more accurate description of how a player adds value to a team. The advanced statistics used in this study are the following:

Player Efficiency Rating (PER): This is a formula using both positive and negative statistics to calculate a player's impact on the basketball floor. It takes the pace of the game into account as well as an adjustment for the strength of opponents. A PER of 15 is considered an average impact of a player compared to the rest of the league and it usually scopes over longer periods or a full single season.

Win shares (WS): This is a metric used to describe how much of a team's success (winning games) can be credited to a specific player. Ultimately winning games is the most important goal of a sports franchise, and this is the best metric currently available to calculate individual impact on the team's success by looking at statistical contributions, playing time and the strength of opponents.

True Shooting Percentage (TS%): This statistics measures how many points a player scores per attempt. The difference in normal shooting percentage is that the worth of 3 pointers and free throws are accounted for and adjusted for their value. A higher TS% means a more efficient scorer.

Usage Rate (USG): The usage rate calculates how much a player is involved during a team's offensive possessions. A percentage is measured by calculating how many shots a player takes and how often he turns the ball over in comparison to the team's total. A player that has a higher usage rate will have a bigger impact on their team's success or failure.

Finally, this study uses some control variables to help better model the performance of NBA players independently of the number of years left on a contract. Data used for this captures general information about demographics and physical attributes.

Data modifications

The data that will be used for this research are the statistics from 5 full consecutive seasons spanning the period from 2017-2022, with the 2017-2018 season starting in October of 2017 and the final season ending in April of 2022. Because of some major changes in the salary cap in 2016, data before this change may not be representative enough to be included. For instance, some players were holding out on long-term contracts to land bigger and better deals after the salary cap change and signing a 1-year deal before. This means players could be in a contract year but not be extra motivated since they would be in a contract year the following season as well.

Only regular season games will be included, so all pre-season and post-season games will be excluded. The data will also be modified to not consider retiring players, who are not playing for a future contract and have no extra incentive to perform better in the current season. To avoid outliers, a minimum threshold of 500 minutes played over the entire season is endorsed. Moreover, all games played of a season are considered. This means if a player played for multiple teams in the same season, all games played for every team are combined to create the single-season stat line for that specific player.

Finally, an exception was made for team options on contracts. In the NBA it is possible to sign partially guaranteed deals with options at the end of the contract for both players and teams. If there is a player option, the player can decide to extend the current contract for the length and salary that was determined at the initial contract negotiation. Usually, a player will decline this option if he expects to sign a better deal than the predetermined salary. However, when there is a team option, the player cannot decide whether he will enter free agency or stay at the same team. If a player were to outperform the pre-negotiated deal, the team option is likely being exercised by the respective franchise. This means there would be no extra motivation to get the best possible contract compared to other players in a contract year.

Methodology

Regression

To answer the sub questions a multiple regression analysis will be applied to determine the correlation between the dependent variable and the independent variable. In this study the dependent variable will be an advance statistic (PER, win shares or true shooting percentage) where the independent variable is the binary fact whether an NBA player is in a contract year or not. This linear regression model will also include multiple control variables to help account for the difference in performance between players. The formula used looks like the following:

$$\boldsymbol{Performance_i} = \boldsymbol{\beta_0} + \boldsymbol{\beta_1} * \mathbf{CY}_i + \boldsymbol{\beta_2} * \mathbf{Age}_i + \boldsymbol{\beta_3} * \mathbf{Age}^2{}_i + \boldsymbol{\beta_4} * \mathbf{Position}_i + \boldsymbol{\beta_5} * \mathbf{USG}_i + \varepsilon$$

As mentioned before, the Performance variable is either PER, WS or TS% depending on the sub-question and relevant regression. For all three of these dependent variables, the same rule of thumb applies: the higher the dependent variable, the better the performance of the respective player.

CY (contract year) is the dummy variable that has a value of 1 if the contract of the concerning player expires at the end of the season. When the value for CY is 0, this player has a guaranteed contract for at least one more season. This thus means that players in a contract year have value 1 for CY.

Age is a variable that contains multiple components regarding basketball players in this research. The biggest one is that players become more experienced over time and a higher age means more experience in general. This experience can result in a higher basketball IQ, better skill development from working with top tier coaches and players specializing in their strengths over time. Besides, most NBA players continue to improve physically until their late 20s. However, this means that age does not improve performance continuously over time as can be seen in Figures 1-3 in the Appendix. After a certain amount of time, players hit their so-called athletic "prime" and will regress afterwards, which could decrease their productivity on the court. Older players also become more injury prone and take longer to recover from said injuries. In the regressions the "age" variable is used as a continuous linear variable with also the variation "agesquared" (or Age^2) which is the same variable "age" times itself to catch some of the ambiguous effects.

The variable Position is a categorical variable. Basketball in the NBA is played 5 on 5 so naturally, there are 5 different positions. Although players can play in multiple positions, Basketball Reference has assigned one position to each player for every season. There are a couple of players with multiple positions for one season, but in this research's database players with multiple positions are categorized in the position most representative of their entire career. By controlling for position, we automatically

control for some differences between players like height and weight. Besides, players with the same position often play similarly and these players are often matched up against each other in games.

Finally, we use the usage rating (USG) to account for decisions made by coaches. Obviously, players that play more minutes will put more statistics up on the scoreboard and the best players generally play the most minutes bar any injuries and irregularities. Coaches are the ones deciding who gets these minutes and design the plays to be run during games. These plays usually revolve around the two or three best players on a team and getting them in the best position with the basketball in their hands. They can then decide to shoot the ball, but also to make the decision to pass. Some players are thus dependent on their teammates and how egotistical they are. That is why USG is part of the regression as offensive impact is measured and compared to teammates with this variable. However, this could lead to some ambiguous results as the usage rate spans an entire season in this specific research. How good or bad a player performs in the beginning of the season affects the opportunities they will receive in the rest of the season, but also their overall performance during the season expressed in advanced statistics. It is therefore difficult to measure if an increase in productivity comes from an increase in opportunities, or an increase in opportunities leads to higher productivity.

Descriptive statistics

Table 1: Summary statistics of all three dependent variables, the independent variable, and all control variables except position and agesquared.

Variable	Observations	Mean	Standard deviation	Minimum	Maximum
CY	1721	0.335	0.472	0	1
Age	1721	26.127	4.099	19	38
MP	1721	1492.062	597.640	500	3028
USG	1721	19.255	5.450	6.9	40.5
PER	1721	14.565	4.590	3.7	32.8
WS	1721	3.248	2.581	-1.9	15.6
TS%	1721	0.561	0.051	0.397	0.745

Table 1 shows some important information about the used variables in the regressions. There is a total of 1721 samples of statistics collected in this dataset over the 5-season period. 33.47% of these were in a contract year. There is a lot of variety in the advanced statistics because all kinds of players are a part of the dataset, from superstars to bench players. The thresholds that have been set can also be seen in the summary statistics, like a minimum of 500 minutes played and the oldest players

in the league have been removed from the data and the average age is thus a little lower than the entire league.

Table 2 shows the distribution of the position variable since there is no numerical value for this variable and can be found in the Appendix. The positions are distributed fairly even but there are more guards (shortest/lightest players) than forwards/centers (biggest and heaviest). This means the competition for a new contract in free agency will be higher for these positions.

Analysis

Player Efficiency Rating

The three hypotheses will now be tested with the help of the modified dataset. As said before, to answer the first hypothesis: "*What is the effect of being in a contract year on productivity?"* the advanced statistic PER will be used as a dependent variable. The results of this regression can be seen in Table 3.

Table 3: Linear regression results for the relationship between contract year status and Player Efficiency Rating.

					95% Confidence Interval	
Variable	**Coefficient/Value**	**Standard error**	**t**	**p**	**Lower level**	**Upper level**
Contract year	-0.5661*	0.1495	-3.79	0.000	-0.8594	-0.2728
Age	1.4536*	0.1898	7.66	0.000	1.0813	1.8259
Age^2	-0.0253*	0.0035	-7.19	0.000	-0.0322	-0.0184
Position.SG	-1.2254*	0.2017	-6.07	0.000	-1.6210	-0.8298
Position.SF	-0.0158	0.2228	-0.07	0.943	-0.4527	0.4211
Position.PF	1.1706*	0.2128	5.50	0.000	0.7532	1.5881
Position.C	4.9574*	0.2123	23.35	0.000	4.5409	5.3738
USG	0.5607*	0.0127	44.15	0.000	0.5358	0.5856
β_0	-17.2307*	2.5179	-6.84	0.000	-22.1692	-12.2922
R^2	0.6423					
Observations	1721					

** p < 0.05.*

In Table 3 the control and independent variables used in the regression can be seen on the left. The values of the coefficients are indicated with a * if they are significant with an alpha of 5%. This can also be seen in the t and p columns, as well as the columns regarding the 95% confidence interval. The p-value here depicts whether the null hypothesis of the t-test can be accepted or rejected, using the t-value from the previous column. The null hypothesis states that there is no significant impact of the

variable in question on the dependent variable PER, when the p-value is lower than 0.05 the null hypothesis is rejected and there is significant evidence that a variable affects the dependent variable. The standard errors in the table show the expected difference between the estimation of the regression and the true value in the sample population. Furthermore, the R^2 for this regression is 64.23%, meaning that this proportion of the variance of the dependent variable PER is explained by the independent variables in this regression. Lastly, the number of observations is 1721, so all data from the sample is being used in this regression.

The regression table shows with statistical significance that being in the last year of your contract negatively correlates with the Player Efficiency Rating of that player. On average, the PER rating of contract year players is 0.566 lower than players with multiple seasons left on their current contract.

The variable age brings both a positive and a negative component to this specific regression. An increase of 1 year in age leads to a higher PER by 1.454 on average. But an increase in age also leads to a decrease of 0.025 in efficiency for year in age times itself. This means that the older a player becomes, the decrease of productivity given by the variable 'agesquared' will be higher. Both coefficients are also statically significant.

For the variable position, point guards are taken as the base, and the difference with the other positions can be seen in Table 3. The coefficients for position show that there is some variety between positions and productivity. Where the PER is lower for the smaller, lighter players (PG&SG) and the so-called 'big men' (PF&C) have a higher production rate. The only coefficient that is not significant is that of the small forwards. This coefficient is also very small with it being only -0.015, so it looks like point guards and small forwards have very similar production in this sample. The average difference between point guards and shooting guards is 1.225 in favor of the former. When it comes to power forwards and centers, their PER is on average 1.171 and 4.957 higher than point guards respectively.

Lastly, usage rate is significantly correlated with PER. A higher usage rate translates to more productivity. This can be taken in two different ways. First, it looks like being more involved leads to playing better basketball. However, by design the best players will be put into the best possible positions by their coaches and teammates and the best players will get the most opportunities to affect the game. These results are therefore ambiguous.

The relevant hypothesis for this regression analysis is: *Being in a contract year has a positive effect on Player Efficiency Rating.* These results show that the players in a contract year do not instantly become better players because they are pursuing a new deal in the off-season. In fact, their efficiency

decreased in this specific data sample testing the productivity. There are a couple of factors that could have impacted these results.

The sense of urgency created by the need for a new contract could be counterproductive. Instead of being motivated by the possibility of a big contract, the added pressure of this could lead to inefficient basketball being played. Players could attempt moves that are outside of their skillset as an attempt to do more than they were doing in previous seasons.

Teams could also focus on players that are signed long term and will for sure be a part of the franchise in the future. This gives them the chance to develop and get to know a team's specific system better than players that could leave. Especially when the respective team does not have a lot of salary cap space available for contracts in the upcoming free agency period.

Another possible limitation could be the heterogeneity of the sample population. All NBA players are different with unique characteristics. While some players could be more motivated by a looming new contract, others could not be affected by this in their playstyle. Combined with all other factors on and off the court that can influence an athlete and their performance, it is difficult to pinpoint exactly where a change in productivity comes from. A player could thus be extra motivated to play better, but this motivation alone does not automatically translate to better performances.

Finally, players could not be as motivated to compete for a new contract because they have already locked up a lot of money from their previous contract and there are other financial opportunities outside of NBA contracts, like brand deals with sponsors. Because this could apply to players for all three sub-questions, this will be discussed more thoroughly in the discussion segment of this paper.

To conclude, this regression shows a decrease in productivity for players in the final year of their contract. That is why the hypothesis that players in their contract year will be more productive than those who are not in a contract year is rejected at the 5% significance level. There are a lot of different factors that influence the Player Efficiency Rating, and each players skill set is unique, but the players not in a contract year performed better overall and signing players to longer deals, so the amount of contract years decrease, looks to be the most efficient ways of signing athletes for NBA franchises.

Win Shares

To answer the question: *What is the effect of a player being in a contract year on their team's success?* Win shares will be used as the dependent variable in the regression. Players in the sample will now be compared to their teammates as opposed to the whole league. Contributions of productivity will now be measured to determine success for the team and winning games. The relevant hypothesis that will be tested here is: *Being in a contract year has a positive impact on win shares.*

Table 4: Linear regression results for the relationship between contract year status and win shares.

					95% Confidence Interval	
Variable	**Coefficient/Value**	**Standard error**	**t**	**p**	**Lower level**	**Upper level**
Contract year	-0.7999*	0.1188	-6.73	0.000	-1.0329	-0.5669
Age	1.2589*	0.1508	8.35	0.000	0.9631	1.5546
Age^2	0.0212*	0.0028	-7.62	0.000	-0.0286	-0.0158
Position.SG	-0.3063	0.1602	-1.91	0.056	-0.6206	0.0081
Position.SF	0.4231*	0.1769	2.39	0.017	0.0761	0.7702
Position.PF	0.7511*	0.1691	4.44	0.000	0.4195	1.0827
Position.C	1.8532*	0.1687	10.99	0.000	1.5223	2.1841
USG	0.1819*	0.0101	18.04	0.000	0.1622	0.2018
β_0	-18.5036*	2.0003	-9.25	0.000	-22.4269	-14.5803
R^2	0.2860					
Observations	1721					

** p < 0.05.*

Table 4 shows that players in the last year of their contract were significantly worse than players that weren't when it comes to win shares. The coefficient is -0,800 and shows how the latter type of players were better on average. As seen in the descriptive statistics, the total average of the sample size for win shares was 3.248. This makes it seem like it is better for organizations in the NBA to not have players in their contract year and these franchises are better off with their players on multi-year deals.

Once again, the variable age brings both a positive and a negative component to this specific regression. An increase of 1 year in age leads to an increase in WS by 1.259 on average. An increase in age also leads to a decrease of 0.021 in win shares for year in age times itself. This means older players have a bigger decrease of win shares on average. This can be because older players have more of a mentor role rather than an actively playing role, whereas younger players are giving more opportunities to improve despite not being the best possible option at times. Both coefficients are statically significant.

With a 5% significance level, all coefficients of position are significant except for sg. This coefficient is also the only negative one at -0.306. On average small forwards have a higher win share of 0.423 compared to point guards. Power forwards have 0.751 win shares more on average and centers have the highest win shares on average, with 1.853 more than the base position.

It is not surprising that players with a higher usage rate help their team win significantly more than players with a lower rate. On average, every percentage point of usage rate extra will give a player

0.182 more win shares. The players with the highest usage rates are the vocal points of teams and most responsible for the team's success.

Win shares are negatively correlated with players in a contract year in this second regression. This shows that players in a contract year do not help teams win as many games as players who are not in a contract year. The hypothesis "*Being in a contract year has a positive impact on win shares"* is rejected with an alpha of 5%.

This can partially be explained by the fact that better teams have a better structure and are set up better overall than teams that lose more games. One of these aspects is having the right type of players on the team roster that also complement each other, this is often done with players who have established themselves and their value is known. Whereas worse teams do not have this chemistry and team bond because they haven't figured out the right formula and are testing things out with players on shorter deals, who are thus more often in a contract year.

Another reason for this could be a more careful approach to the game. Getting injured right before becoming a free agent could be catastrophic for the opportunities of signing a new contract and will make franchises less likely to sign you. Players are therefore less likely to make plays that do not show up on the stat sheet, like boxing out, diving for loose balls or setting charges. These plays can increase injuries and are not interesting for players purely focused on themselves and not the team's success.

This goes hand in hand with contract year players becoming more selfish, the potential for 2 or 3 points weighs more than the potential of an assist, even when a teammate is more open for the shot. This leads to inefficient basketball and will not help teams to win games. The use of advanced statistics helps with this problem since there is not a focus on one particular basic statistic like points scored to draw conclusions. With the help of advanced statistics, the impact of individual players is more accurately described.

Another important point of discussion as far as a team's success goes is the phenomenon of tanking. The teams in the NBA that lose the most games will get the best odds at a good draft pick at the end of the season. Although it is not allowed to lose on purpose, recently teams have been resting their best players more often, while giving worse players more chances if the team is not expected to make the play-offs. This could lead to contract year players being given more opportunities to play selfishly without repercussions, stimulating inefficient basketball and losing more games, leading to a lower win share for these specific players.

Overall, the hypothesis that being in a contract year improves the respective team's success is rejected at the 5% level of significance. Being in a contract year leads to winning fewer games on average and contract year players are thus not reliable when it comes to winning the most games as a team.

True Shooting Percentage

The final sub-question and hypothesis tested is: *What is the effect of being in a contract year on shooting efficiency?* The shot selection and shooting efficiency are tested with this final regression, where True Shooting Percentage is the dependent variable, with the same control variables as before. The results for this regression can be found in Table 5.

Table 5: Linear regression results for the relationship between contract year status and True Shooting Percentage.

					95% Confidence Interval	
Variable	**Coefficient/Value**	**Standard error**	**t**	**p**	**Lower level**	**Upper level**
Contract year	-0.0074*	0.0024	-3.03	0.002	-0.0121	-0.0026
Age	0.0162*	0.0031	5.22	0.000	0.0101	0.0222
Age^2	-0.0003*	0.0001	-4.70	0.000	-0.0004	-0.0002
Position.SG	0.0121*	0.0033	3.69	0.000	0.0057	0.0186
Position.SF	0.0201*	0.0036	5.55	0.000	0.0130	0.0272
Position.PF	0.0284*	0.0035	8.19	0.000	0.0216	0.0352
Position.C	0.0663*	0.0035	19.15	0.000	0.0595	0.0731
USG	0.0006*	0.0002	2.80	0.005	0.0002	0.0010
β_0	0.2943*	0.0410	7.18	0.000	0.2139	0.3748
R^2	0.2247					
Observations	1721					

** $p < 0.05$.*

Being in a contract year lowers the true shooting percentage by an average of 0.007, or 0.739 percentage point. With our 5% significance level we can say there is enough evidence that being in the last year of a contract negatively correlates with shooting in this sample.

The variable age has a positive coefficient and the variable agesquared is negative, both at the 5% significance level. This makes aging effects ambiguous once again. Part of this can be explained because players get more skilled throughout the years and get a better understanding of what good shot selection is with experience. On the other hand, diminishing physical capabilities results in players

becoming worse at finishing through contact and getting into the positions they need for an efficient shot.

This is the only regression where all coefficients for position are statistically significant. All coefficients are also positive and in ascending order, making point guards the least efficient shooters and centers the most efficient. In general, the tallest players take more shots closer to the basket and thus the easier shots, so the results make sense from that perspective.

The coefficient for USG shows that taking more shots and being more involved in a team's offense does not lead to more inefficient shots. An increase of 1 percentage point in usage rate leads on average to an increase of 0.058 percentage point in TS%. This is statistically significant with an alpha of 5%. However, it must be said that the players who are the best at making shots likely get to take more as well.

The hypothesis that is being tested here is: *Being in a contract year has a positive impact on True Shooting Percentage.* From this regression we see a negative correlation between players in a contract year and true shooting percentage. The most logical reason for this is a chance in shot selection as an attempt to become a more effective scorer, as mentioned in the analysis of the first regression. Taking more shots can lead to more points but does not necessarily mean that the shots taken are efficient. Besides, taken shots you are not specialized in can lead to a drop in percentages. An increase in motivation alone to make more shots is not enough to actually make these shots.

Furthermore, defenses are more prepared for players in their contract years. The importance of coaching and scouting opponents has become more and more prevalent over the years as teams try to use every tool available to perform better. If a certain player's play style is recognized as a contract year player trying to increase his personal statistics, defenses can adjust accordingly. They can send more double teams, help more often on defensive rotations, or give no help if the contract year player is off the ball trying to get open. This increased defense can affect productivity and will likely lower the efficiency of the offensive player.

Finally, teammates can recognize selfish behavior exerted by contract year players. Players can start the season trying to improve their productivity and neglecting their teammates, but an obvious change in playstyle can lead to changes in the team as well. Teammates do not want to pass to a selfish player and coaches will not condone selfish play if it leads to losing basketball being played. If an NBA player who is in the last year of his contract blatantly tries to improve his personal play at the expense of the team, adjustments will be made by the organization around him, and his personal statistics will suffer.

So, players in the final year of their contract are worse shooters than players with multiyear deals. It cannot be argued that the shot selection of the contract year players was better, and this is most likely correlating with the drop-off in productivity and win shares as well. The hypothesis that *being in a contract year has a positive impact on True Shooting Percentage* is thus rejected with an alpha of 5%.

Conclusion

The main research question of this paper is: *Does being in a "contract year" have a positive effect on the performance of NBA players?* Using a sample population spanning a period of 5 full NBA seasons, NBA players were compared with the help of a linear regression. There were three hypotheses that were tested by using three different regressions. The hypotheses were:

- *Being in a contract year has a positive effect on Player Efficiency Rating.*
- *Being in a contract year has a positive impact on win shares.*
- *Being in a contract year has a positive impact on True Shooting Percentage.*

For all three regressions the control variables were the same and only the dependent variable changed. A dummy variable was created for "contract year" which had a value of 1 for players who were in the final year of their contract and looking for a new deal in the next season. The regression analysis then tested the impact of this dummy variable on the three different dependent variables: PER, WS and TS%. For every regression, there was enough evidence to conclude that the impact of being in a contract year negatively correlated with the three dependent variables measuring productivity and efficiency.

All three hypotheses are rejected with a 5% significance level. Contract year players were not more efficient, they were not helping their team win more games and they were making shots at a lower rate than the players who had multiple years left on their contract. These players may have had extra motivation to play better, but the regressions show a decrease in performance and productivity.

Therefore, the conclusion of this paper is that being in a contract year did not have a positive impact on the performance of NBA players. The Player Efficiency Rating, the total amount of win shares and the overall True Shooting Percentage were all lower for contract year players when compared to non-contract year players. The possibility of a looming new contract is not enough incentive for NBA players to significantly increase their productivity.

Discussion

The results and conclusion of this paper are different from the results seen in similar papers discussed in the literature review section. First, the data used for this research was a sample population

specifically modified for this research and has not been used in any other research. The data stems from a 5-year period starting in 2017. This was right after the biggest salary cap increase in the history of the NBA, where teams were allowed to spend around 24 million dollars more annually on contracts than earlier seasons.

This increase led to an increase in contracts for all levels of NBA players, from the superstars to the worst bench players. If we assume that the more money someone has already earned leads to less motivation to earn more money in the future, this means that the motivation to play for a new contract when in a contract year has decreased, on average, over time with the increase in the salaries earned by professional basketball players.

Besides, opportunities outside of NBA contracts have grown over the years as well. Michael Jordan is known for his performances on the basketball court, but he has also made a huge impact with his own customized shoes in a deal signed with Nike early on in his career. This ultimately led to the Jordan brand, producing shoes that can be found all over the world (Kellner, 2001). Nowadays, it is much more common for NBA players to sign with a shoe brand or have an endorsement deal with another sports related brand, like sports drinks or basketball video games. This means that NBA players do not have to focus on being the best possible basketball player to make the most amount of money. For example, players could be trying to increase their follower count on social media to get more endorsement deals and become more marketable, while they could also invest this time in practicing their skills to become better basketball players.

The use of newer data could thus be a reason why there are different results from other papers and NBA players have changed in their behavior when it comes to being motivated to earn the most money. For future research it could be beneficial to exclude the highest earning players from the sample data and focus on the players that do not have the highest salaries and do not have a lot of endorsement deals and opportunities outside of playing basketball professionally. These players could also be extra motivated because they are surrounded by people who earn more money than them and they can directly see the benefits of a more luxurious lifestyle.

The literature review also showed one outlier in previous research. Gaffany (2013) also used advanced statistics and concluded that being in a contract year does not lead to higher productivity or efficiency as well. Meanwhile, the papers using basic statistics found evidence of the contract year phenomenon to be true. An increase in basic statistics does not automatically translate to higher advanced statistics and future papers should use advanced statistics to give a more accurate image of productivity among NBA athletes.

As mentioned earlier, teammates and coaches could react to selfish behavior done by players who are trying to ensure a more lucrative contract after their current contract expires. Especially with the contract year phenomenon being more widely known by athletes and sports enthusiasts nowadays. Although an increase in efficiency is welcomed by both teammates and coaches, if this attempted increase actually leads to worse outcomes, adjustments will be made. If players are suspected of playing selfishly for their own benefit and future contract and teammates and coaches react to this, the overall productivity will decrease just like the sample populations' productivity for contract year players.

Furthermore, there could be extra motivation coming from being in a contract year, but not an improvement in productivity. The extra motivation can help with increased practice hours and more dedication to becoming better, but this extra motivation is not enough to automatically play better, and athletes need to do more than just be motivated to increase productivity.

Another limitation for this research is the heterogeneity of the data sample. The difference in characteristics of NBA players cannot be controlled for. We cannot account for how much time someone invests in themselves practicing basketball and going to the gym. The impact of earning more money is different for everyone because everyone has a different background and different responsibilities in life. Also, the possibilities outside the NBA discussed earlier are different for every athlete.

To take away these differences between players, a time series test could be done in future research on this topic. This way, players are compared with themselves over time and a change in statistics during a contract year could be evidence of the contract year phenomenon in the NBA. Gaffany (2013) has researched this, but his limited data sample and many restrictions allow for improvements on his methods. More extensive research using time series and advanced statistics to measure the contract year phenomenon in the NBA could thus be insightful. However, this is under the assumption that a specific player's characteristics and motivation does not change over time, and the only change in motivation could come from being in a contract year.

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Appendix

Figures

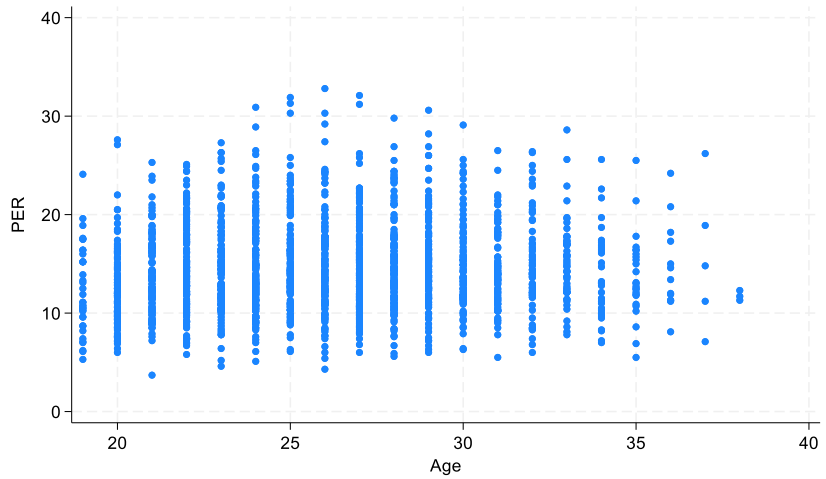

Figure 1: Correlation between the variables Age (in years) and Player Efficiency Rating.

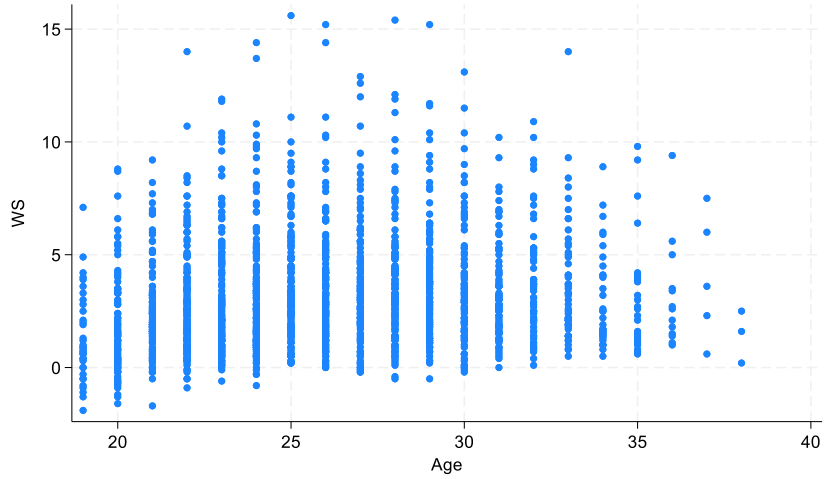

Figure 2: Correlation between the variables Age (in years) and win shares.

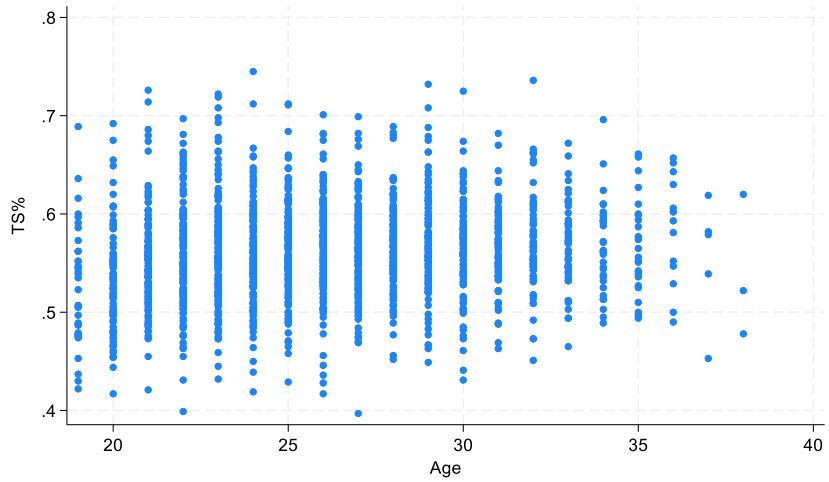

Figure 3: Correlation between the variables Age (in years) and True Shooting Percentage.

Tables

Table 2: Distribution of the variable position.

Position	Frequency	Percentage
Point Guard	354	20.57
Shooting Guard	407	23.65
Small Forward	292	16.97
Power Forward	332	19.29
Center	336	19.52