ERASMUS UNIVERSITY ROTTERDAM

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Bachelor Thesis Strategy Economics

What is the Effect of Wage on the On-Court Performance of NBA Players?

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Abstract

This study investigates the pay-performance relationship and the age-performance profile of basketball players in the National Basketball Association using player data from the 1997/1998 season to the 2018/2019 season. Using an individual fixed effects model, a non-linear effect for both the one-year lagged salary as well as relative salary from the average salary in their team is found. The relationship between lagged salary and performance is N-shaped and the relationship between relative salary and performance is U-shaped. The rise in the salary cap was also used as an instrumental variable and no significant effect of salary on performance was found. Unfortunately, this instrumental variable was unable to adhere to all the assumptions of an instrumental variable. Finally, the studied turning point of the performance-age profile of basketball players differed depending on the position of the player.

Introduction

The North American basketball competition, the National Basketball Association (NBA), is the best-paying sports competition in the world. The average NBA athlete earned $7.15 million in the 2017/2018 season, nearly double of what was earned in the second-highest competition, which was the Mayor League Baseball (MLB) (SportyCo, 2018). In Forbes Magazine’s list of the 50 highest-earning athletes of 2019, 19 are NBA players, more than for any other sporting competition (Badenhausen, 2019). Badenhausen gave the near doubling of the salary cap over the past five years as an explanation for the high earnings in the NBA.

The problem that arises is: do these NBA players deserve these lavish salaries? Do wages actually have an impact on the on-court performance of NBA players? This study will address this question and try to answer it.

Sports economics is often used as a laboratory to study effects on labor markets (Kahn, 2000). Sports is such a good forum for research because of its transparency. Nearly all player information such as name, race, age, full career history is known. Also, all players' performance statistics and compensation are easily available to researchers. It is also possible to easily link the player information on its performance and salary, which is much harder in a ‘normal’ economic setting. Additionally, sports leagues have had major changes in the rules and structure of the labor market, which in turn create new natural experiments to analyze. The elements of supply and demand are presented in sports labor markets and can thus be empirically investigated for research in applied economics (Rosen & Sanderson, 2001). However, there are some downsides to using sports economics to study economic theory. The biggest one is that wages in sports labor markets are far above wages in “normal” labor markets (Kahn, 2000). This could prove troublesome to generalize the findings in sports economics to “normal” economics.

The scientific relevance of this research is that a direct analysis of an NBA player’s wage on their on-court performance has, according to my research on the topic, never been done before at a player level. This effect has been studied in soccer by Torgler and Schmidt (2007). Stiroh (2007) has analyzed the effect regarding the signing of a new multi-year contract in the NBA, but not for a regular situation. Additionally, the majority of the research regarding the effect of wage on performance has been done in the context of inequality within a team and not with a player’s own salary. As mentioned above, conclusions found in sports economics could be applied to personnel economics. So, if the result of this study is that there is an effect of wage on performance, this study could be used in a non-sport setting to have more information in employee salary determination, which would provide the social relevance of this study.

This study will first look at the existing literature on the effect of pay on performance and wage dispersion on performance. First in “normal” personnel economics, followed by research done in both sports economics as a whole and research in the NBA in particular. Next, the existing studies regarding the performance-age profile of athletes will be discussed. After that, the used data and the methods used in this study will be described. The results of this study will then be shown and dissected. Lastly, this study will be concluded by the conclusions and the discussion of this study.

Literature Review

Context pay-performance

In personnel economics, a way to improve the performance of a worker is by increasing his or her incentives (Lazear, 2000). One example of this is that the average output per worker increases when wages are changed from hourly wages to piece rates. This is due to an increase in incentive for the workers to produce more. Also, firms that pay higher salaries are more productive than firms that pay lower salaries (Abowd, Kramarz, & Margnolis, 1999). However, the authors said that person-specific effects, not level of productivity, explain a large part of the difference in wages between firms.

In sports economics, there is another key factor to consider in determining the performance-wage link. Athletes are assumed to be at least for some part intrinsically motivated to perform well in their work (Vallerand, Deci, & Ryan, 1987). An intrinsically motivated person performs for internal incentives rather than external ones such as a monetary reward (Ryan & Deci, 2000). Take for instance the difference between a factory worker and a professional basketball player. If the factory worker does not get paid for a day, he is unlikely to go to work that day. For a basketball player, it can be assumed that he would still be tempted to go to work regardless of his lack of payment but just out of the love for his work. This can be seen by the pickup basketball games NBA players play with each other without financial compensation (Wood, 2011). This means that a monetary incentive is not the only determinant of a player's performance and pay is not the only influencing factor on his performance.

Pay-performance in sports

The effect of pay on performance in sports is a subject that is often studied. However, the majority of research analyzes the effect of wage dispersion within a team on performance (Harder, 1992; Frick, Prinz, and Winkelmann, 2003) or the effect of performance on earned wage (Barnes & Morgeson 2007; Barnes, Reb, and Ang, 2012).

First of all, it is important to establish whether there is a causality link that runs from salary to performance in professional sports and not the other way around. Hall, Szymanski, and Zimbalist (2002) applied a Granger causality test in MLB and English soccer to test the direction of the causality link of payroll and team performance. They found that in English soccer wage significantly improves team performance and not the other way around. In baseball, on the other hand, they found mixed results. There was no causality link from wage to performance in baseball from 1980 to 1994. However, from 1995 onwards there is evidence of Granger causality from salary to performance. It is important to note that their MLB data was from 1980 to 2000, so this Granger causality from salary to team performance is likely to still exist in baseball today. According to the authors if they had more precise data the causality link would increase in strength. The difference in the Granger causality between English soccer and the MLB is due to the restrictions in player spending, roster sizes, player mobility, etc. that exist like baseball in all North American sports, such as the NBA, and that does not exist in English soccer.

Similarly, Dobson and Goddard (1998) similarly concluded that in English soccer the influence of lagged performance on current revenue is weaker than the lagged revenue on current performance. This implies that the causality link runs from revenue to performance and not *vice versa*.

The effect of a player's own wage on his individual performance has rarely been studied. On a team level, Zimbalist (2002) concluded that in the NBA a team's salary significantly increased that team's win percentage. Simmons and Forrest (2004) found a quadratic relationship between wage and team performance in the NBA. Torgler and Schmidt (2007) extended this research and found a non-linear effect in the German Soccer league the *Bundesliga* on an individual level in the form of an N-shape.

The effect of pay-performance on an individual level is less often studied in the NBA. Stiroh (2007) found that a player's on-court performance improved significantly in the year before signing a new contract. But after signing the contract, his performance declines. This shows that NBA players do improve performance when presented with a monetary incentive, in this case, the chance of signing a long-run lucrative contract.

This leads to the first hypothesis:

H1: An NBA player's wage has a non-linear effect on his on-court performance and this effect is N-shaped.

Context wage dispersion

The effect of wage dispersion on performance is a complicated issue. Namely, economic theories have been derived that state that wage inequality can both decrease and improve performance.

Having wage dispersion within a firm can lead to disharmony among workers (Lazear, 1989). Reducing wage dispersion also leads to an increase in cohesion within the firm (Levine, 1991). An increase in cohesiveness also results in greater productivity. This would mean that a way to increase productivity is to reduce wage dispersion within the firm, this is called the cohesion effect. There could also be a negative of an increase in cohesiveness. If the goals of the workers and the firm do not align, an increase in cohesion will lead to a reduction of productivity. However, this study will discuss wage dispersion within basketball teams and it can be assumed that the goal of the firm, to win basketball games, is also shared by their employees, the athletes. So, this negative side of cohesion within a firm is unlikely to influence performance in this study.

According to the fair wage effort hypothesis, wage dispersion reduces a worker's effort (Akerlof & Yellen, 1990). A worker's effort depends on the difference between the wage he or she receives and the wage he or she perceives to be fair. If a worker receives a lower wage than deemed fair by the worker, he or she will reduce his or her effort. The wage earned by their colleagues influences this fair wage. As a consequence, higher wage dispersion would increase the perceived fair wage. So, higher wage dispersion would cause less effort from the workers and thus less output by the firm because their actual wage is lower than this new fair wage.

It could also be a rational choice for the firm to have wage dispersion. Ramaswamy and Rowthorn (1991) argued that it is best to pay the highest wage to the person with the potential to do the highest damage to the output of the firm. Whereas a worker that can cause less disruption to the firm is paid less. This divide in payment due to shirking potential leads to wage dispersion. By monitoring their employees' actions, the firm is less susceptible to the damage done by them. However, if monitoring is difficult and or expensive a firm has to result in paying higher wages to the high damage potential workers.

Additionally, wage dispersion can also have a positive effect on productivity. If worker compensation is based on the relative ranking of the worker as compared to his or her co-workers instead of his or her individual output, wage dispersion can lead to an increase in output (Lazear & Rosen, 1981). This set-up leads to an increase in the effort of workers and a better selection of quality workers. So, this increase in wage dispersion leads to better productivity.

Differences in wages among co-workers can lead to a situation where players compare their co-workers' wages against their own which can result in envy against their colleagues (Torgler & Schmidt, 2007). This envy among the workers can have a positive and a negative effect on individual performance. These comparisons can lead to a 'rat race' among the workers causing the employees to work harder and possibly even overworking (Landers, Rebitzer, & Taylor, 1996). But these comparisons can also harm the individual performance. Envy can also lead to a willingness to harm either the organization or the envied person (Cohen-Charash & Mueller, 2007). This results in both lower organization and individual performance.

Wage dispersion in sports

One of the first analyses of wage dispersion in sports was in golf. A reason why golf is an attractive sport to analyze economic theory is that golf is a sport that is played individually (Melton & Zorn, 2000). Unlike sports that are played directly against an opponent, such as boxing, it is clear whether the player performed well as compared to whether the opponent performed poorly. Ehrenberg and Bognanno (1990) found support for the tournament theory when studying two professional golf tournaments. The performance of the competitors increases, expressed in lower scores, with the larger total price money that can be earned in that tournament. This effect is particularly strong for the best golf players, also known as exempt players. The authors gave two possible explanations for this stronger effect. It could be that the exempt players are more responsive to the reward structure or alternatively it could be that since nonexempt players are not just inclined to perform by financial incentive, but they are also inclined to perform well to increase their chances of qualifying as an exempt player for the next installment of the tournament. The authors gave a preference to the first explanation that better players are more responsive to financial incentives.

The total price money also influences which players choose to enter the tournament (Ehrenberg & Bognanno, 1990). If the price money increases, better players enter the tournament. This means that there is a threshold to how low the price money can be before the top players choose to not compete in a tournament. This could be an explanation of the high wages paid in the NBA. The best players would choose to not play in the NBA if the wages were too low. So, the wages need to be of a certain height in order to attract the best players.

Franck and Nüesch (2011) found evidence of a non-linear effect of wage dispersion in team performance in soccer. Teams with either very little or very much wage dispersion have higher performance than teams with a medium level of wage dispersion. This means that the relationship between wage dispersion and team performance is U-shaped. Successful teams have, according to the authors, either a strong culture of teamwork or a strong culture of individualism. The team culture is based on whether they have very little or a lot of wage dispersion respectively within the team. Also, the wage structure influences the style of play, with teams with high dispersion having significantly more dribbling and runs, statistics that are more individualistic than for instance passes and crosses, than teams with low dispersion.

Wage dispersion basketball

Harder (1992) found evidence of a mixed effect of wage dispersion on the on-court performance of NBA players. He found that under-rewarded players in the NBA acted more selfish and less cooperatively. These players took more shots while scoring fewer points. Overrewarded players, on the other hand, acted more cooperatively and assisted the team more in a non-scoring way.

Simmons and Berri (2011) divided wage dispersion into two types: justified inequality and unjustified inequality. Justified inequality is inequality that is derived from the difference in performance between players. In essence, players who score more points get a higher salary than players who score fewer points. Unjustified inequality is inequality that cannot be explained by the difference in quality within a team. Justified inequality has a positive effect on both team performance as well as individual performance. The authors interpreted this as a confirmation of tournament theory. There was no effect significant effect found on team performance or individual performance by unjustified inequality.

Additionally, Frick, Prinz, and Winkelmann (2003) concluded that more wage dispersion within a team is associated with higher performance. In basketball, there are only five players allowed at a time on the court. This is much lower than in other team sports such as baseball and American football. This implies that the team performance is influenced heavily by a single high-quality player, so the high wage dispersion does not negatively affect the performance of the other lower-paid players.

Berri and Jewell (2004), however, found no significant effect of wage dispersion on team performance. According to their research, the only determinants of team performance were the quality of the players and the quality of the coach. A given possible reason for the insignificancy of inequality on team performance was that the wage structure is not a factor players consider during their games. If a player chooses to perform poorly due to the wage dispersion, the team could punish this player by cutting that player's game time possibly causing a reduction of future pay. This means that players cannot respond negatively to the wage dispersion by reducing the team’s performance, which explains the insignificant effect of wage dispersion on team performance.

Using three different measures of salary dispersion, dispersion among players in the current game, players that played in more than half of the games in a season, and all of the players in the NBA, Katayama and Nuch (2011) found no causal effect of inequality on team performance in any of the three measures. They did find a negative effect of this dispersion on the performance, but this effect was not significant. The authors concluded that this effect might have been significant if they would have had a bigger data set; their study only included five regular seasons from 2002 to 2006.

From the literature mentioned above the following second hypothesis is formed:

H2: The effect of wage dispersion within a team on the individual on-court performance of NBA players is non-linear and U-shaped.

Performance-Age profile

Another factor influencing performance is the age or experience of the player (Schulz & Curnow, 1988). The relationship between a player’s age and performance is non-linear and in the form of an N-shaped parabola (Hollings, Hopkins, & Hume, 2014). This could be because at first age improves performance due to greater experience, but as the athlete grows older his or her physical abilities decline causing performance to decrease (Torgler & Schmidt, 2007). The age at peak performance is different across sport disciplines but is typically between 20 and 30 years old (Schulz & Curnow, 1988). Elite level baseball players differed from medium quality players in that their abilities decreased more gradually and they kept their highest performance for a longer period (Schulz, Musa, Staszewski, & Siegler, 1994).

Research in the performance-age profile of professional athletes has been done for athletes other than NBA players. The age at peak performance is different across sport disciplines and depends on the skills required within that sport (Allen & Hopkins, 2015). In a sport where explosive power or sprint is required, the age of peak performance decreased with the duration of the event. In endurance sports, on the other hand, the age increased with the duration. Whereas in mixed sports, which includes basketball, the turning points of the performance-age profile differed too widely for the authors to make a valid conclusion.

So, since there is no research on the performance-age profile in basketball, it is important to look at sports similar to basketball such as soccer and baseball. These sports are similar to basketball in that they are both team sports and are played using a ball. Basketball is also considered to be a good cross-over sport for soccer players (Nagel, 2016), so they will be used to estimate the turning point in the performance-age profile.

In soccer, Torgler and Schmidt (2007) found that the turning point in the performance age profile was 31, whereas Lucifora and Simmons (2003) found the turning point in the earning-age profile to 28. The age of peak performance in baseball is around 27 years old (Schulz et al., 1994). This leads to the last hypothesis:

H3: The turning point in the performance-age profile in NBA players is between ages 27 and 30.

Data

Data location

To determine the performance of NBA players, this study uses three measures: points made, assists provided, and rebounds won. These three measurements are typically used as the three main metrics for measuring performance in the NBA. The data for these performance metrics for NBA players is gathered using the platform Kaggle. Kaggle is an online portal for user-generated databases (Moltzau, 2019) The data contains data from the seasons 1996/1997 to 2019/2020.

The data set with the performance of NBA players also contained the player's height, wage, age, college attended, nationality, and draft information. Three other data sets from Kaggle were used to gather the salary information and were matched to the performance measures. Missing salary data was manually gathered using the websites Basketball-Reference and Hoopshype. Basketball-Reference is a website with official data from the NBA (Basketball-Reference, n.d.). Hoopshype is owned by USA TODAY Sports Digital Properties and is a website with NBA news and data (USA TODAY Sports Media Group, 2013).

The data concerning the salary cap for the seasons 1996/1997 until 2017/2018 were gathered from the website RealGM. RealGM is a website that offers official NBA data and the data from RealGM is also used by NBA teams (Bechtel, 2004). RealGM did not offer the data from the 2018/2019 season onwards, so this data was obtained from Basketball-Reference.

Basketball-Reference was also used to obtain coach data, both experience for managing the franchise as well as the overall experience of managing in the NBA. In the case where there were multiple coaches in the same team for one season, the coach with the highest number of games coached was considered to be the coach of that season. Basketball-Reference was also used to manually fill in the missing data for the positions of players.

This study will analyze the NBA in the period from the season 1997/1998 to 2018/2019. This period was chosen because, as mentioned, earlier the data set used in this study ran from 1996/1997 to 2019/2020. However, because this study will use a one-year lag for the NBA player's salary, the data from the first season could not be used. Additionally, because at the time of writing this study the 2019/2020 season is still ongoing, the data from that season is incomplete and is thus not used for the analysis either. This study will also refer to the season by the year in which the final took place. So, the 1997/1998 season will be referred to as the year 1998 and so on.

Every observation that either did not have data for the salary in the previous season or did not have data for the salary of his current season was removed from the data set. As mentioned above, data from the year 2020 was also removed since that season is still incomplete. Also, players that played in 8 or fewer games were removed. This restriction was applied to confine the analysis of this study to players that have actually played for the team and are not just "benchwarmers" for a season. This caused the number of observations to drop from 11077 to 7625.

A complication factor of this study was to determine which teams belong to which franchise. This was needed to properly portray the number of years the coach had been with the franchise. In the

NBA the teams can change their name and move to a different city. For example, in the season 2001/2002, the Vancouver Grizzlies moved to Memphis and changed their name to the Memphis Grizzlies. The coach, Sidney Lowe, coached the Vancouver Grizzlies in 2000/2001 and the Memphis Grizzlies in 2001/2002. He still managed the same team in this period, but the name changed. So, his experience as the Vancouver Grizzlies head coach should also count to his experience with the franchise as head coach of the Memphis Grizzlies. In Table 1 the information of the teams that changed their name in the studied period is shown. It also includes which team belongs to which franchise and for how long the team was active. This study names the franchise by the team that plays in the NBA in the 2019/2020 season. Thus the New Jersey Nets are part of the franchise the Brooklyn Nets because that is what this team is called in the 2019/2020 season.

Table 1: Franchises that changed their names in the NBA and their teams, 1998-2019

Franchise	Team	Active period
Brooklyn Nets	New Jersey Nets	1998-2012
	Brooklyn Nets	2013-2019
Charlotte Hornets	Charlotte Hornets	1997-2002, 2015-2019
	Charlotte Bobcats	2004-2014
Memphis Grizzlies	Vancouver Grizzlies	1998-2001
	Memphis Grizzlies	2002-2019
New Orleans Pelicans	New Orleans Hornets	2003-2005
	New Orleans/Oklahoma City Hornets	2006-2007
	New Orleans Pelicans	2008-2019
Oklahoma City Thunder	Seattle Supersonics	1998-2008
	Oklahoma City Thunder	2009-2019

Source: Basketball-Reference

According to Table 1, in the studied period, even the number of teams in the NBA changed. In the 2002/2003 season the New Orleans Pelicans were added as the 30th team in the NBA.

Descriptive data

This study will use panel data to analyze the effect of wage on performance in the NBA. The data contains, as seen in Table 2, 7625 observations. One observation is the performance of a player in one particular season. There are 1431 unique players in the data. On average one player has data from 5.3 seasons with a minimum of 1 season and a maximum of 20 seasons. In Table 2 the descriptive statistics of the data used in this study are shown.

Table 2: Descriptive statistics for NBA players, 1998-2019

Variable		Observations	Mean	Std. Dev.	Min.	Max.
Salary						
	Current_Salary ($)	7625	5,104,252	5,187,098	11,679	3.75e+07
	Lagged_Salary ($)	7625	4,615,788	4,839,163	5,000	3.47e+07
	Relative_Salary ($)	7625	3,466,052	3,565,623	129.47	3.03e+07
Player						
	Age (yrs)	7625	28.00	4.18	19	43
	Player_Weight (kg)	7625	101.25	12.56	60.38	154.22
Coach						
	Coach_Team_Exp (yrs)	7625	3.68	3.65	1	23
	Coach_Overall_Exp (yrs)	7625	8.16	6.94	1	31
Performance						
	Games (#)	7625	59.52	20.21	9	85
	Points (#)	7625	9.34	5.97	.1	36.1
	Assists (#)	7625	2.06	1.87	0	11.7
	Rebounds (#)	7625	4.03	2.51	0	16.0
Team						
	Number of players (#)	7625	11.68	1.65	6	16

According to Table 2, the average player earned $5,104,252, was 28 years old, and weighed 101.25 kg. Coaches had on average coached the same team for 3.68 years and had an average overall experience in the NBA of 8.16 years. A team had on average 11.68 players that are represented in this study.

Figure 1 shows the spread of salary in the NBA for the season 2018/2019. Figure 1 is skewed to the right with most athletes having the lowest salary and a few superstar athletes who earn more than $30 million.

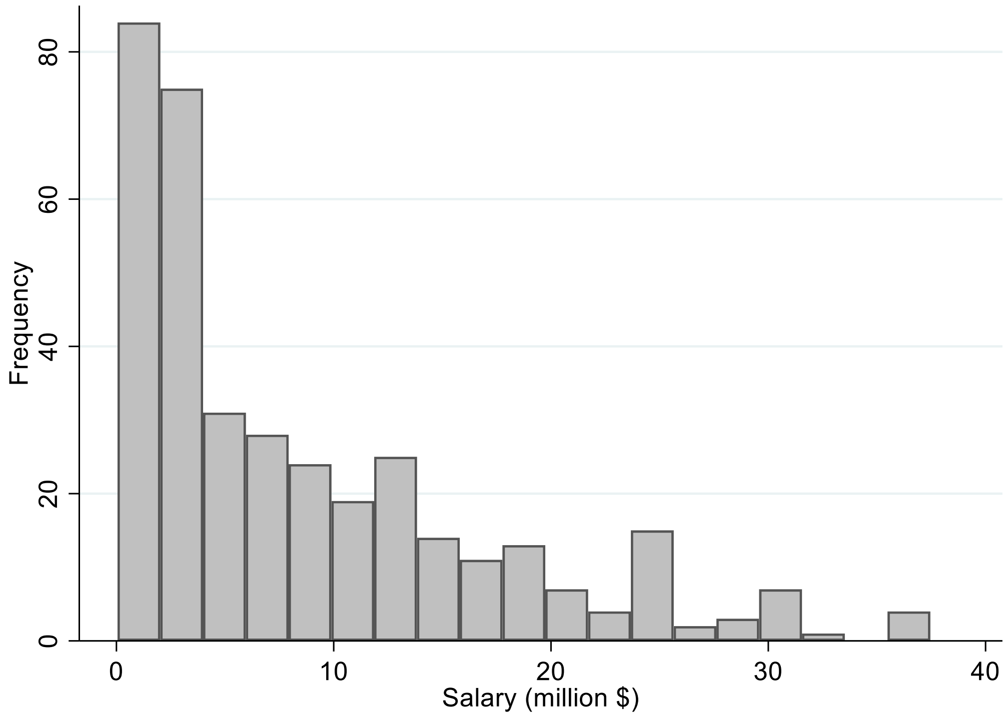

Figure 1: Histogram of salary in million $ of NBA players, 2019

This study also analyzes the turning point in the performance-age profile for the different positions in basketball. Basketball has five main positions: small forward (SF), power forward (PF), point guard (PG), shooting guard (SG), and center (C). Because no one data set had all positions for all players studied, multiple data sets had to be used. However, a problem arose when determining the positions for each player because there was a difference in how each data set names the positions. Some data sets used the five positions as mentioned above, others only used three, namely forwards, guards, and centers. So, this study will also only use three positions, namely forwards (F), guards (G), and centers (C). Guards are either point guards or shooting guards, forwards are small forwards or power forwards, and centers are just centers.

In Table 3, Table 4, and Table 5 the descriptive statistics for forwards, guards, and centers, respectively, are given. Forwards and guards have roughly twice the number of observations as centers, but because forwards and guards contain two positions and centers only one, this was to be expected. Centers on average have the highest salary and the highest dispersion in their wage. All three positions are also around the same age, 28. But their average weight does differ. Guards are the lightest with 89.89 kg, forwards are second with 105.57 kg, and centers are the heaviest with 115.94 kg.

Table 3: Descriptive statistics for forwards in the NBA, 1998-2019

Variable	Observations	Mean	Std. Dev.	Min.	Max.
Salary					
Current_Salary ($)	3082	5,141,280	5,225,968	27,059	3.57e+07
Lagged_Salary ($)	3082	4,662,163	4,889,190	27,059	3.33e+07
Relative_Salary ($)	3082	3,483,334	3,650,470	3,424.62	3.03e+07
Player					
Age (yrs)	3082	27.99	4.20	19	42
Player_Weight (kg)	3082	105.57	7.19	82.10	131.09
Performance					
Games (#)	3082	59.60	20.28	9	85
Points (#)	3082	9.28	6.13	.3	35.4
Assists (#)	3082	1.47	1.20	0	9.1
Rebounds (#)	3082	4.56	2.40	.3	15.4

Table 4: Descriptive statistics for guards in the NBA, 1998-2019

Variable	Observations	Mean	Std. Dev.	Min.	Max.
Salary					
Current_Salary ($)	3072	4,726,204	4,954,870	16,000	3.75e+07
Lagged_Salary ($)	3072	4,224,578	4,542,612	5,000	3.47e+07
Relative_Salary ($)	3072	3,264,542	3,305,961	129.47	2.88e+07
Player					
Age (yrs)	3072	28.04	4.18	20	41
Player_Weight (kg)	3072	89.89	7.62	60.33	119.29
Performance					
Games (#)	3072	60.39	19.62	9	84
Points (#)	3072	10.06	5.85	.2	36.1
Assists (#)	3072	3.14	2.18	0	11.7
Rebounds (#)	3072	2.69	1.38	0	11.8

Table 5: Descriptive statistics for centers in the NBA, 1998-2019

Variable	Observations	Mean	Std. Dev.	Min.	Max.
Salary					
Current_Salary ($)	1471	5,816,180	5,187,098	11,679	3.75e+07
Lagged_Salary ($)	1471	5,335,621	4,839,163	5,000	3.47e+07
Relative_Salary ($)	1471	3,850,672	3,565,623	1976.42	2.28e+07
Player					
Age (yrs)	1471	27.95	4.29	19	43
Player_Weight (kg)	1471	115.94	8.01	79.83	154.22
Performance					
Games (#)	1471	57.53	21.11	9	85
Points (#)	1471	7.98	5.65	.1	29.7
Assists (#)	1471	1.06	1.00	0	7.3
Rebounds (#)	1471	5.72	3.08	.1	16.0

Centers play on average the least amount of games, 57.53, and forwards and guards play a very similar number of games, 59.60 for forwards and 60.39 for guards. Expectedly, centers have the highest average rebound per game, 5.7, and guards the highest number of assists, 3.14. The average number of points made per game is highest for guards with 10.6 with forwards following with 9.28.

Methodology

Salary

Individual fixed effects

To study the effect of salary on performance and to determine the turning point in the performance-age profile, this study will use panel data. The panel variable is the name of the player and the time variable is the season.

The used type of analysis is an individual fixed effects regression. This method was used because with this regression time-invariant variables cannot influence the analysis. Multiple time-invariant variables influence both salary and performance, such as height, college attended, the player's youth and upbringing, etc. The individual fixed effects models used in this study will use fixed effects.

To analyze the effect of wage on performance two types of salary will be studied. First, to study the effect of a player's own salary on his on-court performance, this study uses a one-year lag of the players' salary. This one-year lag will be used to circumvent the reverse causality that may exist. The current performance of a player could also influence his current salary, but his current performance can never influence the salary he received in the previous season. Second, to study the effect of wage dispersion within a team the relative salary will be used. The relative salary of a player is the absolute value of the difference of the athlete's current salary and the average salary in the team, which was generated with the existing data sets. Since this study, predicts a non-linear relationship between both the lagged wage and the relative wage, the individual fixed effects model will include a squared variant of both of these.

The individual fixed effects model also controls for the effect of the coach on the individual performance of the athletes. This study will use two variables for the effect of a coach, namely, the experience of the coach with the franchise and the overall experience of the coach in the NBA. The weight of the player is also included in the model. This is because a player's weight was variable in time, so this will be used in the regression. Finally, the individual fixed effects model will also use dummy variables for all years.

A control for the player's positions was also considered, however, a player's position turned out to be time-invariant and was thus omitted due to collinearity. In addition, an interaction variable of team and year was considered, but this interaction had no effect on the model and thus was also excluded.

Instrumental variable

Additionally, this study will test the effect of wage on performance using an instrumental variable (IV) regression. The raise of the official NBA salary cap will be used as the IV, as this is likely to influence the athlete's salary, but is unlikely to influence his on-court performance. This additional test will be done due to the possible issues of endogeneity. It could be that other variables influence both an NBA player's salary and performance. By using an IV this omitted variable bias could be circumvented and the true effect of salary on performance can be determined.

Performance-age profile

Positional restrictions were used on the individual fixed effects model to locate the turning point of the performance-age profile for each position. For example, the individual fixed effects model was only run for players that had the position of guard to locate the turning point for guards. The same was done for forwards and centers. To find the overall turning point in the NBA the individual fixed effects model was run without any of the positional restrictions.

Results

Salary

The results of the individual fixed effects analysis are shown in Table 6. The performance measures used are the points scored, assists made, and rebounds won. The weight of the player was insignificant for all three measures. All but one salary-related variables are significant at one percent in Table 6. Salary_Relative is still significant for assists but only at five percent. The number of years the coach teamed that specific team is significant at five percent for all three performance metrics. Only for points was the overall experience of the coach significant at five percent. For rebounds, it was significant at ten percent and for assists was not significant at all.

Table 6: Individual fixed effects analysis of performance from NBA players, 1998-2019

	Performance		
Variable	**Points**	**Assists**	**Rebounds**
Salary (in mln $)			
Salary_Lagged	.214***	.051***	.034***
	(.311)	(.009	(.013)
Salary_Lagged_Squared	-.138***	-.002***	-.003***
	(.001)	(.000)	(.001)
Salary_Relative	-.086***	-.019**	-.040***
	(.031)	(.009)	(.013)
Salary_Relative_Squared	.0163***	.003***	.0055***
	(.002)	(.001)	(.001)
Player			
Age	4.051***	.813***	1.255***
	(.162)	(.046)	(.067)
Age_Squared	-.066***	-.013***	-.022***
	(.002)	(.001)	(.001)
Player_Weight	-.014	.000	-.001
	(.017)	(.005)	(.007)
Coach			
Coach_Team_Exp	-.037**	-.008**	-.012**
	(.014)	(.004)	(.006)
Coach_Overall_Exp	.014**	.001	.005*
	(.007)	(.0019)	(.003)
Season	Yes	Yes	Yes
Constant	-42.015***	-8.683***	-11.818***
	(2.830)	(.797)	(1.168)
R^2	0.3431	0.1847	0.2445

Note: Standard errors are between parentheses. *p<0.10, **p<0.05, ***p>0.01.

In Table 6 both the linear and the squared variables for the NBA player's salary received in the previous season are significant. It is also important to note that the linear variable is positive and the squared variable is negative in all measures. This means that the relationship of a player's salary from the previous year on performance is quadratic and in the form of a parabola opening downward. This means that it is possible to improve an NBA player's performance in the next season by increasing his salary in the current season. However, this happens at a decreasing rate and has a turning point. After this turning point, the performance can decrease with an increase in pay. In this study the turning points are at $7,731,755.3 for points, $10,545,978 for assists, and $6,381,511.4 for rebounds. All these turning points lay inside the sample.

The first hypothesis was that there was a non-linear relationship and this relationship was N-shaped. According to Table 6, there is a quadratic relationship and this relationship is N-shaped. So, the first hypothesis is cannot be rejected.

The signs of the coefficients for the variables for relative salary are the opposite of the lagged salary. The coefficient for relative salary is negative and its squared variable is positive. This means that the relationship of relative salary on performance is quadratic and U-shaped for NBA players. This is the same relationship as was hypothesized in the second hypothesis. So, the second hypothesis cannot be rejected either. The top of this parabola is at $2,647,723.4, $2,744,922.7, and $3,692,513 for points, assists, and rebounds, respectively, which are all within the sample. This U-shaped relationship indicates that for an athlete's individual performance, it is best to have a wage that is the same as the average wage or a wage that is either a lot more or a lot less than this average wage. This would imply that it is better for a team to have high wage dispersion or nearly no wage dispersion than moderate wage dispersion.

Table 6 shows that the coaches do have a significant effect on the individual performance of players. Interestingly the sign of Coach_Team_Exp is negative. So, according to Table 6 the more seasons a coach is with a team, the lower the performance is of the players. This would imply that it is better to have a ‘journeyman’ coach that coaches a lot of different teams but never stays at one team for a long time, than to have a coach like Gregg Popovich, who started as a rookie coach at the San Antonio Spurs in 1996 and, at the time of writing this study in 2020, is still at the club so has never coached another NBA team[1]. A coach’s total experience in the NBA though is positive, this is intuitive as a very experienced coach is more likely to get higher performance out of their players than a rookie coach.

The coefficients for the effect of coaches in Table 6 seem at first glance rather low. One season more experience would only improve the average points scored per game by a player by less than 0.02. However, this is an individual performance, not team performance. As was shown in the descriptive data an NBA player plays on average 59.52 games resulting in 0.014 * 59.52 = 0.83328 additional points per season for each player. To get the total effect of one additional season of experience on the total points one has to multiply this number by the average number of players

[1]Gregg Popovich did get appointed to head coach of the USA Basketball Men’s National Team for the years 2017 to 2020 (USA Basketball, 2015). However, this study only discusses data from the NBA and not from the international level.

in a team, which is 11.68. So, one extra season of experience for the coach would result in 0.83328 * 11.68 = 9.73 extra points, which is also rather low. This means that even though one additional year of experience for a coach is significant, it only results in less than 10 extra points per season.

Finally, the dummy used to denote the seasonal fixed effects of performance is also significant for all three measurements. In contrast, the variable Player_Weight is not significant. This implies that if a player gained or lost weight during his career, his performance does not change. A gain of an athlete's weight often means that the player grows muscles. So according to this analysis, gaining muscles does not influence an athlete's individual performance.

Instrumental variable

In Table 7 the results of the IV regression of the raise in the salary-cap on the three measures of performance are shown. The IV regression used in Table 7 has a first stage F-test of 11.90 for all three measures. This implies that the assumption that the instrument has a clear and strong causal effect on the variable of interest holds for this IV.

Interestingly, neither assists nor rebounds are significant and points are only significant at ten percent. This is in contrast as was determined in Table 6 where are three and their squared versions were significant at one percent. This would imply that an NBA player's salary has no significant effect on his performance.

Table 7: Instrumental variable raise of the salary-cap two-stage squares on lagged salary in million $ in the NBA, 1998-2019

	Performance		
Variable	**Points**	**Assist**	**Rebounds**
SalaryCap_Raise	.572*	.061	.061
	(.294)	(.100)	(.133)
Cons	6.702***	1.783***	3.748***
	(1.359)	(.461)	(.615)
First Stage F-test	11.90	11.90	11.90

Note: Standard errors are between parentheses. *p<0.10, **p<0.05, ***p>0.01.

There are multiple possible explanations why there is such a difference between the individual fixed effects regression in Table 6 and the IV regression in Table 7. First, it could be that the regression used in Table 6 was biased and thus gave an incorrect result. This is a probable answer because the R-squared in the regressions were quite low with 0.3431, 0.1847, and 0.2445 for points, assists, and rebounds, respectively.

Another possible explanation is that the analyses in Table 6 and Table 7 both measure something different. Whereas the individual fixed effects regression in Table 6 measures the average treatment effect on the treated (ATT), the IV regression in Table 7 measures the local average treatment effect (LATE). This could mean that the regression used in Table 6 is not biased.

Lastly, it could be that how much the salary cap was raised or decreased is not a good IV to use. Even though the F-statistic exceeded the requirement of 10 and thus the IV has a clear and strong causal effect on the variable of interest, it cannot be stated that the instrument was uncorrelated to the error term. This is because the IV did not pass the informal test of this assumption. The instrument is correlated with weight, relative salary, and the overall experience of the coach. This would imply that the IV is highly likely to be correlated to the error term and thus is not a good IV in this case. So, it is possible that the IV regression in incorrect, which explains the difference between the results of Table 6 and Table 7.

Peak performance

The data in Table 8 is gathered by using the same individual fixed effects regression as in Table 6, but in Table 8 only the variables relating to age are mentioned for each position. To obtain the effect for each position, the regression was run only for that one position. For players with that play as a center in the NBA, the non-squared variant of age had no significant effect on the number of assists per game they provided. All other variables for all positions and all players are significant at one percent, which means all performance measures for forwards and guards are affected by age in a quadratic manner, and for centers points and rebounds. Also, all relationships are in the form of an N-shaped parabola. This means that in all positions for all performance measures there is an age of peak performance.

Table 8: Individual fixed effects analysis for the relationship between age and performance in the NBA per position, 1998-2019

	Performance		
Variable	**Points**	**Assists**	**Rebounds**
Forwards			
Age	4.023***	.608***	1.290***
	(.233)	(.048)	(.102)
Age_Squared	-.067***	-.011***	-.023***
	(.003)	(.001)	(.002)
Peak performance	29.850	28.593	27.781
Guards			
Age	4.336***	1.318***	.762***
	(.287)	(.101)	(.068)
Age_Squared	-.069***	-.020**	-.012***
	(.004)	(.001)	(.001)
Peak performance	31.072	33.334	30.544
Centers			
Age	2.370***	.171	1.877***
	(.789)	(.154)	(.500)
Age_Squared	-.060***	-.005***	-.038***
	(.005)	(.001)	(.003)
Peak performance	19.797	16.780	24.786
Overall			
Age	4.051***	.8126128***	1.255***
	(.162)	(.0457182)	(.067)
Age_Squared	-.066***	-.013***	-.022***
	(.002)	(.001)	(.001)
Peak performance	30.471	31.024	28.766845

Note: Standard errors are between parentheses. *p<0.10, **p<0.05, ***p>0.01.

Interestingly, the turning points of the performance-age profile for forwards and centers are lower in every measure than the average NBA player and guards had turning points that were higher than the average NBA player.

For guards and all NBA players, rebounds have the lowest age of peak performance, followed by points and assists have the highest age of peak performance. This is not the case for forwards and centers. Forwards peak first in rebounds, followed by assists and points. With centers rebounds peak the latest and points the earliest. The age of peak performance for assists for centers cannot be interpreted because the non-squared variable of age for assist among centers is not significant. This could explain why this age is so low, 16.780 years.

All interpretable turning points in the performance-age profile lie within the sample. Only the centers' turning point for assists does not lie within the sample, but as mentioned earlier this turning point already could not be interpreted.

A possible explanation for the fact that assists have the last turning point is that to give assists the player has to let someone else score and the player that gave the assist has to take a supporting role. It could be that with age athletes are more willing to be in a supporting role which explains the delayed peak of assist.

The hypothesis was that the turning points of the performance-age profile in the NBA are between 27 and 30 years. For forwards, these turning points are between 27.781 and 29.850 years, so the hypothesis for this position cannot be rejected. Guards have turning points between 30.544 and 33.334 years and centers have turning points 19.797 and 24.786 years. This means that for both positions the hypothesis is rejected. For guards, the hypothesis is rejected because the actual turning points are above the hypothesized window and for centers because the actual turning points are below the hypothesized window. Finally, for all NBA players, the hypothesis is rejected for points and assists, but cannot be rejected for rebounds.

Conclusion

So, to conclude, do wages have an impact on the on-court performance of NBA players? They do in two ways. First, the performance of an NBA player is influenced by the salary he received in the previous season. This found effect is non-linear and N-shaped, so at first, the player's performance increases rapidly with a salary increase. However, this increase in on-court performance decreases, and, after a peak threshold, the effect of wage is negative on performance. The threshold differs for each of the three performance metrics. These findings are similar to Hall et al. (2002), who concluded that salary impacted team performance in the MLB and English soccer. The U-shaped relationship between wage and individual performance was also found in German soccer by Torgler and Schmidt (2007). This quadratic relationship has also previously been established in the NBA by Simmons and Forrest (2011) but on a team level.

An IV was also used to determine the effect of an NBA player's wage on his performance, which concluded that there was no significant effect. However, the used IV was not able to adhere to all the assumptions of an IV. So, it is likely that the IV gave an incorrect result.

The relative salary of a player as compared to his teammates also influences his performance. This effect is also non-linear but is U-shaped. The U-shaped effect of relative wage on performance is the same as Franck and Nüesch (2011) found in soccer. This effect is in contrast to the findings of Berri and Jewell (2004) and Katayama and Nuch (2011), who found no effect. The performance of an NBA player decreases as the relative salary increases. But after the turning point, the relative salary has a positive impact on the athlete's performance in all three measures. This implies that having either no to very little wage dispersion within a team or very much wage dispersion is optimal for the individual performance of NBA players.

This U-shaped relation between relative salary on individual performance could mean that there are multiple theories in effect. It could be that at first, as the difference between wage grows, the athlete's performance decreases either due to the loss of cohesion caused as mentioned by cohesion theory (Levine, 1991). It could also be that due to the dispersion in wage, the player believes he receives less than he believes is 'fair', so he reduces his effort and thus performance, which is according to the fair wage hypothesis (Akerlof & Yellen, 1990). Finally, this decrease in performance could also be because the willingness to harm the organization increases, due to the increase in envy due to the lower wage relative to his teammates (Cohen-Charash & Mueller, 2007). However, after a bottom threshold, the performance starts increasing with relative wage. It could be that after this threshold the amount of money that could be earned, causes effort to increase to have the chance to get this salary. This is according to the tournament theory (Lazear & Rosen, 1981) and resulting in the 'rat race' Landers et al. (1996) predicted.

These results could also be applied to 'normal' labor economics. The N-shaped effect of salary on performance could also exist in a non-sports setting. This would then imply that there are diminishing returns for an increase in salary and possibly even a decrease in performance with a raise in salary. Additionally, the found U-shape of relative salary could mean that for a non-sports firm, it is better to either have an equal wage amongst all employees or have a couple 'superstar' workers that receive a greater salary than their co-workers to increase the overall firm performance. However, it could be that the found conclusions about the relationship between wage and performance are different for 'normal' firms. This is because, as was mentioned at the start of this study, it is difficult to generalize the relationship between salary and performance for the multimillionaires that play in the NBA to employees that earn near the minimum wage in a 'normal' firm.

The turning point of the performance-age profile of NBA players was also studied for the overall player and each position. These turning points differed for all positions. For forwards the ages of peak performance were between 28 and 30 years, guards had ages of peak performance between 31 and 33 years, and the overall NBA player had ages between 29 and 31 years. The results for centers were 20 for points and 25 for rebounds. The turning point for the centers' performance-age profile for assists could not be interpreted because the effect of age was not significant. The turning points for guards were the same as Schulz and Curnow (1988) said were typical across sports, and is similar to what Schulz et al. (1994) concluded to be the turning point in baseball and Lucifora and Simmons (2003) in the earnings-age profile in soccer. The turning points of guards and the overall player were similar to what Torgler and Schmidt (2007) concluded in soccer. The turning points of centers were different than any other research in team sports.

Discussion

A possible problem of this study could be that the used model suffers from omitted variable bias. This is likely because the R-squared in all models used in this study are rather low. The highest is 0.40, but most are around 0.20. Attempts were made to reduce this bias, but many factors impact performance and salary. These issues of endogeneity were also attempted to be solved by using an IV but the IV did not adhere to all the assumptions and could not be interpreted. So, the problem of endogeneity remains.

Another possible flaw in this study is the model to determine the turning point of the performance-age profile for centers. The two significant results, points, and rebounds, are both much lower than the results for the other positions, points had a turning point at age 19.80, and rebounds at age 24.79, whereas most were around the age of 30. The variable for age was not significant at all for assists, which is highly unlikely.

Next, this study uses only three measures of performance, points, assists, and rebounds. But these are not the only factors that make up a player's performance in the NBA. Metrics like steals, blocks, free throws made, fouls committed, and shots attempted are all important to an NBA player's performance, but not used in this study. So, this study does not give the full view of the effect of the impact of wage on performance.

Although the IV analyses did not adhere to the assumptions of an IV and are thus not interpretable, it found no significant effect of wage on performance. This could imply that the effect of wage on performance is more limited than this study suggests.

It is also important to take into account that it is more difficult for an NBA player to show his displeasure of pay on the court as Berri and Jewell (2004) mentioned. If the player out of spite for his pay, performs poorly, he gets less game time as punishment. This also harms his future salary, so an athlete is unlikely to do this. Examples of this do exist in the NBA, most famously in Scottie Pippin. Chicago Bull's Scottie Pippin was not satisfied with his pay in 1997 (Armstrong, 2020). When he needed foot surgery, he chose to delay the procedure causing him to miss the start of the season. He did this to harm management and force them to increase his pay. However, Scottie Pippin was an exceptionally gifted player[2], that was likely to earn a new contract with a new team, so an average performing player is unlikely to dare to do the same.

Future studies on the effect of wage on performance in the NBA could study how the effect differs for the different stages in an NBA player's career. It could be that this effect is different between rookies and NBA veterans. For instance, it is likely that veterans are less effected by tournament theory than rookies, as their chance to earn a high salary if they are not doing that already, are low. Also, it could be that veterans, that have already earned enough money to live comfortably for the rest of their life, are less likely to increase their effort to earn more because they are less incentivized by their wage. Whereas a rookie still has to earn his keep to afford his daily expenditure and thus is more incentivized by monetary rewards.

[2] Scottie Pippin was the second star on a Chicago Bulls team that won its sixth NBA title the year before (Silva, 2020)

References

Abowd, J. M., Kramarz, F., & Margnolis, D. N. (1999). High wage workers and high wage firms. *Econometrica*, 251-333.

Akerlof, G. A., & Yellen, J. L. (1990). The fair wage-effort hypothesis and unemployment. *The Quarterly Journal of Economics*, 255-283.

Allen, S. V., & Hopkins, W. G. (2015). Age of peak competitive performance of elite athletes: A systematic review. *Sports Medicine*, 1431-1441.

Armstrong, M. (2020, April 20). *Scottie Pippen on Delaying Surgery in 1997: 'I'm Not Gonna F--k My Summer Up'*. Retrieved from Bleacher Report: https://bleacherreport.com/articles/2887502-scottie-pippen-on-delaying-surgery-in-1997-im-not-gonna-f-k-my-summer-up

Badenhausen, K. (2019, June 11). *The World's Highest-Paid Athletes*. Retrieved from Forbes.com: https://www.forbes.com/athletes/#4f5c559b55ae

Barnes, C. M., & Morgeson, F. P. (2007). Typical performance, maximal performance, and performance variability: Expanding our understanding of how organizations value performance. *Human Performance*, 259-274.

Barnes, C. M., Reb, J., & Ang, D. (2012). More than just the mean: Moving to a dynamic view of the performance-based compensation. *Journal of Applied Psychology*, 711-718.

Basketball-Reference. (n.d.). *About Basketball-Reference.com*. Retrieved from Basketball-Reference.com: https://www.basketball-reference.com/about/

Bechtel, M. (2004, August 16). *WHAT IS ... REALGM.COM?* Retrieved from vault.si.com: https://vault.si.com/vault/2004/08/16/what-is-realgmcom

Berri, D. J., & Jewell, T. R. (2004). Wage inequality and firm performance: Professional basketball's natural experiment. *Atlantic Economic Journal*, 130-139.

Cohen-Charash, Y., & Mueller, J. S. (2007). Does perceived unfairness exacerbate or mitigate interpersonal counterproductive work behaviors related to envy? *Journal of Applied Psychology*, 666-680.

Dobson, S. M., & Goddard, J. A. (1998). Performance and revenue in professional league football: evidence from Granger causality tests. *Applied Economics*, 16411651.

Ehrenberg, R. G., & Bognanno, M. L. (1990). Do tournaments have incentive effects? *Journal of Political Economy*, 1307-1324.

Forrest, D., & Simmons, R. (2002). Team salaries and playing success in sports: A comparative perspective. *Sportökonomie*, 221-238.

Franck, E., & Nüesch, S. (2011). The effect of wage dispersion on team performance and the way team outcome is produced. *Applied Economics*, 3037-3049.

Frick, B., Prinz, J., & Winkelmann, K. (2003). Pay inequalities and team performance: Empirical evidence from the North American major leagues. *International Journal of Manpower*, 472-488.

Hall, S., Szymanski, S., & Zimbalist, A. S. (2002). Testing causality between team performance and payroll. *Journal of Sports Economics*, 149-168.

Harder, J. W. (1992). Play for pay: Effects of inequity in a pay-for-performance context. *Administrative Science Quarterly*, 321-335.

Hollings, S. C., Hopkins, W. G., & Hume, P. A. (2014). Age at peak performance of successful track & field athletes. *International Journal of Sports Science & Coaching*, 651-661.

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

Katayama, H., & Nuch, H. (2011). A game-level analysis of salary dispersion and team performance in the National Basketball Association. *Applied Economics*, 1193-1207.

Landers, R. M., Rebitzer, J. B., & Taylor, L. J. (1996). Rat race redux: Adverse selection in the determination of work hours in law firms. *The American Economic Review*, 329-348.

Lazear, E. P. (1989). Pay equality and industrial politics. *Journal of Political Economy*, 561-580.

Lazear, E. P. (2000). Performance pay and productivity. *American Economic Review*, 1346-1361.

Lazear, E. P., & Rosen, S. (1981). Rank-order tournaments as optimum labor contracts. *Journal of Political Economy*, 841-864.

Levine, D. I. (1991). Cohesiveness, productivity, and wage dispersion. *Journal of Economic Behavior & Organization*, 237-255.

Lucifora, C., & Simmons, R. (2003). Superstar effects in sport. *Journal of Sports Economics*, 35-55.

Melton, M., & Zorn, T. S. (2000). An empirical test of tournament theory: The senior GPA tour. *Managerial Finance*, 16-32.

Moltzau, A. (2019, December 8). *What is Kaggle?* Retrieved from Medium.com: https://medium.com/dataseries/what-is-kaggle-4751e384e916

Nagel, A. (2016, January 28). *The Best Crossover Sports for Soccer and Why*. Retrieved from Skylinesoccer.org: http://www.skylinesoccer.org/the-best-crossover-sports-for-soccer-and-why/

Ramaswamy, R., & Rowthorn, R. E. (1991). Efficiency wages and wage dispersion. *Economica*, 501-514.

Rosen, S., & Sanderson, A. (2001). Labour markets in professional sports. *The Economic Journal*, 47-68.

Ryan, R. M., & Deci, E. L. (2000, January). Intrinsic and extrinsic motivations: Classic definitions and new directions. *Contemporary Educational Psychology*, 54-67.

Schulz, R., & Curnow, C. (1988). Peak performance and age among superathletes: Track and field, swimming, baseball, tennis, and golf. *Journal of Gerontology*, 113-120.

Schulz, R., Musa, D., Staszewski, J., & Siegler, R. S. (1994). The relationship between age and major league baseball performance: Implications for development. *Psychology and Aging*, 274-286.

Silva, O. (2020, April 20). *Scottie Pippen Was The 122nd Highest-Paid Player In The NBA During The Chicago Bulls' 6th Championship*. Retrieved from Fadeaway World: https://fadeawayworld.net/2020/04/20/scottie-pippen-was-the-122nd-highest-paid-player-in-the-nba-during-the-chicago-bulls-6th-championship/

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

SportyCo. (2018, July 30). *Which sports leagues pay the most?* Retrieved from SportiCo.com: https://news.sportyco.io/2018/07/30/which-sports-leagues-pay-the-most/

Stiroh, K. J. (2007). Playing for keeps: Pay and performance in the NBA. *Economic Inquiry*, 145-161.

Torgler, B., & Schmidt, S. L. (2007). What shapes player performance in soccer? Empirical findings from a panel analysis. *Applied Economics*, 2355-2369.

USA Basketball. (2015, October 23). *usab.com.* Retrieved from Gregg Popovich Named 2017-20 USA National Team Head Coach: https://www.usab.com/news-events/news/2015/10/gregg-popovich-mnt-head-coach.aspx

USA TODAY Sports Media Group. (2013, October 10). *USA TODAY Sports Re-launches HoopsHype.* Retrieved from PR Newswire.com: https://www.prnewswire.com/news-releases/usa-today-sports-re-launches-hoopshype-227244321.html

Vallerand, R. J., Deci, E. L., & Ryan, R. M. (1987). Intrinsic motivation in sport. *Exercise and Sport Sciences Reviews*, 389-426.

Wood, R. (2011, January 6). *NBA Stars Explain Their Love of the Game*. Retrieved from usab.com: https://www.usab.com/youth/news/2011/01/nba-stars-explain-their-love-of-the-game.aspx

Zimbalist, A. S. (2002). Competitive balance in sports leagues. *Journal of Sports Economics*, 111-121.