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# Salary Dispersion and Team Performance in the National Basketball Association

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# Salary Dispersion and Team Performance in the

# National Basketball Association

By

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**Abstract**

  This paper explores the relationship between salary dispersion in the National Basketball Association (NBA) and team performance. Team performance will be measured by regular season win totals as well as playoff performance. I hypothesize that teams with higher salary dispersion typically perform better because of superstars in the NBA. Superstars are more effective in basketball than in any other sport because of rules inherent to the game. They also create high salary dispersions on their respective teams, and being superstars, they contribute largely to team success. This study will encompass all 30 NBA teams over the past 20 NBA seasons, 1995-96 to 2015-16.

**Keywords:** National Basketball Association; Salary Dispersion; Team Performance; Cohesion Theory; Tournament Theory

# 1. Introduction

The National Basketball Association (NBA) is widely regarded as the top basketball league in the world. It consists of 30 teams, 29 of which in the United States, with 1 team in Canada (Toronto Raptors). The league was created as the Basketball Association of America (BAA) in 1946, but later adopted the National Basketball Association name after merging with the National Basketball League (NBL) in 1949. Teams consist of 15 players with 12 of which being active and able to play at all times.

Collective bargaining agreements (CBA) are a contract between the NBA and the NBA players' association (NBAPA) that help shape the schematics of player contracts, revenue distribution, and trades, among many other things. Over the years collective bargaining agreements have affected salary dispersion on NBA teams. With the introduction of the "max contract" players can take anywhere from 25-35% of a team's salary cap. Having two max contract type players will result in a small amount of cap remaining for the other 13 members of the roster. This is certainly a strategy currently used by many General Managers in the effort to create a "super team". A super team consists of traditionally 3 or more stars that overshadow the rest of their teammates. Recent examples of super teams include, the 2007-2012 Boston Celtics, 2011-2014 Miami Heat, 2015-2017 Cleveland Cavaliers, and the 2014-2017 Golden State Warriors. There are several recent championship-winning teams that wouldn't traditionally be considered super teams, such as the 2004 Detroit Pistons, 2011 Dallas Mavericks, and 2014 San Antonio Spurs. Super teams tend to have higher salary dispersion, in that there is a greater variance between the top end players and bottom end players. Super teams

have become more common in recent decades. In the 1950's and 60's Bill Russell led the Boston Celtics to 11 championships in 13 years and often battled Wilt Chamberlain's Lakers. This era of basketball was characterized by this rivalry, but these still don't classify as super teams.

The National Basketball Association (NBA) consists of 82 game seasons. Collective bargaining agreements over the years have created salary caps in which teams cannot exceed without paying a severe luxury task. Team salary's can be dispersed between a couple superstars or several journeymen. If we can conclude which is the better option, we will have a better tool for executives to use when negotiating contracts. Looking at the current literature there seems to be a disagreement between the effects of salary dispersion on team success. An extension to the literature would be the effects of salary dispersion on playoff success. Team success can be measure by regular season win-loss records; however, I would argue that playoff success is more important to teams. With this paper we will investigate the relation between salary dispersion and win-loss records and playoff performances for teams in the NBA over 20 years.

# 2. Background

## 2.1 Collective Bargaining Agreements

There have been a total of 11 collective bargaining agreements in the NBA. These are some of the important highlights to follow: The 1970 collective bargaining agreement was the first for the NBA. This specific agreement increased minimum salaries for the lowest paid players in the league. The 1976 CBA succeeded in merging the NBA and

ABA, as well as added limited free agency for players. The 1983 CBA added "Bird Rights" for teams (famously named after Larry Bird) in order to help teams better retain their current players (Coon, 2012). The 1988 CBA introduced unrestricted free agency, in which players could join any team in the league following the completion of their signed contracts. This was a large redistribution of power from the owners to the players, as players could leverage other teams offers against their current team in an effort to get paid more. The 1995 CBA introduced rookie scale contracts, which gave a set value of money to each draft pick, respectively going forward. For example, the first pick of the NBA draft would make $2 million, while the second would be set at $1.75 million, and so on. The 1999 CBA is widely considered to be the most prominent agreement between the players and owners in NBA history. This agreement introduced max salaries, which "corrected the skewness of the NBA's salary distribution" (Hill et. al, 142). Hill and Groothuis argue that the 1999 CBA redistributed wealth from the superstars to the median players and lower tier players, something that future CBA's will counteract. The 1999 CBA also introduced the luxury tax, in an effort to end the 1998-99 NBA season lockout. A luxury tax is an expensive option to go above the soft salary cap in order to retain players, resulting in a substantial tax. Cleveland Cavaliers owner "Gilbert paid $82 million in salaries and $7 million in luxury tax in 2014-15. Last season, Gilbert paid $107 million in salaries and $54 million in luxury tax. Currently, the Cavs are committed to $127.6 million and $27 million in luxury taxes for this season" (NBA.com). LeBron James, the current best player in the world, wouldn't sign with the Cavs until Dan Gilbert assured him that luxury tax spending wouldn't be a problem. Often, teams must dive deep into the luxury tax bracket in order to pay the talent necessary to win NBA

championships, as the Cavs won the 2015-16 championship. Given the Economic Recession in 2007-2008, the owners proposed a severe decrease in NBA player's revenue sharing from 57 percent of league revenue available for contracts to only 40 percent. Evidently, this did not go smoothly with the NBA players and led to a substantial lockout in the 2010-11 season. The recent 2016 CBA will be highlighted further in the next section.

"In their infancy, professional sports unions struggled to escape the stranglehold of monopolistic power that owners exerted through the reserve system"(Hill & Jolly, 344). However, with the introduction of free agency, players were freer to pursue large contracts with other teams or their own teams by threatening to leave unless paid more. Unions struggled with the competitive bidding and drastic salary differences stemming from vastly different player productivity levels. Traditional unions for non-sport settings often introduce collective bargaining agreements (CBAs) that reduce productivity oriented wage inequities, and instead replace them with seniority differentials. Through the course of several CBAs, the NBA has attempted to follow the path of non-sport unions, by rewarding veteran players with larger contracts, whilst simultaneously reducing the level of differentiation that can exist based on the productivity of players.

## 2.2 Special Maxing

A new collective bargaining agreement in December of 2016 created a new concept of "special maxing" a player in which they can account for 35% of a team's cap space. With the 2016-2017 salary cap limit being $94.14 million, this would equate to over 30 million dollars per special max player. This new clause is known as the "Kevin

Durant Rule" because of the offseason before the 2016-2017 season. For reference, the Golden State Warriors have been the best team in the NBA since the 2014 season. In the 2015-16 season, the Golden State Warriors, led by MVP Stephen Curry finished the regular season with a 73-9 record. This is the best regular season record of all time, rivaled only by Michael Jordan's 95-96 Chicago Bulls who finished 72-10. Kevin Durant was the Most Valuable Player (MVP) in the 14'-15' season and is still widely considered to be a top-three player in the NBA. Following the historic 73-win season by the Golden State Warriors, Kevin Durant decided to join their ranks. This is quite possibly the greatest example of a super team ever created. The outrage by NBA owners and executives, following this free agency acquisition led the league to the Kevin Durant Rule, where teams can pay players that they had originally drafted more than other teams. The players who are special max eligible must have been selected to an all-NBA team the season prior, or won Most Valuable Player (MVP) or Defensive Player of the Year (DPOY) in one of the previous two seasons.

Consequences from the new CBA are already starting to show; most notably from the Sacramento Kings. The Kings traded their superstar DeMarcus Cousins to the New Orleans Pelicans for a cheaper player on a rookie contract, as well as a draft pick. Before the new CBA, this deal would have made no sense (and some argue it still doesn't), however, the Kings traded Cousins to avoid paying his new "super-max deal". Cousins was an all-NBA caliber player in his contract year, thus making him eligible for the new super-max deal created in this most recent collective bargaining agreement. This super-max would've cost the Kings $207 million over five years to keep DeMarcus. This implied that DeMarcus would have taken up 35% of his team's salary cap. Not even

LeBron James, the best player in the world for the last decade, has exceeded 30% of his team's cap. This unprecedented contract forced the Kings to trade DeMarcus for pennies on the dollar, and it is implied that other teams might do this with their stars as well moving forward. If teams issue these super-maxes, then salary dispersion will climb higher than ever before, yet might not contribute to winning as much as prior years. It is one thing to have three all-star players dominate a salary cap, but if only two players take upwards of 70% of the salary cap up, then there is very little wiggle room to fill the rest of the roster with serviceable players. This will be a problem for the NBA moving forward, as it has profound effects on salary dispersion and the cohesion theory.

## 2.3 Play style

Play style has changed dramatically over the past two decades as well. In 1995-1996, big men like Hakeem Olajuwon, Shaquille O'Neal, and David Robinson dominated the game from inside the paint. These players were impossible to guard near the hoop, resulting in ridiculous stat-lines of 30 points, 15 rebounds, and 5 assists each game. Michael Jordan also dominated the game during this era, as his isolation shooting kept him head and shoulders above all other players. NBA players became great when they could shoot a contested two-pointer consistently. However, with the growing obsession with the three-point line, these types of players are becoming fazed out of stardom. Three point attempts have increased steadily over the past two decades. In the 1995 season there was a league-wide average of 5.9 three-pointers attempted per game, however, the 2016 season averages 9.6 three-point attempts per game (basketball reference). This is a huge shift in play style, as the game is moving from inside to outside. Perimeter play or half

court play is much more common than posting up near the basket in today's game. This makes sense if we calculate the expected value of each shot. Suppose there is a player who shoots 40% from the three-point line (this is considered a good shooter). Their expected value for every three-pointer attempted is 1.2 points. That is equivalent to a 60% shooter from inside the arc (where all attempts are worth two points). Three-pointers can often be wide-open shots, while twos are often contested by defenders, making a three-point attempt a much more viable shot. This shift in NBA play has given rise to a new breed of players, called sharpshooters. Stephen Curry is the most notable shooter in the NBA and he is considered a superstar. He is still on a cheaper contract because he re-signed while injured; yet he has won the last two MVP awards.

This shift in play style has created a wave of over-inflated contracts for one-dimensional players. Often, great three-point shooters focus the majority of their practice time shooting. This seems obvious, but it makes them liabilities on defense and in other aspects of offense, leading to hindering performances, in an effort to excel in the one category NBA teams are emphasizing. This overpayment of sharpshooter contracts has led to salaries being eaten up by this type of player, when in reality, teams need rebounders and other players with good intangibles that help make winning plays. With teams paying substantial salaries to one-dimensional sharpshooters, we see teams having trouble filling their roster with players of necessary skillsets. Salary dispersion is inherently effected by these overpayments, as it will create a larger dispersion if an entire salary cap is paid to three above average sharpshooters.

# 3. Literature Review

## 3.1 Parity

The NBA is historically the league with the least amount of parity of the four major sports. "Exploring Interleague Parity in North America: The NBA Anomaly" by Duane W. Rockerbie explores this phenomenon. Parity is important for the NBA because of the importance of unpredictability to fans, and therefore advertisers as well. The uncertainty of outcome hypothesis suggests the perfect mix of unpredictability and predictability will maximize profits and league-popularity. Thirty owners and a commissioner is a sort of "joint venture" headed by the current commissioner, Adam Silver. All four major sports leagues in North America use some sort of revenue sharing, indicating that competitive balance is an important aspect of these leagues.

The NBA anomaly signifies that the league has had much less parity than the other three major sports leagues over the past three decades. "Despite this empirical fact, the NBA has experienced an impressive increase in revenues over the last three decades, from an estimated US$843 million in 1990 to an estimated US$3.68 billion in 2011, resulting in an average annual growth rate of 15.3%" (Rockerbie, 290). The NBA has never truly focused on parity, but instead intentionally promoted superstar players in key rivalry matchups. This paper argues that this lack of parity is actually inherent to the game of basketball. This is a caveat of the high number of scoring attempts per game in basketball, eliminating the significance of random occurrences that are frequent throughout basketball games. Given eighty-two games in an NBA regular season, teams' records are fairly close to their "true record". Scoring attempts are much less frequent in

the other three sports leagues. Scoring attempts are also difficult to define in Football and Baseball.

Another explanation for the NBA anomaly is the "superstar effect", where a superstar will have a greater effect on their team in the NBA than any other sports league. This is due to the few amount of NBA players on an active roster compared to other leagues. "An NBA team is allowed only 12 players on its roster, in comparison to the 23 players in the NHL, 25 players in MLB, and 53 players in the NFL" (Rockerbie, 300). This allows for individual players to have a greater effect on their teams than superstars in other leagues. Given the limited number of superstar players in the NBA, their effect is even more impactful. LeBron James, who may be the most iconic superstar of this generation, has been to the previous seven NBA finals. LeBron has won four out of the last eight Most Valuable Player (MVP) Awards, signifying that superstars truly carry their teams to contention in the NBA.

Through an econometric analysis, Hausman and Leonard discovered that TV ratings are much higher in NBA games that feature at least one superstar. Therefore, they generate a large amount of revenue for the league, and their respective teams. Superstar effects are not to be underestimated, as they have a large amount of sway on television audiences. "The 1993 NBA Finals, which featured Michael Jordan, averaged a 17.9 Nielsen television rating. The 1994 Finals, however, averaged only a 12.2 rating despite the presence of the New York Knicks, a team playing in the largest Nielsen market" (Hausman & Leonard, 1997, 586). Michael Jordan's first game back from retirement in 1995 captured 11% of all US households televisions, which was the highest rated regular season game in 20 years. Companies, in which Michael was the spokesman for, saw large

increases in their stock prices after his return announcement, including McDonalds and

Nike. The authors found that a player such as Michael Jordan can have positive effects on

the revenues of other teams, by making the league more popular as a whole. Hausman

and Leonard (1997) estimate that Michael Jordan is worth more than $50 million to other

teams in the league (600).

## 3.2 Salary Dispersion

The paper, "A game-level analysis of salary dispersion and team performance in

the national basketball association" by Hajime Katayamaa and Hudan Nuch uses game-

level panel data in their research. In professional sports, teams pay their players salaries.

Some sports will pay their players relatively equally, while other sports have a high

percentage of salary focused on a few star players. "Given a fixed payroll budget, it is

unclear which salary structure leads to better team performance: is it a more disperse or a

more compressed structure"(Katayamaa & Nuch, 1193)? Akerlof and Yellen (1988)

argue that compressed and even salary structure leads to "harmony and cohesion" among

teammates, thus increasing productivity. The tournament theory, however, suggests

greater salary dispersion incentivizes players to exert more effort and increases

productivity. This study uses individual game outcomes as well as regular season win-

loss records. They found that salary dispersion has no causal effect on performance,

regardless of the level of dispersion. This indicates that players do not care or care little

about the salaries of their NBA teammates. This game-level analysis conclusion directly

coincides with their season-level findings as well. This is directly contradictory to

instances within the NBA. There have been numerous instances of NBA players unhappy

with their salary, given the compensation of other players as their frame of reference. For example, Timofey Mozgov was a critical rim-protector for the Cleveland Cavaliers in the 14-15' NBA season; however, he became a relative non-factor in the 15-16' season, due to performance issues. The Cavs were already paying 72% of their salary cap to LeBron James, Kevin Love, and Kyrie Irving. This high-level salary dispersion between the "Big 3" and the rest of the Cavs pushed Timofey Mozgov to the Los Angeles Lakers for a 4 year, 64 million dollar deal. This is a clear example of high instances of salary dispersion leading to teams losing talent. Although their conclusion of salary dispersion having little effect on team performance may be correct, I claim their assumption that players care little about the salaries of their teammates to be wrong.

This study of employment can be extended to the NBA. If players are underpaid, do they underperform? Or do they exert more effort in an attempt to receive higher compensation? Of course, the NBA is much different than a typical occupation, however, some of these factors can play into NBA player productivity.

The wage-effort hypothesis can support or oppose the team cohesion theory in basketball. If players are all paid the same amount, then there is no one to compare wages with, resulting in workers/players being content with their salaries. This might create divide, however, where better players feel that they aren't paid a fair value for their level of productivity, which could possibly lower their performance in the long-run. This level of inefficiency could be evidence towards the tournament theory in the NBA, where a greater level of salary dispersion will increase performance because players will try to earn larger salaries. Also, salaries are more upward/downward mobile than other careers, given the volatility of production levels from players yearly. A player could be a star one-

year, but have a dramatic reduction in production the next year. This salary mobility can increase productivity by incentivizing players to exert more effort consistently.

There are instances when recently promoted workers/players show a decrease in productivity. This can be explained by luck contributing to their promotion, thus regressing to the mean following their promotion. This is called the Peter Principle, and this paper uses NBA data to empirically test this. The Peter Principle states that, "…everybody is promoted to his or her level of incompetence"(Dilger, 2003, 1). One explanation for this phenomenon is moral hazard, which is when employees exert more effort in order to get promoted, yet plan on lowering their effort and productivity once they're promoted. Another excuse for this principle is the expectation of less effort given a promotion. "The promotion to a position with less work is then a reward for past effort and serves as an incentive for lower and younger employees to work hard for the same. It is a soft form of retirement" (Dilger, 2003, 1).  This soft-retirement incentivizes younger employees to work harder for years, so that they may enjoy a decreased workload paired with higher pay later on.

Studies on the effects of player mobility, as well as sports market size on salary earnings are prominent in this field of research as well. This study by Lee, Leonard, and Jeon measured pay and performance in the NBA from 1991-2008. "This study recognizes basketball as an offensive and defensive team sport while considering each individual player rather than individual teams as the unit of observation. And thus no team-level effects such as number of team wins are considered in this study"(Lee et. al, 2009, 2). This paper differentiates itself from others by (1) studying the capacity of the local market to hold more teams or not, and (2) frequency of players movements between

teams. They concluded that scoring ability was the largest determinant in a player's salary. They also determined that rebounds and assists and blocks all have their own specific values in terms of contract values, as they are weighed differently. Players that move more were found to have a lesser salary and often less talent. If a team is found to compete with other local teams in the sports market then they typically have lower salaries.

This paper contributes significantly to previous literature, however, it has some downfalls, most notably, their conclusion on local sports markets. Sports markets that have a lot of local competition, i.e. Los Angeles, New York, Dallas, typically offer some of the largest salaries in the four major sports leagues. Los Angeles has two local NBA teams, the Clippers and Lakers, yet they both are almost always in the luxury tax bracket.

Koch and Nafziger employ a moral hazard model to determine the trade-off between incentive provision and inefficient job assignments. Workers are often incentivized through promotions; however, sometimes they are better suited for their current position. They argue that there is a job distortion in promotion decisions, mainly derived from employees being better suited for their previous position, over their promoted position. However, demotions are rare in any work environment, but employers theoretically should demote a worker if they're not well suited for that position. "Put differently, why do some employees rise to their level of incompetence and then remain at that hierarchy level, a phenomenon known as the Peter Principle" (Koch & Nafziger, 2007, 2). The authors argue that employees towards the bottom of the skill spectrum who get promoted, will be worse off in their promoted position, due to the severe amount of additional effort required for them in the new position.

Tangents can be drawn to the NBA where a team will offer a large role and contract to a player not deserving of it, leading to a feeling of failure and inadequacy for the player. Another route for the Peter Principle would be a player getting paid substantial money compared to previous contracts, yet decreasing productivity because they are contracted at that price regardless. There have been many cases in the NBA of "lazy players" who dropped off after receiving large contracts. The safety of these multi-year deals allows recently signed players to take it easy.

## 3.3 Cohesion Theory

Cohesion theory states that the less disperse wages are, the more productive the workers of a firm will be. Levine's (1991) argues: "The fundamental hypothesis of this paper is that a firm with large wage dispersion will have a less cohesive work groups." He claims that firms who consider cohesiveness will have a more homogenous wage structure, while firms that don't value cohesiveness will often have more disperse wages. He also believes firms who have a high skilled work force, which often results in higher wages for those workers, will trickle down to a small increase in wages for less skilled workers, in order to maintain some level of cohesion. Furthermore, the outcome will not be Pareto Optimal because low workers are getting paid more, resulting in less bottom-tier workers getting hired, due to the wage increase fostered by the high-skilled workers. Levine defines cohesion as, "the propensity to obey group norms because approval of the group is valued".

Levine's models incorporate reservation wages as a means of garnishing cohesiveness. If a firm meets a workers reservation wage at its bottom line, then they will

work, yet maybe not at their full potential. If a firm pays a worker more than their reservation wage, there should be an increase in cohesion, as well as obedience to the firm's goals. There is a fine balance, however, between nurturing this cohesion and not overpaying for low-end labor. "In this model, the firm increases the wages to L workers until the marginal benefit of greater in cohesiveness just balances the cost of higher wages" (Levine 1991). Levine also concludes that increasing low-end wages will increase efficiency. Levine argues that a "perfectly egalitarian policy is the most productive" for the firm itself, however, it must be mentioned that this hurts high skilled laborers, who's salaries are being stretched towards the mean in an effort to increase lower skilled laborers cohesion. This study emphasizes wage dispersion as a main factor in productivity.

Workers have a perception of fair wage, and when actual wage is less than fair wage, it results in workers exerting less effort corresponding to that difference in fair and actual wage. This helps explain the existence of unemployment, particularly when the fair wage surpasses the value of the market-clearing wage. This results in a negative correlation between skill and unemployment. "The motivation for the fair wage-effort hypothesis is a simple observation concerning human behavior: when people do not get what they deserve, they try to get even"(Akerlof & Yellen, 1990, 256).

Breunig finds a negative correlation between wage inequality and performance in major league baseball. He "derives the probability of a team winning as a function of the effort of all players on both teams using a contest success function (CSF), which is useful in holding all other factors equal. The CSF is ideal because it has the "property of equi-proportionate changes in effort across teams leaving the probability of each team winning

unchanged". This allows the authors to solely find the impact of wage inequality on performance, whilst not being affected by other variables and metrics.

Often firms have to worry about what their workers will think from certain firm-level decisions or actions. Milgrom and Roberts (1988) argue that firms can adjust wages in a manner, such that employees are no longer influenced by non-fiscal decisions made by firms. Therefore, "they would then be indifferent among the various decisions the organization might take, and they would have no reason not to cooperate fully in promoting the organization's objectives" (Milgrom and Roberts, s158). Applying this to basketball could deter teammates from locker room trouble because players wouldn't be concerned with the coming and going of players. As long as pay was compact, players would have no reason to garner hate for any decision made by the organization, thus creating a firm sense of cohesion.

Superstars in sports are becoming more important. They sell tickets, merchandise, and contribute significantly to winning. For example, on the last day of Kobe Bryant's career on the Los Angeles Lakers, the team sold $1.2 million worth of Kobe merchandise in their arena (NBA.com). Superstars often require the highest salary on the team, however "on the back of escalating salary dispersion within an organization, intra-organization salary disparity may undermine group cohesion by creating feelings of inequity, thus generating destructive reactions that can impair team performance" (Tao, et. al, 2015, 152). Both Lazear (1989) and Levine (1991) argue that small salary dispersions will reduce dissonance between players, thus improving cohesiveness and productivity. This contradicts the tournament theory, in which employees or players are incentivized to perform, given the high levels of salary dispersion and earning potential.

The paper *Compensation and performance in Major League Baseball: Evidence from salary dispersion and team performance* (Tao et. al 2015) looks into the divisiveness of authors in their empirical research supporting either the cohesiveness theory or tournament theory and supplies their own empirical evidence with Major League Baseball (MLB). Looking into the conclusions of this study, as well as the key differences between the NBA and MLB, will give further insight into my hypothesis.

It is important to note in panel data collection, that teams with the same payroll in different years often have a substantial difference to the average MLB payroll in that specific year. For example, the 1998 Montreal Expos (Currently Washington Nationals) had a payroll of US$371,240, which was only 23% of the average MLB payroll that year, while the 1986 Oakland Athletics had a similar payroll of US$376,776, which accounted for 81% of an average MLB payroll (Tao et al, 153). This clarification is crucial to make if the data is to be unbiased. The authors use payroll level as a control variable as well as replacing level with a team's relative position in payroll in the MLB in that given year as another control variable. This, paired with comparing the results at an absolute and relative level give key insights into the effects of salary dispersion in baseball. The "dynamic panel method suggests that compensation does play a role in team performance. In terms of salary dispersion, its negative effect on team performance turns somewhat weaker when a team's relative payroll position variable replaces the payroll level variable" (Tao, et al, 154). Therefore, this study on baseball supports the team cohesion theory as opposed to the tournament theory, which I hypothesize isn't the case in basketball.

## 3.4 Tournament Theory

The main reason for this dichotomy between baseball and NBA salary structure is inherent to the rules of each sport. Baseball teams consist of more players and positions, resulting in a lessened impact from superstar players. In the NBA, only 5 players are on the court for each team, resulting in a greater impact felt from each player, particularly superstars. Baseball also can have star players only play once every fortnight if they are pitchers. MLB teams have 5-man starting pitching rotations and a star pitcher will only play in approximately 30 out of a total 128 games in a season. This lessens the effect of a superstar pitcher, despite demanding a large salary nonetheless. In the NBA, superstar players play every game, barring injury, and often 40 minutes out of all 48 minutes available per game. This paired with the high number of games in a season, suggests that basketball should support the tournament theory.

Through studying the hierarchy of Audit Firms in Taiwan, Yang, Yang, and Su sought the relationship between the salary gap in different structures and firms' operating performances. "The empirical results are consistent with the tournament theory and show that the salary differences in different hierarchies are statistically and positively related to the operating performance" (Yang et. al, 2015, 15). Employees are incentivized by the salary gap to increase productivity in aspiration of a promotion and salary increase. The salary gap increases at each level, i.e. bigger difference between head auditor and vice head auditor, than vice head auditor and assistant auditor, and so on. Therefore, the incentive to increase productivity and performance increases at every subsequent level. This firm's hierarchy, supported by the tournament theory, creates a large effort boost in their employees.

The same argument can be made for the NBA, where young or cheap players will be incentivized to increase their productivity in exchange for a large pay increase. If every player is incentivized to make as much money as the salary cap allows, then the team will consist of solely maximum effort players. If there were not a salary cap, like baseball, then the incentives would be even more dramatic. No salary cap would incentivize the superstars in the NBA to play with maximum effort in order to capture their highest market value, as opposed to highest allowed value because of the salary cap restrictions.

It is evident that superstars dominate the sport of basketball. They justifiably demand the largest salaries because of their contribution to the revenue growth of the NBA. Their specific teams also benefit dramatically, as Jerseys and other team gear with the superstar players name are sold feverishly. Teams with superstars are also more often nationally televised, as well as sell more tickets because of that one player. Although these players are not fairly compensated due to their salary cap hindrances, they are almost always at the very top of the available pay scale. I hypothesize that this semi-god celebrity status enjoyed by superstar players, incentivizes younger or worse players to increase performance in order to reach this stardom. However, most successful NBA teams have a couple stars at least, indicating that teams with greater salary dispersion will perform better consistently.

Ramaswamy and Rowthorn find a positive correlation between wage disparity and performance, but do not attribute it to the tournament theory. They argue, "wage dispersion emerges as a consequence of the heterogeneity in the production structures of firms" (Ramaswamy et. al, 512). This is because workers will get paid more if their job is

more susceptible to damage, while lower skilled workers are placed with relatively safer jobs for the firm. For example, a person handling incredibly confidential and important information will be paid more than a person who handles public and less important information.

Lazear and Rosen (1981) argue that paying a worker for their rank or position can prove more fruitful than paying someone directly for their performance. This incentivizes young workers or in this papers case, players, to attempt to reach the rank of their superiors. Basketball players are all technically the same rank, however, this can be applied to years of service in the NBA. The NBA already does something along this line, where 5-7 year veterans can earn a larger max contract than rookies, while 7-9 year veterans can earn even more than the 5-7 year players, and so on. This loose definition of ranking within the NBA supports the tournament theory, as it incentivizes young players to produce in an effort to reach later stages of their career. "For example, the large salaries of executives may provide incentives for all individuals in the firm who, with hard labor, may win one of the coveted top positions" (Lazear and Rosen, 841).

Sherwin Rosen goes one step further from his earlier paper with Lazear and introduces the idea of high-end incentivizing. "Elevating the top prizes effectively makes the ladder appear longer for higher ranking contestants, and in the limit of making it appear of unbounded length: no matter how far one has climbed, there is always the same length to go" (Rosen, 711). Rosen argues, by incentivizing top-end players or workers they will strive to reach these prizes or feats, while simultaneously incentivizing younger workers to increase productivity in an effort to catch up or reach the top themselves. This is directly relatable to basketball as every player grows up watching superstars in the

NBA and once in the league themselves; these players continue to grow in an attempt to catch their one-time hero or idol. The countless endorsements and fame also incentivize the younger players to strive for greatness. Rosen's ideas also apply to players at the very top in ways other than monetary. Basketball greats are constantly compared to one another throughout the eras. LeBron James may be the greatest player in the world right now, whilst earning as much as he possibly can through salaries and endorsements. However, he keeps pushing himself farther because he is chasing the greats. Michael Jordan is considered the best basketball player of all time and LeBron is constantly in his shadow, therefore incentivizing him to increase his performance in an effort to transcend Jordan's legacy.

## 3.5 Lack of Correlation

In the heated debate between whether cohesion or tournament theory is the supporting theory of performance, there is an entire fleet of authors who found no correlation at all between the two. This is the third and final explanation between wage dispersion and performance. If cohesion theory supports condensed wages, and tournament theory supports stretched out wages, the final option would be for salary dispersion not to matter in the first place. Therefore, it is important to include literature that found the correlation to be inconclusive as that is one of the three main prongs.

Berri and Jewel (2004) found no correlation between winning performance and salary dispersion. In fact, "these results suggest that only two factors matter in terms of team wins: quality of players and quality of coaching" (Berri and Jewel, 2004). They mention that because of the lack of correlation between salary dispersion and team

performance, authors should instead focus on the relationship between salary dispersion and individual player performance, as it might tell more.

# 4. Analytical Framework

The purpose of this paper is to test salary dispersion in the NBA and see if 1) there is an effect, and 2) if aforementioned effect supports the cohesion theory or the tournament theory. Therefore, my performance metric must be my dependent variable, while salary dispersion is my main independent variable. Cohesion theory states that players will be more productive if their salaries are more homogenous, creating an additional sense of chemistry, whilst eliminating jealousy from the equation. Cohesion theory argues that this constant envy of teammates salaries will only lead to worse performance. Tournament theory argues the opposite; that a more disperse salary will incentivize players towards the bottom of the payroll to play better, in order to reach that upper echelon of salary some of their teammates get to experience. It is worth noting that the minimum salary for a non-rookie in the 2017-18 NBA season is $815,615 (NBA.com). Clearly tournament theory might have a somewhat different effect in the NBA than in other industries due to the large salary figures even at the very bottom of the league, however, maybe it is even more incentive to live the "superstar lifestyle" only available through endorsements and $30 million contracts.

There is a divide in the literature, sports and non-sports authors alike, to the support of cohesion theory versus tournament theory. Lazear (1989), Levine (1991), Akerlof and Yellen (1988 and 1990), and Milgrom and Roberts (1988) all find results supporting the team cohesion theory; arguing that less disperse salaries will increase

cohesion, thus increasing productivity. Sometimes authors find different results in different mediums, as Lazear and Rosen (1981) find evidence to support the tournament theory. Rosen (1986) also finds more empirical evidence in support of the tournament theory in addition to his previous work with Lazear. Ramaswamy and Rowthhorn (1991) also argue that an increase in wage disparity will improve productivity and firm performance.

The divide between theories becomes evident, the further this study goes, therefore I will attempt to use 20 years of NBA data in order to find support for one of these theories. I believe my research will support tournament theory, as fewer players are necessary to carry a team to success than in other sports, by rules inherent to the game. My addition to the literature is my time frame; using 20 NBA seasons, compared to the nearest paper, which uses 10, as well as the inclusion of playoff performance as a productivity metric. Playoff performance is when performance matters most, and therefore should be included in any study that measures performance in sports, I argue. With a combined interdisciplinary approach through labor economics and basketball, we should have a solid foundation to build our model.

## 5. Data and Variables

The salaries used in this paper were retrieved from (P. Bender) and listed by the 15 players on each NBA roster per year. Each year's salary per team was imported into Microsoft Excel and variance and standard deviation were calculated in turn from then. Because of this massive panel data set, there should be interesting trends found between the mid 90s and mid 2010s. The variables for performance were retrieved from

"basketballreference.com." This website listed the win totals for every team in any given year, as well as playoff results for the applicable teams.

The variable for performance is created from a few components. The NBA season has 82 games every year, and for each win earned in any given year, it adds 1 to their "final score". For example if a team wins 50 out of their 82 total games in a given year, then that 50 would be part of their final score for that year. The other component to the performance variable is playoff success. If a team doesn't make the playoffs then nothing is added to their final score, aside from regular season wins. If a team makes the playoffs, then their success within the playoffs will affect their final score in different ways. If a team makes the postseason and loses in the first round, they will not be awarded any additional points to their final score, in an effort to balance the difference between Eastern and Western Conferences in the NBA. Sometimes the 8th seed (bottom seed of playoffs) is drastically different between the Eastern and Western Conference. Therefore, if a team is going to be awarded playoff performance points, then they must win a round of 7 in the playoffs (all series are a best of 7 games). If a team makes it to the second round of the playoffs, also known as the conference semi-finals and loses, then they will receive an additional 10 points. If a team makes the conference finals and loses, then 20 points will be given to their final score. If a team loses in the NBA finals, they will receive 30 points tallied onto their final score, while a championship team will receive 40. For example, the 2014-15 Chicago Bulls won 50 games out of the possible 82, as well as lost in the second round of the playoffs. Therefore, their final score of team performance in that given year is 60. Theoretically the highest score a team could receive

is 122, with a perfect 82-0 record and a championship, but the highest score used in this paper is the 1995-96 Chicago Bulls, led by Michael Jordan, with a score of 112.

The main independent variable in this paper is salary dispersion. This is calculated between the 15 NBA players on each roster in any given year. Standard deviation will be the measurement of salary dispersion, with higher standard deviation representing higher salary dispersion and vice versa.

A dummy variable will be instituted for the 1998-99 season as well as the 2011-12 season for their respective lockouts. The 1998-99 season consisted of 50 games, while the 2011-12 season had 66 games. This dummy variable will account for the lack of regular season wins present, due to the lockouts.

The salary cap independent variable was created as a means to protect against the ever-increasing salary cap and its relation to dispersion. In the 1995-96 NBA season the salary cap was only $23 million, while the last year of my data set, 2015-16 had a $70 million salary cap. The number continues to go up exponentially, given new TV deals and collective bargaining. The salary cap for this current NBA season, 2016-17 is a whopping $94 million. This salary didn't uniformly increase, however, as some years had no salary growth, due to lockout discussions or other reasons, while others, like this past year have exploded onto the scene. This independent variable for salary cap should account for the ever-changing salary cap and not allow it to distract from the true relationship between salary dispersion and team performance

# 6. Methodology

Econometric model

The econometric model used in my paper is as follows:

(1)  $FS = \beta_0 + \beta_1 LNSalaryDispersion + \beta_2 Lockout1 + \beta_3 Lockout2 + \beta_4 SalaryCap$

Where:

**FS** = FinalScore/Team Performance (i.e. winning metric: Regular season wins + Playoff round)

**SalaryCap** = Salary cap in a given year

**SalaryDispersion** = Standard Deviation of 15 salaries on any given NBA team in any given year

**LNSalaryDispersion** = Log of standard deviation of 15 salaries on any given NBA team in any given yea

**Lockout1**: 1998-99 Lockout dummy variable

**Lockout2**: 2011-2012 Lockout dummy variable

*Four models will be used, but are all an extension of this base model.*

 

      The final score metric I have created is the sole dependent variable being used in this study. Salary dispersion is the main independent variable in my paper. I argue that salary dispersion will have a profound effect on team performance, supporting the tournament theory because a more disperse salary indicates the presence of stars deserving of those large contracts, and stars are essential to win in the NBA. However, there is the complication of massive, bloated contracts for undeserving players that stay

on a team's book for a few years. This can heavily skew my results away from my prediction. For example, Joe Johnson received a 6- year $119 million contract from the Atlanta Hawks in 2010. He never approached anywhere near that value of production and was traded because of it to worse teams with more salary space, such as the Brooklyn Nets. It could be possible that large, yet unjustified contracts, such as Joe Johnson could muddy the waters of large contracts being reserved for star players.

Multicolinearity robustness checks must be run in order to see if there exists a strong connection between the two variables, as we do not want that in our model.

I will have an unbalanced panel data set because of a few nuances. The 2002-2004 Charlotte Hornets did not exist as they were relocated to New Orleans, in order to replace their leaving team. This left a gap in data for these two years, however, the team was reinstituted in the 2004-05 season and continued from there. This gives them 18 years of data, as opposed to 20 years. The New Orleans Pelicans are also victims of having less than 20 seasons of data. They began as an organization in 2002 when the Charlotte team relocated to New Orleans, so New Orleans seasons began in 2002, giving them a 13-year data set, as opposed to 20 years. These are the only instances of unbalanced data, as the next nearest (almost) issue was the creation of the Toronto Raptors in 1995, which was the first season of my data, thus avoiding that issue. Teams have relocated or changed their names, but if they had the same player base, I continued to use them in my data set. For example, the Memphis Grizzlies were once the Vancouver Grizzles, however, the relocation didn't change the players on the team or any other circumstances other than venue. The same case applies to the Seattle Supersonics

turning into the Oklahoma City Thunder, and the New Jersey Nets turning into the Brooklyn Nets.

# 7. Results and Discussion

The results from the four models are seen in table 1. Model 1 was the only model that had fixed effects, with the remaining being random. We saw that Lockout1 and Lockout2 had large effects on performance, which is intuitive, given the smaller number of games in each of those seasons. Salary dispersion showed significance up to 99% on the final score metric, however, the coefficient was incredibly small. This is measured in dollar figures however, and because we are dealing with millions of dollars, this small coefficient still tells a story. It says that for every 1 dollar added to dispersion, there is a .00000328 increase in the performance value. If we extrapolate this to millions, we see that for every addition million dollars we see an increase in 3.28 for performance. Therefore, this model supports the tournament theory, agreeing with Lazear and Rosen (1981), Rosen (1986), and Ramaswamy and Rowthhorn (1991). This is a large finding, as GMs can use this data moving forward, in order to more efficiently build their rosters.

Model 2 used the log of salary dispersion as an independent variable, instead of regular salary dispersion. LN salary dispersion showed significance up to 99%, with a coefficient of 12.184. This indicates that for every 1 percentage point increase in salary dispersion, there is a 12% increase on the final score variable. This is an incredibly high coefficient and I'm curious to see if it holds true. Lockout1 and Lockout2 had similar

effects as they did in Model 1. The constant in this model was negative and significant. This furthers the support of the tournament theory.

Model 3 introduces salary cap into the independent variables in an effort to see if that has an effect on team performance. The coefficient of salary dispersion was very small again, and also significant. Lockout 1 and 2 had negative effects on performance again, similar to the previous two models. Salary cap has an incredibly small negative coefficient and was significant. This is the opposite of my expectations for the variable, because I thought that an increasing salary cap would give teams more flexibility to change their rosters, therefore increasing performance. It is found in fact that the extra salary has a negative effect on performance. This might be because of the ability of teams to raise the price on a free agent player through bidding, thus artificially increasing their value, resulting in a large contract player not adding high levels of productivity. This makes sense, as we see through the increases in salary, that players are getting paid way more than their market value in an effort for teams to stay in contention. Sometimes teams consider themselves one piece away from winning a championship and if that piece is available, teams will more often than not pay large sums of money to acquire that player, even if they don't add incredible value to the franchise.

Model 4 used the log of salary dispersion with the salary cap variable included as well. LN salary dispersion's coefficient was a whopping 20, indicating for every 1% increase in salary dispersion, there was an 20% increase in wins. This seems like an unrealistic value, however, these were the coefficients that I received from my regressions. This model heavily supports tournament theory, and almost suggests that it should be the "golden rule" for teams to follow if they wish to maximize performance.

No Multicolinearity was found in any of the four models. The VIF for each independent variable was less than 5 across all four models, as seen in Table 2. The closest to a VIF of 5 that any of our models' variables got to, was 1.76 between final score and salary cap in Model 4.

Graph 1 shows the strong correlation between salary dispersion and finals score. Graph 2 shows another strong correlation between the log of salary dispersion and score. With these two graphs, we can visually see the effect of salary dispersion on performance in the NBA. Graph 3 looks at the relationship between salary dispersion and performance for the Cleveland Cavaliers from 1995-2015. This team currently has a "big 3", while it was a relatively compact salary structure in the late 90s and early 2000s. This franchise can be used as an example of the relationship between payroll structure and performance in the NBA. As we see, there is a correlation between the two variables, as a greater salary disparity will influence wins in a positive manner. This is explained by the three stars that absorb over 70% of the Cavs' cap space. LeBron James, Kyrie Irving, and Kevin Love all have multiple all star appearances and are considered to be a super team, hence the high salary disparity and excelling performance. This franchise structure heavily supports the tournament theory as the Cavs role players are signed to cheap contracts, yet produce powerfully in an attempt to reach the stardom of their big 3 teammates.

My findings from all four of my models support the tournament theory. Every one of my dispersion independent variables proved significant to the 99th percentile and showed a large influence on team performance in the NBA. Cohesion theory seems to be more applicable in the common workforce based on aforementioned literature in this

paper; however, tournament theory seems to work hand in hand with basketball in particular. We can conclude that this is inherent to basketball predominantly because of the rules of the game. In basketball, individual players have much more effect on performance than in other sports, and in other industries. Small start-ups can be carried by a few individuals to a certain point, but eventually other contributors become important to succeed. In the NBA, certain superstars truly can carry their teams to contention, especially if the team has 2 or 3 stars. Role players always serve their purpose and are important, but not nearly as significant than in other sports. LeBron James has been to seven straight NBA Finals, on two separate teams. He has had good teammates and other stars, however, his teams have always had a large salary dispersion, given the high level of salary allocated to LeBron and his 1-2 co-stars. Nevertheless, his teams are constantly successful because of his influence. Every player in the NBA wants to be LeBron, as he is considered the best player since Michael Jordan, as well as the numerous lucrative sponsorships he has, including a billion dollar lifetime deal with Nike. Rookies from all over the country put in work on their game in an effort to reach the transcendence that LeBron has reached. The tournament theory supports NBA productivity because of superstars taking up large portions of any given salary cap, as well as the drive of younger and less successful players trying to reach the top, thus increasing their performance.

# 8. Tables

## 1.

Dependent Variable: Final Score

|  | Model 1 | Model 2 | Model 3 | Model 4 |
|---|---|---|---|---|
| Salary Dispersion | .00000328*** (.000000548) |  | .00000611*** (.000000621) |  |
| LN Salary Dispersion |  | 12.184*** (1.735) |  | 20.051*** (2.113) |
| Lockout1 | -11.459*** (3.772) | -10.195** (4.100) | -15.839*** (4.063) | -15.737*** (4.083) |
| Lockout2 | -10.059*** (3.672) | -10.608*** (3.991) | -7.119* (3.904) | -6.883* 3.923 |
| Salary Cap |  |  | -.000000455*** (.0000000775) | -.000000503*** (.0000000815) |
| Constant | 35.334*** 2.281 | -135.508*** (26.156) | 45.939*** (3.208) | -230.224 (29.686) |
| $R^2$ | .1099 | .097 | .158 | .150 |
| N | 621 | 621 | 621 | 621 |
| Fixed Effects | Yes | No | No | No |

All standard errors are in parentheses
* indicates significance at 10% level of significance
** indicates significance at 5% level of significance
*** indicates significance at 1% level of significance

## 2(a). Model 1 Multicollinearity Test

| Variable | VIF | 1/VIF |
|---|---|---|
| Salary Dispersion | 1.03 | 0.967 |
| Lockout1 | 1.03 | 0.973 |
| Lockout2 | 1.01 | 0.990 |
| Mean VIF | 1.02 |  |

## 2(b). Model 2 Multicollinearity Test

| Variable | VIF | 1/VIF |
|---|---|---|
| LN Salary Dispersion | 1.04 | 0.961 |
| Lockout1 | 1.03 | 0.968 |
| Lockout2 | 1.01 | 0.989 |
| Mean VIF | 1.03 | |

## 2(c). Model 3 Multicollinearity Test

| Variable | VIF | 1/VIF |
|---|---|---|
| Salary Dispersion | 1.48 | 0.674 |
| Lockout1 | 1.09 | 0.921 |
| Lockout2 | 1.03 | 0.966 |
| Salary Cap | 1.61 | 0.622 |
| Mean VIF | 1.30 | |

## 2(d). Model 4 Multicollinearity Test

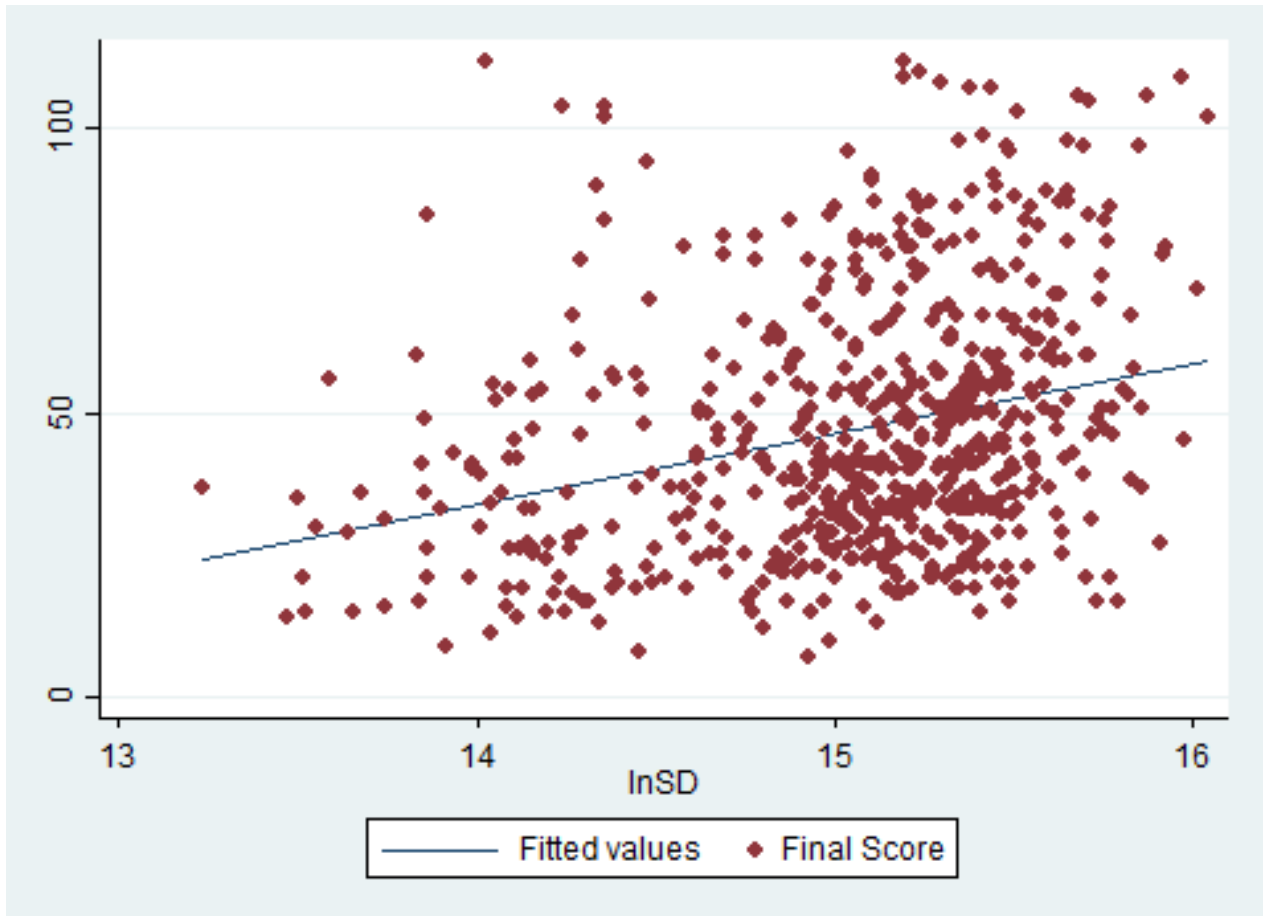| Variable | VIF | 1/VIF |
|---|---|---|
| LN Salary Dispersion | 1.64 | 0.611 |
| Lockout1 | 1.09 | 0.921 |
| Lockout2 | 1.04 | 0.965 |
| Salary Cap | 1.76 | 0.567 |
| Mean VIF | 1.38 | |

# 9. Graphs

1.
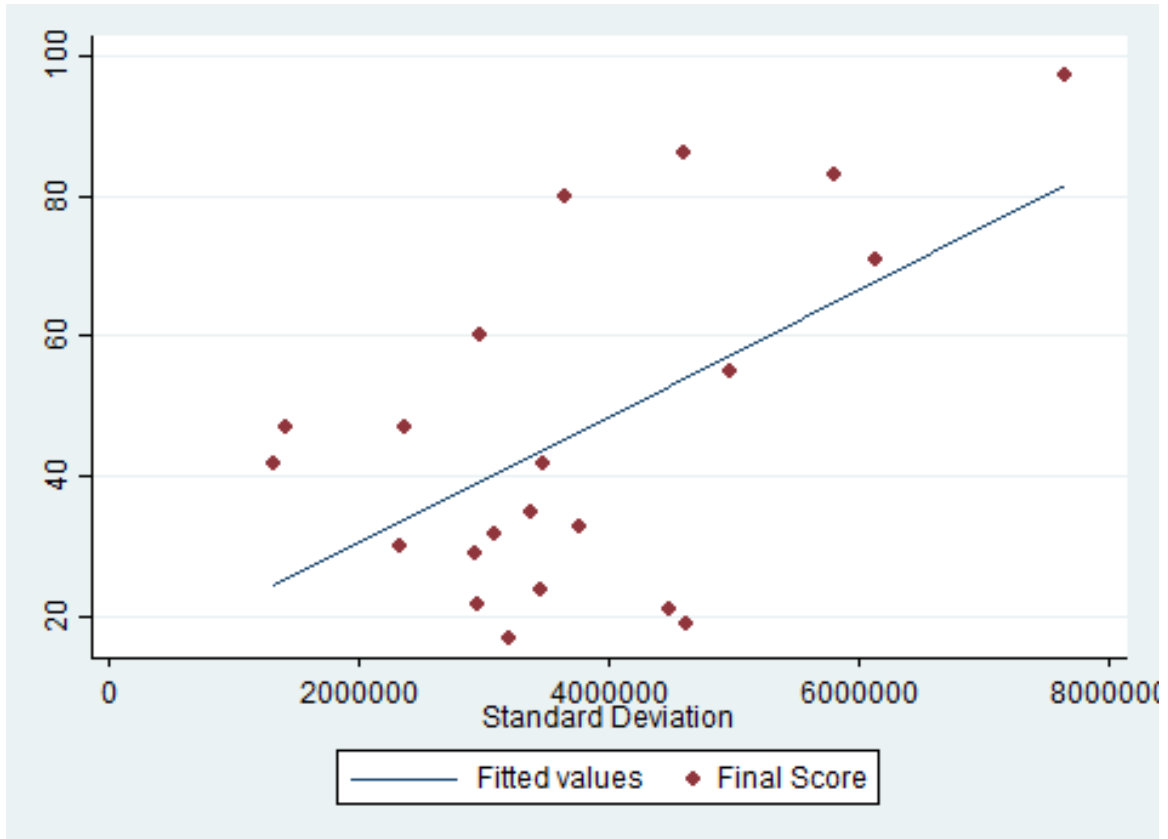
Final Score vs. Standard Deviation (salary disp.)
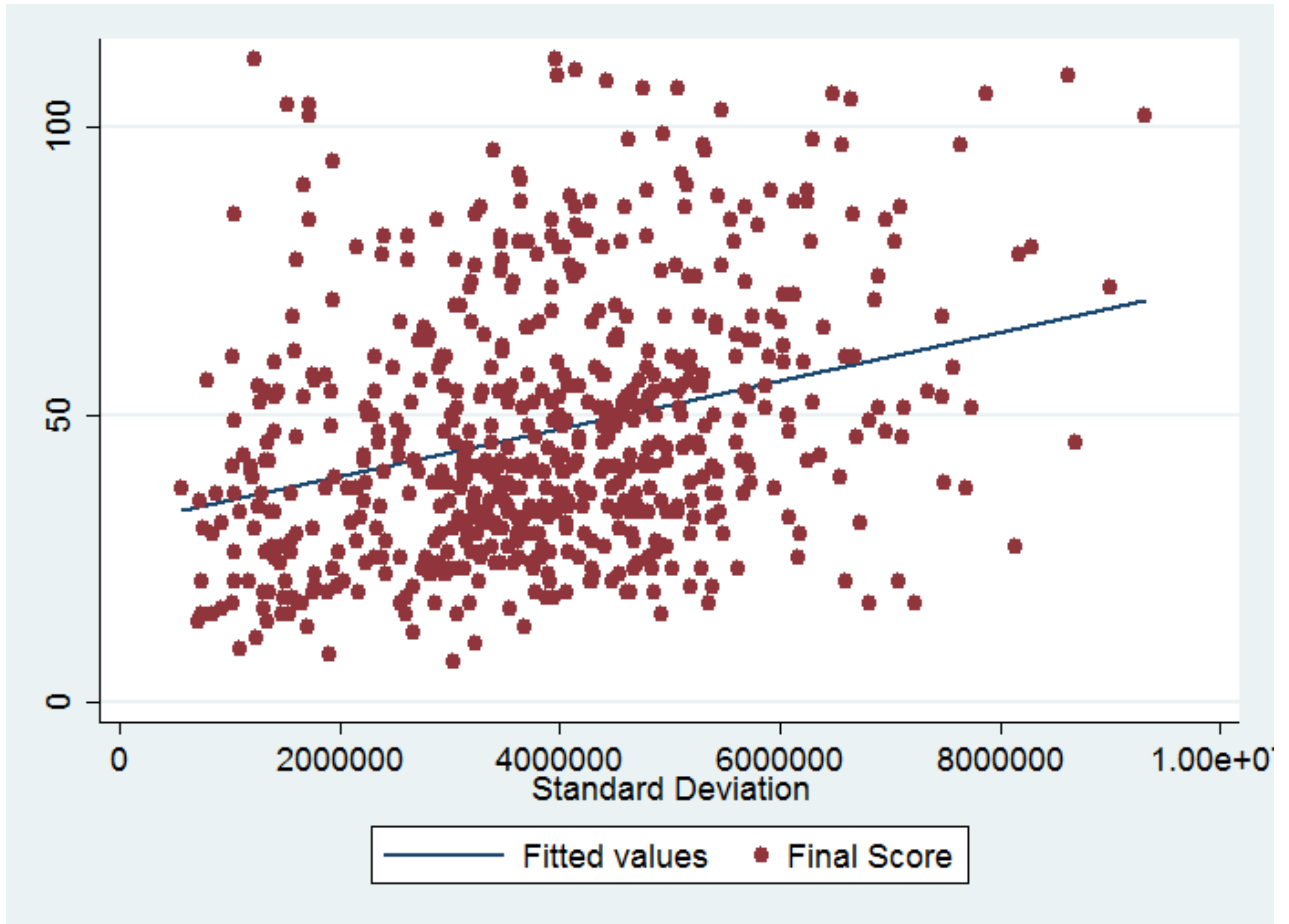
**2.**

Final Score vs. LN Standard Deviation (LN Salary Dispersion)

3.

Final Score vs. Standard Deviation (Salary Dispersion) for **Cleveland Cavaliers**

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