The Park Place Economist

Volume 20 | Issue 1 Article 16

2012

Economics of Salary Dispersion in the National Basketball Association

Dan Schouten '12
Illinois Wesleyan University

ECONOMICS OF SALARY DISPERSION IN THE NATIONAL BASKETBALL ASSOCIATION

Dan Schouten

I. INTRODUCTION

In the business world, every firm faces salary allocation decisions. Managers and executives of companies have to ask themselves how to allocate salaries across positions. This question also applies to teams within the National Basketball Association (NBA). NBA players provide a differing amount of value to their respective team and therefore are worth different amounts of money in comparison to one another. General managers have to decide which players to sign as well as figure allocation decisions of the salary they distribute to their signed players. An important research question to consider is: What is the best way to allocate salary amongst a NBA team? The term "best" in this situation can be interpreted in different ways. First, "best" can be viewed as a salary distribution that maximizes wins. Wins are obviously important to fans and are also important to management. In addition to win maximizing, "best" can also be viewed as a salary distribution that maximizes revenue as each team is attempting to make money.

There are many reasons as to why this research question is important, both in terms of the NBA and other businesses. With regards to the NBA, the answer to this question could play a significant role in the shaping of the league. General managers will hopefully be able to construct their teams better and more appropriately after this study and also be able to understand how the distribution of the salaries that they give out will affect their goals for the season.

With general managers' knowledge of team construction increasing, the competitive balance of the NBA might also be able to increase. The biggest problem any sports league faces is competitive imbalance. A large amount of imbalance can lead to a contraction in the number of teams, or even the disbanding of the entire league (Rosen et al, 2000). The NBA has the biggest competitive imbalance problem of any of the four major sports leagues when it comes to number of wins and amount of revenue generated. As of the end of the 2010-11 NBA season, two teams, the Boston Celtics and Los Angeles Lakers, have won a combined 33 NBA Championships in the 65 year existence of the NBA. In addition to this fact, differences across teams in the amount of revenue generated are enormous. Within the last five years, there has been up to a 254% difference between the top and bottom teams in total revenue. The competitive imbalance problem deals with a problem at the league level, whereas the research question at hand deals with the team level disparity. They are connected, however, because if salary dispersion on a team level affects wins and revenues, general managers would be able to use this knowledge and create their teams to be more competitive against the rest of the league. This would increase the health of the league and therefore everyone involved with the NBA would reap the benefits.

In addition to these facts on the importance of this topic in the NBA, this research can also be extremely beneficial to other firms, companies and industries. The research done during this study can possibly expose a new system of managing and a new way to organize firms, similar to the way the book Moneyball by Michael Lewis changed perceptions throughout the business world. Every firm faces salary allocation decisions, but the fact that outcomes are more easily measured in sports than in other business firms makes studying research topics such as this one easier to complete when applying it to a sports organization. Basketball players' productivity is much more easily measured than workers in other firms because of the statistics that are compiled with the sport.

This study aims to determine the optimal amounts of salary dispersion to maximize wins and maximize revenue. Based on economic theory provided in the following section, I hypothesize that the optimal amount of salary dispersion will be different for teams that have a goal of maximizing wins and teams that have a goal of maximizing revenue. In addition, the theory in the following section also helps generate other hypotheses. In terms of win maximization, I hypothesize that the greater the dispersion the greater the number of wins achieved. In terms of revenue maximization, I also hypothesize that the greater the dispersion, the greater the amount of revenue generated. However, I believe the effect of dispersion will be greater for revenue.

II. THEORY AND LITERATURE REVIEW

There has been a large amount of literature on topics related to this research question pertaining to wage disparities within a firm, but not a great amount done specifically on salary dispersion in the NBA and its effects. The majority of the literature that is similar to this topic deals with the effect of salary dispersion on the number of wins and does not even consider revenue. The literature that deals with wins and salary dispersion is relatively new (Berri et al, 2004). This is a result of the Collective Bargaining Agreement (CBA) between the NBA owners and players' union that was developed at the start of the 1995 NBA season. This was the first time in NBA history where the salary dispersion within teams really exploded. The "middle-class" of the NBA was basically lost and teams had very high salary players and low salary players (Berri et al, 2004). Many teams, as a result of the terms of the new CBA, took the path of devoting a substantial amount of team payroll to a few stars and then complete their roster with players offered the NBA minimum wage or close to it.

David Berri and Todd Jewell (2004) saw this rapid change in distribution of salaries as a chance for a natural experiment to understand how changes in disparity impact team/firm performance. Hajime Katayama and Hudan Nuch (2011) completed a similar study. Each study defined the dispersion variable differently, but both came to the same conclusions. Both studies found the amount of salary dispersion among a team to have no significant effect on team performance. The authors say that, for this industry at least, the idea of tournament theory, which states that pay inequality results in higher worker productivity, and pay compression school of thought, which states that wage equality will enhance cooperation and therefore performance, are both inapplicable (Berri et al, 2004). The datasets used, however, were admittedly somewhat small and both Berri and Katayama believe there could be a significant effect if the sample size was larger (Kayama et al, 2011). Another similarity of these authors was their conclusion that salary dispersion might not affect team performance because the lower salaried players will perform to their best abilities to maximize the amount of salary they can obtain on their next contract.

Stefan Kesenne (2007) discusses the multiple objectives of professional sports teams in his book The Economic Theory of Professional Team Sports. He acknowledges that professional sports organizations are businesses that attempt to maximize revenue and profit, but at the same time many teams are focused on maximizing wins. Studies have been shown to be inconclusive in accepting or rejecting the profit or win maximization goals. Kesenne provides a simple diagram that leads to the underlying hypothesis of this paper, which is that revenue maximizing teams and win maximizing teams will have a differing amount of salary dispersion. Figure 1 shows the different amount of talent demand levels depending on team goals. The number of talents, or superstars, is represented on the horizontal axis and total revenue and cost is represented on the vertical axis. The variables t1, t2, etcetera, on the horizontal axis do not specifically mean one superstar, two superstars, and so forth. They represent different possible number of talents on a team, but not incremental increases in talents. The farther to the right on the horizontal axis, the higher the total amount of talents on a team. Total cost increases as the number of talents increases, but the revenue curve is concave. According to Kesenne, this is a result of revenue increasing with the team becoming more successful, but then decreasing if the team becomes too good and public interest fades because of lack of uncertainty. A revenue maximizing team will hire at the t2 amount of talents on this graph, where the revenue curve is at its highest point. Under the assumption that the more talents there are on a team, the team will be more talented overall, and therefore a more successful team, a win maximizing team would want to hire as many talents as financially possible. Therefore, a win maximizing team will hire t4 amount of talents on this graph, where they can maximize the amount of talents without losing any money (Kesenne, 2007). This analysis makes clear that the revenue maximization point and win maximization point requires a different amount of talents and therefore a differing amount of salary dispersion.

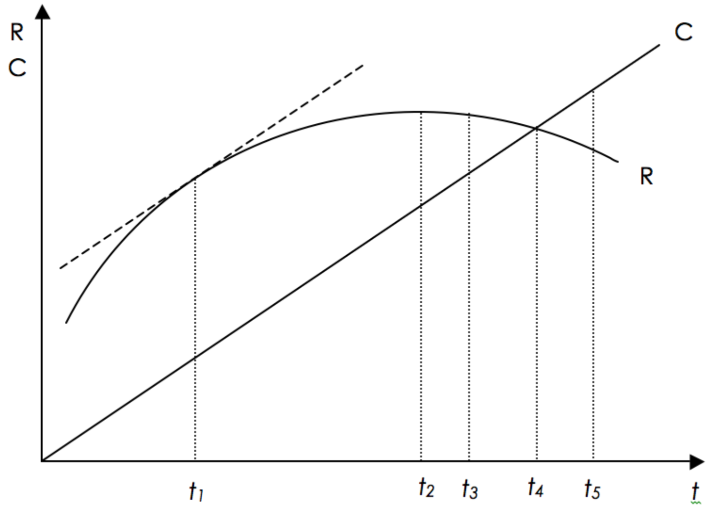


Fig. 1. Kesenne's Theory of Sports Teams

The effect of superstars on revenue has also been extensively studied. Sherwin Rosen (1981) and Walter Oi (2008) have studied the economics of superstars. Rosen discusses that the settings in which superstars are found share two common elements. These are a close connection between personal reward and the size of a person's own market, and a strong tendency for market size and reward to be skewed toward the most talented people in a specific activity. Oi believes that superstars' gigantic income and rare talents is what attracts attention. They both acknowledge that superstars are of interest to fans and therefore create attention. In most circumstances superstars are considered entertaining and it is the search for entertainment, admiration, and a desire to understand how they are as good as they are at what they do that creates the increase in revenue generated for their firm. Jerry Hausman and Gregory Leonard (1997) studied the effect that NBA superstars had on both team and league revenue during a number of seasons in the 1990's. Some of the avenues that superstars help produce revenues are through increased television ratings, increased attendance at games, and an increase in sport paraphernalia sales. They found that not only does a superstar positively impact his team's total revenue, but he also positively impacts other teams' revenue (Hausman et al, 1997). This means that small market teams would attempt to free-ride off large market teams. According to Hausman, a suggestion to fix this free rider benefit is the institution of a salary cap. A salary cap, however, will over correct the superstar externality. The NBA has tried to correct this problem by instituting a soft salary cap (Coon, 2011). This means that there are a few exceptions to the salary cap rule and teams are able to have a payroll that exceeds the salary cap, but are fined when payrolls exceed a certain luxury tax level. The luxury tax level is determined by a complicated formula, but is typically in the range of $12-13 million above the salary cap.

With Kesenne's theory and the effects of superstars understood, the specific questions of win maximization and revenue maximization have to be dealt with. Salary dispersion and the effect it has on teams can be explained within the framework of demand theory. Marginal revenue product (MRP) is the underlying component of a demand for labor curve. Human capital theory is underlying the MRP curve since human capital is directly related to the marginal productivity of workers. Human capital refers to the productive capabilities of human beings as income generating components in the economy (Rosen, 2008). According to human capital theory, the higher the productivity that is obtained through investments in education and training, the higher amount of income a person should achieve. Also, human capital theory suggests that the returns to investments in education and training are directly related to the individual's innate ability and physical endowments. Therefore, the higher the basketball player's skill, the higher the amount of income he should generate and the higher his MRP.

Fig. 2. Marginal Revenue Product curve of Superstars and Normal Players

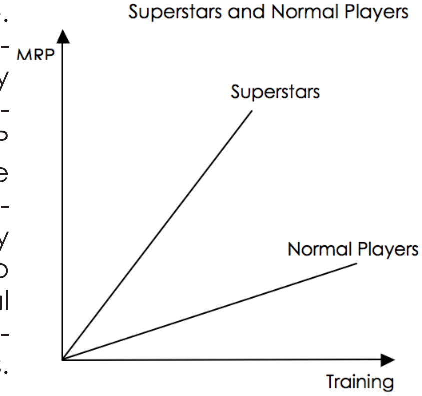
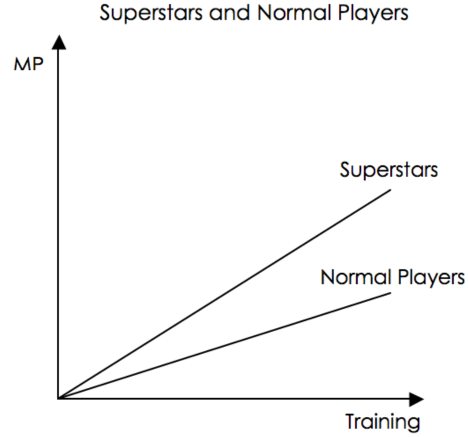


Fig. 3. Marginal Productivity Curve of Superstars and Normal Players



According to Oi (2008), small differences in talent can be associated with large differences in income, especially when the market size is big, which is definitely the case with the NBA. This idea is illustrated in Figures 2 and 3. Figure 3 shows that with increased training all players' marginal product increases, but superstars' marginal product increases by a larger amount. The same thing occurs in Figure 2 with marginal revenue product increasing with training, but superstars' marginal revenue product increases by an even greater amount than it did with marginal product in comparison to the normal players. This large difference in MRP allows superstars to earn a high income compared to normal players and could cause great salary dispersion within a team.

Teams, in essence, construct their own demand curve and have different curves than other teams (Rosen et al, 2000). With the knowledge of MRP of players and the presence of a salary cap, demand curves can be understood. With a larger number of high skilled players, a large amount of the team's total salary, which is limited as a result of the salary cap and luxury tax level, is devoted to a few players and therefore the demand curve would be very steep and inelastic. Teams with more balanced salary dispersion will have a flatter, more elastic demand curve (Rosen et al, 2000). This idea is represented in Figures 4 and 5. Figure 4 represents a MRP curve of a team that employs a few superstars and the rest below average players, therefore creating an uneven distribution of talent. The superstars, as a result of their high skill level, require larger salaries. Given the salary constraints a team faces, the rest of the team is filled with below average skill level players who only require smaller salaries. This uneven distribution of talent, therefore, creates a large amount of salary dispersion and an inelastic MRP curve. Figure 5 represents a MRP curve for a team with players of similar abilities. As a result of the abilities of players being similar, the salary each player receives should be somewhat similar. Certain players would still make more than others, but the overall salary dispersion for the team would be much less. This more balanced distribution of talent, therefore, creates little salary dispersion and an elastic MRP curve.

Fig. 4. Team With High Salary Dispersion

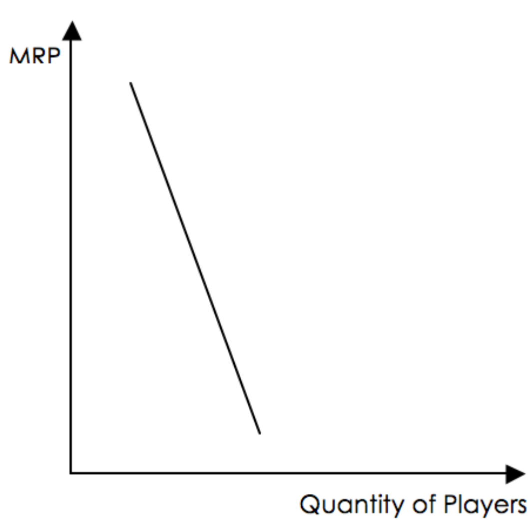
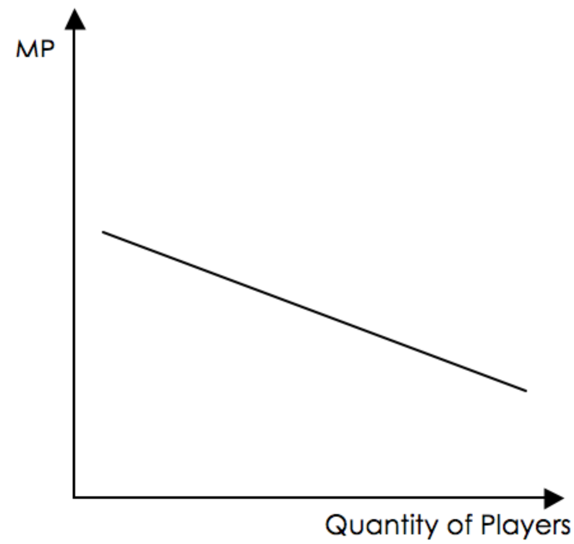


Fig. 5. Team With Low Salary Dispersion



Free agency in the NBA allows players to negotiate their contracts. This enables the player to have power over receiving their full worth. Teams have to bid for players and players can decide if they believe the offer is fair. The potential producer surplus obtained by the team that signs the player is squeezed out by the player as a result of the ability to negotiate. At the extreme, players receive their personal MRP and teams receive no producer surplus. An interesting part to this is that teams offer salaries to players at what they believe the player's future MRP will be. The amount paid to each player in comparison to his true MRP will determine the amount of revenue each team brings in. The decision process of whom to sign and for what price enables each team to create their own demand curve (Rosen et al, 2000).

Kesenne's theory of professional sports teams along with demand for labor theory sets the stage for the remainder of this research study. When looking into the effects of salary distribution amongst NBA teams, both of these theories are relevant.

III. DATA

Two different regressions are going to be utilized using cross-sectional data in order to determine the best way to allocate salary amongst an NBA team. This section discusses all the data that is needed to be obtained in order to carry out these regressions. The next section specifically discusses the variables used in these regressions in terms of each variable's definition, importance, and expected affect.

In the first regression, the Wins Regression, the number of wins a team achieved during the regular season is the dependent variable. Only regular season wins, and not playoff wins, are being included in this study because every team participates in the same number of regular season games whereas not every team makes the playoffs. Using only regular season wins allows the study to be more consistent and accurate. This data is compiled from the NBA's website ("NBA.com"). In the second regression, the Revenue Regression, the team's total revenue of each season is the dependent variable. Forbes publishes valuations and other reported money figures, such as revenue, of sports teams every year (The Business of Basketball, 2011). The years of data for this study are from the seasons of 2006-07 to 2010-2011. The Wins Regression, which has wins as the dependent variable, uses all five seasons of data. The Revenue Regression, which has revenue as the dependent variable, uses only the first four seasons of data as a result of the NBA not reporting the 2010-11 season revenue figures until January 2012.

Total television market size in each NBA team's metropolitan area needs to be accounted for as that could play a role in the revenue and possibly wins a team is able to generate. This data is reported by Nielson Ratings, which is the most credible source when it comes to television monitoring ("Local Television Market Universe Estimates"). One limitation to the Nielson Ratings, however, is that it only reports figures for cities in the United States. The NBA is a multinational league with one team being located in Toronto, Canada. The Bureau of Broadcast Measurement (BBM) is Canada's equivalent of the United State's Nielson Ratings. The only year of data reported, during the range of this study, for Toronto's television market size was for the 2008-09 year. The other four years of television market size data for Toronto are estimations based on Toronto's population.

Another piece of data that is pertinent to this study is the luxury tax level in the NBA for each of the seasons. These figures are widely reported but for this study the data is taken from the NBA's website ("NBA.com").

Finally, the last data that are needed are total team salaries to see if each given team is above or below the luxury tax level and a breakdown of team salaries by player in order to analyze the amount of wage dispersion for each given team. This data is reported by USAToday, which is a very reliable source for this type of data, however, there was a problem with some of the information retrieved from this source ("National Basketball Association Salaries"). When analyzing the salary data of the 2009-10 Houston Rockets, it was evident that the database double counted one player. Yao Ming, a player on the Houston Rockets, was included twice, and therefore, that needed to be corrected. The false Yao Ming was removed in order to make the study more accurate. Another shortcoming from this source was that it did not include the 2006-07 and 2007-08 Seattle Supersonics in its database. The Seattle Supersonics relocated to Oklahoma City after the 2007-08 season and therefore became Oklahoma City in the database. The salary figures for the two years of data in this study where Seattle did have an NBA team comes from the NBA's website ("NBA.com").

IV. EMPIRICAL MODEL

A. Dependent Variable

In this study, OLS regressions will be used to analyze the effect salary dispersion has on team performance and revenue. The dependent variable changes from the Wins Regression to the Revenue Regression. In the Wins Regression, number of wins a team achieved during the regular season will be the dependent variable, where in the Revenue Regression the total revenue generated by a team will be the dependent variable.

B. Explanatory Variables

The explanatory variables remain the same in both models. Table 1 provides a short explanation about each variable and also reports descriptive statistics of each variable. Despite the fact that this study is attempting to find the "best" amount of salary dispersion for an NBA team, other variables must be included in this model to control for other circumstances.

Table 1: Explanation and Descriptive Statistics of Variables

Variable	Definition	Minimum	Maximum	Mean	St. Dev.
Dependent Variables					
Model A					
Wins	Number of Regular Season Wins per NBA Team	12.00	67.00	41.00	12.89
Model B					
Revenue	Total Revenue of NBA Team	$81,000,000			$31,594,769
Explanatory Variables					
Models A & B					
TVMarketSize	Number of Homes with Television in Metropolitan Area of Each NBA Team's Home City	566,960.00	7,515,330.00		1,822,547.28
DispersionFactor	Average Salary of Top 3 Highest Paid Players Divided By Average Salary of Next 9 Highest Paid Players	0.52436	3.60562	1.25268	0.47619
DispersionFactor2	Square of DispersionFactor	0.27496	13.00046	1.79445	1.71732
LuxuryTaxAbove	A Team With Total Salary That is Above the Luxury Tax Level	0.00	1.00	0.39	0.49
LuxuryTaxBelow	A Team With Total Salary That is Below the Luxury Tax Level	0.00	1.00	0.60	0.49
Fixed Effect 06-07	Team Competing in the 2006-07 Season	0.00	1.00	0.20	0.40
Fixed Effect 07-08	Team Competing in the 2007-08 Season	0.00	1.00	0.20	0.40
Fixed Effect 08-09	Team Competing in the 2008-09 Season	0.00	1.00	0.20	0.40
Fixed Effect 09-10	Team Competing in the 2009-10 Season	0.00	1.00	0.20	0.40
Fixed Effect 10-11	Team Competing in the 2010-11 Season	0.00	1.00	0.20	0.40

The most important variable to this study is the wage dispersion factor. This variable is defined as the summation of salary of the top three paid players on an NBA team divided by the summation of salary of the next nine highest paid players. Twelve players are being taken into account for each team because it is a requirement in the NBA that a team has at least 12 signed players at a time. There are many more players that are signed to teams throughout a season, but they normally are signed for 10-day or 1-month contracts and therefore would be outliers in this study. This definition of dispersion is different than every other study reviewed that was designed to test the effect salary dispersion has on performance and revenue. At the same time, however, it is a definition that completely takes into account the salary of superstars and is a good representative measure of the dispersion factor that exists on a team. As mentioned previously, the predicted effect of the dispersion factor is positive for both number of wins and amount of revenue.

Another variable to be tested is the dispersion factor squared variable. The value of this is simply the square of the dispersion factor. This is used in the empirical model to attempt to see if there is a parabolic curvature to the effect dispersion has on both wins and revenue. If there is, the maximum point on that curve would represent the "best" amount of dispersion for wins or revenue respectively. The predicted sign of this variable is negative, which would create a concave curve and, therefore, a maximum point representing the "best" possible dispersion level.

The television market size is the next variable. This takes into account the number of homes with a television in the metropolitan area of each NBA teams' home city. It seems obvious that the size of a team's market should have an impact on the amount of revenue generated throughout a season. It is also plausible to suggest that the market size could have an impact on wins as well considering the possibility of there being more money available from increased revenue for big market teams. There has historically been very little revenue sharing in the NBA, which makes the possibility of market size having an impact on wins even greater (Dosh, 2001). The market size variable is predicted to contain a positive effect on both team wins and revenue.

The next explanatory variable is a dummy variable that takes into account a team's salary position relative to the luxury tax level. The luxury tax level is needed in comparison to the salary cap level. This is because teams can have payrolls that exceed the salary cap due to certain league exceptions and are not punished for that, but are punished for exceeding the luxury tax level threshold. As a result of this, most teams have a payroll that does exceed the salary cap, but a much smaller portion of NBA teams have a payroll that exceeds the luxury tax level. One of the variables in the model will be a dummy variable representing if a team has a salary that is over the luxury tax threshold. The above luxury tax dummy variable, in this sense, is a good proxy for the level of a team's payroll and is predicted to be positively correlated with wins and revenue. If teams are spending enough money to have a payroll that exceeds the luxury tax level, they most likely have a number of superstars that should create more wins and revenue.

The last variables included in the empirical model are fixed effect variables for time. These are included to deal with the possible omitted variable bias. The goal of this variable is to control for things not already controlled for in the regression. There might be some reason why revenue or wins are affected by omitted variables that are related to time. These variables will be dummy variables for each year except for 2010-11 in the Wins Regression and 2009-10 in the Revenue Regression which are the reference years for each respective regression. Each of the five seasons has its own fixed effect for time dummy variable associated with it. There is no logical predicted relationship of the fixed effect variable for time on both wins and revenue.

$$\text{Wins Regression: Wins} = ß_0 + ß_1(\text{MRKT}) + ß_2(\text{LXTABOVE}) + ß_3(\text{DISP}) + ß_4(\text{DISP2}) + ß_5(\text{FE06-07}) + ß_6(\text{FE07-08}) + ß_7(\text{FE08-09}) + ß_8(\text{FE09-10}) + \mu$$

$$\text{Revenue Regression: Revenue} = ß_0 + ß_1(\text{MRKT}) + ß_2(\text{LXTABOVE}) + ß_3(\text{DISP}) + ß_4(\text{DISP2}) + ß_5(\text{FE06-07}) + ß_6(\text{FE07-08}) + ß_7(\text{FE08-09}) + \mu$$

V. RESULTS

The results proceed in two separate sections. The first presents the results of the Wins Regression and the effect dispersion has on the number of wins a team achieves, and the second deals with the results of the Revenue Regression and the effect dispersion has on the amount of

Table 2: Regression Results Predicting Wins

	Wins Regression	
	Model 1	Model 2
Dependent Variable	Wins	Wins
Constant	24.475 / (3.914)***	32.436 / (9.695)***
Dispersion Factor	16.833 / (2.212)**	7.693 / (3.793)***
Dispersion Factor2	-2.624 / (-1.246)	-
Market	-1.690E-6 / (-3.206)***	-1.701E-6 / (-3.223)**
LuxuryTaxAboveDummy	10.485 / (4.917)***	10.566 / (4.947)***
Fixed Effect 06-07	0.342 / (.116)	.235 / (.079)
Fixed Effect 07-08	-0.901 / (-.304)	-1.095 / (-.369)
Fixed Effect 08-09	-0.135 / (-.045)	-.577 / (-.195)
Fixed Effect 09-10	-4.774 / (-1.499)	-5.148 / (-1.620)
Fixed Effect 10-11	-	-
Adjusted R2	0.215	0.212
F-Value	6.088	6.709
Sample Size	150	150

Note: Values in parantheses are absolute t-statistics.
*** = significant at .01 level
** = significant at .05 level
* = significant at .10 level

revenue a team generates.

Table 3: Regression Results Predicting Revenue

	Revenue Regression	
	Model 1	Model 2
Dependent Variable	Revenue	Revenue
Constant	8.031E7 / (5.390)***	8.551E7 / (10.448)***
Dispersion Factor	6.074E6 / (.342)	-1.078E6 / (-.226)
Dispersion Factor2	-2.015E6 / (-.418)	-
Market	6.752 / (5.2151)***	6.753 / (5.235)***
LuxuryTaxAboveDummy	3.328E7 / (6.320)***	3.334E7 / (6.356)***
Fixed Effect 06-07	1.234E7 / (1.702)*	1.255E7 / (1.741)*
Fixed Effect 07-08	1.305E7 / (1.891)*	1.320E7 / (1.921)*
Fixed Effect 08-09	1.487E7 / (2.141)**	1.482E7 / (2.142)**
Fixed Effect 09-10	-	-
Adjusted R2	0.368	0.373
F-Value	10.914	12.798
Sample Size	120	120

Note: Values in parantheses are absolute t-statistics.
*** = significant at .01 level
** = significant at .05 level
* = significant at .10 level

A. Wins Regression

Two different regressions need to be completed in order to understand the effect salary dispersion within a team has on team wins. Table 2 presents the results of the two OLS regressions.

In Model 1, all the explanatory variables are utilized. The market size variable is the only variable to have an opposite effect than what was predicted. This is a result that, at first, appears to have no logic. After reviewing the data, however, a reason for the size of the market negatively affecting wins emerges. A number of the big markets in the United States have two NBA teams. Both of these teams in each respective market technically, by reported figure standards, have the same market size. In reality, however, one team most likely dominates the popularity within the market. For example, the New York Knicks and New Jersey Nets share the same New York City metropolitan market. The Knicks, however, are the much more popular team, while the Nets do not have nearly as many followers. This, in effect, means the Nets really have a lower market size than would be reported by ratings systems. This effect is one possible explanation for the market size negatively affecting the number of wins achieved by an NBA team.

Every other variable behaves according to the presumed logic. Only three of the variables included in the regression, however, are significant. These are the market size, dispersion factor, and luxury tax above dummy variable. With the dispersion factor squared variable being insignificant, it is no longer possible to determine the exact "best" amount of salary dispersion for an NBA team. This is because the dispersion factor squared variable is responsible for creating the parabolic shape to the curve, and, therefore, a max value of wins according to dispersion. With dispersion factor squared being insignificant, the parabolic curve that it creates is insignificant and the "best" amount of dispersion/max number of wins point on the curve is not relevant.

Model 2 uses every explanatory variable except for the dispersion factor squared. This creates the curve to now be linear, in comparison to the parabolic curve from Model 1. With a linear function, a specific "best" amount of dispersion cannot be interpreted, but instead, the "best" amount will occur at either zero dispersion or maximum dispersion, depending on whether the function is downward sloping or upward sloping. The market size is still the only variable to have the opposite effect of what was expected, and has a negative effect on number of wins, which is possibly a result of the multiple teams in a single market problem discussed earlier.

The market size, dispersion factor, and luxury tax above dummy variable are all significant, with market size being significant to the .05 level and the other two being significant to the .01 level. Every fixed effect variable is shown to be insignificant to the model. The fixed effect variables, while not being significant, still control for the possible omitted variable bias. The negative effect of the market size is considerable. For every 1,000,000 people in a market, the regression states that an NBA team will lose another 1.7 games. In more realistic win-loss terms, a team with a mean market size, which is 2,350,181 people, will lose an additional 4.00 games as a result of being in that market. To put the amount of wins in perspective, each team only competes in 82 games in a season. The luxury tax dummy variable also shows a sizeable relationship to a team with a total salary over the luxury tax level on wins compared to a team below the luxury tax level. Teams that have a total salary above the luxury tax level will win an additional 10.556 games as a result of their high total salary. The dispersion factor, the main focus and most important variable in this study, exhibits a smaller but still somewhat large effect on wins. An increase of one in the dispersion factor will lead to 7.693 more wins.

With the results of Model 1 being insufficient to obtain a specific "best" amount of salary dispersion, Model 2 seems to be the best model to describe the effect dispersion has on wins. The best amount of salary dispersion, in terms of generating wins, is the maximum amount possible given the salary constraints. Model 2's results predict that for every increase of one to the dispersion factor of a team, the team will win 7.693 more games.

B. Revenue Regression

Two different regressions need to be completed in order to understand the effect salary dispersion within a team has on team revenue. Table 3 presents the results of the two OLS regressions.

In Model 1, all explanatory variables are utilized. All of the explanatory variables also have the expected positive or negative effect that was assumed from the empirical model. All of the variables besides the dispersion factor and the dispersion factor squared are significant. With the dispersion variables being insignificant, the "best" amount of salary distribution for a revenue maximizing team cannot be predicted. This result means, according to this model, that salary dispersion does not affect revenue.

In an attempt to improve the significance and deal with the insignificant parabolic curve of Model 1, Model 2 is completed. The explanatory variables in Model 2 include all but the dispersion factor squared variable. This creates the curve to now be linear, in comparison to the parabolic curve from Model 1. With a linear curve, a specific "best" amount of dispersion cannot be interpreted, but instead, the "best" amount will occur at either no dispersion or maximum dispersion depending on whether the linear function is upward sloping or downward sloping.

The dispersion factor in Model 2 contains the opposite effect of what theoretically makes sense and is also insignificant once again. The dispersion factor carries a negative effect on revenue according to Model 2. Based on the theory presented earlier, one would expect the opposite to be true as a result of higher dispersions occurring from a higher number of superstars on a team, which is supposed to lead to an increase in fan fare and thus revenue. The negative effect found is statistically insignificant, however, which makes it somewhat irrelevant to the discussion.
Every other explanatory variable in Model 2 is significant with the size of the market and luxury tax dummy variable significant at the .01 level, the fixed effect variable for the 2008-09 season significant at the .05 level, and the fixed effect variables for the seasons of 2006-07 and 2007-08 significant at the .10 level. The fixed effect variables are reported in comparison to the omitted fixed effect variable of the 2009-10 season.

For every 1,000,000 people in a market, an NBA's team revenue would increase by $6,753,000. In terms of the mean market size of 2,350,181 people, the size of the market would have a direct positive impact of $15,870,772.29 on revenue. The coefficient for the luxury tax dummy variable reports that a team will earn $33,340,000 more in revenue if a team's total salary is above the luxury tax level compared to teams with a total salary that is below the luxury tax level. The fixed effects variables, which are less significant than the market and luxury tax dummy variable, display that a team would generate an extra $12,550,000; $13,200,000; and $14,820,000 during the 2006-07, 2007-08, and 2008-09 seasons respectively in comparison to the 2009-10 season. This can be the result of many different circumstances. The fixed effect variables are included to control for any possible omitted variable bias, and the fact that these variables are significant to the regression proves that there are other explanatory variables that revenue depends on during these years.

The biggest result taken away from these two Models is that it is not possible to determine a "best" amount of salary dispersion for revenue maximizing teams because the dispersion factor is insignificant in both models. In addition to this, despite the statistically insignificant result, the negative effect the dispersion factor is found to have on revenue in Model 2 is opposite of the hypothesis that was generated from relevant economic theory.

VI. CONCLUSIONS

The relatively new phenomenon of large disparities in salary among an NBA team has allowed a number of studies to be completed to test the effect that salary dispersion has on an organization. The aim of this study was to determine the "best" amount of salary dispersion for both a win maximizing NBA team and a revenue maximizing NBA team. Using data from the 2006-07 season to the 2010-11 season, two empirical models were constructed that could help determine the "best" amount of dispersion for both types of teams.

It is interesting to discover, however, that after these models were tested, a specific "best" amount of salary dispersion is not able to be determined from the results. Despite this, the effect salary dispersion has on the number of wins a team achieves and amount of revenue a team generates is able to be determined. Based on the results of this study, the dispersion factor has a significant positive effect on the number of wins a team achieves throughout a season. This relationship suggests that the "best" amount of salary dispersion is the maximum amount of dispersion possible given the salary constraints a team faces. The results also indicate that the dispersion factor has a negative but statistically insignificant effect on the amount of revenue a team achieves. As a result of the insignificance, there does not seem to be an optimal level of salary dispersion for generating revenue. Both of these results are in contradiction to previous literature.

Berri and Jewell (2004) performed a study in an attempt to relate salary dispersion and the number of wins an NBA team achieves. They found there to be no significance between the amount of salary dispersion on a team and number of wins. Their definition of dispersion was based on the standard deviation of the Herfindahl-Hirschman Index, which is a different definition than employed by this study, which could be the reason for the difference in results.

Katayama and Nuch (2011) also completed a study attempting to relate the salary dispersion among an NBA team and the number of wins achieved. They tested three different dispersion levels (players participating in every game for a given team, players participating in at least half of the games for a given team, and every player on payroll for a given team) and found salary dispersion to have no significant effect on the number of wins a team achieves. Once again, the definition of dispersion differed from Katayama and Nuch's study to this study.

Hausman and Leonard (1997) executed a study to determine if superstars in the NBA increase their team's total revenue. They found superstars to have a high positive effect on total team revenue. The study just completed does not necessarily look at superstars specifically and their effect on revenue, but instead, the effect salary dispersion has on team revenue. Built into the dispersion factor variable, however, is the effect a superstar should carry. Teams with more superstars will have a higher dispersion factor, and therefore, if superstars did affect revenues positively, the dispersion factor would have a significant positive effect on revenue. The fact that the dispersion factor does not have a significant effect on team revenue alludes to the idea that superstars do not have a significant effect on revenues, which is in complete contradiction to Hausman and Leonard's study. Hausman and Leonard's study, however, took place during the time period of the NBA where there was no maximum salary for players, which is not the case for the study that was just completed here. According to Rosen and Oi (1981, 2008) part of the reason people are attracted to superstars is the extreme amount of money they receive. If this is in fact true, it is possible that setting a maximum salary for an individual player does not allow fans to reach their highest level of intrigue and therefore provide less revenue to the firm.

Whatever the reasons may be, both the findings for the effect salary dispersion has on wins and the effect/absence of effect it has on revenue are in complete contradiction to the previous literature.

Based off the results from this study, an NBA team that wants to maximize wins should try to acquire as many superstars as possible and then fill the remaining spots on their roster with low salary players. This seems to show that there must not be that great of a drop-off in talent level of the lower salaried players in the league and the middle salaried players. The greater the amount of dispersion, the better in terms of number of wins, but that does not mean general managers should create dispersion for the purpose of creating it. Players still need to be paid the value they bring to the team, but for a win maximizing team, general managers should get as many high-skilled, and therefore high-paid, players signed to their team as possible and then complete the roster with low-paid players instead of signing all middle-value players. Those teams that are most successful at signing superstars will have the most success.

This result can be connected back to the competitive imbalance problem that exists in the NBA today. The fact that greater salary dispersion leads to greater number of wins suggests one reason for the competitive imbalance problem. As already noted, teams most successful at signing superstars will have the most success on the court. With superstars in limited supply and the NBA instituting a soft salary cap with many exceptions to the rule, certain teams are presented the opportunity to become more successful in signing superstars. These teams that are able to do so will dominate the league in terms of number of wins. As noted earlier, these results might be able to be translated into other fields of business. Based on these results, it is possible that in some business environments where team performance is important, like it is in the NBA, managers may benefit from hiring as many top notch employees at each respective job and then hire lower skilled or cheaper workers to round out the company in order to possibly increase performance.

In terms of policy implications of salary dispersion and revenues, no conclusions can be drawn from this study. With salary dispersion having no significant effect on revenue it is impossible to state what an NBA team or outside firm should strive to do in terms of salary dispersion to generate the most revenue.

Further research should be conducted on this topic to clarify the effect salary dispersion has on firm performance and generating revenue. The simple fact that this study contradicts many before it represents the need to further explore and understand the relationship that exists between these factors. One possible way to further explore this research is to create different definitions of salary dispersion and test each one. The way dispersion is calculated may have a significant impact on the effect it has on both performance and revenue. With a better and more complete understanding of how salary dispersion affects firm performance and revenue, NBA teams and possibly other companies will be able to construct their teams/companies more appropriately.

REFERENCES

Berri, David, and Todd Jewell. "Wage Inequality and Firm Performance: Professional Basketball's Natural Experiment." Atlantic Economic Journal 32.2 (2004): 130-39. Web

Coon, Larry. "NBA Salary Cap FAQ." 2011. Web. Sept. 2011. <http://members.cox.net/lmcoon/salarycap.htm>.

Dosh, Kristi. "Want to Repair the NBA? Start With Revenue Sharing. - Forbes." Information for the World's Business Leaders - Forbes.com. Forbes, 09 Aug. 2011. Web. 20 Nov. 2011. <http://www.forbes.com/sites/sportsmoney/2011/08/09/want-to-repair-the-nba-start-with-revenue-sharing/>.

Hausman, Jerry, and Gregory Leonard. "Superstars in the National Basketball Association: Economic Value and Policy." Journal of Labor Economics 15.4 (1997): 586-624. JSTOR. Web. Sept. 2011.

Katayama, Hajime, and Hudan Nuch. "A Game-Level Analysis of Salary Dispersion and Team Performance in the National Basketball Association." Applied Economics 43.10-12 (2011): 1193-1207. EconLit. EBSCO. Web. 21 Sept. 2011.

Késenne, Stefan. The Economic Theory of Professional Team Sports: an Analytical Treatment. Cheltenham, UK: Edward Elgar, 2007. Print.

"Local Television Market Universe Estimates." Nielsen. Web. 10 Oct. 2011. <http://www.nielson.com/content>.

"National Basketball Association Salaries." USA Today. Web. Sept. 2011. <http://content.usatoday.com/sportsdata/basketball/nba/salaries/team>.

"NBA.com." NBA. Web. 15 Oct. 2011. <http://www.nba.com/home/index.html>.

Oi, Walter. "Superstars, Economics of." The New Palgrave Dictionary of Economics Online. 2008. Web. Sept. 2011.

Rosen, Sherwin, and Allen Sanderson. "Labor Markets in Professional Sports." Journal of Economic Literature (2000). National Bureau of Economic Research. Web. Sept. 2011

Rosen, Sherwin. "Human Capital." The New Palgrave Dictionary of Economics Online. 2008. Web. Sept. 2011.

Rosen, Sherwin. "The Economics of Superstars." The American Economic Review. JSTOR, Dec. 1981. Web. Sept. 2011

"The Business Of Basketball." Information for the World's Business Leaders - Forbes.com. Forbes, 26 Jan. 2011. Web. 13 Nov. 2011. <http://www.forbes.com/lists/2011/32/basketball-valuations_land.html>.