True Value in the NBA:

An Analysis of On-Court Performance and Its Effects on Revenues

Undergraduate Honor Thesis
Harrison Li

Advisor: David Card

Department of Economics
University of California, Berkeley

May 2011

Abstract

Previous studies have investigated the relationship between player and team performance in the National Basketball Association (NBA). Separately, others have looked into team performance and it's correlation with revenues. There are also studies that connect these two relationships in order to determine the marginal revenue product (MRP) of individual players for Major League Baseball. There is significantly less literature on this specific task in the NBA. This paper estimates these relationships using data for several `seasons of NBA play, and then uses the results to estimate the value of individual players to their team. This study finds that the salaries paid to NBA stars closely match with their marginal revenue products.

Acknowledgement: I would like to thank Professor David Card, my thesis advisor, for kindly guiding me along the research and writing process and for his willingness to help and answer my questions. Without his assistance, this paper would not have been possible.

Introduction

"For the love of the game." That is a popular response from athletes when answering questions as to why they put their bodies and minds through such vigorous training year in and year out in order to compete professionally. Despite the self-professed motives of the athletes themselves, many analysts believe otherwise. Specifically, most commentators point to the inordinately high salaries earned by professional athletes as the primary motive for their extreme work ethic. For example, during the 2009-2010 NBA season, the Los Angeles Lakers' superstar Kobe Bryant earned over 21 million dollars. Where do the owners and general managers of the NBA come up with this amount to offer a player like Kobe Bryant? This is the question that the following paper will answer.

Standard economic reasoning suggests that a player's salary will be set to (approximately) equal his expected contribution to the team's revenues over the season – his so-called "marginal revenue product". From a fan's perspective, a player's contributions mostly relate to the team's win-rate: can this athlete help win the team more games and eventually secure a championship title? However, when owners analyze this problem they actually think in much more economic terms. They believe that the player will improve the team's performance and in turn will generate higher revenues which are generated from gate receipts, unshared local television contracts,[1] and distributed national television contracts[2].

There have been several papers that already examined the relationship between certain variables and NBA team revenues. Some of them have looked into the belief that there are a few star players in the league that single handedly have a significant effect on team revenues. Hausman and Leonard (1997) proposed that certain players' stardom was the significant revenue driver in the NBA. They illustrated this point through their data analysis, stating that Michael Jordan of the Chicago Bulls was responsible for 200,000 dollars of the New Jersey Nets' revenue in a season during which the Bulls only played twice at New Jersey. On top of this, Hausman and Leonard suggest that superstars such as Larry Bird and Michael Jordan in fact had

[1] http://nbcsports.msnbc.com/id/16877177/
[2] http://www.nba.com/2010/news/features/david_aldridge/02/15/morning.tip/index.html

a significant effect on team attendance[3]. This in turn positively affected the team's revenues. It seemed that a major factor in team revenue was not the number of wins they could accrue over a season but how many NBA stars they could acquire in order to attract more fans.

Berri, Schmidt, and Brook (2004) extended this work and delved deeper into the "superstar" effect. Not only did they examine certain star players like Michael Jordan, Shaquille O'Neal and Grant Hill, but they also looked at players who did not have as much popular recognition but were still considered All-Star caliber players by the NBA.[4] They found that these kinds of stars did not have significant effects on gate receipts, which is one of the major revenue sources for an NBA team. They concluded that a star's effect on revenue was mostly due to their effects on a team's win-loss record and not from the popularity of that individual player.

This paper examines the previously mentioned relationship and connects it with the relationship between players and team wins. This paper is similar in scope to the research done by Macdonald and Reynolds (1994) in which they found the marginal revenue product of an average baseball player.

Data to be Employed

This paper ultimately looks at the changes in revenue due to the statistics of a certain player. The revenue data goes back to the 1998-1999 season (the NBA season that started late because of a lockout) and ends with the 2009-2010 season[5].

Revenue Factors

Team performance variables will eventually connect a player's statistics to changes in revenue. The specific variables that will be included are the number of regular season wins (current and last year's), playoff wins from the current and previous years, as well as championship dummy variables for last year and two years prior. The lagged regular season

[3] Albeit Hausman and Leonard did state that their study on attendance effects of a superstar to be "less formal" (pg. 609)
[4] This was determined by summing up the number of All-Star votes a team had in total
[5] Revenue data collected from Forbes. The revenue numbers include gate, media and stadium revenues

variables have been included because fans often have delayed reactions to the success of a team. During a season, the success of a team will attract higher revenues through gate receipts and possibly renegotiated TV contracts. However, the entire spectrum of effects of an improved team will not be fulfilled within the current season. For example, after a more successful season, season ticket sales for the next year will increase as well as demand for single game tickets. This variable will capture increased revenues from possible "band-wagon" fans.

Along with regular season wins, playoff wins have also been included as a factor for team revenues. Even though there are much fewer playoff games played, this factor should be significant. Not only are playoff tickets much more expensive than regular season tickets (and get exponentially more expensive the farther a team goes into the playoffs), but also the deeper a team gets into the playoffs the better quality the team. This is how we can differentiate between the truly elite teams and those that barely made it into the playoffs[6]. For this reason, playoff dummies were not used instead of number of playoff wins, as it gave too much credit to teams that got knocked out in the first round. On top of this factor, championship dummies were also included to try to capture any significant increases in revenues because of recent past championships. It is one thing to get into the playoffs, but there could be a greater separate effect if a team wins it all.

On top of team performance, general factors such as interest in the NBA and city variables are major contributors to revenues as well. The way this paper will address these factors is through city dummy variables for each team, as well as dummy variables indicating the year. The city dummy variable will pick up general economic effects in the urban area that the team is located in, and the dummy year variable will account for effects like general interest in the NBA and the national economic environment.

Lastly, there is a dummy variable that indicates a '1' if the team did not sell out the year before[7]. This variable is then interacted with the current season wins.

[6] Presumably these teams will win only a couple playoff games and get knocked out in the first round
[7] Attendance data collected from ESPN.com

All these variables were then put into a relationship with revenues and it resulted with equation (1):

$$Y_i = \alpha + \sum_{I=1}^{50} X_i + \varepsilon_i \quad i = 1,2,\ldots,354 \qquad (1)$$

Y = Log(revenues)

X = Revenue factors

Win Factors

The next part of this paper deals with the relationship between wins and certain basketball statistics[8]. This will determine how the statistics a player obtains over the course of the season affect the number of wins of his team. The manner in which this paper goes about determining this effect is based off of the approach created by Scully (1974). His method found the marginal product of a player by connecting his statistics to wins. Berri (2004) developed a method where winning percentage was regressed on points per possessions and points allowed per possession. This method is based on the concept of possessions developed by Oliver and Hollinger (2003) who suggested that the main determinant of wins was not the absolute statistics a player amassed during a season but how efficient they were at doing so. The data collected for this paper takes that into consideration.

In order to accomplish this, total aggregate statistics for each team and their opponents for that year were recorded. This was completed for both the regular and post season. These opponent statistics are unique to each team as they all play a different mix of teams and perform differently against each one. The reason for collecting the opponents' statistics was to account for players on teams with higher tempos, which score more points yet also allowed more points, or teams that had a high-powered offense but lacked in defensive prowess were not given a bias. In effect, this found how efficient teams were at scoring points relative to the teams they played.

[8] Basketball statistics collected from Basketball-reference.com

The end variable used in the win estimation model is the statistics of the specific team's season stats, divided by their specific opponents' season statistics. All the major statistics were included: two-point field goals made, three-point field goals made, free throws made, turnovers, defensive rebounds, blocks, assists, personal fouls and offensive rebounds. The offensive rebound statistic had to be relative to the number of field goals missed or else this statistic would give a negative coefficient. This would suggest that obtaining offensive rebounds would actually hurt your team's chances of winning[9]. Of course this is not true, so how could we explain this phenomenon? The answer is that teams that tend to lose more games miss more field goals, which in turn gives the team more opportunities to collect offensive rebounds. In order to combat this effect, this study has created another variable that tries to find the value of another offensive rebound given the amount of field goals missed.

These ratio statistics were put together into equation (2):

$$W_i = \alpha + \sum_{I=1}^{10} Z_i + \varepsilon_i \quad i = 1,2,\ldots,10 \qquad (2)$$

Z = $\frac{\text{Team's total season statistics}}{\text{Opponents' season statistics}}$

W = Number of wins

Estimation of the Models

The following is equation (1) which was used to model team revenues on certain factors:

$$Y_i = \alpha + \sum_{I=1}^{50} X_i + \varepsilon_i \quad i = 1,2,\ldots,354$$

Below is Table 1 that shows the results for this linear regression. Out of the top 7 variables in the table only four of them are significant in affecting revenue: number of current season wins, number of lagged wins, number of playoff wins and the interactive sell out variable. It is clear that out of these seven team performance variables that current season wins has the greatest effect on revenues. The coefficient of .0036, in this context, means that about

[9] In the book "The Wages of wins: taking measure of the many myths in modern sport" by Berri, Schmidt and Brook (2006) they found that offensive rebounds had a coefficient of -.2

every extra win during the season will bring in .3% more revenue to a team. To put this into context, each individual win for a team like the Los Angeles Lakers, who gained about 214 million dollars in revenues this past year, brought in about 642,000 dollars. And that the 57 wins that the Lakers accrued last year contributed to 57*.0036431 ≈ 20.8% of the revenues that were generated that year. Finally, since the Lakers did sell out[10] on average this past year the positive effect of wins was not offset by the interactive term.

TABLE 1: Estimated coefficients for equation (1)[11]

Variable	*Coefficient*	*SE*	*t Statistic*	*P Value*
Wins	0.0036431	0.00069	5.21	0.000
Wins(-1)	0.0029043	0.00061	4.76	0.000
Championship(-1)	-0.018641	0.03756	-0.50	0.620
Championship(-2)	0.0043962	0.03295	0.13	0.894
Playoff Wins	0.0043694	0.00185	2.37	0.019
Playoff Wins (-1)	0.0007206	0.00202	0.36	0.722
No98	-0.0015006	0.00035	-4.28	0.000

Observations = 354
R^2 .9436
Adjusted R^2 .9343

Wins = Current regular season wins; Wins(-1) = Lagged regular season wins; Championship(-1) = Dummy variable for lagged championship won; Championship (-2) = Dummy variable for two year lagged championship won; Playoff Wins = Number of playoff wins this season; Playoff Wins(-1) = lagged number of playoff wins; No98 = Interactive variable with Wins, this variable had a value if the team did not sell out (using 98% capacity as the cut off for selling out) on average the year prior and had a '0' if they did sell out the year before.

The negative effect on the interactive term (No98) came as a surprise. The initial intuition behind this variable was that if a team had sold out on average the previous year

[10] Sell out cut off was filling up 98% of full capacity on average.
[11] There are 43 more dummy variables which encompass yearly effects and general city effects. The cities with the largest coefficients are the large sports markets with rich NBA history (listed in order of coefficient size): New York Knicks, Chicago Bulls and the Los Angeles Lakers.

(dummy variable would equal '0'), the effect of wins would be diminished. This belief emerged from the thought that once a team had a strong fan base, the additional revenues to be gained would be tougher to obtain than the initial gains, because the team would then have to look for more creative ways to increase revenues such as better advertising deals and local television contracts which take a longer time to take effect than gate receipts. If this hypothesis had been correct, then the interactive variable should have a positive coefficient.

Because this interactive variable has a significantly negative coefficient[12], it must be re-evaluated. There are several reasons why this variable should be negative. Firstly, if a team could not sell out last year there is a good chance that it is not a top caliber team which would hurt future season ticket sales. On the topic of ticket sales, if a team was not able to sell out the previous year, then they will not be able to raise ticket prices in the following year because they know that demand will not be high enough to warrant a rise in prices. Lastly, a team that isn't able to win a lot of games and bring in a lot of fans will not be attractive to corporate sponsors.

These three reasons are epitomized in the Boston Celtics. Before the 2007-2008 season, the Celtics had been consistently recording a below .500 record. What changed for the Celtics during the offseason? They acquired two All-Stars in Ray Allen and Kevin Garnett. The first year these two were acquired, the Boston Celtics went on to win 42 more games than they did the previous year and secured an NBA championship. With this success, the Boston Celtics were able to sell out their games that season which situated them for higher profitability in the future. Even before the season ended, Boston Celtics executives were planning to raise ticket prices 10-15% for the next season. On top of this, they wanted to sign additional corporate sponsors, which were estimated to be worth 5 – 10 million dollars[13].

Along the same lines, the lagged wins variable has a strong effect on a team's revenues. The intuition behind this variable is very similar to the intuition that was just explained using

[12] Negative for all sell out percentages from the cut off of being a "sell-out" of 100% all the way down to 90% of full capacity.

[13] These two factors: gate receipts and sponsorship deals were specifically important to Boston Celtics team revenue.
http://www.boston.com/sports/basketball/celtics/articles/2008/06/05/ticket_prices_sponsors_on_rise_for_the_green/?page=2

the Boston Celtics as an example. In addition, this lagged effect is greater than the effect gained from the wins during the current season when a team did not sell out their games the year before.

Is there a similar relationship with playoff wins and lagged playoff wins? The number of playoff wins positively affects the revenue. Even though there are relatively very few playoff games to gather revenues, these ticket prices can be sold at much higher prices. Unlike regular season wins, the lagged playoff victories are not significant.

Total Team MRPs

There are generally two different types of teams that obtain success in the NBA. The first type follows the route of the Boston Celtics who signs or trades for multiple stars in order to improve the quality of their team. In doing so they are able to quickly obtain more wins than they did in the previous season and therefore quickly grow their revenues. In the instance of the Boston Celtics, the increased number of wins can be clearly attributed to the acquisitions of the two superstars and we can see the effect these wins had on Boston's revenues:

% Effect on Current revenues (.0036431 - .0015006) * 42 = .089985 => 9%

% Effect on Current revenues (.0043693) * 16 = .06991 => 7%

% Effect on future season revenues (.0029043) * 42 = .12198 => 12.20%

The above numbers are the percentages that the increase in wins by the Boston Celtics affected Boston's revenues. During the 2006-2007 season, the Boston Celtics obtained 24 wins and 58 losses. The following season they obtained 66 wins and won the NBA Championship. In the above equations, the number 42 is calculated from the difference in wins between the 2007-2008 season and the 2006-2007 season. This is the increased revenue obtained from the extra wins. The 16 is calculated in the same way that the 42 was calculated. The total revenue effect from the improved team performance can be calculated in the following manner:

Boston Celtics 2007-2008 Revenue: $ 149 Million dollars

Boston Celtics 2006-2007 Revenue: $ 144 Million dollars

Team Performance MRP:

9% * 149 = $ 13.41 Million Dollars

-> The immediate dollar effect of the increase in wins over last season.

12.20% * 144 = $ 17.57 Million Dollars

-> The delayed effect that this season's increase in wins over last season will have on the following year's revenues.

7% * 149 = $ 10.43 Million Dollars

-> The immediate effect the increased playoff wins had on team revenues.

Total team MRP = $ 41.41 Million Dollars

Team Salary during 2006-2007 Season = $ 53.62 Million Dollars

Team Salary during the 2007-2008 Season = $ 73.81 Million Dollars

Total increase in salary = $ 20.19 Million Dollars

Luxury taxes paid in 2007-2008 Season = $ 8.32 Million Dollars

Total player cost = 20.19 + 8.32 = $ 28.51 Million dollars

On the other hand, there are more teams that take another route. They obtain younger players who they believe will develop into stars and sign cheaper supporting players to help their developing stars. This strategy keeps a team's roster relatively constant throughout the years. This can be demonstrated through the Atlanta Hawks team. Between the 2006-2007 and the 2009-2010 seasons, the team had a slow and steady increase in wins from 30 to 52 wins. Using the same techniques we used for the Boston Celtics, we find that these 22 more wins from these two periods should account for about a 14 Million dollar increase between the two periods. In fact their team revenues jumped up by 20 million dollars, and the team improved team performance was matched by a 23 million dollar increase in team salary. This salary

increase was mostly for players that were originally on the team but got larger contracts for their improved performance.

Estimation of the Win Model

In order to complete our estimation of a specific player's worth to a team, we must model number of wins against the specific statistics of each team. Referring back to equation (2):

$W_i = \alpha + \sum_{I=1}^{10} Z_i + \varepsilon_i \quad i = 1,2,\ldots,10$

Z = Team's total season statistics / Opponents' season statistics

Table 2: Estimated values for equation (2)

Variable	*Coefficient*
TwoFG	24.4153
FT	3.2402
ThreeFG	17.2092
DRB	112.6733
ORB	3.217
AST	1.4918
STL	5.7035
BLK	2.0905
TOV	-56.0667
PF	-12.7199

Number of observations = 354
R^2 .7136
Adjusted R^2 .7053

All variables are ratios of specific team's total season statistics over each specific opponents' total season statistics
TwoFG = two-point field goals made; FT = free throws made; ThreeFG = three-point field goals made; DRB = defensive rebounds; ORB = offensive rebounds over field goals missed; AST = number of assists; STL = steals; BLK = blocks; TOV = turnovers; PF = personal fouls

As we can see in Table 2, the largest contributing factor to wins is the number of defensive rebounds a team gets compared to their opponents. Every defensive rebound gives a

team another chance to score and does not allow the opponent a second chance. The largest negative factor towards number of wins is the number of turnovers compared to one's opponents. The next two important factors to winning were number of two point field goals made and three point field goals made. There was only one more negative factor and that was number of personal fouls, which can be explained by the fact that a personal foul not only usually leads to opponent making free throws but also leads to limited playing time. And for an impactful player to have limited playing time lowers their chances at winning.

TABLE 3: Estimated values for equation (2) applied to playoff statistics

Variable	*Coefficient*
TwoFG	10.5314
FT	1.1225
ThreeFG	4.8997
DRB	25.7317
ORB	0.6448
AST	-1.0281
STL	-3.5152
BLK	0.902
TOV	-12.4182
PF	-4.9546

Number of observations = 192
R^2 .4910
Adjusted R^2 .4629

Table 3 displays the playoff statistics; they were not as strong of a fit as the regular wins (the R^2 was less than .5). The statistics were all normalized by finding per minute statistics. The worse fit can be explained by less observations and games being decided by a lot smaller differentials on average, as teams are closer in quality to one another. The fewer amounts of observations may explain the abnormal results regarding the ratios of assists and steals to number of playoff wins. These turned out to be slightly negative, but the rest of the coefficients were very similar in scale to the regular season results. A possible explanation for the negative

value on assists is that playoffs are a time where star players tend to take over the game, and their value is really accentuated. This can result in less passing, as fans of the Lakers are aware of, and therefore less assists. At the same time though, the teams that seem to have the stronger star players seem to win more often than not in these close contests.

In the case of steals, the smaller number of games emphasizes any differences including number of possessions. A good explanation for the apparent negative relationship between playoff wins and number of steals could be that getting more steals is a result from having fewer possessions than the opposing team. This usually means that the team has fewer chances of scoring, and obviously fewer chances of scoring will lead to less wins.

Table 4: Accuracy of Win Model

Team	Actual Wins	Predicted Wins	Error
Atlanta Hawks	30	28.5	(1.5)
Boston Celtics	24	28.9	4.9
Charlotte Bobcats	33	30.7	(2.3)
Chicago Bulls	49	53.5	4.5
Cleveland Cavaliers	50	51.8	1.8
Dallas Mavericks	67	61.7	(5.3)
Denver Nuggets	45	43.2	(1.8)
Detroit Pistons	53	52.0	(1.0)
Golden State Warriors	42	37.6	(4.4)
Houston Rockets	52	51.9	(0.1)
Indiana Pacers	35	35.2	0.2
Los Angeles Clippers	40	36.3	(3.7)
Los Angeles Lakers	42	37.2	(4.8)
Memphis Grizzlies	22	25.9	3.9
Miami Heat	44	42.2	(1.8)
Milwaukee Bucks	28	27.6	(0.4)
Minnesota Timberwolves	32	29.8	(2.2)
New Jersey Nets	41	38.7	(2.3)
New Orleans Hornets	39	34.9	(4.1)
New York Knicks	33	31.5	(1.5)
Oklahoma City Thunder	40	40.1	0.1
Orlando Magic	35	32.8	(2.2)
Philadelphia 76ers	61	54.9	(6.1)

Phoenix Suns	32	28.1	(3.9)
Portland Trail Blazers	33	33.5	0.5
Sacramento Kings	58	62.8	4.8
San Antonio Spurs	31	31.4	0.4
Toronto Raptors	47	40.3	(6.7)
Utah Jazz	51	47.8	(3.2)
Washington Wizards	41	38.9	(2.1)

The above table demonstrates the accuracy of the estimated win model from the 2006-2007 season. The average error in this season was 2.8 wins in absolute terms. This accuracy suggests that the following estimations of contributed wins will be accurate estimations.

What does this all mean?

Rewind back to the last time the Los Angele Lakers won a championship with Kobe Byrant and Shaquille O'Neal. That was the last successful run of the tumultuous duo. During their time with the team, they would get along and then have conflicts. And of course each one of them thought that they were more important to the team than the other. Using equation (2) applied to both regular season and playoff statistics, we can calculate the number of wins that each single player contributed to the team's total.

Players	2001 - 2002
Kobe Bryant	10 wins – Regular Season Wins 4.2 wins – Playoff wins
Shaquille O'Neal	16 wins – Regular Season wins 4.6 wins – Playoff Wins

Maybe the long debate to who was more crucial to the team can come to the end with these results. The main difference in these results seems to be the amount of defensive rebounds grabbed by each player. O'Neal nabbed a total of 151 defensive rebounds more than Bryant that year. This accounts for the difference in wins as this difference accounts for 6.7 wins during the regular season. Bryant fares better during the playoffs, yet still isn't as crucial to

the team as O'Neal. This is true because defensive rebounds are relatively less important compared to three point field goals in the playoffs.

What do these differences mean for the owners of the team? Plugging in each of these values for O'Neal into the revenue equation we get:

Shaquille O'Neal's MRP:

% of 2001-2002 Revenue = (.0036431)*16 ≈ 5.8%

% of 2001-2002 Revenue from Playoffs = (.0043694)*4.6 ≈ 2%

% of 2002-2003 Revenue = (.0029043)*16 ≈ 4.6%

Total MRP of O'Neal = 152 * 5.8% + 152*2% + 149* 4.6% = $ 18.71 Million dollars[14]

For Kobe Bryant, doing the same calculations we get that his MRP was 11.06 Million dollars[15]. In conclusion, O'Neal was a total of about 6 wins more valuable than Bryant with respect to the team's on-court performance and about 7.65 million dollars more valuable with respect to the team's revenues.

How is Kobe faring nowadays? Following the same calculations but with his 2009-2010 statistics, Kobe contributed about 14 wins during the regular season and 4.4 playoff wins. Kobe's MRP is 23.5 million dollars, assuming team revenues go up by $ 5 million dollars next year (the amount it increased from the 2008-2009 season to the 2009-2010 season). His actual salary is 21.26 million dollars. The salary paid closely matches Kobe's MRP. His playoff performance has seemed to stay pretty consistent over the years, other than a slight .2 game increase. However, his regular season contribution has increased by 4 wins and this can be attributed to the fact that Kobe hit three times as many three point field goals this season than he did in the 2001-2002 season and had less personal fouls. Even with this increase, Kobe is still not the most valuable player to the Los Angeles Lakers. Pau Gasol has contributed about 20 wins to the Lakers during the regular season and 5.8 playoff wins (making even more valuable than Shaquille O'Neal was during the 2001-2002 season). Pau Gasol's MRP is 33.74 million

[14] Shaquille O'Neal's actual salary during the 2001-2002 season was $ 21.42 Million dollars (salary data from USA Today)

[15] Kobe Bryant's actual salary during the 2001-2002 season was $ 11.25 Million dollars(salary data from USA Today)

dollars. (assuming team revenues go up by $ 5 million dollars). His actual salary last year was only 15.10 million dollars. Gasol seems to be underpaid according to these estimates. Kobe Bryant won the Finals MVP award. Maybe Gasol actually earned the MVP award with earning 1.4 more wins during the playoffs.

Concluding Observations

How does a player's performance on the court affect the owner's off the court? Some literature looked into whether or not superstars had an effect on revenues, and other literature investigated what players were most valuable to a team with respect to team wins. This paper goes against the approach of Hausman and Leonard (1997) and more closely follows the lead of Berri (2004) when determining what affects revenues the most. This study puts into consideration all team performances from current and past seasons and account for general city and yearly effects. The second part of this paper is to connect the value of this team performance with the statistics that a certain player obtains over the season.

The results find that ultimately the big men in the NBA rule the game. The strong effect defensive rebounds have on wins shows that rebounders are the most important part of the game. As each shot is missed by an opponent, it is crucial to the opposing team to get the rebound. With each defensive rebound, the team gets a new chance at scoring points. If a team lacks players that specialize in rebounds then not only do they miss more opportunities to score, but they also allow their opponents more chances to score as well.

And what does this mean for revenues? It means if there were two players who were the same quality relative to their position, that an owner would be smart to choose the center or power forward instead of the guard. This move will gain more wins and therefore more revenues for his team. The last finding of this paper is that for how large these contracts are for the NBA players, they are mostly align with their marginal revenue product (if not lower than how much they bring to the team). Even superstars like O'Neal do not get much salary premium over their MRP if any. And younger big men like Gasol seem to be outperforming their current salaries giving the owners a healthy margin.

To extend this research, one might want to incorporate an accurate clutch variable. There are many games over the course of the season decided in the last minute. This makes some of the player statistics less differentiated. This causes a problem when trying to value certain statistics and estimate wins. An addition of a clutch variable, that recorded within the last 3 minutes of the game how many field goals or free throws a certain player made, would add greater value to star players or certain “clutch” players.

References

Berri, David J., Martin B. Schmidt, and Stacey L. Brook. "Stars at the Gate The Impact of Star Power on NBA Gate Revenues." *Journal of Sports Economics* 5.1 (2004): 33-50. Print.

Macdonald, Don N., and Morgan O. Reynolds. "Are Baseball Players Paid Their Marginal Products?" *MANAGERIAL AND DECISION ECONOMICS* 15 (1994): 443-57. Print.

Hausman, Jerry A. "Superstars in the National Basketball Association: Economic Value and Policy."*Journal of Labor Economics* 15.4 (1997): 586-624. Print.

Hollinger, John. *Pro Basketball Prospectus: 2003–04*. Washington , DC : Brassey's, 2003.

Oliver, Dean. *Basketball on Paper*. Washington , DC : Brassey's, 2003.

Berri, David J., and Anthony C. Krautmann. "Shirking on the Court: Testing for the Incentive Effects of Guaranteed Pay." *Economic Inquiry* 44.3 (2006): 536-46. *WIley Online Library*. Web. Feb.-Mar. 2011. <http://onlinelibrary.wiley.com/doi/10.1093/ei/cbj033/full>.

Berri, David J. "Who Is 'Most Valuable'? Measuring the Player's Production of Wins in the National Basketball Association." *MANAGERIAL AND DECISION ECONOMICS* 20 (1999): 411-27. *Online Wiley Library*. Web. Feb.-Mar. 2011. <http://onlinelibrary.wiley.com/doi/10.1002/1099-1468(199912)20:8%3C411::AID-MDE957%3E3.0.CO;2-G/pdf>.

Schmidt, Martin B., and Stacey L. Brook. "Modeling Team Wins in the NBA." *The Wages of Wins: Taking Measure of the Many Myths in Modern Sport*. By David J. Berri. Stanford: Stanford UP, 2006. 93-94. Print.

Leeds, Michael, and Peter Von Allmen. *The Economics of Sports*. 2nd ed. Pearson Education, 2005. Print.