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A Study of the Marginal Revenue Product of LeBron James

By

Jared Taylor

**A Thesis Submitted to the Pace University Pforzheimer Honors College in Partial
Fulfillment of the Requirements for Graduation with Honors**

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Major: Economics

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Précis:

A. Statement of Research Hypothesis

The purpose of this paper is to determine if LeBron James has made the Cleveland Cavaliers basketball team a more profitable business since joining the team in 2003. The principles of labor economics will be applied in determining the marginal revenue product of LeBron James and its relationship to the profits of the Cavaliers. It is the premise of this paper that proper utilization of one input can positively affect a firm's profitability. An understanding of such a concept can be very useful in showing firm's how to manage and employ labor in their pursuits of increased revenues.

B. Context of the Issue

It is well known that LeBron James is a very powerful name in sports. He has been deemed the next Michael Jordan and in the business world this means vast sums of money can be made off of him. For example, Nike offered LeBron a \$90 million contract as soon as he entered into the National Basketball Association to promote the Nike brand name. With so much money flowing in his direction I want to grasp how he affects the revenues of the business which he is a part of.

C. Methods and Procedures

The main concept utilized in this paper is marginal revenue product. In finding the marginal revenue product of LeBron James it is possible to understand how his production has translated into changes in revenues for his team. In conceptualizing this topic for research I wanted to look at the production of LeBron as a percentage of the total production of the team. To calculate this production I had to employ the Hollinger Game Score method, which measures an individual players' productivity i.e. marginal product, and modify the original formula to include the total production of the team also. It is the belief of the writer that this approach offers an innovative technique in determining marginal revenue product of a basketball player.

D. Findings

Analysis of the data found a significantly positive relationship between the added production of LeBron James to the team and the teams increased win percentage. It was also revealed that as win percentage increased the team realized increased gate and venue revenues. The examination of marginal revenue product and its relationship with winning percentage of the team has brought to light the effect a superstar athlete like LeBron James can have on making the firm a more fruitful enterprise.

E. Conclusions

The results found here represent a possible new beginning for research in this area. If others in this field agree with these findings, the National Basketball Association could utilize this model in comparing the productivity of a player to their salary. The next step

in the research is to have it reviewed and refined for errors in logic or calculation. For future research it will be beneficial to incorporate how a players' presence in the game affects the play of the other team. Is there a significant way to quantify the psychological effects a superstar athlete has on the other team? I believe that integrating this aspect into the formulas will provide an improved solution to the problem.

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Introduction

This paper will investigate the potential effect that LeBron James has had on the revenue flows of his team, the Cleveland Cavaliers, since he has come to the National Basketball Association. With the addition of LeBron James the team has realized revenue gains for the franchise, but how can we know how much these revenue flows can be attributed to LeBron James personally? Marginal Revenue Product, or MRP, is one way firms can measure the effect one input can have on the performance of the firm as a whole, and for the purpose of this discussion we will focus on the concept of MRP and the relationship between LeBron James being on the Cleveland Cavaliers and the teams increased revenues.

Prior to much research, it is the belief of this writer that the potential effect LeBron could have on business is profound considering he is a superstar athlete. In order to answer this question thoroughly we must show all the data that refer to this issue and prove graphically and statistically how LeBron has affected the revenues of the Cavaliers.

Methodology

The purpose of analyzing marginal revenue product, or MRP, is to see how much the addition of one more unit of labor will translate into additional revenues for the firm.

The definition of MRP of labor is:

$$\text{MRP} = \text{MP} * \text{MR},$$

Where, MP is the marginal product of the labor input, also described as the labor inputs contribution to total productivity of the firm and MR refers to the marginal revenue or the amount that revenue changes when the labor input is added. When MP and MR are multiplied together the resulting figure describes the contribution that an additional unit of labor has made to additional output and additional revenue expressed as the combined measurement of marginal revenue product. In this model we define MP of LeBron James as being equal to his production in a variety of statistical categories during a single game divided by the team totals in each of the same statistical categories. The resulting percentage represents what proportion LeBron's production makes up of the total production of the team. Regression analysis will be done to measure whether or not there is statistically significant relationship between the MP of LeBron and the winning percentage of the Cleveland Cavaliers. Once the MP of LeBron is determined we can attempt to measure LeBron's MR, defined as the change in team revenue since he joined the team.

The discussion will develop the model for sports teams' revenues. Once the individual contributions of one input can be determined, a firm can decide how much to pay for the use of the input. In sports this is an essential concept the firm must

understand in order to see if they are paying too much or too little for an athlete on their team.

When describing the MRP of a team it is important to understand that winning percentage measures a team's productivity (Fort 108). A team comprised of productive players should realize a higher winning percentage than a team made up of less productive players. In the case of the Cleveland Cavaliers they have a player in LeBron James whose production surpasses that of his teammates as well as a host of other players in the league.

The production of the team is very important to teams because they make money by producing an entertainment experience for fans. A reasonable assumption would be to say that as fans enjoy the experience more, the team makes more money. It is also reasonable to assume that as the experience becomes more enjoyable, attendance and loyalty increase also. If both attendance and loyalty increase, then revenues will also increase because with more people attending games with greater regularity, this should translate into increased revenues for the team.

However, team owners understand that creating a more rewarding experience for the fans comes at a cost to the firm. It seems that the most obvious method of creating a better experience for the fans would be to buy better players so that the team would win more games. Fans of any sport love a winning team more than a losing team. A critical concept in sports though is that although fans love their team to win, fans also need to know that there is the possibility they can lose. Fans want the most exciting experience possible, and in order for a firm to be a profit maximizing entity they need to deliver an

exciting experience. Herein lies the problem because purchasing the best and most exciting players comes a major cost to the firm.

Gerald Scully did work on the MRP of major league baseball players and this work has been the foundation much subsequent research has built upon. Less research has been conducted on the MRP of basketball players. A possible reason for this is that in baseball it is easier to calculate the data needed because it is a slower paced game where each player's contribution to a winning game is easily discernable. In a slower paced game it is often much easier to see how one player's efforts affect the game. For example, in baseball if a player hits a home run it is very obvious how that one player changed the game – their swing of the bat added a run to the score. In basketball however, a player's contribution may not be as noticeable but it leads to points also. LeBron James is known in the basketball world not only for his awesome scoring abilities but also for his ability to incorporate his team into a winning effort.

Basketball, more so than baseball, is a fundamental team sport. Basketball players must work with one another each moment of the game to try and win the game. Each play in basketball must be communicated by the players and executed using teamwork. Baseball requires much more of an individual effort of its players because baseball is more so a duel between pitcher and hitter than it is a combined team effort in each play to score a run. Therefore, the nature of basketball being more team oriented makes the MP of a single player less discernable than in baseball.

Most other research that has been done in this area focuses on salary versus marginal revenue product of the players (*Atlantic Economic Journal*). The intention of this paper is not to analyze MRP in its relationship to salaries. The focus here is instead

on the relationship between LeBron James' contributions to his team and how that affects the revenues of the franchise. In order to accomplish this task, I had to modify the Hollinger Game Score equation (*Basketball-Reference.com*), which calculates the productivity of a single player in one game. In the model being developed however, the hope is to show how LeBron's statistical contributions have added to the team's effort to win a game. For this reason it is my intention to show LeBron's statistical contributions as a percentage of the team's total contributions and then apply the resulting figures in a modified Hollinger Game Score formula. The modification occurs because I extended the original Hollinger equation to include LeBron's marginal product as a percentage of the total production of the team. In the model being developed we define win percentage of the Cleveland Cavaliers to be a function of the marginal product of LeBron James. Regression analysis will then find the relationship between marginal product and the winning percentage of the team. The equation is modeled after the Hollinger model used in basketball with some adjustments necessitated by the structure of the model trying to be created. The dependent variable is the winning percentage of the team defined as:

$$\text{Winning Percentage} = \text{Wins} / \text{Total Games Played}.$$

In this model the winning percentage will be examined under statistical regression as a function of the marginal product of LeBron. The dependent variables in the equation are the individual statistics of LeBron divided by the team totals in each of the statistical categories. The figures will then be entered into the Hollinger Game Score formula and combined into a single term known in the model as a modified Hollinger Game Score.

The formula is:

$$Y = \text{PTS} + 0.4\text{FG} - 0.7\text{FGA} - 0.4(\text{FTA} - \text{FT}) + 0.7\text{ORB} + 0.3\text{DRB} + \text{STL} + 0.7\text{AST} + 0.7\text{BLK} - 0.4\text{PF} - \text{TOV}$$

Where:

Y = Modified Hollinger Game Score; this number is the marginal product in the model

PTS = Points scored in a game/Team Points

FG = Field goal, also known as a basket, that is made/Team field goals

FGA = Field goal, or basket, that is attempted/Team field goal attempts

FTA = Free throw attempt/Team free throw attempts

FT = Free throw that is made/Team free throws made

ORB = Offensive Rebound/Team offensive rebounds; An Offensive Rebound is collected after a missed shot in the other team's defensive side of the court

DRB = Defensive Rebound/Team defensive rebounds; A Defensive Rebound is collected after a missed shot in the team's own defensive part of the court

STL = Steal/Team steals; When the player takes the ball away from the other team and ball is possessed by the player

AST = Assist/Team assists; When the player passes the ball to another player on his own team and that player makes a field goal

BLK = Block/Team blocks; When the player blocks the attempted shot of a player on the other team

PF = Player Foul/Team fouls; When the player commits a foul against an opponent

TOV = Turnover/Team turnovers; When possession of the ball is lost and regained by the other team

*Terms borrowed from Basketball-Reference.com

Once the respective statistics are placed in the equation the result is the Hollinger Game Score measuring the marginal product of LeBron, modified to incorporate the productivity of the team also.

The next step is to calculate marginal revenue with respect to changes in winning percentage since LeBron has joined the Cavaliers. Marginal revenue is:

MR = the amount that revenue changes when the labor input is added

The change in MR of sports teams can occur thru four channels:

$TR = R(g) + R(b) + R(v) + R(l)$ where,

TR = Total Revenue

R(g) = Revenue generated by ticket sales, or Gate Revenue

R(b) = Revenue generated by television contracts, or Broadcast Revenue

R(v) = Revenue generated by sales at the arena, such as food and drinks, or Venue Revenue

R(l) = Revenue generated by the selling of licensed goods, or Licensing Revenue.

*Terms borrowed from Sports Economics, by Fort

A change in MR may refer to any changes in the quantities of attendance, broadcast rights, venue output, or licensing sales (Fort pp. 38-39). Sports teams in any given year may experience changes in any of these quantities. The data testing section will show how the Cavaliers have greatly increased both gate and venue revenue since LeBron has joined the team. Data for the two other revenue streams is available, however the marginal changes in gate and venue revenues since LeBron has joined the team provide a strong indication by themselves of how LeBron has affected the revenue of the team. Therefore, gate and venue revenue alone will be sufficient in determining marginal revenue for the model.

The Fan Cost Index, or FCI, is a tool developed by the people at Team Marketing that “tracks the cost of attendance for a game for a family of four. The FCI includes: four average-price tickets; four small soft drinks; two small beers; four hot dogs; two game programs; parking; and two adult-size caps.” The Fan Cost Index illustrates on average

how much fans spend in a given night on a sports event (TeamMarketing.com). This data can be extremely valuable to teams in that it can show them how much extra total revenue they receive from an increase in attendance. In later sections of the paper it will be explained how the FCI has increased at the Cavaliers arena since LeBron has been there. This will help put into perspective how much revenue can be attributed to the increased attendance since LeBron's rookie year.

Data Testing

1. Marginal Product

The model created will attempt to measure the relationship between LeBron James' individual contributions with respect to the team's total contributions, and the teams winning percentages, or the teams' output. Data was collected for the following 6 seasons:

	FG	FGA	FT	FTA	ORB	DRB	AST	STL	BLK	TOV	PF	PTS
No LeBron												
2002-2003	2850	6746	1502	2012	1,118	2,542	1,712	636	521	1,501	1,864	7,495
LeBron: 2003 2004	622	1492	347	460	99	333	465	130	58	273	149	1,654
Team: 2003-2004	2922	6753	1528	2030	1,118	2,619	1,808	585	537	1,216	1,743	7,619
LeBron/Team	0.2129	0.2209	0.2271	0.2266	0.0886	0.1271	0.2572	0.2222	0.1080	0.2245	0.0855	0.2171
LeBron: 2004 2005	795	1684	477	636	111	477	577	177	52	262	146	2,175
Team: 2004 2005	2990	6687	1634	2174	1,117	2,352	1,851	654	461	1,141	1,850	7,914
LeBron/Team	0.2659	0.2518	0.2919	0.2925	0.0994	0.2028	0.3117	0.2706	0.1128	0.2296	0.0789	0.2748
LeBron: 2005 2006	875	1823	601	814	75	481	521	123	66	260	181	2,478
Team: 2005 2006	2908	6412	1689	2318	959	2,511	1,560	567	392	1,137	1,733	8,002
LeBron/Team	0.3009	0.2843	0.3558	0.3512	0.0782	0.1916	0.3340	0.2169	0.1684	0.2287	0.1044	0.3097
LeBron: 2006 2007	772	1621	489	701	83	443	470	125	55	250	171	2,132
Team: 2006 2007	2978	6658	1484	2133	1,039	2,529	1,708	625	353	1,177	1,781	7,934
LeBron/Team	0.2592	0.2435	0.3295	0.3286	0.0799	0.1752	0.2752	0.2000	0.1558	0.2124	0.0960	0.2687
LeBron: 2007 2008	794	1642	549	771	133	459	539	138	81	255	165	2,250
Team: 2007 2008	2,937	6687	1477	2061	1,092	2,563	1,640	579	427	1,145	1,712	7,903
LeBron/Team	0.2703	0.2456	0.3717	0.3741	0.1218	0.1791	0.3287	0.2383	0.1897	0.2227	0.0964	0.2847

Figure 1-1

*Chart Data comes from Cavaliers.com

Where:

PTS = Points scored in a game/Team Points

FG = Field goal/Team field goals

FGA = Field goal attempt/Team field goal attempts

FTA = Free throw attempt/Team free throw attempts

FT = Free throw that is made/Team free throws made

ORB = Offensive Rebound/Team offensive rebounds

DRB = Defensive Rebound/Team defensive rebounds

STL = Steal/Team steals

AST = Assist/Team assists

BLK = Block/Team blocks

PF = Player Foul/Team fouls

TOV = Turnover/Team turnovers

The chart above illustrates the three necessary figures from each season that will determine the marginal product of LeBron James. The first are the excel cells that list LeBron and the “Season.” These cells refer to LeBron’s own statistics in each respective category for that respective season. The second are the cells listed for the team which refer to team totals in each statistical category for the respective year. Lastly, the cells referring to “LeBron/Team” are those which divide the individual stats of LeBron by the team total in each statistical category. The resulting figure represents the percentage of each category that can be attributed to LeBron’s individual contributions. It is the third figure that will be used in the Hollinger Game Score formula, as it measures the marginal product of LeBron as a percentage of the teams’ total production.

As the graph presents LeBron, in his rookie 2003-2004 season, accounted for nearly 22% of the team’s total points, and in the 2004-2005 season that percentage increased to over 27%. In LeBron’s rookie year the Cavaliers won 18 more games than they had won in the 2002-2003 season. In the following season the team won 7 more games than in the previous season. This shows a strong indication of how LeBron’s individual point contributions to the team have helped increase the team’s winning

percentage. The following chart depicts wins, losses, and changes in win percentage for the Cavaliers during LeBron James tenure with the team thus far:

Season	Wins	Losses	Y	Change in Y	Change in %
2002-2003	17	65	0.2073		
2003-2004*	35	47	0.4217	18	0.2144
2004-2005	42	40	0.5122	7	0.0905
2005-2006	50	32	0.6098	8	0.0976
2006-2007	52	30	0.6341	2	0.0244
2007-2008	45	37	0.5488	-7	-0.0854

*LeBron's rookie year

*Some chart data from Cavaliers.com

The changes in the win percentage are the dependent variables for the model.

The next step is to determine the modified Hollinger Game Score, or marginal product. Taking the Hollinger Game Score formula and inputting the respective statistical data will give us one figure that represents the marginal product of LeBron James during a given season. To demonstrate with more clarity the idea behind the formula it is necessary to present the concept of the Game Score in a game by game sequence. Data was collected from the first 10 games of the current 2007-2008 season:

GmSc	FGM	FGA	FTM	FTA	OFF	DEF	AST	STL	BLK	TO	PF	PTS
20.4	10	18	7	12	1	3	5	2	1	5	3	27
13.1	3	9	7	9	0	11	7	1	2	5	1	13
26.1	13	21	6	12	0	6	2	3	0	3	2	34
34	11	21	10	13	4	3	8	1	2	0	2	33
11.6	6	22	4	8	5	2	9	2	2	5	1	17
24.9	10	24	10	14	0	5	4	2	2	3	4	33
28.4	11	19	6	6	2	2	5	3	2	4	6	29
32.3	11	18	3	3	3	6	9	3	1	1	4	26
1.6	4	17	4	6	0	4	5	0	0	5	0	13
21.5	6	14	8	10	0	3	8	2	2	2	2	21

The chart displays the Hollinger Game Score figure, or GmSc, in the first column.

According to the Hollinger, a score of 40 is an outstanding performance and 10 is an

average performance (Basketball-Reference.com). For the entire 2007-2008 season LeBron averaged a Game Score of 25.89 which illuminates how much above average he is in his production. The GmSc from each game represents LeBron’s productivity in each of these respective games, as determined by the Hollinger Game Score formula. Averaging the individual GmSc’s for the entire season determines LeBron’s average productivity. In seasons prior to 2007-2008 it was much harder to find comprehensive data for each game. Therefore, to find a season GmSc meant dividing LeBron’s season totals by the team’s season totals and inputting this data into the Hollinger formula. The resulting figure is the average GmSc for each season which for the purpose of the model represents the x-variable.

To calculate the GmSc’s for each season, data from Figure 1-1 was inputted into the GmSc formula and the following figures were calculated:

Season	GmSc
2002-2003	0
2003-2004	0.5355
2004-2005	0.7048
2005-2006	0.7268
2006-2007	0.6385
2007-2008	0.776
Career	0.67632

The formula calculated one figure for each season that is representative of the productivity of the team for that respective season. The cell titled “Career” represents LeBron’s Marginal Product because by taking the average of each GmSc from each season, the figure that is calculated represents the productivity he has offered over the course of his career thus far. Therefore, MP of LeBron James = .6763.

The right hand side of the equation is now determined because the GmSc figures are the x-variables for the regression. Charting both win percentage and the GmSc numbers puts into visual form the variables needed to proceed with regression analysis.

Season	Wins	Losses	Win %	GmSc
2002-2003	17	65	0.2073	0
2003-2004	35	47	0.4268	0.5355
2004-2005	42	40	0.5122	0.7048
2005-2006	50	32	0.6098	0.7268
2006-2007	52	30	0.6341	0.6385
2007-2008	45	37	0.5488	0.7760

LeBron was not in the NBA during the 2002-2003 season, therefore there is no GmSc figure for that season. The 2002-2003 season must be included though to illustrate the impact on win percentage that was experienced before and after his arrival to the league.

The next step is to utilize regression analysis to see the relationship between the independent variable (Y) of Win % and dependent variable (X) GmSc. Regression analysis derives the following Summary Output:

SUMMARY OUTPUT

<i>Regression Statistics</i>	
Multiple R	0.915762026
R Square	0.838620088
Adjusted R Square	0.79827511
Standard Error	0.07043522
Observations	6

ANOVA					
	<i>Df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>
Regression	1	0.103122999	0.103122999	20.78623241	0.010345177
Residual	4	0.019844481	0.00496112		
Total	5	0.12296748			

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>
Intercept	0.209141974	0.067951007	3.077834811	0.037009491	0.020479734
X Variable 1	0.498050243	0.109240899	4.559192079	0.010345177	0.194748883

	<i>Upper 95%</i>	<i>Lower 95.0%</i>	<i>Upper 95.0%</i>
Intercept	0.397804213	0.020479734	0.397804213
X Variable 1	0.801351604	0.194748883	0.801351604

Important to note here is the Adjusted R Square term is .7983. The adjusted R square term indicates the amount of variance that occurs in the Y variable that is accounted for by variations in the independent x-variable. In other words the adjusted R squared number measures how much the x-variable causes changes in the y-variable. If the number was 1 there would exist perfect correlation between the two and any change in x would lead to the exact same change in y. If adjusted R square were 0 then a change in x would have zero affect on y.

In the model being developed adjusted R square indicates that the productivities that were determined using the Hollinger Game Score formula account for 79.83% of the variations in the winning percentage. This figure supports a relatively strong relationship between LeBron James' productivity and the changes in win percentage.

2) Marginal Revenue

Perhaps the most dramatic revenue stream increase since LeBron has come to the Cavaliers occurred at the gate. It is easy to understand why this is so. Before LeBron was in the league, there was so much hype surrounding him because he was such a talent. Being that he is from Ohio and in 2003 the Cavaliers having the first draft pick, the people of Ohio were very excited that the Cavaliers were going to pick LeBron as their first pick. As it is obvious now, LeBron did go to the Cavaliers and as a result of this there was a renewed interest in the Cavalier basketball team who had for the past many years been a terrible team with little fan base. LeBron coming to Cleveland revived the fans to a point where they were willing to pay to see LeBron play. This meant that the

Cavaliers were going to generate a lot of extra revenue by signing LeBron to play for the team.

To estimate how much LeBron changed the revenue's of the Cavaliers another regression must be employed. Running a regression of marginal revenue will require that I establish a relationship between the change in revenue experienced by the team and the change in production (winning percentage) of the team:

Winning percentage	Change in Winning % (X)	Revenue	% Change in Revenue (Y)
2002-2003: $17/82 = 20.732\%$	0.0000	2002-2003: \$72 Million	0.0000
2003-2004: $35/82 = 42.683\%$	1.0588	2003-2004: \$93 Million	0.2917
2004-2005: $42/82 = 51.22\%$	1.4706	2004-2005: \$102 Million	0.4167
2005-2006: $50/82 = 60.976\%$	1.9412	2005-2006: \$115 Million	0.5972
2006-2007: $52/82 = 63.415\%$	2.0588	2006-2007: \$152 Million	1.1111
2007-2008: $45/82 = 54.88\%$		N/A	N/A

The x-variables were found by calculating the difference between the wins in a given season, minus the 17 wins from the 2002-2003 season when the Cavaliers were without LeBron James, and that figure divided by the original 17 wins. Similarly, percentage change in revenue change was calculated by finding the difference between revenue in a given season and the original \$72 million the Cavaliers earned without LeBron James being on the team. This number was then divided by the original \$72 million in revenue to find the percentage that Cleveland Cavalier revenue with LeBron has changed in comparison to when he was not a part of the organization.

The next step is to utilize regression analysis to measure the responsiveness in the independent variable, percentage change in revenue (Y), to changes in the dependent variables of winning percentage. The summary output is:

SUMMARY OUTPUT

<i>Regression Statistics</i>	
Multiple R	0.883264907
R Square	0.780156897
Adjusted R Square	0.706875862
Standard Error	0.223535098
Observations	5

<i>ANOVA</i>					
	<i>Df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>
Regression	1	0.531963464	0.531963464	10.64609557	0.047030702
Residual	3	0.14990382	0.04996794		
Total	4	0.681867284			

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>
Intercept	-0.089561425	0.202045987	-0.443272479	0.687586753	-0.73256193
X Variable 1	0.438703194	0.134454585	3.262835511	0.047030702	0.010808697
	<i>Upper 95%</i>	<i>Lower 95.0%</i>	<i>Upper 95.0%</i>		
Intercept	0.553439079	-0.73256193	0.553439079		
X Variable 1	0.86659769	0.010808697	0.86659769		

From this summary output and the Adjusted R Square it can be determined that approximately 71% of the changes in revenue can be attributed to the changes in winning percentage due to LeBron James' productivity. Important to note here is that the seasonal revenues indicated in the chart are total revenues of the team. However, in the model marginal revenue will be a function of attendance at Cleveland Cavaliers basketball games. MR will be determined by looking at how attendance flows have changed gate and venue revenues. Therefore:

$$MR = \text{change in total revenue} / \text{change in quantity}$$

The focus is on the change in attendance that occurred therefore, the equation can be re-written to say that marginal revenue is a function of attendance (A):

$$MR(A) = P(A)A, \text{ where } P \text{ is also a function of attendance (because it usually is anyway).}$$

This goes to say that:

$$\text{Revenue}(A) = P(A)A, \text{ therefore, after we take the derivative of this function we get:}$$

$$MR(A) = ((\text{change in P}/\text{change in A}) * A) + P.$$

Now that we have the formula let us look at the data necessary for solving this problem.

<u>Season</u>	<u>Attendance(A)</u>	<u>Cost of Ticket \$(P)</u>
2002-2003	471,374	38.52
2003-2004	749,790	40.15
Change	278,419	1.63

(Information from Teammarketing.com)

Now that both P and A have been determined the equation can be solved for MR:

$$MR(A) = ((\text{change in P}/\text{change in A}) * A) + P$$

$$A = 749,790$$

$$\text{Change in A} = 278,419$$

$$P = \$40.15$$

$$\text{Change in P} = \$1.63$$

$$MR(A) = ((1.63/278,419)*749,790)+40.15 = MR(A) = \$44.54$$

Application of this formula to each of the seasons LeBron James has been on the Cleveland Cavaliers provides the following:

Season	Attendance	Change in Attendance	Ticket Price	Change in Ticket Price	MR
2002-2003	471,374		\$38.52		
2003-2004	749,790	278,416	\$40.15	\$1.63	\$44.54
2004-2005	784,349	34,559	\$42.15	\$2.00	\$87.54
2005-2006	792,391	8,042	\$45.52	\$3.37	\$377.57
2006-2007	837,883	45,492	\$50.02	\$4.50	\$132.90
Average					\$160.64

Finding the average MR of each season gives the average amount that marginal revenue, as a function of attendance, has increased since LeBron joined the team as a rookie in the 2003-2004 season.

3) Marginal Revenue Product

$MRP = MP * MR$. Having determined both MP and MR the equation can be solved to find the marginal revenue product of LeBron James:

$$MP = .6763$$

$$MR = \text{average of each season's MR} = \$160.64$$

$$MRP = .6763 * \$160.64 = \$108.64$$

Here, MRP is LeBron James' contribution to the gate and venue revenues, or revenues that are functions of attendance, earned by the franchise. \$108.64 of increased gate and venue revenues can be attributed to LeBron James' productivity and his ability to attract larger crowds to watch a game.

Analysis of Data

The greatest surge in revenue occurred at the gate because many more people came to games to see LeBron. From the 2002-2003 season to the 2003-2004 season,

home attendance increased 59%, from 471,374 to 749,790, the largest attendance increase in team history (Fort p. 226). This increased attendance translated into huge increases in gate and venue revenues for the team. Winning percentage increased over 22% at the same time revenue jumped from \$72 million to \$93 million (Forbes.com). Both of these increases occurred in LeBron's rookie year.

Change in revenues as a result of change in winning percentage:

<u>Winning percentage</u>	<u>Change in Revenue</u>
2002-2003: $17/82 = 20.732\%$	2002-2003: \$72 Million (no change)
2003-2004: $35/82 = 42.683\%$ *	2003-2004: \$93 Million (+\$21 Mil.)
2004-2005: $42/82 = 51.22\%$	2004-2005: \$102 Million (+\$9 Mil.)
2005-2006: $50/82 = 60.976\%$	2005-2006: \$115 Mil. (+\$13 Mil.)
2006-2007: $52/82 = 63.415\%$	2006-2007: N/A

* LeBron's rookie year

*All Revenue Data from Forbes.com

According to Forbes.com, the Cavaliers as a team have gone up in value significantly since LeBron has joined the team. This past year the team has been valued at \$455 million. This number is up from \$222 million in 2002 (Revenue Data from Forbes.com – NBA Valuations 2007). Graphically, the team's value has gone up significantly every year since LeBron has come to the organization:



*Chart from Forbes.com

The graph shows a relatively steady increase in team value over the time period but the largest increases occur in the years LeBron has been on the team. Forbes also graphed the revenue increases the Cavaliers have experienced:



*Chart from Forbes.com

Another example of how the Cavaliers have benefited financially from LeBron is the home game attendance statistics. According to Forbes.com again, “2005-2006 season ticket prices jumped 8% (more than double the NBA average) and attendance was fifth highest in the league. Six home playoff games also added millions to the Cavaliers coffers.” This is an amazing feat because in the years before LeBron, the Cavaliers ranked among the worst in the league in home attendance levels. This extra attendance results in vast sums of revenue for the Cavaliers. Coming back to the notion of the Fan Cost Index, we can find out exactly how much revenues went up due to the increased attendance.

Fan Cost Index: F.C.I.

F.C.I. includes: four average-price tickets; four small soft drinks; two small beers; four hot dogs; two game programs; parking; and two adult-size caps. Team Marketing took all of the prices of the above factors and added them together to get the FCI of the Cleveland Cavaliers. The figure they calculated was that the total cost of a family of 4 going to a Cavaliers game was \$224.06 in the 2002-2003 season. The FCI from the

2003-2004 season was \$230.60. Multiplying the change in attendance by ticket price, results in the gate revenue generated by an increase in attendance.

$$R(G) = (\$40.15 * (749,790 - 471,374)) = \$11,178,402.40$$

This revenue is gate revenue generated by an increase in attendance. However, using the FCI, where ticket revenue is included as is concessions and merchandise, the factor could be much more significant:

$$\text{Revenue (Attendance)} = ((\text{change in attendance})/4) * \text{FCI}$$

$$R(A) = ((749,790 - 471,374)/4) * 230.60$$

$$R(A) = \$16,050,682.40$$

This figure demonstrates that ticket revenue in LeBron's rookie year is over \$16 million. The revenue found using the FCI incorporates multiple revenue streams for the team in its calculation so it is a better estimate for ticket revenue than is simply multiplying ticket price by the attendance. In LeBron's rookie year the Cavaliers possibly earned an additional \$16 million due simply to the increased attendance of people coming to see LeBron.

Conclusion

How did the Cavaliers do in the LeBron James deal?

The Cavaliers paid LeBron about \$4 million salary for his rookie year and he was also paid an estimated \$12 million signing bonus (Fort p. 226). The Cavaliers broke even

paying LeBron his rookie year in ticket revenue alone. Based on the findings in this paper I would argue that the Cavaliers made out very well in the transaction and LeBron was quite possibly underpaid in comparison to what he contributed to the team's revenue flows.

In conclusion, this analysis of "The LeBron Effect" has shown that LeBron James has had a significant influence on the Cleveland Cavaliers, not only in increasing wins, but also in increasing the revenues of the franchise. The data shown in the Analysis section provides strong evidence that since joining the Cleveland Cavaliers and adding his productivity to that of the team's, the team has enjoyed increased revenues.

Bibliography

1. "TMR's Fan Cost Index," Teammarketing.com, 2008,
http://www.teammarketing.com/fci.cfm?page=fci_nba_03-04.cfm
3. Sports Economics 2ed., Fort, Rodney D. Pearson Prentice Hall. Upper Saddle River, NJ. 2006.
4. "NBA Team Valuations," Forbes.com, 2007,
<http://www.forbes.com/lists/2007/32/biz_07nba_NBA-Team-Valuations_Revenue.html>

5. "#7 Cleveland Cavaliers," Forbes.com. 12/06/2007.
<http://www.forbes.com/lists/2007/32/biz_07nba_Cleveland-Cavaliers_324902.html>
6. "Statistics," Cavaliers.com. 2007. <http://www.nba.com/cavaliers/stats>
7. Thomas A. Zak, Cliff J. Huang and John J. Siegfried. "Production Efficiency: The Case of Professional Basketball." *The Journal of Business*. Vol. 52, No. 3 (Jul., 1979), pp. 379-392.
8. Frank A. Scott Jr., James E. Long and Ken Somppi. "Salary Vs. marginal revenue product under monopsony and competition: The case of professional basketball." *Atlantic Economic Journal*. Volume 13, Number 3 / September, 1985. p. 50-59.
9. "Glossary-'Hollinger Game Score'." Sports Reference LLC. 2008.
<<http://www.basketball-reference.com/about/glossary.html#pf>>