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The LeBron Effect: The Economic Impact of NBA Superstars on Their Franchise

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Abstract

This thesis investigates the economic value a basketball superstar contributes to their franchise in the National Basketball Association (NBA) over a three-season span (2021-2024), using multivariable regressions to examine how several independent variables affect the dependent variable-revenue. A key feature of the analysis is the incorporation of a lagged variable, superstar lagged, which assesses the impact of having superstars the season prior on revenue. The results suggest that superstars do not have a statistically significant effect on revenue, and other variables, including revenue from seasons prior, market size, and ticket price, have a more substantial impact on revenue.

KEYWORDS: (National Basketball Association, Salary Cap, Player Estimate Impact, Revenue, Superstar)
JEL CODES: (J44, Z22, Z23, Z28)

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Acknowledgments

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1. Introduction

When LeBron James returned to the Cleveland Cavaliers, he brought more than just his top-notch level basketball skills, he also brought with him the "LeBron Effect". [1]The year before his return the Cleveland Cavaliers won 33 games, landing the first overall pick in the NBA draft. In his first game back, the crowd hit capacity, as 20,562 people bought tickets to see LeBron play. This crowd was 3000-4000 more people than the average attendance of Cavaliers home games the year prior. [2] Not only did the Cavaliers benefit from an increase in tickets sold, jersey sales, and concessions, the surrounding area saw a significant increase in the number of bars and restaurants within a mile of the stadium. There was a 13 percent increase in the number of bars and restaurants, and employment rose by 23 percent. The team ended up winning 53 games that season, making the playoffs, and LeBron was able to help bring the first Larry O'Brien trophy (NBA championship trophy) in 2016 to the franchise.

The National Basketball Association (NBA) was founded in 1949 when the Basketball Association of America (BBA) and the National Basketball League (NBL) merged forming a 17-team league. In the first ever season the Minneapolis Lakers (current day Los Angeles Lakers) defeated the Syracuse Nationals (current day Philadelphia Seventy Sixers) to claim the first-ever NBA championship. The league has now expanded to thirty teams spanning coast to coast and into Canada, with league talks of possible expansions into other countries such as Mexico. The rise of superstars such as LeBron James, Stephan Curry, Kevin Durant, and Victor

[1] https://www.blackenterprise.com/economic-impact-lebron-james/

[2] https://www.aei.org/articles/where-lebron-takes-his-talent-there-the-jobs-will-be-also/

Wembanyama, has helped the NBA grow globally. These players bring significant value to the NBA, but what value do they bring to their franchise?

The National Basketball Association is valued at around 120 billion dollars, making each NBA franchise worth about 3.85 billion.[3] The five highest-valued franchises are the Golden State Warriors, New York Knicks, Los Angeles Lakers, Boston Celtics, and Los Angeles Clippers. While these teams are in some of the biggest markets in the world, they all have another thing in common. All five of these teams have a face of their franchise, a star player that fans are excited to watch. Superstar players create strong brand recognition, generating significant interest and revenue for a team.[4] Van Liederke's (2017) study of NBA franchise value used a hedonic model to see that having an NBA superstar does have a significant impact on the value of an NBA franchise and a substantial impact on the revenue and the potential to make the playoffs. However, is it worth teams to invest resources necessary to acquire a superstar? Some of the lowest-valued teams have some of the biggest stars in the game, as the Memphis Grizzlies, Minnesota Timberwolves, and New Orleans Pelicans all have a superstar on their team, yet are all valued between four to five billion dollars lower than the top three valued teams according to Forbes (2023).

NBA franchises have two primary goals: to generate revenue and win championships. Franchises act as a business, relying on multiple revenue streams, such as ticket and merchandise sales, TV rights, sponsorships, and concessions, all with the hopes of taking home an NBA Championship. Of the past 10 teams to win

[3] https://www.forbes.com/sites/justinteitelbaum/2024/10/24/the-most-valuable-nba-teams-2024/
[4] https://sites.duke.edu/djepapers/files/2017/06/matthewvanliedekerke-dje.pdf

the championship, everyone had a superstar.[5] However, acquiring a superstar player such as LeBron James, Kevin Durant, or Steph Curry comes with significant challenges. The biggest challenge is salary: the top five salaries in the NBA each exceed 50 million USD annually. Another challenge acquiring a superstar-caliber player is the cost of acquiring them, not in dollars but in assets, which includes future draft capital and players. When the Brooklyn Nets acquired James Harden from the Houston Rockets in 2021, they gave up four first-round picks, and three first-round pick swaps[6], Caris LeVert and Jarrett Allen who became an all-star two years later. It was a lot of assets to give up in order to acquire a player who did not bring a championship to the Nets and helped contribute to the franchise losing 34 million dollars during the 2021-2022 season.[7] The NBA introduced rules that make it harder to retain star-caliber players. The NBA operates under a soft cap, which allows teams to find ways to go over the salary cap of 145.8 million, yet as teams go further and further over the cap and into the luxury tax, the tax the teams are charged increases. After the 2023-2024 season, the NBA implemented the second apron, if teams exceed the second apron, teams are penalized, not only financial penalties but also roster-building penalties, restrictions to which free agents a team can sign, who they can acquire in a trade, and access to their future draft picks.[8] So, is it worth having these star-level players on the team?

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[5] https://www.si.com/nba/2014/08/28/top-100-nba-players-2015-list

[6] https://www.nba.com/news/reports-nets-acquire-james-harden-trade

[7] https://www.netsdaily.com/2022/10/28/23428317/forbes-nets-only-nba-team-to-lose-money-over-last-year-but-valuation-rises-9

[8] https://sports.yahoo.com/nba-offseason-what-is-the-cbas-second-apron-and-how-does-it-limit-high-spending-teams-215607328.html

The question I am looking to investigate is what is a superstar player's value for the franchise he plays for? To investigate this, I have decided to look at several different factors: Did the team make the playoffs, ticket sales, the average price of tickets, win percentage, total attendance, and the number of superstars on a team the season prior, to see what impacts the total revenue for an NBA franchise. To define what constitutes a superstar, I have decided to count if an NBA player is a superstar if they carry a contract that accounts for 20 percent of the team's salary cap. According to NBA.com, the salary cap for the 2024-2025 season is 140.58 million dollars; with 15 players on an active NBA roster, the minimum salary cutoff means that these players accounts for at least $1/5^{th}$ the total cap for the team. Yet salary alone can't be the only indicator of who counts as a superstar as some players get paid and don't perform. I have also decided to use Player Impact Estimate (PIE), a statistic that measures the impact a player provides to a team.

2. Literature Review

There have been numerous studies done on how difficult it is to land superstar, how much should the team give up or pay for a star, and what does a star bring to a franchise. "Recruiting a star player involves a high opportunity cost to the franchise"(Dsousa, 2022: 22). For this reason, NBA teams must allocate resources to maximize their competitive performance and internal revenue. This study uses a panel data regression between specific control variables, such as "total salary, total salary paid last season, pay paid to the top player last season, regular season winning percentage last season, and whether the team made playoffs or won the championship last season." (Dsousa,2022: 24) Controlling these variables, the study aimed to see the relationship between a team's player investment strategy and the team's competitive performance. There is a significant impact on the presence of star players and regular season win percentage. However, there is no strong correlation between the presence of star players and postseason winning percentage. Some additional findings suggest that "teams who go deep into a postseason likely carry over strong players into the next season, but winning a championship still needs to be achieved." (Dsousa,2022:24). There are limitations to the study, such as using a limited number of control variables, not considering things such as percent roster health, player experience, and investment into facilities. Future research can be done to help further this study, such as what components of team composition increase winning and how superstar players impact franchises in other sports leagues.

The concept of a superstar in team sports drastically differs from that of superstar in an individual sport. "The key to the mechanism is that the probability of winning differs tremendously depending on whether or not a team has top-ranked

players" (Harashima, 2018). The critical difference between team and individual sports, according to Harashima (2018), is that the monopoly producer is the team, not the individual player. Even though this was to be the case, any given player could earn a disproportionately large salary compared to the other players on a team. "An essential point in this mechanism is that the probability of a team winning differs depending on whether or not the team has high-ability players." (Harashima, 2018:2). As a result, there can be superstars in team sports, which significantly impact the team's success.

What determines how much a given player is worth? What statistics are significant factors in which player makes the maximum level contract, and which player makes the minimum? Previous studies have found that statistics such as points, rebounds, assists, blocks, and player experience are significant factors in determining player salaries. This study by Sigler et al (2018) also included a three-point percentage and Hollinger's player efficiency (per), a measure of players' per-minute statistical production.[9] The study found that points, rebounds, fouls per game, and experience were significant factors in player salaries. While three-pointers made, Hollinger's player efficiency and shooting percentage were insignificant. However, there are limitations to these findings, such as players who do not play a lot tend to have higher field goal percentages because they shoot less. Also, most of the NBA is on rookie contracts, who, due to NBA salary rules, tend to earn a lot less than veteran-level players.

"I do not think it is good for the league," said the NBA commissioner when he was asked about the idea of super teams in the NBA. Bringing multiple superstars to one team might seem good for the NBA as fans can watch multiples of their

[9] https://www.basketball-reference.com/about/per.html

favorite stars play, yet it might also hurt the league as it limits the parity in the league. The criteria used in this study to count as a super team is any team with two or more players who have made an All-Star or All-NBA team within the last 3 years. The study (Finci, 2017) goes back to the 1986-1987 season, “gathered the win totals, attendance figures, playoff finishes, number of All-Stars, number of All-NBA team members and usage of the salary cap for every team up through the 2015-2016 season." (Finci, 2017:12). The study conducted a survey and got information on everyone's favorite team, the Warriors, who had four superstars, and were coming off winning the NBA finals, were by far the most liked team. 91/536 respondents also had the Warriors as their second favorite team. The survey showed that NBA super teams did not hurt the league's growth, even though some respondents believed it made the games boring, a majority thought it was nothing new and good for the league. With super teams not stopping anytime soon, this study provides good insight into whether multiple stars joining one team either helps or limits the league's growth.

The NBA is one of the most recognizable sports brands in the World, yet it was not always this popular, so how did it grow so big? The NBA started to make changes. "The rules to encourage attack appeared, which greatly increased the players' hit rate and made the game more exciting." (Cai, 2022:576). Rules made to increase scoring led to games being more exciting to watch, yet some teams have better, more skilled players who might create an imbalance in the league, so the NBA created several rules and regulations to try to keep balance. "Because each team has salary restrictions, coupled with the luxury tax system, each team will generally have only one or two stars, so that the strength of the team tends to be balanced. "(Cai, 2022:576). The rules of the NBA allow for more physical play, which helps attract viewers and increases scoring. Each offseason, the NBA summarizes the players'

behaviors that harm the game's content, implementing rules to limit these behaviors. However, the thing the NBA is pushing most are their stars: "These stars are no longer athletes; they are ICONS in all walks of life and around the world" (Cai,2022:577). People are fascinated by every part of these players' lives, so it's not just basketball that people are becoming interested in, viewers become interested in all aspects of these star players' lives.

Numerous studies have been conducted to see the impact star players have on the demand for tickets, “Over time, if the player misses multiple games, it can add up to millions of dollars lost because the star player did not play” (Wanahgan et al, 2023:3). Players missing games cause ticket prices to drop anywhere from 7% to 25% ($9-$25). Not only do star players missing games negatively impact the player’s franchise, but it also impacts the opposing team’s franchise. Kaplan’s (2019) study shows that a fan's willingness to pay for a ticket to an NBA game increases when a superstar comes to town. When a superstar is expected to miss a game the price for a ticket drops by 4% - 22% ($4-$41). “Additionally, LeBron James and Stephen Curry exhibit larger impacts in away games: 21% ($73/ticket) for James and 18% ($50/ticket) for Curry.” (Kaplan,2019). This study provides a novel methodology to estimate superstar value, generating implications for the entertainment industry.

3. Theory & Methodology

The National Basketball Association acts in a way that resembles a monopoly. By limiting the expansion of teams, the NBA creates a shortage of franchises, driving up the profitability of the existing franchises and the league overall.[10] By controlling broadcasting rights nationally, the league demands much higher prices to stream games. The NBA recently signed an 11-year agreement with ESPN/ABC, NBCUniversal, and Amazon Prime Video for 76 billion dollars for the rights to stream games. This new tv deal has the projected salary cap to go up to over 227 million by the 2029-2030 season with players' wages potentially exceeding 100 million dollars per season.[11] The NBA shares between 49% and 51% of the basketball related income (BRI) with the players. There is a positive impact on players' salaries, specifically the players who are above the median salary, as television revenue increases. Increasing the wage inequality gap between "low Caliber "nonunionized players" and high Caliber "unionized stars" (Kelly, 2017). Currently, the salary cap is determined by:

$$\frac{(49\%\text{-}51\%)\ \text{Projected Basketball Related Income} - \text{Projected Benefits for players}}{30\ \text{Teams}}$$

Basketball related income comes not only from television rights but also includes ticket sales, naming rights, interest income, and stadium revenue. Projected player benefits include medical treatments, 401K plans, and other benefits NBA current and former players receive (Kelly, 2017).

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[10] https://scholarlycommons.law.wlu.edu/wlulr/vol72/iss2/4/#:~:text=Four%20monopoly%20sports%20leagues%20currently,arcane%20and%20outdated%20blackout%20provisions.

[11] https://www.nytimes.com/athletic/5510838/2024/05/24/nba-media-rights-deal-player-salary-cba-contract/

The NBA existence relies heavily on its fanbase, which drives the leagues demand and success. By creating a compelling product, the NBA has cultivated a global following with superstars playing a massive role in attracting fans. There is a superstar externality that appears to last over players careers. Rosen (1981) developed a model showing how small groups of people can earn substantially higher salaries compared to their counterparts, using a model containing profit-maximizing firms and utility-maximizing consumers showing how the number of tickets sold by a firm providing a product (NBA) depends on two things, ticket price and quality of the talent. Rosen's model predicts that a small number of athletes with marginally more talent will attract more fans willing to pay to watch their favorite players play. Only a select group of players have far more fans who are willing to watch them play. These players are earning much larger salaries than the other players. With these players demanding more of an audience, the NBA can use a dynamic pricing model: "firms charge a higher price to consumers who value the good more than consumers who value the good less, as long as the minimum sale price is above the firm's marginal cost" (Wanghan et al., 2023). Using this pricing model, the firm (NBA) can generate more revenue than having every customer pay the same price. Ticket prices within games can also vary considerably as seats closest to the court have a greater demand, typically costing significantly more than the seats farther away from the court.

The NBA's salary cap promotes competition by ensuring more balanced team payrolls. In other sports leagues, such as Major League Baseball, there is no cap, which creates extreme imbalance in team's payrolls. The highest team in Major League Baseball has a payroll of over 254 million higher than the lowest team.[12] The

[12] https://www.spotrac.com/mlb/payroll/_/year/2024/sort/cap_total2

cap gives teams penalties for going over the salary cap, financial and roster penalties that makes it harder for teams with large payrolls to retain players on high salaries. This increases competition, making games more competitive leading to less lopsided games that are more exciting and intriguing for the fans. "The optimal level of competitive balance is crucial for overall demand and total revenues in professional sports, as fans tend to prefer competitions with uncertain outcomes" (Dietl et al. 2011, 2).

Superstar players are eligible to become free agents when their current contracts expire. Players can then enter an open market where teams bid against each other to acquire the players. However, these players don't always return the value teams pay for them. The winner's curse is a problem in sports: "The winning curse is a tendency for the winning bid in an auction to exceed the intrinsic value or true worth of an item." (Hayes,2024). In free agency, teams have varying levels of willingness to pay for specific players, driving up the value some players get in free agency as teams are unsure how other teams value a given player. This can lead to players getting contracts beyond the value they provide to a team on the court. These players deemed overpaid become negative assets, as they limit a team's flexibility in future trades and signing future players. Teams often need to attach positive assets such as draft capital or promising young players to trade players who are on contracts for which they don't meet the value of the contract.

Salaries around the NBA are not evenly distributed among teams. Factors such as age, position, and player performance influence player salaries. There is a right skewed distribution of salaries on the NBA, meaning a small number of players earn significantly higher salaries than the majority. For example, the average salary during the 2023-2024 season was 9.7 million, with a median salary of 4.6 million. Age is

also a significant factor in player salaries. Players aged 18-27 make up 5.3% of the cap on average, players 28-35 make 11.3% of the cap on average, age 33 players make 12.1% of the cap on average, that is the peak of any age. Finally, players 35 and up make on average 6.7 percent of the cap. Only 12 of the 450 active players are signed to a supermax deal and only two max level players at a time. The demand for the top-level players is massive, yet teams need to make the right decisions on who they want to sign, because if they get it wrong it can set a franchise back for years.

Teams in the NBA revenue share, one might assume that this would make league more competitive, teams in smaller markets get more revenue, increasing their willingness to spend. However, according to the dulling effect, "revenue sharing reduces the incentives for clubs to invest in playing talent because each club has to share some of the resulting marginal benefits of its talent investment" (Dietl et al., 2011, 2). While there are circumstances in which revenue sharing does positively affect competitive balance, this occurs when revenue sharing has a positive impact on marginal revenue. This study by Dietl et al. does not consider a salary cap. However, the soft cap of the NBA does not fully restrict the spending of teams.

Basic Equation

Total Revenue=

$$b0 + b1(\hat{S}) + b2(\text{Win Percentage}) + b3(\text{Playoff}) + b4(\text{Total Tickets Sold}) + b5(\text{Average Ticket Price}) + \epsilon. \quad (1)$$

I have decided to create an equation to estimate superstars on a team. Using current superstars might lead to endogeneity in the model so I have created equation (2) to estimate superstars based off factors from the season prior (t-1).

$$\hat{S} = b0 + b1(\text{Revenue}_{t-1}) + b2(\text{Playoffs}_{t-1}) + b3(\text{Market Size}) + b4(\text{Superstar}_{t-1}) + \epsilon \quad (2)$$

To estimate how many superstars each team should have I have decided to include four variables in my equation. First variable is teams' revenue from the prior season (Revenuet-1). Teams who bring in more revenue are more inclined to spend to bring in superstar Caliber players. The second variable is a categorical variable that defines if a team made the playoffs from the prior season. Teams who are coming off a season in which they made the playoffs are inclined to have superstars on their team the following season. The next variable is market size, the larger markets offer greater exposure, larger fanbases, sponsorship opportunities, and the potential for team to build their brand. I have decided to categorize market size into three categories, large, medium, and small. The final variable is how many superstars the team had in the prior season, using the definition of who classifies as a superstar that I have provided earlier in this study. The maximum number of superstars any team had in a previous year was 3, so for the variable superstars lagged (Superstar t-1) teams could be assigned a number 0 to 3.

4. Data

This study is modeled after previous research done in 2021, "An Explanatory Study Of the value of NFL Superstar to their Franchise" by Weinberg (2022). Using similar methods and variables to determine how superstars impact their NBA franchise.

For equation (1), the dependent variable is revenue, taken from Statista, which has data on all 30 NBA teams dating back to 2001. The numbers are given in millions of dollars, with the Golden State Warriors generating the most revenue over the past 3 seasons.

The linear regression equation (1) has several independent variables. First is estimated superstars, calculated using equation (2). Each team will have a different estimated superstar value, as talent is not evenly distributed around the league. The next independent variable is win percentage, Statmuse provided me with each of these values. Win percentage is calculated by taking how many wins a team gets each year and dividing that by the 82 games each team plays in the regular season, next rounding that to 3 decimal places. Winning increases potential economic opportunities for a franchise, Bradbury (2017) [13]found a positive relationship between a team winning and the revenue they generate. The second variable related to on-court success is playoffs, a categorical variable that states whether the team made the playoffs. If yes, that the team made the playoff, the team gets a value of 1. If the team did not make the playoffs, the team receives a value of 0. Playoff success was chosen as a variable because as a team makes the playoffs, they are added to a group of teams

[13] https://www.sportico.com/feature/how-sports-teams-leagues-make-money-1234766931/#

who also made the playoffs, and those teams split the revenue from the playoffs. The farther a team goes, the more revenue that team generates.

I used several financial variables as independent variables, the first is total tickets sold. This financial variable impacts real monetary variables, such as ticket price, concession sales, and merchandise sales. Concession and merchandise sales account for 13 % of total revenue for NBA teams. Previous research (Ehrlich et al., 2024) shows home-field advantage is related to crowd attendance. This home-field advantage gives the home team an advantage, increasing the probability of winning. I used this data from ESPN, which posts every franchise's total attendance for each NBA season. The second financial variable I used was the average ticket price for each team adjusted for 2023/2024 inflation. According to the law of demand, when the demand for a product increases, the item's price will increase. Ticket price averages were taken from multiple sources, for the 2021/2022 and 2022/2023 season, Slam Online provided the average price. I adjusted the ticket prices for inflation into 2024 terms, and then rounded the price to the nearest dollar. For data on the 2023/2024 season ticket prices Slam Online did not have data, so I used AXIOS which gave me the average ticket prices for that season.

I used four variables for equation (2), which is the equation I used to estimate how many superstars each team has. The first was revenue from the prior year (Revenue t-1), I took this data comes from Statista. I took the value Statista gave me and adjusted the revenue for the 2021/2022 and 2022/2023 seasons to put it into 2023/2024 prices. Revenue is in millions of dollars and rounded to the nearest million. Revenue is an important indicator of how many superstars a team will have in the following season, as the higher the revenue, the more money the team can spend on its roster. The second variable in the equation is playoffs lagged (Playoffs t-1),

which indicates whether a team made the playoffs in the prior season. I assigned a value of one if the team made the playoffs in that season and a value of zero if the team did not make the postseason during that year. I used the official NBA bracket to determine who made the playoffs each season.

The next variable I used is market size, this variable is determined based on the city's population in which the team plays. For this study, I broke market size into three categories. The first is small, a market with fewer than 1.5 million homes, ten teams fell into this category. Medium market size teams were categorized as cities with 1.5-2 million homes, and six teams fell into that category. Finally, large market cities have over 2 million homes, 14 teams fell into that category with Los Angeles and New York having two teams each. I have assigned a value of 0 for small market teams, 1 for medium market teams, and 2 for each large market team. The final variable in equation (2) is superstar lagged, which is how many superstars the team had the prior season.

To determine who counted as a superstar, I used a two-step approach. First, I included a financial minimum of 20 percent of the team's salary cap, with inflation and the increase in cap every season, giving me a floor that is consistent over the years. The second step was identifying on-court variables a player must meet to be considered a superstar. I have included a Player Impact Estimate (PIE), a stat to gauge a player's all-around contribution to the game. I have decided to use this stat as it includes almost all statistical categories in the box score, as players impact the game in many ways. I used the top 50 players with the highest impact estimate stat for the past three seasons. Nikola Jokic had the highest PIE stat over this time at 23.00, and Kyrie Irving had the lowest PIE at 13.5 out of anyone in the top 50. Another way a player can be a star-caliber player is if that player made the All-Star Game during a

year. Teams were given a value of 0 if they had zero superstar players, 1 if they had one, 2 if they had two, and 3 if they had three. The most any team had was 3.

Since the estimated superstars used data from the prior year, I gathered revenue, playoff appearances, and potential superstars from the 2020-2021 season. The NBA was still recovering from COVID-19, which could impact the data. Although I understand this can create potential flaws, I still believe it provides accurate information about the NBA's state.

This study conducted a multi-variable regression to see which variables have a statistically significant impact on the independent variable. This study used a 95 % confidence level. Here are the hypotheses this study is going to answer.

H1: Teams with more estimated superstars on their roster have a statistically significant impact on total revenue.

H2: Market size has a statistically significant impact on revenue.

H3: Total attendance has a statistically significant impact on revenue.

H4: Making the playoffs the prior year and the current year does not have a statistically significant impact on total revenue.

H5: Win percentage does not have a statistically significant impact on total revenue.

I am going to run separate regressions for each year to see how different years might impact a team's total revenue. I started with the season 2020-2021 for the data I collected for equation (2) as I took data from the season before estimating how many superstars a team should have the following season. The data comes from 2020/2021, 2021/2022, 2022/2023. For equation (1), I collected data from the past 3 NBA seasons, 2021/2022-2023/2024, this three-year sample size allows me to compare the results from the previous three seasons.

5. Results and Analysis

First, I created summary statistics tables for each of the seasons that I will be running regressions on. Looking at nine variables, playoffs, total ticket sold, ticket price, revenue, win percentage, market size, playoffs lagged, superstars lagged, and revenue lagged adjusted for inflation.

TABLE 1- 20221/2022 Statistical Summary

Variable	Obs	Mean	Std. dev.	Min	Max
Playoffs	30	.5333333	.5074163	0	1
Total Tickets Sold	30	704463.7	74577.4	577583	856148
Ticket Price	30	209.5667	119.6546	91	562
Revenue	30	360.9667	104.357	274	842
Win Percentage	30	.4998333	.1409975	.244	.780
Market Size	30	1.13333	.8995529	0	2
Playoffs Lagged	30	.5333333	.5074163	0	1
Superstars Lagged	30	.8	.8866831	0	3
Revenue Lagged Adjusted for Inflation	30	260.5107	40.07118	218.38	385.52

Statistical summary obtained from data from NBA.com, Statista, Hoop Social, and Slam Online, using StataBE.

TABLE 2- 2022/2023 Statistical Summary

Variable	Obs	Mean	Std. dev.	Min	Max
Playoffs	30	.5333333	.5074163	0	1
Total Tickets Sold	30	738687	55214.25	636903	841632
Ticket Price	30	246.1667	107.7213	143	632
Revenue	30	362.6333	106.8671	267	791
Win Percentage	30	.4995667	.122166	.207	.707
Market Size	30	1.13333	.8995529	0	2
Playoffs Lagged	30	.5333333	.5085476	0	1
Superstars Lagged	30	.933333	.9071871	0	3
Revenue Lagged Adjusted for Inflation	30	360.9667	104.357	274	842

Statistical summary obtained from data from NBA.com, Statista, Hoop Social, and Slam Online, using StataBE.

TABLE 3- 2023/2024 Statistical Summary

Variable	Obs	Mean	Std. dev.	Min	Max
Playoffs	30	.5333333	.5074163	0	1
Total Tickets Sold	30	751214.5	49487.67	674400	845620
Ticket Price	30	304.6567	143.3572	159	745
Revenue	30	377.9667	102.2635	272	800
Win Percentage	30	.5033333	0.1593715	0.171	0.78
Market Size	30	1 .1333	0.8995529	0	2
Playoffs Lagged	30	0.5	0.5085476	0	1
Superstars Lagged	30	0.933333	0.7848153	0	2
Revenue Lagged Adjusted for Inflation	30	362.6333	106.8671	267	791

Statistical summary obtained from data from NBA.com, Statista, Hoop Social, and Axios, using StataBE.

Table one corresponds to the 2021/2022 season, table two to the 2022/2023 season and table three to the 2023/2024 season. Playoffs was the first variable that I looked at, with 16 out of the 30 teams making the playoffs each year, it was expected to see a mean of .533 for each of the three seasons. Total tickets sold was the following variable observed. The standard deviation for total tickets sold ranged from 49487.67 to 74577.4, as most teams have attendance statistics around the mean. The next variable ticket price goes up throughout the study as the mean ticket price goes from $209.56 to $304.66, with the standard deviation ranging from $107.72 to $143.36. Revenue remained relatively constant throughout the study, ranging from $360.97 Million to $377.97 Million. The team's win percentage each season had a mean of nearly .500, which was expected. The following four variables were used in equation (2). Market size was the same in all three years, so getting the same mean, standard deviation, minimum, and maximum in the three tables above was expected. Similar to the playoff's variable, playoffs lagged had a mean of .533 for all three years. Revenue lagged dipped in Table 1, as the mean was at $213.53 million due to the 2020/2021 COVID season, in which the league generated lower revenue overall. Superstars lagged had a minimum of zero and a maximum of 3, with the mean ranging from .8 to .9333.

I ran three separate multiple-variable regressions over a time series, one each for the 2021/2022, 2022/2023, and 2023/2024 season. Each of the three regressions includes equation (2), the superstar estimator equation, which included data from the previous year. Each regression will run using Stata, and I used a p-value of $< .05$ to see which variables are statistically significant over a 95 % confidence interval. I have also used the White test for heteroscedasticity to determine if the variance in my

regression model was constant. The regression equation below (3) comes from equation (1) and equation (2)

Total Revenue=

b0 + b1(Revenuet-1) + b2(Playoffst-1) + b3(Market Size) +b4(Superstar t-1) +

b5(Win Percentage) + b6(Playoff) + b7(Total Tickets Sold) + b8(Average Ticket Price)

$+\in$ (3)

For the first year in the time series, I got a p-value of 0.0017, indicating that the independent variables are statistically significant on revenue over a 95% confidence interval. Ticket price was the only statistically significant variable. When I used data from the prior year for equation (2) for this first year in my time series, I used data from the COVID-19 season. While the NBA still played an entire season during the 2020-2021 season, many teams had restrictions on fan attendance for most of the season. This limited the total revenue for the league as the total revenue was down 3.61 billion during that season. As you will see, when I ran the other regressions, revenue lagged was statically significant as both other years produced a p-value of 0.0000, and during this first regression I got a P-value of 0.587. Table (4) shows you the rest of the P-values I got for the first regression. Besides ticket price, every other variable was not statistically significant. The R-squared value from the first regression was 0.6497, this R-squared value indicates a moderately strong relationship between the dependent variable and the independent variables in the model, as 64.97% of the variance in the dependent variables is explained by the independent variables in the regression. I used the White test of heteroscedasticity to check to see if there is heteroscedasticity in the regression. I got a value of .0959. Since the value is more then .05, I failed to reject the null hypothesis of homoscedasticity, meaning that heteroscedasticity is unlikely to be present. Table 4 shows the results after the first regression for the season 2021/2022.

TABLE 4- 2021/2022 Season Regression Results

Number of Observations	30
Prob > F	0.0017
R-Squared	0.6497
Adj- R-Squared	0.5163
Root MSE	72.582

Revenue	t	P>| t |	Coefficient
Market Size	0.54	0.595	10.4568
Playoffs Lagged	-0.04	0.977	-1.6549
Superstars Lagged	-1.95	0.065	-39.3411
Revenue Lagged Adjusted for Inflation	0.55	0.587	0.3331
Win Percentage	-0.52	0.606	-112.5637
Ticket Price	3.77	0.001	0.6913
Playoffs	1.74	0.097	98.1797
Total Tickets Sold	-0.85	0.404	-0.002713
_Cons	1.90	0.071	347.8673

Regression results obtained from data from NBA.com, Statista, Hoop Social, and Slam Online, using StataBE.

The second regression of the time series was for the year 2022/2023. For the overall regression, I got a p-value of .0000. Three independent variables were statistically significant over a 95% confidence interval during this year: revenue lagged, market size, and ticket price. revenue lagged, which is revenue from the year prior, has a p-value of .0000. Due to limited time from year to year, I expected not to see a significant change in a team's revenue. Market size was statically significant over a 95% confidence interval, as I got a p-value of 0.024. This is not surprising as market size directly impacts the potential pool of fans willing to spend money to watch the local team. "Market Size is a signal for demand" (Go, 2018). The third independent variable that was statistically significant over a 95% confidence interval was ticket price, with a p-value of 0.022. The higher a team can charge for tickets, the more money in ticket revenue a team can generate. It is interesting that total tickets sold was not a statically significant factor, due to the fact that most NBA teams are around the mean attendance. I ran the White test for heteroscedasticity and got a value of 0.5378, which is greater than .05. This means that I failed to reject the null hypothesis of homoscedasticity, indicating that it is unlikely that heteroscedasticity is present. Table 5 shows the results after I ran the regression for the season 2022/2023.

TABLE 5- 2022/2023 Season Regression Results

Number of Observations	30
Prob > F	0.0000
R-Squared	0.9426
Adj R-Squared	0.9207
Root MSE	30.092

Revenue	t	P>| t |	Coefficient
Market Size	2.43	0.024	19.3356
Playoffs Lagged	-1.72	0.100	-29.2319
Superstars Lagged	-0.01	0.991	0.1071519
Revenue Lagged Adjusted for Inflation	7.15	0.000	0.669674
Win Percentage	0.85	0.407	67.0970
Ticket Price	2.47	0.022	0.26538
Playoffs	-0.17	0.865	16.7381
Total Tickets Sold	1.04	0.310	.000013
_cons	-0.87	0.071	95.6951

Regression results obtained from data from NBA.com, Statista, Hoop Social, and Slam Online, using StataBE.

The final regression was for the season 2023/2024. Once again, I got a p-value of 0.0000, indicating that the independent variables are statistically significant. Only one variable had a p-value of below .05. Revenue lagged adjusted for inflation was the only variable that was statically significant over a 95% confidence interval. The t-value for revenue lagged adjusted was 12.61, much larger than any of the other t-values for any of the other variables, as all the other variables fall below the critical value of 1.96. The third regression also produced the highest R-squared value at 0.9573, indicating a strong relationship between the dependent variable and the independent variables in the model, as the independent variables in the regression explain 95.73% of the variance in the dependent variables. Finally, I ran the White test for heteroscedasticity, I got a p-value of .4140 which is >.05 p-value, failing to reject the null hypothesis of homoscedasticity, meaning that it is unlikely that heteroscedasticity is present like the other three tests. Table 6 shows the results after I ran the regression for the 2023/2024 season.

TABLE 6- 2023/2024 Season Regression Results

Number of Observations	30
Prob > F	0.0000
R-Squared	0.9573
Adj R-Squared	0.9410
Root MSE	24.845

Revenue	t	P>| t |	Coefficient
Market Size	-0.97	0.344	7.0942
Playoffs Lagged	-0.68	0.502	11.4716
Superstars Lagged	-0.91	0.371	7.5512
Revenue Lagged Adjusted for Inflation	12.61	0.000	0.0727
Win Percentage	0.40	0.694	56.232
Ticket Price	1.18	0.251	0.055415
Playoffs	-0.85	0.407	16.8945
Total Tickets Sold	-0.21	0.0838	0.0001
_cons	0.71	0.487	82.2950

Regression results obtained from data from NBA.com, Statista, Hoop Social, and Axios, using StataBE.

Overall, for the time series, each of the different regressions was statistically significant and had p-values below .05, with two of the three years giving me p-values of 0. For each regression, playoffs, superstars lagged, playoffs lagged, total attendance and win percentage did not significantly impact Revenue. Besides, in the first regression, which data came from the COVID-19-impacted season, revenue lagged had the most considerable significance on Revenue. The ticket price was statistically significant during the first two regressions, and the market size was statistically significant for the second regression. Each of the three regressions was checked for heterogeneity using the White test for heterogeneity, and each test got a p-value above .05, indicating heterogeneity was not a problem in any of the regressions.

6. Conclusion

The central hypothesis of this study (H1) states that teams with a greater number of superstars in the prior year will experience a statistically significant impact on franchise revenue. When I ran the regression analysis (Equation 3) across the three models, I obtained p-values < 0.05, indicating that the independent variables collectively have a significant statistical influence on revenue. However, the lagged superstar variable did not prove statistically significant, as the p-values (0.065, 0.991, and 0.371) for this variable exceeded 0.05 in all three regressions. The coefficients for the lagged superstar variable were -39.3411, 0.1072, and 7.5512. The negative coefficient of -39.3411 suggests a negative relationship between having superstars in the previous year and revenue, which I attribute in part to the exceptional constraints on revenue caused by the COVID-19 pandemic. The other two coefficients indicate a slight positive relationship between past superstars and subsequent revenue, but the economic impact of this relationship appears minimal.

I aimed to identify which variables contributed for the low p-values observed. My second hypothesis (H2) stated that market size would have a statistically significant impact on revenue. This hypothesis was only true in the second regression for the 2022/2023 season, where I obtained a p-value < 0.05 (0.024), indicating statistical significance. The coefficient of 19.3356 also suggested a strong positive relationship between market size and revenue. However, in the first and third regressions, 2021/2022, and 2023/2024 season, the p-values for market size were > 0.05 (0.595, 0.344), indicating that market size did not significantly impact revenue. Hypothesis three (H3), stated that total attendance would significantly affect revenue, this was not supported. The p-value for this variable was > 0.05 (0.404, 0.310,

0.0838) in each of the three regressions, indicating no statistically significant relationship. Furthermore, the coefficients for total tickets sold were close to zero, reinforcing the conclusion that total attendance had little to no impact on revenue. Hypothesis four (H4) suggested that making the playoffs, either the year prior or in the current season, would not significantly affect total revenue. This hypothesis held true, as the p-values for both the playoffs and playoffs lagged variables were > 0.05 (0.865,0.097, 0.407) for playoffs and (0.977,0.100,0.502) for playoffs lagged. The coefficients for playoffs lagged were negative in two out of the three years, implying a slight negative relationship between making the playoffs the previous year and revenue the following season. In contrast, the playoffs variable showed positive coefficients, indicating some positive relationship between current-season playoffs and revenue. Finally, hypothesis five (H5) stated that win percentage would not have a statistically significant impact on revenue. This was supported, with p-values > 0.05 (0.606,0.407, and0.694). Although the first regression showed a large negative coefficient of -112.5637, which I attribute to the pandemic's impact on revenue, the other two regressions yielded positive coefficients of 56 and 67, suggesting a positive relationship between win percentage and revenue. Despite these substantial coefficients, the lack of statistical significance led me to conclude that H5 is supported.

So, is it worth it for an owner of an NBA team to pay these superstar players massive contracts? Is the "LeBron Effect" isolated to a select few players and not all superstars? After running my regressions, I do not believe it is worth having superstars if you look at it from an economic perspective. Seeing the results from the regressions, specifically on the superstar-lagged variable, has led me to conclude that superstars are not worth the contract in terms of economic value. These players could

still bring on-court success, such as winning and making the playoffs, which I do believe is true. While LeBron might have a positive impact on his team's revenue, fans might be more enticed to watch teams who play together, although they might lack a superstar caliber player, play exciting team basketball. Teams might benefit financially from players outperforming their contract's value, players on rookie contracts and players who signed contracts lower than their market value. The value of their contract might bring in more revenue as owners do not need to pay these players as large of a salary as the players I used for this study.

This is just the beginning to the approach to see how superstar player in the NBA affect revenue. In future work I would like to adjust a few things. First, I would like to look at players who made the Hall of Fame to see how they impacted their team's revenue. How superstars are classified in this paper might be controversial to some, yet using the players in the Hall of Fame would be a better way to classify superstars. Second revenue is subject to external factors, finding a different dependent variable that is a more direct measure might lead to results that better answer the question. Finally, I would like to add more years, as Covid-19 did impact some of the variables in the study so as more data comes out for more years it would be interesting to see if what I found changes.

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