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Analysis of Consumer Demand for American Sports Leagues

Sam Healy

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Claremont McKenna College

Analysis of Consumer Demand for American Sports Leagues

To be submitted to
Professor Vossmeier
and
Professor Pedace

By,
Sam Healy

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ABSTRACT

Long before the first pitch is thrown, the first snap is taken or the first puck is dropped, organizations in the professional sports industry set their ticket prices. The secondary ticket market, on the other hand, has grown into a billion dollar industry and gages the consumer's true willingness to pay. This study examines the myriad of factors that influence the secondary market ticket price of a professional sports game across the MLB, NFL, NBA, and NHL during the 2013-2014 regular season. Using median ticket prices from a secondary market ticket aggregator, the results indicate that weekend games and the expected quality of the away team significantly impact median ticket price. If the game is played during the last month of the season, median ticket prices decrease by 17%, unless the home or away team was a playoff team the year before. Furthermore, games that include a home team where one or two players are among the top ten in jersey sales are associated with higher median ticket prices.

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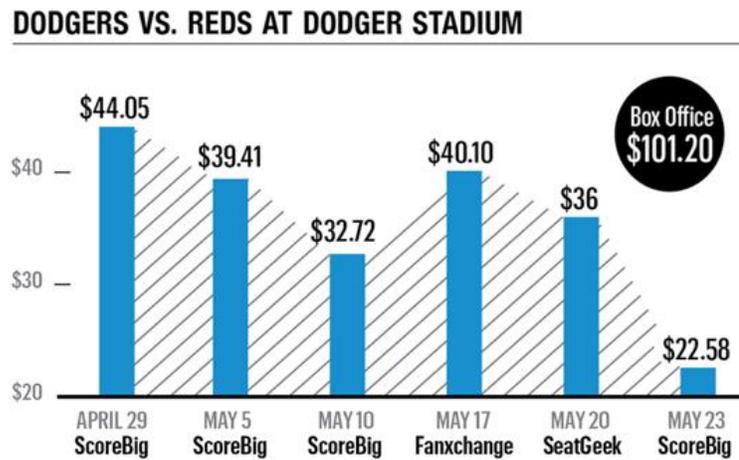
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I. INTRODUCTION

The secondary ticket market for live events has increased dramatically in the last decade. With consistent growth since the early 2000's, the secondary ticket market is estimated to be worth about \$15 billion, according to Sports Marketing Quarterly (2017). Major firms in the market have experienced the same growth. As of 2013, Stubhub has their name on a 27,000 seat professional sports stadium in Santa Clara, CA. Ticketmaster and Stubhub have both developed huge partnership deals with the NFL, NBA, NHL and MLB. The partnerships give these companies the rights to sell and resell the league's primary and secondary market tickets and serve as the official ticket marketplace for the professional franchises. As a result, the online secondary ticket market has become the ideal place for a fan to visit when s/he is looking to attend a live sporting event.

As time passes, the product that is expected to go onto the playing field, court, or rink changes. Players can get hurt during the days leading up to the game, lineups can change to where your favorite player is now delegated to the bench, and even the weather forecast is a factor that affects fan's expectations of the quality of the game. As the product changes, the demand for it and its value in the eyes of the consumer naturally changes as well, as demonstrated in Figure 1. According to consumer reports, as an event draws near, the ticket prices for a particular seat can experience a great deal of fluctuation.

Figure I: graph from consumerreports.org highlighting the fluctuating secondary market ticket prices for an MLB game depending on the date



The quality of play, during the length of an entire season, will vary enormously from game to game. Some games are inherently more popular than other games because of a rivalry or a certain players' celebrity. As a result, each game should be viewed as a unique product. Professional franchises have to set their ticket prices months before the season begins. They look at every seat within their stadium and assign it a face value for that season. No one can predict what the demand will be for a game three-quarters of the way into a season. For a fan, the face value is often not the same as the ticket value. That is where the secondary ticket market enters the equation. It capitalizes on an organization's inability to predict the future and provides a forum where buyers and sellers agree upon a thoughtful price minutes before tip-off. The secondary market reveals at what time and cost people will buy and sell tickets for a particular game, whereas the primary ticket market does not. Companies, like the two previously mentioned, make it relatively painless to both buy and sell tickets on their websites. Thousands of buyers and sellers converge on these secondary ticket market online platforms, making transactions from the moment the tickets are released up until the moment the game ends. There are hundreds of secondary market

platforms that offer a wide variety of tickets at a wide variety of prices. Thus, the secondary market is a great place to observe actual consumer demand and willingness to pay for a professional sports game.

Since dynamic pricing is a rather new phenomenon within the sports industry, this study seeks to provide a modern look into what characteristics, across games and professional sports leagues, consumers value most. Previous ticket pricing studies have focused predominantly on the primary market. Rische and Mondello (2003) proposed that “only changes in the demand for a given team’s tickets will cause that team’s ticket prices to change” (p.73). What shifts the demand, the authors further noted, is the consumers’ tastes and expectations for the game. The nature of the sports industry is that demand fluctuates from game to game and even day to day (Rascher, McEvoy, Nagel & Brown 2007). Therefore, the ticket price found in the secondary market is the true price that a fan is willing to pay for a game in that point in time. These prices encompass the fans perceived value of a game and accommodate for the quality of the teams, any star players, day of the week, and many more characteristics.

The current study looks at the median ticket price of each 2013-2014 regular season game across the MLB, NFL, NBA and NHL, and investigates whether or not factors like, last month of the season or a team’s net worth influences those prices. By using data from a secondary market ticket aggregator, the prices used to calculate the median ticket price for each game were obtained from various primary and secondary market sources, which means having a much bigger sample size and along with up-to-date prices. This provides a more accurate depiction of how and which specific factors affect consumers’ willingness to pay for games and for specific sports leagues.

Unlike previous research, this study investigates which unique regular season game characteristics consumers value across the four major American professional sports leagues. We plan to establish which leagues fans perceive have a higher value compared to others, and, if there are changes to a consumer's perceived values when specific players are featured a game. From the results of this study, we hope to achieve a better understanding of what particular game and league characteristics drive consumer's tendency to pay more or less than the regular, or set, price. In addition, this study implements original explanatory variables to better explain why consumers value some games and league more than others. This provides valuable insight for professional sports leagues and franchises alike, into what the general sport consumer, as well as fans of a specific sport, value in a game. Each of these professional sports leagues can evaluate what they offer that their consumers give more weight to as compared to one of the other professional leagues. If the seasons overlap (as do the NBA and NHL), the leagues can then market themselves differently knowing what their consumers will be interested in. The variables manipulated in this study highlight consumer trends, which will allow the leagues and franchises to more efficiently price their tickets and everything else, (i.e. memorabilia, food & beverage etc.) that surrounds a game in this billion dollar industry.

Other industries have been able to capture the fluctuating demand using a concept called dynamic ticket pricing. The idea of dynamic ticket pricing is to regularly alter prices in order to capitalize on times when demand is high and ensure sales when demand is low. For example, prices for the same hotel room or for a seat on a flight are determined by a variety of factors and will fluctuate up until the room is booked or the flight takes off. Hotels will increase their prices on the weekend of college graduation because they know

hundreds of families will be coming into town and will need a place to stay. Whereas the price of a ticket for a seat on an airplane, investigated by Beat and Fuchs (2004), is dynamically set to adjust over time based on the number of remaining seats and observed demand. Typically, airline tickets are more expensive on select days of the week when more people are traveling. Oddly, this strategy had not been used in professional sports until 2009 when the San Francisco Giants implemented dynamic ticket pricing as their strategy.

Dynamic ticket pricing allows companies to take advantage of consumer demand. And now, professional sports franchises are moving towards dynamic ticket pricing strategies for their products. Rische and Mondello (2003) acknowledge that the pricing strategy will vary from team to team and league to league. In 2010, the San Francisco Giants fully implemented this strategy and recognized a 7% revenue increase compared to the year before. However, the organization also noticed that there were still a considerable number of Giants' tickets being sold in the secondary market. Thus, even in a dynamic ticket pricing environment, the secondary market continues to play a pivotal role for the consumer. Using data from the time when dynamic ticket pricing was just coming onto the sports industry, this study will highlight variables that not only help explain what drives consumer demand between games, but also between the biggest sports leagues in the world.

II. LITERATURE REVIEW

The literature available on factors that contribute to the setting of professional sport ticket prices is slowly becoming more prevalent as dynamic ticket pricing is becoming the

new norm. However, previous studies tend to focus solely on the primary market where franchises have priced their tickets far in advance to the start of their season.

Research done by Hansen and Gauthier (1989) discusses factors that affect attendance at professional sports games across various North American sports leagues such as Major Indoor Soccer League, National Hockey League, and the Canadian Football League, among others. The authors compiled a questionnaire describing forty attendance factors and asked team representatives to rate which factors they believed to have had the most influence on game attendance. The two items voted most responsible for increasing attendance on a per game basis were those concerning the home team's involvement in competing for first place as well as the quality of the opponent. The two leagues, NFL and MLB, accounted for most of the differences between attendance factors.

The research by Reese and Mittelstaedt (2001) is one of the earliest works that addresses ticket-pricing strategies within a professional sports league, specifically, the National Football League. The researchers developed a(n) electronic questionnaire regarding the process that an organization goes through to establish ticket prices for their NFL team. Following the 1998 season, they submitted their questionnaire with their goal being two-fold: to determine whether the organizations followed some standardized process to price their tickets, and which factors the pricing administrators (i.e., the people within each organization that determine their team's ticket pricing strategies) considered the most important when devising a pricing strategy for the upcoming season. Their results showed that team performance from the previous season was the most significant element that influenced the ticket pricing administrators' decisions. Although this study had direct access and data from the people who are responsible for pricing tickets in the primary

market, the survey methodology used does not reveal the true relationship between ticket prices and price fluctuations among teams in the NFL.

This research was extended by Rische and Mondello (2003) when they created an empirical model that identifies factors that cause differences in ticket prices across teams in the NFL. This study used primary market data from the year 1996 to 2001. What Rische and Mondello concluded was that factors such as playing in a new stadium, previous year's success, fan income levels, and population size of the home team's city were major contributors to the variation in average ticket prices. Furthermore, this study found that neither the size of the team's payroll nor seasonal changes in the team's payroll significantly affect ticket prices across teams. Nonetheless, using data from the primary market, this study cannot make any conclusions as to what consumers value.

Rische and Mondello (2004) continued their research by attempting to explain cross-sectional differences in ticket prices among teams across the four major American sports leagues: NBA, NHL, NFL, and MLB. The study uses sample data from the years 1996-2002. Their study showed that team payroll does significantly affect cross-sectional ticket price differences in the MLB and NBA where the correlation between winning and team payroll is strongest in the MLB. The team's payroll did not play a significant role in the NHL or NFL ticket pricing strategies. Moreover, as reported by this study, a variety of factors impact primary market ticket prices including previous year's success, the home city's level of income, and the home city's population. Although the data set incorporates multiple seasons from all four leagues, there remain some minor discrepancies. For example, the salary cap rules have changed, new organizations have formed, the authors were not able to obtain data from all of the teams, and the NHL experienced a lockout

during one of the seasons in question. The current study's data is exactly that, current, with up-to-date metrics and a complete season of games from every team in all four leagues.

From the results of Paul and Weinbach (2013), variables such as day of the week, the quality of the opponent, in-game promotions, starting pitcher, and weather all play significant roles in dynamic ticket pricing in the MLB. This study focused on ticket prices from only four MLB teams during the 2011 baseball season. The authors concluded that dynamic ticket pricing can illustrate a fan's true willingness to pay for specific game characteristics, but limits the fan to the face value the team has set. The secondary market has no limitations. Rascher et al (2007) demonstrates how the secondary market can fluctuate all the way up to the day of the game with regression and elasticity analysis of every MLB team in the 1996 season. Their research determined that if every team were to use variable ticket pricing as their pricing strategy, *ceteris paribus*, each team would have yielded an average of approximately \$504,000 per year in additional ticket revenue. Some MLB teams have now "concluded that their 81 home games are not 81 units of the same product, but rather... are 81 unique products. As such, the 81 unique products should each be priced according to their own characteristics" (Rascher et al 2007).

Thus far, previous research has shed light on the determinants of ticket pricing strategies that affect only the face value of tickets in the primary market. These ticket prices express the revenue needs and focus of the sports franchises and do not reflect the true consumer demand. Fans value these tickets differently than the organizations pricing them. Drayer and Shapiro (2009) is one of the first studies that examined potential factors that influence fans' perceived value for NFL playoff games during the 2007-2008 season. This study "is the first 'value determination' investigation, which looks at the prices fans are

willing to pay and the factors that influence their willingness to pay” (Drayer and Shapiro 2009). Using prices from www.ebay.com, the authors found that for NFL playoff games, face value of the ticket, population of the home city, and the total number of secondary market transactions for the game were the strongest predictors of the ticket prices in the secondary market.

Drayer, Rascher and McEvoy (2012) also examined secondary market ticket prices using data from all 32 teams during the 2007–2008 NFL regular season. The authors obtained game-by-game average ticket prices and the number of tickets sold from a secondary market firm. They concluded that there is a “tremendous gap in primary and secondary market pricing” (Drayer, Rascher and McEvoy 2012). Ticket prices fluctuate dramatically in the secondary market based on the characteristics of each game. The data accumulated by the authors only covered about 5% of all seats in the NFL. The study also reported that resellers of these NFL tickets captured approximately \$260,000 worth of consumer surplus per game in the secondary market - demonstrating a small portion of the total value this market has.

The current study will add to the existing literature by exclusively analyzing secondary market ticket prices across the four major American sports leagues. This study illuminates what specific factors drives consumer demand. The prices used from each game in this study are established by consumer’s willingness to pay for each game. This model highlights various game and community characteristics that consumers consciously or unconsciously deem valuable. As a result, the conclusions made in this paper can be utilized by sports organizations and ticketing companies around the world as how to more

accurately price their tickets for professional sports games, and what demand to expect from consumers depending on the characteristics of the host city or the teams featured.

III. DATA

The data set used in this study utilizes the median ticket price of every game across the four major American sports leagues during the 2013 – 2014 regular season. This data was collected from a secondary market ticket aggregator, SeatGeek. SeatGeek is a secondary market ticket resale platform that offers customers various price points from numerous primary and secondary market sources (i.e. StubHub, eBay). The data does not include season ticket prices nor differentiates between seat quality – just the median ticket price gathered over time for each game. Nonetheless, season ticket holders are not representative of the true consumer demand. These tickets are usually purchased far in advance, well before the season starts. There are also some stadiums that have a greater number of premium seats compared to others that may have a larger percentage of general admission seats. By using the median ticket price, we hope to control for some of the variation in the number of tickets sold at different seat quality throughout the individual stadiums. Other observations were eliminated due to their uniqueness which we believe is not representative of the standard regular season game for that sport (ex: NFL game in London, NHL outdoor games). While the current data set used in this study represents a larger subset of the secondary market, it is not representative of the entire market. One must acknowledge that this data was acquired from a single source looking at a single regular season, thus, generalizing findings from this study to the secondary market as a whole may not entirely be accurate.

The data used in this study includes 5,132 observations, one price for each regular season game played in 2013-2014 across all four major sports leagues: MLB, NBA, NHL and NFL. Each observation in the data set specifies which (two) teams played, which team was home, the median ticket price for that game (dependent variable), and on what date the game took place.

Fourteen explanatory variables were then created for this study in an attempt to explain fluctuations in the median ticket price across different games and different leagues. Data on the explanatory variables came from a variety of sources. First, variables that describe the home team's city and community were acquired from Statistics Canada for the Canadian cities used in this study. It offers population and median household income data for 2014. Population and median household income for the U.S cities was obtained through datausa.com, which utilizes the Bureau of Labor Statistics, The American Community Survey, and the Public Use Microdata Sample. Population of each professional franchise's city was a commonly used explanatory variable in previous literature as a proxy for demand. The larger the potential fan base and audience for a given team, the larger the demand is to see the team play, thus, higher ticket prices. Then, we predict that higher median household incomes will yield higher median ticket prices because the more affluent the local community, the higher the ticket prices can be. Similarly, a cost of living index was obtained for all of the cities observed in this study. Numbeo.com provided this data where each city's index was put in relation to New York City's index of living value of 100. A city's cost of living index measures the differences in prices of goods and services in that city. It is hypothesized that the higher the cost of living, the higher the median ticket prices.

Next, we gathered data that focused on the venue and the team. The total capacity for each stadium was used to get a sense of how many total tickets a team could offer in the market. The more tickets a venue can support could affect the demand for tickets to that venue. Additionally, the average stadium attendance for each team was retrieved from Espn.com to get an idea of how full the venues usually get. *Ceteris paribus*, teams that have a tendency to fill their stadium more often will have higher ticket prices than teams that do not. We believe that the higher the average attendance the higher the median ticket prices. Forbes.com contains all of the team's total net worth figures for 2014. The greater the teams' worth, the higher their median ticket prices should be to see them play. Furthermore, this study included a unique dummy variable; where a value of one identifies that the home team has a player in the top ten jersey sales for the season, and a value of zero if the home team does not have any top ten players. The data was gathered from three sources: cardboardconnection.com for the NHL and NBA 2013-14 regular seasons, nfl.com for the NFL, and axs.com was used for the top selling MLB jerseys during the 2014 season. It is hypothesized that the median ticket prices will be higher for games where there are one or more players playing that are in the top 10 jersey sales.

Whether or not the Home or Away team made the playoffs the year before is a dummy variable in this study used to measure the expected quality of the teams, and, thus, the game. Teams that are more successful in the previous year are likely to have higher ticket prices than teams that are not successful because fans will be willing to pay more to watch a higher quality product. Finally, one measure of the importance or level of excitement towards a game is whether the teams playing each other are rivals. Most of these rivalries exist between at least two teams in the same division. Thus, a dummy

variable was constructed denoting whether or not the game is a divisional game. A divisional game usually produces a rivalry between teams regardless of the sport. We predict, as in previous studies, that a divisional game is associated with higher median ticket prices across all four sports.

The last month of the regular season is also characterized as a dummy variable with the idea in mind that in the last month, whether the team was a playoff contender or in last place, ticket prices would fluctuate. We hypothesize that a playoff caliber team from the season before will increase ticket prices in the last month of the season. We construct an interaction term between home & away team playoff team last season and the last month of the season variables to observe this relationship. Another explanatory variable used in previous literature was day of the week. In this study, whether or not the game was played on a weekend serves as a dummy variable with a value of one if the game was played on Friday, Saturday or Sunday, and zero if the game was played on any other day of the week. We expect a weekend game to have higher median ticket prices. Lastly, the four sports leagues are utilized in two ways in this research. The first way is in a pooled regression where the MLB, NHL, and NBA are regressed in relation to the NFL's median ticket prices. Second, the four leagues are separated and four different regressions are run analyzing consumer demand across the individual sports leagues. We believe that the NFL will be the most expensive league with the highest median ticket prices in relation to the NHL, MLB, and NBA because of its tendency to sell-out compared to the other leagues.

As shown in Table 1, the average median ticket price from this data set is \$62.5. The range of values span from a maximum median ticket price of \$423 (an NFL game played in New England between the Denver Broncos and New England Patriots) to a

minimum median ticket price of \$14 (an NBA game played in New Orleans between the Atlanta Hawks and the New Orleans Pelicans). Stadium capacity has a large scope ranging from the 82,500 seat MetLife Stadium where the New York Giants and Jets call home, to 11,093 seats at the Scotiabank Saddledome where the Calgary Flames play. Approximately half of the games in this study are played on a weekend, which is partly due to the NFL scheduling almost all of their games on Sundays. The Indiana Pacers hold the lowest team net worth figure at \$139 million, compared to the Dallas Cowboys whose net worth equals \$3.2 billion. Washington DC maintains the highest index of living at 100.38, where Milwaukee has the lowest value at 67.75. The average is 82.5. Less than 40% of the games in this study are divisional games.

Similarly, less than 40% of the games played involve either a home or away team playoff team the year before. Games that are played during the last month of the season incorporate almost 18% of the observations. Median household income is lowest in Detroit at \$25,980 and highest in San Francisco at \$92,094. The average median household income across the professional franchise's home cities is \$52,000. A city's population had a wide range of values as well. Uniondale, NY, where the NY Islanders play, has the smallest population 25,092. While New York City bears the largest population at 8.5 million. The average population size in this study is 1,472,450. About 27% of teams have one player in the top ten jersey sales for the year, and 5% of teams have two players in that category. From the entire data set, descriptive statistics for each league can be found in the appendix. Games played in the NFL make up only 5% of the observations (Table 1A), the MLB 47% (Table 4A), and the NBA (Table 3A) and NHL (Table 2A) both encompass around 24% of the total observations with a little over 1,200 games each. The data, thus, contains a great

deal more MLB games relative to the other three sports leagues with the NFL constituting a very small portion of the observations.

Table 1: Descriptive Statistics

<i>Variable</i>	<i>Mean</i>	<i>Standard Deviation</i>	<i>Min</i>	<i>Max</i>
Median Ticket Prices	62.536	47.248	14	423
Stadium Capacity	33539.85	15704.48	11,093	82,500
Weekend Game	0.4929	0.4999	0	1
Net Worth (\$ millions)	741.6247	428.222	139	3,200
Index of Living	82.5127	9.1674	67.75	100.38
Divisional Game	0.3681	0.4823	0	1
Average Attendance	82.8735	17.1935	42.4	117.6
Away Team Playoff	0.3852	0.4867	0	1
Home Team Playoff	0.3917	0.4881	0	1
Last Month of Season	0.1795	0.3838	0	1
Median Household Income	52000.82	16342.13	25,980	92,094
Population	1,472,450	1,984,801	25,092	8,550,000
Player in Top 10 Jersey Sales	0.2746	0.4463	0	1
2 Players in Top 10 Jersey Sales	0.0567	0.2313	0	1

IV. METHOD

The cross sectional analysis performed in the study addresses what factors cause variation in game-to-game median ticket prices across sports leagues. This model is unique compared to previous models and studies that investigate fluctuations in ticket prices in professional sports due to the modern data acquired from both the primary and secondary market, combined with original explanatory variables. The linear model in consideration follows the format:

$$y_i = x_i' \beta + \varepsilon ,$$

where y_i is the log of median ticket prices and x_i is a vector of controls that includes the log of stadium capacity, weekend game (dummy), log of the home team's net worth (\$ millions), log of index of living in the city the game is played, divisional game (dummy), the log of average attendance of the home team's games, away team a previous playoff team (dummy), home team previous playoff team (dummy), last month of the season (dummy), log of median household income of the home team's city, population of home team's city, a player (home team) in the top 10 in jersey sales (dummy), two players (home team) in the top ten in jersey sales (dummy), if the game was played in the MLB, NHL, NBA, or NFL, and then two interaction terms using the last month of the season with both the home and away team playoff team the year before. The model is estimated by ordinary least squares.

Most of the eighteen independent variables created for this study were inspired by previous research that focused primarily on factors that influence the primary ticket market. Since this research contains observations from across different sports, the variables had to be generalized and applicable to each sport. Demographic factors include Population of the

home team's city and the home team's Stadium Capacity. Variables such as Divisional Game, Weekend Game, Home or Away Team a Playoff Team the season before, Average Home Team Attendance, Last Month of the Season, Net Worth of Team, and whether or not a team had one or two players in the Top 10 Jersey Sales all help account for the attractiveness of the game. Then, Median Household Income of the home team's city and the Index of Living of the home team's city describe the economic factors surrounding the environment the game is played in. Lastly, in which professional sports league the game was played, was also recorded as an independent variable. Each league is defined by a specific number. In the end, because it is predicted that the NFL would be the most expensive, the primary regression model is run using the MLB, NHL and NBA league variables in relation to the NFL's ticket prices.

Once these are recorded, the variables Stadium Capacity, Net Worth, Average Attendance, Median Income, Population, Index of Living, and Median Ticket Prices are all transformed into logs. This allows the coefficients to be interpreted as percent change in median ticket price. In order to get a better understanding of how the last month of the season affects ticket prices when the team is predicted to be competitive, the last month of the season dummy variable is combined with both home and away team playoff team dummy variables to generate two interaction terms.

The Breusch-Pagan test for heteroscedasticity is run, which suggests the model is heteroscedastic. Thus, White's robust standard errors are used. When considering model specification, the Akaike Information Criteria (AIC) is computed. The information criteria tells us the quality of one model specification relative to another specification.

Regressions are then run for each individual league to determine what factors influence which leagues individually and to highlight any significant differences in consumer preference between them.

V. RESULTS

Table 2 provides the regression results for each of the independent variables in this study. In an attempt to uncover the determinants of cross-sectional differences in median ticket prices, this model has an R-squared of 52%. Fourteen of the eighteen independent variables are statistically significant to median ticket price values at the 5% level.

Stadium capacity, Divisional game, Average home game Attendance, and Median household Income are the four variables found to be insignificant in this model. Once this study controls for factors like the quality of the teams, when the game is played, and certain aspects of the home city, stadium features seem to lose their significance. Especially since the other independent variables have such strong significance to median ticket prices, we believe there is some overlap in the original model, specifically between the average attendance and stadium capacity variables. Furthermore, because index of living is strongly positive, this could potentially override the median household income variable in the model. Also, dependent on the season each team is having, divisional games could have resulted in lopsided non-competitive matchups. The rivalry game is not nearly as exciting when one team is expected to blow out the other. This goes back to one of the limitations of this study, only analyzing one regular season. These could all be some of the causes for the insignificant results.

Reviewing each factor that affects secondary market median ticket prices, both variables home and away team playoff team the prior season have positive significant effects; however, their effects differ immensely in their magnitude. If the home team was a playoff team the season before, median ticket prices go up by 6.2%, compared to a 21.5% increase if the away team was a playoff team the season before. These results are as predicted. First, when a high ability team plays, no matter if they are the home or away team, they offer a higher quality product for the fan. This results in a positive coefficient with median ticket prices. Second, the consumers demand to watch the home team play is already relatively set in their minds as they know who the home team is going to be. The median ticket price is originally catered to the home team's quality. The unknown is who the home team plays against. When a high caliber away team is expected to play people are willing to pay more money to be able to witness what they expect to be a better, more competitive game. The away team triggers the price change which explains why the away team playoff team variable's coefficient is larger than the home team playoff team coefficient.

A team's total net worth is significantly correlated to median ticket prices. For every one percent increase in a team's net worth, the median ticket price goes up 0.25%. The teams that have the highest net worth's for their respective leagues are the ones who have large fan bases, a rich history, and usually boast a winning record. Some fans want to see these special franchises in action and will pay more to do so. However, there could exist reverse causality. Most of these high net worth teams are based out of large metropolitan areas such as New York, Boston, and Los Angeles. It could be the case that median ticket prices are higher for the games that feature these organizations to help pay

for the organization's expenses, or because the cities where the teams are located maintain a higher index of living.

Accordingly, the variable index of living also has a similar dilemma. The popular and wealthier teams play in more populated and wealthier cities. These cities have larger markets and, thus, can support higher median ticket prices. Nonetheless, the results indicate that index of living of the home team's city is positively correlated with median ticket prices. A one percent increase in a city's index of living results in a 0.79% increase in the median ticket price. Population, as predicted from previous literature, also has a significant positive effect on median ticket prices. Specifically, median ticket prices increase 0.08% for every one percent increase in the population. It is important to note that although population and index of living focus on consumers within the city of the home team, it is expected that people from outside of the city also purchased tickets to these games and help determine the demand in the secondary market. It is anticipated that the majority of the ticket buyers are people who reside in the city, however, the interpretation for the significant results surrounding the city's demographics should consider that buyers may have been located outside of the home team's city.

Next, both having one player in the top 10 in jersey sales and two players in top 10 jersey sales maintain positive significance. If the home team has one player in the top 10 jersey sales for the entire league that season, the median ticket price goes up 10.6%. If the home team has two players in the top 10 jersey sellers then median ticket price goes up 12.5%. The results are as expected and capture the consumer's willingness to pay to witness specific players. Players in the top ten in jersey sales for the year are not only the most popular by default, but are also some of the best players in the world in their respective

sports. Demand is higher to watch the best players in the world compete on the biggest stage. The bigger and more popular the star, the more people want to see him play. Games played on a weekend, as hypothesized, increase the median ticket price by 24%. This result confirms previous study's findings that weekend games are innately more expensive due to their naturally higher demand. The weekend is a time when individuals are usually off from work and have the time and energy to attend a live sporting event. It is usually the most convenient time for people, and, therefore, adds value to the game and increases median ticket prices.

During the last month of the regular season, median ticket prices go down 17%. Generally, games played at this time are irrelevant and, therefore, less competitive and less desirable to attend as a fan. The majority of teams do not even qualify for the postseason, hence, the negative coefficient. Thus, the interaction terms were created to capture the excitement around a team potentially bound for the playoffs. Both interaction terms (Last Month of season and Away team Playoff team & Last Month of season and Home team Playoff team) have positive effects on median ticket prices. First, if the home team was a playoff team the year prior, and it is in the last month of the season, median ticket prices go up 17%. Whereas if the away team was a playoff team last year and it is the last month of the season, the median ticket prices go up 11%. It is safe to assume that the fans want to see their home team make it into the postseason. That is the goal for any team and fan alike. When it boils down to the final few games in order to determine which team goes to the postseason, tensions are high on both sides and the games are often dramatic. Sports fans dream for the big moments that these kinds of games can produce. As a result, the demand for these games are higher, pushing median ticket prices up. These results highlight the

differences in consumer demand when a team is winning towards the end of a season, versus when a team is losing and has no promise for the postseason.

We believe that these results in particular would be more accurate and telling if the two playoff variables did not signify a playoff team from the year before, but in fact, a playoff team from this current season. The same teams that made it to the playoffs last year will certainly not all make it to the playoffs this year. Nonetheless, we still believe that these two variables (home and away playoff teams) highlight the intended effect and capture a team's quality. Usually, a team that qualifies for the playoffs the previous season remains a competitive one the following season.

Lastly, this model is executed in relation to the NFL's median ticket prices. The MLB, NBA and NHL league dummy variables are all statistically significant and have negative coefficients. It was hypothesized that the NFL would be more expensive relative to the other three leagues since there are a lot fewer NFL games per season. A game played in the MLB results in a 87% decrease in the median ticket price. If the game was played in the NBA, the median ticket price goes down 55%, and if it was an NHL game, the median ticket price drops by 34% in relation to the NFL's ticket prices. We believe that NHL median ticket prices are most closely related to the NFL's median ticket prices because the view from the top tier seats at a professional hockey game are not as lousy as top tier seats of an NBA or MLB game. The view from the upper deck at a hockey game has its perks: you are able to follow the puck better and it offers a unique vantage point. This logic can also be applied to the NBA, however, one can feel lost being up in the rafters. The NBA and NHL viewing experience are marginally different. Whereas baseball stadiums have a wide variety of seats including bleacher and upper deck seats that cost very little. A top tier

view at a baseball game can make one feel like they are miles away from the action and only feet away from the sun.

Table 2: Regression Results
* indicates significance

<i>Explanatory Variables</i>	<i>Coefficient</i>	<i>Robust Std Error</i>	<i>p-value</i>
Stadium Capacity	0.0034	0.0049	0.495
Weekend Game*	0.2382*	0.0116	0.00
Net Worth (\$ millions)*	0.2541*	0.0237	0.00
Index of Living*	0.7936*	0.0671	0.00
Divisional Game	0.0185	0.0123	0.131
Average Attendance	0.0597	0.0429	0.164
Away Team Playoff *	0.2154*	0.0135	0.00
Home Team Playoff*	0.0625*	0.015	0.00
Last Month of Season*	-0.1692*	0.0218	0.00
Median Household Income	0.0199	0.0213	0.351
Population*	0.0827*	0.0077	0.00
Player in Top 10 Jersey Sales*	0.1063*	0.018	0.00
2 Players in Top 10 Jersey Sales*	0.125*	0.0375	0.00
Last Month x Home Team Playoff*	0.1705*	0.0309	0.00
Last Month x Away Team Playoff*	0.1161*	0.0318	0.00
MLB*	-0.8731*	0.0344	0.00
NBA*	-0.5535*	0.0372	0.00
NHL*	-0.3414*	0.0387	0.00

Estimating the relative quality of the model used in this study, the Akaike Information Criterion (AIC) is calculated. Illustrated in Table 3, the original model specification in this study garners an AIC value of 5495.906, compared to the AIC value of 5606.434 from the model that discounts the five unique variables to this study. A one-hundred point difference in the AIC is substantial and demonstrates the higher quality of the model. The inclusion of the variables Last month of season, having one or two players in Top 10 in jersey sales, and the two interaction terms between the last month of season and home and away team playoff teams establishes this model as a more accurate predictor of median ticket prices across the four leagues.

Table 3: Model Comparison using Akaike Information Criterion
 unique variables to this model include Last month of season, Player(s) in Top 10 in Jersey Sales, and the two interaction terms between Last month of season and the home and away playoff team variables

	<i>Original Model</i>	<i>Model without unique Variables</i>
Degrees of Freedom	19	14
R-squared	0.5167	0.5053
AIC	5495.906	5606.434

Four separate regressions are then run for each individual league using the same independent variables as in the original model as seen in Table 4 (disregarding the league dummy variables). One can observe which characteristics consumers value more or less depending on what sport they are watching.

NFL

First, what factors contribute to the variation in the NFL's median ticket prices are considered. This model contains 252 observations and has an R-squared of 54%. If a team has one player in the top ten jersey sales for the season the median ticket price increases

by 41%. If a team has two players in the top ten jersey sales then median ticket prices decrease 71%. This negative relationship can be explained by the fact that there is only one team in the data set that falls under this category, and that is the Dallas Cowboys. A game during the last month of the season results in a 27% drop in median ticket prices. This expresses the consumers' preference to watch football games from somewhere else other than the stadium when your team is most likely finishing up its disappointing season.

Other variables that significantly correlate to the NFL's median ticket price include away team playoff team, the home team city's population, average attendance, and the team's net worth. An away team a playoff team the season prior generates a 16% increase in median ticket prices for the NFL. The home team city's population significantly correlates with NFL median ticket prices, where every percentage increase in population results in a 0.09% increase in median ticket prices. For every percentage increase in average attendance the NFL's median ticket price significantly increases a little over 2%. Average attendance fluctuates marginally in the NFL; so, for every small percentage change that attendance undergoes, median ticket prices experiences a relatively large over 2% increase, capturing the intense demand that exists for NFL games. As a franchises net worth increases one percent, the median ticket price increases 0.58%. On the other hand, stadium capacity, index of living, weekend game, divisional game, home team playoff team, median household income of home team's city, and the two interaction terms - last month of the season home and away team playoff team - all result in insignificant values.

Stadium capacity has no significance on median ticket prices on account that almost every game is filled to capacity in the NFL. Moreover, since almost every game in the NFL is played on a Sunday, it makes sense that weekend games are insignificant in this

regression. Although divisional games are expected to be highly touted and publicized games in a team's regular season, the variable's insignificance illustrates how every game in a team's season is important in the NFL. The consumer's willingness to pay does not significantly change when there is a rivalry game. The consumer is simply seeking competitive football. This does not hold true in the NHL, however.

NHL

In a regression focusing solely on the NHL, the dummy variable that indicates the home teams that have two players in the top ten jersey sales has the greatest influence on median ticket prices out of any variable in this study, increasing ticket prices more than 80%. The two teams that have two players in the top ten in jersey sales in the '13-'14 NHL season are the Pittsburgh Penguins and Chicago Blackhawks. These are two very loyal fanbases that have experienced a great deal of recent success which explains the correlation to high median ticket prices. Meanwhile, the NHL's median ticket price decreases almost 35% when the home team has only one player in the top ten jersey sales. We predict that if the variable instead accounted for the players in the top ten jersey sales on the away team there would be a stronger and positive correlation to median ticket prices, because fans would pay more to see popular players that they do not normally see. If a game is played on a weekend in the NHL, the median ticket price increases 28%. A team's net worth is significant, where a one percent increase in the net worth of the home team results in a 0.43% increase in median ticket prices. For every percentage increase in average attendance median NHL ticket prices significantly increase 1.01%. Then, median ticket prices increase 1.64% for a one percent increase in index of living in the home team's city.

This result reflects the consumer's ability to pay for a ticket when a game is played in a wealthier city.

Next, if the game is a divisional game, median ticket prices increase 9.3%. With fighting being a part of the game, a rivalry only enhances the probability of a fight and increases the intensity in an already hard, tough, and violent sport. Fan's will pay more to see what they expect to be a physical battle. The population of the home team's city is significantly correlated to NHL median ticket prices as well. A one percent increase in a city's population produces a 0.12% increase in median ticket prices. If the away team was a playoff team the year before, median ticket prices increase 17%. The home team's stadium capacity has a significant negative result in the NHL. Median ticket prices decrease .31% for every one percent increase in stadium capacity. Lastly, if a game is played in the last month of the regular season and the home team was a playoff team the season prior the median ticket price increases 19%. The other explanatory variables, home team playoff team, last month of season, median household income, and last month of season interaction term with away team playoff team all have insignificant results. From 1,225 observations, this regression garnered an R-squared of 62%.

NBA

In the 1,230 observation data set for the NBA, nine out of the fifteen variables are statistically significant and result in a 60% R-squared. If the away team was a playoff team a year ago median ticket prices increase 48% whenever they play. Whether the home team was a playoff team also significantly affects median ticket prices, resulting in an 8% increase. The dummy variable describing teams that have two players in the top ten jersey sales in the NBA increases median ticket prices over 50%. Meanwhile, a team with only

one player in the same category generates a 43% increase in median ticket prices. The NBA is a star powered league led by globally recognized names. Even though it's a team sport, one person can arguably have the single greatest impact in a game of basketball compared to the other three major sports. Consumers have a strong preference for the quality and entertainment potential of an NBA game. Separately, if the game is played on a weekend the median ticket price increases 25%. A percentage increase in an NBA franchise's net worth produces a 0.19% increase in median ticket prices. Finally, a one percent increase in population and index of living of the home team's city results in a 0.11% and a 0.4% increase in median ticket prices in the NBA, respectively.

In this model, along with divisional game, average attendance, stadium capacity, median household income, last month of the season and both of its associated interaction terms are insignificant at the 95% confidence level. One explanation for these results is that more than half of the teams in the NBA will make the playoffs (16/30). The playoff teams are usually well established by the final month and both players and fans alike are anxiously waiting for the postseason to start.

MLB

Finally, a regression analysis is completed for the MLB. The largest sub sample, this data set contains 2,425 observations, almost ten times the size of the NFL's. This model produced an R-squared of 28%. Seven of the fifteen variables are insignificant at the 95% confidence level, including stadium capacity, a team's net worth, divisional game, home team playoff team, both having one and two players in the top ten in jersey sales, and the interaction term between last month of the season and away team playoff team. During the last month of the season in Major League Baseball, median ticket prices decrease about

21%. However, if it was the last month of the season and the home team was a playoff team, there exists a significant positive correlation and median ticket prices increase 11%. Part of the reason for both the negative and positive results is that only eight teams make it to the postseason. As a result, most fans are disappointed come the final month of the season, while some are very excited at the possibility of seeing their team clinch a playoff spot at the very last minute.

Additionally, if the away team was a playoff team the season before median ticket prices go up 9.8%. A weekend game also increases median ticket prices by 23%. If the home team's average game attendance and city's population both increase one percent, median MLB ticket prices increases by 0.22% and 0.08%, respectively. Further, median ticket prices decrease 0.12% as median household income increases one percent. For every percent increase in a city's index of living, MLB median ticket prices increase 0.95%. In wealthier zip codes, consumers will pay almost a full percentage point more to attend a baseball game. However, it remains possible that the high median ticket prices simply reflect the size of the market of the home team. Especially the teams from big cities.

Table 4: Individual League Regressions
 * indicates significance

Variables	NFL		NBA		NHL		MLB	
	Coeff.	Robust Std. Error	Coeff.	Robust Std. Error	Coeff.	Robust Std. Error	Coeff.	Robust Std. Error
Stadium Capacity	-0.0704	0.2977	-0.1019	0.2200	-0.3149*	0.1412*	0.0102	0.0053
Weekend Game	0.0679	0.0701	0.2476*	0.0216*	0.2842*	0.0224*	0.2278*	0.0132*
Net Worth (\$ millions)	0.5813*	0.1437*	0.187*	0.0306*	0.4335*	0.0473*	0.0048	0.0353
Index of Living	-0.5238	0.4260	0.3999*	0.1302*	1.6437*	0.1599*	0.9499*	0.0866*
Divisional Game	-0.0121	0.0543	0.0519	0.0283	0.0931*	0.0233*	-0.0062	0.0136
Average Attendance	2.2288*	0.6357*	0.0571	0.1586	1.0123*	0.1601*	0.2159*	0.0506*
Away Team Playoff*	0.1574*	0.0520*	0.4839*	0.0241*	0.1688*	0.0251*	0.0983*	0.0156*
Home Team Playoff	0.0704	0.0666	0.0793*	0.0357*	0.0236	0.0265	0.0193	0.0208
Last Month of Season	-0.2680*	0.0916*	0.1133*	0.0473*	-0.0893	0.0523	-0.2099*	0.0249*
Median Household Income	0.0682	0.1024	-0.0345	0.0655	-0.0089	0.0413	-0.1168*	0.0237*
Population	0.0909*	0.0396*	0.1121*	0.0147*	0.1183*	0.0147*	0.0768*	0.0111*
Player in Top 10 Jersey Sales	0.4067*	0.0735*	0.4326*	0.0350*	-0.3463*	0.0301*	0.0351	0.0261

2 Players in Top 10 Jersey Sales	-0.7148*	0.1542*	0.5046*	0.0661*	0.8047*	0.0488*	0.0272	0.0501
Last Month x Home Team Playoff	0.1544	0.1153	-0.0105	0.0555	0.1877*	0.0576*	0.1109*	0.0448*
Last Month x Away team Playoff	0.1595	0.1239	-0.0194	0.0555	0.0999	0.0553	0.0070	0.0387

VI. CONCLUSION

The ticket resale market is no longer a frowned-upon marketplace that consists predominantly of greedy scalpers. Professional franchises and leagues both endorse the secondary resale market now and even use resale ticket companies as their primary ticket providers. This provides is a continuous ticket price that reflects the up to the minute consumer demand for that event. The range of ticket prices for an event will weigh the consumers expectations along with seat quality and the other characteristics aforementioned.

The purpose of the current study is to develop a model that measures the various determinants of the four major American professional sports league's secondary market ticket prices. The findings of this study illustrate what consumers value when they purchase tickets on the secondary market. In addition, this model reveals that there is still a great deal more to uncover as it pertains to other factors that shape consumer demand for professional sports. Nonetheless, these findings do provide us with a better understanding of what drives consumer behavior.

Specifically, NFL fans value games and buy tickets to watch certain players and teams play no matter who they are playing against. The NFL recently had a group of soon to be hall of fame players that fans were willing to pay a great deal more to see. There are some players in the NFL that attract singular attention such as Tom Brady or Peyton Manning. Similarly, in the NBA, certain players receive a great deal of extra attention. Unlike in the NFL, free agents in the NBA are able to evaluate and respond to the free market resulting in the formation of a few super teams which have multiple all-stars on the same team. After controlling for specific players, it is evident that consumers look for high caliber teams.

Hockey is the least popular of the four predominant American sports. A negative correlation between ticket prices and stadium capacity emphasizes how difficult it is to fill a larger stadium for hockey teams. With more available seats, fans have more options and can thus compare prices until they find the cheapest ones. It is easy to move around at a hockey game especially when there are more available seats in a stadium. When consumers are aware of the teams and stadiums with greater attendance, they will pay a higher price knowing that it is harder to get a good seat. Lastly, in the MLB, game specific variables do not offer much in the way of explaining of median ticket price fluctuations because of the length of an MLB season. Teams play one another multiple times at each other's stadiums over a span of 162 games. If a fan would like to see a certain team or specific player, there are a number of games that can provide that opportunity. This is in contrast to the NFL, where the consumer only gets one game to see their preferred matchup or their favorite player.

Overall, sports fans want to see high quality teams play when they buy their tickets to sports games; and, preferably, a game that includes one of the most popular players in the league. Little or no surprise there. However, once the season comes down to the end, fans will pay significantly more to see their home team potentially make it to and clinch a playoff spot, no matter who the away team is or what sport they are playing. In the end, fans will pay more to see their own team succeed. Each sports league has unique elements that consumers all value differently. Thus, in order to maximize revenue, unique ticket prices must be calculated for each organization within each league. Future research should attempt to acquire a greater sample size from multiple seasons and determine whether variables similar to the ones used in this study change in significance.

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VIII. APPENDIX

Table 1A: NFL Descriptive Statistics (*252 observations)

Variable	Mean	Std. Dev.	Min	Max
MedianTicket	142.1825	75.9847	32	423
StadiumCapacity	70110.78	7214.822	52525	82500
WeekendGame	0.861111	0.3465	0	1
NetWorthMills	1434.702	526.2986	930	3200
IndexofLiving	81.8076	8.8413	67.75	100.38
DivisionalGame	0.3691	0.4835	0	1
AverageAttendance	97.6448	6.0378	85	112.6
AwayTeamPlay	0.3730	0.4846	0	1
HomeisPlay	0.3809	0.4866	0	1
LastmonthOpen	0.3056	0.4616	0	1
MedianHourlyIncome	49346.68	14499.74	25980	92094
Population	1282481	1981943	104847	8550000
Top10inJerseys	0.2857	0.4527	0	1
2inTop10Jerseys	0.0318	0.1757	0	1

Table 2A: NHL Descriptive Statistics (*1,225 observations)

Variable	Mean	Std. Dev.	Min	Max
MedianTicket	82.2571	53.5960	15	356
StadiumCapacity	18684.73	1889.809	11093	21273
WeekendGame	0.4571	0.4984	0	1
NetWorthMills	596.7959	316.0644	300	1500
IndexofLiving	83.639	8.5729	70.48	100.38
DivisionalGame	0.3518	0.4777	0	1
AverageAttendance	96.5119	8.9800	79.1	117.6
AwayTeamPlay	0.5184	0.4998	0	1
HomeisPlay	0.5331	0.4991	0	1
LastmonthOpen	0.1788	0.3833	0	1
MedianHourlyIncome	59387.95	21129.55	25980	91451
Population	1221546	1614350	25092	8550000
Top10inJerseys	0.2653	0.4417	0	1
2inTop10Jerseys	0.0661	0.2486	0	1

Table 3A: NBA Descriptive Statistics (*1,230 observations)

Variable	Mean	Std. Dev.	Min	Max
MedianTick~e	65.37154	43.65975	14	376
StadiumCap~y	19292.77	1421.213	17317	24276
WeekendGame	0.4756	0.4996	0	1
NetWorthmi~s	609.6675	272.2857	139	1400
IndexofLiv~g	81.213	9.3896	67.75	100.38
Divisional~e	0.1951	0.3965	0	1
AverageAtt~s	90.9033	10.3644	68	103.9
AwayTeamPl~m	0.4992	0.5002	0	1
HomeisPlay~m	0.4984	0.5002	0	1
Lastmontho~n	0.1829	0.3868	0	1
MedianHouIn~e	50018.07	10365.87	28831	75628
Population	1637678	2104974	190679	8550000
Top10inJer~s	0.3	0.4584	0	1
2inTop10Jer~s	0.0333	0.1796	0	1

Table 4A: MLB Descriptive Statistics (*2,425 observations)

Variable	Mean	Std. Dev.	Min	Max
MedianTick~e	42.8594	21.5227	14	418
StadiumCap~y	44469.99	6384.59	32225	63132
WeekendGame	0.4817	0.4998	0	1
NetWorthmi~s	809.6936	444.3349	485	2500
IndexofLiv~g	82.6762	9.2958	67.75	100.38
Divisional~e	.4639	0.4988	0	1
AverageAtt~s	70.3760	14.8707	42.4	99.4
AwayTeamPl~m	0.2614	0.4395	0	1
HomeisPlay~m	0.2668	0.4424	0	1
Lastmontho~n	0.1649	0.3712	0	1
MedianHouIn~e	51666.96	15340.22	25980	92094
Population	1535130	2077547	298537	8550000
Top10inJer~s	0.2652	0.4415	0	1
2inTop10Jer~s	0.0664	0.2490	0	1