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Effect of Expected Match Result on the Number of Spectators in Sports Events: Comparison of Different Loyalty Level of the Consumer Group

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고 사 랑

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Abstract

Effect of Expected Match Result on the Number of Spectators in Sports Events: Comparison of Different Loyalty Level of the Consumer Group

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This study aimed to identify the factors that influence the number of spectators in sports events. The intension here was to confirm the utility model of the audience, which varies depending on the content and results of the sporting event, and to confirm whether the actual change in the number of audience can be explained based on this model. Based on the number of spectators of all Major League Baseball (MLB) games for 10 years from 2010, the analysis showed that the number of spectators in sports games is affected by the odds of the home team and the difference between the odds of the two teams. The study confirmed an inverted U-shaped relationship between these aspects. In

addition, the shape of the parabola was found to vary depending on the level of the fans' loyalty to the club, and this loyalty is affected by the club's salary levels. These results imply that sports club marketing managers could tailor their marketing messages on their teams' strengths to attract spectators to each game considering the level of fans' loyalty. Additionally, clubs' salary levels can be used as a policy to determine fans' loyalty levels.

Keywords: Sports spectators, Sports viewing motives, Fixed effect panel Regression model, Sports fan utility, Match result expectation

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1. Introduction

Given the recent economic and media technology development, the sports market is growing at a rapid pace. With this growth, the sports industry is attracting a lot of capital attention and proving to be important, not only socially and culturally, but also economically. Brenda and Stotlar (1996) predicted that the sports industry would grow at a rate of 6.8% annually. Today, the market size is growing at an even faster pace. To attest to this, the National Football League's (NFL) TV broadcasting rights fee increased from $20.4 billion in 2013 to $39.6 billion in 2014, and ESPN agreed to pay the Major League Baseball (MLB) about $700 million per year in 2012 up from $360 million for broadcasting rights. Besides this increase in broadcasting rights fees, other monetary aspects of the sports industry are also rising sharply. For example, SoFi, an American online personal finance company, annually pays an estimated $40 million to acquire the naming right of the LA Rams home stadium for 20 years.

Despite the rapid growth of revenues from broadcasting rights and sponsorship, the revenue generated from spectators visiting the stadium still occupies a very large portion of a sports club's total revenue. According to an announcement by MLB in 2019, media and sponsors accounted for only 33% of the club's revenue, while spectators' admission fees and expenses accounted for 39% of the total revenue. In addition, according to a report by the BBC, in the 2018−2019 season, English Premier League clubs recorded £677 million in revenue from spectators visiting the stadium, accounting for about 13% of total revenue. These numbers show us that sales generated from spectators visiting the stadium are still an important source of revenue in the sports business.

Therefore, understanding consumer demand and analyzing the variables that influence this demand is important for various sports clubs and related organizations.

Such analyses are typical research topics in the marketing field and have been used in sundry studies examining diverse industries. These include studies that attempt to find the variables that affect box office movies and revenues (Basuroy, Chatterjee, & Ravid, 2003; Dellarocas, Zhang, & Awad, 2007; Liu, et al., 2016; Vujić & Zhang, 2018) and the number of people visiting tour sites, museums, or art galleries (Brida, Meleddu, & Pulina, 2012; Shafiullah, Okafor, & Khalid, 2019). Likewise, similar studies have been conducted on the sports industry in an effort to identify the factors that influence the number of people coming to watch sports events at stadiums (Baade & Tiehen, 1990; Baimbridge, Cameron & Dawson, 1995; DeSchriver & Jensen, 2002; Funk & James, 2006). These studies have mainly focused on understanding consumers' motivations for watching sports events (Kim, et al., 2019) since uncovering the various elements of a sports event that motivate people to watch can be beneficial in boosting the effectiveness of sports clubs' marketing efforts. That is, based on the characteristics of the target consumers, it is possible to develop an effective marketing message that conveys these elements. Therefore, the purpose of this study was to identify the elements of sports events considered by spectators that patron stadiums and to confirm whether the real number of sports events attendee changes due to such factors.

The remainder of this article is organized as follows. First, we explore previous research related to sports-viewing motives as well as sports consumer demand and its determinants in Section 2. Then, in Section 3, we build hypotheses that predict changes in overall spectator demand based on the utility function of individual consumers. Next, we analyze whether the variables identified through the hypotheses have a significant impact using empirical data in Section 4 and 5, and conclude the paper with the managerial implications of the findings and opportunities for future research in Section 6.

2. Theoretical Backgrounds

2.1. Motives for Watching Sports Games

There are numerous studies on sports management, particularly regarding the motivations for watching sports. Based on such studies, it is commonly accepted that sports fans are motivated by one or more of the following eight factors: escape, entertainment, economic gain, esthetics, group affiliation, family needs, eustress, and self-esteem (Bilyeu & Wann, 2002). Escape refers to the desire to find an escape or diversion from everyday life (Sloan, 1989; Smith, 1988) while entertainment refers to the desire to be entertained (Sloan, 1989; Zillmann, Bryant, & Sapolsky, 1989). Both are well-known motives for participating in and watching sports. Of course, some game watchers are motivated by the potential income obtainable through sports betting (Chorbajian, 1978); nonetheless, these types of spectators enjoy watching games as fans as well (Wann, 1995). The esthetic value of sports has also been identified as a factor of sports watching behavior (Duncan, 1983; Sloan, 1989; Smith, 1988). In this sense, audiences want to obtain visual satisfaction by watching extremely trained players. Group affiliation (Branscombe & Wann, 1991; Gantz & Wenner, 1989; Wann, et al., 2001) and family needs (Wann, 1995) are also often mentioned as motives for sports spectators.

Among these motivators, the most commonly accepted is eustress (Elias & Dunning, 1970; Gantz & Wenner, 1989; Sloan, 1989). Eustress refers to a positive form of stress that stimulates and energizes an individual. For certain fans, sports are enjoyable because they provide the exact amount of stress desired (Zuckerman, 2014), and thus the excitement and anxiety that accompany sports game watching motivates them into attending sports events (Wann, Schrader, & Wilson, 1999). One of the important sources of eustress in sports is the unpredictability of game outcomes. Trail and James (2001)

developed a motivation scale for sports consumption to categorize the reasons for watching sports. In the scale, one of the major motivations is "drama," which captures the preference of individuals for an unpredictable result. Bryant, Rockwell, and Owens (1994) used a laboratory experiment to confirm that enjoying pleasurable tension during a game, which is a product of unknown game outcomes, is a major reason for watching sports games.

Team identification, which refers to the valence of the unit relationship between the fan and the team, is another motive for sports game watching (Madrigal, 1995). Those who watch sports tend to identify themselves with the team they support, expect their team to win, and celebrate their team's victory. These fans feel a sense of accomplishment and achievement when their team succeeds, and motivation based on this emanates from a need for self-esteem enhancement (Sloan, 1989). Thus, as the team identification tendency increases, people "bask in reflected glory," which increases their satisfaction through the accomplishment of other objectives (Robert et al., 1976). In other words, the higher the team identification tendency, the greater the satisfaction obtained from the victory of the supported team.

Unlike the other motives mentioned above, eustress resulting from unpredictable game outcomes and self-esteem from team identification are directly related to the content and result of the game itself. Bryant, Rockwell, and Owens (1994) illustrated the phenomenon where suspense is viewed as having a high degree of certainty of a negative outcome, and the greater the suspense, the greater the fear of a negative outcome. Therefore, we can easily determine that sports spectators prefer a sports game that offers both a high degree of suspense and a "proper" level of certainty that their team will win, which are contradictory. Typical examples of this include the experience of chatting with friends rather than focusing on the sports game when the score difference is significant or

avoiding the seat so as to not witness an extremely tense penalty shootout. Those who watch sports will get the maximum utility somewhere between these two extremes.

Several existing studies have focused on finding an explanation for what causes sports fans to have different preferred levels of suspense and determining the optimal level of suspense. Zillmann and Paulus (1993) demonstrated that dedicated fans of teams involved in lopsided contests do not experience diminished interest. If the team they support can achieve a one-sided victory over the opposing team, they will get great satisfaction even if they do not feel any special tension in the game. Bryant, Rockwell, and Owens (1994) reported that when the suspense is high, spectators more strongly want their teams to win than when suspense is low. Su-lin et al. (1997) also illustrated that the gender of the viewer can be a major factor affecting the preferred level of suspense. According to their research, men more strongly prefer lopsided games to close games than women do.

Therefore, we can assume that “eustress” is caused by uncertain game outcomes, and those who watch a sporting event will predict this uncertainty according to the expected odds levels prior to viewing. If the expected win rate is remarkably high or low, the uncertainty is expected to be low, and if the expected win rate converges to 0.5, the win cannot be predicted easily. Thus, before watching a game, people will predict their eustress levels through a variable called the expected win rate, and this will have an important influence on deciding whether they will watch the game.

On the other hand, we consider that self-esteem is expected based on the possibility of winning the game. If there is a high likelihood of ones’ team winning, the level of self-esteem that can be obtained from watching that game will also be high, and opposition will also be established. In this study, we analyzed whether these variables really affect the audience's viewing motives and cause changes in the actual number of

spectators.

2.2. Determinants of the Number of Attendees

Studies that confirm the differences in the number of spectators in sports events through empirical data can be classified into several topics. Among the determinants of the number of spectators, research has been conducted on factors not related to the game itself, such as ticket price (Alexander, 2001; García & Rodríguez, 2002) or the characteristics of the city in which a game is played (Dobson & Goddard, 1992; Donihue, Findlay, & Newberry, 2007). The capacity of the stadium can also be an important variable (Berri, Schmidt, & Brook, 2004), but it has also been found that it can be a less important factor when the stadium is not often full (Jones, 1984).

Various studies have been conducted regarding the change in the number of spectators caused by TV broadcasts. Price and Sen (2003) showed that TV broadcasts act as a kind of advertisement and make more people visit the stadium. On the other hand, there is also a study that shows that the number of people visiting the stadium decreases as TV viewing becomes possible (Baimbridge, Cameron, & Dawson, 1995). Still, other studies have confirmed that the effect of TV broadcasting varies depending on the type of TV broadcasting, free or pay-per-view (García & Rodríguez, 2002). In addition, it was found that the weather on the day of the game (Cairns, 1990; Falter & Pérignon, 2000; Noll, 2001) and whether or not it is a holiday have a significant influence on the number of spectators visiting stadiums (Forrest, Simmons, & Szymanski, 2004; Paul, 2003; Peel & Thomas, 1992).

For the audience of a sports event, the game they watch can be said to be a product. Therefore, the quality of the game they are watching becomes another variable that determines the number of spectators. Cairns (1990) confirmed that the home team's win

rate had a significant positive relationship with the number of spectators, and the ranking of the home team within the league was mainly used as an indicator variable of the quality of the game expected by the audience (Villar & Guerrero, 2009). The esthetic appeal of athletes' performance is one of the main motives for watching sports (Wann, 1995), and team rosters encourages the audience to visit the stadium by judging that the quality of the game is high (Falter & Pérignon, 2000; García & Rodríguez, 2002).

Various unpredictable situations that can occur in a sports event are a major factor that arouses the interest of sports spectators. This uncertainty is largely divided into the uncertainty of individual matches, the uncertainty of the entire season, and the uncertainty of the league performance without a special powerhouse (Borland & MacDonald, 2003). In order to measure the uncertainty of an individual match, the difference in ranks between the two teams playing against each other is measured (Hart, Hutton, & Sharot, 1975); otherwise, the uncertainty is measured based on the win rate from the last season or month (Whitney, 1988). Betting odds ahead of the game are also a criterion (Vergin & Sosik, 1999; Vlastakis, Dotsis, & Markellos, 2009). Research dealing with uncertainty in season performance defines uncertainty based on play-offs clinch or league championships (Jones, 1984). In addition, research has shown that a few teams successively winning the league over a long period negatively affects the number of spectators and shows that uncertainty about the outcome of the game is an important factor for spectators watching a sports game (Szymanski, 2001). This study used the difference in the win rate of two teams playing a game as a variable representing the uncertainty of the game, and in particular, wants to show that the variable has an inverted U-shaped relationship to the number of spectators.

3. Hypotheses

3.1. Influences of Win Rate on the Number of Attendees

If consumers are rational enough, they will consume to maximize their utility. Likewise, if spectators watching a sports event are rational, they will decide whether to consume the sports event so that their utility can be maximized. Sloan (1989) explained that, while watching a game that the team they support is winning, spectators feel as though they too are winning. This consumers' regard of the team's victory as their own, even though this victory actually has nothing to do with them, is an important characteristic of sports consumption. In other words, the utilities of sports game attendees are maximized when the team they support wins the game.

For these audiences, sports games are a kind of product, and like other everyday consumption behaviors, consumers of sports games want to consume high-quality goods. Villar and Guerrero (2009) confirmed that a team's standing can be a factor in the quality of a match, and the higher the standing, the more people visit the stadium. Baade and Tiehen (1990) also analyzed the number of annual spectators of each MLB club for 19 seasons and confirmed that the standing of the club was significantly related to the number of its spectators.

The effect of each club's performance on the number of spectators can be related not only to the annual cumulative number of spectators, as prior research explains, but also to changes in the number of spectators in each daily event. Individual consumers want to make a choice that maximizes their utility when they decide whether to visit the stadium and watch the game. If the quality of the game they watch is expected to be high, or their utility is expected to be maximized, more consumers will decide to buy tickets to watch the game; otherwise, they will not choose to visit the stadium. In this case, which variables do people use to forecast whether the team they support will win the game? The win rate of the team they support will be appropriate for use as a basis. If the team's win

rate is high, it will be more likely to win in the upcoming game. Conversely, if the win rate is low, it can be expected that it is less likely that the team will win in the future as well. Therefore, we can derive the following hypothesis:

H1. The higher a team's win rate, the more spectators will visit the stadium.

3.2. Influences of Win Rate Differences on the Number of Attendees

With regard to the rational consumers apply when deciding whether to visit stadiums to watch games, we will look at the utility function of the consumer in detail. The total demand of the market is the sum of the purchasing behavior of individual consumers, and rational consumers will make choices that maximize their utility. Therefore, identifying the utility function of individual consumers will be the starting point for predicting demand in the market.

To identify the utility function of individual sports spectators, we can assume that the utility of a sports spectator (U) consists of two different types of utility. First, as Bilyeu and Wann (2002) explained, eustress caused by situations in which it is difficult to predict the outcome of the game is an important motive for watching a sports event. Based on this characteristic, we can assume a utility function where utility is maximized when the game result cannot be predicted easily because the game is accurately divided in half, and is minimized when the game is determined by tilting one side. In other words, we can derive a utility function U_1, which is a utility of the game aspect as a quadratic function that is maximized at the point where $P(win)$, the subjective expected probability of a win, is 0.5, and is minimized when $P(win)$ is 0 or 1

$$U_1 = -\alpha \cdot P(win) \cdot (P(win) - 1) + \beta ,$$

where α and β are individual utility differences (α and $\beta \geq 0$).

Second, as already mentioned, the audience of a sports event will gain greater utility when the team they support wins than when it loses. Thus, we consider the utility function in which the higher the probability of winning, the greater the utility, and the lower the probability of winning, the smaller the utility. Reflecting this, we can derive another utility function U_2, which is also determined by the subjective expectation of the probability of win:

$$U_2 = P(win) \cdot S(loyalty) + (1 - P(win)) \cdot (-S(loyalty)),$$

where *S(loyalty)* represents the level of satisfaction when the favored team wins. Since people with high loyalty have a high level of team identification, the variable *S(loyalty)* will increase in proportion to the level of loyalty. Therefore, the total utility function of sports spectators, *U*, can be stated as

$$\begin{aligned} U &= U_1 + U_2 \\ &= -\alpha \cdot P(\text{win})^2 + (\alpha + 2S(\text{loyalty})) \cdot P(win) + (\beta - S(loyalty)) \end{aligned}$$

Assuming that consumers decide whether to purchase tickets based on their utility level, the purchase probability of individual consumers can be expressed as:

$$\text{Probability of Purchase} = \frac{\exp(U)}{1+\exp(U)}$$

Figure 1 below shows the change in the probability of an individual consumer

watching the game according to the change in *P(win)*. At the point where *P(win)* is close to 0, *U* is low owing to the low U_2, so the probability of purchase is also very low. However, as the utility increases with increasing *P(win)*, the purchase probability also increases, and when *P(win)* exceeds a certain value, the purchase probability decreases again as U_1 decreases. Based on this relationship, we can derive the following hypothesis:

H2. There is an inverted U-shaped relationship between win rate difference and the number of spectators.

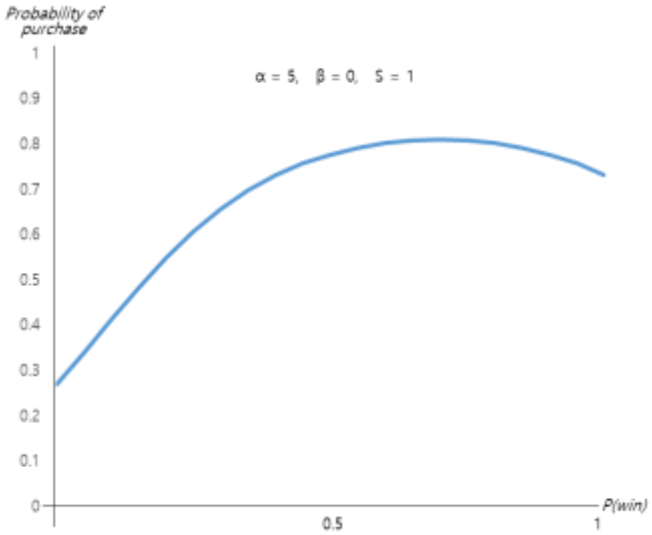

Figure 1. Probability of purchase

3.3. Impact of Win Rate Differences Depends on Fan Loyalty

As with other business areas, it is very important to build strong customer loyalty when running a sports club. In particular, in the sports industry, it is very unusual for a brand switch to occur even when customers do not satisfy the outcome (Da Silva & Las Casas, 2017). Therefore, it is more important for sports club managers to manage the loyalty of their fans and understand their characteristics.

Since loyal customers have a high degree of team identification, the change in U_2 as a

result of the game will be large, while the change in U_1 due to the content of the game will be relatively small. Zillmann and Paulus (1993) also explained that the utility of loyal spectators would not decrease significantly even in a lopsided game. Because watching their teams' games in something they enjoy in itself, the difference in fans' utility due to a change in the game aspect is not that significant. On the other hand, since the level of team identification is low for an audience with low loyalty, the change in U_2 will be relatively small, while the change in U_1 due to "eustress" will appear large. This is because they prefer a game where the tension is high due to an unknown match result to the end rather than which team will win. Regarding this difference, we can understand that the value of the coefficient α in our U_1 may vary with the fans' loyalty levels. Fans with high loyalty will have a relatively small α value, and fans with low loyalty will have a relatively large α value.

Figure 2 shows that the shape of the purchase probability varies depending on the levels of α and *S(loyalty)*. The higher the loyalty, the larger the value of *S(loyalty)* and the smaller the α value, whereas the lower the loyalty, the smaller the value of *S(loyalty)* and the larger the α value. Based on this, we derive the following hypotheses:

H3. The inverted U-shaped relationship between win rate difference and the number of spectators will differ based on the loyalty of the consumer groups.

H3a. The more (less) loyal fans there are, the wider (narrower) the parabola.

Sports clubs are making various efforts to increase consumer loyalty. In particular, consistently investing heavily in the composition of the squad is a great way to increase the loyalty of fans as this shows the fans that the managers are striving to achieve good results (Collignon & Sultan, 2014; Da Silva & Las Casas, 2017). In particular, determining the size of the investment in the squad, e.g., salaries, can vary based on the managerial direction of the manager rather than on the content or results of the game on which direct control is not possible. Accordingly, this study established the following hypothesis:

H3b. The more (less) money the club spends on salaries, the wider (narrower) the parabola.

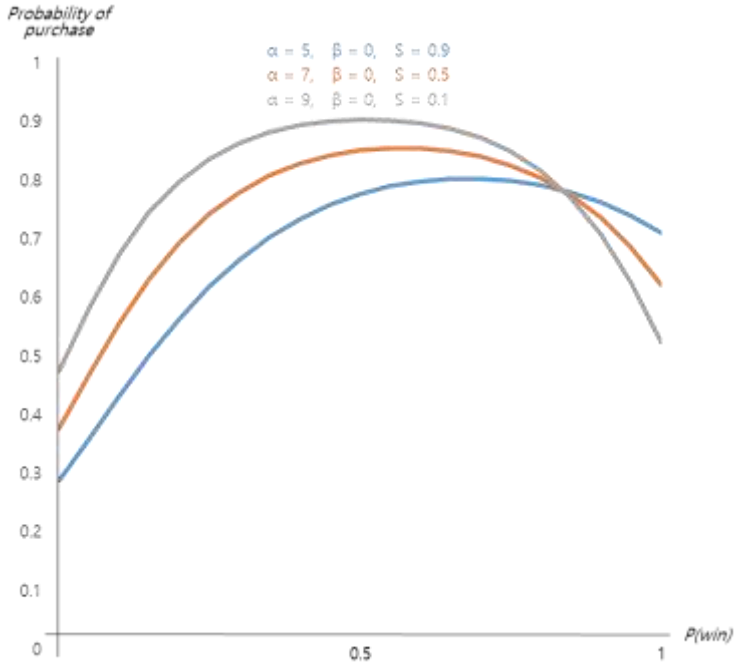

Figure 2. Probability of purchase reflecting different values of α and *S(loyalty)*

4. Materials and Methods

4.1. Data

Among the four major sports leagues in North America - MLB, NFL, National Basketball Association (NBA), and National Hockey League (NHL) - this study chose the number of MLB events attendees as the research context for the following reasons. First, a sufficiently large number of games is required to confirm the change in the number of spectators. However, compared to the MLB, which plays more than 80 home games a year, the NFL plays less than 10 games, making it difficult to observe the latter's change in spectatorship, and therefore rendering the NFL unsuitable for our analysis. Second, the size of the stadiums has to be considered in determining attendance, particularly because data may be truncated due to full attendance if a game is played in a relatively small stadium. In the case of the NBA or NHL, the size of the stadium is small, so full attendance frequently occurs; thus, they were excluded from the study, leaving us with only MLB to work with. This league presents the most adequate platform for

observing changes in the number of spectators because it holds numerous games in a large stadium throughout the seasons.

The data collected on MLB consisted of all 24,297 matches played over 10 years from 2010 to 2019. Among them, second match of doubleheader games were excluded because they were not suitable for our analysis purpose, so only the remaining 24,023 games were analyzed. All data related to individual matches were obtained from the official MLB website (www.mlb.com) and a baseball data-archiving website (www.baseball-reference.com).

4. 2. Definition of Variables

Table 1 describes the definitions of the variables. The number of spectators in the game is based on the actual number of spectators in every home game ("ATD"). The win rate of a match ("WR") is based on the cumulative win rate of the home team from the start of the season to just before the match takes place, and WR of the first match of each season is assumed to be 0.5. The difference in win rate of a match between the two teams playing games ("WRD") is considered as a variable that shows the uncertainty of the game. In this study, in order to control the change in the number of spectators due to the multi-scoring game, the average score of the home team in the previous five games ("RUN") was added as a control variable. The score difference ("SD") was defined as the absolute value of the average score difference for the previous five games before the match.

All teams in the MLB operate with the goal of advancing to the playoffs, and the more important the games are to achieve that goal, the more people watch the game. The Championship Leverage Index ("*CLI"*) measures the importance of a game to a team's chances of winning the World Series, so this study included it as a control variable. In accordance with a previous study (Villar & Guerrero, 2009), this study also reflected the division standing of the participating teams ("*STAND"*) in the model. To control the effect of weather (Cairns, 1990; Falter & Pérignon, 2000; Noll, 2001), the temperature when the game started in the stadium's location ("*TEMP"*) was included in the model, and whether it rains or not ("*RAIN"*) was also included as a dummy

Table 1. Definition of variables

Variable	Measurement	Source
ATD_{it}	Number of home game spectators for team *i* on day *t*	MLB Official
WR_{it}	Win rate from the start of the season for team *i* on day *t* (the first match of each season is assumed to be 0.5)	MLB Official
WRD_{it}	Difference in win rate against the opposing team for team *i* on day *t* (WR of home team - WR of away team)	
RUN_{it}	Average scores in the previous five games of team *i* on day *t*	MLB Official
SD_{it}	Absolute value of average score differences for previous five matches of team *i* on day *t*	
CLI_{it}	Championship Leverage Index of team *i* on day *t*	Baseball-reference.com
$STAND_{it}$	Division standing of team *i* on day *t*	MLB Official
$TEMP_{t}$	Temperature where the stadium was located of team *i* on day *t*	
$RAIN_{it}$	A dummy variable indicating if it rains on day *t* (coded as 1 if it rains on day *t*, and 0 otherwise)	
WD_{it}	A dummy variable indicating each weekday of team *i* on day *t*	
$HOLI_{it}$	A dummy variable indicating if day *t* is a federal/national holiday (coded as 1 if day *t* is holiday, and 0 otherwise)	
DN_{it}	A dummy variable indicating whether a team plays during the daytime (coded as 1 if it plays during the daytime, and 0 otherwise)	MLB Official
$OPEN_{it}$	A dummy variable indicating if day *t* is an opening day (coded as 1 if day *t* is opening day, and 0 otherwise)	
$AWAY_{it}$	A dummy variable indicating each away team of team *i* on day *t*	MLB Official
DIV_{it}	A dummy variable indicating whether the opponent is in the same division (coded as 1 if the opponent is in the same division, and 0 otherwise)	MLB Official

variable. Additional dummy variables were added to reflect the day of the week ("*WD"*) and whether the game was on a holiday ("*HOLI"*) (Forrest, Simmons, & Szymanski, 2004; Paul, 2003; Peel & Thomas, 1992). The time of day when the game was played ("*DN"*) was also included as

a dummy variable. In addition, in the case of the first home game of each team, it was expected that an unusually large number of people would visit the stadium due to the season opening effect, so the first game of each season was classified as a dummy variable ("*OPEN"*). In order to control the impact of rivalry between each club (Paul, 2003), the away team ("*AWAY"*) and whether the away team belongs to the same division as the home team ("*DIV"*) were also classified as dummy variables.

4. 3. Methods - Model Specification

Panel regression is a method that uses both cross-sectional and time series data, and can obtain additional information that cannot be obtained when only one cross-section and time series are considered (Wooldridge, 2016). In this study, data were analyzed using a fixed-effects model that takes one season of a club as one panel. The fixed-effects model is effective in estimating causal relationships and is capable of producing unbiased estimations compared to a standard regression analysis, which may cause bias when there are unobservable elements (Brüderl & Ludwig, 2015; Gangl, 2010). The regression model for the analysis is as follows.

$$\begin{aligned} Ln(ATD_{it}) = {} & \beta_0 + \beta_1 WR_{it} + \beta_2 WRD_{it} + \beta_3 WRD_{it}^2 + \beta_4 RUN_{it} + \beta_5 SD_{it} \\ & + \beta_6 CLI_{it} + \beta_7 STAND_{it} + \beta_8 TEMP_{it} + \beta_9 RAIN_{it} + \sum_{m=1}^{6} \gamma_m WD_{mit} \\ & + \beta_{10} HOLI_{it} + \beta_{11} DN_{it} + \beta_{12} OPEN_{it} + \sum_{n=1}^{29} \delta_n AWAY_{nit} + \beta_{13} DIV_{it} \\ & + u_{it} \end{aligned} \quad (1)$$

Equation (1) was used to explain the number of spectators for team *i* in period *t* by a linear combination of explanatory variables. Since our dependent variable is skewed, log transformation was taken for the dependent variable to yield the bell-shaped distribution (Russell & Dean, 2000). βs, γs, and δs indicate the influence of the explanatory variables that determine the number of spectators. An analysis was conducted on the entire sample to confirm

H1 and H2.

$$Ln(ATD_{it}) = \lambda_0 + \lambda_1 WR_{it} + \lambda_2 WRD_{it} + \lambda_3 WRD_{it}^2 + \lambda_4 (WRD_{it}^2 * Loyalty) + \lambda_5 RUN_{it} + \lambda_6 SD_{it} + \lambda_7 CLI_{it} + \lambda_8 STAND_{it} + \lambda_9 TEMP_{it} + \lambda_{10} RAIN_{it} + \sum_{m=1}^{6} \gamma_m WD_{mit} + \lambda_{11} HOLI_{it} + \lambda_{12} DN_{it} + \lambda_{13} OPEN_{it} + \sum_{n=1}^{29} \delta_n AWAY_{nit} + \lambda_{14} DIV_{it} + u_{it} \quad (2)$$

Equation (2) was used to verify H3a. Through λ_4, we sought to confirm whether the shape of the parabola varied depending on the level of loyalty. Among the various surveys evaluating the loyalty of fans, in this study, the level of fans' loyalty was classified based on the ranking published annually by Emory University's Marketing Analytics Center in consideration of the convenience of access and the consistency of standards. Since the current standard has been applied to this indicator since 2016, four-year samples from 2016 to 2019 were used for this analysis. By year, each team was classified into top 10 and bottom 10 groups based on their loyalty levels, and coded as a dummy variable (coded as 1 if team *i* is included in top 10, 0 otherwise).

$$Ln(ATD_{it}) = \omega_0 + \omega_1 WR_{it} + \omega_2 WRD_{it} + \omega_3 WRD_{it}^2 + \omega_4 (WRD_{it}^2 * Salary) + \omega_5 RUN_{it} + \omega_6 SD_{it} + \omega_7 CLI_{it} + \omega_8 STAND_{it} + \omega_9 TEMP_{it} + \omega_{10} RAIN_{it} + \sum_{m=1}^{6} \gamma_m WD_{mit} + \omega_{11} HOLI_{it} + \omega_{12} DN_{it} + \omega_{13} OPEN_{it} + \sum_{n=1}^{29} \delta_n AWAY_{nit} + \omega_{14} DIV_{it} + u_{it} \quad (3)$$

Equation (3) was used to verify H3b. Through ω_4, we sought to determine whether the shape of the parabola varied depending on salary levels. In this study, we classified each team into top 15 and bottom 15 according to annual salary levels by year, and coded them as dummy variables (coded as 1 if team *i* is included in top 15, 0 otherwise). In addition, according to the results of H3a and H3b, the feasibility of H3 could be confirmed.

5. Results

5.1. Summary Statistics

A summary of the variables is presented in Table 2. The average number of spectators was found to be 30,009. The average win rate of the home team was 0.500, and on average, there was a difference of 3.4 points in the last five games. In addition, the difference in win rates between the home team and the away team was 0.000, and the square of the difference in the win rates between the home team and away team was 0.030. As shown in the table, the home team scored an average of 4.4 points in the last five games. The average CLI was 0.8, and the average temperature of the game place was 73.5°F. Table 3 summarizes the correlation between the variables.

Table 2. Summary Statistics of the Variables

Variable	Mean	Std.Dev.	Min.	Max.
ATD	30,009	10,238	2,429	59,659
WR	0.500	0.107	0.000	1.000
WRD	0.000	0.172	-1.000	1.000
WRD^2	0.030	0.104	0.000	1.000
RUN	4.4	1.5	0.0	16.0
SD	3.4	1.2	0.0	15.0
CLI	0.8	0.6	0.0	11.9
STAND	2.9	1.4	1.0	6.0
TEMP	73.5	10.8	23.0	108.0

5.2. Estimation Results

Table 4 summarizes the estimated results of the proposed equations. According to the results, the higher the home team's win rate at the time of the game, the higher the number of spectators (β_1 = .2549, $p < .01$), which is consistent with H1 of this study and prior research (Cairns, 1990). Moreover, the larger the difference in win rate between the two teams, the smaller

Table 3. Correlation matrix

Variable	ATD	WR	WRD	RUN	SD	CLI	STAND	TEMP
ATD	1.000							
WR	0.266***	1.000						
WRD	0.148***	0.797***	1.000					
RUN	0.070***	0.251***	0.216***	1.000				
SD	-0.032***	-0.012	-0.001	0.371***	1.000			
CLI	0.242***	0.443***	0.281***	0.109***	-0.020**	1.000		
STAND	-0.302***	-0.731***	-0.535***	-0.174***	0.020**	-0.590***	1.000	
TEMP	0.077***	-0.008	0.007	0.062***	0.045***	-0.047***	0.004	1.000.0

※ *: p < 0.1, **: p < 0.05, ***: p < 0.01

the number of spectators (β_2 = -.1322, p < .01), and the larger its quadratic term, the smaller the number of spectators (β_3 = -.0730, p < .01). This finding confirms H2.

The average score of the home team was not significantly related to the number of spectators (β_4 = .0007, n.s.). That is, the smaller the difference in the scores of a recent game, the more spectators will visit the upcoming one (β_5 = -.0030, p < .05). Therefore, it can be assumed that spectators' choices are also affected by short-term trends. It was also confirmed that the more important the games with higher CLI, the more spectators will attend (β_6 = .0263, p < .01); thus, the decrease in spectators as the team's standing lowers (β_7= -.0072, p < .01) further supports H1. Additionally, consistent with the results of previous studies (Cairns, 1990; Falter & Pérignon, 2000; Noll, 2001), it was confirmed that the temperature at the time of the game had a significant relationship with the number of spectators (β_8 = .0042, p < .01), but no significant relationship was found between the rain and the number of spectators (β_9 = -.0040, n.s.). This is because in the case of a baseball game, when there is a large amount of rainfall, the game is canceled. Thus, in the case of our sample, if it rained, it would be thought that the degree was not severe. In addition, and also consistent with the findings of previous studies (Forrest, Simmons, & Szymanski, 2004; Paul, 2003; Peel & Thomas, 1992), we found that more spectators visited the stadium on public holidays (β_{10} = .0149, p < .01). It was confirmed that the audience prefers day games to night games (β_{11} = .0147, p < .01) and the number of spectators is increased if the game

Table 4. Fixed Effect Panel Regression Results

Variables	*Equation (1)*	*Equation (2)*	*Equation (3)*
WR	.2549 (.029)***	.2985 (.057)***	.2537 (.029)***
WRD	-.1322 (.014)***	-.1191 (.026)***	-.1359 (.014)***
WRD²	-.0730 (.013)***	-.1324 (.034)***	-.1127 (.017)***
WRD² * Loyalty		.1225 (.002)**	
WRD² * Salary			.0960 (.001)***
RUN	.0007 (.001)	.0035 (.002)*	.0008 (.001)
SD	-.0030 (.001)**	-.0007 (.002)	-.0029 (.001)**
CLI	.0263 (.003)***	.0217 (.006)***	.0266 (.003)***
STAND	-.0072 (.002)***	-.0102 (.004)***	-.0074 (.002)***
TEMP	.0042 (.000)***	.0046 (.000)***	.0043 (.000)***
RAIN	-.0040 (.019)	-.0132 (.039)	-.0033 (.019)
HOLI	.0149 (.004)***	.1383 (.021)***	.0149 (.010)***
DN	.0147 (.004)***	-.0071 (.007)	.0145 (.004)***
OPEN	.5209 (.013)***	.5304 (.024)***	.5207 (.013)***
DIV	-.0141 (.003)***	-.0234 (.005)***	-.0141 (.003)***
Observations	24,023	6,403	24,023
Adj. R2	0.3644	0.3574	0.3647

※ ***: $p < 0.01$, **: $p < 0.05$, *: $p < 0.10$

※ Standard errors are in parentheses.

※ *WD* Dummies and *AWAY* Dummies for each equation are not reported.

is the opening match of the season (β_{12} = .5209, $p < .01$). Interestingly, the number of spectators

decreased when teams of the same division competed directly against each other for the championship (β_{13} = -.0141, $p < .01$). It could be explained that the interest of the audience decreases because more games are played against teams of the same division that against teams of other divisions.

Equations (2) and (3) were used to verify H3a and H3b. As we expected, it was confirmed that the coefficient of the quadratic term of win rate difference decreased in the group with high loyalties (λ_4 = .1225, $p < .05$) and the group with high salary (ω_4 = .0960, $p < .01$). At the same time, it was found that the inverted U-shaped relationship between them was maintained. From this, we can conclude that H3, H3a, and H3b are all supported.

6. Discussion

6.1. Summary of the Results

Among the various motives for watching sports, “eustress” and “self-esteem”, unlike the others, are dependent on the content and outcome of the game. People who watch sports games want to feel eustress, which is a positive anxiety that comes from an uncertain match. At the same time, they want to achieve a level of self-esteem that comes from the team they support winning. In this study, we considered that when consumers contemplate to watch a game, they tend to use 'the difference in win rate between the two teams playing' and the 'cumulative win rate of the supporting team' to determine whether they will achieve their targeted levels of eustress and self-esteem. Here, we expressed the utility of sports spectators with a utility function that takes the expected probability of winning before the game as an independent variable. Based on this utility function, we sought to verify the relationship between the win rate and the number of spectators, the difference between the win rate and the number of spectators, and the effect of the difference in loyalty to the team on event attendance using actual MLB spectator data.

To do this, we analyzed the number of spectators for every MLB game from 2010 to 2019, and the results are as follows. First, the number of MLB match spectators increased as the

winning rate of the team playing the game increased. This seems to imply that sports spectators' desire for their teams to win affects their attendance at those teams' games. Second, the results revealed that spectators use the differences in the win rates of two teams playing against each other in a game to predict the game outcome, and this variable is confirmed to have an inverted U-shaped relationship with the number of spectators. As explained through our utility function, this suggests that the eustress caused by the tension of the game and the anticipation of the self-esteem obtained from a win have simultaneous effects. Finally, we confirmed that the influence of the difference in the win rates of teams on the change in the number of spectators depends on the fans' loyalty levels. The degree of change was relatively small for clubs with high fan loyalty, while large for those with low loyalty. In addition, this difference was confirmed to be the same according to the difference in team payroll. This may provide sports club managers guidance to deliver appropriate marketing messages to fans to boost sport game attendance.

6.2. Implications

The purpose of this study was to connect some of the content-specific variables of sports events with the motivations for sports watching, and determine whether they are related to changes in the actual number of sports spectators. We derive a utility function in which the level of eustress is based on the expected probability of winning based on the differences in the win rates of the teams, and the level of self-esteem is based on the level of satisfaction from the game result. It was shown that the expected purchase possibility measured through this utility function is empirically confirmed, contributing to understanding the underlying mechanism of the decision-making process for sports consumption behavior.

This research provides some important implications for marketing managers on how to allocate their sports clubs' marketing budgets. Unlike general products in the market, sports events are difficult for marketers to control in that they cannot control the content of the game, yet they have to market the events. In this study, it was confirmed that the effect of the variables that affect the change in the number of spectators might vary depending on the loyalty levels of the customer

group and - as a loyalty determinant - the clubs' salary levels. Thus, the results of this study provide sports club marketing managers with controllable variables that they can use to develop appropriate and effective marketing messages.

6.3 Limitations and Future Research

This study suffered several potential shortcomings that need to be considered. Firstly, due to lack of information, it was not possible to control changes in ticket prices for each game. Although our data are based on the same season with no change in ticket price, and reflects the days of the week and holidays as control variables, it is not possible to consider the effect of the change in ticket price on the number of spectators. Secondly, this study's analysis was conducted assuming market demand through the purchase possibility of one individual. However, in a real market where heterogeneous consumers exist, the total demand of the market may vary according to the characteristics and distribution of consumers. Nonetheless, the Appendix provides an explanation that verifies that the characteristics of consumers with the same level of loyalty are homogeneous, and that if the level of loyalty is uniformly distributed, the overall market demand does not deviate from our assumption. However, if a demand function that reflects more diverse customer characteristics is derived, it will be possible to conduct an analysis closer to reality. Through future research, it is expected that additional implications can be found if the model reflects factors that have structural changes in the number of sports events spectators, such as the activation of online broadcasting due to the development of media.

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Appendix

This study assumed the following individual utility functions.

$$\mathbf{U_i = U_1 + U_{2i} = -\alpha \cdot P(win)^2 + (\alpha + 2S_i) \cdot P(win) + (\beta - S_i)}$$

Based on their utility function, rational consumers will consume more if the utility is large and consumes less if the utility is small. Therefore, assuming that the individual consumer's demand function is the same as the individual consumer's utility function, the individual consumer's demand function (D_i) is as follows:

$$\mathbf{D_i = -\alpha \cdot P^2 + (\alpha + 2S_i) \cdot P + (\beta - S_i)}$$

$$\mathbf{D_i(P=x) = -\alpha \cdot x^2 + (\alpha + 2S_i) \cdot x + (\beta - S_i)}$$

Because the aggregate demand of the market can be expressed as the sum of individual demand functions, the aggregate demand function can be expressed as

$$\mathbf{AD(P=x) = \int D_i(P=x) \cdot f(S_i) \cdot dS_i}$$

Assuming that the consumers' S_i follows a uniform distribution between 0 and s, the aggregate demand is

$$\mathbf{AD(P=x)} = \int_0^s \mathbf{D_i(P=x)} \cdot \frac{1}{s} \cdot \mathbf{dS_i}$$

$$= \mathbf{-\alpha \cdot x^2 + (\alpha + s) \cdot x + (\beta - \frac{1}{2} s)}$$

In this way, we can derive the demand function of the market in the form of an inverted U-shape according to the expected probability of a win.

국문 초록

본 연구는 스포츠 경기의 관객수에 영향을 미치는 변수가 어떤 것인지를 파악하고 구단이 이를 어떻게 효과적으로 활용할 것인지를 논하고 있다. 구체적으로는 경기 결과에 대한 관객들의 전망과 구단에 대한 관객들의 충성도 수준이 경기의 관객수에 미치는 영향을 밝히고 있다. 본 연구는 10 년 동안 미국 프로야구 메이저리그 전체 경기의 실제 관중 수 데이터를 바탕으로 경기 결과에 대한 예상과 충성도의 영향에 대해 구체적인 실증을 시도하고 있다.

본 연구는 실증 자료를 통한 분석을 위해 개별 소비자의 효용 함수를 활용하고자 한다. 관객들의 관람 동기 중 '긍정적인 스트레스'와 '자존감'에 집중하여 경기의 내용과 결과에 따라 결정되는 소비자의 효용 함수를 도출하고 이를 바탕으로 경기에 대한 수요의 변동을 전망하였다. 스포츠 경기의 관객들은 자신이 응원하는 팀이 승리하길 바라면서 동시에 경기 결과의 불확실성이 높길 바라기 때문에 관객들의 효용은 특정 지점까지는 자신이 응원하는 팀이 승리할 가능성이 높아짐에 따라 증가하다가, 특정 지점을 지나면 승리 확률이 높아질수록 감소하는 2 차 곡선의 형태를 가진다. 또한, 충성도가 높은 소비자가 많을수록 이러한 수요의 변화는 상대적으로 적게 나타났으며, 선수단에 많은 투자를 하는 것은 고객의 충성도를 높이는 것과 같은 효과를 얻을 수 있다는 것을 확인하였다.

본 연구는 관중 수에 영향을 주는 다양한 변수를 모형화하기 위해 고정 효과 모형을 활용하였다. 고정 효과 모형은 시간에 따라 변화하지 않는 변수들의 영향을 통제한 후 독립변수의 효과를 측정하기 위해 일반적으로 활용되고 있는 모형이다. 또한 왜곡된 자료를 표준화하기 위해 종속변수인 관중 수를 로그 변환하여 분석을 시행하였다.

본 연구의 결과는 스포츠 경기를 관람하는 관객들의 효용 변화를 이해할 수

모형을 제시하고 있으며, 이를 구단이 마케팅에 활용할 수 있는 단서를 제공하고 있다. 또한 마케팅 활동의 중요한 변수인 고객의 충성도 수준이 스포츠 구단의 흥행에도 중요한 영향을 미칠 수 있음을 시사하고 있다. 나아가, 본 연구에서 제시하고 있는 모형은 스포츠 경기의 관객수를 예측하는 도구로 활용할 수 있다.

주요어: 스포츠 관객수, 스포츠 관람 동기, 고정 효과 패널회귀분석,
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