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Online Webcast Demand vs. Offline Spectating Channel Demand (Stadium and TV) in the Professional Sports League

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Abstract: This study investigates the online spectating behavior of sports fans. Due to the great mobility and low opportunity/switching costs, webcast sports fans' spectating behaviors are distinct from those associated with traditional spectating channels such as stadium attendance or TV viewership. We explore the unique characteristics of online webcast demand in professional sports leagues by rigorously modeling all three spectating choices of sports fans. To consider the substitute relationship of the three spectating choices simultaneously, we employ a BLP (Berry–Levinsohn–Pakes)-style random coefficient model. For the analysis, we collect a comprehensive game-level dataset from the Korean Professional Baseball Organization (KBO) League fan samples from three different channels: online webcast viewership, stadium attendance, and TV viewership. We find that the demand for online webcasts is distinctive compared to that of traditional spectating channels. Notably, we find that the impact of team performance is three times stronger than that of TV viewership demand and that the impact of game quality is four times stronger than that of attendance demand. In contrast, a nonperformance variable is relatively less effective in attracting sports fans to online broadcasting. Furthermore, we find evidence of a strong retention effect of online webcast viewers. Our findings indicate that the previous spectating experience of online webcasts increases the next-time choice of sports fans for the webcast because the genuine spectating experience with distinctive webcast services (such as real-time interactive communication or various supplementary programs) can induce consumers to revisit the channel.

Keywords: online webcast demand; online vs. offline spectatorship; online sports consumption; digital marketing

1. Introduction

> *"The drop-off in attendance for live sporting events is getting worse, ... and there's the huge, cost of going to live events plus fighting through traffic and parking just to get to the games, and even more important is the experience of watching games in the comfort of your home, on a big screen without the hassle at a stadium. That keeps a lot of people away." (Lee Igel, a professor of sports management at New York University)*

Along with the rapid development of the internet and the proliferation of smartphones in daily life, online webcasts as interactive multimedia platforms for sports games have rapidly gained momentum as a major spectating channel for sports fans. In 2012, when Major League Baseball (MLB) launched the MLB.tv Premium service (live webcast broadcasting) that allowed users to watch a game on their mobile phones as well as their computers, MLB recorded revenues of USD 250 million purely from

MLB.tv subscription fees, which is more than 30% of the revenue earned from their national TV broadcasting. CBS News reported that MLB Advanced Media, the official partner of the MLB online division (MLB.com), generated USD 380 million in revenue in 2007 and is still growing by 30 percent a year.

With the soaring popularity of webcasting, the National Baseball Association (NBA) also launched live online streaming services for basketball fans, starting with the 2015–2016 season (CNBC.com) ("NBA to broadcast first live pro sports event in virtual reality," (2015, Aug.)). The popularity of the new broadcasting media has unanimously spread to sports consumers over many countries due to advances in information technology (IT) development. For example, in Korea, where people enjoy the fastest internet service (26 Mb/s on average, 2015) and have the highest smartphone penetration rate (88% of the population owns smartphones, 2015) in the world, online webcasting has rapidly become a major spectating channel for sports fans. In 2014, an average of 39,714 viewers watched a baseball game online, a figure almost four times larger than the average number of fans who attended a game at the stadium.

This tremendous popularity of online webcast services is mainly based on the convenience of enjoying a sports game without time and place restrictions [1–4]. This fundamental flexibility can significantly change the spectatorship's landform from the stadium or home to the subway and workplace, even in any public place such as the library or the airport. The secured privacy of online webcasts using personal devices also helps to increase the demand for sports games. In addition, the instant availability of information on games and players provides unique benefits for using online webcast channels. In particular, it provides real-time interaction communication tools among sports fans during the game and various supplementary services such as highlight videos. Therefore, online webcast users have different motivations and preferences for watching a sports game. For example, due to extremely low switching costs, these fans can frequently switch their spectating choices [1,5]. Unlike fans who attend a game at the stadium, they do not need to wait until their team turns the tide if their team is losing; they simply leave the game and return to watch it again whenever their team performs better.

From the manager's perspective, online spectating channels are considered an important source of new business opportunities. They increase team revenues not only from the subscription fees for live broadcasting and selling more spots for advertising during games but also from new additional online services related to the game, such as various Video On Demand (VOD) services and online virtual games. Bud Selig, an MLB commissioner, mentioned that "online spectating services are not only one of the great stories in the American sports business in the past 12 years, but one of the great stories in American business".

However, while the distinctive services and the importance of online spectating platforms are well accepted, little is known about the spectating behaviors of sports fans through online webcasts either in practice or in academia. In previous studies, sports consumers have been known for a bewildering array of attitudes and behaviors [6]. Key factors affecting their spectating demands have been extensively studied for several decades [7–12]. However, the vast majority of previous studies disproportionately analyzed fans' spectating choices by focusing on traditional channels such as stadium attendance or TV viewership [9,13–15]. As aforementioned, sports fans are likely to behave differently in their spectating choices due to the distinctive benefits provided by different spectating channels. In addition, it is critical to examine fans' spectating choice behavior by considering all these spectating channels together because these channels are basically considered alternative choices for each other.

Thus, this paper investigates the unique characteristics of online webcast demand in professional sports leagues by comprehensively modeling all three sports fans' spectating choices: game attendance, TV viewership, and online webcasts. It is particularly critical to consider the demand of all three channels together because they fundamentally act as substitutes for each other. To rigorously model this relationship, we built a comprehensive choice model based on Berry–Levinsohn–Pakes (BLP)-style random coefficient models by including the heterogeneous characteristics of sports consumers in

each market [16,17]. Additionally, we explore whether and how differently the key demand factors driven by previous literature influence online webcast choices compared to traditional channels. To accomplish our task, we collected a unique game-level dataset from the Korean Professional Baseball Organization (KBO) League in 2014 through three reliable data providers: the KBO official website for game attendance and team performance data, the TNS research company for TV rating data, and Naver.com, the number one portal site in Korea, which is an exclusive online live broadcasting provider for the KBO. Particularly, the data collection process for online webcast demands was an arduous task. We manually collected the webcast viewership data for each game by visiting the focal website at the same time slots every day during the 2014 season.

The findings provide strong evidence that there is a large difference in the influence of key demand factors on online webcast demand compared to traditional channels. Specifically, we find a strong propensity of online webcast viewers toward team performance and game quality. For example, the impact of the team performance variable, the victory of the team, is three times stronger than the TV viewership demand and the game quality variable; the competitive balance between teams has a four-times stronger impact than the attendance demand, while the existence of star players is relatively less effective in attracting sports fans to the online webcast. This implies that the disproportionate preference for certain game attributes is due to the lower switching costs of the online spectating platform. However, star power is not an effective driver in increasing online webcast demand compared to other traditional channels since it is a less attractive option than offline platforms. More interestingly, we find evidence of a strong retention effect among online webcast viewers. This indicates that the previous spectating experiences of the online webcast help to increase sports consumers' next-time choices concerning the online webcast channel for watching a game due to spectating experiences linked to webcast services (such as real-time interactive communication or various supplementary services), which can induce them to revisit this channel.

2. Literature Review

In this section, we first discuss the economic and marketing literature related to sports consumers' distinctive characteristics and behaviors. Moreover, we discuss the relevant literature on Korean sports consumers' spectating behaviors and the Korean professional baseball market. We then move our discussion to the literature that investigates game demand in the sports industry and discusses the key demand drivers verified in previous literature. Finally, we discuss the literature related to consumers' choice behaviors in the online purchase context. Afterward, we state our research questions related to online webcast demand in professional sports.

2.1. Sports Product Consumption and Sports Consumers

Sports goods, like other products and services, can be considered as a combination of attributes. Schaaf considers the sports product as "either the entertainment of the competition, or a product/service associated with the excitement of the event, or both" [18]. Therefore, the utility that a consumer obtains from sports products derives from not only the association with teams in the competition but also the quality of the contest and the uncertainty of the outcome [19–21]. A unique feature of the sports product is produced by the two competing teams in that the opponents compete with each other, but they are "cooperating" with each other at the same time. This distinctive feature generates an unavoidably contradictory effect between key game attributes on fans' consumption of sports goods. For example, fans can perceive higher value from a game when their team is strong, which implies a higher probability of winning and enjoying the glory of the victory. However, this also lowers the degree of competitiveness in a match with the other team, making a game less exciting.

Moreover, sports consumers are distinctive because their values, attitudes, and behaviors are widely diverse [6]. Holt provides multidimensional typologies of sports consumers using the survey data of Chicago Cubs baseball fans [22]. He suggests four dimensions of sports consumers related to the level of involvement of consumers with teams. He argues that sports consumption must be

comprehensively understood based on not only the emotional attachment to the team but also the individual identity, the enhancement of social status, playful exchange, and so on. McDonald and Milne categorize sports fans into four types, using their value of the team's value and their commitment to the team [23]. They suggest that sports consumers who have a higher value, stronger commitment, and show strong financial support for the team must be the primary target for marketers and that marketers need to design their strategy to bring their consumers to a higher level of consumer type. Stewart et al. reviewed previous literature related to sports consumers' behavior and categorized sports consumers into three different tiers along with their major focus of consumption [10]. For example, first-tier fans are the most loyal, committed, and focused on their emotional connection to the team. Second- and third-tier fans, on the other hand, focus more on the game's excitement and entertainment quality. Furthermore, he argues that sports fans display their fandom in diverse ways, such as regularly attending a game at the stadium, watching paid television sports channels, or watching a game even at the workplace through online channels. Similarly, Wann et al. argue that sports consumers experience sports products differently to meet their diverse needs [24].

Another important factor to consider for sports game consumption and demand is developing alternative spectating channels such as TV or online webcasts. As Whannel states, spectatorship experiences for sports consumers have been transformed along with their technical development [25]. Live spectatorship provides unique experiences to the sports consumers at the stadium, but this uniqueness of experience erodes once these new alternative channels provide more convenient ways to enjoy live events. Furthermore, along with technical developments, live broadcasting through TV or online provides distinctive services such as close-up views, replays, detailed explanations by professional anchors, and unparalleled mobility, which are missing in live spectatorship at the stadium. The advent of TV helped to broaden sports consumers' profile in that the "gripping" or "enthralling" nature of this type of broadcasting makes viewing almost compulsory, and the sports commentary delivers a sense of "personalities". Non-ardent fans or even non-fans may be attracted, building sports audiences [26]. This trend accelerated once online live broadcasting was introduced in the early 2000s. In particular, an online webcast provides unique benefits in spectatorship to sports consumers. For example, sports consumers using webcasts can watch a game at any place with an internet connection, such as on the subway, during travel, or even while walking on the street. New media users' expectations are different from those of traditional audiences; they desire instant, interactive coverage of sports events that provide entertainment, interpersonal communication, and socialization benefits [5,19]. High mobility also leads to lower switching costs; unlike watching a game in the stadium, the interruption does not come at great cost, and an interrupted game may be picked up promptly with almost no extra cost [5,19]. Moreover, along with the unparalleled mobility, it provides secrecy of spectatorship. Consumers can even enjoy a game at work or while studying at the library. According to Puijk, sports streaming attracts considerable viewership during working hours. We will discuss the online consumption literature in more detail in the last part of this section [2].

2.2. Korean Sports Consumers and Korean Professional Baseball Market

Due to sports globalization, sports fans have expanded their opportunities for enjoying sports games in various leagues worldwide [27–30]. In particular, world-class leagues have led the globalization of the focal sports game to expand their businesses into international markets or find elite players for their leagues from domestic leagues [27,31]. While this globalization brings various issues from economic, legal, and cultural perspectives, it also helps to standardize sports games to provide an opportunity for sports consumers to enjoy world-class league games and their domestic sports games simultaneously [30,32]. Due to internet technology development, sports fans can enjoy sports games from various leagues using online platforms such as webcast broadcasting services.

A baseball game is considered one of the major sports games in many countries as well as the US, its original country [33]. Baseball was introduced in Asian countries such as South Korea and Japan and gained popularity over the last century [34,35]. They share common rules and a similar league

system to Major League Baseball (MLB). For example, a local team represents a certain city or state by considering it as its hometown, and fans enjoy their home team's live games by visiting the stadium, watching at home on TV, or through a webcast using their computer or mobile phone. These leagues conduct a regular game schedule with matches between all the teams during the season and determine an annual champion using playoff games after the seasonal game schedules.

In particular, baseball has been considered a national pastime in Korea since baseball games were introduced there in 1904. The Korean Professional Baseball Organization (KBO) League launched in 1982 with six teams. Each team played 80 games in the first year and averaged 6344 spectators in attendance. It expanded to 10 teams in 2020, with 144 games per team and approximately 10,119 fans attending each game on average (covering 51.7% of average stadium capacity). Due to its relatively short time in existence and smaller economic size, players' overall payroll is lower than in MLB, which is also reflected in lower per-game ticket prices and costs for a field trip to a game [30]. Additionally, star players and young elite players have frequently migrated to MLB teams, which has a negative impact on domestic league demands [30,36].

While professional baseball leagues' economic impact and history are relatively smaller and shorter, KBO fans are no less loyal to their home teams and star players than any other baseball fans [29,37]. Indeed, it is known that baseball has the most loyal fan base among the other professional sports leagues in Korea. KBO fans have supported their home team for approximately 8 years on average, almost double that of other professional sports fans (KPSA, 2017) (Korean Professional Sports Association (2017), Source: https://en.yna.co.kr/view/AEN20170406010800315). KBO fans, in particular, enthusiastically engage in the game, having developed a unique cheering culture for the teams they support (ABCnews, 2020) (ABCnews (2020) Source: https://abcnews.go.com/International/inside-south-korean-baseballs-elaborate-cheer-culture/story?id=50817262). Along with distinctive Korean culture, spectatorship at sports games has been considered a party. However, while cultural differences exist in KBO fans' spectating behaviors, the fundamental key factors motivating their spectating decisions are consistent with global baseball fans. Prior literature finds that fundamental key drivers of baseball attendance demand, such as winning, competitive balance, and star power, also play a critical role in Korean baseball consumers, determining their spectating decisions [30,35,36]. Since professional baseball games have been played with the same rules and similar systems globally, the key factors influencing sports fan attendance decisions are generally adopted across different baseball leagues across countries. Korean professional baseball games are broadcast live to 130 countries through ESPN to provide an alternative baseball viewing opportunity for global baseball fans during the period for which their domestic leagues were delayed due to COVID-19 in 2020 (WSJ, 2020) (The Wall Street Journal (2020), Source: https://www.wsj.com/articles/bts-parasite-and-now-baseball-south-korean-pop-culture-is-having-a-moment-11588932001).

2.3. Game Demand and the Key Determinants

Understanding the factors affecting fan interest and game demand has been a primary issue in sports literature. According to classic demand theory, fan interests related to sports game attributes are considered the key demand determinants [38]. A significant body of previous literature has investigated the impact of these factors on game demand, such as team winning, the competitiveness of the match, star power, and consumer loyalty [8,16].

First, experiencing their supported team's victory is one of the most important factors for fans to enjoy a game [8]. Cialdini et al. suggest that people can have psychological benefits when their supported team wins because of the affiliation with their teams, described as "basking in reflected glory (BIRG)" [7]. These studies have argued that fans tend to enhance their self-esteem by decreasing the psychological distance between their team and themselves when their team performs successfully, whereas they protect themselves by denouncing their association with their team when the team performs poorly. Moreover, Wann and Branscombe show that loyal fans who highly identify with

their respective teams are less likely to denounce their association when they perform poorly than less identified fans [39].

Along with team performance, the excitement of the match is another important attribute of the game. This is a distinctive feature of sports products that are produced by two competitors together. According to the "uncertainty outcome" theory, if some teams become overly dominant, fan interests will diminish because the results of the game are obvious [40,41]. Neale refers to this dichotomy as "the peculiar economics of professional sports" because the league must maintain parity among teams while teams are incentivized to improve field success [40]. This competitiveness of the match derived from the uncertain outcome has become the core issue of the sports industry in the economics and marketing literature for the last several decades. Many empirical studies test uncertainty outcome theory using team ranking, team performance, point spreads, or betting odds between the home team and visiting teams [42]. However, their empirical findings are puzzlingly mixed and provide weak support at the most.

Besides team performance attributes, players themselves serve as an important attribute of the game. In addition to the attributes related to team performance, Lewis and Yoon claim that star players are an important attribute affecting game demand [9]. They argue that this is not because of talent differences between players but because of the communal nature of consumption among fans. Additionally, star players can be considered brands themselves, and their personal brands can guarantee the quality of the game or transfer positive associations to their fans [43]. Yang et al., using two-sided matching models, argue that star players and teams maximize their brand value through the optimal matching of each other [44]. They suggest that high brand equity players can optimally match with a medium brand equity team. Star power has been incorporated into demand models as a key demand factor in many empirical studies [13].

While previous literature confirms that sports consumption and demand are multifaceted, the vast majority of demand studies provide a disproportionate analysis of attendance, and only one part of the game demand is derived by sports consumers [7,8,13]. Little empirical evidence has been provided for the comprehensive analysis of game demand. Some empirical studies have recently focused on alternative demands rather than attendance demands [14,15,45,46]. Pacey and Wickham investigated the TV demand for college football games using Nielsen rating data [14]. They argued that TV demand is influenced by game quality in the same direction. Forrest et al. used TV audience data for English Premier League football games from BARB, a nonprofit research company owned by all major UK broadcasters, to test the uncertainty outcome theory on TV demand [8]. They confirmed that competitive imbalance reduces TV audiences. Tainsky and McEvoy employed Nielson company data for NFL postseason games to test the uncertainty outcome hypothesis on TV audience demand; however, they did not find evidence of impacts on TV ratings [15].

Unlike spectatorships through the two traditional channels (e.g., stadium attendance and TV viewership), little is known about what factors influence online webcast spectatorship and how differently these factors affect sports fans' online spectating demand. This is mainly due to the recent advent of online webcast services and the rapid speed of smartphone penetration during the last decade. It is critical to analyze the spectating demand when considering these three major channels when examining the impact of key demand drivers on the respective channel demand because sports fans consider these to be alternative choices for each other. However, the vast majority of the previous literature focused on a single channel in their demand analyses and was limited to examining the relationship between each channel's choices. In the next section, we discuss consumers' distinctive characteristics in the online purchase context and derive our research questions related to sports consumers' spectating demand for online webcasts.

2.4. Characteristics of Sports Consumers for Online Webcast

Stadium attendees can be identified as those consumers who are loyal fans with strong emotional involvement with the team and for games [47,48]. They are, in general, less sensitive to game quality [39].

TV viewers enjoy the convenience of watching a game at home and the social bond created while watching games with other people; they care about the competitiveness of the game, which enriches the atmosphere when they are social [49]. In contrast, online webcast viewers have unique characteristics due to the distinctive benefits of using online broadcasting. Particularly, with almost ubiquitous access to internet service to consumers and the spread of smartphones, online webcasts provide a great level of mobility and secrecy for spectators of live broadcast services. In 2014, 87% of the population were internet users and 56.4% of the US population were smartphone users, while these numbers were 92% and 73%, for Korea, respectively. The nature of online broadcasting allows consumers to watch a game under any circumstance, e.g., at the workplace, in the subway, or at the library, among others. The limitation of time or space is no longer a concern for online webcast spectators. Rather, the only inconvenience of using online broadcasting is the relatively lower quality of spectatorship compared to the two traditional channels. Therefore, these consumers are likely to be the ones who value time more or are more restricted in their spectating circumstances. Hence, these consumers are more sensitive to their team's results and the game's excitement when compared to the other two consumer types. Online sports consumption also exhibits some unique properties related to the characteristics of webcast viewers.

As documented in the general marketing literature, accessibility, time convenience, and efficiency in the acquisition of products and services increase the utilitarian value of the products and services perceived by a consumer and have been identified as important factors that determine the purchase intentions of online shoppers [50,51]. In the context of sports consumption, online webcasts provide exactly these benefits to sports consumers. For example, sports consumers using webcasts can watch a game anywhere with an internet connection, such as on the subway, during travel, or even while walking on the street. The high efficiency and easy access to sports webcasts in this sense renders a high utilitarian value for the sports games and lowers the initial costs of consumption compared to the costs involved with stadium attendance.

Watching games incurs costs in terms of both money and time. Monetary costs should be understood in terms of both opportunity costs and switching costs, and in the decision process of sports consumers, they are sometimes the same and at times different. For example, prices paid for tickets are both opportunity costs and switching costs in the context of sport consumption, while the monetary value associated with loyalty, commitment, and emotional involvement is cumulative and represents switching costs in the context of longer-run alternative purchase decisions. In Downs' discussion of consumer efficiency, consumers intend to minimize their consumption cost [52]. According to Nichols et al., the judgment of opportunity costs will influence customers' evaluation of the time and money for a consumption decision [53]. In the context of opportunity costs involved in choosing different shopping channels and in the case of online webcasts, high mobility due to ease of access to the desired content leads to lower switching/opportunity costs. Unlike watching a game in the stadium, the interruption may not incur great costs, and an interrupted game may be picked up promptly with almost no extra cost [1,5]. Given that consumers perceive the high costs as strong barriers for exiting a contest in the case of stadium attendance, those consumers who value time more or who are more restricted in their spectating circumstances will tend to choose online broadcasting.

The cost efficiency and the utilitarian value of consumption are also highly related to habitual purchases, which determine the frequency and magnitude of repeated purchases: the higher value an online shopper perceives, the more likely the shopping habits will be reinforced, and the greater the repeated purchase intention [54,55]. Habit is defined as a behavioral tendency based on previous shopping experiences [56]. Satisfactory results in previous online shopping experiences can trigger habitual shopping behaviors [57,58]. In a sense, habit is one factor that constitutes the switching costs for a consumption choice [59]. This type of switching cost will discourage consumers from exploring new suppliers (e.g., new channels for spectating), and they tend to stick with their current supplier [55,60,61]. A strong habit of repeated activities can be considered an "addiction", which is a powerful force in repeated online shopping. Additive online shopping activities further increase

consumers' switching costs, thus reinforcing online consumption [24,62]. As evidenced in our results, webcast spectatorship has a high retention rate.

Alongside the costs and utilitarian value, online purchasing is believed to provide opportunities for consumers to get away from mundane, day-to-day life [63,64]. With the online broadcast of sports games, the low cost of escapism and the secretiveness of spectatorship enable consumers to enjoy games at the workplace or while studying at the library. According to Puijk, sports streaming attracts considerable viewing during working hours [2]. It is reasonable to believe that escapism and the secretiveness of spectatorship may play independent roles or work together, although the observed effect is that they help to promote the popularity and growth of webcast spectatorship.

Another motivational factor of online sports consumption reported in the literature is the social needs of the consumers. As discussed previously, new media users' expectations are different from those of traditional audiences; they desire instant, interactive coverage of sports events that provides entertainment, interpersonal communication, and socialization benefits [1,5,65,66]. They may utilize the communication tools provided by the webcaster to share their opinions regarding the performance of the team and exchange feedback in an instant and interactive way [65,66].

Thus, in this paper, we investigate how game demand is driven differently by sports consumers from all three spectating channels. Specifically, we emphasize the following research questions:

RQ 1. *Whether the key demand factors (the team winning, the competitive balance, and the star power) play significant roles in influencing the game demand of Korean professional baseball organization (KBO) consumers for an online webcast channel.*

RQ 2. *How differently these key demand factors influence game demand of Korean professional baseball organization (KBO) consumers for an online webcast channel. Specifically. The effect of key demand factors on the online webcast channel is stronger than for the other two channels.*

RQ 3. *Previous experience of Korean professional baseball organization (KBO) consumers for online webcast increase the current demand of online webcast and decrease (or increase) the number of sports consumers for the alternative channel.*

3. Methods

3.1. Model

To capture the substitutional nature of spectating choices, we consider a choice model to comprehensively include the three spectating choices. Specifically, we propose a BLP-style random coefficient utility model [16,17,67] including three choice options for a consumer to watch a game. Specifically, we assume that a consumer decides whether to watch a game by choosing one of the three channels—(i) attending a game, (ii) watching a game on TV, or (iii) watching an online webcast—by comparing the utility that they obtain from each choice. Moreover, we include an outside option for a consumer who does not choose any of these options and rather opts to participate in other leisure activities such as watching a movie or other TV shows instead of watching a baseball game. Moreover, our model allows for the idiosyncratic characteristics of a consumer from different markets.

3.1.1. Random Utility Model

The indirect utility of consumer "h" from watching game "g" of home team "i" through spectating channel "k" is

$$
\begin{aligned}
U^h_{k,\,i,g} \ =\ & \beta_{k,0} + \beta^h_{k,win\%,\,i}*Win\%_{i,g-1} + \beta^h_{k,CIB,i}*CIB_{i,g} + \beta^h_{k,SP,i}*SP_{i,g} \\
& + \beta_{k,\,Share}*Share_{k,i,g-1} + \beta_{-k,\,Share}*Share_{-k,\,i,g-1} \\
& + TeamD_{i,k} + DateD_k + MonthD_k + \xi_{k,i,g} + \varepsilon^h_{k,i,g}
\end{aligned}
\tag{1}
$$

where k = 0 if a consumer chooses not to watch a game, k = 1 if they choose to attend a game, k = 2 if they choose to watch TV, or k = 3 if they choose to watch an online webcast. $Win\%_{i,g-1}$ is the

cumulative winning percentage of team i until game g [7,68]. $CIB_{i,g}$ captures the competitiveness of a match by measuring the difference in the winning percentage between home and visiting teams [41]. Thus, a higher value indicates a serious imbalance of competitiveness between teams. $SP_{i,g}$ represents the star power of team i by using the number of last season's all-star game players who are in the starting line-up at game g [9,38]. Note that star power varies across games depending on the daily roster so that it accurately measures the star power of team i at game g, e.g., if a star player suffers an unexpected injury and is excluded from the roster, the star power of team i is computed without his portion. We assume that this information is available to fans before a game starts because the game roster is publicly announced one day before the game date.

In addition to the game attribute variables, we include the previous share of each spectating channel to capture the impact of previous experiences on the current choice, such that the previous shares of both the chosen channel and other alternative channels are $Share_{k,i,g-1}$ and $Share_{-k,\ i,g-1}$, respectively. Moreover, in order to capture consumers' intrinsic preference toward their teams, a team dummy vector, $TeamD_{i,k}$, is included. Note that this would be different across teams based on the degree of fan loyalty, team history, and team ability in managing the team's brand. Moreover, game-level data allow us to verify the impact of the game date on fans' choices. This is particularly important in our context because a fan's choice is likely to be affected by their entertainment purpose that would be seriously different according to the date. For example, the choice of attending a game is highly likely to be involved with weekend getaway activities instead of working days, while game dates have little influence on consumers' choices for watching a game through TV, which provides more flexibility of participation and with less cost required. To control for this, dummy vectors for the game date, $DateD_k$, are included. Furthermore, we include a monthly dummy, $MonthD_k$, to control for the potential seasonality effect. In addition, $\xi_{k,i,g}$ is included to represent the unobserved game factors that we as researchers cannot observe, e.g., marketing promotions for a certain game, breaking news on a certain day, or an unexpected blackout in a certain market. Finally, $\varepsilon_{k,i,g}^h$ is a household-specific error term that is assumed to be an i.i.d type I extreme value distribution.

3.1.2. Alternative Varying Parameters for Game Quality Parameters

The unique feature of our utility model is that we allow alternative varying parameters for each choice option k. As we have discussed, these variables can influence a fan's choice differently in accordance with the alternative choices because the weight of each factor can vary across alternatives. For example, the competitiveness of a match might be relatively less critical for consumers who consider going to the stadium to watch a game because it is harder for them to leave the stadium even if their team is hopelessly losing a game at the early inning. They spent much more money and time to attend the game and it is rather costly to find another alternative at that point. In contrast, consumers who want to watch a game on TV might be more concerned about the match's competitiveness since it is relatively easier and cheaper to change to alternative TV shows. In addition, we allow for the heterogeneous tastes of consumers in a different market, the hometown of team i, by employing market demographic factors such as age, education level, and the consumption rate from individual incomes. Thus, the random coefficient of alternative varying parameters, $\beta_{k,q,\ i}^h$, is specified as follows:

$$\beta_{k,q,i}^h = \ \beta_{k,q} + D_i^{h'} \cdot \Lambda_{D,q} + \eta_{q,i}^h \tag{2}$$

where k represents the choice option, q is a key quality factor (Win%, CB, or SP), and i is the hometown city of team i. Parameter $\beta_{k,q}$ measures the population mean value of the coefficient for the quality of game q of channel choice, k. D_i^h is a 3 × 1 vector of demographic variables, including age, education, and the consumption ratio, and $\Lambda_{D,q}$ is a 3 × 3 coefficient matrix of these variables. Thus, the effect of the game quality factors varies across each quality factor ($\beta_{k,q}$) and differs with heterogeneous tastes of fans for each team along with their demographic characteristics ($D_i^{h'} \cdot \Lambda_{D,q}$). Finally, we include the error term to represent the random household tastes for each attribute, which is assumed to follow a

log-normal distribution: $\log(\eta^h_{q,i}) \sim N(0, \sigma^2_{q,\eta})$. This distributional assumption is employed since the coefficient's sign is well known from previous studies [69].

3.1.3. Choice Probability and Game Demand

Based on the extreme value distribution assumption for $\varepsilon^h_{k,i,g}$ and $\varepsilon^h_{0,i,g}$, the multinomial logit specification [70] is

$$S_{k,i,g} = \int_\eta \int_D \frac{\exp\left(\bar{U}^h_{k,i,g}\right)}{1 + \sum_{k=1}^N \exp\left(\bar{U}^h_{k,i,g}\right)} \, dF\left(D^h_i\right) dF\left(\eta^h_i\right) \tag{3}$$

where $\bar{U}^h_{k,i,g}$ is the deterministic part of $U^h_{k,i,g}$ in Equation (2) without $\varepsilon^h_{k,i,g}$, and $F(\cdot)$ is the distribution function of the variable inside the parentheses. Let M_i be the total city population of team i's hometown representing the potential market size of each team; thus, the aggregate demand of alternative option k is defined as $\sum_i S_{k,i,g} \cdot M_i$.

3.2. Data

For our analysis, we collected game data from the Korean Professional Baseball Organization (KBO) League in 2014 through manifold sources. First, we collected the number of webcast viewers from the official portal service, Naver.com. Particularly, this webcast viewers' data required a significant amount of time and effort because the numbers of viewers can only be determined during the live broadcasting time period; thus, we had to manually collect the data for every game day. We collected the number of viewers twice per game, at the 30-min and 1.5-h mark after the game started. Once collected, we used the average viewer numbers at both time spots to measure webcast viewers. However, webcast viewer data do not specifically report the number of viewers for the home team; instead, they report the overall viewers for both teams. Thus, we approximated the home team viewers by using additional data from the supporters. On the screen for live online broadcasting, the numbers of supporting text messages for the home and visiting teams are reported separately in real time. We computed the ratio of these supporting messages between the two teams to approximate the online viewership number for the home team. In addition, we collected game attendance data from the official KBO website. Finally, we employed the TNS Media Korea research company to collect the TV rating data. The data included people who watched a KPB league game on the major TV broadcasting channels.

Moreover, data for game attribute variables such as the winning team and the number of All-Stars were collected from the KBO official website. Demographic variables for the market housing of each team were collected from Korean census data. The descriptive statistics are reported in Table 1.

Table 1. Descriptive statistics of key demand variables.

	Min	**Mean**	**sd**	**Max**
Attendance	1295	11,273	6102	27,500
TV rating (%)	0.2	1.152	0.647	4.085
Webcast viewers	13,795	43,067	12,234	72,342
Win%	0.211	0.497	0.098	0.687
CIB (competitive imbalance)	0	0.119	0.081	0.364
SP (star power)	1	8.125	4.207	18
Capacity of stadium	10,000	19,537	6993	27,500
City population (mil.)	1.058	4.675	3.717	9.794

Game attendance varies widely; on average, 57.7% of the stadium seats are occupied by spectators. The TV rating is 1.15%, and it is 4 times larger than the average rating at the maximum and less than 20% of the average rating at the minimum. Similarly, online viewers also vary across games. The average market size is 4.6 million; however, larger market has almost 10 times more viewers than smaller ones. In addition, the demographic profile of each market is reported in Table 2.

Table 2. Descriptive statistics of demographic variables.

	Min	Mean	sd	Max
Age (<30 years old)	34.77%	38.29%	2.25%	41.39%
Education (>Univ.)	25.25%	34.27%	6.63%	43.44%
Consumption rate (>Average)	48.08%	58.50%	6.96%	65.79%

In Table 3 we report the correlation analysis between key factors. We cannot find evidence of multicollinearity between the key variables.

Table 3. Correlation analysis of key demand variables.

	Attendance	TV Rate	Webcast	Win%	CB	SP	Population
Attendance	1						
TV rate	0.174	1					
Webcast viewers	0.134	0.175	1				
Win%	0.158	−0.008	−0.054	1			
CIB	0.069	−0.007	0.058	0.130	1		
SP	0.400	0.140	0.114	0.265	0.218	1	
Population	0.134	−0.113	−0.013	−0.049	−0.024	0.439	1

4. Results

4.1. Estimation Approach

Our empirical strategy is similar to the estimation procedure proposed by previous literature [16,17]. First, we start with the initial value of the nonlinear demographic parameters, θ_1^0, where $\theta_1 = \{\Lambda_{D,win\%}, \Lambda_{D,CIB}, \Lambda_{D,SP}, \sigma_{q,\eta}\}$ in the utility function defined in Equation (2). Given an initial trial θ_1^0, we simulate $D_i^{h,ns'}$ and $\eta_{q,i}^{h,ns}$ for a number of consumers in every market of team i based on the empirical distribution from the census data and the aforementioned distribution assumption, where ns is the total number of simulation draws. Thus, the choice probability of alternative choice k is approximated as

$$s_{k,i,g}^{sim} = \frac{1}{NS} \sum_{ns=1}^{NS} \left(\frac{\exp\left(\bar{U}_{k,i,g}^{h}\left(\eta_{win\%,i}^{h,ns}, \eta_{CIB,i}^{h,ns}, \eta_{SP,i}^{h,ns}, D_i^{h,ns'}\right)\right)}{1 + \sum_{j=1}^{K} \exp\left(\bar{U}_{j,i,g}^{h}\left(\eta_{win\%,i}^{h,ns}, \eta_{CIB,i}^{h,ns}, \eta_{SP,i}^{h,ns}, D_i^{h,ns'}\right)\right)} \right) \tag{4}$$

where

$$\begin{aligned} \bar{U}_{k,i,g}^{h}\left(D_i^{h,ns'}\right) &= \delta_{k,i,g} + \left(Win\%_{i,g-1}\cdot\left(D_i^{h,ns'}\cdot\Lambda_{D,win\%} + \eta_{win\%,i}^{h,ns}\right)\right.\\ &\left. + CIB_{I,g}\cdot\left(D_i^{h,ns'}\cdot\Lambda_{D,CIB} + \eta_{CIB,i}^{h,ns}\right) + SP_{i,g}\cdot\left(D_i^{h,ns'}\cdot\Lambda_{D,SP} + \eta_{SP,i}^{h,ns}\right)\right). \end{aligned} \tag{5}$$

$\delta_{k,i,g}$ represents the mean utility that is common to all consumers in the market of team i. Then, we use the contraction mapping procedure suggested by [16] to "invert" $\delta_{k,i,g}$ from the observed choice share in our dataset. Once $\delta_{k,i,g}$ is inverted, we can estimate the linear parameters in the utility function (1). Specifically, let $X_{k,i,g}$ be defined as $\{\beta_{k,0}, Win\%_{i,g-1}, CIB_{i,g}, SP_{i,g}, TeamD_{i,k}, DateD_k, MonthD_k\}$; then, $\delta_{k,i,g} = X'_{k,i,g}\theta_2 + \xi_{k,i,g}$. Using the OLS condition, we can estimate $\hat{\theta}_2$. Then, we use the residual of $\hat{\xi}_{k,i,g}$ to search for nonlinear parameters θ_1^1 that minimize the criterion function $F(\hat{\theta}_1, \hat{\theta}_2) = \hat{\xi}(\theta_1)\hat{\xi}(\theta_1)$ using a numerical optimization procedure.

4.2. Estimation Results

Table 4 reports the estimation results of the key demand variables. First, related to our first research question, we find that the three key variables (team winning, the competitiveness of the match, and star power) play a significant role in sports fans' online webcast demand. As we expected, a higher team winning percentage has a positive effect, while an increase in competitive imbalance has

a negative impact on the online spectating choice. This is similar to the other traditional spectating choices. Star power also shows a significant positive effect on online webcast choice.

Table 4. Estimation results of demand parameters.

Parameter	Choice		
	Online Webcast	Attendance	TV
Constant	−9.067 ***	−6.346 ***	−5.292 ***
$Win\%_{i,g-1}$	1.057 ***	0.583 ***	0.317 ***
$CIB_{i,g}$	−1.101 ***	−0.253 ***	−0.826 ***
$SP_{i,g}$	1.577 ***	1.303 ***	4.381 ***
$Share_{Online\ Webcast,i,g-1}$	4.729 ***	0.314	1.052
$Share_{Attendance,i,g-1}$	0.139	0.358 ***	0.344 ***
$Share_{TV,i,g-1}$	−0.042	0.018	0.146 ***
Team 1 (Doosan)	−0.085	0.0001	−0.400 ***
Team 2 (Hanwha)	0.416 ***	0.081	−0.057
Team 3 (Kia)	0.264 ***	0.297 ***	0.038
Team 4 (LG)	0.178 **	0.181 **	−0.303 **
Team 5 (Lotte)	0.104	−0.107 *	0.006
Team 6 (NC)	−0.296 ***	0.233 ***	−0.439 ***
Team 7 (Nexsen)	−0.061	−0.887 ***	−0.332 ***
Team 8 (Samsung)	0.128	−0.466 ***	−0.229 *
Date (Wed.)	−0.049	0.114 **	−0.034
Date (Thur.)	−0.029	0.086 *	−0.066
Date (Fri.)	−0.017	0.271 ***	−0.044
Date (Sat.)	−0.184 ***	0.602 ***	−0.058
Date (Sun.)	−0.125 *	0.260 ***	−0.013 **
April	0.421 ***	0.051	0.020
May	0.502 ***	0.243 ***	−0.034
June	0.315 ***	0.122 *	0.018
July	0.137 *	0.160 **	−0.011
Aug.	0.081	0.105 *	−0.059

*** <0.01, ** <0.05, * <0.1.

In addition, the demographic characteristics of sports consumers show idiosyncratic differences in their tastes for these demand variables (Table 5). We find that consumers who are younger and better educated value the victory of the team more. Additionally, this type of consumer is less sensitive to the competitiveness of the game. Considering star players, we find that consumers who are older, less educated, and consume less have higher evaluations of their favorite star players.

Table 5. Estimation results of demographic parameters.

Demo Parameters	Game Quality Variables		
	Win%	CIB	SP
Age (<30 years)	2.489 ***	1.674 ***	−9.393 ***
Education (>Univ.)	1.892 ***	3.151 ***	−15.954 ***
Consumption rate (>Mean)	−0.028	1.003 ***	−1.685 **

*** < 0.01, ** < 0.05, * < 0.1.

Therefore, our estimation results support the previous literature: the three key demand drivers also play significant roles in the online webcast demand case. However, it is noteworthy that team winning and competitive balance represent critical factors to increase the online spectating demand rather than the star power. The effect of these factors is much stronger for the online webcast choice than for alternative choices. To see this difference, we compute the impact of the percent change of the three key demand factors on the percent change of the demand of each channel (Table 6). The victory of the team has a three-times stronger influence than on the TV viewership demand, and the game

excitement (measured by the competitive balance between teams) has a four-times stronger impact than on the attendance demand, while star players are relatively less effective in attracting sports fans to online broadcasting. This implies that the disproportionate preferences for certain game attributes are due to the unique nature of the online spectating platform. Due to the considerably lower opportunity/switching cost, online spectators could selectively enjoy the glory of their team's victory. For example, a sports fan who attends a game at the stadium will not be able to freely leave the stadium when a team is losing against the competing team because they are not able to come back once they leave. Of course, they can come back if they buy another ticket to enter; however, there are very few alternative choices available to them once they leave the game. However, online spectators can return to watch a game at any time.

Table 6. Percent change in key variables on percent change in demand for each spectating channel.

	Game Quality Variables		
	Win%	CIB	SP
Attendance	0.289%	−0.029%	0.103%
TV	0.156%	−0.097%	**0.354%**
Online Webcast	**0.526%**	**−0.130%**	0.125%

Additionally, for sports game watching, consumers have a lower opportunity cost when switching to other alternative options (not related to sports games) because they can watch a game using their mobile phones or laptops and then return to other tasks at any time. Therefore, team winning has come to play a vital role in attracting more sports fans to online webcasts. Similarly, competitive balance is important because online spectators can leave a game whenever the game becomes predictable. Therefore, the uncertainty of outcome is more critical to these online spectators: more online sports fans are likely to return to the game once the game is competitive.

Furthermore, we find evidence of a strong retention effect regarding online webcast spectatorship, which means that the previous spectating experience of online webcast impacts the next-time choices (Table 4). This finding implies that online spectating fans might be more addicted to the game than audiences utilizing other spectating channels. This might be due to the typical nature of the online webcast platform: lower costs of spectatorship and no restrictions of the spectating environment. Similar to other product-purchasing experiences through the internet (e.g., online shopping, online game, etc.), the benefits of using an online platform that is incommensurable with other traditional ones could cause their users to become more addicted to its services. This "addiction" serves as a powerful force for repeated online shopping and increases a consumer's switching costs, thus reinforcing the online consumption and discouraging the consumers from exploring new suppliers, so they tend to stick with the current supplier [55,60–62]. To see this retention effect clearly, we computed the impact of the percent change in the previous share from each spectating channel on the percent change in each channel's demand (Table 7). The results indicate that the retention effect of online webcast spectatorship is as strong as the effect of stadium spectatorship and even larger than that of TV spectatorship.

Table 7. Percent change in previous share of each spectating channel on percent change in demand of each channel.

	Demand		
	Attendance	TV	Online Webcast
Share (attendance, t-1)	**0.1733%**	−0.0012%	−0.00005%
Share (TV, t-1)	0.1665%	**0.1389%**	−0.0005%
Share (Online Webcast, t-1)	−0.0021%	−0.0012%	**0.1784%**

One might argue that this could be caused by the characteristics of online webcast users. For example, the retention rate is higher if the majority of the online webcast users are more loyal

fans than other channel users because these fans are those who are willing to invest their time and effort in watching the game instead of turning to other alternative entertainment choices for their leisure or refreshment. They might be loyal particularly in the way that they are attentive towards the game during the entire duration, even if they only actually watch a game from time to time. However, this might be out of the scope of our study. Future studies need to verify how and why previous spectating experiences strongly influence the current spectatorship of online webcasts, in addition to and beyond the possible addiction of online game watching.

Moreover, the impact of the game date is widely digressive across each choice. For example, the attendance choice is significantly wider on the weekend. While there is little impact of the game date on the TV audience or online webcasting choice during weekdays, there is a significantly negative impact on the weekend. This reflects the notion that the purpose of sports consumers' choices would be different. Similarly, we find different seasonality effects for each choice. For game attendance, the month matters, while there is no significant seasonality effect for the TV choice. Interestingly, for online webcasting, we find significant seasonality until June, while there is no significant effect from July, which is the beginning of the summer vacation. This implies that online webcasting is preferred by consumers who do not have enough time to invest in a game or are just using it to kill time.

5. Conclusions

In this paper, we study the online webcast demand of professional sports games by simultaneously considering the major spectating channel choices in a BLP-style model. Due to the distinctive characteristics of the online spectating platform, this new medium could provide a completely different spectating environment for sports fans. By collecting a comprehensive dataset from the KBO, we empirically analyze the online spectators' choice behavior. Our findings support the notion that that key demand factors such as team winning, the competitive balance, and star power play significant roles in increasing the online webcast channel demand of KBO fans. Specifically, our study finds that certain key demand drivers particularly relevant to the team performance and the game quality are overwhelmingly important for the fan's choice of online webcast than for other traditional channels. However, the existence of star players is relatively less important than the other game factors. More interestingly, we find evidence of a strong retention effect of online webcast demand. This impact is as strong as those effects of other spectating channels. This might be due to the unique benefits provided by the online spectating platform.

These findings expand our understanding of sports marketing and management literature in the aspect of online spectatorship, which is rapidly becoming a major spectating channel. We also contribute to the online marketing literature by adding our study of online consumers' behaviors in the sports industry, where online webcast has been considered as a new business model that might change the landscape of the overall sports business. In particular, our findings provide meaningful implications to the general managers and league designers who have struggled with the aging problems of their customers (Nielson) ("Baseball is struggling to hook kids—and risks losing fans to other sports (April 2015)" (https://www.washingtonpost.com/sports/nationals/baseballs-trouble-with-the-youth-curve--and-what-that-means-for-the-game/2015/04/05/2da36dca-d7e8-11e4-8103-fa84725dbf9d_story.html?utm_term=.77a8640c8db2&noredirect=on)). The problem of aging fans has been given central attention to because it relates to the different spectating behaviors of younger sports consumers who would make up a major portion of sports fans in the future. This aging trend is similarly found in other sports industries, e.g., the average age of sports fans in the NFL and NBA is 47 and 37, respectively, and is becoming increasingly older. One believes that, due to this aging of fans, more and more young fans are leaving the traditional channels of watching games.

The younger generation are technology-oriented and their daily lives are strongly dependent on IT gadgets such as smartphones, tablets, notebooks, and so on. They are less patient and not willing to invest large costs and time in watching a sports game. Unlike the traditional fans, the alternative leisure activities to sports are likely to be digital-related activities such as online games or watching

YouTube programs. Moreover, they do not value the in-person experience of the sports game compared to traditional fans (Intelligencer, 2018) ("Nobody's going to sports in person, and no one seems to care (July, 2018)," (http://nymag.com/intelligencer/2018/07/nobodys-going-to-sports-in-person-and-no-one-seems-to-care.html?gtm=bottom&gtm=bottom)). Aware of this gravity, many professional sports leagues have competitively begun providing online streaming services (OSS) to attract young sports fans and our findings provide an important implication to them to understand the unique characteristics of online sports fans who watch games using webcasts.

However, while we find strong empirical evidence of the distinctive properties of online spectating behavior, there are some limitations in this study. First, our findings are based on a sample of Korean professional baseball league fans. Thus, it might be limited to apply to the general context of sports fans' spectating choice decisions. However, as studied in previous literature, the fundamental spectating nature of baseball fans and the league system is very similar across countries that operate a professional baseball league due to the successful globalization of MLB [30,32,35]. In addition, the major operation channels by which to enjoy a sports game are not different across worldwide sports fans, such as stadium, TV, or online webcast if possible. Thus, even if our analysis is based on Korean baseball samples, the findings are able to provide meaningful implications and opportunities for other sports industries.

Thus, it would be meaningful for future researchers to provide further study related to the online webcast users' behaviors in various sports leagues such as professional basketball leagues or soccer leagues. For example, with the rapid penetration of online webcast channels for the National Baseball Association (NBA), it has become a critical issue to successfully manage online sports fans in the next business model (The Washington Post) (The Washington Post (2019), "The NBA isn't surprised its TV ratings are way down. Radical change already was afoot" (https://www.washingtonpost.com/sports/2019/12/24/nba-ratings-decline-explanation-espn-tnt-abc-adam-silver/)). Particularly, along with the recent global pandemic of COVID-19, the online webcast channel has become a more important sports spectating channel than ever before [71,72]. Thus, future studies also need to expand our understanding of online webcast spectators' behaviors in other sports industries and environments.

Another limitation of our analysis is that we do not consider the possibility of simultaneous choices of multiple spectating channels. One might argue that some sports consumers go to the stadium to watch a game while using webcast broadcasting as an auxiliary tool for better spectatorship. This might be possible; however, we cannot incorporate this auxiliary role of webcast broadcasting into the proposed BLP-style model. While we firstly consider the substitutional relationship of three alternative spectating channel demands in our model, it would enrich our understanding of online spectating behaviors if future studies investigate the auxiliary relationship among these channels. Finally, because we collected data based on a single season, we cannot separately identify the impact of the team's postseason performance on a fan's channel choices. It would be interesting for future studies to expand our study by incorporating these factors to verify how they might influence online webcast spectating channel choice decisions of sports fans.

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