스포츠매니지먼트학 석사학위 논문

The Co-Existence of Two Baseball Leagues

in a single TV market:

Substitute, Complimentary or Independent

미국 메이저리그와 한국 프로야구의 관계

: TV 시청률 분석을 중심으로

2021 년 8 월

서울대학교 대학원

체육교육과 글로벌스포츠매니지먼트 전공

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이 논문을 스포츠매니지먼트학
석사 학위논문으로 제출함
2021 년 8 월

서울대학교 대학원
체육교육과 글로벌스포츠매니지먼트 전공
김 바 로

김바로의 석사 학위논문을 인준함
2021 년 8 월

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Chapter 1. Introduction

1.1. Background

Hyun Jin Ryu, who was a starting pitcher for LA Dodgers in 2013-2019, showed a sensational performance in 2019 finishing second in National League Cy Young Award voting behind Jacob deGrom of New York Met in Major League Baseball (MLB). It was a historical moment in the history of Korean Major Leaguers. The history of Korean Major Leaguer started back to 1996. Chan Ho Park, a first Korean starting pitcher in MLB, debuted in 1996, and his starting job for Dodgers coincided with the regular broadcast of MLB games on Korean national television (Lee, 2006). His 100th winning game was televised on June 5th of 2005, and the game reached the second highest TV rating figure among the 98 cable television channels during the period (Chung, 2008).

The appearance of Chan Ho Park had been a watershed event of Korean Major Leaguers because, with his successful careers in MLB, the MLB scouters' attentions were headed to Korean Baseball Organization (KBO). In 2016, the unprecedented prime season of Korean Major Leaguers came, which there were eight Korean players in the big league; Shin Soo Choo, Hyun Jin Ryu (LA Dodgers), Seung Hwan Oh (Saint Louis Cardinals), Jung Ho Kang (Pittsburgh Pirates), Hyun Soo Kim (Baltimore Orioles), Dae Ho Lee (Seattle Mariners), Byung Ho Park (Minnesota Twins),

and Ji Man Choi (LA Angels). Since then, MLB fans in Korea have been growing rapidly with not only the increasing number of Korean players but also their ready−made fandoms in Korea. Many of Korean Major Leaguers in 2016 transferred to the big league after acquiring the qualification of Free Agents after playing in KBO at least six years of service time, so they were able to their formal KBO fans to MLB. In addition, not only Korean born players moved to MLB, but also foreign players in KBO have gone back to MLB and showed great performances; Eric Thames (Milwaukee Brewers) and Merrill Kelly (Arizona Diamondbacks).

The Korean baseball market has a unique feature of the co−existence of Korean Baseball Organization (KBO), the domestic baseball league, and Major League Baseball (MLB), the foreign baseball league. As mentioned above, the lively player transactions between KBO and MLB have affected to each other on their fans, including sports media consumers. For sport media consumers, only the small amount of empirical work on the demand for sports has attempted to understand the relationship between local markets and fan preferences toward one team or another. Winfree et al. (2004) showed that this in MLB game attendance, finding that locally nearby teams reduce the total demands for their counterparts. In addition, Tainsky & Jasielec (2014) showed that leagues thrive on the complementary relationship with spillover effects among its member franchises. However, there was no study on the

relationship between two leagues on the same sports in a single TV market like KBO and MLB but Lee (2006).

 Lee (2006), the only study on the relationship between KBO and MLB, suggests that the emergence of MLB as a rival league to KBO accounted for more than half of the decline in attendance that occurred between 1995 and 2000. He called this "the Major League Effects". However, after 2000, the popularity of Korean baseball has been risen up with a gold medal in 2008 Beijing Olympic, and the attendance of KBO has grown consistently and became the most popular professional league in the country now. Also, the number of Koran Major Leaguers has increased since then, so it is worth to examine "The Major League Effects" again.

1.2. Purpose of Study

In the past, the audiences demand for sports have only focused on stadium goers, and the profits of gate receipts had been the major sources of revenue for the league. However, recently, as the world has been globalized and the technology has advanced, the profits on broadcasting media rights have been a new dominant source of revenue of the league (Buraimo & Simmons, 2015).

This study primarily aims to examine the relationship on Korean TV market between two leagues; Korean Baseball Organization (KBO) professional league and Major League Baseball (MLB), using TV viewership data from 2017 to 2019. Our method is derivative of Rottenberg's (1956) demand model as detailed by Borland and MacDonald (2003). Because the original model is created to investigate the demand of attendance, it needs to be modified for TV audience demand. For this, we limit the scope of our independent variables related to traditional audience demand factors; consumer preference and game attribute, and external factors; MLB factors. There has been a long debate whether the foreign league on the same sports is substitute, compliment or independent to the domestic league in a single country. Korean baseball market has an appropriate feature for the purpose of this study; the co-existence of two leagues in a single TV market. Using the both leagues' data, this study investigates how watching MLB affects to watching KBO on TV.

Chapter 2.

Audience Demand of Televised Sports

2.1. Overview

The topic of demand for sport had attracted substantial attention in the fields of sports economics recently. An economic approach to demand for sporting contests means both 'direct' demands and 'derived' demands (Borland & MacDonald, 2003). Firstly, direct demand comes out where a consumer derives utility from the sporting contests such as attending to the stadiums. Secondly, derived demand comes out where the sporting contest is consumed as an input in producing another good or service such as TV, radio, and internet broadcasters. Lots of sports marketing and management academic researchers have developed typologies to identify different sources of demand, and these typologies explaining the structure of relationship between fan interest and various factors. The conclusions from this research cam relate to the approach of the economic literature.

Understanding the determining factors of audience demand for sport is the most important issue in analyzing the professional sporting markets. Many of objectives of professional leagues can ultimately be focused to the idea maximizing fan interest (Borland & MacDonald, 2003). This requires to understand the determinants of

attendance and TV viewership. Traditionally, studies on the demand for sport are rooted in the attendance studies, which investigates the determinants of stadium attendance in a number of professional sports across the world. However, there are inherent problems to the attendance data in understanding demand for sport such as the possible bias led by the season ticket holders, unobservable excessive demand beyond stadium capacity, and generally high proportion of home supporters (Feehan, Forrest & Simmons, 2003). Also, not only the demand for attendance but also the demand for TV viewership is crucial to understand the determinants of the audience demands because sports fans watching televised sporting contests revealed 'heterogenous' preferences compared to that of fans attending games in stadium (Mongeon & Winfree, 2012).

Horowitz (1978) notes, after 1945, that broadcasting represented a potentially important area of demand. As revenue streams grow beyond gate receipts with the advance of technologies such as satellite and telecommunication, academic researches have moved toward understanding the factors driving sports fans to TV. In addition, with the growth of sports media rights markets, professional sports leagues in the world have seen continuous increases in broadcast media rights and advertisement markets, accounting for a much greater proportion of total revenues than ever before.

As the broadcasting systems have covered larger regions and reached more households, sports fans have two choices on consuming sporting contests: go to the stadium or watch them on TV. One of the biggest differences between stadium goers and television viewers is the respective costs compared to each other. Television viewers are less constrained by time or financial costs when watching a game because they avoid spending on the ticket, travel, parking, and concessions associated with attendance.

The economic theory of demand for sport is rooted on a typical consumer theory model, but it focused only on the direct demand side, attending to the stadium. A representative consumer is assumed to choose a consumption options to maximize utility. Borland and Macdonald (2003) suggest five main categories of determinants of demand for attendance to sporting events as to apply the consumer theory model: (1) consumer preferences, (2) economic price, (3) quality of viewing, (4) game characteristics, and (5) supply capacity. Yet, as aforementioned, because this construct is created to model attendance, the theoretical specification must be modified for TV viewership.

For this study, variables were selected by modifying previous models. For instance, economic price doesn't affect to the demand for TV audience because TV viewers don't need to buy tickets to watch the game. Also, quality of viewing doesn't affect much to TV viewers comparing the stadium goers who are affected

by seat locations and the facility of stadiums. Lastly, supply capacity clearly has no application to TV broadcasts. As a result, we maintain the focus on two categories; consumer preferences and game characteristics.

2.2. Consumer Preferences Factors

2.2.1. Fan Identification

Fan identification is the personal commitment and emotional involvement that customers have with a sport organization (Sutton, McDonald & Milne, 1997). As the marketing and communication functions of a sports team cannot directly influence on-field success, fan identification is an important concept because it may minimize the possibility of losing the position in the sport entertainment hierarchy of its community and long-term fiscal success separated from the effects of team performance.

Wann & Branscombe (1993) found that individuals with high level of fan identification were more connected to the team, and this involvement turned into longer periods as a fan, greater number of attendances to games, and high expectations for team's future. Also, highly identified fans are more easier to invest their money and time in their attempts to follow their team comparing to the normal fans.

2.2.2. Community Affiliation

Community affiliation is the most significant component of fan identification. According to Rooney's (1974) concept of "Pride in Place", in which means a key expression of community affiliation, sports promote communication, involve people together, and provide common symbols, resulting in a collective identity and a reason for solidarity (Lever, 1995). Indeed, this component in community affiliation is the most instrumental in making fan identification.

The community affiliation component came out from the friendship and bonding researches and is defined as kinship, bond, or connection the fan has to a team. The expression of common symbols, history, shared goals, and the fan's need to belong links the team to the community and provides an identity for the team that is inseparable from that of the community (Sutton, McDonald & Milne, 1997). As a component of the community, a fan affinity is associated and extended to the team.

2.2.3. Superstar Effects

Besides community affiliation as a significant correlate of fan identification, there is another strong correlate, called "Superstar Effects". Sports fans bond to a certain sports team although they have no connection to the team's city. For example, there are many fans of Los Angeles Dodgers in Korea. The fandom started with Chan Ho Park, a first Korean MLB starting pitcher. He debuted

in 1996, and his starting job for Dodgers coincided with the regular broadcast of MLB games on Korean national television (Lee, 2006). People in Korea were eager to watch his games and became fans of his team, LA Dodgers. His 100th winning game, televised on June 5th of 2005, reached the second highest TV rating figure among the 98 cable television channels in Korea (Chung, 2008).

Housman & Leonard (1997) call players who have this "incremental" positive effect on TV market as "superstars". Going back to the work of Noll (1974) for team sports and Rosen (1981), Adler (1985) and Boorstin (1992) regarding the value of superstars, they have consistently been showing the positive influences on stadium attendance and TV viewership. Therefore, the existence of a superstar externality has implications to be distributed keeping the competitive balance in the leagues.

An increasing body of literature in sports economics has emerged in recent years, which has placed greater emphasis on "star power" and talent as more significant drivers of attendance demand than competitive balance (Treme & Allen, 2011; Franck & Nüesch, 2012; Hogan & Massey, 2013; Sacheti, Gregory-Smith & Paton, 2014; Ormiston, 2014; Buraimo & Simmons, 2015; Lewis & Yoon, 2016; Jewell, 2017). However, these studies on the influence of superstars suffer from a potential problem; that is, defining "superstar status" is somewhat arbitrary. In this study, instead of using the term "superstar", uses the term "Korean Major

Leaguers" to capture the potential combination of talent and popularity that may drive the much of TV viewership of MLB and affect to KBO TV market.

Since Chan Ho Park appear, there have been a number of Korean Major Leaguers as presented in [Table 1]. With Chan Ho Park's successful careers in MLB, the MLB scouters' attentions to Korean Baseball Organization (KBO) have grown on consistently. In 2016, the unprecedented prime season of Korean Major Leaguers, there were eight players in the league. Even though some of them could not survive in the big league and returned to Korea next year, there have been at least five players from 2017 to 2019. During the periods, Seung Hwan Oh, a relief pitcher, recorded 20 saves as a closer for Saint Louis Cardinals in 2017. In 2018, Shin Soo Choo reached base in 51 consecutive games, the longest since 2007, and became the first Korean-born position player to appear in al All-Star Game. In 2019, Hyun Jin Ryu, a starting pitcher for LA dodgers, became the first Korean-born pitcher to start the All-Star Game and finished second in National League Cy Young Award voting in 2019. As shown in [Table 2], there were consistent performances of Korean Major Leaguers from 2017 to 2019, and events such as All-Star Game have brought a great momentum on expanding a baseball fandom in Korea.

Table 1. Korean Major League players in history.

Player	Position	Debut Year	Final Year
Chan Ho Park	SP	1994	2010
Jin Ho Cho	SP	1998	1999
Byung Hyun Kim	RP	1999	2007
Sang Hoon Lee	RP	2000	2000
Sun Woo Kim	SP	2001	2006
Jung Keun Bong	SP	2002	2004
Hee Seop Choi	1B	2002	2005
Jae Weong Seo	SP	2002	2007
Cha Seung Baek	SP	2004	2008
Shin Soo Choo	OF	2005	Active
Dae Sung Koo	RP	2005	2005
Jae Kuk Ryu	RP	2006	2008
Chang Yong Lim	RP	2013	2013
Hyun Jin Ryu	SP	2013	Active
Jung Ho Kang	3B/SS	2015	2019
Ji Man Choi	1B/DH	2016	Active
Hyun Soo Kim	OF	2016	2017
Dae Ho Lee	1B	2016	2016
Seung Hwan Oh	RP	2016	2019
Byung Ho Park	1B/DH	2016	2016
Jae Gyun Hwang	3B	2017	2017
Kwang Hyun Kim	SP	2020	Active

Table 2. Active Korean Major Leaguer players (2017 – 2019).

Pitchers					
Year	Player	Games	Innings	ERA	W-L / SV
2017	Hyun Jin Ryu	25	126.2	3.77	5W 9L
	Seung Hwan Oh	62	59.1	4.1	20SV
2018	Hyun Jin Ryu	15	82.1	1.97	7W 3L
	Seung Hwan Oh	73	68.1	2.63	3SV
2019	**Hyun Jin Ryu** (All-star)	**29**	**182.2**	**2.32**	**14W 5L**
	Seung Hwan Oh	21	18.1	9.33	0SV
Batters					
Year	Player (Position)	Games	AB	HR	AVG
2017	Shin Soo Choo	149	636	22	0.261
	Ji Man Choi	6	15	2	0.267
	Hyun Soo Kim	96	212	1	0.231
	Jae Gyun Hwang	18	52	1	0.154
2018	**Shin Soo Choo** (All-star)	**149**	**665**	**21**	**0.264**
	Jung Ho Kang	3	6	0	0.333
	Ji Man Choi	61	190	10	0.263
2019	Shin Soo Choo	149	660	24	0.265
	Jung Ho Kang	65	65	10	0.169
	Ji Man Choi	127	410	19	0.261

Note. ERA, earned run average; HLD, holds; SV, saves; AB, at bats; HR, home runs; AVG, batting average; OBP, on base percentage; SLG, slugging percentage.

2.3. Game Characteristics Factors

2.3.1 Uncertainty of Outcome Hypothesis

Rottenberg's (1956) Uncertainty of Outcome Hypothesis (UOH) has been driving a body of literature in understanding characteristics of the game. He found out that sports fans prefer games with greater unpredictability, ultimately showing that preferences for sporting contests are dependent on levels of competitive balance between teams in a league. Specifically, if fans are not specifically concerned on competitive balance or outcome uncertainty, there is a little need for policies. Assumptions with fan preferences for the uncertainty of outcome require substantial evidence and consideration across the various leagues on the world (Fort, 2017).

Although there are clear needs for competition in sports leagues to be fierce, recent works have questioned whether Rottenberg's UOH applies to the individual game level, particularly when fans are partial to only one of the teams (Coates, Humphreys, & Zhou, 2014). However, a large body of literature on outcome uncertainty and gate attendance has revealed mixed results with respect in uncertainty as shown in [Table 3].

Table 3. Empirical testing of the UOH in various leagues.

Author(s)	Sport	Date	Dependent Variable	UOH Measure	UOH Result
Rascher & Solmes (2007)	NBA	2001-2002	Attendance	Win %	For
Beckman, Cai, Esrock & Lemke (2011)	MLB	1985-2009	Attendance	Betting odds	Against
Coates et al. (2012)	MLB	2005-2010	Attendance	Betting odds	Against
Tainsky & Winfree (2010)	MLB	1996-2009	Attendance	Win %	No impact
Coates & Humphreys (2010)	NFL	1985-2008	Attendance	Points spreads	Against
Paul & Weinbach (2007)	NFL	1991-2002	TV audience	Win %	For

(continued)

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Table 3. (continued)

Tainsky, Xu & Zhou (2014)	NFL	2005-2009	TV audience	Betting odds, win %	Local market: no impact Non local: For
Coates & Humphreys (2012)	NHL	2005-2010	Attendance	Betting odds	Against
Mills & Fort (2014)	NBA, NFL, NHL, MLB	1900-2000	Average attendance	Win %	Against: NHL, MLB For: NBA, NFL
Sung, Mills & Mondello (2019)	MLS	2010-2014	TV audience (Local)	Betting odds, win %	No impact
Buraimo & Simmons (2008)	EPL	2000-2006	Attendance	Betting odds	Against
Forrest, Buraimo & Simmons (2005)	EPL	1993-2002	Attendance	Points difference	For
Buraimo (2008)	EPL	1997-2004	Attendance, TV audience	Points difference	No impact

(continued)

Table 3. (continued)

Pawlowski & Anders (2012)	Bundesliga	2005-2006	Attendance	Betting odds	Against
Benz, Brandes & Franck (2009)	Bundesliga	1999-2004	Attendance	Betting odds, standings	No impact
Buraimo & Simmons (2009)	La Liga	2003-2007	Attendance, TV audience	Betting odds	Against: attendance For: TV audience
Jang & Lee (2015)	KBO	1987-2011	Average attendance	Win %	For
Ryu, Kim, Paik & Cheong (2019)	KBO (the post-season)	2008-2016	TV audience	Points difference	For

Note. NBA = National Basketball Association; MLB = Major League Baseball; NFL = National Football League; NHL = National Hockey League; MLS = Major League Soccer; EPL = English Premire League; Bundesliga = German Football League; La Liga = Spanish Football League; KBO = Korean Baseball Organization; UOH = Uncertainty of Outcome Hypothesis.

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The UOH, despite the mixed results found in previous literature, is a speculation of fan preferences which is assumed to be inherently different from individual to individual, so that it needs substantial investigation to reveal fan preferences in various context. Since professional sports depend on cultures of the nation, the socio−economic factors around the professional leagues may drive heterogenous factors to affect the audience demands for televised sports (Ryu et al., 2019).

In order to understand the determinants of TV audience demand correctly, these determinants should be examined in accordance with each cultural and sports contexts where the sports league comes from. As the dependent variable of this study is TV viewership of KBO, the variables need to be controlled in the context of Korean cultural and sports−specific context. This study uses the typology of Ryu's (2019) study, who studied in the context of KBO through a careful review of previous studies. They grouped the determinants of KBO game characteristics into two categories by whether the factors are related to the match or not; match−related factors and match−unrelated factors. A match−related factor refers to the variables 'directly' accounted for by the games such as uncertainty of outcome and score sum, whereas a match−unrelated factor refers to the variables 'not directly' accounted for by the game such as weather and game time.

2.3.2. Match-Related Factors

As shown in [Table 4], there are five match-related factors, indicating the demand for KBO games are identified; the uncertainty of outcome, score sum, score difference, and extra innings, and a number of match-unrelated factors in various contexts of the league operated by its respective country.

Table 4. Factors of TV audience demand for KBO.

Match-Related factors		Match-Unrelated factors
Predicted match factors	UOH (THEIL / BETRO)	Time (day / night)
		Weekday / Weekend
Current match factors	Score sum	Weather
	Score difference	Temperature
	Extra innings	Team values

The general proposition of the outcome uncertainty is that the greater the outcome uncertainty, the greater the suspense and enjoyment the audience experiences while consuming media sports will be (Berkowitz et al., 2011). Previous studies applied a variety of indices to measure the uncertainty of outcome such as betting odds, score sum, and the closeness of league standings,

The uncertainty of outcome works in collaborations with various other factors in heterogenous contexts, and different combinations of factors are able to make more or less influences depending on the contexts such as the national environment and

history where the league is operated (Ryu et al., 2019).

Accordingly, the relationship between the uncertainty of outcome
and the audience demand for televised matches is certainly
predictable, but should be empirically verified in each sporting
context. This study uses THEIL and BETRO as
the "predicted" match factors. THEIL is the measure of uncertainty
of outcome introduced by Theil (1967). It is based on betting odds,
and past work has used this measure for evaluating the uncertainty
of outcome (Peel & Thomas, 1997; Czarnitzki & Stadtmann, 2002;
Buraimo & Simmons, 2008; Pawlowski & Andres, 2012). THEIL is
calculated as follows:

$$Theil = \sum_{i=1}^{3} \frac{p_i}{\sum_{i=1}^{3} p_i} \log\left(\frac{\sum_{i=1}^{3} p_i}{p_i}\right).$$

Here, p_i denotes the probability of either a home win or an
away win, calculated from betting odds. As THEIL increases in
magnitude, the uncertainty of outcome increases, and BETRO is the
reverse bet outcome defined as any outcome that has turned out to
be opposite of the calculated expectation.

Following the predicted match factors that are decided
before the game starts, there are "current" match factors that are
affected after the game starts such as score sum, score difference,
and whether the match went into extra innings or not. Unlike
stadium goers who are mostly affected by the predicted match

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factors, TV viewers are most likely to be affected by the current match factors while the match are being televised. Also, scoring have a positive impact on television audience demand (Paul & Weinbach, 2007) because it generates exciting, arousing and suspenseful viewing experiences to the consumers, increasing the audience demand for the game (Peterson & Raney, 2008; Alavy et al., 2010).

2.3.3 Match-Unrelated Factors

Numbers of match-unrelated factors that are not directly related to the matches affect to the audience demand for the televised sports matches. Among them, match schedule such as game day and time is an important factor that influences the media sports demand (Tainsky, 2010; Forrest et al., 2005). The findings of previous research indicate that weekend matches tend to be higher in TV viewership than weekday matches (Choi, 2008; Berkowitz et al., 2011; Buraimo, 2008), and matches starting at the night time tend to be higher than matchers starting at the day time (Chiang & Jane, 2013; Feddersen & Rott, 2011; Tainsky, 2010). Also, weather conditions, whether it rains or not, are additional significant factor affecting the audience demand for televised sports (Barnett et al., 1991; Roe & Vandebosch, 1996). This relationship emerges because broadcasts compete with other recreational activities, many of which take place outdoors (Ryu et al., 2019). Feddersen &

Rott (2011) found that sunnier and warmer weather affect negatively the demand for televised sports, and higher temperature, lower rain precipitation, and weaker wind-force are also associated with lower demand for televised sports.

In addition, team values contribute to the demand for televised sports as well. Forrest & Simmons (2002) found that the demand for football matches is affected by the competing team's quality and performance. Additionally, the better the historic and older franchise team performance in the league, the higher demand to see the team play (Tainsky & Jasielec, 2014; Cox, 2018). Pérez, Puente, Rodríguez (2017) found that the expected uncertainty of outcome may either have no effect on the TV audience in La Liga. However, they found that traditional interpretation of UOH seems to only work in the case of the most popular teams; Real Madrid and FC Barcelona. There are multiple dimensions accounting for team valuation, so it needs to adjust by the nature and the context of the country operating the league.

In KBO, there are 10 teams rooted in 8 cities, as seen in [Table 5]. The average TV viewership of older franchise teams with long histories based on a local singular city has shown to be higher than those who have shorter histories and are franchised in Seoul, a capital city. Doosan Bears, LG Twins, and Kiwoom Heroes share Seoul city as a hometown, so they share the baseball fans in the areas making their fandoms weaker comparing to other teams,

franchised in a single local city such as KIA Tigers, Hanhwa Eagles, and Lotte Giants.

Lee and Shin (2013) found that the biggest factors that influence the TV ratings in KBO are the team itself and its opponents, and KIA Tigers and Lotte Giants were the two teams who generally attain the highest TV ratings. To evaluate team values, this study uses the average ranking scores (Ryu et al., 2019). Six teams are grouped into two groups of three teams based on the TV viewership data from 2017 to 2019; a group of high popularity teams attaining highest TV viewership and the other of low popularity teams attaining lowest TV ratings. According to [Table 5], the formal group involves KIA Tigers, Hanhwa Eagle and Lotte Giants, and the latter group involves NC Dinos, Kiwoom Heroes and KT Wiz. Each group gets its average daily ranking scores, calculated by assigning greater weights to higher ranking teams. The score ranges from 0 to 9, for example, the first-place-ranked team receives nine points, whereas the bottom-ranked team gets nothing, zero point.

Table 5. Average TV viewership per game of KBO teams (2017 - 2019).

Team	City	Founded	TV viewership (TV rating)			
			2017	2018	2019	Average
KIA Tigers	Gwangju	1982	307,399 (1.669)	299,114 (1.599)	233,249 (1.223)	279,921 (1.507)
Hanhwa Eagles	Daejeon	1986	181,764 (0.986)	261,815 (1.401)	185,776 (0.968)	209,785 (1.118)
Lotte Giants	Busan	1982	182,284 (0.986)	203,754 (1.088)	176,666 (0.925)	187,568 (1.000)
Samsung Lions	Daegu	1982	161,500 (0.877)	202,266 (1.081)	161,335 (0.850)	175,034 (0.936)
LG Twins	Seoul	1982	148,439 (0.801)	160,820 (0.859)	154,087 (0.806)	154,449 (0.822)
Doosan Bears	Seool	1982	147,102 (0.795)	157,068 (0.841)	143,774 (0.749)	149,315 (0.795)
SK Wyverns	Incheon	2000	137,966 (0.750)	136,807 (0.731)	128,332 (0.670)	134,368 (0.717)
NC Dinos	Masan	2013	122,610 (0.666)	127,695 (0.684)	126,713 (0.662)	125,673 (0.671)
Kiwoom Heroes	Seoul	2008	114,975 (0.623)	133,204 (0.716)	121,925 (0.638)	123,368 (0.659)
KT Wiz	Suwon	2015	106,376 (0.574)	115,261 (0.617)	103,069 (0.538)	108,235 (0.576)

2.4. External Factors

Besides game characteristic factors, there are other factors affecting to the audience demand, called 'external factor'. However, there is no general definition because it can be various by the context of the league operated by each respective country. For examples, 2002 FIFA World Cup, hosted in Korea and Japan, can be an external factor affecting to the baseball market in Korea as a substitute. As the purpose of this study is to investigate the relationship between KBO and MLB in a single TV market, the external factor and the focus factor is related to MLB.

In this study, instead of using the term "External Factors", uses the term "MLB Factors" to make the clear on the purpose of this study. MLB factors include the number of Korean Major Leaguers, the number of MLB games broadcasted, the total TV viewership of MLB games broadcasted, and online MLB clips viewership on each day of KBO games. In Korea, every MLB games are broadcasted from early in the morning, and when all the MLB games are over, KBO games start. Even though players, teams, and leagues are different, they are same sports, baseball. Also, there are Korean players in the big league, called "Korean Major Leaguers", and they may play an important role on audience demands in Korean TV market. This study investigates the relationship between two leagues using "MLB Factors".

Chapter 3. Competition Across Leagues: Substitute, Complementary or Independent

3.1. Korea Baseball Organization Contents

Baseball is the most popular professional sports in Korea. The professional league of Korea Baseball Organization (KBO) is the oldest and the most popular professional league, and its market size has been always on the top comparing to other professional sports leagues, as shown in [Table 6].

KBO league consists of 10 teams. Each team plays 144 games, a total of 720 games, in each regular season. The unique setting of KBO TV market is that unlike other professional sports leagues in the US or Europe, all games, with only a few exceptions, are televised nationally via pay-TV channels. Those games that are not televised via pay-TV channels are approximately under ten games per season, and they are broadcasted by national TV channels. Only less than five games have no TV exposure.

KBO games are scheduled from Tuesday through to Sunday. Five games played each day, and five pay-TV channels are ready to broadcast the games; MBC SPORTS+, KBS N SPORTS, SBS SPORTS, SPOTV, and SPOTV2. There is a well-followed rule among the broadcasters to determine which channel gets which

Table 6. Korean popular professional sports total attendance / average attendance per a game.

	KBO (baseball)		K-league (soccer)		KBL (basketball)		KOVO (volleyball)	
2010	6,236,626	11,402	2,432,127	11,260	1,133,841	3,941	345,549	1,848
2011	7,154,441	13,079	2,862,179	11,635	1,154,948	4,543	395,853	1,706
2012	7,533,408	13,747	2,419,225	6,853	1,333,787	4,160	358,518	1,867
2013	6,744,030	11,373	2,293,957	5,609	1,227,644	4,450	416,288	2,124
2014	6,754,619	11,429	2,084,768	5,048	1,341,748	3,971	498,421	2,205
2015	7,622,495	10,357	2,150,416	4,747	1,154,258	3,542	507,479	2,226
2016	8,631,829	11,744	2,139,826	4,734	1,030,905	3,167	520,768	2,264
2017	8,713,420	11,839	1,913,164	4,644	927,754	2,896	517,674	2,261
2018	8,400,502	11,398	1,570,628	3,812	848,507	2,992	580,448	2,546

* 2018 Sports Industry White Paper

game to broadcast. At the beginning of each season, a random pick order among the five pay－TV channels is determined, and according to this order, each channel chooses from the available matchups in the following week which game to televise; this pick order rotates sequentially throughout the season (Kim, Sung, Noa & Lee, 2020). This creates a unique setting where broadcasters face decisions every week to choose the most preferred games to televise considering the matchups including more popular teams like KIA Tigers and Hanhwa Eagles. Also, there is another unique setting in KBO highlight TV programs. After all game end, all five pay－TV channels produce their own highlight TV programs adjacently after their games, covering all games.

Park, Ahn & Shin (2018) found that the first highlight of the program has a significant effect on the TV viewership, which it depends on whether the first highlight features the more popular teams or not. They also found that, as the characteristics of the game, the lower the ranking difference and the more score difference of the game in the first highlight affect the TV rating positively. In [Table 7], TV ratings of highlight TV programs can be strongly correlated to TV ratings of broadcasts live by the inheritance effects because the channels who have higher TV ratings on KBO broadcast live generally have higher TV ratings on KBO highlight programs. However, it is just one of many factors

accounting for the audience demand, so it needs to be examined more closely.

Table 7. KBO games and H/L programs TV Viewership (TV ratings).

Channel	2017	2018	2019
KBO games			
MBC SPORTS+	164,396	193,803	180,733
	(0.891)	(1.033)	(0.946)
KBS N SPORTS	178,791	177,112	150,449
	(0.966)	(0.951)	(0.785)
SBS SPORTS	173,015	211,424	167,931
	(0.937)	(1.131)	(0.879)
SPOTV	140,356	183,269	144,217
	(0.761)	(0.980)	(0.757)
Sky Sports / SPOTV2	144,986	125,632	120,873
	(0.789)	(0.673)	(0.630)
KBO H/L programs			
MBC SPORTS+	19,637	19,950	16,687
	(0.545)	(0.555)	(0.461)
KBS N SPORTS	15,066	13,486	14,215
	(0.418)	(0.376)	(0.392)
SBS SPORTS	18,073	18,534	14,072
	(0.501)	(0.517)	(0.389)
SPOTV	11,494	15,008	11,981
	(0.319)	(0.419)	(0.331)
Sky Sports / SPOTV2	10,857	10,128	14,869
	(0.301)	(0.282)	(0.410)

NOTE. The fifth broadcaster changed from Sky Sports to SPOTV2 in 2018.

3.2. Major League Baseball Contents in Korea

Major League Baseball (MLB) is one of major professional sports leagues in the U.S., holding a long history. Currently, MLB consists of the National League and the American League. Within each league, there are three divisions (East, Central and West), containing five teams each, and every team plays 162 games, a total of 2,430 games per each regular season.

In Korea, toward the end of the year 2010, the popularity of MLB had decreased due to declining number and the weak on-field performances of Korean Major Leaguers. Therefore, in 2012, the price for the broadcast rights of MLB dropped to US$ 3 million and sold to MBC SPORTS+, one of five pay-TV sports channels. In 2013, Hyun Jin Ryu debuted successfully as a starting pitcher for LA Dodgers, and the price for the broadcast rights of MLB had escalated to US$ 7 million a year from 2013 to 2017. The popularity of MLB has grown up as more and better Korean Major Leaguers play, so the deal has renewed three more seasons from 2018 to 2020 with MBC SPORTS+.

Therefore, since 2012, MBC SPORTS+ has been the exclusive broadcaster of MLB for 9 years in Korea. Although there have been other Korean sports players abroad leagues such as Heung Min Son in English Premier League (EPL), MLB has a great merit for broadcasters in Korea with their game times. For example, EPL game times are mostly in the very late night or the very early

morning in Korea due to the time difference between Korea and England. However, MLB game times are from the morning to the noon in Korea, so people can watch the games without exchanging of their sleep time. People watch MLB games while having breakfasts and going to work, during work and even in the lunch time. In addition, for TV broadcasters, there are no other competitive sports contents in the morning time, so MBC SPORTS+ has been monopolized on TV viewership from 6 a.m. to 2 p.m. among pay-TV sports channels, as shown in [Table 8].

Besides the merit of the game time, since Hyun Jin Ryu, a number of Korean players moved to MLB after acquiring the qualification of Free Agents with playing in KBO at least six years of service time, in which means they are capable to bring not only pure MLB fans but also their formal KBO fans to MLB. In the past Korean Major Leaguers went to challenge for the big league right after graduating high schools or colleges; Chan Ho Park (Hanyang University), Shin Shoo Choo (Busan High School) and Ji Man Choi (Dongsan High School). However, after Hyun Jin Ryu's success, the way to the big league has changed, and many Korean Major Leaguers moved to MLB after playing in KBO; Hyun Jin Ryu (Hanhwa Eagle), Seung Hwan Oh (Samsung Lions), Jung Ho Kang (Kiwoom Heroes), Hyun Soo Kim (Doosan Bears), Dae Ho Lee (Lotte Giants), Byung Ho Park (Kiwoom Heroes), Jae Gyun Hwang (Lotte Giants).

Table 8. TV ratings of sports channels broadcasting KBO by times.

	MBC SPORTS+	KBS N SPORTS	SBS SPORTS	SPOTV	Sky Sports / SPOTV2
2017					
02:00-06:00	0.096	0.051	0.086	0.056	0.057
06:00-10:00	**0.265**	0.071	0.099	0.070	0.052
10:00-14:00	**0.554**	0.124	0.151	0.133	0.105
14:00-18:00	0.277	0.263	0.271	0.290	0.177
18:00-22:00	0.607	0.624	0.634	0.492	0.476
22:00-02:00	0.287	0.270	0.313	0.193	0.211
2018					
02:00-06:00	0.076	0.045	0.064	0.045	0.031
06:00-10:00	**0.340**	0.071	0.098	0.068	0.033
10:00-14:00	**0.717**	0.124	0.167	0.138	0.047
14:00-18:00	0.320	0.263	0.308	0.253	0.129
18:00-22:00	0.651	0.625	0.703	0.583	0.382
22:00-02:00	0.302	0.276	0.352	0.229	0.134
2019					
02:00-06:00	0.147	0.044	0.053	0.080	0.054
06:00-10:00	**0.501**	0.075	0.063	0.084	0.055
10:00-14:00	**0.941**	0.104	0.113	0.132	0.067
14:00-18:00	0.411	0.202	0.229	0.189	0.124
18:00-22:00	0.612	0.496	0.542	0.466	0.374
22:00-02:00	0.338	0.192	0.252	0.194	0.164

NOTE. The fifth broadcaster of KBO changed from Sky Sports to SPOTV2 in 2018.

3.2. Substitution or Complementary Effects

The notion of sporting contests as substitutes or complements for one another is an important topic among sport management researchers (Siegfried & Hinshaw, 1979; Baimbridge, Cameron & Dawson, 1996; Garcia & Rodriguez, 2002; Allan & Roy, 2008; Winfree & Fort, 2008), often by way of broadcast as a potential substitute or complement for live spectatorship. The substitution effect originally refers to the phenomenon that consumers will replace more expensive items with less costly alternatives when their incomes decrease or prices rise, and the complementary effect originally refers to the phenomenon that consumers will consume more items of a product when the demand for another complement product increases (Mao, 2019).

Lee (2006), the only study on the relationship between KBO and MLB, suggests that the emergence of MLB as a rival (substitute) league to KBO accounted for more than half of the decline in attendance that occurred between 1995 and 2000. He called this "the Major League Effects", but there was a crucial socio-economic factor, a severe financial crisis in Korea. In 1998, Korea experienced negative economic growth for the first time in history. From the nature of the league that majority of KBO teams are owned by major conglomerates with the name of the parent company in front of the team name (e.g. the KIA Tigers, Samsung Lions, Lotte Giants, etc.), the effect of the aforementioned Korean

financial crisis on the league competitive balance was crucial. For example, when the parent company went bankrupt, the company resorted to trading their star players for cash, and it increased financial imbalance among team owners. As a result, it may have altered the competitive balance of the league causing the decline of the attendance as well.

However, time has passed since then, and as Korean baseball national team had a great success in 2008 Beijing Olympic with a gold medal, the attendance of KBO has increased back consistently and became the most popular professional league in the country now. In addition, following Chan Ho Park's success, as Hyun Jin Ryu has debuted in MLB successfully in 2013, there have been many Korean Major Leaguers unprecedently, opening the second prime time of MLB in Korea. Besides aforementioned factors, the demand proxy of the previous study on the relationship between KBO and MLB was only the attendance, so it is worth to examine "The Major League Effects" on TV rating in the current periods.

This study assumes the relationship between KBO and MLB in three ways; Substitution, Complimentary or Independent. First of all, substitution relationship between KBO and MLB can occur by time constraints. As watching both KBO and MLB on TV costs time, watching MLB can substitute out one's investment in watching KBO due to a time constraint. From this resource allocation, MLB can

substitute KBO or vice versa. There is other kinds of substitution between different sports leagues. Rascher et al. (2009) presented evidence of cross-league attendance substitution between the National Hockey League (NHL) and National Basketball Association (NBA), and between the NHL and minor and junior hockey leagues. In the absence of the NHL (2004-2005 strike year), minor league teams and NBA teams competed on the margin with the NHL. Winfree et al. (2004) addressed substitution effects within MLB for attendance, finding that the closer two teams are, the lower attendance is at each team relative to two teams that are farther apart. In addition, she found that there is an additional initial reduction in attendance for the incumbent team when a new team moves into the area of an existing team. For example, the attendances of both the Washington Wizards (NBA) and the Washington Capitals (NHL) declined after the Washington Nationals (MLB) came into the market in 2005.

Secondly, there is a complementary relationship between leagues. Tainsky & Jasielec (2014) showed that leagues would thrive on the complementary relationship with spillover effects among its member franchises. Especially, if one of local markets is having a success, the nearby local fans are more likely to watch both their local teams' games even though they are in other leagues. Also, Mills et al. (2016) found out that a local market competitor's playoff appearance increases the other local team's

TV audience demand in the next year. These findings show that there are spillover effects of nearby team success. For example, if New York Yankees in MLB went to the playoff after the regular season, it affects positively to TV viewership of New York Mets, the other local franchise team in MLB, in the subsequent season. In addition to that, the complementary effect in sports management literature has been primarily discussed in the framework of 'Demonstration Effects' (Hogan, 2000). The demonstration effect, called the 'trickle-down' effects, refers to how a nation's excellence in sports performance leads to an increased mass interest in sports. As MLB is the top baseball league in the world, so watching its excellence on TV can bring out a mass interest on baseball leading to increase TV viewership of KBO, according to the demonstration effect.

These are contrary to evidence found by Winfree et al. (2004) and Rascher et al. (2009), mentioned above, and it implies that the relationship between or across leagues can be different respectively depending on the context of the league operated by its country. The relationship between KBO and MLB can be neither substitute nor complementary to each other, and operated 'independently' in its own TV market. There have been a few studies on the relationship of same sports and the different leagues in a single TV market such as KBO and MLB. As sports coverage

across the world has grown, it is incumbent to question whether and how this notion of abroad sports leagues into sports demand.

In this study, the complementary effect is broadly defined as the positive relationship between KBO TV markets and MLB TV markets – MLB TV viewership increases KBO TV viewership. By the same token, the substitution effect is broadly defined as the replacement of KBO TV viewership with MLB TV viewership under circumstances of external or internal constraints such as fan preferences and the game characteristics such as team values and the uncertainty of outcome.

4. Research Method

4.1. The Data

The TV viewership data of KBO and MLB were collected by
Arianna software developed by the AGB Nielsen, the third-party
television audit company, and the data consists of 2,109 KBO games
& 2,063 KBO highlight TV programs of five pay-TV sports
channels; MBC SPORTS+, KBS N SPORTS, SBS SPORTS, SPOTV,
SPOTV2, and Sky Sports, and 1,828 MLB games broadcasted in
Korea. The unit of analysis was the date from the 2017 regular
season to the 2019 regular season, a total of 557 units. Among 557
units, dates when KBO games and MLB games are broadcasted
together are selected; a total of 437 units.

This study uses both TV viewership and TV rating to
investigate the relationship between KBO and MLB in a single TV
market. TV ratings are minute-by-minute average percentages of
TV households tuned into a particular channel as a proportion of the
total TV households. Whereas TV rating is a relative measure, TV
viewership is the minute-by-minute average number of individual
television viewers averaged by each game, which rather indicates
the absolute size of the viewing audience each day. As both TV
viewership and rating measures are complementary to each other,
this study employs both as dependent variables.

Table 9. Description of variables.

Variable	Description	Type
Dependent variables		
ln_KBOVAVG	Total TV viewership of KBO games	Numerical
KBORAVG	Total TV rating of KBO games	Numerical
ln_KBOHLVAVG	Total TV viewership of KBO H/L programs	Numerical
KBOHLRAVG	Total TV rating of KBO H/L programs	Numerical
ln_KBOVMSP	TV viewership of MBC SPORTS+'s KBO game	Numerical
KBORMSP	TV rating of KBO game on MBC SPORTS+	Numerical
ln_KBOHLVMSP	TV viewership of KBO H/L program on MBC SPORTS+	Numerical
KBOHLRMSP	TV rating of KBO H/L program on MBC SPORTS+	Numerical
Match-related factors		
SSAVG	The average of teams' final scores' sum	Numerical
SDFAVG	The average of absolute difference in the team's final scores	Numerical
EXIN	The average of EXTRA innings indexes	Numerical
THEILAVG	The average of all games' THEIL measures	Numerical
BETRO	The average of BETRO indexes	Numerical
SSMSP	The sum of both teams' final scores on MBC SPORTS+	Numerical
SDFMSP	The absolute difference in the team's final scores on MBC SPORTS+	Numerical
EXINMSP	Whether the match went into extra innings or not (yes =1; 0)	Dummy
THEILMSP	Measure of uncertainty of outcome based on betting odds	Numerical
BETROMSP	Whether the match outcome has turned out to be opposite of bet outcome (yes =1; 0)	Dummy
Match-unrelated factors		
WETHR	The average of weather indexes of all KBO games	Numerical
TIME	The average of game time indexes of all KBO games	Numerical

WETHRMSP	Whether the match day was sunny or windy/rainy (windy/rainy = 1; sunny = 0)	Dummy
TIMEMSP	Whether the match was day- or night time (night time = 1; day time = 0)	Dummy
MATCHMSP	Match value factor depending on team popularity indexes*	Numerical
WKEND	Whether the match was weekday or weekend (weekend = 1; weekday = 0)	Dummy
MLB factors		
KMLT	Total number of Korean major leaguers played on the day	Numerical
ln_MLBTV	Total TV viewership of MLB games on the day	Numerical
MLBTR	Total TV ratings of MLB games on the day	Numerical
MLBN	Total number of MLB games broadcasted	Numerical
ln_KMLTBZ	Online viewership of Korean major leaguers' highlight contents	Numerical
ln_MLBBZ	Online viewership of MLB highlight contents other than Korean players	Numerical
YEAR	Year of the day	Categorical

Note. Year dummy was included to pool the data from 2017 to 2019.

A natural logarithmic transformation was performed for TV viewership variables and online viewership variables to ensure linearity of the relationship and more practical interpretations of the results in percentage terms.

As for the independent variables, there is a slight difference depending on the empirical models. There are two empirical models in this study. Model 1 is focused on the TV audience demand of all KBO games, and Model 2 is focused on the TV audience demand of MBC SPORTS+ channel, the only exclusive MLB copyright holder

in Korea. According to the type of the empirical models, there are five match-related factors for both empirical models; SS, SDF, EXIN, THEIL, BETRO, three match-unrelated factors for the empirical model 1; WETHR, TIME, WKEND, and four match-unrelated factors for the empirical model 2; WETHR, TIME, MATCH, WKEND. MATCH is calculated for team value factors because there is only one match in the empirical model 2. To calculate MATCH index, the popularity indexes of Home team and Away team are multiplied. The team popularity indexes are set from 1 point to 3 point by the team rankings of annual TV viewership through 2017 to 2019; KIA, Hanhwa, Lotte = 3 points / Samsung, LG, Doosan, SK = 2 points / NC, Kiwoom, KT = 1 point. For example, if KIA plays against Doosan, the MATCH index is 6 points, in which 3 points of KIA are multiplied by 2 points of Doosan.

For the focal factors of the study, there are six MLB factors including two Online MLB factors as shown in [Table 9]; KMLT, ln_MLBTV, MLBTR, MLBN, ln_KMLTBZ, ln_MLBBZ. For Online MLB variables; ln_KMLTBZ, ln_MLBBZ, the most popular online platform of MLB contents is NAVER, the largest web search engine in Korea. The data of online live streaming viewership is not open to the public, but the viewership of MLB highlight contents is accessible through SMR Wisdom software, which SMR, a joint venture between MBC and SBS, developed for analysis of clip

viewing patterns for online advertising business. The data of online MLB highlight contents viewership was grouped into Korean Major Leaguers Online Viewership (ln_KMLTBZ) and other MLB contents Viewership (ln_MLBBZ). As adding these variables, we try to examine the relationship not only between the leagues but also between the platforms; TV and online.

4.2. Analysis

Before analyzing the data of three years of observations, White's test for and homoscedasticity was performed for the dependent variables, TV ratings and logarithmic-transformed TV viewership. The test results showed insignificant signs of variability in the residuals, as shown in [Table 10]. In TV ratings of Model 2 and TV viewership of Model 4, the null hypothesis of constant variance can be rejected at 5% level of significance, so heteroscedasticity is in the residuals.

Table 10. White's test results for homoscedasticity.

Model	DV	Test results
1	TV viewership	$\chi 2(165) = 191.37$ (p = 0.15)
	TV ratings	$\chi 2(165) = 191.65$ (p = 0.06)
2	TV viewership	$\chi 2(184) = 204.64$ (p = 0.14)
	TV ratings	$\chi 2(184) = 218.46$ (p = 0.04)
3	TV viewership	$\chi 2(180) = 198.52$ (p = 0.16)
	TV ratings	$\chi 2(180) = 196.92$ (p = 0.18)
4	TV viewership	$\chi 2(200) = 234.51$ (p = 0.05)
	TV ratings	$\chi 2(200) = 233.64$ (p = 0.08)

Therefore, to correct heteroscedasticity, this study uses a robust command to fulfill the assumption of ordinary least squares (OLS) regression. As a result, this study applied the pooled OLS regression method to analyze the data. Four empirical models were analyzed, as follow:

Model 1:

KBO TV viewership/TV ratings = f (SS, SDF, EXIN, THEIL, BETRO, WETHR, TEMP, WKEND, TIME, KMLT*ln_MLBTV/MLBTR, MLBN, ln_KMLTBZ, ln_MLBBZ, YEAR)

Model 2:

KBO HL TV viewership/TV ratings = f (ln_KBOVAVG/KBORAVG, SS, SDF, EXIN, THEIL, BETRO, WETHR, TEMP, WKEND, TIME, KMLT*ln_MLBTV/MLBTR, MLBN, ln_KMLTBZ, ln_MLBBZ, YEAR)

Model 3:

KBO TV viewership/TV ratings on MBC SPORTS+ = f (SS, SDF, EXIN, THEIL, BETRO, WETHR, TEMP, WKEND, TIME, MATCH, KMLT*ln_MLBTV/MLBTR, MLBN, ln_KMLTBZ, ln_MLBBZ, YEAR)

Model 4:

KBO HL TV viewership/TV ratings on MBC SPORTS+
= f (ln_KBOVMSP/KBORMSP, SS, SDF, EXIN, THEIL, BETRO, WETHR, TEMP, WKEND, TIME, MATCH, KMLT*ln_MLBTV/MLBTR, MLBN, ln_KMLTBZ, ln_MLBBZ, YEAR)

4 8

Since total TV viewership and TV ratings of MLB is highly dependent on how many Koran major leaguers are appeared and played on the day, the interaction term between KMLT and MLB total TV viewership / TV ratings is added to expand understanding of the relationship among the variables in the models.

5. Findings and Discussion

5.1. Descriptive statistics

For Model 1, total 437 units of 557 units were analyzed because 120 units were dropped; 109 units including every Monday when KBO doesn't hold games and All-Star break, 11 units of MLB All-Star break. For Model 2, total 436 units were analyzed because there was one day of unit when only one of KBO games was hold and others were all cancelled by raining, in which all KBO highlight programs were cancelled. For Model 3, total 411 units were analyzed because there were 26 more KBO games cancelled by raining. For Model 4, there were 13 days when MBC SPORTS+ broadcasted only the game other than highlight program because there was another TV program scheduled following after the game such as a football match, so 398 units were analyzed.

The highest average of KBO TV rating was 1.68%, whereas the mean rating was 0.88%. The highest TV rating on MBC

SPORTS+ channel was 2.63%, and the mean rating was 0.96%. For match-related factors, the maximum number of games that went into extra innings in a day was three games (0.23%), and the mean EXIN was 0.35. BETRO index was from 0 to 5, and the mean was 1.94, in

which approximately 2 of 5 games resulted in reverse outcomes based on betting predictions. The reason why the observation number of match-related factors on MBC SPORTS+ (404 units) is 7 fewer than the number of games broadcasted on the channel (411 units) is because 7 games were cancelled before 6 innings by raining. Even though those games were cancelled with no decision, the broadcasting time was over two hours that was enough sample size of TV viewership to be investigated. For match-unrelated factors, the match factor only applied in Model 3 and 4 was from 1 to 9, and the mean was 3.78. The highest popular matchup of 9 points was 5.20%. In addition, among total 437 units, 218 days (49.89%) were weekdays, and 219 days (50.11%) were weekends.

For MLB factors, there were maximum of 6 Korea major leaguers throughout 2017 to 2019 seasons, as shown in [Table 2]. The maximum number of Korean major leaguers played on the same day was 5 (0.69%), and MLB games without Korean major leaguers broadcasted were 7.78%. MLB games were broadcasted from 1 game to 5 games each day, and over two thirds the days were broadcasted 3 to 4 games in a day (81.01%).

Table 11. Descriptive statistics.

Variable	Obs	Mean	Std. Dev.	Freq. (%)	Min	Max	Skew-ness	Kurt-osis
Dependent variables								
ln_KBOVAVG	437	12.00	0.22		11.25	12.53	0.00	0.00
KBORAVG	437	0.88	0.18		0.32	1.68	0.57	0.00
ln_KBOHLVAVG	436	11.27	0.24		10.33	11.86	0.00	0.62
KBOHLRAVG	436	0.43	0.10		0.16	0.76	0.09	0.67
ln_KBOVMSP	411	11.96	0.56		10.15	13.11	0.01	0.25
KBORMSP	411	0.96	0.51		0.12	2.63	0.00	0.94
ln_KBOHLVMSP	398	11.36	0.42		10.03	12.37	0.21	0.74
KBOHLRMSP	398	0.50	0.22		0.12	1.26	0.00	0.02
Match-related factors								
SSAVG	437	10.25	2.75		1.20	19.00	0.14	0.30
SDFAVG	437	3.96	1.40		0.40	9.00	0.00	0.29
EXIN	437	0.35	0.57		0.00	3.00	0.00	0.00
0 game				303 (69.34)				
1 game				116 (26.54)				
2 games				17 (3.89)				
3 games				1 (0.23)				
THEILAVG	437	29.17	0.56		24.80	30.04	0.00	0.00
BETRO	437	1.94	1.16		0.00	5.00	0.44	0.00
0 game				50 (11.44)				
1 game				110 (25.17)				
2 games				136 (31.12)				
3 games				100 (22.88)				
4 games				39 (8.92)				
5 games				2 (0.46)				
SSMSP	404	10.09	5.21		1.00	35.00	0.00	0.00
SDFMSP	404	3.96	2.95		0.00	16.00	0.00	0.00
EXINMSP	404	0.08	0.27		0.00	1.00		
no extra				373 (92.33)				
extra innings				31 (7.67)				
THEILMSP	404	29.15	1.05		25.09	30.10	0.00	0.00
BETROMSP	404	0.44	0.50		0.00	1.00		
predicted				225 (56.25)				
reversed				175 (43.75)				

Match-unrelated factors

	N	Mean	SD	Freq (%)	Min	Max	Skew	Kurt
WETHR	437	0.80	1.27		0.00	5.00	0.00	0.00
TIME	437	0.89	0.31		0.00	1.00		
WETHRMSP	404	0.24	0.43		0.00	1.00		
TIMEMSP	404	0.89	0.31		0.00	1.00		
MATCHMSP	404	3.78	2.10		1.00	9.00	0.00	0.32
WKEND	437	0.50	0.50		0.00	1.00		
Weekday				218 (49.89)				
weekend				219 (50.11)				
TEMP	437	26.56	5.20		9.18	37.65	-0.66	3.69

MLB factors

	N	Mean	SD	Freq (%)	Min	Max	Skew	Kurt
KMLT	437	1.84	0.98		0.00	5.00	0.04	0.38
0 player				34 (7.78)				
1 player				119 (27.23)				
2 players				188 (43.02)				
3 players				76 (17.39)				
4 players				17 (3.89)				
5 players				3 (0.69)				
ln_MLBTV	437	12.41	0.50		10.70	13.88	0.00	0.05
MLBTR	437	1.44	0.69		0.24	5.62	0.00	0.00
MLBN	437	3.33	0.83		1.00	5.00	0.00	0.58
1 game				9 (2.06)				
2 games				53 (12.13)				
3 games				180 (41.19)				
4 games				174 (39.82)				
5 games				21 (4.81)				
ln_KMLTBZ	437	12.40	1.28		8.08	15.34	0.00	0.04
ln_MLBBZ	437	12.36	1.01		8.40	14.26	0.00	0.00
YEAR	437							
2017				149 (31.10)				
2018				136 (31.12)				
2019				152 (34.78)				

Note. MSP=MBC Sports +(Plus)

5.2. Findings

In [Table 12], the corresponding regression estimates are presented. With respect to Model 1, SSAVG ($\beta_{viewership}$ = .018, p < .01; β_{rating} = .014, p < .01) SDFAVG ($\beta_{viewership}$ = −.023, p < .01; β_{rating} = −.02, p < .01), and EXIN ($\beta_{viewership}$ = .051, p < .01; β_{rating} = .037, p < .01) had a significant impacts on KBO TV audience demands, ln_KBOVAVG and KBORAVG. Even though game outcome uncertainty, THEILAVG, did not seem to play a major role for the audience demand, BETRO ($\beta_{viewership}$ = .022, p < .01; β_{rating} = .015, p < .05) played a major role positively. Among match−unrelated factors, TEMP ($\beta_{viewership}$ = −.011, p < .01; β_{rating} = −.009, p < .01) affected to the audience demand negatively, TIME ($\beta_{viewership}$ = .130, p < .01; β_{rating} = .098, p < .01) had a positive impact as night game time increases TV audience demand, in accordance with findings by Ryu et al., (2019).

Most strikingly, one of MLB factors, KMLT ($\beta_{viewership}$ = −.699, p < .01; β_{rating} = −.039, p < .01) had a great negative impact, but the interaction term between KMLT and total MLB TV audience demands, ln_MLBTV and MLBTR, showed the opposite way of positive impact ($\beta_{viewership}$ = .055, p < .01; β_{rating} = .022, p < .01). To investigate this outcome more closely, the graph of the interaction term was made, as shown in [Figure 3]. It shows that as the number of Korean major leaguers increased, the effect of MLB

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Table 12. Results of pooled OLS for KBO games and KBO HL programs

VARIABLES	Model 1		Model 2		Model 3		Model 4	
	ln_KBOVAVG	KBORAVG	ln_KBOHLVAVG	KBOHLRAVG	ln_KBOVMSP	KBORMSP	ln_KBOHLVMSP	KBOHLRMSP
ln_KBOVAVG /KBORAVG			0.493***	0.216***			0.489***	0.296***
			(0.052)	(0.029)			(0.043)	(0.025)
SSAVG	0.018***	0.014***	-0.001	-0.001	0.005	0.004	-0.000	-0.000
	(0.004)	(0.003)	(0.004)	(0.002)	(0.004)	(0.004)	(0.003)	(0.002)
SDFAVG	-0.023***	-0.020***	0.006	0.002	-0.026***	-0.022***	0.004	0.004
	(0.007)	(0.006)	(0.008)	(0.003)	(0.008)	(0.008)	(0.006)	(0.003)
EXIN	0.051***	0.037***	0.019	0.012*	0.135	0.145*	0.006	-0.003
	(0.015)	(0.013)	(0.016)	(0.007)	(0.086)	(0.078)	(0.071)	(0.035)
THEILAVG	0.022	0.012	0.034	0.012	-0.015	-0.005	-0.007	-0.007
	(0.021)	(0.019)	(0.025)	(0.010)	(0.018)	(0.018)	(0.013)	(0.007)
BETRO	0.022***	0.015**	0.020**	0.009**	0.022	0.010	0.018	0.005
	(0.008)	(0.007)	(0.009)	(0.004)	(0.041)	(0.038)	(0.030)	(0.016)
WETHR	-0.006	-0.003	-0.009	-0.003	0.054	0.053	-0.065*	-0.014

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	(0.007)	(0.006)	(0.007)	(0.003)	(0.052)	(0.050)	(0.038)	(0.020)
TEMP	-0.011***	-0.009***	-0.005**	-0.002**	-0.008**	-0.004	-0.004	-0.001
	(0.002)	(0.001)	(0.002)	(0.001)	(0.004)	(0.004)	(0.003)	(0.001)
WKEND	-0.022	-0.021	-0.066***	-0.029***	0.007	-0.033	-0.052	-0.021
	(0.018)	(0.015)	(0.020)	(0.009)	(0.043)	(0.040)	(0.034)	(0.017)
TIME	0.130***	0.098***	-0.067*	-0.027*	0.150**	0.132**	-0.043	-0.024
	(0.038)	(0.032)	(0.038)	(0.016)	(0.060)	(0.054)	(0.069)	(0.036)
MATCH					0.171***	0.152***	-0.013	-0.010*
					(0.010)	(0.009)	(0.010)	(0.005)
KMLT	-0.699***	-0.039***	-0.426*	-0.016*	-0.922**	-0.052	-0.517	-0.050**
	(0.197)	(0.015)	(0.221)	(0.009)	(0.433)	(0.042)	(0.493)	(0.022)
ln_MLBTV/MLBTR	-0.042	-0.025	-0.018	0.000	-0.059	-0.074	-0.010	-0.001
	(0.031)	(0.023)	(0.034)	(0.012)	(0.081)	(0.070)	(0.076)	(0.029)
KMLT*ln_MLBTV /MLBTR	0.055***	0.022***	0.034*	0.008*	0.074**	0.040*	0.039	0.019
	(0.016)	(0.008)	(0.017)	(0.004)	(0.035)	(0.023)	(0.039)	(0.013)

MLBN	0.037***	0.036***	-0.014	-0.006	0.025	0.048*	-0.002	-0.006
	(0.013)	(0.011)	(0.014)	(0.006)	(0.033)	(0.029)	(0.026)	(0.012)
ln_KMLTBZ	0.012	0.010	-0.010	-0.005	0.018	0.020	0.012	0.005
	(0.009)	(0.007)	(0.009)	(0.004)	(0.021)	(0.019)	(0.015)	(0.008)
ln_MLBBZ	0.012	0.007	-0.006	-0.002	0.022	0.007	0.004	0.000
	(0.012)	(0.010)	(0.012)	(0.005)	(0.024)	(0.023)	(0.020)	(0.010)
2018.YEAR	0.105***	0.093***	0.052*	0.027**	0.163***	0.139***	0.005	0.006
	(0.024)	(0.020)	(0.029)	(0.012)	(0.058)	(0.052)	(0.045)	(0.023)
2019.YEAR	-0.059**	-0.047**	-0.071**	-0.040***	0.010	-0.020	-0.280***	-0.137***
	(0.029)	(0.024)	(0.034)	(0.013)	(0.069)	(0.059)	(0.052)	(0.023)
Constant	11.484***	0.305	4.998***	0.069	11.944***	0.123	6.023***	0.553**
	(0.718)	(0.545)	(0.977)	(0.285)	(1.110)	(0.635)	(1.102)	(0.243)
Observations	437	437	436	436	398	398	376	376
R-squared	0.366	0.351	0.405	0.401	0.479	0.456	0.500	0.536

Robust standard errors in parentheses
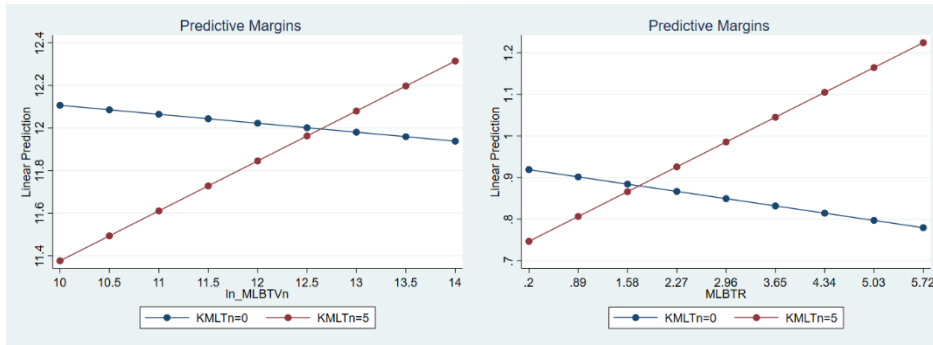*** p<0.01, ** p<0.05, * p<0.1

Figure 3. The interaction term effect analysis in Model 1

TV audience demands had a positive impact on the KBO TV audience demands, indicating the relationship is complementary. However, if the number of Korean major leaguers is fewer, it decreases the KBO TV audience demands indicating a substitutional relationship. Regarding KMLT factor, it cannot be assumed that KBO TV audience demands decrease as more Korean major leaguers play because there can be other more factors composing the MLB factor out of TV market not only the number of Korean players but also their playing positions, on−field performances, game times overlapped each other, and so on. For examples, batter can play either full−time in the game or just for a pinch hit, and there would be just one game broadcasted in Korea even though two or more Korean major leaguers play if the game starts at the same time. In cases of MLB games that two or more Korean major leaguers play at the same time, the exclusive broadcaster, MBC SPORTS+, has the control on the number of MLB games broadcasted, MLBN ($\beta_{viewership}$ = .037, p < .01; β_{rating}= .036, p < .01). If the broadcaster switches to the game of Jung Ho Kang in

the middle of broadcasting the game of Hyun Jin Ryu, a starting
pitcher, as Ryu got kicked out of the game in the first inning, the
number of MLB games broadcasted would be counted as two even
though the game duration is as long as just one game. This would be
one of limitations on this study, but the main study focus is the
relationship between two leagues in a single TV market. Therefore,
this study focuses on the interaction term of MLB TV audience
demands and the number of Korean major leaguers as the focal
factor.

    For YEAR factor, comparing to 2017 season, the KBO TV
audience demand increased in 2018 ($\beta_{viewership}$ = .105, p < .01;
β_{rating} = .093, p < .01), and it is assumed that baseball got more
popular as Korean national baseball team won a gold medal in the
18th Asian Games in 2018. In contrast, the KBO TV audience
demand decreased in 2019 ($\beta_{viewership}$ = −.059, p < .05; β_{rating} =
−.047, p < .05), and one of the reasons is assumed that many
baseball fans didn't follow the full season because all popular teams
such as KIA and Lotte who ranked the first and fifth in the previous
season of 2017 dropped to the fifth and the seventh and couldn't
make to the playoffs.

    In Model 2 for TV audience demands of KBO highlight
programs, the audience demands for KBO games ($\beta_{viewership}$ = .493,
p < .01; β_{rating} = .216, p < .01) was the greatest factor, in
accordance with findings by Lee and Shin (2013) that the TV

audience demands for highlight programs are highly related to the

demands for the game because of the trickle−down effects. Other

than that, BETRO ($\beta_{viewership}$ = .020, p < .05; β_{rating}= .009, p < .05)

had a positive impact, and TEMP ($\beta_{viewership}$ = −.005, p < .05;

β_{rating}= .002, p < .05) and WKEND ($\beta_{viewership}$ = −.066, p < .01;

β_{rating}= −.029, p < .01) had impacts, indicating people don't watch

highlight programs with higher temperatures and on weekends. In

addition, KMLT ($\beta_{viewership}$ = −.426, p < .1; β_{rating}= −.016, p < .1)

and the interaction term between KMLT and MLB TV audience

($\beta_{viewership}$ = .034, p < .1; β_{rating}= .008, p < .1) had the same

negative and positive impacts as Model 1, and the relationship was

also depending on the number of Korean major leaguers, as shown

in [Figure 4].
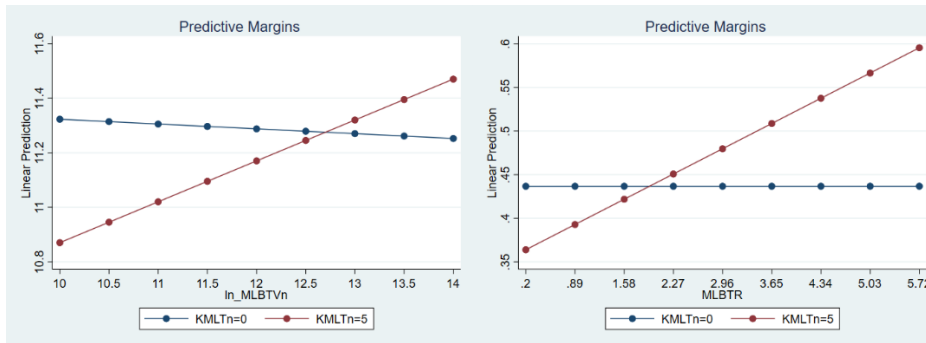
Figure 4. The interaction term effect analysis in Model 2

Model 3 and 4 was to investigate how having the exclusive

MLB broadcast rights affects to TV audience of the copyright

holder channel, MBC SPORTS+. In Model 3, SDF ($\beta_{viewership}$ =

−.026, p < .01; β_{rating}= −.022, p < .01), TEMP ($\beta_{viewership}$ = −.008,

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p < .05), and TIME ($\beta_{viewership}$ = .150, p < .05; β_{rating}= .132, p < .05) had impacts. However, most striking factor was MATCH ($\beta_{viewership}$ = .171, p < .01; β_{rating}= .152, p < .01), indicating more popular teams in the matchup, more people watch no matter how the game goes.

Interestingly, MLB factors in Model 3 showed the same pattern as Model 1 and 2 with KMLT ($\beta_{viewership}$ = −.922, p < .05) , but it was only related to TV viewership, not on TV rating. However, the interaction term of KMLT and MLB audience demands ($\beta_{viewership}$ = .074, p < .05; β_{rating}= .04, p < .05) showed the positive impact, and the relationship was shown in [Figure 5]. For TV audience demands for MBC SPORTS+ highlight programs in Model 4, the audience demand for KBO game played a most
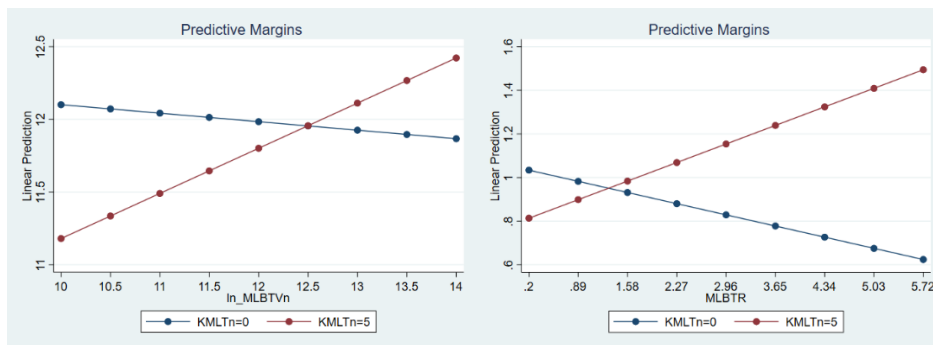

Figure 5. The interaction term effect analysis in Model 3

significant role ($\beta_{viewership}$ = .489, p < .01; β_{rating}= .296, p < .01), and other factors were not significant. This study adds ln_KMLTBZ and ln_MLBBZ to investigate the relationship between the

platforms; TV and Online, but both online factors didn't play any significant role in KBO TV audience demands.

5.2. Discussions

This study examined the determinants of TV audience demands for KBO from 2017 to 2019 to investigate the relationship between the domestic league and the abroad league in same sports, baseball. The most popular sports in Korea is baseball, and baseball is scheduled on TV from the early morning to the late night every single day because fandoms for MLB have grown as many Korean star players have gone to the big league since Chan Ho Park. The results show that the KBO TV demands are affected by a number of match-related and match-unrelated factors in a similar pattern, in accordance with the previous works by Lee and Shin (2013) and Ryu et al., (2019).

      Regarding two factors related to the uncertainty of outcome, THEIL and BETRO, but only BETRO showed a significant role on KBO TV audience demands. It showed that people are more interested in games when the game turned out to the opposite of their expectations. However, there were all different results on the uncertainty of outcome depending on the context of the nations and leagues, and the measurement of the factor are varied other than THEIL and BETRO. Also, the sample size of this study was only from 2017 to 2019, so it would need more sample size and

complementary measures to investigate on the uncertainty of outcome more accurately in the future.

The focal factor of this study is MLB factors. There were five MLB factors; the number of Korean major leaguers appeared, the number of MLB games broadcasted, total TV viewership and ratings of MLB games, and total online viewership of MLB contents. Most interesting result of MLB factors was the interaction term of the number of Korean major leaguers appeared and total TV viewership and ratings of MLB games on the day. The interaction term showed different effects depending the condition of the number of Korean major leaguers. When the number of Korean major leaguers appeared on the day increased, MLB TV audience demands increase KBO TV audience demands indicating the complementary relationship. However, if no Korean major leaguers appeared on the day, MLB TV audience demands decrease KBO TV audience demands slightly indicating the substitutional relationship or independent relationship, in accordance with findings by Mills et al. (2016) who found that propensity for cross-nation sports between leagues to act as substitutes of one another or whether there exist more complex complementary spillover effects between them.

This result can be explained by three theoretical backgrounds, superstar effects, inheritance effects, and screen size effects. For superstar effects, every Korean major leaguer is a star

player in Korea, and there have been many cases that one superstar rises the awareness and popularity of the league. Jewell (2017) found that stadium attendances that David Beckham played were 25% higher than the league average. There have been more Korean players than one who can bring out 'Beckham effects' in MLB. Korean fans cannot go to the stadiums, but they can watch MLB games on TV.

Regarding the inheritance effects, the game times of MLB scheduled in Korean were perfect to show the inheritance effect, so called 'spillover effect'. Kirsch and Banks (1962) first introduced the concept in noting inordinately high levels of audience duplication between programs scheduled back-to-back. From the early morning to the late afternoon, MLB games are broadcasted in Korea, and KBO games start following MLB games so that baseball fans can keep the engagements and retentions from MLB to KBO, as shown in [Table 13]. Additionally, MLB teams with Korean major leaguers are identified as home teams to Korean fans regardless of their hometowns, so all KBO teams and MLB teams with Korean players can be identified as member franchises to Korean baseball fans even though there is no connection between those teams but the nationality factor. Tainsky and Jasielec (2014) and Tainsky et al. (2015) found that leagues may thrive on the complementary relationship and spillover effects among its member franchises, and they showed that a local game on the same network resulted in a

significant lead−out effect. It indicates that higher MLB TV audience demands with more Korean major leaguers played, higher KBO TV audience demands with spillover effects and lead−out effects with not only adjacent TV scheduling but also fan identification of the member franchises.

Table 13. The general TV schedule of MBC SPORTS+

Time	Weekday	Weekend
2:00	MLB game 1 (live)	MLB game 1 (live)
3:00		
4:00		
5:00	MLB game 2 (live)	MLB game 2 (live)
6:00		
7:00		
8:00	MLB game 3 (live)	MLB game 3 (live)
9:00		
10:00		
11:00	MLB game 4 - 5 (live)	MLB game 4 (live)
12:00		
13:00		
14:00		
15:00		KBO game (live)
16:00	MLB highlight program (live)	
17:00		
18:00	KBO game (live)	KBO highlight program (live)
19:00		
20:00		MLB highlight program (recorded)
21:00		
22:00	MLB highlight program (recorded)	
23:00		

Lastly, Lombard (2000) found that viewers feel greater sense of physical movement, enjoyment, and excitement on larger screen, indicating people prefer to watch on TV with large screen than smart phones or PC monitors to carry and retain the momentum of their enjoyments and excitements from watching great plays of Korean major leaguers. MBC SPORTS+ had run short MLB highlight clips during the KBO live games and even in the KBO highlight programs because they know that people want to feel the excitements and enjoyments again and again in large TV screens although they know the results of MLB games or already watched Korean major leaguer highlights.

Despite the contribution that this study can make within current data, there are few limitations that future study can address. First, for MLB TV audience demands, not only the number of Korean major leaguers but also factors such as their positions and on-field performances should be examined to investigate the effect of KMLT factor. A starting pitcher brings higher TV viewership than a relief pitcher, and slugging in-fielders are more popular than defensive out-fielders because they can make more highlight and impactive plays on the field. Secondly, future study needs to control the MLB exclusive broadcaster choice factor. There are more than five MLB games in a day, but there is only one

exclusive channel for broadcasting MLB games. Korean major leaguers don't appear in a row for a TV schedule. There can be games at the same with two or more Korean major leaguers, and the exclusive broadcaster needs to choose and schedule the games considering the TV audience demands. This study only focuses on the quantities of TV audience demands for MLB games broadcasted to investigate the relationship between two leagues in a single TV market, but future study would need to take a look more closely on the broadcaster choices before the MLB games to be scheduled. Lastly, regarding the relationship between platforms; TV and Online, the results showed no evidence of relationship each other. However, the online MLB factors of this study were very limited because the data were collected from only the highlight contents, not including the live streaming viewership. In these days, many people watch the live games through online platforms with their smart phones, but the live streaming viewership data are not accessible for the public yet. Therefore, to investigate the relationship between the platforms in the future, the live streaming viewership data needs to be added with MLB highlight contents viewership as MLB online factors.

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