Determinants of the Number of Spectators in the Korean Professional Baseball League

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Introduction/Literature review
Since the Korean Professional Baseball League (KPBL) was established in 1982, it has been the most popular professional sport in Korea, attracting more than eight million spectators in 2016. Despite its immense popularity, there has been little research on competitive balance (CB) and uncertainty of outcome, two key factors for attracting spectators. These factors can be understood by how each teams’ winning percentage is equally distributed within a league.

Rottenberg’s (1956) uncertainty of outcome hypothesis (UOH) explained that sports fans value uncertainty of outcome, implying that attendance would increase as the degree of CB increases. This is due to the fact that if the winning percentage difference between the home and visiting teams is large, fan excitement will be minimal since the outcome is highly predictable (El-Hodiri & Quirk, 1971). Szymanski (2003) stated that games are exciting only when there is uncertainty of outcome which can be categorized by game uncertainty, playoff uncertainty, and consecutive season uncertainty.

Recently, Fort and Lee (2016) found that spectators in KPBL respond to a change in CB, generally preferring to attend games in which the outcome is in doubt. As UOH has been regarded one of the most significant factors in analysis of sports economics, a variety of approaches have been developed to estimate CB. For example, there have been many studies on using the standard deviation of winning percentage (Scully, 1999), Herfindahl-Hirschman Index (Depkin, 1999), competitive balance ratio (Humphreys, 2002), Gini coefficient (Mizak, Daniel, Stair, & Rossi, 2005), and correlation of year to year winning percentage (Salaga, 2015).

Unlike Major League Baseball (MLB), the majority of previous KPBL studies used yearly data and hence are limited to long-term uncertainty of outcome. Because the history of KPBL is relatively brief, use of data collected annually severely hampers in-depth analysis of CB and uncertainty of outcome. Accordingly, the purpose of this study is to minutely examine the effect CB has on KPBL using daily data to better understand fans’ demand on game uncertainty and playoff uncertainty.

Data and Method
The data set includes daily observations for each KPBL teams over the period from 2007 through 2015. Out of 5008 observations, the number of first week games (239) were deleted in an effort to eliminate any outliers in the measurement of CB (Meehan, Nelson, & Richardson, 2007). Furthermore, 11 double header games were deleted in order to distinguish panel data from raw data. A total of 4758 observations were used in this study. This study utilized unbalanced panel data which is a combination of time-series data and cross-section data. Ordinary least squares, fixed effect model, and random effect model were estimated in addition to the Hausman test. The general form of the estimating follows:

\[ \ln(\text{Attendance}) = B_0 + B_1 \text{pwindiff} + B_2 \text{nwindiff} + B_3 \text{hometeamwin} + B_4 \text{pughGB} + B_5 \text{puvGB} + B_6 \text{distance} + B_7 \ln(\text{salarydiff}) + B_8 \text{dummyprecipitation} + B_9 \text{humidity} + B_{10} \ln(\text{capacity}) + B_{11} \ln(\text{ticketprice}) + B_{12} \ln(\text{gdp}) + B_{13} \ln(\text{population}) + B_{14} \text{holiday} + B_{15} \text{newteam} + B_{16} \text{megasportevent} + B_{17} \text{hometeamplayofflast} + B_{18} \text{visitingteamplayofflast} + B_{19} \text{hometeamkorealast} + B_{20} \text{visitingteamkorealast} + B_{21} \text{hometeamkoreawinlast} + B_{22} \text{visitingteamkoreawinlast} + B_{23} \text{year} + B_{24} \text{month} + B_{25} \text{day} + \varepsilon \]

While most variables are self-explanatory, information for the following variables are needed: pwindiff is the winning percentage difference when home team is ahead of visiting team, nwindiff is the winning percentage difference when...
visiting team is ahead of home team, puhGB is the home team games behind the leading team, and puvGB is the visiting team games behind the leading team.

Results
Findings for this study revealed that spectators in the KPBL are sensitive to both game uncertainty and playoff uncertainty, and this supports UOH. With respect to game uncertainty, the correlation coefficient for winning percentage difference between home and visiting team is negatively significant to daily attendance; Games back variable, which indicates playoff uncertainty, is also negatively significant to daily number of spectators.

The ticket price variable, on the other hand, is positively significant to attendance. In other words, despite the increase in ticket price, more spectators attended the stadium. However, traditional microeconomic theory posits that price should be negatively related to quantity. This might be due to the fact that the initial ticket price was too low since professional baseball teams in Korea pursue winning maximization rather than profit maximization. Most professional baseball teams belong to their parent company and are therefore used as a marketing tool instead of standing alone on their own bottom line.

Discussion
This study examines the effect CB has on KPBL daily attendance and shows that CB and uncertainty of outcome are the key factors for consumer demand. These results will contribute not only to re-estimate adoption of rules including salary cap, luxury tax, foreign player system, and amateur draft but also lead to the promotion of increased enforcement of the new sports policy going forward to 10 million spectators’ era. Follow-up research needs to be conducted to determine if there are any independent variables which could affect daily attendance like parking lot capacity, fan loyalty and accessibility. Furthermore, because the correlation coefficient for ticket price did not match with the traditional economic theory, additional studies incorporating the tobit model or the censored regression model need to be considered to see if this phenomenon is due to the uniqueness of the KPBL or not.