Factors Determining TV Soccer Viewing: Does Uncertainty of Outcome Really Matter?

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Abstract

The uncertainty of outcome hypothesis is revisited in this paper in the context of a more general demand analysis of free-to-air soccer games broadcast in Spain. Apart from analyzing some expected determinants of television viewers' aggregate behavior, such as the quality of the game and the type of match broadcast, and other seasonal effects, an alternative approach based on bettor predictions of the possible outcome of a particular match is used to test this hypothesis. The empirical findings show that expected uncertainty of outcome may either have no effect on (soccer) TV audiences or lead television viewer behavior in different directions according to the type of match broadcast.

Keywords: soccer, broadcasting, television audience, aggregate viewer behavior, uncertainty of outcome

Introduction

In the sports economics literature, the analysis of the uncertainty of outcome hypothesis has consistently been a major topic of discussion. Both researchers and experts continue to work in this field with the aim of finding accurate and precise methods that enable them to test this hypothesis. The assumption that, as uncertainty of outcome increases, the event becomes more attractive to the audience seems to be widely spread and accepted. Nevertheless, the differences among sports, countries, and leagues, and in the methodologies employed, have generated a rich controversy, and total agreement has not yet been reached. This paper contributes to this debate by proposing a different and innovative approach to measuring the (expected) uncertainty of outcome

and by testing its effect on television (TV) viewers' aggregate behavior. The study investigates the case of the top Spanish soccer competition, *La Liga*.

Generally, most conventional tools for examining the level of uncertainty of outcome are based on information from betting markets. Thus, bookmakers' odds are used as predictors to calculate *ex-ante* probabilities of winning, drawing, or losing a particular sporting event (soccer match) and then to build outcome uncertainty short-run measures despite the possible bias derived from the bookmakers—that for every event, bookmakers calculate what they believe to be the correct odds and then use it to offer a bit less, so they are likely to underestimate or overestimate outcomes because the overround represents bookmakers' expected profit, as shown by Cortis (2015). On the other hand, Strunbelj (2014) explains how probabilities derived from bookmaker odds are biased through an analysis of the major European soccer leagues. Skrok (2016) also goes in a similar direction. However, this article proposes an alternative procedure that does not focus on bookmaker perceptions of a match outcome. Rather, it focuses directly on bettor choices and impressions before the games and employs data from Spanish soccer pools (La Quiniela). Because all bets in this type of gambling have only three possibilities (i.e., home team win, draw, or away team win) information on the distribution of bettor preferences among these possible outcomes is analyzed to describe the degree to which a given soccer game is tight or uncertain.

Furthermore, the uncertainty of outcome hypothesis is tested here in the context of a more general demand analysis of the TV audience of *La Liga* matches in which other determinants of TV demand, such as the quality of the match and the type of game broadcast, are considered. It should be noted that TV audiences in Spain are measured by the company Kantar Media (also present in other European and non-European countries), which employs so-called people meters. These meters are spread strategically over the national territory such that a representative sample can be obtained to calculate the number of viewers that tune in to a certain TV program. The audience measure used in this paper is the number of viewers of each game. Then, the general framework of this paper is based on an empirical study of the determinants of the aggregate behavior (demand) of people who watch soccer on TV that includes a new proposal for measuring the expected uncertainty of outcome using an exclusive and unique data set from Spain's *La Liga*. This study contributes to the sports and media economics literature.

Literature Review

Few topics in the sports economics literature have been as discussed, reviewed, and addressed as the relevance of the uncertainty of outcome hypothesis and how this uncertainty can be proxied. The majority of previous research focuses on its impact on stadium attendance, but very few studies approach this issue from the point of view of the TV audience.

An issue underlying the analysis of audience figures is the choice of games to be broadcast, which is expected to align with viewer preferences (Forrest et al., 2005, Garcia & Rodriguez, 2006). In the English Premier League, for instance, that choice is positively affected, among others, by the quality of the teams involved (measured as the combined wages of both), the participation of teams leading the competition in the

game, and even by the combination of league leaders and relegation or mid-table teams taking part in a particular match (Forrest et al., 2005).

One of the most representative papers published to date that analyzes the uncertainty of outcome hypothesis in regard to TV ratings is Alavy et al. (2010). By using minute-by-minute TV viewership figures for the English Premier League between 2002 and 2005, the authors test the impact that this hypothesis may have on TV demand by employing three different measures of the uncertainty of outcome: the squared difference between the probability of home team win and away team win, the probability of draw, and the sum of squared deviations from the initial probabilities. They run a multinomial logit regression of match outcome for each minute during the game and obtain the probability for four possible scenarios: no-score draw, score draw, away win, and home win. These probabilities are used in a second stage to build the three previously mentioned measures of outcome uncertainty to check whether they have an impact on television audience demand. For the first measure, they find that an even game attracts more viewers; this result is aligned with the uncertainty of outcome hypothesis. Nevertheless, viewers are averse to games that may end in a draw. Regarding the third measure used, "viewership is increasing in the deviation of outcome probabilities during the game from the initial outcome probabilities … suggesting that viewers are attracted to the unexpected" (Alavy et al., 2010, p. 76).

The relationship between TV audience and uncertainty of outcome has also been analyzed in Chung et al. (2016) for the case of Korean baseball games. After applying inning-varying coefficient panel data models to analyze the *ex-ante* and *ex post* uncertainty effects on TV ratings, they obtain interesting empirical findings, from which it can be concluded that uncertainty of outcome is statistically and economically significant, as *ex-ante* expectations of outcome uncertainty and game quality have an impact even in later innings. In addition, among the variables that they examine, *ex-ante* game quality has an effect on viewership. On the other hand, Coates et al (2014) suggest that the inclusion of reference-dependent preferences and loss aversion in the model is key to explain outcomes that cannot be explained by the uncertainty of outcome hypothesis. When they test such theoretical models on Major League Baseball, the empirical findings support the importance of considering both reference-dependent preference and loss aversion when analyzing the consumer's decision to attend a sporting event.

In the particular case of Spain, Buraimo and Simmons (2009) found a discrepancy between how TV viewers and spectators at the stadium behave to the outcome uncertainty hypothesis. While the TV audience increases with the uncertainty of outcome, stadium attendance increases with higher home win probabilities. However, in a later study based on the English Premier League (Buraimo & Simmons, 2015), these authors found a gradual decrease in the interest of TV viewers on match outcome uncertainty (just slightly significant in the two first analyzed seasons), but an increased preference for watching football stars on the field. This is in line with the results reached by Feddersen and Rott (2011) in their analysis of broadcasts of the German national football team.

In regards to research on the US, Paul and Weinbach (2015) use betting market prices as explanatory variables in their analysis of National Football League TV ratings. They show that primetime broadcasts are expected to respond positively to the win percentages of the teams playing. Also Salaga and Tainsky (2015) study the effects of the outcome uncertainty hypothesis on Nielsen ratings for the American college foot-

ball Bowl Championship Series games. The empirical findings suggest that ex-ante, viewers show preference for matches predicted to be certain. Nevertheless, as long as the games progress, they reveal interest for uncertainty.

Buraimo and Simmons (2008) examine stadiums' gate attendance in the English Premier League to test if fans really value uncertainty of outcome. Using a data set that includes six consecutive seasons (from 2000–01 to 2005–06) and given that a characteristic of the English Premier League is that a significant number of matches regularly sell out, they show evidence that an increase in uncertainty of outcome is related to lower gate attendance, leading to the conclusion that the supporters are normally home team fans who prefer their team to win and beat an inferior team rather than it be a more closely contested game. Continuing with this line, Pawlowski and Anders (2012) carry out their work on the German Bundesliga and obtain findings that are similar to those of Buraimo and Simmons (2008). Specifically, they claim a certain unimportance of the uncertainty and conclude that gate attendance is only affected positively when the home or the away team have a theoretical chance of winning the championship.

This paper attempts to move this literature forward by proposing an alternative approach to estimating expected uncertainty of outcome and testing its importance as a factor in determining TV soccer viewer aggregate behavior (demand).
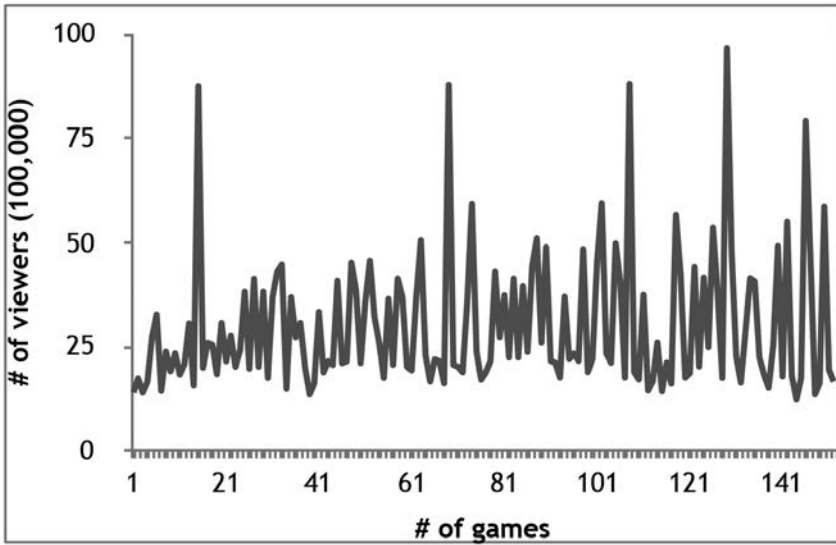
Data

Two types of data are employed in this work. First, the TV demand for soccer games is studied through the average number of viewers of each game; second, the expected outcome of those matches is calculated based on the number of bets placed on each possible final result assigned by La Quiniela bettors. Pooling data from both sources leads to an exclusive data set, which is a key part and a major strength of this research.

Soccer Games TV Audience (Number of Viewers)

In Spain, TV audience indicators are provided by the company Kantar Media, which is also responsible for measuring TV audiences in other European and non-European countries. The tool that Kantar Media uses to gather the number of viewers of a certain TV program is the people meter. These devices are placed in households all over the national territory and take into account number of family members, age, social class, etc.; thus, they obtain a representative sample of the Spanish population. Moreover, only viewers who are tuned into a TV show for one minute or more are considered in the sample. In this case, we consider the average number of viewers who watch a particular soccer game. Thus, the dependent variable here is calculated as the mean of the number of viewers during each minute of the match.

The studied period in this work covers four complete *La Liga* seasons, 2008–09, 2009–10, 2010–11, and 2011–12, when any *La Liga* game, including one *El Clásico* match per season, was eligible to be free-to-air broadcast (it can be considered then that all the games had similar probabilities to be free-to-air broadcast). No other seasons beyond the 2011–12 season are considered because at the beginning of the 2012–2013 season there was a change in the rules that regulate the choice of the match to be broadcast free-to-air (Real Madrid Club de Fútbol [RMA] and Fútbol Club Barcelona [FCB] are no more eligible and some limitations were established with respect to other teams playing European competitions, such as the UEFA Champions League or the

Source: Author calculations from *Kantar Media* data

Figure 1. Average number of viewers per game.
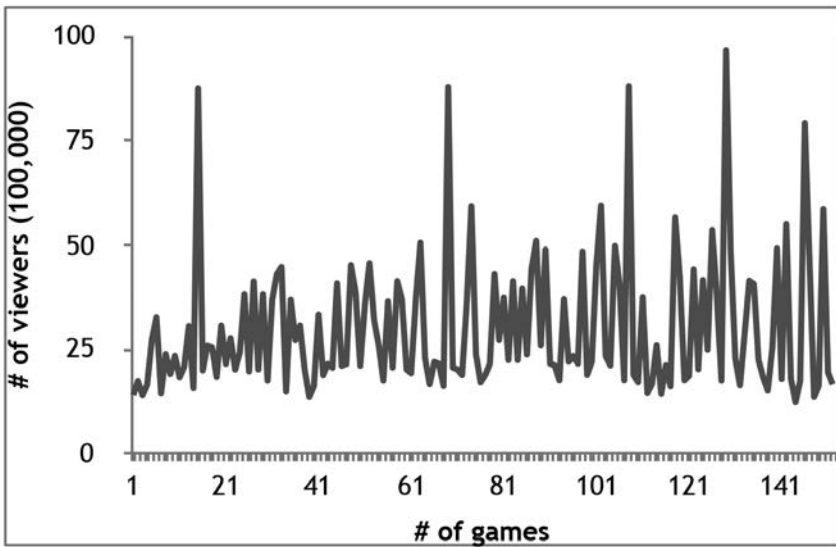
Source: Author calculations from *Kantar Media* data

Figure 2. Average number of viewers per game (*El Clásico* games are excluded).

UEFA Europe League). During the sample period, the Spanish national channel La Sexta broadcast one free-to-air game every Saturday night, which is equivalent to one game per round (since the 2012–13 season, the free-to-air match has been broadcast by different TV stations (Cuatro, Energy, La1, and MarcaTV). Unfortunately data on pay-per-view or pay-TV broadcast by commercial TV is not available, so the sample is restricted to the games broadcasted free-to-air. TV audience measures have been collected for 152 matches (each season has 38 rounds, with one free-to-air game broadcast every round; additionally, the seasons are typically scheduled to start in late August and finish in early May the following year). The development of the average number of viewers per game through the sample size is shown in Figure 1.

The spikes in Figure 1 correspond to the most popular soccer games in Spain, which are the contests between RMA and FCB, known worldwide as El Clásico. This match is played two times per season—all the teams play against the other teams two times during the season, one time at home and one time away—and given the major interest in the event, one match is broadcast in free-to-air TV while the other is in pay-per-view. Figure 1 shows the TV audience reached by the four free-to-air El Clásico games that La Sexta had the rights to broadcast. These events are notorious for achieving a much larger TV audience, each reaching approximately 9 million spectators. Apart from "El Clásico" games, extensive variation in terms of average number of viewers is observed for the other games that, as illustrated in Figure 2, can be classified into two groups: those games involving one of the two big teams previously mentioned (i.e., games played by either RMA or FCB) and those games for which neither of these two big teams play.

Generally speaking, free-to-air soccer games in Spain secure more than 1.2 million viewers. The average number of viewers per game during the study period is nearly 3 million spectators (see Table 1). However, it exceeds 4 million when taking into account only matches involving RMA or FCB. The maximum number of viewers is reached when "El Clásico" is broadcasted. The extraordinary popularity of this match seems to guarantee a TV audience of approximately 9 million viewers. This result suggests that this particular game can be considered as an outlier.

Table 1. TV Viewers Per Soccer Game (Key Summary Statistics)

	N	Mean	Std. Dev.	Min.	Max.
All games	152	2,993,853	1,597,518.0	1,232,956	9,656,579
All games excluding *El Clásico*	148	2,831,620	1,269,090.0	1,232,956	7,907,826
El Clásico game	4	8,996,498	440,573.2	8,748,614	9,656,579
RMA or FCB games excluding *El Clásico*	57	4,194,038	977,708.2	2,335,795	7,907,826
No RMA nor FCB games	91	1,978,237	351,998.9	1,232,956	2,860,881

Source: Author calculations from Kantar Media data

Spanish Soccer Pools: La Quiniela

As noted before, this article proposes an alternative approach for estimating expected uncertainty of outcome of soccer games using information on the ex-ante preferences of bettors in the Spanish soccer pools (La Quiniela). This betting product consists of a coupon (betting slip) that includes a list of 15 soccer matches (mainly La Liga matches). Players must forecast the result of each match, home win, away win, or draw. Those who correctly guess the 15 results win a share of the jackpot pool. If there is no winner of the jackpot, the amount devoted to this first prize category rolls over into the next fixture. There are also minor prizes for those who correctly guess a lower number of results. Accordingly, bettors' pre-match predictions for each game outcome can be estimated using data from La Quiniela. These data are provided by Loterías y Apuestas del Estado, the public institution that operates soccer pools in Spain.

La Quiniela offers two main types of bets: "Simple bets," by which bettors bet on only one possible outcome, assigning a "1" to those matches that they think will be won by the home team, a "2" to those matches they believe the away team will win, and an "X" to those matches they think will end in a draw; "multiple bets," where bettors have the choice of simultaneously choosing two of the three possible outcomes for each match—double bet—or even all three possible outcomes—triple bet—(thus, they will certainly guess the final outcome). Obviously, bettors are not permitted to complete the whole coupon using only "multiple bets," and the number of triple bets allowed is strongly limited. Additionally, the more multiple bets placed, the more expensive the price of the bet. Therefore, considering all the possible combinations of the results, there are seven possible choices (simple and multiple bets included). These choices can be summarized as follows: bets assigning 1; bets assigning X; bets assigning 2; bets assigning 1 and X; bets assigning 1 and 2; bets assigning X and 2; and bets assigning 1, X, and 2. Key figures about La Quiniela bets placed on each free-to-air La Liga game from the 2008–09 season to the 2011–12 season are summarized in Table 2.

Table 2. La Quiniela Bets on Free-to-Air *La Liga* Games (*N*=152)

	Mean	Std. Dev.	Min.	Max.
Simple bets				
1	1,940,462.00	1,216,580.00	7,071	4,806,735
X	897,277.70	392,279.60	6,249	1,923,069
2	1,273,550.00	973,165.10	5,175	3,878,054
Multiple bets				
1 and X	37,546.48	32,837.31	172	124,537
1 and 2	42,890.10	36,479.85	214	152,958
X and 2	27,274.03	30,691.16	70	125,851
1, X and 2	5,304.19	4,794.90	30	21,104
Total	4,224,304.00	1,224,692.00	24,837	6,487,729

Source: Author calculations from La Quiniela data

Determinants of Soccer Games' TV Audience

As previously explained, the general aim of this paper is to carry out a demand analysis of the TV audience for the free-to-air soccer matches broadcast by the Spanish national channel La Sexta on Saturday nights. An exclusive data set that combines the number of viewers for each match and the number of bets placed by the bettors on each possible outcome before the games is employed in the empirical exercise. The argument here is that the observed large variation in the number of viewers of free-to-air soccer games from Spain's La Liga could be explained based on three main determinants.

Type of Game

As shown in both Figure 2 and Table 1, soccer games involving either RMA or FCB are the games broadcasted that have the most notorious positive impact on TV audience figures. The general interest in these matches is also supported by Perez et al. (2015), who perform a panel data analysis for free-to-air soccer games in Spain at a regional level to determine whether a "general interest" in this sporting event among Spanish viewers exists. They show that general interest does not exist, with the exception of those games played by RMA, FCB, and local teams. Therefore, a dummy variable (madbargame) that takes the value of 1 when one of these two teams is playing the game is considered to control for the type of match (games involving either RMA or FCB, or no RMA nor FCB games).

Quality of the Game

The quality of the match is considered by including a variable (quality) representing the weighted sum of the positions in the ranking table (20 teams compete in La Liga in a season) of the two teams playing the broadcast match. It is expected that as this sum increases, the quality of the game decreases. Following Dang et al. (2015), this sum is weighted by $(n-1)/N$, where $n= 1, 2 \ldots N$ stands for the round number within a particular season to accurately reflect the actual quality of the teams.

Expected Uncertainty of Outcome

Information from data on La Quiniela bets is used to calculate the expected uncertainty of outcome for each considered game. The idea is that bettors' predictions on the possible outcome of a particular match can be understood as the uncertainty of outcome they expect for that match. This is quite different from the traditional approach in the literature of using bookmaker odds and may offer some advantages over it. First, millions of bets are placed (on average) on each free-to-air broadcasted La Liga game; thus, based on the wisdom of crowds hypothesis (Surowiecki, 2004), one could expect that the many (La Quiniela bettors, who are likely to be football fans) should collectively forecast optimally and may make better predictions than the few (bookmakers). Even though there have been several papers in the literature trying to analyze whether the forecasts of the results of professional sports games by experts are better than those based on statistical models—see Boulier and Stekler (2003), Forrest and Simmons (2000), and Forrest et al. (2005) among others—as far as we know, forecasts based on football fans bets have not been previously considered. Second, because bettors could be potential viewers, their perception of the final result of a particular game may better reflect the uncertainty of outcome they really expect and, then, its effect on TV demand and avoid potential bookmaking odds biases (Strumbelj, 2016).

On the other hand, a disadvantage of this approach could be the issue of sentiment that might accompany a bettor's choices (Feddersen et al., 2017; Forrest & Simmons, 2008). However, in the particular case of La Quiniela, which clearly differs from bookmakers business, bettors not only place a bet on the game involving the team they potentially support, but also on all the games listed in the coupon (so all La Quiniela players are placing bets on every game in the coupon). Accordingly, the proportion of bets placed by potential supporters over the number of bets placed by all La Quiniela bettors on a particular match could be considered as insignificant. Of course, RMA or FCB fans are a different story, but in this case any potential bias may be captured by the dummy variable that controls for the type of game and the corresponding interaction terms. Accordingly, three new measures of the uncertainty of outcome hypothesis are presented in this paper. Considering that bettors place triple bets on those games for which no result is more expected than others, it could be assumed that this type of bet represents the highest expected uncertainty of outcome. Thus, the ratio of the number of triple bets over the total number of bets placed in a particular game (uncertainty_triple) is included in the demand model. The second proposed measure of expected uncertainty of outcome expands the previous ratio by including not only triple bets but all multiple bets (uncertainty_multiple). Third, using information from both simple and multiple bets, the total number of times each possible outcome is chosen by La Quiniela bettors is calculated. If bettor preferences are equally distributed among the three possible results (1, X, or 2), a great uncertainty of outcome may be expected. By contrast, if one outcome is clearly preferred to the others, there is no uncertainty. The coefficient of variation in the total number of bets placed on each possible result is employed to proxy bettor preferences. However, not all types of bets should be equally treated (as explained, multiple bets represent more expected uncertainty); thus, the calculated coefficient of variation is weighted according to equation (1):

$$ w = \left(1 - \frac{number\ of\ triple\ bets}{number\ of\ total\ bets}\right)\left(1 - \frac{2}{3}\frac{number\ of\ double\ bets}{number\ of\ total\ bets}\right) \tag{1} $$

where 2/3 is used because in a double bet, bettors are ensuring two results out of the three possible results. The higher the value of this weighted coefficient (uncertainty_allbets), the lower the expected uncertainty of outcome.

Tables 3 and 4 give main figures and the correlation coefficients for all these considered covariates. Although some of them show a statistically significant correlation, analysis of the variance inflation factors (VIF) showed there was no evidence of multicollinearity because, apart from a couple of interaction terms—in these instances multicollinearity was removed by centering the corresponding continuous predictor variable—in no cases were the VIF above 10 (Kleinbaum et al., 1998).

Furthermore, given the nature of the data, other variables are taken into account in the demand model specification. Some seasonal variables are included in the model specification. The soccer season in Spain starts in late August and ends in May of the following year. Dummy variables for each month are used to determine if TV viewers follow a pattern in their behavior when watching free-to-air soccer matches throughout the season. It could be expected that the last months of the season would show a larger audience size because some of the important matches are played at that stage

Table 3. Determinants of Soccer Games TV Audience

	Mean	Std. Dev.	Min.	Max.
Type of game (madbargame)	0.401	0.492	0	1
Quality of the game (quality)	6.969	5.941	0	29.368
Expected uncertainty of outcome				
Ratio of triple bets (uncertainty_triple)	0.001	0.001	<0.001	0.006
Ratio of multiple bets (uncertainty_multiple)	0.027	0.019	<0.001	0.065
Weighted coefficient of variation (uncertainty_allbets)	0.550	0.287	0.035	1.139

Table 4. Correlation Matrix

	madbargame	quality	uncertainty	uncertainty	uncerainty
madbargame	-				
quality	-0.210**	-			
uncertainty_triple	0.057	0.164**	-		
uncertainty_multiple	0.022	0.187**	0.935**	-	
uncertainty_allbets	0.360**	-0.117	-0.037	0.136	-

Significance level **=$p<0.05$

(games involving teams fighting either to avoid relegation or to win the championship, or matches with teams trying to qualify to play in European competitions in the following season, etc.). However, weather conditions may also explain some seasonal patterns of the demand for TV soccer games, as there may be a larger number of viewers during the winter months, when people spend more time at home due to the bad weather. Finally, dummy variables accounting for each season included in the sample are considered in the econometric analysis with the goal of capturing any positive or negative trend in the size of the audience of Spain's La Liga.

Empirical Findings

In the empirical analysis, an ordinary least squares (OLS) model is estimated to explain observed variation in the number of TV viewers of soccer games that are free-to-air broadcasted in Spain (the dependent variable and all continuous covariates are taken in logs). Apart from viewers (the average number of viewers of a particular match), other audience variables, including rating (the percentage of viewers of a match as a proportion of the total population) and share (the percentage of viewers who watch a match as a proportion of the total number of viewers who are watching TV at that moment), were considered as dependent variables for all model specification, but not displayed in Table 5. The estimated results are nearly the same.

A different model specification is estimated for each of the previously proposed measures of expected uncertainty of outcome. Furthermore, to test whether the effect of expected uncertainty of outcome on the number of TV viewers changes according to the type of match broadcast, an interaction term for these two variables is included in the specification. Given the large relevance in terms of number of TV viewers that "*El*

Table 5. Estimation Results for the TV Demand Model
(Dependent variable: (*log*) number of TV viewers of free-to-air soccer games in Spain)

	Expected uncertainty of outcome							
	log of "*triples*" ratio				log of weighted "*multiples*" ratio			
	(I)	(II)	(III)	(IV)	(V)	(VI)	(VII)	(VIII)
El Clásico game included	no	yes	no	yes	no	yes	no	yes
Type of game interaction	no	no	yes	yes	no	no	yes	yes
(log) quality madbargame	-0.106***	-0.167***	-0.085***	-0.161***	-0.107***	-0.162***	-0.099***	-0.161***
	0.694***	0.708***	1.436***	1.072***	0.697***	0.711***	0.964***	0.767***
(log) uncertainty _triple	-0.004	-0.023	-0.038**	-0.040**				
(log) uncertainty _triple*madbargame			0.104***	0.051*				
(log) uncertainty _multiple					-0.018*	-0.033***	-0.036***	-0.037***
(log) uncertainty _multiple*madbargame							0.064***	0.013
(log) uncertainty _allbets								
(log) uncertainty_allbets*madbar								
September	0.186*	0.137	0.176*	0.128	0.165	0.117	0.163*	0.115
October	0.315***	0.344***	0.289***	0.333***	0.303***	0.329***	0.291***	0.327***
November	0.430***	0.472***	0.411***	0.465***	0.418***	0.454***	0.416***	0.455***
December	0.413***	0.594***	0.346***	0.574***	0.400***	0.563***	0.366***	0.561***
January	0.520***	0.617***	0.452***	0.595***	0.510***	0.594***	0.481***	0.591***
February	0.534***	0.648***	0.467***	0.623***	0.526***	0.626***	0.487***	0.621***
March	0.614***	0.750***	0.535***	0.721***	0.623***	0.744***	0.589***	0.742***
April	0.476***	0.664***	0.392***	0.636***	0.479***	0.645***	0.437***	0.642***
May	0.500***	0.640***	0.406***	0.607***	0.493***	0.614***	0.451***	0.610***
Season 0910	0.102**	0.097**	0.108***	0.099**	0.097**	0.090*	0.105***	0.091*
Season 1011	0.173***	0.171***	0.170***	0.170***	0.173***	0.168***	0.167***	0.167***
Season 1112	0.146***	0.153***	0.139***	0.150***	0.149***	0.155***	0.144***	0.154***
cons	14.094***	13.970***	13.873***	13.852***	14.057***	14.003***	13.990***	13.987***
adj R2	0.814	0.796	0.833	0.799	0.818	0.805	0.830	0.804
DW	1.815	1.982	1.807	1.997	1.787	1.950	1.815	1.962
N	148	152	148	152	148	152	148	152

Significance levels *=p<0.1, **=p<0.05, ***=p<0.01

Clásico" games have (as previously mentioned, these matches could be considered as outliers), each specification is estimated, including and excluding these matches from the sample. Overall, the estimated coefficients are displayed in Table 5.

The Durbin-Watson statistic is used to test absence of serial correlations in the error terms. In all cases, the statistic seems to support it. Additionally, the coefficient of determination (R^2) obtains ranges between 0.794 and 0.833, indicating that the proposed model specifications explain a considerable portion of the variance in the average audience of free-to-air soccer games broadcast in Spain.

Table 5 (cont.) Estimation Results for the TV Demand Model
(Dependent variable: (*log*) number of TV viewers of free-to-air soccer games in Spain)

		Expected uncertainty of outcome log of weighted coefficient of variation		
	(I)	(II)	(III)	(IV)
El Clásico game included	no	yes	no	yes
Type of game interaction	no	no	yes	yes
(log) quality	-0.104***	-0.158***	-0.101***	-0.142***
madbargame	0.695***	0.719***	0.679***	0
(log) uncertainty _triple	-0.004	-0.023	-0.038**	-0.040**
(log) uncertainty _triple*madbargame				
(log) uncertainty _multiple				
(log) uncertainty _multiple*madbargame				
(log) uncertainty_allbets	-0.002	-0.021	0.004	0.003
(log) uncertainty _allbets*madbargame			-0.032	-0.123*
September	0.191*	0.165	0.192*	0.171
October	0.317***	0.355***	0.316***	0.348***
November	0.432***	0.482***	0.429***	0.466***
December	0.414***	0.598***	0.407***	0.563***
January	0.520***	0.615***	0.517***	0.594***
February	0.533***	0.641***	0.531***	0.624***
March	0.609***	0.719***	0.603***	0.686***
April	0.472***	0.641***	0.465***	0.597***
May	0.490***	0.605***	0.479***	0.550***
Season 0910	0.103**	0.102**	0.105**	0.107**
Season 1011	0.172***	0.167***	0.176***	0.180***
Season 1112	0.146***	0.148***	0.151***	0.165***
cons	14.119***	14.104***	14.121***	14,116***
adj R2	0.814	0.794	0.813	0.797
DW	1.819	1.980	1.798	1.908
N	148	152	148	152

Significance levels *=p<0.1, **=p<0.05, ***=p<0.01

As previously mentioned, soccer games' TV audience appears to have a strong seasonal behavior, either monthly or inter-season. As typically done in the time series literature, monthly and season dummies are included in the estimated specification. Here, August (the month in which the first matches of each season are played) and the 2008–09 season are the reference group. With respect to these seasonal patterns, all estimates show that the number of viewers has a positive trend as long as the season progresses, reaching a maximum in March. Then, the TV audience decreases towards the end of the season, likely because only games of teams that are already eliminated from any (sub-) championship race are broadcasted free-to-air—games involving any

Table 6. Marginal Impact on TV Audiences and Short Run Estimated Elasticities

	Mean	Std. Dev.	Min.	Max.
type of game	1.328	0.663	0	3.204
short run elasticities[a]				
quality of game	-0.129	0.031	-0.167	-0.085
uncertainty (no RMA nor FCB games)	-0,0	0.018	-0.04	-0.033
uncertainty (games involving RMA or FCB)	0.047	0,027	0	0,066

Notes: [a] Only coefficients statistically significant at or above the 0.05 level were considered in calculations.

team playing to win the championship, avoid relegation, or to qualify for any European competition must be scheduled at the same time (for the studied seasons, this time was Saturday evening); thus, these matches are broadcast in pay-per-view. In addition, better weather, which increases leisure opportunities, appears at this stage of the year, raising the opportunity cost of watching TV at home. Regarding the season dummies, the estimates reflect that the number of viewers steadily increases from the first season analyzed (2008–09) to the last one (2010–11).

With regard to the determinants of the number of viewers of free-to-air soccer games from Spain's La Liga, the estimated coefficient for (log of) quality is negative and strongly significant. Thus, as expected, the lower the quality of the match, the lower the number of TV viewers. The type of match broadcast also seems to matter. Apart from those extraordinary figures for El Clásico game, the madbargame dummy variable coefficient is positive and strongly significant. From this result, it can be concluded that all games involving either RMA or FCB produce an important increase in the number of viewers compared to those games without either of these two teams. Table 6 reports the marginal impact of the type of game on TV audiences and the estimated short run elasticities for the quality of the game and the expected uncertainty of outcome (given the functional form chosen for the demand equation the estimated coefficient of the economic variables in logs could be interpreted as short run elasticities). The estimated coefficients show that broadcasting a game involving either RMA or FCB increases TV audiences (on average) by approximately 133%, while a (unit) reduction in the quality of the game may reduce TV audience by 0.13%.

The analysis of the responsiveness of the TV demand for soccer games to the expected uncertainty of outcome gives different results. When proxying it by either the ratio of the number of triple bets over the total number of bets placed on a particular game (uncertainty_triple) or the weighted coefficient of variation of the total number of bets placed on each possible result (uncertainty_allbets), expected uncertainty of outcome does not seems to explain variation in the number of TV viewers (columns I, II, IX, and X). This result is also found when El Clásico games are included in the sample. However, if the ratio of all multiple bets over the total number of bets placed on a particular game (uncertainty_multiple) is the selected measure of expected uncertainty of outcome, there seems to be a negative impact on the TV audience (columns V and VI). A criticism here could be that not all double bet options (1X, X2, and 12) may reflect the same perceived uncertainty of outcome. Accordingly, the model is re-estimated by considering the ratio of only the number of bets placed on 12 over the total number of

bets placed in the match. The results remain mostly similar in terms of the magnitude, sign, and significance level.

In an order to attempt to shed more light on these contradictory findings (both between them and with the general consensus on the uncertainty of outcome hypothesis), an interaction of the dummy variable that controls for the type of match broadcast and each of the proposed measures of expected uncertainty of outcome is included in the specification. This allows us to test the consistency of previous findings or whether the findings change according to the type of match broadcast. Surprisingly, expected uncertainty of outcome seems to have a different effect on TV viewers' aggregate behavior, depending on the type of match broadcast. In line with Buraimo and Simmons (2008), expected uncertainty of outcome reduces the number of TV viewers of a particular match (Table 6 shows that short run elasticity ranges between -0.04 and -0.03); however, this effect is reversed when games involving either RMA or FCB are broadcast (average short run elasticity estimate is approximately 0.05). According to Perez et al. (2015), only fans of the teams playing a certain match are willing to watch this kind of game on TV, and these fans do not enjoy uncertainty of outcome but enjoy watching their team win. Nevertheless, games with either RMA or FCB could be considered of "general interest" and are the most-watched soccer games in Spain because they interest all viewers. Furthermore, people are more willing to watch these games as expected uncertainty of outcome increases (columns III, IV, VII, and VII). It should be noted that throughout the analyzed period, RMA and FCB won (on average) 77% of the games they played; thus, Spanish soccer viewers interest in these games may increase with expected uncertainty of outcome. It is possible that they exhibit preferences for upsets. Even so, statistical significance of this finding is strongly reduced (and even disappears) when El Clásico games are included in the sample.

When examining the interaction of the dummy variable for the type of game with the weighted coefficient of variation of the total number of bets placed on each possible result (uncertainty_allbets), there is no evidence that expected uncertainty of outcome plays a role in terms of the TV demand for free-to-air soccer games broadcast in Spain (column XI). Only when El Clásico games are considered is a weakly statistically significant effect found for those games played by either RMA or FCB (column XII). Here, the sign of the estimated coefficient is negative, showing that the higher the weighted coefficient of variation, the lower the expected uncertainty of outcome and, thus, the number of TV viewers.

Concluding Remarks

By using an exclusive data set containing TV audience levels and the *ex-ante* preferences of bettors in Spanish soccer pools (La Quiniela), this paper analyzes the factors determining TV viewer aggregate behavior in the particular case of Spain's *La Liga* for four consecutive seasons between 2008–09 and 2011–12.

Mainly, the paper focuses on the analysis of the responsiveness of the TV demand for soccer games to the expected uncertainty of outcome using an approach that differs from the traditional approach based on bookmaker odds. Here, alternative measures of expected uncertainty of outcome are estimated using information on the preference of bettors in Spanish soccer pools (La Quiniela). The picture that emerges from the empirical findings shows that expected uncertainty of outcome may either have no

effect on the TV audience or lead TV viewer behavior in different directions according to the type of match broadcast. The traditional interpretation of the uncertainty of outcome hypothesis (i.e., as the uncertainty of outcome of a given sport event increases, the event becomes more attractive to the audience) seems to only work in the case of the most popular—in terms of interest for viewers and TV audience—soccer games (in this case, those played by either RMA or FCB). Otherwise, TV viewers, who want to watch their team win, flee from uncertainty. Policy implications of these findings may assist interest groups (e.g., television channel operators) in choosing, when possible, the soccer game to broadcast as free-to-air.

A calendar pattern is also found when describing variation in the number of TV spectators throughout a particular season. Furthermore, a steady increase in the number of viewers can be seen in a season-by-season basis. Additionally, both the quality of the match and the type of game broadcast have been proven to be key factors that lead viewers behavior, with a positive impact on the aggregate TV audience, especially when the most popular soccer teams in Spain, Real Madrid CF or FC Barcelona, play in the broadcasted game.

A future line of research can better understand the effect of the uncertainty of outcome hypothesis on sports consumer behavior by directly using consumer ex-ante preferences. Other methodological approaches or measures of statistical uncertainty or information, such as entropy measures, could also be proposed to further exploit data from soccer pools to clarify the controversies around the uncertainty of outcome hypothesis. Also other factors influencing TV demand and soccer viewing figures, such as competing TV formats at the same broadcasting time on other channels, among others, could be considered in future research.

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Authors' Note