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Spectator Demand, Uncertainty of Results, and Public Interest: Evidence From the English Premier League

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Abstract

This article tests the impact of match outcome uncertainty on stadium attendance and television audiences of English Premier League football. The method accounts for different measures of outcome uncertainty, an issue identified as a potential source of discord between existing evidence. Results show that more certain matches are preferred by spectators at the stadium yet more uncertain matches are preferred on TV spectators. Thus, a change in revenue sharing polices aimed at promoting a more uncertain match may affect both TV and stadium demand in opposing directions.

Keywords

premier league, football, demand, outcome uncertainty, collective selling

Introduction

The English Premier League is one of the most popular football leagues globally. Live matches aired in 212 territories, reaching approximately 4.7 billion viewers and raising £1.2 billion in revenue per year (Premier League, n.d.). Domestically,

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stadium attendance was over 13 million in the 2011-2012 season (Rollin, 2012), driving £547 million in match-day revenue (Deloitte, 2013). The Premier League (PL) restricts access to the television (TV) market by not allowing broadcasters to negotiate with individual clubs and instead forcing them to buy a package from the central negotiating body. The U.K. Restrictive Practices Court and the European Commission found in favor of this collective selling method to promote solidarity at all levels of football by redistribution of revenue (European Commission, 2002). The argument is that a collective selling method would better promote financial equality among member clubs and therefore promote competitive balance in the league (Szymanski, 2001). This is in the public interest due to the underlying assumption that competitive imbalance reduces spectator demand for matches. Despite a lack of consensus in existing studies, the Premier League uses a revenue sharing regime to enhance competitive balance, allocating around £730 million in the 2007-2008 season to the member clubs (Deloitte, 2009).

This article contributes toward building a consensus view on the uncertainty of outcome hypothesis (UOH) in the English Premier League, using match-level data from 2004 to 2012. There are two key contributions: Firstly, this article makes use of a more exhaustive set of outcome uncertainty measures to remove the possibility that differences in previous findings are based on the use of alternative measures. Secondly, using data not previously scrutinized by existing studies, this article tests the impact of outcome uncertainty on both stadium attendance and TV audiences.

Outcome Uncertainty and Demand

The hypothesis that a more balanced sporting competition leads to a greater interest in the event stems from the seminal work of Rottenberg (1956). This argument, known as the UOH, implies that fans prefer observing a sporting contest between teams with an unpredictable outcome (Knowles, Sherony, & Haupert, 1992). A sports league where the outcome of all matches are highly uncertain is deemed a balanced league, this balance stems from a close matching of the ability of member clubs. Neale (1964) argued that legal leniency for professional sports teams is acceptable, given the unique joint production of the spectacle. This is because the ticket receipts depend on the competition among the players of the teams rather than between the firms running the teams. Each team in a league will gain, what is described as free advertising, if the league standings are closer and the standings frequently change.

Discussion stemming from this seminal article provided early empirical evidence testing the hypothesis that outcome uncertainty is needed for a consumer to be willing to pay to spectate. Most commonly, the focus is on stadium gate receipts, less commonly and more recently the focus is on stadium and TV demand. The impact of outcome uncertainty on stadium attendance still attracts debate, as there appears no consensus across sporting contests or across method of spectating. Instead, there appears to be localized patterns of similar results by sporting contest or by research method. Table 1 shows details of the evidence concerned with this hypothesis. Building on information shown in Coates, Humphreys, and Zhou (2014), Table 1 separates American Sports, European Football, and other sporting leagues from around the world.

North American Sports

Concerned with the impact of outcome uncertainty in Major League Baseball, Beckman, Cai, Esrock, and Lemke (2011); Lemke, Leonard, and Tlhokwane (2010); Coates et al. (2014); and Meehan, Nelson, and Richardson (2007) found against the UOH. The method in each study was similar, all used a censored normal regression technique to account for sell-out crowds at the stadium. In examining the optimal level of competitive balance in Major League Baseball, Rascher (1999) found evidence that supports the UOH. This study used a fixed effects (FEs) ordinary least squares method of computation. Using Monte Carlo simulations to forecast game outcomes, Tainsky and Winfree (2010) find no impact of outcome uncertainty on match attendance. Similar to Rascher (1999), however, they do not take account of sell-out crowds. More recently, extending the time series breakpoint literature regarding annual league-level attendance and the impact of outcome uncertainty, Mills and Fort (2014) present evidence that agrees with Beckman et al. (2011), Lemke et al. (2010), Coates et al. (2014), and Meehan et al. (2007). Paul, Wachsman, and Weinbach (2010) measured the impact of outcome uncertainty on spectator preferences toward matches in the American National Football League (NFL) using a fan ratings survey. The evidence shows that a greater margin of victory reduces fan interest in the match. They and Mills and Fort (2014) both find in favor of the UOH for NFL. Using stadium attendance numbers and a method to account for sell-out matches, Coates and Humphreys (2010) show evidence against the UOH for NFL games. Rascher and Solmes (2007) have estimated the optimal probability of the home team winning, which attracts the largest attendance in American National Basketball Association matches. Rascher and Solmes (2007) and Mills and Fort (2014) find that a more balanced match increases stadium attendance, supporting the UOH in the National Basketball Association (NBA).

Global Sports

Outside of North American sports, studies focused on football in Brazil (Madalozzo & Berber Villar, 2009), Australian Rules football (Borland, 1987), and international cricket (Sacheti, Gregory-Smith, & Paton, 2014) found no evidence of outcome uncertainty affecting stadium attendance. Sacheti, Gregory-Smith, and Paton (2014) distinguished between uncertainty of outcome in the short run and uncertainty of outcome in the long run, showing that controlling for team strength as an absolute measure is important in estimating the impact on outcome uncertainty in International Cricket. Jang and Lee (2015) analyzed changes in the Korean

Table 1. Empirical Testing of the UOH.

Author(s)	Sport	Date	Dependent Variable	UOH Measure	Computation	Functional Form	UOH Result
North American Sports							
Rascher and Solmes (2007)	American National Basketball Association	2001-2002	Attendance	f (win%)	Censored normal regression	Quadratic	For
Beckman, Cai, Esrock, and Lemke (2011)	American Major League Baseball	1985-2009	Attendance	Betting odds	Censored normal regression	Quadratic	Against
Lemke, Leonard, and Tlhokwane (2010)	American Major League Baseball	2007	Log attendance	Betting odds	Censored normal regression	Quadratic	Against
Coates et al. (2012)	American Major League Baseball	2005-2010	Log attendance	Betting odds	Censored normal regression	Quadratic	Against
Meehan, Nelson, and Richardson (2007)	American Major League Baseball	2000-2002	Attendance	Win %	Censored normal regression	Linear	Against
Rascher (1999)	American Major League Baseball	1996	Attendance	Betting odds, f (win%)	Fixed effects OLS	Quadratic	For
Tainsky and Winfree (2010)	American Major League Baseball	1996-2009	Log attendance	f (win%)	Probit, Mote Carlo	Linear	No impact
Coates and Humphreys (2010)	American National Football League	1985-2008	Log attendance	Point Spreads	Tobit	Quadratic	Against
Paul and Weinbach (2007)	American National Football League	1991-2002	TV audience	Win %	OLS	Linear	For
Paul, Wachsman, and Weinbach (2010)	American National Football League	2009-2010	Fan rating	Margin of victory	OLS	Linear	For

(continued)

Table 1. (continued)

Author(s)	Sport	Date	Dependent Variable	UOH Measure	Computation	Functional Form	UOH Result
Tainsky, Xu, and Zhou (2014)	American National Football League	2005-2009	TV audience	Betting odds, win %	OLS	Linear	Local market: no impact. Non local market: For
Coates and Humphreys (2012)	American National Hockey League	2005-2010	Log attendance	Betting odds	Censored normal regression	Band/step	Against
Mills and Fort (2014)	NBA, NFL, NHL, MLB	1900-2000	Log average attendance	Win %	Times series, break point	Linear	Against: NHL, MLB. For: NBA, NFL
European Football							
Peel and Thomas (1992)	English Football Division 1–4	1986-1987	Log attendance	Betting odds	OLS	Quadratic	Against
Forrest and Simmons (2002)	English Football PL—Division 4	1997-1998	Log attendance	Betting odds	Fixed effects OLS	Quadratic	Against
Buraimo and Simmons (2008)	English Premier League Football	2000-2006	Log attendance	Betting odds	Tobit	Quadratic	Against
Forrest, Beaumont, Goddard, and Simmons (2005)	English Premier League Football	1997-1998	Log attendance	Betting odds	Fixed effects OLS	Quadratic	Against
Forrest, Buraimo, and Simmons (2005)	English Premier League Football	1993-2002	Log TV audience	Points difference	OLS	Linear	For
Buraimo (2008)	English Premier League Football	1997-2004	Log attendance/ Log TV audience	Points difference	Prais–Winsten regression/ Two stage least squares (2SLS)	Linear	No impact

(continued)

Table 1. (continued)

Author(s)	Sport	Date	Dependent Variable	UOH Measure	Computation	Functional Form	UOH Result
Falter, Perignon, and Vercruysse (2008)	French Football Ligue 1	1996-2000	Log attendance	f (points)	Fixed effects OLS	Linear	No impact
Pawlowski and Anders (2012)	German Football Bundesliga	2005-2006	Log attendance	Betting odds	Tobit	Linear	Against
Czarnitzki and Stadtmann (2002)	German Football Bundesliga	1996-1997	Log attendance	Betting odds	Tobit	Quadratic	Against
Benz, Brandes, and Franck (2009)	German Football Bundesliga	1999-2004	Log attendance	Betting odds, f (standings)	Censored quantile regression	Quadratic	No impact
Buraimo and Simmons (2009)	Spanish Football Primera division	2003-2007	Log attendance/ Log TV audience	Betting odds	Prais–Winsten regression/2SLS	Quadratic/ absolute difference	Against (stadium)/ For (TV)
Global Sports							
Borland (1987)	Australia Football League	1950-1986	Log attendance	f (win%, standings)	Logit	Linear	No impact
Madalozzo and Berber Villar (2009)	Brazilian Football League	2003-2006	Log attendance	Standings	Fixed and Random effects OLS	Linear	No impact
Peel and Thomas (1997)	British Rugby League	1994-1995	Attendance	Betting odds (Handicap)	OLS	Linear	Against
Sacheti, Gregory-Smith, and Paton (2014)	International Cricket	1980-2011	Log average attendance	Test ratings	Fixed effects OLS	Quadratic	No impact

(continued)

Table 1. (continued)

Author(s)	Sport	Date	Dependent Variable	UOH Measure	Computation	Functional Form	UOH Result
Jang and Lee (2015)	Korean Professional Football League	1987-2011	Log average attendance	Win %	OLS	Quadratic	For
Owen and Weatherston (2004a)	New Zealand First Division Rugby Union	2000-2003	Log attendance	Betting odds	OLS	Quadratic	For
Owen and Weatherston (2004b)	New Zealand Super 12 Rugby Union	1999-2001	Log attendance	Betting odds	OLS	Quadratic	For

Note. OLS = ordinary least squares; MLB = Major League Baseball; NFL = National Football League; UOH = uncertainty of outcome hypothesis; NHL = National Hockey League.

Professional Football League between 1987 and 2011 and found that a more uncertain match (measured by the team's win percentage) increased stadium demand. Owen and Weatherston (2004a) and Owen and Weatherston (2004b) tested the UOH in New Zealand First Division Rugby Union to refute a specific policy proposal to exclude an All Blacks team from the league, finding in favor of the hypothesis. Using spread betting odds for rugby league in England, Peel and Thomas's (1997) study is the only study in this group (Table 1) to find a negative relationship between uncertainty of winning and stadium attendance.

European Football

Studies testing the UOH on football in European countries use pre-match fixed betting odds as a measure of outcome uncertainty. This follows a study on English Football Divisions 1–4 during the 1986-1987 season by Peel and Thomas (1992). As betting odds are often subject to bias derived from bookkeepers profits, Forrest and Simmons (2002) corrected for this bias in a study of the same leagues during the 1997-1998 season. Czarnitzki and Stadtmann (2002) acknowledged the problem of not being able to observe true demand for stadium attendance due to the capacity constraint of a stadium when analyzing German Bundesliga football for the 1996-1997 season. They, along with 4 of the 12 studies in this section (Table 1), use a method to account for sell-out crowds. Benz, Brandes, and Franck (2009) advanced the literature by recognizing heterogeneity in fan demand. To account for behavioral differences among consumers, they used a method that allows the impact of outcome uncertainty to vary across the range of stadium attendances. However, the study finds no evidence to support the UOH.

Stadium attendance is only part of the total demand for a professional sports match. Live rights for a match are often sold to broadcasters. When a match is broadcast live, the demand includes stadium attendance and the TV audience. Other media is also available, such as radio broadcasts and illegal streaming. The prominence of sports broadcasting and the recent availability of audience data have led to a handful of studies focusing on the impact of the UOH on TV demand. Buraimo (2008) modeled match-day attendances and TV audiences using data from tier two of English league football, finding that while televised matches reduced stadium attendances, larger stadium attendances have positive impacts on the size of TV audiences. Paul and Weinbach (2007) found evidence of within-match uncertainty affecting TV audiences in American NFL between 1991 and 2002. Tainsky, Xu, and Zhou (2014) used broadcast ratings for NFL playoff games to test the UOH in teams' local markets as well as national markets of the competing teams. Forrest, Simmons, and Buraimo (2005) modeled both the choice of which games to show and the size of audience attracted by each game for Premier League matches between 1993 and 2002. Buraimo and Simmons (2009) consider total audiences (stadium and TV) in Spanish Football Primera division from 2003 to 2007. These studies find in favor of the UOH for TV audiences.

More recently, Buraimo and Simmons (2015) found that outcome uncertainty had little impact on TV audiences of Premier League matches from 2002 to 2008. The study used the absolute difference in each team's win probability to measure outcome uncertainty. When including the team's wages in the modeling, the study found that this (as a measure of the quality of footballing talent on the pitch) was far more important to the TV viewer than the closeness of the match outcome. The existing evidence surrounding Premier League football shows stadium-attending consumers prefer more certain match outcomes. The evidence surrounding TV audiences for Premier League football is less clear. Forrest et al. (2005) showed TV audiences prefer more uncertain match outcomes but Buraimo (2008) and Buraimo and Simmons (2015) showed that there is no significant impact to support this result.

Over half of the studies in Table 1 used a quadratic function (of the home win probability) to estimate the marginal effect of the UOH on demand for a sports event. A linear or a quadratic functional form assumes that a more complex relationship does not exist. Coates and Humphreys (2012) argued that spectator preferences are not symmetric, given that spectators do not dislike a team's loss to the same degree as they like a victory. The measure of match uncertainty is split into bands or steps and allowed to vary more flexibly across values of stadium attendance to account for reference-dependent preferences, while the marginal impact of competitive balance upon attendance is allowed to vary at different levels of competitive balance. Using this method, so far unique to the literature, Coates and Humphreys (2012) found against the UOH for National Hockey League games. Benz et al. (2009) recognize there maybe heterogeneity in fan demand. They allow the impact of outcome uncertainty to vary across quantiles of stadium attendance by a censored quantile regression method, this accounts for behavioral differences among consumers. Benz et al. (2009) find that fan demand does show heterogeneity across quantiles of stadium attendance numbers in German football, concluding that increasing match uncertainty of outcome exclusively benefits teams who already face strong attendance demand.

Outcome Uncertainty in the English Premier League

This article contributes toward building a consensus view on the UOH in the English Premier League with two elements. Firstly, this article tests the UOH with a more exhaustive set of measures of outcome uncertainty to those that are commonly used in the existing evidence. Sacheti et al. (2014) noted that results might be sensitive to the uncertainty measure used. Coates et al. (2014) used the probability of the home team winning as the measure of uncertainty. This required a nonlinear relationship to test the UOH. Buraimo and Simmons (2009) and Forrest et al. (2005) use the probability of a draw or the absolute difference of win probability as the measures of uncertainty, allowing a simple linear relationship to be postulated.

Secondly, using data from the English Premier League between 2004 and 2012, this article tests the outcome uncertainty hypothesis for both stadium attendance and

TV audiences. This hypothesis has not been tested on both types of demand for Premier League matches during this data period, to the authors' knowledge. Using data from 1997 to 2004 for English Premier League matches, Buraimo (2008) used a two-stage estimation method to estimate the UOH but found that outcome uncertainty had no significant impact and therefore removed the measure from the analysis.

Revenue Sharing in the Premier League

The Premier League provides each member club with an equal share of monies from the sales for broadcast rights. This equal share was £13.53 million per club during the 2007-2008 season and £13.80 million per club during the 2012-2013 season. Revenues from broadcast rights are distributed further (unequally) into a merit payment for final league position, and a facility fee for hosting a live broadcast. The total payment from the Premier League to member clubs also includes a second (equal) payment for sales of international broadcast rights, a strong potential growth area for sales. Table 2 shows these payments from the Premier League in the 2007-2008 season and the size of each payment as a percentage of the club's total revenue (ordered by total club revenue).

With the exception of the richest three clubs, the equal share payment is a larger proportion of club income than payments based on the merit "end of season" league position. Equal share payments were as much as 30% (approximately) of total revenue for clubs such as Derby, Middlesbrough, and Wigan. Each received a much lower payment (1–18%) for their league position. For the poorest clubs, total payments from the Premier League amount to 61–78% of the club's total revenue. Thus, there is strong incentive to stay within the 20 member clubs of the Premier League, although the incentive to move up the league standings is much smaller. The expectation is that member clubs will strengthen their ability to compete on the football pitch based on the rise of these shared revenues. The weight given to sharing revenue equally is the chosen method with which to promote competitive balance in the Premier League and thus demand for spectating matches.

Data

Data have been collected for each of the 20 teams in the Premier League from 3,040 matches between 2004 and 2012. To analyze the effect of competitive balance on spectator demand, other factors influencing the stadium attendance and TV audience are accounted for. These determinants are grouped into three categories: outcome uncertainty, the current performance of teams, and the characteristics of the match. Each element of the data is considered in turn.

Table 2. Premier League Breakdown of Broadcast Rights Monies by Club 2007-2008 Season.

Club	Club Total Revenue (TR)	Equal Share (as % of TR)		Merit Payment (as % of TR)		Facility Fee	Overseas TV	Total Payment From PL (as % of TR)	
Manchester United	257,116,000	13,534,463	5	14,501,220	6	12,236,636	9,578,954	49,851,273	19
Chelsea	213,648,000	13,534,463	6	13,776,159	6	9,168,914	9,578,954	46,058,490	22
Arsenal	209,294,000	13,534,463	6	13,051,098	6	11,360,144	9,578,954	47,524,659	23
Liverpool	164,222,000	13,534,463	8	12,326,037	8	10,483,652	9,578,954	45,923,106	28
Tottenham	114,788,000	13,534,463	12	7,250,610	6	6,101,192	9,578,954	36,465,219	32
Newcastle	100,866,000	13,534,463	13	6,525,549	6	10,045,406	9,578,954	39,684,372	39
Manchester City	82,295,000	13,534,463	16	8,700,732	11	8,292,422	9,578,954	40,106,571	49
Everton	75,650,000	13,534,463	18	11,600,976	15	7,854,176	9,578,954	42,568,569	56
Aston Villa	75,639,000	13,534,463	18	10,875,915	14	8,730,668	9,578,954	42,720,000	56
Portsmouth	71,556,000	13,534,463	19	9,425,793	13	8,292,422	9,578,954	40,831,632	57
Sunderland	63,597,000	13,534,463	21	4,350,366	7	6,539,438	9,578,954	34,003,221	53
Bolton	59,072,000	13,534,463	23	3,625,305	6	5,662,946	9,578,954	32,401,668	55
Reading	58,023,000	13,534,463	23	2,175,183	4	5,662,946	9,578,954	30,951,546	53
Blackburn	56,395,000	13,534,463	24	10,150,854	18	7,415,930	9,578,954	40,680,201	72
Fulham	53,670,000	13,534,463	25	2,900,244	5	5,662,946	9,578,954	31,676,607	59
Birmingham	49,836,000	13,534,463	27	1,450,122	3	5,662,946	9,578,954	30,226,485	61
Derby	48,558,000	13,534,463	28	725,061	1	5,662,946	9,578,954	29,501,424	61
Middlesbrough	47,952,000	13,534,463	28	5,800,488	12	5,662,946	9,578,954	34,576,851	72
Wigan	43,455,000	13,534,463	31	5,075,427	12	5,662,946	9,578,954	33,851,790	78

Note. Adapted from Deloitte (2009) and Premier League (2009).

Spectator Demand

The stadium attendance figures for each match are taken from respective editions of the Sky Sports Football Yearbook (Rollin, 2012) released annually. Stadium attendance can fail to reflect the true demand for the event due to stadium capacity constraints. The unobserved excess demand will exist if the capacity constraint is binding. Ten of the 20 clubs achieved an average attendance of 95% or more of the stadium capacity during the data period. Stadium capacity figures are taken from respective club reports. The average attendance, capacity, and utilization for all Premier League clubs during their participation in the league between 2004 and 2012 seasons is shown in Table 3. Sixteen of the 34 clubs host matches with an average attendance of 95% or more of the stadium capacity. Given seating arrangements that may differ from match to match due to security and policing of supporters, a capacity utilization of 95% or greater is considered at capacity (Buraimo & Simmons, 2008).

The capacity utilized over the data period shows attendance is constrained at a number of venues. Clubs that are host to matches with high attendance, such as Arsenal, Chelsea, and Manchester United, have the highest capacity utilization. This shows a strong indication of excess demand for attendance at their home matches. By this measure, clubs that host matches with lower average attendance, such as Reading, Blackpool, and Swansea also have high average capacity utilization. Demand exceeds the supply constraint for matches at a variety of clubs, not just those that are considered largest by fan base, stadium size, or revenue.

Attendance at 1,543 of the 3,040 matches is at or greater than 95% of the stadium capacity. The average match capacity utilization is 90%, with a standard deviation of 11. The lowest capacity filled is 40% at an early season fixture at Wigan in 2007 against Middlesbrough. This fixture was the second lowest attended match in the data period.

The TV audience and the stadium attendees together more accurately describe the demand for a football match. BskyB was the sole broadcaster of live matches in the United Kingdom between 2004 and 2007 seasons. The broadcaster aired 88 matches by subscription on Sky Sports channels and a further 50 matches on by pay-per-view channel, Prem Plus. From the auction to purchase broadcast rights for matches played during the 2010-2013 seasons, ESPN won a single rights package, and Sky Sports won rights to the remaining 115 matches. Over the data period, 2004-2012, Sky Sports aired 770 of the 1,104 available rights. Premier League matches are generally scheduled to be played at 3 p.m. on a Saturday, often being moved for international fixtures and national holidays. Matches that are broadcast live are also rescheduled so that they are not played at 3 p.m. on a Saturday.

The number of viewers for each live broadcast of a Premier League match is taken from the Broadcasting Audience Research Board (BARB) database. The BARB data are results from a sample survey approximated with a 95% confidence limit. From this publicly available database, audience numbers for PremPlus,

Table 3. Premier League Average Attendance, Capacity, and Utilization 2004-2012.

Club	Average Attendance	Average Capacity	Average Capacity Utilized
Arsenal	54,450	54,904	0.99
Chelsea	41,562	42,351	0.98
Man Utd	73,604	75,160	0.98
Reading	23,681	24,268	0.98
Blackpool	15,780	16,220	0.97
Swansea	19,946	20,520	0.97
Charlton	26,265	27,111	0.97
Hull	24,602	25,404	0.97
Newcastle	50,327	52,393	0.96
Portsmouth	19,628	20,461	0.96
Liverpool	43,434	45,330	0.96
West Ham	33,976	35,474	0.96
Tottenham	34,714	36,246	0.96
Norwich	24,910	26,096	0.96
Stoke	26,561	27,966	0.95
Wolves	27,244	28,775	0.95
QPR	17,342	18,439	0.94
Sheffield Utd	30,512	32,500	0.94
Southampton	30,610	32,689	0.94
Man City	43,928	47,190	0.93
Fulham	23,138	24,888	0.93
WBA	25,340	27,492	0.92
Crystal Palace	24,108	26,257	0.92
Burnley	20,643	22,546	0.92
Everton	36,125	40,363	0.89
Birmingham	26,606	29,913	0.89
Aston Villa	37,186	42,687	0.87
Watford	18,750	22,000	0.85
Bolton	23,345	28,229	0.83
Middlesbrough	28,669	35,090	0.82
Sunderland	39,235	49,000	0.80
Derby	32,432	42,449	0.76
Blackburn	23,149	31,340	0.74
Wigan	18,517	29,448	0.64

Note. QPR = Queens Park Rangers; WBA = West Bromwich Albion.

Setanta, and ESPN are not complete. However, audience numbers for matches shown on Sky Sports are complete. Average audiences for each broadcaster by year are shown in Table 4. This shows that the average demand for watching matches on TV has grown between 2004 and 2012. Average viewers for matches shown on Sky Sports are between 0.96 million in the 2004-2005 season, increasing to 1.3 million in the 2011-2012 season. Average viewers for matches shown on Setanta or ESPN are between 0.31 and 0.43 million.

Table 4. Average Television Audience of Live Premier League Matches by Broadcaster.

Season	Sky Sports	Setanta	ESPN
2004-2005	0.96		
2005-2006	1.01		
2006-2007	1.00		
2007-2008	1.05	0.31	
2008-2009	1.05	0.28	
2009-2010	1.07	Incomplete	0.36
2010-2011	1.20		0.41
2011-2012	1.30		0.43

The number of matches broadcast live on Sky Sports channels alongside the number of viewers subscribed to the service accounts for the majority of all those available. As such, the analysis discusses Sky Sports audiences only, 770 matches across the data period.

Stadium attendance demand for matches is likely to be correlated with the legacy attendance and the stadium capacity of the host club. A club is unlikely to see large fluctuations in season ticket sales from one season to another, unless there are large changes in stadia or significant changes in performance. The average attendance from last season is used to capture the habit persistence of fans, those who will turn up to a match almost regardless of the team's current performance (Buraimo & Simmons, 2008).

Outcome Uncertainty

Demand for spectating a match increases when the match outcome is more uncertain (Rottenberg, 1956). This study is concerned with uncertainty in the short run, following methods used in the existing literature reviewed. This relates to the outcome uncertainty of an individual match, rather than the outcome uncertainty in the longer term, which may consider a season-long period or beyond. Results in existing studies are arguably sensitive to the measure of outcome uncertainty (Sacheti et al., 2014) and as such, this analysis uses different measures of uncertainty to gain a useful comparison with existing evidence. A number of studies have measured outcome uncertainty by the probability of the home team winning (Benz, Brandes, & Franck, 2009; Buraimo & Simmons, 2008; Coates & Humphreys, 2012; Czarnitzki & Stadtmann, 2002; Forrest & Simmons, 2002; Lemke, Leonard, & Tlhokwane, 2010; Tainsky, Xu, & Zhou, 2014, among others). The closer this probability is to 50%, the more evenly balanced the match is expected to be. If the UOH holds, then it is matches with a home win probability close to 50% that will attract the greatest demand. This would follow an n-shaped relationship between demand and the home win probability. Following Buraimo and Simmons, (2009) and Forrest et al. (2005), this study uses the difference in win probabilities or the probability of a draw as measures of outcome uncertainty. These two measures provide a linear relationship: A higher probabilities of a draw lead to greater the demand if the UOH is true; smaller differences in win probability lead to greater demand if the UOH holds.

The probability data are taken from the average pre-match betting odds offered by a number of bookmakers (between 30 and 40 bookmakers). Betting odds for weekend games are collected Friday afternoons, and midweek games are collected on Tuesday afternoons, odds are made available at http://www.football-data.co.uk. The bookmaker's odds are converted into a percentage probability. A Theil index is calculated to allow for a truer reflection of probability after mitigating the bookmaker's margin (Theil, 1967): The home, away, and draw probabilities are scaled by the sum of the probabilities, as used in Peel and Thomas (1992) and Forrest and Simmons (2002).

Team Performance

The demand for each football match is influenced by the competing team's quality and performance (Forrest & Simmons, 2002). The better the historic and current team performance in the league, the higher the demand to see the team play. The legacy performance of a team can be measured by the average win percentage from the previous season. The greater the previous season win percentage, the greater demand should be to watch the team compete. Newly promoted teams are identified using a dummy variable. These teams faced completion in a lower tier of football the previous season, where the previous win percentage was recorded. The team's current performance is measured on a rolling window of the last six matches by the number of goals scored and conceded.[1] The greater the number of goals scored (and fewer conceded) should increase spectator demand. The average number of goals scored by the home team in the previous six matches is 8.8, the highest is 33 scored by Chelsea during the 2010-2011 season.

Match Characteristics

Spectator demand may increase for matches between neighboring teams that often have a long-standing rivalry, for example, Liverpool and Everton or Newcastle and Sunderland. G. Allan and Roy (2008) and Cox (2012) include a variable for derby matches that involve two local teams based on distance between the stadia. Demand may also be influenced by distance between stadia because this represents an approximation for travel costs. Higher travel costs may reduce the spectators traveling to the stadium (Forrest, Simmons, & Szymanski, 2004), in turn this may increase the TV audience, if the match is broadcast live. Liverpool and Everton have the shortest distance between stadia, 0.9 miles. The largest distance between two teams that play against each other is 361 miles between Newcastle and Swansea. The average distance between stadia is 141 miles, however, the most frequent distance traveled by teams is 213 miles between Merseyside- and London-based teams:

Bolton and Reading, Chelsea and Everton or Liverpool, and Fulham and Manchester City.

The highest Sky Sports TV audiences, above 2 million, correspond to matches between teams that are geographically close or matches between teams that are approximately 213 miles apart (matches between Merseyside and London teams). This suggests that the demand for spectating a match live on TV is greatest when there is rivalry between teams or when there is a large increase in travel costs. The relationship between the distance of the stadia and spectator demand is therefore considered nonlinear.

Approximately 57% of the 3,040 matches between 2004 and 2012 are played on a Saturday. Games are often moved from Saturdays for the reason that they are to be broadcast live or fall on a Bank holiday. The choice of attending a match at the stadium may be affected by when the match is played. Matches that are played during the week should attract a reduced number of spectators at the stadium, compared to matches played on Saturdays (S. Allan, 2004). Demand for watching matches live on Sky Sports is highest on Sunday and lowest on Monday. Weekday games are played in the evening unless on a Bank holiday. The average stadium attendance for matches played on a Bank holiday is 38,005, higher than average attendance on non-Bank holidays (34,605). However, matches played on a Bank holiday that are also broadcast live received an average Sky Sports audience of 0.87 million, this is lower than the average for the remaining days of the week (0.9 million).

Matches that are played toward the end of the season may attract higher attendances (G. Allan & Roy, 2008). The highest stadium attendances are for matches that are scheduled during May, 36,039 on average. The highest average Sky Sports audience is for matches during January and February, when 1.21 million viewers match each match on TV. Dummy variables are included for the day and month.

The descriptive information is shown in Table 5. The first part of this table shows the 3,040 Premier League football matches played between the 2004-2005 and 2011-2012 seasons. The second part of Table 5 shows a subset of the data, for the 770 matches that were broadcast live on Sky Sports.

Empirical Strategy

Stadium attendance and TV audiences are modeled separately as the following functions:

$$\begin{aligned}\text{Stadium Attendance}_{jt} = f(&\text{OUTCOME UNCERTAINTY}_{jkt},\\ &\text{TEAM PERFORMANCE}_{jkt},\\ &\text{MATCH CHARACTERISTICS}_{jkt}),\end{aligned} \quad (1)$$

Table 5. Descriptive Statistics for Model Variables.

	Stadium Attendance					Television Audience				
Variable	Observation	Mean	*SD*	Min	Max	Observation	Mean	*SD*	Min	Max
Dependent variable										
Stadium attendance	3,040	34,640	13,823	13,760	76,098					
Television audience						770	1,092,005	470,210	166,000	2,900,000
Outcome uncertainty										
Probability of home win	3,040	0.45	0.18	0.06	0.86	770	0.43	0.18	0.06	0.86
$.059 < p < .176$	3,040	0.08	0.28	0.00	1.00	770	0.11	0.32	0.00	1.00
$.176 < p < .268$	3,040	0.08	0.27	0.00	1.00	770	0.09	0.29	0.00	1.00
$.268 < p < .359$	3,040	0.11	0.32	0.00	1.00	770	0.14	0.35	0.00	1.00
$.359 < p < .450$	3,040	0.26	0.44	0.00	1.00	770	0.22	0.41	0.00	1.00
$.450 < p < .542$	3,040	0.20	0.40	0.00	1.00	770	0.19	0.39	0.00	1.00
$.542 < p < .633$	3,040	0.10	0.30	0.00	1.00	770	0.10	0.30	0.00	1.00
$.633 < p < .724$	3,040	0.09	0.28	0.00	1.00	770	0.09	0.28	0.00	1.00
$.724 < p < .860$	3,040	0.08	0.28	0.00	1.00	770	0.06	0.24	0.00	1.00
Probability of draw	3,040	0.26	0.04	0.10	0.31	770	0.26	0.04	0.10	0.31
Pr(home win)—Pr(away win)	3,040	0.30	0.21	0.00	0.82	770	0.30	0.20	0.00	0.82
Team performance										
Win% last season	3,040	0.42	0.14	0.16	0.76	770	0.45	0.15	0.16	0.76
Promoted	3,040	0.15	0.36	0.00	1.00	770	0.11	0.32	0.00	1.00
Home goals scored	3,040	8.79	4.07	0.00	33.00	770	9.52	4.42	0.00	31.00
Home goals conceded	3,040	6.17	3.21	0.00	21.00	770	5.78	3.15	0.00	21.00
Away goals scored	3,040	6.23	3.27	0.00	23.00	770	7.16	3.51	0.00	23.00
Away goals conceded	3,040	8.68	3.84	0.00	23.00	770	8.16	3.85	0.00	23.00
Attendance last season	3,040	33,852	13,993	8,611	75,826	770	37,309	15,055	8,611	75,826

(continued)

Table 5. (continued)

	Stadium Attendance					Television Audience				
Variable	Observation	Mean	*SD*	Min	Max	Observation	Mean	*SD*	Min	Max
Match characteristics										
Broadcast on TV	3,040	0.36	0.48	0.00	1.00	770	1.00	0.00	1.00	1.00
Distance	3,040	141	86	0.90	361	770	133	91	0.90	361
Monday	3,040	0.06	0.24	0.00	1.00	770	0.12	0.33	0.00	1.00
Tuesday	3,040	0.05	0.22	0.00	1.00	770	0.06	0.24	0.00	1.00
Wednesday	3,040	0.08	0.27	0.00	1.00	770	0.06	0.24	0.00	1.00
Thursday	3,040	0.00	0.04	0.00	1.00	770	0.01	0.08	0.00	1.00
Friday	3,040	0.00	0.07	0.00	1.00	770	0.01	0.09	0.00	1.00
Saturday	3,040	0.57	0.49	0.00	1.00	770	0.21	0.40	0.00	1.00
Sunday	3,040	0.23	0.42	0.00	1.00	770	0.54	0.50	0.00	1.00
August	3,040	0.09	0.28	0.00	1.00	770	0.08	0.27	0.00	1.00
September	3,040	0.08	0.28	0.00	1.00	770	0.08	0.27	0.00	1.00
October	3,040	0.10	0.30	0.00	1.00	770	0.10	0.30	0.00	1.00
November	3,040	0.10	0.30	0.00	1.00	770	0.11	0.31	0.00	1.00
December	3,040	0.14	0.35	0.00	1.00	770	0.14	0.35	0.00	1.00
January	3,040	0.10	0.30	0.00	1.00	770	0.10	0.29	0.00	1.00
February	3,040	0.09	0.29	0.00	1.00	770	0.09	0.28	0.00	1.00
March	3,040	0.10	0.30	0.00	1.00	770	0.09	0.29	0.00	1.00
April or May	3,040	0.19	0.39	0.00	1.00	770	0.21	0.41	0.00	1.00

$$\text{TV Audience}_{jt} = f(\text{OUTCOME UNCERTAINTY}_{jkt}, \text{TEAM PERFORMANCE}_{jkt}, \text{MATCH CHARACTERISTICS}_{jkt}). \quad (2)$$

This is a cross-sectional time series (panel) regression model where j and k denote the home and away teams, and t denotes season and each observation is a Premier League match. A match is a competition between two teams at the home team's stadium such that Liverpool against Arsenal is a different observation to Arsenal against Liverpool. Each match is played once per year over the 8 years in the data set, although the panel is unbalanced as not all matches are repeated in each time period due to relegation and promotion of teams.

The UOH postulates a positive relationship between demand and uncertainty of outcome. This estimation uses a Tobit method accounting for the capacity constraint of stadiums in the Premier League for Equation 1 on 3,040 observations. As the dependent variable is the natural logarithm of stadium attendance, this method allows for a censor point (at 95% capacity) to vary between observations. Albeit only for comparison with Equation 2, a Tobit model of stadium attendance is estimated with FEs (1-C FE) and estimated using matches that are broadcast live only (1-C TV) in addition to the estimations described below.

The estimation for Equation 2 is a generalized least squares method with FEs on 770 observations (subset of the 3,040 that include only the matches that are broadcast live by Sky Sports). FEs estimation holds constant the match specific unobserved information, thus estimates are the impact of within-observation variation over time. Any between match variation is captured by the FEs, unlike the Tobit estimation method based on random effects.

The hypothesis is tested using four approaches, discussed in turn:

Estimation A: The model uses the probability of the home team winning as the measure of outcome uncertainty. The level and the square of home team win probability is used. The UOH implies an n-shaped relationship between the home win probability and spectator demand. The hypothesis is found to be true if the estimate of the level term is positive and the squared term is negative.

Estimation B: The quadratic approach assumes symmetry either side of the turning point. Coates and Humphreys (2012) note that the effect of expected losses may differ from the effect of expected wins, as captured by the probability of a home win. To allow for this flexibility, not captured by the quadratic function, a series of dummy variables is included representing levels of home win probability. This estimation removes the quadratic function and replaces the outcome uncertainty measure. Eight levels of home win probability are split by approximately equal probabilities from $.059 < p < .176$ to $.724 < p < .860$ and are represented by a dummy variable, shown alongside descriptive information in Table 5. As with Estimation A, the UOH implies an n-shaped relationship. If an n-shaped relationship exists, then the dummy variables representing mid-values of home win probability will be estimated to have a positive and be significant impact on spectator demand.

The highest proportion of matches have a home win probability of between 35% and 45% or between 45% and 54%, one quarter and one fifth of the observations, respectively.[2] This distribution closely follows the directions of Coates and Humphreys (2012) in a study of America Ice Hockey and thus provides a direct comparison. The n-shaped relationship between home win probability and spectator demand will be tested by the significance of each dummy variable compared to matches that have a home win probability between 5.9% and 17.6%.

Estimation C: Using the probability of the competing teams ending the match as a draw removes the need to model the outcome uncertainty in a complex form. A statistically significant positive relationship between the probability of a draw and spectator demand will confirm the UOH.

Estimation D: The absolute difference in the probability of the home team and the away team winning is used as the measure of outcome uncertainty. Used by Buraimo and Simmons (2009), this uncertainty measure provides a comparison to the draw probability. A statistically significant negative relationship between the absolute difference in win probability and demand will confirm the UOH.

Results

Estimated coefficients and t-probabilities based on robust standard errors are shown in Table 6. Joint significance of the included variables is confirmed by a likelihood ratio or Wald test. Coefficient estimates that are statistically significant at 10% or 5% are indicated by two asterisks and one asterisk, respectively.

Outcome Uncertainty

When modeling stadium attendance using model 1, estimation A (1-A), the coefficient estimates for the probability of a home win and its squared value are statistically significant, following a U-shape relationship. This is the opposite of that expected by the UOH. High and low values of the probability of the home team winning correspond to the highest attendance. Coefficient estimates using the dummy functional form (1-B) show that home win probabilities from 17.6% to 54% are negative, compared to probabilities between 5.9% and 17.6%. Matches with a home team win probability of 72.4–86% have a positive impact on attendance. Similar to the quadratic equation (1-A), this shows that stadium demand is greater for Premier League matches with extreme values of the probability of the home team winning. Coates and Humphreys (2012) show a significant impact on stadium demand only with high values of home win probability (71.6% and greater). They argue this result is described by the presence of asymmetry in demand behavior, showing that

Table 6. Stadium Attendance and Television Audience Estimation.

	Stadium Attendance (Ln) Tobit estimation (1)						Television Audience (Ln) Fixed Effects (2)			
Variable	A	B	C	D	C FE	C TV	A	B	C	D
Probability of home win	−0.797**	—	—	—	—	—	0.820	—	—	—
Probability of home win ^2	1.042**	—	—	—	—	—	−0.707	—	—	—
.176 < p < .268	—	−0.029*	—	—	—	—	—	0.012	—	—
.268 < p < .359	—	−0.033**	—	—	—	—	—	0.073	—	—
.359 < p < .450	—	−0.055**	—	—	—	—	—	0.130*	—	—
.450 < p < .542	—	−0.047**	—	—	—	—	—	0.107	—	—
.542 < p < .633	—	−0.027	—	—	—	—	—	−0.031	—	—
.633 < p < .724	—	0.033	—	—	—	—	—	0.148	—	—
0.724 < p < .860	—	0.114**	—	—	—	—	—	0.200	—	—
Probability of draw	—	—	−1.004**	—	−0.299*	−0.668**	—	—	0.225	—
Absolute probability difference	—	—	—	0.145**	—	—	—	—	—	−0.236*
Win% last season	0.196**	0.198**	0.209**	0.236**	0.166**	0.342**	0.162	0.177	0.204	0.235
Promoted	0.204**	0.202**	0.200**	0.200**	0.046*	0.171*	−0.071	−0.065	−0.088	−0.098
Home goals scored	0.007**	0.006**	0.007**	0.007**	0.002**	0.008**	0.005	0.005	0.006*	0.006*
Home goals conceded	−0.005**	−0.005**	−0.006**	−0.005**	−0.002**	−0.005**	0.013*	0.013**	0.012*	0.012*
Away goals scored	0.004**	0.005**	0.004**	0.005**	0.005**	0.008**	0.002	0.002	0.001	0.000
Away goals conceded	−0.004**	−0.004**	−0.004**	−0.004**	−0.002*	−0.007**	0.001	0.000	0.003	0.003
Attendance last season	0.886**	0.888**	0.892**	0.893**	0.179**	0.908**	0.014	0.013	0.023	0.024
Broadcast on TV	−0.015**	−0.015**	−0.014*	−0.014*	−0.012	—	—	—	—	—

(continued)

Table 6. (continued)

	Stadium Attendance (Ln) Tobit estimation (1)						Television Audience (Ln) Fixed Effects (2)			
Variable	A	B	C	D	C FE	C TV	A	B	C	D
Distance	−0.0002**	−0.0002**	−0.0002**	−0.0002**	—	−0.0002**	—	—	—	—
Monday	−0.042**	−0.042**	−0.044**	−0.042**	−0.034**	−0.028	0.161**	0.154**	0.169**	0.161**
Tuesday	−0.046**	−0.046**	−0.046**	−0.047**	−0.069**	−0.037	0.108*	0.108*	0.125**	0.129**
Wednesday	−0.076**	−0.074**	−0.077**	−0.076**	−0.060**	−0.061**	0.091	0.074	0.098	0.094
Thursday	−0.067	−0.076	−0.071	−0.072	0.444	−0.078	−0.044	−0.032	−0.032	−0.067
Friday	0.043	0.050	0.039	0.042	0.049	0.050	0.241**	0.204**	0.251**	0.240**
Sunday	−0.012	−0.012	−0.013*	−0.013*	−0.005	−0.005	0.313**	0.316**	0.313**	0.312**
September	0.002	0.003	0.002	0.000	0.014	−0.005*	0.051	0.080	0.056	0.058
October	0.033**	0.034**	0.035**	0.032**	0.032**	0.020	0.134**	0.146**	0.140**	0.138**
November	0.013	0.014	0.014	0.010	−0.002	0.015	0.187**	0.199**	0.192**	0.189**
December	0.041**	0.042**	0.042**	0.040**	0.035**	0.013	0.203**	0.224**	0.208**	0.208**
January	0.010	0.011	0.011	0.009	−0.001	−0.039	0.268**	0.283**	0.274**	0.272**
February	0.039**	0.041**	0.040**	0.037**	0.025*	0.063**	0.251**	0.263**	0.256**	0.257**
March	0.020	0.022	0.020	0.019	0.020	−0.001	0.150**	0.172**	0.158**	0.153**
April or May	0.078**	0.079**	0.075**	0.075**	0.068**	0.051**	0.091	0.114*	0.097	0.099*
Constant	1.301**	1.179**	1.387**	1.056**	9.343	1.067**	−0.904	−0.797	−0.897	−0.781
Log likelihood	116.868	118.228	108.652	101.011	795.278	−20.687				
ρ	0.346	0.336	0.346	0.357	—	0.341	0.672	0.668	0.653	0.669
Uncensored observations	1,497	1,497	1,497	1,497	1,497	478	770	770	770	770
Right-censored observations	1,543	1,543	1,543	1,543	1,543	626	0	0	0	0
Wald χ^2	6,145.330	229.860	6,145.950	6,137.240	1,7641.020	2,913.770				

Note. FE = fixed effect; TV = television.
**Significant at 5% level. *Significant at 10% level.

stadium attendance is greater when the home team is more likely to win rather than when the match outcome is less certain.

Coefficient estimates for the probability of the match ending as a draw (1-C) are significant and negative. This measure is a linear representation of outcome uncertainty, removing the need for postulating a more complex relationship.[3] This shows that stadium demand will fall when the probability of a draw increases, the opposite of that expected by the UOH. Measuring uncertainty by the absolute difference in win probabilities (1-D) finds a statistically significant and positive coefficient estimate. The larger the difference between the probability of the home and the away team winning, the larger the stadium demand, again this is the opposite of that expected by the UOH. For robustness, the Model 1 C is estimated with FEs added to the Tobit (1-C FE)[4] and also estimated using only matches broadcast (1-C TV). Both estimations continue to show a negative and statistically significant relationship between outcome uncertainty and stadium demand. These results all refute the UOH for stadium attendance in the English Premier league. This confirms the results found using a quadratic function (similar to 1-B) by Peel and Thomas (1992), Forrest and Simmons (2002), Buraimo and Simmons (2008), and Forrest et al. (2005).

When modeling TV audiences for live matches shown on Sky Sports channels (2-A), the coefficient estimates for the probability of a home win and its squared value are not statistically significant. This provides no evidence to support the UOH for TV audiences. Coefficient estimates using the dummy functional form (2-B) show that a home win probability from 35.9% to 45% has a positive and statistically significant impact on the Sky Sports TV audience, compared to home win probabilities between 5.9% and 17.6%. All other bands of home win probability have no significant impact on demand. This shows that a match that is predicted to be more evenly balanced will increase TV audiences, supporting the UOH. The estimates for Equation 2 (2-C), using the probability of a draw, show that this measure of competitive balance does not have an impact on TV audiences. However, using the absolute difference in win probability as the measure of uncertainty (2-D) estimates a statistically significant negative relationship. Here, an increase in the absolute difference (reduction in outcome uncertainty) would decrease the TV demand, opposing the result found for stadium attendance (1-D) and providing support for the UOH.

Using points difference as the measure of uncertainty, Buraimo (2008) finds no evidence of an impact on TV audience whereas Forrest et al. (2005) support the UOH. The results presented in Table 6 show that the relationship between outcome uncertainty and TV audience demand for Premier League matches is sensitive to the measure of outcome uncertainty used. These estimates (2-B and 2-D) show evidence supporting the UOH for TV spectator demand in the English Premier league.

Team Performance

An increase in the win percentage during the previous season increases stadium attendance but has no significant impact on TV audiences. The historical team success or being promoted to the Premier League is important to attract fans to the stadium. An increase in the current form of either teams, over the previous six matches, increases the demand at the stadium form. This is shown by goal scored and conceded by the home and away teams. The number of goals conceded by the home team has a positive and significant impact on TV audiences, contrary to impact on stadium attendance. The results here provide an insight into how spectators may have substituted their consumption of football matches between the TV and the stadium.

Match Characteristics

Stadium attendance decreases when the match is broadcast live on TV. For each mile increase between the stadiums of the competing teams, the stadium attendance decreases, reflecting rivalry between local teams and the increase traveling costs. A squared term of distance, capturing a nonlinear relationship is estimated but removed from modeling due to nonsignificance. The distance between stadia is picked up by the FEs when estimating the TV audiences. Weekday matches attract fewer stadium spectators compared to matches played on a Saturday. Matches played during the end of the season, April and May, attract higher crowds compared to the beginning of the season, August. This reflects a greater interest in team's final league position. Matches played from October onward have a larger TV audience compared with the start of the season, August.

Conclusion

The U.K. Restrictive Practices Court and the European Commission found in favor of collective selling methods of live broadcast rights to promote solidarity at all levels of football by redistribution of revenue (European Commission, 2002). This issue was deemed to be in the public interest due to the underlying assumption that competitive imbalance reduces spectator demand for matches. A premise that was postulated by the outcome uncertainty hypothesis (Rottenberg, 1956).

This article contributes toward building a consensus view on the UOH in English Premier League football. The impact of outcome uncertainty on stadium attendance and TV audiences is estimated with a set of uncertainty measures. Results show evidence that refutes the UOH for stadium attendance, in line with Peel and Thomas (1992), Forrest and Simmons (2002), Forrest et al. (2005), and Buraimo and Simmons (2008). Thus, matches with a more certain outcome are favored by spectators attending the match at the stadium. However, results provide evidence to support UOH for spectating matches live on TV. Here, a less certain outcome is preferred, in line to results shown in Forrest et al. (2005), albeit sensitive to the measurement of uncertainty used.

The results in this study refute the UOH for stadium demand and provide support for the UOH for TV demand. In conclusion, a complication apparent: A revenue sharing policy aimed at promoting a more uncertain match will affect both TV and stadium demand in opposing directions. The Governing body should carefully consider the trade-off between the two discussed types of spectator when considering policies that affect match outcome uncertainty.

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Notes

1. Other measures of current performance have been used in existing studies. For example, win percentage or points scored. These measures are a function of goals scored and conceded in each match, as used in this study.
2. Other forms of distribution of these boundaries set for dummy variables are attempted but not reported as there is little difference to the results.
3. Estimates of more complicated relationships return results that are not statistically significant.
4. The Tobit estimation includes a dummy variable for each panel entity (each football club). Although this is not strictly correct, the author wishes to display the robustness of the results when comparing with fixed effects estimation in Equation 2.

References

Allan, G., & Roy, G. (2008). Does television crowd out spectators?: New evidence from the Scottish Premier League. *Journal of Sports Economics*, *9*, 592–605.

Allan, S. (2004). Satellite television and football attendance: The not so super effect. *Applied Economics Letters*, *11*, 123–125.

Beckman, E. M., Cai, W., Esrock, R. M., & Lemke, R. J. (2011). Explaining game-to-game ticket sales for major league baseball games over time. *Journal of Sports Economics*, *13*, 536–553.

Benz, M.-A., Brandes, L., & Franck, E. (2009). Do soccer associations really spend on a good thing? Empirical evidence on heterogeneity in the consumer response to match uncertainty of outcome. *Contemporary Economic Policy*, *27*, 216–235.

Borland, J. (1987). The demand for Australian rules football. *Economic Record*, *63*, 220–230.

Buraimo, B. (2008). Stadium attendance and television audience demand in English league football. *Managerial and Decision Economics*, *29*, 513–523.

Buraimo, B., & Simmons, R. (2008). Do sports fans really value uncertainty of outcome? Evidence from the English premier league. *International Journal of Sport Finance*, *3*, 146–155.

Buraimo, B., & Simmons, R. (2009). A tale of two audiences: Spectators, television viewers and outcome uncertainty in Spanish football. *Journal of Economics and Business*, *61*, 326–338.

Buraimo, B., & Simmons, R. (2015). Uncertainty of outcome or star quality? Television audience demand for English premier league football. *International Journal of the Economics of Business,* 1–21.

Coates, D., & Humphreys, B. R. (2010). Week to week attendance and competitive balance in the national football league. *International Journal of Sport Finance*, *5*, 239–252.

Coates, D., & Humphreys, B. R. (2012). Game attendance and outcome uncertainty in the national hockey league. *Journal of Sports Economics*, *13*, 364–377.

Coates, D., Humphreys, B. R., & Zhou, L. (2014). Reference-dependent preferences, loss aversion, and live game attendance. *Economic Inquiry*, *52*, 959–973.

Cox, A. (2012). Live broadcasting, gate revenue, and football club performance: Some evidence. *International Journal of the Economics of Business*, *19*, 75–98.

Czarnitzki, D., & Stadtmann, G. (2002). Uncertainty of outcome versus reputation: Empirical evidence for the first German football division. *Empirical Economics*, *27*, 101–124.

Deloitte. (2009). *Football money league: Lost in translation*. Retrieved from http://www.deloitte.com/dtt/cda/doc/content/UK_SBG_DeloitteFML2009.pdf

Deloitte. (2013). *Annual review of football finance*. Manchester, England: Deloitte & Touche. Retrieved from http://www.deloittestore.co.uk/Annual-Review-of-Football-Finance-s/1935.htm

European Commission. (2002). *Commission opens proceedings into joint selling of media rights to the English Premier League* (Press Release. IP/02/1951). Retrieved from http://europa.eu/rapid/press-release_IP-02-1951_en.htm?locale=en

Falter, J., Perignon, C., & Vercruysse, O. (2008). Impact of overwhelming joy on consumer demand. *Journal of Sports Economics*, *9*, 20.

Forrest, D., Beaumont, J., Goddard, J., & Simmons, R. (2005). Home advantage and the debate about competitive balance in professional sports leagues. *Journal of Sports Sciences*, *23*(4), 439–445.

Forrest, D., & Simmons, R. (2000). Making up the results: The work of the football pools panel, 1963-1997. *The Statistician*, *49*, 253–260.

Forrest, D., & Simmons, R. (2002). Outcome uncertainty and attendance demand in sport: the case of English soccer. *Journal of the Royal Statistical Society: Series D (The Statistician)*, *51*, 229–241.

Forrest, D., Simmons, R., & Buraimo, B. (2005). Outcome uncertainty and the couch potato audience. *Scottish Journal of Political Economy*, *52*, 641–661.

Forrest, D., Simmons, R., & Szymanski, S. (2004). Broadcasting, attendance and the inefficiency of cartels. *Review of Industrial Organization*, *24*, 243–265.

Knowles, G., Sherony, K., & Haupert, M. (1992). The demand for major league baseball: A test of the uncertainty of outcome hypothesis. *The American Economist*, *36*, 72–80.

Jang, H., & Lee, Y. H. (2015). Outcome uncertainty, governance structure, and attendance: A study of the Korean professional football league. In Y. H. Lee & R. Fort (Eds.), *The sports business in the Pacific rim* (pp. 59–81). New York, NY: Springer.

Lemke, R., Leonard, M., & Tlhokwane, K. (2010). Estimating attendance at Major League Baseball games for the 2007 season. *Journal of Sports Economics*, *11*, 316.

Madalozzo, R., & Berber Villar, R. (2009). Brazilian football: What brings fans to the game? *Journal of Sports Economics*, *10*, 639–650.

Meehan, J. W., Nelson, R. A., & Richardson, T. V. (2007). Competitive balance and game attendance in Major League Baseball. *Journal of Sports Economics*, *8*, 563.

Mills, B., & Fort, R. (2014). League-level attendance and outcome uncertainty in U.S. Pro Sports Leagues. *Economic Inquiry*, *52*, 205–218.

Neale, W. (1964). The peculiar economics of professional sports: A contribution to the theory of the firm in sporting competition and in market competition. *The Quarterly Journal of Economics*, *78*, 1–14.

Owen, P. D., & Weatherston, C. R. (2004a). Uncertainty of outcome and Super 12 Rugby Union attendance. *Journal of Sports Economics*, *5*, 347–370.

Owen, P. D., & Weatherston, C. R. (2004b). Uncertainty of outcome, player quality and attendance at national provincial championship rugby union matches: An evaluation in light of the competitions review. *Economic Papers: A Journal of Applied Economics and Policy*, *23*, 301–324.

Paul, R. J., & Weinbach, A. (2007). The uncertainty of outcome and scoring effects on Nielsen Ratings for Monday night football. *Journal of Economics and Business*, *59*, 199–211.

Paul, R. J., Wachsman, Y., & Weinbach, A. P. (2010). The role of uncertainty of outcome and scoring in the determination of fan satisfaction in the NFL. *Journal of Sports Economics*, *12*, 213–221.

Pawlowski, T., & Anders, C. (2012). Stadium attendance in German professional football– The (un) importance of uncertainty of outcome reconsidered. *Applied Economics Letters*, *19*(16), 1553–1556.

Peel, D. A., & Thomas, D. A. (1992). The demand for football: Some evidence on outcome uncertainty. *Empirical Economics*, *17*, 323–331.

Peel, D. A., & Thomas, D. A. (1997). Handicaps, outcome uncertainty and attendance demand. *Applied Economics Letters*, *4*, 567–570.

Premier League. (2009). *Premier League Season Review 2008/09*. Retrieved from http://www.premierleague.com/content/dam/premierleague/site-content/News/publications/other/Season-Review-2007-08.pdf

Premier League. (n.d.). *The World's most watched league*. Retrieved 2014 from http://www.premierleague.com/en-gb/about/the-worlds-most-watched-league.html

Rascher, D. A. (1999). A test of the optimal positive production network externality in Major League Baseball. In J. Fizel, E. Gustafson, & L. Hadley (Eds.), *Sports economics: Current research* (pp. 27–45). Westport, CT: Praeger.

Rascher, D. A., & Solmes, J. P. (2007). Do fans want close contests? A test of the uncertainty of outcome hypothesis in the National Basketball Association. *International Journal of Sport Finance*, *2*, 130–141.

Rollin, J. (2012). *Sky sports football yearbook*. Chatham, NJ: Headline Book Publishing.
Rottenberg, S. (1956). The baseball players' labor market. *The Journal of Political Economy*, *64*, 242–258.
Sacheti, A., Gregory-Smith, I., & Paton, D. (2014). Uncertainty of outcome or strengths of teams: An economic analysis of attendance demand for international cricket. *Applied Economics*, *46*, 2034–2046.
Szymanski, S. (2001). Income inequality, competitive balance and the attractiveness of team sports: Some evidence and a natural experiment from English soccer. *The Economic Journal*, *11*, 69–84.
Tainsky, S., & Winfree, J. (2010). Short-run demand and uncertainty of outcome in Major League Baseball. *Review of Industrial Organization*, *37*, 197–214.
Tainsky, S., Xu, J., & Zhou, Y. (2014). Qualifying the game uncertainty effect: A game-level analysis of NFL postseason broadcast ratings. *Journal of Sports Economics*, *15*, 219–236.
Theil, H. (1967). *Economics and information theory*. Chicago, IL: McGraw-Hill.

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