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The Demand for League of Ireland Football

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Abstract: This paper provides some empirical insights on the determinants of spectator demand for League of Ireland football. Using data from three recent playing seasons, the estimated spectator demand relationship revealed important roles for recent team performance, fixture quality, seasonal and match outcome uncertainty, and a selection of opportunity (and other) cost measures. The estimates confirm the importance of fixture quality for spectator attendance and also reveal evidence of a short-run competitive imbalance within the domestic game. The analysis suggests that modest enhancements to attendance may be achieved through increasing fixture quality and reducing such imbalance. These enhancements are more likely to be secured through reducing rather than increasing the current number of teams in the league's top tier.

I INTRODUCTION

The empirical investigation of spectator demand for football has become a popular research theme in the economics of sport in recent decades. However, as evidenced in the comprehensive reviews of Borland and McDonald (2003) and Garcia and Rodriques (2009), the focus has largely been on the

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prestigious leagues of Europe with the more obscure ones attracting little or no research interest.[1] The League of Ireland falls within the less fashionable part of Europe's footballing spectrum with the league ranked 40th of the 54 affiliated to the Union of European Football Associations (UEFA) in 2014/15.

The scale of the national soccer team's support suggests that the sport is popular in Ireland[2] but over the last half-century or so the domestic league has endured a perennial struggle to secure and sustain appeal. A number of reasons have been adduced for this and these include the availability of a higher quality product in the neighbouring Premiership Leagues of England and Scotland, and the competition for spectators provided domestically by other popular team sports.[3]

The modest international ranking of the League of Ireland may go some way to explain its lack of research appeal. However, the absence, up to very recently, of systematic data on spectator attendance is also implicated here. An advantage of the current study is that for three recent playing seasons attendance data are available for League of Ireland Premier Division fixtures. This facilitates an assessment of the factors influencing attendance and permits an investigation into whether the determinants found important for the more affluent and prestigious leagues of Europe are also relevant for Ireland.

The organisation of the paper is now outlined. Section II provides a review of the economics of sport literature germane to the topic examined here. This is followed by Section III that offers contextualisation for the empirical analysis through providing a descriptive background on the League of Ireland and placing its attendance figures in a broader context. The data and econometric methodology are then outlined in Section IV with the empirical results reported in Section V. Section VI offers a summary and some concluding remarks.

II LITERATURE REVIEW

Rottenberg (1956) was one of the first economists to investigate the industrial structure of a professional sports league and argued it could be analysed using the same economic framework as other industries. The author

[1] A number of exceptions include Iho and Heikilä (2008) for Finland and Baranzini *et al*. (2008) for Switzerland.

[2] Although the attendances at Ireland's home internationals have fallen sharply in the last number of years, in 2011, for instance, the average attendance at home international games were among the highest in Europe.

[3] These sports include rugby and the Gaelic Athletic Association (GAA) codes of hurling and football. The average attendance for Leinster's Heineken Cup rugby pool games at the Royal Dublin Society (RDS) stadium for the 2011/12 season was 17,903, while the average attending Dublin's GAA Allianz League All-Ireland football series in 2011 was 16,612.

focussed on US baseball and outlined some of the industry's then key characteristics. One of the important issues stressed by Rottenberg was that in order to produce a successful product in a sports league differences in the quality of rivals should not be "too great". This concept relates to uncertainty of outcome and is central to the notion of competitive balance within a sports league. Neale (1964) referred to this as the Louis-Schmeling paradox to emphasise the intimate nature of the relationship between teams within a league compared to the generally more febrile one existing between firms in a competitive industry. The only way the heavyweight boxer Joe Louis made money from boxing was because Max Schmeling was a good opponent, hence the paradox.[4]

The professional sports industry is unique in regard to the importance placed on competitive balance given the good produced is the result of an interaction between two teams producing the match, and ultimately between teams producing the league championship over the playing season. Thus, clubs do not behave as traditional profit-maximising firms in trying to eliminate their market competition. Although teams will contract the largest amount of playing talent their resources allow in order to increase the probability of winning, if teams are too successful at winning the complementary objective of maximising club revenue (or profit) is compromised. It is the case that the passage of time, changes in regulations, and new technological innovations have altered the significance of some of the attributes originally emphasised by Rottenberg. However, the importance of competitive balance within a league has remained an immutable theme in the economics of sport.

Since the early contributions of Rottenberg (1956) and Neale (1964) for the US and subsequently Sloane (1971) for the UK, economists have sought to investigate the determinants of spectator demand for sporting events. The majority of the early studies modelling soccer demand used data from either the English or Scottish professional leagues. The early generation studies largely focused on the role of price and income but more recent vintages sought to investigate the empirical importance of outcome uncertainty, match quality, and an array of opportunity cost measures. There are a number of different dimensions to outcome uncertainty in modelling spectator attendance. These are generally defined as short run, medium term (or seasonal), and long run, though the latter is not a subject of focus in the current paper.

[4] The use of this boxing pair to coin the paradox is not entirely convincing. They only fought twice in the 1930s and the bouts assumed added political significance given their interpretation as contests between an African-American (Louis) and a German portrayed by the Nazi regime as a personification of Aryan superiority (Schmeling). In more recent times the paradox has become known as the "Yankee paradox".

Outcome uncertainty at the match level (or short-run outcome uncertainty) is of central interest for our analysis and can be modelled in a number of different ways. For instance, an early study by Hart, Hutton and Sharot (1975) used the absolute difference in league positions prior to the fixture. More recent studies, however, exploit bookmaker odds to compute an *ex ante* measure of the home team's win probability (e.g., see Peel and Thomas 1988, 1992, 1996; Forrest and Simmons, 2002 and Buraimo, 2014). The medium term (or intra-seasonal) outcome uncertainty can be measured by the league position the team occupies in relation to its objectives in terms of, for example, winning the league championship. Janssens and Késenne (1987) suggest a measure that captures whether, at particular periods in the season, a team remains in contention to achieve its target of winning the championship. Czarnitski and Stadtmann (2002) exploit this approach in their study of German football demand.

The quality of the fixture is also an important determinant of spectator demand. In particular, contests between two high ranking teams in a league competition might attract spectators with little attachment to either of the competing teams given the anticipation of a high quality encounter. Borland and McDonald (2003) suggest the average ranking of the two teams provides an informative measure of such quality. In addition, some fixtures might be characterised by local rivalries (e.g., derby matches), and may attract more spectators regardless of the league positions of the competing teams.

There may also be costs (unrelated to stadium admission prices) associated with attending a football match and these reflect the opportunity and other indirect costs of attendance. For example, adverse weather conditions are likely to discourage attendance. Bird (1982), Baimbridge, Cameron and Dawson (1996) for England, Garcia and Rodriques (2002) for Spain, and Iho and Heikilä (2008) for Finland investigate, *inter alia*, the impact of weather on attendance. The former two studies detect no role for adverse weather conditions, while the latter two report significant negative effects. The travel distance between the two locations where the competing clubs are based also represents both an opportunity and indirect cost for visiting fans that may potentially deter demand. The day of the week may also influence attendance with the opportunity cost of attending on a Saturday (or whenever the customary day for football) lower than say a mid-week fixture. In addition, the time of the kick-off may also be important with an individual's opportunity cost of attendance varying with fixture timing.

The broadcast of matches on either satellite or terrestrial TV may impact not only attendance at the match that is the subject of broadcast but also at other games scheduled around the same time. This again can be taken to reflect an opportunity cost effect. Baimbridge *et al*. (1996), Forrest, Simmons and Szymanski (2004) and Forrest and Simmons (2006) provide evidence relating

to the effect of TV broadcasts on attendance at English league games. The first two studies examine the impact on attendance at the broadcasted fixture and find a small negative effect. The latter study investigates the impact on attendance of broadcasted UEFA Champions' League matches for fixtures in the second, third and fourth tiers of the English game and again finds negative effects, which are reported as strongest for clubs in the bottom two tiers.

The foregoing review highlights a fairly extensive array of factors generally interpreted as important in modelling match-level football attendance. There are a number of potentially interesting hypotheses suggested here and these inform the empirical modelling to be conducted in the current paper.

III LEAGUE OF IRELAND BACKGROUND AND ATTENDANCE

The League of Ireland was formed in 1921 after a split from the Belfast-based Irish Football Association (IFA).[5] Since 1985 the League of Ireland has comprised a Premier Division and a First Division with relegation from the latter and promotion to the former. Since the turn of the new century a number of innovations and re-structuring initiatives have been implemented. The most significant change in recent times was introduced in 2003 when the playing season moved from a traditional autumn/spring sequence across two calendar years to a spring/summer season within the same calendar year. The motivations for the change were driven in part by an aspiration that staging matches in more favourable weather conditions would enhance attendance. There was also the added advantage that the majority of the league's fixtures would be scheduled in the off-season of the English and Scottish football leagues thus attenuating the competition for spectators from these rival leagues. In addition, the new arrangement was also designed to provide League of Ireland teams with a greater advantage in European club competitions since the preliminary rounds of these are generally scheduled in early July.

The Premier Division currently comprises 12 teams and, in common with its top tier counterparts in the UK and Europe, is an open entry league contingent on clubs being granted a license. There are three rounds of 11 matches with a total of 33 fixtures for each club of which approximately 16/17 are played at home. The league could thus be described as unbalanced given all clubs do not have identical fixture lists. The first three teams automatically qualify for European competition. The bottom team is automatically relegated and replaced by the top team in the second tier with the second from bottom in

[5] A more detailed history of football on the island of Ireland and on the emergence of the League of Ireland can be found in Byrne (2012). In addition, Whelan (2006) provides an excellent overview of the League of Ireland from the 1950s to 2005.

the top tier consigned to a two-legged play-off tie involving a team from the tier below.

A number of clubs in the League of Ireland have attempted to employ full-time professional playing squads in the recent past but this has generally proved financially unsustainable. The majority of the playing talent in the league since the 2012 season has been contracted on a part-time professional basis, and many contracts are short term in nature covering only the duration of the playing season. However, a small number of clubs retain a core of full-time professional players on longer term contracts. The ownership structure of league clubs has also evolved radically in recent times. A significant number is now either owned by their membership (e.g., Drogheda United and Shamrock Rovers), by supporters trusts (e.g., Cork City) or organised on a cooperative basis (e.g., Sligo Rovers).[6]

Attendance figures for the League of Ireland Premier Division for three recent seasons are now examined. These are reported in Table 1 below.[7] The average over the three seasons is approximately 1,550 with a median attendance of 1,250. The minimum attendance across the three seasons was 139 for a UCD home fixture against Limerick in 2014 with the highest (6,219) recorded for Cork City's final home game of the 2014 season against Bohemians. A characteristic feature evident from this table is the wide dispersion in attendance across clubs as revealed in the range and the standard deviations reported for these data. This is confirmed in Table A1 of the Appendix, which reports average attendance levels by club across the three playing seasons. All clubs operate well below their stadium capacity with an average over the three seasons of about 25 per cent. Sell-out crowds are uncommon in League of Ireland football and occurred only twice over the three seasons under review here.[8]

In order to place the average and median League of Ireland figures within a geographically local context, a comparison with a set of neighbouring lower

[6] There is an increasing trend towards a greater involvement of supporter trusts in the administration of League of Ireland clubs. For example, see FORAS (2012) for an informative account.

[7] The attendance and other football related data for the League of Ireland are obtained from the www.extratime.ie website. The majority of attendance figures for the League of Ireland are official figures from the clubs, though those reported for Bray Wanderers, Derry City and some for Shamrock Rovers are estimates provided by journalists and others in attendance at the relevant fixtures.

[8] Both fixtures involved Sligo Rovers and occurred during their Championship winning season in 2012 when sell-out crowds attended the Showgrounds to witness their final two home fixtures involving St.Patrick's Athletic and Shamrock Rovers respectively. The fact that the overwhelming majority of League of Ireland fixtures record attendances well below stadium capacity provides some advantage in terms of the econometric modelling in that the dependent variable is not right-censored. This is a modelling challenge that invariably presents itself when using match-level attendance data for the more highly ranked European leagues.

tier leagues in England and Scotland is now undertaken.[9] These leagues are chosen as it is sometimes argued they possess broadly comparable playing standards to those prevailing in the League of Ireland. However, it is acknowledged this may be a contentious assertion given that some of the comparator leagues are comprised entirely of full-time professional clubs. Figure 1 provides a graphical presentation of the mean and median attendances for seven English and three Scottish leagues for the 2011/12 season. The mean and median attendance for the closest comparable League of Ireland season (in 2012) are well below those reported for the third to the fifth national tiers of English football and the second national tier in Scotland. However, the League of Ireland figures are comfortably above those reported for the semi-professional regional tiers six and seven in England and national tiers three and four in Scotland.[10] The attendance patterns reported in Figure 1 are broadly the same for the two later seasons.

Table 1: *League of Ireland Premier Division Attendance*

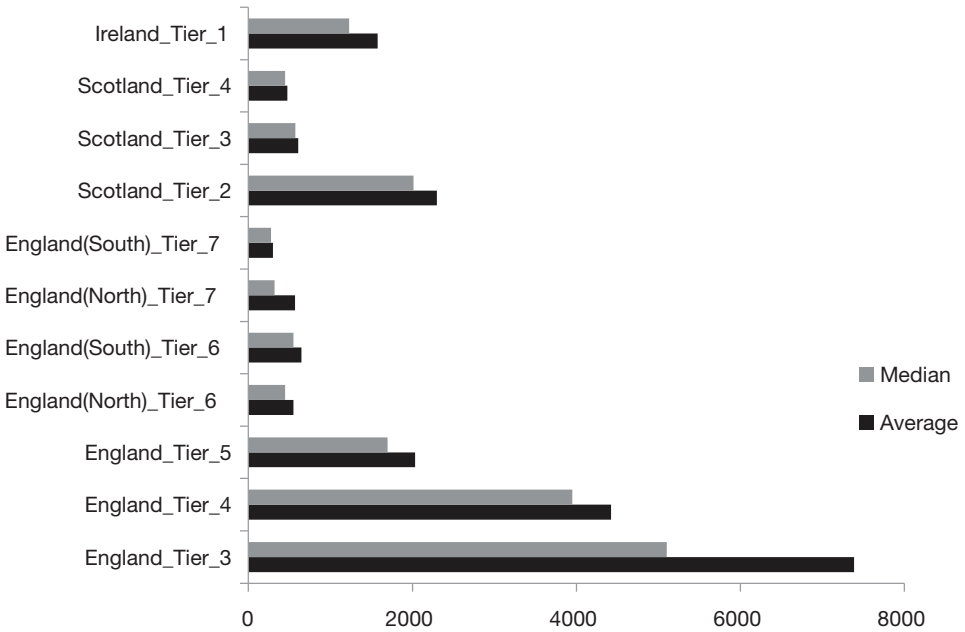
Season	*Average*	*Median*	*Minimum*	*Maximum*	*Average Capacity Utilisation (%)*	*Sample Size*
2012	1,574.9 (1,078.1)	1,228.0	151	6,097	26.3	179
2013	1,552.3 (875.3)	1,411.0	170	4,703	23.9	197
2014	1,522.6 (1,158.4)	1,140.5	139	6,219	24.4	194

Notes: (a) The clubs that feature are: Bohemians, Bray Wanderers, Cork City, Derry City, Drogheda United, Dundalk, Shamrock Rovers, Sligo Rovers, St.Patrick's Athletic and UCD (for all three seasons); Monaghan United (part of the 2012 season); Shelbourne (the 2012 and 2013 seasons); Limerick (the 2013 and 2014 seasons); and Athlone Town (the 2014 season only). (b) The standard deviations are reported in parentheses. (c) The average capacity utilisation is computed as the average attendance divided by stadium capacity multiplied by 100. (d) The sample sizes are different across the three seasons because of Monaghan United's withdrawal from the league mid-way through the 2012 season, one attendance figure is missing for the 2013 season, and four for the 2014 season.

[9] The attendance data for the English and Scottish leagues are obtained from the website http://stats.football.co.uk.

[10] Using the data reported in Figure 1, the average and median attendance for England's fifth tier in the 2011/12 season were respectively 29 per cent and 35 per cent higher than the comparable figures for the League of Ireland Premier Division. The t-test for the mean difference was computed to be 3.94 (prob-value=0.000) with the chi-squared test value for the median difference 19.83 (prob-value=0.000). The mean and median attendance for the Scottish second tier were respectively 46 per cent and 64 per cent higher than the top tier in the League of Ireland for the comparator *(contd.)*

Figure 1: *Spectator Attendance for Selected Tiers of England, Scotland and the League of Ireland*



Notes: The data for the English and Scottish leagues relate to 2011/12 season, while the League of Ireland data are drawn from the 2012 season. The sample sizes used to compute the attendance statistics are: 552 for England Tiers 3 to 5; 462 for England Tier 6 (North and South); 462 for England Tier 7 (North and South); 180 for Scottish Tiers 2 to 4; 179 for the League of Ireland Premier Division (Tier 1).

IV DATA AND ECONOMETRIC METHODOLOGY

The empirical analysis is undertaken at match-level and exploits information on 570 fixtures played in the League of Ireland Premier Division over the 2012, 2013 and 2014 seasons. The data allow an investigation of the effects on attendance of a variety of measures related to club playing form, fixture quality, match outcome uncertainty, seasonal uncertainty, and opportunity (and other) costs. Given there is little variation in admission prices across League of Ireland clubs (either within or over the three seasons of

[10] (contd.) seasons with mean and median tests yielding values of 6.68 (prob-value=0.000) and 46.4 (prob-value=0.000). However, for all the other lower tiers in England and Scotland reported in Figure 1, average and median League of Ireland attendances were found to be statistically higher on the basis of relevant tests.

interest here) and that income variation across the regions (and over time) in which the clubs are located is limited, price and income effects cannot be empirically identified.[11] Therefore, the effects of price and income are assumed to be implicitly absorbed within the set of club-specific fixed effects. These time-invariant effects are also assumed to capture the influence of stadium quality and other local demographic factors on attendance.

The literature review suggests a number of variables that are potentially important to the determination of match-level spectator demand. After preliminary empirical investigation, the following spectator attendance (or demand) equation was found to provide an adequate fit to the data:

$$\begin{aligned} \text{Ln(ATTEND)}_{it} = {} & \sum_{i=1}^{14} \alpha_i D_{it} + \gamma_1 T_t + \sum_{j=2}^{14} \gamma_j (D_{it} \times T_t) + \\ & \beta_1 \text{PROP\_POINTS}_{it} + \beta_2 \text{SEAS\_UNCERT}_{it} + \beta_3 \text{FIX\_QUAL}_{it} + \\ & \beta_4 \text{DERBY}_{it} + \beta_5 \text{PROB\_WIN\_SPLINE\_1}_{it} + \\ & \beta_6 \text{PROB\_WIN\_SPLINE\_2}_{it} + \beta_7 \text{Ln(DISTANCE)}_{it} + \\ & \beta_8 \text{FRIDAY}_{it} + \beta_9 \text{SUNSET}_{it} + \beta_{10} \text{SEAS\_13}_{it} + \beta_{11} \text{SEAS\_14}_{it} + u_{it} \end{aligned} \quad (1)$$

where:

Ln(ATTEND)_{it} = the natural logarithm of the number of spectators in attendance at the i^{th} home team's match in the t^{th} fixture of the league championship (including season ticket holders).

PROP_POINTS_{it} = the proportion of points won in the last three league matches by the home team prior to the current fixture. This variable captures the home team's recent form.

SEAS_UNCERT_{it} = 1 if $c - b_{it} \leq m - 3 \times t$ where c denotes the points needed to win the league championship, b_{it} is the number of points the i^{th} team has acquired at time t prior to the current fixture, m is the maximum number of points a team can win in a given season, and t is the number of games already completed (where three points are awarded for a win);

[11] The median adult admission price to a League of Ireland Premier Division match over the three seasons under analysis here is €15.

$SEAS\_UNCERT_{it}$ = 0 if $c - b_{it} > m - 3 \times t$. This binary variable is designed to capture seasonal uncertainty.[12]

FIX_QUAL_{it} = $(R_i + R_j)/2$ where R_i is the rank of the home team and R_j is the rank of the visiting team prior to the fixture at time t. The ranks range from 1 for the bottom club to 12 for the top club. This variable is included to capture the quality of the fixture.

$DERBY_{it}$ = 1 if the i^{th} fixture in the t^{th} series of the league championship is a derby match involving games between Dublin city rivals Bohemians, Shamrock Rovers, Shelbourne and St. Patrick's Athletic or fixtures involving the two County Louth clubs (Dundalk and Drogheda), and = 0 otherwise.

$PROB\_WIN_{it}$ = the implicit probability of a home win prior to the fixture expressed in proportional terms and computed from the betting odds quoted for the match as provided by the bookmaker Paddy Power.[13] The implicit probabilities used are net of the bookmaker's profit or "over-round". This probability measure is then transformed into two "splines" (see below):

$PROB\_WIN\_SPLINE\_1_{it}$ = the "spline" of PROB_WIN (defined above) where the node is determined by the first quintile of the implicit win probability. The "spline" assumes the value of PROB_WIN if its value is less than or equal to the node, and equals 0 otherwise;

$PROB\_WIN\_SPLINE\_2_{it}$ = the "spline" of PROB_WIN (defined above) where the node is again determined by the first quintile of the implicit win probability. The "spline" assumes the value of PROB_WIN if its value is greater than the node, and equals 0 otherwise.

The foregoing pair of variables is included in Equation (1) to capture the effect of match outcome uncertainty.

[12] A limitation of this type of measure is that the total number of points required to win the league championship can only be known *ex post* (see Cairns *et al*., 1986).

[13] The fixed odds betting data were obtained from the website www.paddypower.com/football/football-matches/ireland. If the market in fixed odds betting for the League of Ireland is information efficient, then the odds posted by the betting company should incorporate all publically available information on the competing clubs in terms of recent team form, home advantage and player availability *etc*.

$FRIDAY_{it}$ = 1 if the i^{th} match in the t^{th} series of the league championship was played on a Friday, and = 0 otherwise.

$Ln(DISTANCE)_{it}$ = the natural logarithm of the distance by road between the competing teams' stadia, where the distance is measured in kilometres.

$SUNSET_{it}$ = the time of sunset on the day the fixture is played expressed in terms of the 24-hour clock.

$SEAS\_13_{it}$ = 1 if the i^{th} match in the t^{th} series of the league championship was played in the 2013 playing season, and = 0 otherwise;

$SEAS\_14_{it}$ = 1 if the i^{th} match in the t^{th} series of the league championship was played in the 2014 playing season, and = 0 otherwise.

The α_i represent a set of i home team specific fixed effects, D_{it} represents dummy variables for each of the 14 teams that featured in the Premier Division over the three seasons, T_t is a time trend, u_{it} is an idiosyncratic error term assumed independently identically distributed, and $Ln(\cdot)$ denotes the natural logarithmic operator. The interaction of the trend variable with the D_{it} team specific effects in Equation (1) allows for club specific trends and these are included to capture differing trend effects in fan loyalty across the different clubs.

Table 2 provides summary statistics for the above variables with standard deviations reported for the continuous variables in parentheses. The mean value for the SEAS_UNCERT variable suggests that the home team remained in contention to win the championship in about 60 per cent of fixtures. Just under 10 per cent of all fixtures were classified as local "derby" matches with the overwhelming majority of these involving the historical rivalries between the league's Dublin clubs. The implicit *ex ante* probability of the home team winning ranges in value from 0.0769 to 0.8247. After some experimentation, and as already anticipated above in Expression (1), the data were found to support just one breakpoint with the node separating the two "splines" located at the first quintile value of the series (0.2471). In spite of the concentration of clubs along a stretch of modest length on the island's Eastern seaboard, the longest road distance between two stadia is 400 kilometres (Cork and Derry) with the shortest (at about 1.6 kilometres) between Dalymount Park (Bohemians) and Tolka Park (Shelbourne) in Dublin city. The table also reveals that 70 per cent of all matches in the three seasons were played on a Friday with the latest sunset time reported as 12 minutes past ten.

Table 2: *Selected Summary Statistics*

Variable Names	*Mean*	*Minimum*	*Maximum*
Ln(ATTEND)	7.1157 (0.7163)	4.9345	8.7354
Recent Team Performance:			
PROP_POINTS	0.4852 (0.2841)	0	1
Seasonal Uncertainty			
SEAS_UNCERT	0.6088	0	1
Fixture Quality and Significance:			
FIX_QUAL	6.7325 (2.5032)	1.5	12
DERBY	0.0947	0	1
Match Outcome Uncertainty:			
PROB_WIN	0.4178 (0.1840)	0.0769	0.8247
PROB_WIN_SPLINE_1	0.2309 (0.0384)	0.0769	0.2471
PROB_WIN_SPLINE_2	0.1869 (0.1622)	0.0	0.5776
Opportunity Cost Variables:			
FRIDAY	0.7017	0	1
DISTANCE	147.98 (100.11)	1.650	400.0
Ln(DISTANCE)	4.5392 (1.2032)	0.5008	5.9915
SUNSET	20.1321 (1.1879)	18.02	22.12
Season Specific Dummies			
SEAS_12 (omitted in estimation)	0.3140	0	1
SEAS_13	0.3456	0	1
SEAS_14	0.3404	0	1
Sample Size	570		

Notes: (a) The standard deviations are reported only for the non-binary variables.

V EMPIRICAL RESULTS

A fixed effects panel estimator is used in estimation and Table 3 reports the estimates for the model described in (1) above.[14] The standard errors are adjusted for heteroscedasticity of unknown form.[15] The null hypothesis of common trends across clubs is rejected justifying the inclusion of club-specific trends. In addition, the set of club specific fixed effects is also found to be jointly statistically significant.

All but two of the estimates for the included set of covariates in Table 3 is found to be well determined statistically, and attention now turns to a discussion of the model results. A team's most recent form is found to affect attendance. On average and *ceteris paribus*, an additional point secured in the last three games is found to raise attendance by 1.8 per cent.[16] The importance for match attendance of retaining an interest in the league championship for as long as possible is also confirmed in the estimates reported here. Holding the array of other factors constant, higher attendances are associated with those clubs remaining (at least arithmetically) in contention to win the Premier Division title. The quality of a fixture is also found to be statistically important. In particular, a one place increase in the average position of the two competing teams raises attendance by about 8 per cent, on average and *ceteris paribus*. There is clearly a strong appetite for match quality among League of Ireland supporters and this variable alone accounts for about one-fifth of the total variation explained by the included regressors. The local rivalry associated with derby fixtures also appears to be attractive to spectators. Specifically, a derby match is associated, on average, with attendances that are over 24 per cent higher compared to those fixtures without any local rivalry.[17] The magnitude

[14] A random effects estimator could have been used as an alternative estimation procedure here. However, a Hausman test to determine the appropriateness of this estimator proved uninterpretable in the current application given the difference in variance-covariance matrices between the fixed and random effects estimators was not found to be positive-definite. Under such circumstances the use of the fixed effects estimator is preferable as the estimates remain consistent.

[15] Stock and Watson (2008) suggest use of a cluster-robust variance-covariance matrix, where clustering in our application would be on the basis of the football club. Given the small cross-sectional dimension of the panel dataset, use of such a cluster-robust correction is more likely to create than solve any problems as the variance-covariance estimator only converges on its true value when the number of clusters (and not the number of observations) approaches infinity. For this reason we use the more standard White (1980) adjustment to the variance-covariance matrix.

[16] If a club secures one additional point from a recent league match this translates as an increase of 1/9 in the PROP_POINTS variable relative to the mean. Therefore, the effect for this variable is $(1/9) \times 0.1589 = 0.0176$.

[17] Given the logarithmic form of the dependent variable in Expression (1), the percentage effects for the k^{th} dummy variable is computed as $(\exp(\beta_k) - 1) \times 100$ where β_k is the estimate for the k^{th} dummy variable.

of this estimate is comparable to that reported by Buraimo (2014) for the lowest national tier of the English game.

We now turn to examine the role of match outcome uncertainty. The U-shaped relationship generally posited in the literature between attendance and the *ex ante* home win probability, has been used extensively in studies to capture match outcome uncertainty (e.g., Peel and Thomas, 1992. 1996; Czarnitski and Stadtmann, 2002 and Buraimo, 2014). However, a constraint of the quadratic parameterisation is that declines on the downside occur too slowly with increases on the upturn occurring too rapidly. The use of splines overcomes this limitation and arguably provides a more data coherent characterisation of the relationship of interest. The specification was originally parameterised in terms of five piece-wise linear splines with the four nodes determined at the quintile values of the win probability. However, a more austere parameterisation comprising two linear splines with a single node at the first quintile value was found to statistically dominate the original five-spline specification and other intermediate variants tested.

As is evident from Table 3, only the estimated effect for the first of the two splines is statistically significant at an acceptable level. The estimate for this spline suggests a negative gradient between log of attendance and win probabilities in the range from 0.0769 to 0.2471, with a zero gradient thereafter. A more informative way of characterising this result is to distinguish between home fixtures with a very low implicit home win probability, specifically those with a forecasted home win chance of approximately one-quarter or less (i.e., the first "spline") and all other home fixtures. Contests with a low anticipated chance of a home win, on average and *ceteris paribus*, attract lower attendances. The obvious absence of outcome uncertainty at the bottom end of the probability distribution clearly exerts a negative impact on attendance and is attributable to a lack of short-run competitive balance within the league. Although many leagues are likely to be characterised by such imbalance, it represents a sizeable one-fifth of League of Ireland matches on the basis of the estimates reported here.

For completeness Table A2 of the Appendix reports estimates for a variety of alternative parameterisations of the win probability, including the more popular U-shaped relationship, but none is found to dominate the "spline" form reported in Table 3 in terms of "goodness-of-fit". The point estimate corresponding to the "turning point" at which log attendance is minimised (for the quadratic case) is 0.574 with a standard error of 0.084. This estimate is consistent with those generally reported in the sports attendance literature broadly defined and the null hypothesis that the true turning point is 0.5 cannot be rejected by these data using an asymptotic t-ratio ($|t| = 0.87$ and a prob-

value = 0.382).[18] Nevertheless, if we use two splines with the node set approximately at 0.57, there is again no evidence of a positive upturn as implied by the quadratic form thus questioning the empirical suitability of the quadratic parameterisation for the current application.[19]

Three separate opportunity cost measures are included in the attendance specification. Friday evening remains the most popular day for League of Ireland Premier Division fixtures when the majority of matches are played.[20] The econometric estimates suggest that there is an advantage to staging fixtures on a Friday evening relative to other days of the week. The attendance is, on average and *ceteris paribus*, over 13 per cent higher on a Friday compared to games scheduled for other days. It is acknowledged that clubs do not exercise complete autonomy in match scheduling as some fixtures may take place on other days of the week due to the staging of European ties involving domestic clubs, for example, or enforced re-scheduling to avoid a clash with the national team's fixtures, some of which are now scheduled for Friday evenings.

The second opportunity cost measure relates to the geographical distance travelled by fans for certain fixtures. The variable also reflects the direct costs incurred in attending an away fixture aside from the cost of stadium admission. The elasticity estimate suggests that a 10 per cent increase in the distance between the two stadia reduces attendance by almost 1 per cent. It is sometimes argued that this measure also captures the (inverse) effect of a derby fixture. However, given a derby covariate is already included in the specification, the *ceteris paribus* distance effect is interpreted in this particular application as reflecting the role of opportunity and other indirect costs.

The change in the timing of the League of Ireland playing season in 2003 has meant that many of the league's fixtures now occur in the summer months. The longer days may provide alternative recreational opportunities for soccer fans. In order to investigate this issue further, another opportunity cost variable, based on the sunset time of the match day, is included. This is measured in the form of a 24-hour clock. The estimate suggests that, on average and *ceteris paribus*, a 15-minute lengthening of daylight reduces attendance by approximately 1 per cent. Thus, summer soccer may have brought with it some advantages but the array of alternative recreational activities available in the

[18] Borland and McDonald (2003) provide a review of these estimates for a variety of different spectator sports.

[19] It should be noted that the estimates for all other variables reported in Table 3 are invariant to use of either the quadratic or the spline specifications.

[20] The choice of Friday is largely dictated by the fact that it is normally the one day of the week where matches from the neighbouring top-tier leagues in England and Scotland are not broadcast on Sky. However, the English Premiership (EP) recently opened invitations for broadcasters to bid for rights and envisages from 2016/17 the live broadcast of 10 EP league games on Friday evenings.

Table 3: *Spectator Demand for League of Ireland Premier Division Football*

Independent Variables	*Estimates*
Recent Team Performance:	
PROP_POINTS	0.1589**
	(0.0702)
Seasonal Outcome Uncertainty	
SEAS_UNCERT	0.3117***
	(0.0534)
Fixture Quality and Significance:	
FIX_QUAL	0.0778***
	(0.0097)
DERBY	0.2199***
	(0.0681)
Match Outcome Uncertainty:	
PROB_WIN_SPLINE_1	–2.3246***
	(0.5428)
PROB_WIN_SPLINE_2	–0.0380
	(0.1616)
Opportunity and Other Cost Variables:	
FRIDAY	0.1261***
	(0.0375)
Ln(DISTANCE)	–0.0906***
	(0.0208)
SUNSET	–0.0308**
	(0.0138)
Individual Season Effects:	
SEAS_12	‡
SEAS_13	0.0816**
	(0.0362)
SEAS_14	–0.0087
	(0.0383)
R^2 – within	0.4432
Sample Size	570
Number of Clubs	14
Test for Significance of Team Fixed Effects ~ F(13,531)	30.010
	(0.000)
Test for Common Team Trend Effects ~ F(13,531)	1.860
	(0.032)

Notes: (a) The model is estimated using a LSDV fixed effects estimator and the specification also includes club specific time trends. (b) Given the presence of heteroscedasticity, robust standard errors are reported in parentheses. (c) ***, **, * denote statistical significance at the 0.01, 0.05 and 0.10 levels respectively. (d) ‡ denotes category omitted in estimation. (e) The F-test values are Wald transformed test statistics computed using the robust variance-covariance matrix. The numbers in square brackets represent the prob-values for these tests.

warmer months of the year appears to impact negatively on spectator attendance.

Finally, there is some variation in attendance across the three playing seasons with the demand found to be higher in the 2013 season. Specifically, on average and *ceteris paribus*, attendances were about 8.5 per cent higher in 2013 compared to the preceding season. This contrasts with the findings from the raw data, where the average increase in log attendance between these two seasons is of the order of 3.2 per cent. The point estimate for the raw differential is not found to be statistically significant using a t-test ($|t| = 0.46$ and prob-value=0.64). The *ceteris paribus* effect reported above for the 2013 season is not sensitive to the separate exclusion of any of the variables (or sets of variables) reported in Table 3. Therefore, the estimated effect is best interpreted as reflecting the impact on attendance in 2013 once we control for the influence of team performance, fixture quality, outcome uncertainty, opportunity cost and other sundry variables.

The role of other variables the literature suggests as influencers of spectator demand is now briefly reviewed. The variables are broadly delineated across three separate categories (viz., expected match quality and recent team form, match and seasonal outcome uncertainty, and opportunity costs) and were added separately to Specification (1). Table 4 reports the prob-values for the statistical tests for the estimated effects, where the prob-values are based on t-tests using a robust variance-covariance matrix.

The initial focus is on match quality and a team's very recent playing form. The quality of the opposition in terms of being in one of the league's top four positions prior to the fixture is found to be statistically unimportant and a similar finding is detected for the league position of the visiting team. None of the variables that capture the home team's most recent playing performance is found to exert an influence on attendance, nor does the number of absentees from the home team due to either injuries or suspensions.[21]

Attention now turns to the match outcome uncertainty variables. The Hart *et al.* (1975) measure capturing the absolute difference in league positions yields an insignificant effect, as does an alternative variable reflecting the absolute difference in the proportion of points acquired by the home and the away side prior to the fixture. In order to investigate the effect on spectator attendance of a "surprise" result by a team in its most recent league match, we use an

[21] It could be argued that one reason why none of the expected match quality or recent team performance variables yields statistically significant effects is because all the relevant information is impounded into the fixed odds betting data that already feature in the estimated specification. However, even when the two "splines" containing this information are excluded, only the dummy variable for whether the opposition is placed in the top four achieves statistical significance at a conventional level.

empirical construct suggested by Bell *et al*. (2012). This computes the expected match outcome in the last league match played using bookmaker odds, and compares it to the actual outcome assigning 3 points for a win, 1 for a draw and 0 for a loss. If the actual result is above expectation, then this constitutes a positive surprise and could potentially stimulate attendance at the next home game. However, we find no evidence that such "surprises" matter. A variable representing the relegation analogue to the SEAS_UNCERT variable included in Specification (1) fails to register a statistically significant effect.[22]

A set of opportunity cost variables are now the subject of discussion. In spite of its "summer" scheduling a significant number of the league's fixtures were affected by rain in the three seasons under review. However, the relevant asymptotic t-ratio for a precipitation dummy yielded a fairly modest value of –0.26. In addition, the ambient temperature prevailing (approximately) at the time of the fixture was also found to exert no independent effect on attendance. About 7 per cent of League of Ireland Premier Division matches were broadcast live on terrestrial television (RTE 2) over the three seasons analysed here, and the timing of these broadcasts overlapped (albeit sometimes imperfectly) with the scheduling of other fixtures in the Premier Division in about one-fifth of cases. However, neither attendance at the broadcasted matches nor at those games scheduled on the same evening was found to be adversely impacted.[23] A particular feature of the League of Ireland Premier Division over the period of analysis is the presence of a large number of clubs in the Dublin/North Wicklow area. This suggests the possibility of strong competition for fans among these clubs. A dummy variable capturing whether competing Premier Division fixtures were scheduled within a 25-kilometre radius of the home stadium at approximately the same time was included in the demand specification. This again yielded a statistically insignificant effect suggesting that the concentration of clubs in a confined geographical space does not appear to matter for attendance. Separate variables for the days between two consecutive competitive home fixtures (designed to capture the role of fixture congestion) and kick-off times both failed to feature as significant determinants. Finally, no evidence of an upturn in League of Ireland attendances was detected after the completion of the English and Scottish league seasons.

It is worth noting that the estimates for the variables reported for Equation (1) in Table 3, and their significance, remain robust to the inclusion of these variables in every case. This provides some comfort that the equation of choice for the empirical analysis is adequately specified.

[22] The variable is constructed in an analogous fashion to SEAS_UNCERT but the "c" now represents the number of points that would consign a club to either automatic relegation or a relegation play-off tie with a second tier club.

[23] There is a potential endogeneity issue in regard to estimating the effect of a broadcast on attendance at the broadcasted match. This issue is ignored in this case for convenience.

Table 4: *Prob-values for the Effects of Excluded Variables*

Excluded Variable	*Prob-value*
Expected Match Quality & Recent Team Form:	
The visiting team is in a top four place (dummy variable)	0.660
Number of absentees from the home team through injury or suspension	0.266
The league position of the visiting team prior to the fixture	0.625
The score differential in the last home game	0.365
The score differential in the last game – home or away	0.144
The home side won the last home game (dummy variable)	0.729
The home side won the last game – home or away (dummy variable)	0.710
The home side lost the last home game (dummy variable)	0.720
The home side lost the last game – home or away (dummy variable)	0.823
Match and Seasonal Outcome Uncertainty:	
The absolute difference in league positions of the competing teams prior to the fixture defined as $\lvert R_i - R_j \rvert$ where R represents the rank of the team	0.580
The absolute difference in the proportion of points won by the competing teams prior to the fixture.	0.895
A surprise result in the last league game (see text for description)	0.226
The home side is at risk of relegation or play-off (dummy variable)	0.788
Opportunity Cost and Fixture Congestion Variables:	
The fixture was affected by rain (a dummy variable)	0.806
The temperature in centigrade approximately one hour prior to match	0.928
The natural logarithm of the temperature variable defined above	0.917
The kick-off time based on the 24-hour clock	0.270
There was another Premier Division match being played within a 25 kilometre radius at approximately the same time (dummy variable)	0.294
The number of days since the last home competitive match (i.e., European Champions League, Europa League, FAI Cup, Setanta Cup or League of Ireland Premier Division fixtures)	0.142
The log of the number of days as defined above	0.963
The English/Scottish league seasons are completed (dummy variable)	0.360
The fixture occurs after the mid-season break (dummy variable)	0.534
The fixture was broadcasted live on RTE 2 (dummy variable)	0.507
The fixture occurred while another Premier Division fixture was being broadcasted live on RTE 2 (dummy variable)	0.939

Notes: (a) The variables listed above are added to Specification (1) reported in Table 3 separately. (b) The prob-values are based on asymptotic t-tests using robust standard errors.

VI CONCLUSIONS

This study is the first to provide an empirical analysis of spectator demand for League of Ireland football. The average attendance figures for the domestic game are found to be well below those for the lowest national tiers of English football and even the second national tier in Scotland. The domestic league is also characterised by a fairly high degree of dispersion in attendance across clubs. In addition, and although not the subject of analysis in this paper, long-run competitive balance in the Premier Division of the League of Ireland is also poor compared to the lower tiers in England and Scotland.[24]

It is salutary that many of the factors found to influence football demand in Ireland's domestic league are redolent of those detected as important in the more prestigious leagues of Europe. The spectator demand relationship estimated for Ireland suggests important roles for fixture quality, recent team performance, derby matches, and seasonal and match outcome uncertainty. In regard to the latter, the findings suggest that the perceived certainty of a match outcome adversely affects attendance for matches where the *ex ante* home win probability is 0.25 or less. Since about one-fifth of all Premier Division fixtures fall into this category, the degree of short-run competitive balance within the league and its effect on attendance is clearly an issue. A set of opportunity and other cost variables capturing the day of the week and the time of the season is also found to be important, as is travel distance between stadia. However, adverse weather conditions is found to be statistically unimportant, and, in contrast to findings elsewhere in the empirical literature, matches broadcast live on television are found to exert no independent impact on attendance at either the match that is subject to the broadcast or other fixtures scheduled concurrently with the broadcast.

League of Ireland fans of more mature years are apt to recall a time in the 1950s and early 1960s where many grounds were filled close to capacity every Sunday afternoon. Given the wider global football market within which domestic clubs now compete for fans[25], and the strong support and interest in

[24] The Herfindahl Index of Competitive Balance (HICB) provides a measure for the long-run competitive balance of sports' leagues (see Owen, 2014). A value of 1 reflects a perfectly balanced league, while values greater than 1 suggest imbalance. The average HICB for the League of Ireland Premier Division over the 13 seasons since the introduction of summer soccer is 1.12. This compares to an average over the same period of 1.06 in tiers three to five in England, and an average of about 1.07 in regional tiers six to seven in England and national tiers two and three in Scotland. The degree of average competitive balance in the League of Ireland over this period is closest to the Irish League (1.11), the Welsh Premier League (1.14), and the fourth national tier in Scotland (1.11).

[25] The attraction of the English and Scottish Premiership Leagues to visitors from Ireland is confirmed by a recent VisitBritain Survey conducted in 2011. The survey found that out of 767,000 tourist visits to Britain that included attending a football match as part of the visit, the (contd.)

other spectator sports within the country, this era is unlikely ever to return. Although just over 300,000 spectators attended League of Ireland Premier Division matches in the 2014 season, the gross revenues generated in ticket sales probably did not exceed four million Euros for the season. A lowly ranked club in the second tier of English football would generate considerably more in ticket sales alone in a single season.

It is readily acknowledged that stadium quality and the broader nature of the match event experience might matter for attendance and our empirical analysis provides no insight on these issues. However, the econometric evidence does suggest that modest enhancements in attendance may be obtained by increasing match outcome uncertainty so as to induce a greater degree of short-run competitive balance within the league. In addition, the empirical evidence also suggests a very strong role for fixture quality in animating spectator interest. Therefore, a reform likely to increase attendance is one that entails a sizeable reduction in the number of clubs competing in the top tier. This would help concentrate the limited pool of domestic playing talent within a smaller number of clubs, thus ameliorating the league's playing standard and its average fixture quality. This obviously goes against a current school of thought within some League of Ireland circles that the direction of reform should be towards expanding the Premier Division to say 16 or 18 clubs.[26] Given the forgoing findings such a reform is likely to create greater competitive imbalance and poorer average fixture quality with adverse consequences for attendance. It is acknowledged that a radical proposal to shrink representation in the top tier may have limited appeal for some club administrators, but it is one that merits serious consideration as part of an evidence-based strategy to improve playing standards and enhance attendance in the top tier of the domestic game in Ireland.[27]

[25] (contd.) largest group was from Ireland comprising 164,000. Of course, many of these may be marginal fans of clubs within the English and Scottish Premiership Leagues and some may even be League of Ireland fans.

[26] For instance, in a recent article on this theme John O'Sullivan, a former chairman at Cork City and former CEO at both Athlone Town and Limerick, expressed a preference for re-structuring towards a single 16 team top division (see O'Sullivan, 2014).

[27] It arguable that the empirical evidence reported could also be taken to suggest that a policy of concentrating clubs in a tight geographical area to reduce travel distance and ensure more derby fixtures would also increase attendance. However, this type of prescription, even if at all desirable, conflicts with the open-entry nature of the League of Ireland.

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APPENDIX

Table A1: *Average League of Ireland Premier Division Club Attendance by Season*

Club	*2012*	*2013*	*2014*
Athlone Town	Not applicable	Not applicable	685.1 (370.2)
Bohemian FC	1,488.4 (522.7)	1,517.7 (559.2)	1,480.0 (648.1)
Bray Wanderers	965.0 (422.8)	891.2 (596.9)	695.0 (499.8)
Cork City	2,761.9 (717.4)	1,965.2 (368.9)	3,776.5 (1,225.8)
Derry City	1,446.7 (796.6)	1,438.2 (648.4)	1,109.4 (308.9)
Drogheda United	975.9 (296.7)	780.4 (290.5)	1,032.2 (420.2)
Dundalk	894.7 (389.7)	1,950.2 (589.1)	2,534.3 (890.1)
Monaghan United	754.8 (419.3)	Not applicable	Not applicable
Shamrock Rovers	2,990.6 (956.1)	2,780.9 (989.4)	2,284.4 (1004.9)
Shelbourne AFC	1,150.7 (389.7)	1,113.6 (455.1)	Not applicable
Sligo Rovers	3,007.1 (1244.9)	2,342.1 (733.8)	1,971.3 (800.8)
St. Patrick's Athletic	1,455.7 (296.0)	1,687.3 (717.7)	1,358.8 (638.7)
UCD	487.2 (296.0)	486.6 (302.0)	400.4 (217.8)
Limerick	Not applicable	1,638 (814.7)	766.3 (314.9)
Overall Average	1,574.9 (1,078.1)	1,552.3 (875.3)	1,522.6 (1,158.4)

Notes: The standard deviations are reported in parentheses.

Table A2: *Estimates for Alternative Parameterisations and Measures of Match Outcome Uncertainty*

QUADRATIC	PROB_WIN	LN(PROB_WIN)	SPLINE
–1.3199***	–0.3425***	–0.1657***	–0.6335***
(0.4518)	(0.1459)	(0.0498)	(0.1770)
1.1504**	n/a	n/a	–0.1284
(0.4853)			(0.3488)
R^2 –within:	R^2 –within:	R^2 –within:	R^2 –within:
0.4305	0.4239	0.4318	0.4344

Notes: (a) The model is estimated using a LSDV fixed effects estimator with the two "splines" in Table 3 replaced by linear and quadratic forms of the win probability (column 1), the win probability itself (column 2), the log of the win probability (column 3), and a two piece-wise linear splines with the node approximately at the "turning point" of the quadratic specification reported in column 1 (column 4). (b) The marginal effect for the quadratic case, computed at the sample average win probability, is –0.3586 (with a standard error of 0.1465). (c) ***, **, * denote statistical significance at the 0.01, 0.05 and 0.10 levels respectively. (d) n/a denotes not applicable. (e) The R^2 –within is obtained from the fixed effects regression model based on the win probability specified.