Working Paper in Economics

 # 202505

Big Games: The Importance of Match Significance for Attendances in Four European Football Leagues

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BIG GAMES: THE IMPORTANCE OF MATCH SIGNIFICANCE FOR ATTENDANCES IN FOUR EUROPEAN FOOTBALL LEAGUES

by

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May, 2025

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Abstract

Matches in team sports are usually organised as leagues where there are end-of-season positive and negative prizes such as the championship, playoff qualification, and relegation. Most prior attempts to investigate how the significance of an individual match for these outcomes affects attendance or television ratings have failed to identify an effect. This paper argues that the explanation may be that most studies use ad hoc metrics which fail adequately to capture how important a match is. A recent development is to use metrics more rooted in sport analytics and research based on this approach has supported the notion that the size of the television audience is influenced by how much the match matters in the context of likely seasonal outcomes. Here, we extend the idea by applying it to modelling stadium attendance in four European football leagues. In each case, attendance is elevated as the match becomes more important from the perspective of the home club, whichever prize is considered. Matches which are important to the away club if it is a contender for the championship also raise expected attendance but this is not true for the negative prize of relegation. Implications for organisers of leagues are discussed.

Key words: sport analytics; Monte Carlo simulation; football; stadium attendance; match significance

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1. Background

In club-level team sports, the majority of matches are now almost invariably organised within a league structure rather than as part of a bilaterally arranged series of one-off fixtures. The shift to a league-based programme emerged in the late-nineteenth century. For example, in America, the National (baseball) League dates from 1876 and, in England, the Football League was formed in 1888 and the County Cricket Championship in 1889. In rugby, there was a split in the game in 1895, when a minority of clubs which favoured the creation of a league broke away to form what became essentially a separate sport, with its own rules, rugby league. Remaining clubs in rugby union remained aloof from the idea of leagues for several decades but finally followed other team sports in adopting a league structure in the 1970s. Such appears to be the success of the sport product when presented in a league structure that experimentation currently seeks to extend the model to individual sports, such as horseracing ('The Racing League' in Britain) and golf (the LIV breakaway tour). And, extending the idea from domestic structures to the elite international game, the International Cricket Council has organised a World Test Championship whereas all series of test matches between the top countries had hitherto been just a set of free-standing games arranged on a bilateral basis. In another example, European football instituted the UEFA Nations League, largely to replace "meaningless friendlies" (UEFA, 2024).

One reason for the popularity of leagues is presumably that they are believed to promote public interest in the sport because each game is not just of interest in itself but may also contribute to the outcome of a competition in which prizes are awarded at the end of the season, which may be positive prizes (e.g. the national championship) or, in the European Model of Sport, negative (demotion to the immediately inferior league). The extent to which attendance decisions depend on how important a match looks likely to be, in terms of affecting prospects for end-of-season prizes, has nevertheless been neglected in many consumer demand studies in sport, most of which focus purely on the characteristics of each fixture, treated as a stand-alone event. This is regrettable on at least two counts. First, modelling which captures only match-specific characteristics to the exclusion of a measure of match significance will risk yielding biased coefficient estimates because of correlation with the omitted variable. For example, match outcome uncertainty may be correlated with match significance if the prospectively closest matches are between clubs adjacent to each other in the league table. Second, findings on match significance would be relevant to decisions on the design of leagues. For example, were match outcome uncertainty found to be of low relevance to consumer choices whereas fixtures with high match significance attracted greater demand, there might be a shift from seeking overall competitive balance across all clubs towards trying to manipulate resources such that there would be a cluster of clubs competing with each other at the top of the table and a cluster of weaker clubs fighting each other to avoid demotion. This would be expected to generate a relatively high number of 'significant' fixtures over a season.

Whilst several prior papers (e.g. Cox, 2018, Caruso et al., 2019) have indeed excluded match significance from consideration when modelling stadium or television demand, others have included measures which, however, often proved to be statistically non-significant. But it should be noted that these were typically ad hoc measures of match significance, so much so that it would be fair to regard the evidence from applying them as weak. For example, following Goddard and Asimakopoulos (2004), Buraimo and Simmons (2015) defined the significance of a match for a club in a binary way,

with a fixture classified as ‘significant’ if, immediately prior to the match, the club still had a chance of winning a particular prize if it won all its remaining matches while others averaged only one point per match from theirs. But because, in principle, early in the season, all clubs are in contention for, say, the championship, all matches would then be identified as championship-relevant for several weeks into the season even where supporters might appreciate that their club had in fact no real chance of challenging for the top. Indeed, Buraimo and Simmons identified nearly 19% of 631 televised matches as featuring at least one club in contention for the championship and found this dummy variable as well as those for European qualification and relegation decisively non-significant in modelling audience demand. Forrest, Simmons and Buraimo (2005) confined classification of matches as ‘significant’ to the second half of the season and their criterion was according to whether clubs were currently adjacent in the table to one of the positions where a positive or negative prize is awarded. Again, this is insufficiently discriminating. For example, it takes no account of how many matches remain in the season or the quality of the opponents a club still has to face. Ad hoc indices combining information on how many games behind the leader a team is and how many matches remain to be played, as employed by Kuypers (1997) and García and Rodríguez (2002), similarly fail to account for the quality of opponents yet to be faced by contender teams. Other approaches include the use of measures which were known only ex post and unavailable at the time fans decided whether or not to attend the match. For example, Pawlowski and Nalbantis (2015), examining attendances in Austria and Switzerland (and Nalbantis, Pawlowski, and Schreyer, 2023, in a television demand paper) followed Janssens and Késenne (1987) in employing an index which included the number of points which would turn out subsequently to be required to win the championship at the end of the particular season.

In the context of modelling tv audience demand for matches in the English Premier League, Buraimo et al. (2022) argued that a new approach to measuring match significance was required in the football demand literature and that it was necessary to apply sport analytics to the problem. In sport analytics, Scarf and Shi (2008) had proposed a metric for capturing match importance. Their approach was similar to that of Tainsky and Winfree (2010), who, modelling baseball stadium attendance, measured the significance of a match for playoff qualification. This appears to have been the first such application in a demand study but the approach seems to have failed to gain traction in subsequent audience demand research.

Buraimo et al. (2022) defined the significance of a match as the change in the probability of winning a particular prize (in this case, variously the championship, European qualification, relegation) if a club were to win the match compared with losing it. This involved applying a probabilistic match forecasting model to the current match and to all other fixtures remaining in the season. Monte Carlo simulation of the rest of the season would then yield the required change in probabilities for each of the teams in a match. In contrast to much of the prior literature on football demand, Buraimo et al. found that match significance, particularly for the prizes of the championship and relegation, were strongly predictive of the size of tv audience for the match. In the present paper, we follow methodology similar to Buraimo et al. but apply it to stadium rather than television demand. Stadium attendance remains an important source of revenue across European football (Schreyer and Ansari, 2022), perhaps particularly where television revenue is shared relatively equally such that *differences* in spending power between clubs are most strongly related to ticket and associated merchandise sales. We also extend the spatial scope of the Buraimo et al. study by reporting results for four different European leagues.

Our estimation draws on attendance data from 15,021 football matches played over eleven seasons between 2010-2011 and 2022-2023 (we excluded two seasons disrupted by covid). Four leagues are represented. From the 'Big Five' leagues in Europe, we present analysis for the top tiers of football in France, Italy and Spain. The fourth league in the study is the second-tier of English football, marketed as 'The Championship'. This is still an important league, for example mean attendance at its matches across our data period was 18,499, but its inclusion allows us to evaluate fan preferences at not quite the most elite level of the sport.

Amongst the 'Big Five', we chose to exclude the top tiers in England and Germany from consideration because of the high frequency of sell-outs at their matches. We obtained capacity utilisation figures for all the matches in the 'Big Five' over our data period. In England, the mean capacity utilisation across fixtures has exceeded 0.99 in each individual season since 2012-2013, which may reasonably be regarded as a sell-out given that reported attendance will fall short of capacity if there are no-shows. Arsenal, Brentford and Chelsea had mean capacity utilisation of greater than 0.99 for all home matches played across our data period, indicating repeated sell-outs, with no meaningful variation in reported attendance from match to match. Germany presented similar data. Clubs such as FC Cologne and Hamburg reported mean capacity utilisation of 1 in each season and more than one-quarter of matches across all clubs over the data period had capacity utilisation reported as 1. By contrast, sell-outs in France, Italy and Spain, where the whole period means of capacity utilisation were 0.67, 0.69 and 0.61 respectively, proved to be very rare.

Thus, we excluded the top-tiers of England and Germany from the study because there are so many observations where true demand is not observed. This problem is not amenable to being resolved by Tobit estimation, in our view. Where sell-outs are the norm, attendees will be able to ensure their access to attractive matches only by purchasing a ticket bundle (most often a season ticket) which they may then use also to attend matches which they would not have chosen to attend if they were paying match-by-match. Tobit requires it to be assumed that observed demand equals true demand in observations which are not censored but this condition appears not to be satisfied in the English and German cases where it is common for there to be no space in the stadium for walk-ups. In such circumstances, attempts to discern customer preferences across different fixture characteristics will not yield reliable results.

In Section 2, we explain how we derived the metric for our focus variable, match significance, and explore differences in the numbers of highly significant and completely insignificant matches between leagues and across seasons. Section 3 sets out the controls used in our model and section 4 the results from modelling. The final section offers reflections on the results.

2. Computation of the match significance measures

We regard a match as significant for a club if winning rather than losing would have a strong effect on its chances of winning an end-of-season prize. Thus, for example, the match significance for the title race (the championship) for either the home or away team is expressed as the difference in two probabilities as follows:

$$sig_{ijt}^{title} = Pr(team\ i\ wins\ title | team\ i\ beats\ team\ j) - Pr(team\ i\ wins\ title | team\ i\ loses\ to\ team\ j) \quad (1)$$

If the measure is 0, then match t has no significance for the title race for team i and it either cannot win the title or has already done so. Match significance for the other end-of-season prizes follows a similar computation. The match outcome probabilities used in the match significance variables are calculated using a match forecasting model, which is based on models proposed by Maher (1982) and Dixon and Cole (1997). The number of home goals X and away goals Y follow a Poisson distribution as follows:

$$X \sim Poisson(\gamma \alpha_H \beta_A) \text{ and } Y \sim Poisson(\alpha_A \beta_H) \quad (2)$$

where α_H is the home team's attacking strength, β_A is the defensive strength of the away team, α_A is the attacking strength of the away team, and β_H the defensive strength of the home team. γ is a home advantage parameter, Attacking strength and defensive strength are proxied respectively by goals scored and conceded in prior matches.

The forecasting model is updated each match day, incorporating new match information up to but excluding the current match. The first iteration of the forecasting model uses only matches where the home club has already played two home fixtures in the season and the away club has already played two away games. Given the model's parameters, the probabilities associated with the different number of goals for the home and away teams in each match are estimated for all the remaining matches in the season. With knowledge of these goal probabilities, the probabilities of different scorelines are estimated. The scoreline probabilities which result in a home win are summed to generate the probability of a home win. The probabilities for a draw result and an away win are generated similarly.

Having generated the home win, draw and away win probabilities for the season's remaining matches, the outcomes of these remaining matches are simulated 10,000 times to generate as many end-of-season tables. Based on these simulations, the probabilities that a team finishes in any one of the various league positions conditioned on winning or losing the current match can be estimated at a given match day. The process then moves on to the next match and a new set of probabilities for the match significance computation is estimated on a rolling match-by-match basis until the last day of the season.

Match significance is calculated for each end-of-season prize. In the three top-tier leagues included in our analysis, prizes on offer are the championship, qualification for the European Champions League, and relegation to the second-tier. In the English division we consider, we define the positive prizes as automatic promotion to the Premier League (the top two clubs) and qualification for the play-offs, where the clubs finishing between third and sixth place compete in a knock-out tournament to determine which of them will claim the third promotion place.

The size of each league was constant across our data period. Of the four leagues we consider, three included twenty clubs in the competition but there were 24 in the English second-tier. The French league was reduced to eighteen clubs but not until the season following the end of our data period.

If match significance were important for attracting attendance, it would be desirable for the proportion of matches in a season which were of no significance at all to either team to be relatively low. Across the whole period, the proportions of matches which were of zero significance for any prize were 4.1%

in France, 4.7% in Spain and 7.0% in England (where there are 24 rather than 20 clubs competing for the prizes). But Italy was a clear outlier with 17.5% of fixtures over the whole period irrelevant with respect to any of the end-of-season prizes on offer.

While Italy presents as what might be considered an unhealthy league (too many 'dead' matches) over the whole period, there is variability within leagues from season to season depending on how the standings evolve. To illustrate, the proportion of zero significance matches in Spain was around 5% or lower in ten of the eleven seasons but more than 13% in season 2017-2018. This reflects a remarkable lack of competition for any of the end-of-season prizes in that particular year. The final league standings show that the championship was won by Barcelona with a 14 points margin over runner-up Atlético Madrid. Valencia took 4th place to claim the last Champions League spot, finishing 12 points ahead of the 5th place team. At the bottom of the table, Deportivo La Coruña was the best performing of the three relegated club but would still have needed 15 more points to overtake the immediately superior team. These data indicate that none of the matches played towards the end of the season will have been even mildly significant for season-end prizes.

3. Choice of control variables

For each league separately, we estimate a panel model with home club fixed effects and season dummies. The dependent variable is ln(attendance). Measures of match significance comprise our focus variables. In this section, we specify the controls to be included in the model.

Home club fixed effects will be driven in large part by how 'big' the club is, where its market size is likely in turn to be heavily influenced by history and geography. The average quality of a club's team may be revealed only slowly over a season and we expect attendance to respond to how well the team has been performing recently. Prior literature has employed variables such as the proportion of possible points won by the home club in the season to date at the time of the subject match (Buraimo, Forrest and Simmons, 2009) but this will be distorted early in the season by variation between clubs in the quality of opponents they have faced so far, and, late in the season, may be unduly affected by performance several months before. We follow Sung and Mills (2017) in including the home club Elo rating in the specification of our model. Ratings were obtained from http://clubelo.com/.

Elo ratings have been demonstrated to be efficacious when employed in football forecasting models (Hvattum and Arntzen, 2010), suggesting that they are able to capture current team strength. The ratings are updated after every match according to the prior relative rating of the opponent and whether the match was won, drawn or lost. Adjustments are made for home advantage and margin of victory. Ratings therefore capture the changing information on team ability, based on prior results, as it evolves during as well as across seasons. We expected increases in *home-elo* to have a positive influence on attendance as local fans responded to improving fortunes for their team.

While the absolute quality of the home team appears likely to drive demand, the relative quality of the two teams may also influence decisions on whether or not to attend a particular match. We follow many previous authors modelling attendance in football and other sports (for example, Coates, Humphreys and Zhou, 2014; Sung and Mills, 2018) by including the ex ante probability of a home team win (and its square), where the probability is that implied by the closing odds offered to bettors. Outcome probabilities calculated from published odds sum to more than 1 to allow for bookmaker margins and therefore require adjustment. We used the multiplicative method to scale odds such that

the implied probabilities (of home win, draw and away win) always totalled 1. Betting odds are from Bet-365, as accessed at www.football-data.co.uk

It might be thought that the uncertainty of outcome hypothesis should yield an inverted U-shaped relationship between attendance and home-win probability because low and high values of home-win probability would each be associated with a prospectively unbalanced contest. But, even where such a shape in the relationship has been detected, the turning point has been considerably beyond the point of balance (e.g., in Di Mattia and Krumer, 2023, European basketball fans attended in greater numbers as the chance of the home team winning increased up to the point where the probability of a home win was about four times that of an away win). In studies of football, it has been common for a U-shape rather than an inverted U-shape to emerge, with coefficient estimates on *home-win probability* and its square signed negative and positive respectively, as in Coates, Humphreys and Zhou (2014) and Sung and Mills (2018). That spectators appear here to be drawn to unbalanced matches expected to favour one team or the other is capable of several possible interpretations, for example that potential attendees may have preferences not only over seeing a closely fought match but also over whether their team is likely to win and perhaps placing a high value on the possibility of witnessing an upset. Coates, Humphreys and Zhou, for example, focus on the presence of consumers with reference-dependent preferences and risk aversion. There are other possible explanations still unexplored in the literature. For example, the style of play in a fixture may be a function of how closely matched the two teams are; and if some spectators find goals an attractive feature in football, they might anticipate that there will be more of them in matches where one team is a strong favourite. In our case, we do not include any direct measure of the strength of the visiting club, because of multicollinearity concerns. The relationship between attendance and home-win probability to emerge will therefore be likely to reflect a number of influences on decisions about whether or not to attend, including visiting club strength, the expected closeness of the match, and the risk of disappointment if the home club loses unexpectedly. Jang, Kim and Lee (2023) note that prior studies of attendance demand which use win probabilities based on bookmaker odds may make incorrect inference concerning the validity of the uncertainty of outcome hypothesis because either they exclude team quality as a variable or there is collinearity between team quality and win-probability. Here, we do not seek evidence for or against the importance of uncertainty because our focus is on match significance.

Of course, it is not only home fans who attend a match. We include as another control the natural log of the distance between the home stadia of the two clubs in a fixture because attendance by away supporters may be deterred by higher travel costs and because ‘expatriate’ away fans who have migrated to the home club city will generally be fewer in number the greater the distance. Straight line distances (km.) were estimated using the coordinates of the clubs.

Dummy variables were included in the equations for Italy and Spain to represent cases where the away team in a fixture was a particularly ‘big’ club in the sense of attracting a national following. In each case, this was based on long-term success in the particular national league. For example, in Italy, since 1929, Juventus has claimed the championship thirty times, Inter Milan twenty times and AC Milan nineteen times whereas no other club has won more than nine times (https://www.footballhistory.org/league/serie-a.html). It would appear likely that attendance would be boosted when such clubs were the visitors in a match since it would be a chance for locally based followers of the big team to see it in action. The resulting dummy variables signify that the away team was *AC Milan*, *Inter Milan* or *Juventus* (Italy) and *Barcelona* or *Real Madrid* (Spain).

We include a dummy variable to reference fixtures between clubs with a history of intense rivalry. Often this will be because of close geographical proximity, so-called 'derbies', e.g. Atlético Madrid v. Real Madrid, but there are also cases where history rather than geography explains the rivalry (e.g. Barcelona v. Real Madrid). Such fixtures may tend to attract exceptional interest. In our attendance equation, we include a dummy variable, *rivalry*. Inevitably, there will be some degree of subjectivity in assigning rivalry. Our decisions were informed by correspondents in the relevant countries who were asked which matches they would regard as particularly rivalrous.

Another dummy variable represented whether the fixture was scheduled on a *weekday* rather than during the weekend because many potential attendees may find it difficult or costly to give up the time required (including for travel to the game) on a working day. Only a minority of fixtures are arranged midweek though the English league represented in our data had a substantially higher proportion than in the rest, the result of having more member clubs (more fixtures to fit in) and a slightly earlier end to the season (to leave space for promotion play-offs).

As is conventional in attendance demand studies, we included a series of *month dummies* to allow for seasonality in demand. The strength of demand may vary month to month because of different activities competing with football for leisure time and budget as well as because of variation in probable temperature. We anticipated that the seasonal pattern might differ across the five leagues because, for example, the relative attractiveness of rival sports and the gradient in temperature between months will differ between countries.

Table 1 displays summary statistics by league for the dependent, focus and control variables included in our regression model. Attendance figures were sourced from http://transfermarkt.com and https://fbref.com/en/

Table 1. Summary statistics

	France	Italy	Spain	England
number of observations	3,142	3,354	3,378	5,147
attendance	21,467.288 (12,632.656)	24,204.534 (14,799.634)	27,808.548 (19,169.088)	18,498.681 (6,800.266)
home match significance (title)	0.012 (0.041)	0.009 (0.037)	0.013 (0.053)	
away match significance (title)	0.012 (0.041)	0.009 (0.039)	0.014 (0.056)	
home match significance (Champions League)	0.040 (0.077)	0.025 (0.064)	0.027 (0.060)	
away match significance (Champions League)	0.044 (0.079)	0.024 (0.060)	0.029 (0.066)	
home match significance (automatic promotion)				0.037 (0.063)
away match significance (automatic promotion)				0.038 (0.063)
home match significance (playoffs)				0.077 (0.082)
away match significance (playoffs)				0.080 (0.085)
home match significance (relegation)	0.054 (0.096)	0.025 (0.068)	0.057 (0.105)	0.049 (0.071)
away match significance (relegation)	0.052 (0.095)	0.024 (0.065)	0.053 (0.096)	0.048 (0.072)
Elo home	16.142 (0.951)	17.025 (1.012)	17.375 (1.199)	14.830 (0.659)
home probability	0.448 (0.157)	0.446 (0.180)	0.459 (0.186)	0.434 (0.114)
distance	503.080 (240.168)	362.210 (272.985)	297.471 (199.401)	110.000 (58.992)
rivalry	0.042	0.043	0.027	0.018
weekday	0.178	0.187	0.215	0.364

Numbers displayed are sample means. For continuous variables, the standard deviation is shown in parentheses.

4. Results

Results are displayed in Table 2.

First, we comment briefly on results on the control variables. Except in France, the scheduling of a given fixture on a weekday is associated with a decrease in expected attendance, by as much as 7% in the cases of Spain and England. Findings on the patterns of attendance across months are mixed. In Spain, apart from slightly lower attendance in December and January relative to the reference period (August/September), there is no discernible variation across the months. In the other three leagues, interest in attending increases in March and is at its highest between April and June. In England, December matches tend towards having higher attendance than in the Autumn, probably reflecting that (in contrast to the other countries) a crowded fixture list is scheduled for the period covering Christmas and New Year holidays, when more leisure time is available.

As anticipated, the distance variable attracts a negative and strongly significant coefficient estimate in all four cases. The estimated elasticity of attendance with respect to distance is highest in France and England While estimated elasticities may appear low, it should be borne in mind that away fans will typically account for a relatively low proportion of total attendance and that the coefficients will therefore under-estimate the sensitivity of travelling fans to distance. The dummy variables signifying that the visiting club was a 'superpower' with a national following were all significant. In each case, the boost in expected attendance was in the range 19-31%.

The coefficient estimate on the home club's Elo rating is positive and highly significant in all four leagues. However, except in England, estimated effect sizes are small. In England, a one standard deviation increase in Elo is associated with an 8.7% increase in expected attendance.

Home-win probability and its square yielded a U-shaped relationship in every case, with the U-shape reaching its minimum (i.e. the lowest predicted attendance) at a probability in the range 0.449 (England) to 0.600 (Spain), except in France where the turning point was at 0.736. Taking into account the proportion of draws in football (for example about 30% in a typical season in the English case), the turning point is always at a point where the home club is favoured by the betting market to have a much greater chance of winning than the away club. Since home-win probability can reflect multiple influences, it is not possible to draw a definitive conclusion from these estimates but the findings are not inconsistent with the strength of the visiting team being a major factor attracting customers to the stadium. On the other hand, similar results have been found in prior studies in sports attendance demand even where there has been a variable included to capture visitor strength. For example, Rascher (1999) was, so far as we know, the first to estimate a U-shaped relationship using betting odds data and found that expected attendance was at its minimum where a baseball team was nearly twice as likely to win as its opponent. More recently, for Major League Soccer, Sung and Mills (2018), estimated a quadratic in home-win probability (derived from betting odds) which bottomed out at a win-probability of about 0.44. Given the proportion of draws in their data, this value indicates a probability where the home club is a moderately strong favourite. As with our other control variables, there is therefore nothing in our estimates which is surprising in light of prior literature.

Table 2. Estimation results. Dependent variable is ln(attendance)

	France		Italy		Spain		England	
	coeff.	t stat.	coeff.	t stat.	coeff.	t stat.	coeff.	t stat.
home match significance (title)	0.264**	(2.05)	0.538***	(3.70)	0.181**	(2.39)		
away match significance (title)	0.278**	(2.25)	0.360***	(2.73)	0.159**	(2.30)		
home match significance (Champions League)	0.124*	(1.83)	0.216***	(2.77)	0.171***	(2.77)		
away match significance (Champions League)	-0.040	(-0.62)	0.122	(1.48)	0.150***	(2.81)		
home match significance (automatic promotion)							0.180***	(4.23)
away match significance (automatic promotion)							0.270***	(6.58)
home match significance (playoff)							0.192***	(6.28)
away match significance (playoff)							0.039	(1.36)
home match significance (relegation)	0.160***	(2.83)	-0.030	(-0.41)	0.390***	(10.77)	0.094**	(2.43)
away match significance (relegation)	-0.103**	(-1.98)	-0.098	(-1.35)	-0.034	(-0.96)	-0.101***	(-2.94)
home probability	-1.295***	(-8.82)	-1.187***	(-9.14)	-0.374***	(-3.51)	-0.328***	(-2.74)
home probability squared	0.880***	(5.24)	1.102***	(8.12)	0.312***	(2.91)	0.365***	(2.84)
Elo home	0.166***	(14.03)	0.068***	(6.96)	0.109***	(12.77)	0.126***	(22.51)
ln(distance)	-0.053***	(-7.10)	-0.010***	(-3.38)	-0.022***	(-5.79)	-0.062***	(-21.64)
rivalry	0.066***	(2.67)	0.143***	(5.97)	0.022	(0.86)	0.061***	(3.63)
weekday	-0.015	(-1.25)	-0.037***	(-3.26)	-0.071***	(-9.13)	-0.068***	(-15.76)
October	0.064***	(2.59)	0.032	(0.52)	-0.002	(-0.05)	0.010	(1.12)
November	0.008	(0.32)	0.019	(0.31)	-0.009	(-0.25)	0.010	(1.12)
December	0.026	(1.07)	0.014	(0.24)	-0.041	(-1.11)	0.053***	(5.93)
January	-0.001	(-0.02)	0.003	(0.04)	-0.042	(-1.15)	0.028***	(2.91)
February	0.023	(0.97)	-0.028	(-0.46)	-0.018	(-0.50)	0.030***	(3.27)
March	0.074***	(2.99)	0.024	(0.39)	-0.012	(-0.32)	0.048***	(5.15)
April	0.110***	(4.56)	0.074	(1.22)	-0.008	(-0.21)	0.102***	(11.09)
May/June	0.174***	(7.01)	0.087	(1.42)	-0.009	(-0.25)	0.188***	(11.88)
season end 2012	0.081***	(3.80)	-0.048**	(-2.28)	-0.038***	(-2.59)	-0.029***	(-2.88)
season end 2013	0.113***	(5.15)	-0.065***	(-3.06)	-0.039**	(-2.58)	-0.022**	(-2.18)
season end 2014	0.259***	(10.99)	-0.038*	(-1.80)	-0.099***	(-6.41)	-0.035***	(-3.41)
season end 2015	0.190***	(8.45)	-0.073***	(-3.49)	-0.074***	(-4.73)	0.009	(0.89)
season end 2016	0.215***	(9.18)	-0.076***	(-3.52)	-0.082***	(-5.22)	0.011	(1.10)
season end 2017	0.181***	(8.16)	-0.060***	(-2.79)	-0.037**	(-2.43)	0.071***	(6.81)
season end 2018	0.248***	(10.40)	0.012	(0.57)	-0.019	(-1.24)	0.079***	(7.77)
season end 2019	0.290***	(12.02)	0.070***	(3.27)	0.025	(1.61)	0.082***	(8.02)
season end 2020	0.294***	(11.24)	0.177***	(7.31)	0.080***	(4.65)	0.061***	(5.50)
season end 2023	0.281***	(12.39)	0.193***	(8.45)	0.130***	(8.45)	0.084***	(8.11)
AC Milan is away team			0.228***	(10.94)				
Inter Milan is away team			0.197***	(9.31)				
Juventus is away team			0.272***	(11.75)				
Barcelona is away team					0.174***	(8.09)		
Real Madrid is away team					0.172***	(8.77)		
constant	7.583***	(37.18)	9.053***	(52.93)	8.342***	(55.36)	8.159***	(98.52)
number of observations	3,142		3,354		3,378		5,147	
adjusted r-sq	0.804		0.823		0.925		0.853	
r-sq (within)	0.219		0.316		0.286		0.346	
r-sq (between)	0.363		0.271		0.449		0.463	
r-sq (overall)	0.270		0.277		0.399		0.256	

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

The pattern of coefficient estimates on the season dummies reveals something about underlying trends in attendance in the respective countries. In all cases, the final two years saw higher interest in attending than early in our data period, with a particularly strong performance in 2022-2023, which was the first full season after covid when restrictions were no longer in place. On the other hand, there appear to be important differences between countries in apparent trend, with an uplift in attendances emerging earlier in France than elsewhere.

Results on the full set of control variables may be regarded as entirely consistent with prior literature. We turn now to our focus variables, those relating to match significance.

Regarding the significance of a match for the home club to win a positive or negative prize (the title/ champions League qualification/relegation; in England automatic promotion/qualification for the playoffs/relegation), the relevant coefficient estimate is always positive and statistically significant with just one exception: the importance of a match for possible home club relegation does not appear to influence attendance in Italy. That ten of twelve coefficient estimates are positive and statistically significant at the 5% level (and an eleventh at 10%) appears to present strong support for the hypothesis that stadium attendance will be greater the more a match matters for the home club.

Stadium attendance also responds to the significance of a match for the visiting club's chances of winning the first prize in the competition (champion/automatic promotion to the Premier League in England). However, elevated interest when the match is important to the visiting club for the secondary prize level (Champions League/playoff qualification) is observed only for Spain. Relegation significance for the away club fails to boost attendance anywhere and indeed appears to depress expected attendance in two cases. Regarding the latter, we are unable to observe attendance separately for home and away supporters but it is plausible that this result reflects that relegation-threatened clubs are disproportionately likely to have low market size and therefore bring few travelling fans.

Estimated effect sizes are generally modest. In Italy, a match the result of which would shift the home club's probability of winning the League by ten percentage points would have expected attendance elevated by 5.4% relative to a match where the home club was no longer in contention for this prize. In England, a similar situation where it was play-off qualification (and possible promotion to the Premier League) that was at stake would see expected attendance increase by only 1.9%. In interpreting, the results, it should be borne in mind that it will typically be the case that there will be more clubs in contention for the secondary prizes (Champions League/play-off qualification) and hence a greater number of 'significant' matches than for the first prize. Further, particularly crucial matches at the very end of the season, where the shift in probability between winning and losing was more substantial, would be predicted to have much higher attendance elevation than these illustrative examples would suggest. In any case, the figures are likely to be under-estimates of the effects of prizes on league aggregate attendance since media coverage of the sport will often focus on prospects for end-of-season prizes and this may keep interest in the league's matches high even for matches with no immediate 'significance'.

Results for the English league merit additional commentary because it has a different set of end-of-season prizes on offer compared with the other three because the other three are top-tier with

Champions League places to compete for. The English second-tier in a sense provides alternative prizes to Champions League places in the form of play-offs where clubs finishing between third and sixth place in the final standings have the opportunity to compete with each other for the final promotion place and therefore membership of the prestigious and highly lucrative Premier League. In fact, such is the escalation of revenue associated with moving up to the Premier League that the final playoff match was described by CNN as "the most valuable single football match in the world" (Morse, 2024). In any event, results point to a keen interest by home fans in attending matches relevant to securing a play-off place as well as elevated interest in matches important for settling the first two places in the division. This may reflect that supporters place great value on the team playing in the Premier League given the higher quality of players who would become affordable with enhanced revenue and the glamour associated with hosting matches against some of the 'biggest' clubs in world football. Instituting the play-offs was a departure from reliance on the traditional European model of awarding prizes on the basis of sporting merit (as demonstrated in the final standings) but appears to have been successful in stimulating interest and demand.

5. Reflections

Modelling audience demand, whether on television or at the stadium, has been a strong theme in the economics and operational research literature on sport. Typically, papers in this literature fail to feature match significance as a predictor variable or else employ an ad hoc measure which fails to achieve significant explanatory power. Sport analytics now has the potential to provide alternative metrics to capture match significance. Use of one such metric by Buraimo et al. (2022) demonstrated for the case of the English Premier League that the size of television audience responds positively to the importance of the match for determining end-of-season outcomes, whether the championship, Champions League qualification or relegation. Many in the television audience will be uncommitted to either club in a fixture and may need the extra spice of match significance to draw them to watch. If stadium attendees are mainly committed supporters of a team involved in a fixture, this result would not necessarily carry over to stadium attendance. It could be that fan decisions are less sensitive to match significance. But, we have modelled attendance as a function of match significance and are able to confirm that, on the margin, it indeed matters to prospective attendees how important a fixture is in the context of the whole competition. We have confirmed this for four different football leagues.

For researchers, the finding has two implications. First, failing to account for match significance in model specification runs the risk that coefficient estimates on other variables of interest will be subject to omitted variable bias. Second, ad hoc measures around match characteristics may fail to reveal relationships which become evident when metrics suggested by sport analytics are employed.

For the sports industry, the results validate the approach of creating a greater number of more significant matches by operating with more prize points, as in the introduction of play-offs for the final promotion place in the English Championship. In a sense, the introduction of a number of prize points reduces the need to redistribute revenue to promote competitive balance because interest can then be maintained at clubs where market size is insufficient to allow them to compete for just a top prize. Naturally, there is a need to seek to optimise the number of prizes since, for example, if the idea were pushed to the point where all clubs qualified for the promotion play-offs, a large number of matches would be rendered non-significant. The results also support the idea of investigating alternative ways of generating more significant matches. For example, Devriesere, Csató and Goossens (2024) consider whether part of the schedule of matches should be released during rather than before the beginning of the season, so that latest information on team strength and match results

could be used to produce an ordering for remaining matches to maximise suspense around which club would achieve an end-of-season prize, though the task would of course be complex. Finally, the results here confirm that interest increases as a result of matches taking place within a competition rather than their being one-off games and this is consistent with both historic and contemporary decisions to offer the public sports events within a league structure.

No specific funding was obtained for this research.

The authors report there are no competing interests to declare.

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