IWH
Halle Institute for Economic Research
Member of the Leibniz Association

Discussion Papers

No. 10
May 2018

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IWH Discussion Papers are indexed in RePEc-EconPapers and in ECONIS.

Editor

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ISSN 2194-2188

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Abstract

We use the locational pattern of clubs in four major professional football leagues in Europe to test the causal effect of changes in premier league membership on regional employment and output growth at the NUTS 3 level. We rely on the relegation mode of the classical round-robin tournament in the European model of sport to develop a regression-discontinuity design. The results indicate small and significant negative short-term effects on regional employment and output in the sports-related economic sector when clubs are relegated from the premier division of the respective football league. In addition, we find small negative effects on overall regional employment growth. However, total regional gross value added remains unaffected, indicating that in the main it is the less productive jobs that disappear in the short-term.

Highlights

- We analyse the regional effects of events where premier league clubs have to relegate from four major professional football leagues in Europe.
- The analysis is based on regionally and sectorally disaggregated data at the European NUTS 3 level in the period 1995 to 2012.
- A regression-discontinuity design is employed to estimate causal effects of these.
- We find negative short-run effects of relegations on sectoral employment and output and small negative effects on overall regional employment growth.

Keywords: professional football, relegation, regional growth, regression discontinuity design

JEL classification: J40, R11, R12

1 Introduction

Small things can make a big difference. On May 29th, 1999 at 5:15 pm (89th minute of regular game time), Norwegian striker Jan-Åge Fjørtoft scored the final goal for his football club Eintracht Frankfurt in a 5–1 win in the last regular season game against the 1. FC Kaiserslautern. At 5:17 pm, Czech defender Marek Nikl missed the last chance to tie the game in stoppage time, hitting the post with a shot from around 30 meters in a 1–2 loss to his club 1. FC Nurnberg against SC Freiburg. As a result, when the referee blew the final whistle at 5:18 pm, Frankfurt finished the Bundesliga season ranked 15, with 37 points and a difference in goals made and received of -10. Similarly, Nurnberg collected 37 points with a difference in goals of about -10. The key difference in outcomes between the two teams was in goals made during the season. Frankfurt scored 44 times while Nurnberg only managed 40 goals. These four extra goals allowed Frankfurt to stay in the German football premier league, to face Bayern Munich or Borussia Dortmund. Nurnberg was ranked 16th and relegated to the 2nd division, playing against SSV Reutlingen 05 and Chemnitzer FC in the remainder of the season. Thus, if Fjørtoft had not scored or if Nikl had made a better shot, the final league table would have changed in favour of Nurnberg, and Frankfurt would have been relegated.

This uncertainty in outcome is exactly what creates the drama and excitement of modern sports contests across Europe (Neale 1964). For clubs, the outcome of a whole season can change within seconds although they have achieved almost identical results in a competition over several months. The drama is further increased by the nature of parallel contests on the final game days of each season. In the presence of a system of relegation and promotion, some clubs may have imprecise control over their next season league membership even to the point of the final game of the season. The same holds true for the consumers of these sports events and the economic actors surrounding the respective clubs. If we assume that relegation from the premier league is associated with an adjustment in the quality of the contest (Szymanski and Valletti 2005), and that consumers of sports events are characterised by preferences for extraordinary talent (Rosen 1981, MacDonald 1988), relegations bring about economic shocks that affect everything from labour market consequences for individual players to a drop in income at club level, to reduced economic opportunities for regional actors in football-related sectors. The regional dimension is a factor mainly because fan interest has a distinctive spatial dimension (Borland and MacDonald 2003).

This paper tests the last part of this assumption. It focuses on the empirical identification of regional effects of the relegation of a professional sporting club from the premier league in four countries across Europe. The set of regions under analysis comprises those with clubs in the British Premier League, the German Bundesliga, the Italian Serie A and the French Ligue 1 in the period 1995 to 2010. In the first step, we demonstrate that relegation contributes to significant adjustment in demand for live attendance at club level. This result is in line with earlier findings such as Simmons (1996), who presents time-series evidence that relegation has important short-term effects on demand for live attendance in the UK. In a second step, we test whether relegation also affects regional economic outcomes. Clubs may draw outside visitors to a city. These are assumed to be the primary driver of the regional

economic impact in this case (Coates and Humphries 2001). In order to estimate the causal effect of relegation on regional economic outcomes, we make use of the particular characteristics of the system of relegation and promotion in the European model of sport. The presence of a smooth forcing variable (the points a club has achieved during the season), an arbitrarily defined cut-off (the ranks dedicated to relegation in the league) and the imprecise control clubs have on the cut-off value (the points necessary to reach a non-relegation rank in the final league table) allows the development of a regression-discontinuity design to identify the causal effects of relegation.

The empirical analysis compares the post-relegation performance of regions with clubs close to the relegation ranks. This approach extends the existing literature on the regional impact of large sporting events by adopting a new perspective. The identification strategy abstracts from the use of the presence, arrival or departure of professional sports franchises as a source of identification in studies on the regional economic impact of US sports franchises (Baade and Sanderson 1997, Coates and Humphries 1999, 2003). Instead, we focus on the effects of changes in premier league membership on regional development in Europe. A close relegation decision in a league produces a quasi-experimental variation in the spatial pattern of major sports events. The results reveal that relegation results in significant, negative short-term effects on employment and gross value added (GVA) growth in football-related economic sectors in the affected NUTS 3 regions. In contrast to existing studies on large sporting events, we also find a small negative effect on total regional employment growth. Total regional GVA growth, however, remains unaffected by relegation, implying that it is mostly unproductive jobs that disappear in the short-term.

The remainder of the paper is organised as follows: section 2 discusses the research on regional effects of large sporting events and describes the particularities of the system of relegation and promotion in European sports' leagues. Section 3 presents the identification strategy and the data used to perform the analysis. Section 4 presents the main findings and offers some robustness analysis. The last section concludes the paper.

2 The economic significance of professional sport events

European professional football has become big business in the last decades. Only recently, the British Premier League sold its television rights for the three seasons from 2016 onwards for a record £5.136bn. Television rights for four seasons in the German Bundesliga, starting in 2017, totalled €4.64bn. Live attendance figures also reveal the intense interest in football across the continent. A total of 13.851.829 people attended regular league games in the Premier League during the season 2015/2016. The German Bundesliga attracted 12.980.815 visitors over the same period (DFL 2017). Given these (and other) sources of income, today's premier league football clubs in top European Leagues could be described as medium to large enterprises with increasing relevance for regional development (Deloitte 2016). If these firms are hit by idiosyncratic firm-level shocks such as a relegation, these situation might provide a case where micro-level shocks translate into aggregate regional economic

movements, especially when clubs with a large fan base with a distinctive spatial dimension are concerned.[1]

The growing economic significance of professional sports has indeed contributed to the widespread public belief that clubs have a significant impact on their host regions. The direction, size and even the presence of such effects, however, has been the subject of intense scientific debate (Coates 2015). Ex-ante studies on the economic impact of major sports events tend to present overly optimistic claims for regional or even national outcomes (see Baade and Matheson 2016 and Maenning 2017 for recent illustrative examples). In contrast, early scientific papers on professional sports franchises in the US argued for more cautious expectations with regard to the general regional relevance of professional sport (Baade and Dye 1988, 1990). Studies such as Baade and Sanderson (1997) did not find increases in economic activities in US cities that saw newly constructed stadiums or that had acquired additional professional sports teams in the period 1958 to 1993. Studies such as Coates and Humphries (1999) in fact found consistent negative effects from the presence of professional sporting franchises belonging to the NFL, MLB or NBA on individual incomes in those regions. Coates and Humphreys (2001) presented one the first studies that estimated the causal effects of professional sports franchises on the level of income per capita in US urban areas. Using strikes/lockouts as an example of unexpected, infrequent events that contribute to situations where there are no sporting events to draw outside visitors to a city, they showed that real income per capita in metropolitan areas did not fall during these events.[2]

The key economic rationale behind these findings is the argument of substitution. The majority of consumers is characterised by a fixed budget for leisure (sport) activities. While the presence of sports events may cause individuals to rearrange their spending, they are not likely to add much to it (Siegfried and Zimbalist 2000). Consequently, the literature on the economic effects of sports events is in agreement that if there are positive effects from professional sports, they are likely to be temporally, and sectorally as well as geographically bounded. Using a sample of 37 US cities over the period 1969 to 1997, Coates and Humphreys (2003) demonstrate that professional team sport has a positive effect on earnings per employee in the Amusement and Recreation sector, but that this effect is offset by a decrease in earnings and employment in other sectors. Baade et al. (2011) analysed 25 years (1979 to 2007) of monthly sales tax data for every county in Florida in the US to show that the games of American college football teams yielded modest gains of about US$ 2 million in taxable sales in host cities while men's basketball games did not.[3]

While research has produced consistent results, it becomes apparent from this discussion that the literature on the regional effects of large *regular* sporting events relies mainly on

[1] See Gabaix (2011) for the more general "granular" hypothesis.

[2] Studies that have claimed to provide support for positive effects of the presence of professional sports teams on regional outcomes (Carlino and Coulsen 2004) have been criticized for results that are not robust to outliers or alternative specifications (Coates et al. 2006).

[3] Feddersen and Maenning (2012) use mega-events such as the FIFA World Cup in 2006 to confirm the presence of small positive short-term effects on certain sectors in the host regions. The same applies to the Olympic Games. Feddersen and Maenning (2013) demonstrate that the effect of the Atlanta Olympic Games in 1996 was sectorally and regionally bounded with no long-term effects for the host region.

results from major US leagues. However, there remain fundamental differences between the European and the US model of professional sport that may limit the transferability of results to the European context. The US sporting model is characterised by a closed contest which does not allow for year-by-year changes in league membership. Hence, empirical identification of the effects of sporting franchises or stadia on regional outcomes relies mainly on the arrival, departure or presence of teams (from NFL, NBA, MLB, NHL, MLS, NCAA) in the respective regions, or on natural experiments such as lockouts or strikes (Coates and Humphreys 2001). The pyramid structure of most European professional sporting leagues, however, creates interdependence between leagues from different levels. In Europe, all teams in a certain discipline belong to a governing body that supervises a strictly defined hierarchy of divisional competitions (Szymanski and Valletti 2005). At all levels, a pre-defined number of the lowest performing teams in any given division are relegated at the end of the season to the immediate minor league. In an effort to ensure consistency in league size, the relegated clubs are replaced by an equivalent number of top performing teams from the respective minor league. This hierarchy connects the lowest levels of amateur competition to the highest levels of national or even international competition (Szymanski and Valletti 2005). The disadvantage of this model is that some clubs – as stated in the introduction – are relegated to minor leagues if they fail to achieve the results necessary to qualify for the next season (European Commission 1998).

One apparent feature of the pyramid structure of European professional sporting leagues is the distinct difference in economic significance between the premier and minor leagues. Figures for club-level demand for live attendance in selected premier and secondary football leagues may well reflect this fact. During the season 2015/2016, 36.461 spectators on average attended games in the British Premier League. The German Bundesliga surpassed these numbers with a mean attendance of 43.300 visitors per Bundesliga game. French Ligue 1 and Italian Serie A showed somewhat lower figures with, on average, 20.896 and 22.162 spectators respectively. However, a unifying feature of these leagues is that mean attendance in the same years' immediate minor league is always more than 50 percent lower (see table 1).

Table 1: Differences in live attendance between the first two professional football leagues in selected countries of Europe in 2016

Average live attendance at home games in	European Professional Football Leagues in 2016			
	UK	Germany	Italy	France
Premier League	36.461	43.300	22.162	20.896
Secondary League	17.578	19.165	7.161	7.118
Difference in %	-51.8	-55.7	-67.7	-65.9

Source: Authors own illustration.
Notes: Attendance data was taken from European Football Statistics. Mean attendance per game is calculated in thousands.

This simple mean comparison highlights the point that relegation from the premier league forces regular (yearly) changes in the spatial pattern of major sporting events across Europe, and that these relegations bring with them a loss of (football-related) economic activity in the region. In total (over a whole season), relegations may produce regional shocks to the football-related economy, or even to the region as a whole, that are comparable to the occurrence of large sporting events such as in the hosting the FIFA World Cup or the UEFA European Football Championship. Our main task is now to provide causal evidence for the presence and extent of the effect of the relegation of a premier league football club on short-term regional development, both from a sectoral and an overall regional perspective.

3 Empirical approach

3.1 Identification strategy

Many professional sports leagues in Europe apply the system of relegation and promotion. We focus our analysis on relegations from four major professional football leagues in Europe, the British Premier League, German Bundesliga, Italian Serie A and French Ligue 1, over the period of 1995 to 2010. All these leagues applied the system of relegation and promotion during this period.[4]

The majority of existing studies on the regional effects of professional sports franchises rely on panel estimations with fixed effects and some higher-level regional trends to perform the analysis. This study, however, develops a regression discontinuity (RD) design to deal with endogeneity concerns related to the relegation of a club (e.g. the regional performance may translate into club performance) and to limit the bias of pre-relegation anticipation effects on economic actors. These effects may result from cases were relegations are a result of the poor long-term performance of clubs during a season (see for example the performance of AC Arles-Avignon in the season 2010/2011, AFC Sunderland and West Bromwich Albion in 2002/2003, Derby County in 2007/2008 and FBC Unione Venezia in 2001/2002).

The RD design is a widely used research approach in empirical work (see Hahn et al. 2001, Lee 2008, Lee and Lemieux 2010). In this design, units receive a treatment on the basis of whether the value of an observed covariate is above or below a certain cut-off (Hausman and Rapson 2017). In this paper, the relegation of a premier league football club represents the treatment of interest. Hence, a region is treated if a club in the region has been relegated in a given season to an immediately lower league. The treatment assignment

[4] However, there remain some differences across leagues with respect to the number of ranks dedicated to relegations and the size of the league, which we will explain briefly. In the British Premier League the three lowest ranked teams were relegated to the Football League Championship, while promotion to the Premier League involved a mixture of fixed places and a series of play-offs. In our sample period, the Premier League applied a 20-team format. The French Ligue 1 has followed a similar format in recent years. Ligue 1 is characterised by a 20-team format with the three lowest ranked teams being forced to relegate to Ligue 2. However, there were some changes in league size in the period 1997–2002. Here, only 18 teams were active in Ligue 1. The Italian Serie A also experienced some changes in league structure over time. Since the 2004/2005 season, the league has consisted of 20 teams (as opposed to the previous 18). Similar to the leagues discussed above, the clubs in the last three places were relegated to the Serie B. The German Bundesliga also forced the three lowest ranked teams in the final league table to be relegated to the 2nd Bundesliga until the season 2007/2008. After this, the formal regulation was changed in favour of a play-off scheme between the 3rd ranked team of the 2nd Bundesliga and the 16th ranked team of the 1st Bundesliga. Contrary to the Premier League, Ligue 1 and the Serie A, the Bundesliga had an 18-team format over the whole sample period.

occurs as a result of the proximity of the treatment assignment variable *X* to a threshold *c*. In our case, *X* is the difference in points to the first non-relegation rank in the final league table of the respective league and season. This procedure sets the threshold *c* to zero. That is, if the difference in the number of points to the first non-relegation rank $X >= 0$, the region is not treated, and if $X < 0$, the region faces the relegation of a premier league football club. Table 1 illustrates this example with the help of the final league table of the British Premier League in the season 1996/1997.

Table 2: Final league table and transformation procedure for the Premier League in the season 1996/1997

Rank	Club	NUTS 3 code	Games	Points – Final Table	Difference in Points to First Non-Relegation Rank (*X*)	Treat-ment Status	Fixed Rele-gation Ranks	Outcome
1	Manchester United	UKD31	38	75	34	0	0	Change of the regional outcomes between 1996 and 1998 / Change of the club level outcomes between season 1996/97 and 1997/98
2	Newcastle United	UKD72	38	68	27	0	0	
3	FC Arsenal	UKC22	38	68	27	0	0	
4	FC Liverpool	UKI43	38	68	27	0	0	
5	Aston Villa	UKG31	38	61	20	0	0	
6	FC Chelsea	UKI33	38	59	18	0	0	
7	Sheffield Wednesday	UKE32	38	57	16	0	0	
8	FC Wimbledon	UKI63	38	56	15	0	0	
9	Leicester City	UKF21	38	47	6	0	0	
10	Tottenham Hotspur	UKE42	38	46	5	0	0	
11	Leeds United	UKF11	38	46	5	0	0	
12	Derby County	UKI43	38	46	5	0	0	
13	Blackburn Rovers	UKD41	38	42	1	0	0	
14	West Ham United	UKI41	38	42	1	0	0	
15	FC Everton	UKD72	38	42	1	0	0	
16	FC Southampton	UKJ11	38	41	0	0	0	
17	Coventry City	UKG33	38	41	0	0	0	
18	AFC Sunderland	UKC23	38	40	-1	1	1	
19	FC Middlesbrough	UKC12	38	39	-2	1	1	
20	Nottingham Forest	UKF14	38	34	-7	1	1	

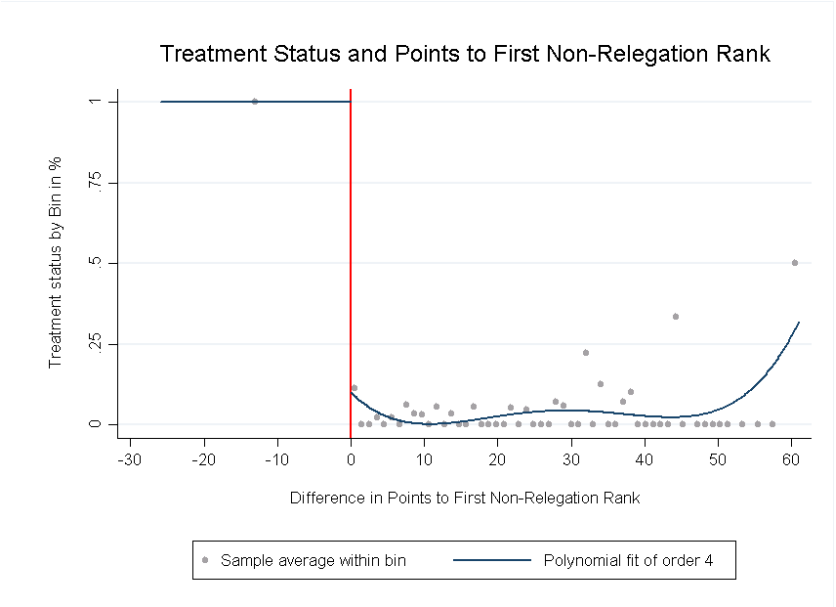
Source: Authors own illustration. Data are taken from http://www.european-football-statistics.co.uk/.

In the absence of clubs finishing the season with a similar number of points, we would apply a sharp RD design, comparing the changes in regional development outcomes of regions with clubs close to the relegation ranks in the four leagues under analysis. However, the presence of clubs with the same number points in the final league table and the small share of regions with more than one club playing in the premier league of the respective country makes our approach a fuzzy RD design. Figure 1 illustrates the relationship between the assignment variable and the treatment. In the fuzzy RD design, the officially fixed relegation ranks in each league (cf. footnote 3) are used to specify the treatment status variable. The procedure allows for the estimation of the treatment effect via the pooled cross-sectional comparison of the regional performance after the relegation of regions just above and just

below the threshold (see also Coates and Humphreys 2003 for a discussion on appropriate control groups).

Identification of causal effects in an RD design relies furthermore on the continuity assumption. In this case, it requires that regions with clubs just below and just above the relegation ranks have the same potential outcome in the case of relegation. Although this is not directly testable, Lee (2008) demonstrates that if a treatment depends on whether an assignment variable exceeds a known threshold and agents cannot control the forcing variable precisely, the continuity assumption is satisfied since the variation in treatment around the cut-off is randomized.

Figure 1: Relegation status by Bins of size one



Source: Authors own illustration.
Notes: The figure shows the average treatment rates in equally sized bins of 1 point. The vertical red line represents the difference to the first non-relegation rank.

This lack of control is a reality and precisely what makes the drama of close relegation decisions in football contests. The nature and uncertainty of outcomes, right up until the final game days in the Premier League, the Bundesliga, Serie A and Ligue 1 ensures that clubs close to the relegation ranks have imprecise control over the difference in points between the relegation and non-relegation ranks. This is because the difference can change even until the final whistle on the final game day. For this reason, we assume relegation to be exogenous for clubs close to the relegation ranks and hence that it produces exogenous shocks to the regions of the relegated clubs. Nevertheless, the randomization assumption implies that we can test whether relegated and non-relegated regions and those clubs close to the relegation or promotion ranks are similar. This similarity between the two groups of clubs is the result of the randomization (Lee 2008). This test will be part of section 3.3 in this paper.

Given the exogeneity of relegation ranks and the non-deterministic relationship between relegation ranks and treatment, we estimate the treatment effect within a fuzzy RD design. We make use of a robust data-driven inference procedure for the estimation, using local

polynomial regressions, as suggested in recent econometrics literature (see Calonico et al. 2014, Calonico et al. 2015, Cattaneo et al. 2017, Cattaneo and Escanciano 2017).

3.2 Outcomes and Data

The club represents our first level analysis. Most fans express allegiance to a specific club. Live attendance is largely an expression of support for that club (Simmons 1996). If relegation does not affect live attendance figures at home games, regional effects become unlikely because visitors to a region are seen as the primary driver of economic impact in recent empirical studies (Coates and Humphreys 2001). With regard to club-level outcomes, we apply the mean figure of total live attendance during the season. However, our primary focus is on more aggregated regional effects. Here, we focus on two different outcomes on two scales. The first regional outcomes involve employment and GVA development in football-related sectors in the NUTS3 region in which the clubs are located. We consider the Wholesale, Retail, Transport, Accommodation & Food Services, Information and Communication sector to have the closest links to football-related activities (see also Coates and Humphreys 1999, 2003). The second regional outcome addresses effects at the overall regional level. As outcome indicators, we use the growth of employment and GVA in the time t-1 to t+1 of relegation. This procedure results mainly from the fact that the only available data is calendar year data, which does not match football season data. Subsequently, if a club is relegated at the end of season 2010/2011, the outcomes under analysis reflect the growth of employment or gross value added in the period 2010 to 2012. In the analysis, we pool all observations from the final league tables of the respective leagues over time.

The analysis relies on data from various sources. Firstly, attendance and final league tables have been taken from the publicly available website http://www.european-football-statistics.co.uk/. This website provides rich information on country-level league tables and league formats as well as attendance statistics for 51 countries, 166 leagues, 2.558 clubs and 44.020 games. The attendance data is combined with regional information from the clubs' NUTS3 region. The regional data is provided by the European Regional Database of Cambridge Econometrics. This database offers a wide-ranging, sub-national (up to NUTS3), pan-EU database of economic indicators. It allows us to access a complete and consistent, historical time series of data for our period of analysis of 1995–2012. In this way, the regional (NUTS3) and sectoral disaggregation represents the most detailed information available for European regions. We merge both datasets by the location (NUTS3 code) of the stadiums belonging to the clubs under analysis.[5]

The database allows us to work with information from the seasons 1995/1996 to 2010/2011. We chose to start in 1995 for reasons of German reunification: in line with the reunification of the two parts of the country, there was a unification of the two formerly independent football leagues. The presence of former GDR Oberliga clubs contributed to the introduction

[5] Standard Eurostat or OECD regional level data do not allow for such a finely grained analysis. Most information here is only available at the NUTS2 level. We also considered Spain in a first step of the analysis. However, Spain only has 59 NUTS3 regions. France (101), Italy (107), the UK (174) and Germany (402) are characterised by more precise spatial information on regional employment and gross value added. This is why Spain was not included in the analysis.

of an integration scheme between the two leagues, starting in the season 1991/1992 and ending in 1993/1994. In the following season of 1995/1996, the German football league introduced the three-point rule; this meant that from that season onwards clubs would receive three instead of two points per win. Hence, by conducting our analysis from the 1995/1996 season, we were able to work with a consistent application of the three-point rule across all leagues under analysis and to avoid endogeneity issues related to the presence of former GDR Oberliga clubs in the German Bundesliga.

We analysed a total of 16 seasons in four leagues, leading to 1202 observations and including 218 regions affected by relegations. As stated above, we pooled the data for all seasons. In the observation period, a total number of 151 clubs from 128 NUTS3 regions participated in the premier division of the four leagues.[6] Of these 128 NUTS3 regions, 23 (18.0 percent) had never seen clubs relegated to the second division in the period of analysis. Forty-three NUTS3 regions (36.7 percent) experienced this event once, 36 NUTS3 regions twice (28.9 percent), 12 regions three times (11.7 percent) and 14 regions (6.3 percent) more than three times.

Table 3: Sample properties of pre-relegation characteristics

	Regions with relegated teams			Regions with non-relegated teams		
	N	Mean	Std. Dev.	N	Mean	Std. Dev.
Attendance (club-level)	216	22.009	11.490	999	29.956	15.456
Population (NUTS3 region)	218	884.1	609.9	984	1156.4	955.1
Active Population (NUTS 3 region)	218	416.0	287.8	984	553.6	466.1
Regional Sectoral Employment (NUTS 3 region)	218	119.4	89.5	984	164.0	149.2
Total Regional Employment (NUTS 3 region)	218	405.1	282.0	984	561.7	501.2
Regional Sectoral GVA (NUTS 3 region)	218	6268	5459	984	9782	10501
Total Regional GVA (NUTS 3 region)	218	24241	19588	984	37550	38893

Source: Authors own illustration.
Notes: Attendance data was taken from European Football Statistics. Regional data stem from the Cambridge Econometrics database. Mean attendance per game, population (overall and active) and employment in football related sectors is calculated in thousands. GVA in football related sectors as calculated in millions of Euro. N may vary for selected indicators due to data availability. Two-group mean-comparison test (not reported) show that the differences between regions with relegated teams and regions with non-relegated teams reported in in table 3 are statistically significant.

Table 3 presents pre-treatment differences in means between regions with relegated and non-relegated clubs for selected variables.[7] Table 3 also contains information on pre-relegation differences in mean attendance at home games in the season of relegation as a club-level outcome. The mean comparison between both groups shows that relegated teams

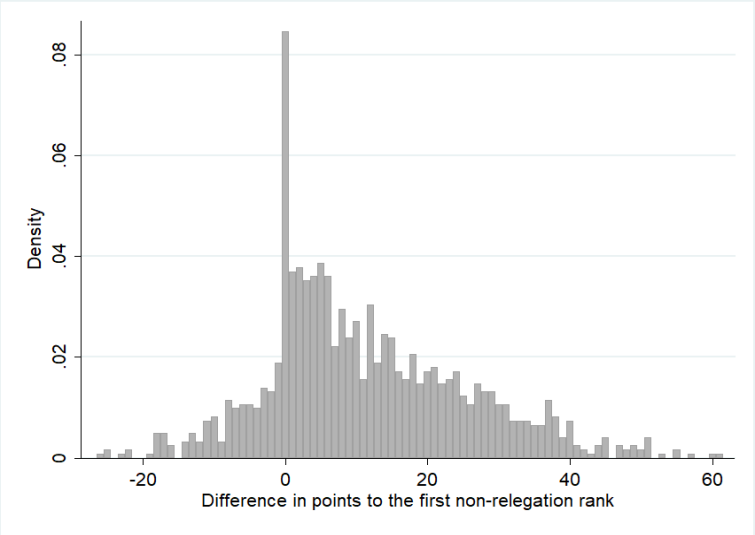
[6] Of these 151 clubs, 42 (27.8 percent) never experienced a relegation during this period. Fifty clubs (33.1 percent) experienced relegation once, 37 clubs twice (24.5 percent), 15 clubs three times (9.9 percent) and seven clubs more than three times (4.6 percent).
[7] Regions appear more than once in each group. The sample properties are calculated for the pooled version of the data.

perform worse in attracting attendance to the stadium. The simple difference in means is about 7.947 fewer spectators per home game in the season of relegation.

The regional characteristics (calculated for the year in which the season started) also differ across the two groups. For the overall regional size (population and active population), regions with non-relegated teams are significantly larger, indicating the presence of greater market potential. The same holds true for the sectors that are related to football activities, such as the Wholesale, Transport, Accommodation and Food Services sectors. Here, regions with non-relegated teams display significantly larger mean values. These differences clearly point towards differences in regional economic potential as a source of endogeneity bias in simple panel frameworks between clubs and regions with and without relegations. Furthermore, it highlights the need to search for a control group of regions that are (un-) affected by relegations. This endogeneity concern is addressed by the RD design.

In addition, figure 2 displays the density distribution of the sample by differences in points between the first non-relegation rank. The density distribution is obviously lower on the left-hand side of the cut-off because of the smaller number of relegated teams than non-relegated teams. The highest density values in cases of relegation are given for a zero difference in points to the first definite relegation rank. However, overall, 278 observations (23.1 percent) can be found in the range of -3 to +3 points around the first non-relegation ranks in all four leagues in the sample period. Given this fact, many regions are indeed threatened by the relegation of their club until the final game day of the season.

Figure 2: Density distribution by difference in points to the first non-relegation rank



Source: Authors own illustration.

3.3 The randomization assumption of the RD design

The randomization assumption in RD designs implies that we can test whether regions with hosting clubs close to the relegation ranks are a more appropriate control group and more similar in various dimensions related to the outcomes of interest. While table 3 indicates significant differences in the sample properties of regions when considering all observations for regions with relegated and non-relegated clubs, table 4 highlights that these differences

become insignificant around the cut-off. Seven different indicators are used to illustrate this. The results in table 4 are estimated using local polynomial and partitioning methods as proposed by Calonico et al. (2014a, 2014b, 2015). While table 2 indicates substantial differences between the overall groups of regions with and without relegated clubs, these differences become insignificant for regions close to the cut-off.

Table 4: Testing for regional differences around the cut-off before treatment

Differences in outcomes in the year before relegation	Attendance	Population / Size of region I	Active Population / Size of region II	Regional Sectoral Employ-ment	Total Regional Employ-ment	Regional Sectoral GVA	Total Regional GVA
Relegation	-1.461	87.778	24.737	-1.065	-8.231	-409.960	-2257.900
	(3.293)	(172.610)	(65.097)	(17.677)	(54.292)	(1094.700)	(3999.100)
N	1215	1202	1202	1202	1202	1202	1202
BW type	Mserd	Mserd	Mserd	Mserd	Mserd	Mserd	Mserd
Kernel	Triangular	Triangular	Triangular	Triangular	Triangular	Triangular	Triangular
Number of obs (l|r)	178|1037	180|1022	180|1022	180|1022	180|1022	180|1022	180|1022
Eff. Number of obs (l|r)	84|332	95|374	95|374	95|374	107|374	107|374	95|374
Order loc. poly. (p) (l|r)	1|1	1|1	1|1	1|1	1|1	1|1	1|1
Order bias (q) (l|r)	2|2	2|2	2|2	2|2	2|2	2|2	2|2
BW loc. poly. (h) (l|r)	5.8|5.8	6.1|6.1	6.7|6.7	6.6|6.6	7.8|7.8	7.1|7.1	6.6|6.6
BW bias (b) (l|r)	10.7|10.7	11.0|11.0	11.5|11.5	11.5|11.5	14.5|14.5	12.4|12.4	11.7|11.7
rho (h/b) (l|r)	0.5|0.5	0.6|0.6	0.6|0.6	0.6|0.6	0.5|0.5	0.6|0.6	0.6|0.6

Notes: Standard errors in parentheses, * p<0.1, ** p<0.05, *** p<0.01.
Source: Authors own calculation.

The tests for differences at the club and regional level consider the pre-relegation differences in club-level mean attendance at home games in the season of the relegation as in table 2. Hence, we test whether clubs around the cut-off differ with respect to attractiveness to fans in terms of live attendance during the season of relegation. We also test for differences in regional characteristics such as market size by using total population, total active population, total regional employment and total regional gross value. Furthermore, we consider the attractiveness of the sports-related economic sectors of the regions by testing for differences in the absolute size of these sectors in terms of gross value added and employment, the base for the growth rates analysed in this paper. In all these cases, we do not find significant differences between the characteristics of regions and clubs (attendance) around the cut-off. This implies that NUTS3 regions hosting a football club that is playing against relegation in one of the premier divisions in a particular European football league under analysis are indeed an appropriate control group with regard to all the dimensions analysed in table 4.

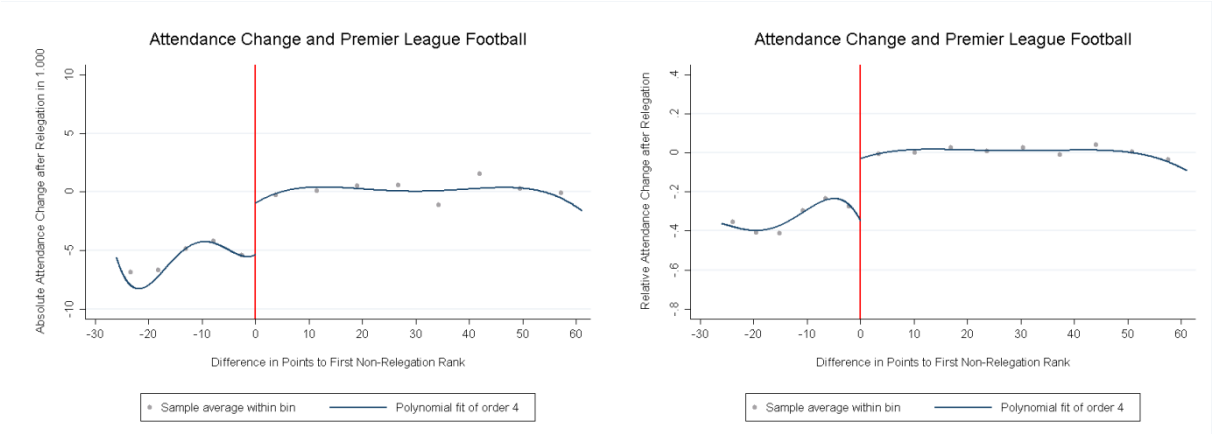
4 Results

4.1 Baseline Results

The effect of relegation on demand for live attendance

After having demonstrated that this research design is able to produce a credible control group for the analysis of the effects of relegation, we now provide a discussion of the results. We begin with an indicator that is likely to be most closely related to relegation from the premier division of a football league and to regional (sectoral) growth – the demand for live attendance in the stadium. Economic theory suggests that demand for live attendance is based on standard consumer theory (Neale 1964). Relegation contributes to an adjustment in the quality of the game offered to fans. We first present visual evidence with data-driven RD plots using evenly spaced binning, and second estimation results using a *clubs* change in the average absolute and relative number of live spectators at home games in the season following relegation. A negative coefficient in the regressions would imply that relegated clubs suffered from attendance losses more than non-relegated clubs close to the cut-off. Figure 3 is constructed using the approach of Calonico et al. (2014). It illustrates the relationship between the absolute (left-hand side of figure 3) and the relative development (right-hand side of figure 3) of attendance in relation to the difference in points to the first non-relegation rank using a 4^{th}-degree polynomial on either side of the cut-off value 0. Both plots indicate that there is a considerable jump in attendance change at the cut-off value.

Figure 3: RD plots using club level attendance data as outcome



Source: Authors own illustration.

This visual interpretation is confirmed by the econometric estimates for both variables of interest (cf. table 5). Hence, the findings verify the results of Simmons (1996) for our more general sample of four major European football leagues and show that demand for attendance is very elastic to changes in league membership. The size of the effects suggests that relegation contributes to a substantial loss in club level home game attendance. Although showing a similar size in mean live attendance during the season of relegation (cf. table 3), clubs face an average reduction of -4.254 (in thousands) spectators per home game in the following season. The coefficients for relative changes in inter-seasonal attendance also indicate this negative and highly significant effect. Here, estimates show a causal

reduction in live attendance of about 28.7 percent. Given that teams in these four leagues have between 17 and 19 home games per season, relegation creates a substantial *and* continuous loss of demand for football-related activities in a region over the entire following season.

Table 5: The effects of a relegation on demand for live attendance in the stadium

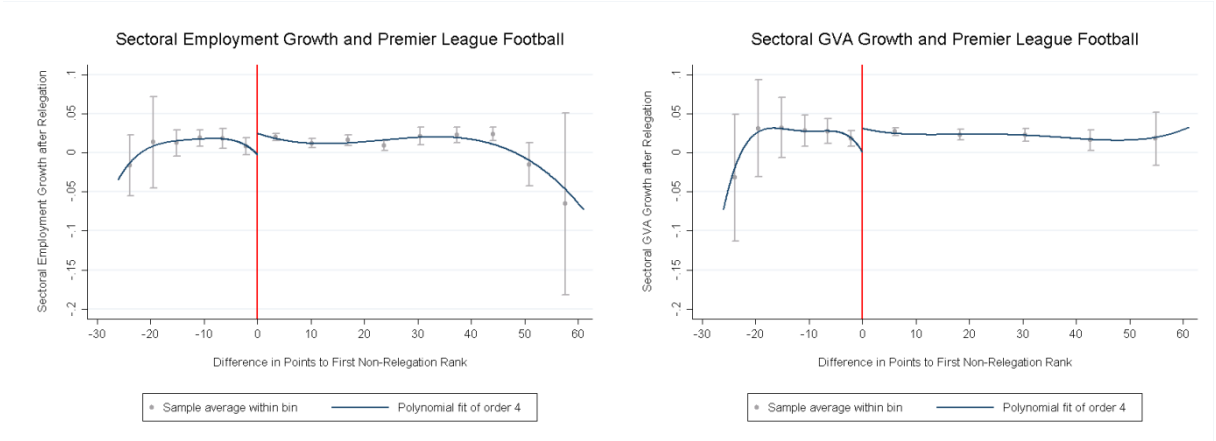
Outcome	Change attendance (abs.)	Change attendance (rel.)
Relegation	-4.254***	-0.287***
	(1.472)	(0.049)
N	1292	1292
BW type	Mserd	Mserd
Kernel	Triangular	Triangular
Number of obs (l|r)	188|1104	188|1104
Eff. Number of obs (l|r)	74|299	101|397
Order loc. poly. (p) (l|r)	1|1	1|1
Order bias (q) (l|r)	2|2	2|2
BW loc. poly. (h) (l|r)	4.6|4.6	6.3|6.3
BW bias (b) (l|r)	8.6|8.6	10.4|10.4
rho (h/b) (l|r)	0.5|0.5	0.6|0.6

Outcome: Change in club level attendance between the season of relegation an the immediate next season.
Notes: Standard errors in parentheses, * p<0.1, ** p<0.05, *** p<0.01.
Source: Authors own calculation.

The effect of relegation on football-related sectors in a region

In the next step, we test directly for short-term regional implications of relegation. Hence, we now leave the club level analysis and move to the more aggregated level of the region. First, we follow the hypothesis of Feddersen and Maenning (2012), that any economic impact from major sporting events might be spatially, temporally and sectorally localised. We test this on the basis of employment and GVA growth rates for the aggregate figures of the Wholesale, Retail, Transport, Accommodation and Food Services sector at the NUTS3 level. Again, we start with a visual representation of the results and then report regression estimates in table 6.

Figure 4: RD plots using regional sectoral development as outcome



Source: Authors own illustration.In line with the results for attendance, regional sectoral outcomes also seem to respond negatively to relegation shocks. Figure 4 indicates a small decrease in growth at the cut-off. These results are supported by table 6. The estimations show a significant negative short-term effect of relegation of a premier league football club on both dimensions of regional sectoral outcomes. Firstly, regional sectoral employment growth in football-related sectors decreases by about 2.7 percent in regions facing the relegation of their premier league club. In addition, the effect on regional sectoral growth in gross value added is negative and significant. Here, the effect size is about -3.0 percent. Hence, we confirm the results of Feddersen and Maenning (2012) that short-term sectoral employment and gross value added effects of large sporting events exist for the set of regions of the four European football leagues under analysis.

Table 6: Estimation of the effects of a relegation on football related sectors in the region

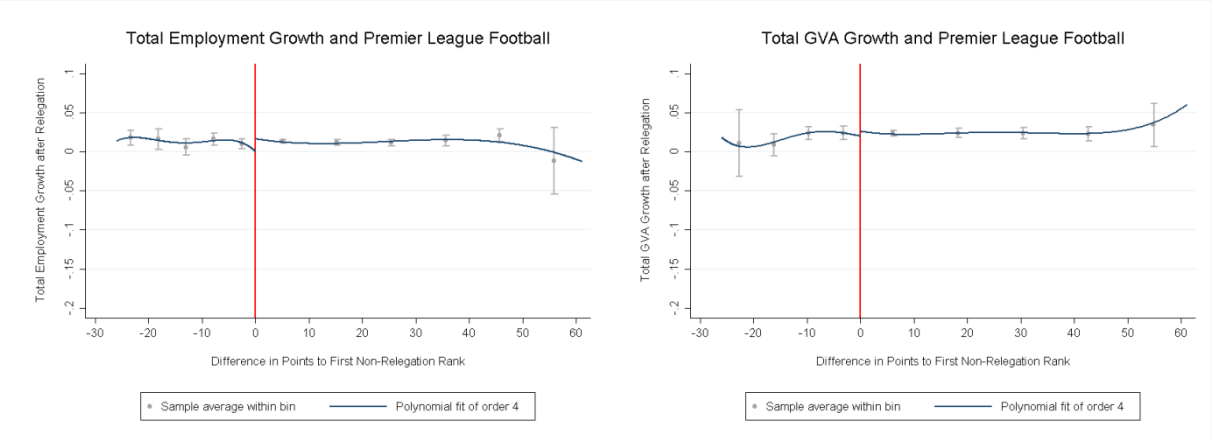
Outcome	Regional sectoral employment (NUTS 3)	Regional sectoral gross value added (NUTS 3)
Relegation	-0.027**	-0.030**
	(0.013)	(0.014)
N	1202	1202
BW type	Mserd	Mserd
Kernel	Triangular	Triangular
Number of obs (l|r)	180|1022	180|1022
Eff. Number of obs (l|r)	95|374	83|328
Order loc. poly. (p) (l|r)	1|1	1|1
Order bias (q) (l|r)	2|2	2|2
BW loc. poly. (h) (l|r)	6.3|6.3	5.1|5.1
BW bias (b) (l|r)	11.2|11.2	9.1|9.1
rho (h/b) (l|r)	0.6|0.6	0.6|0.6

Outcome: Growth of regional sectoral employment and gva between t-1 and t+1, t = year of relegation.
Notes: Standard errors in parentheses, * p<0.1, ** p<0.05, *** p<0.01.
Source: Authors own calculation.

The effect of relegation on overall regional development

While regional and sectoral effects of sporting events exist, scholarly analysis has so far provided almost no evidence for the relevance of such events on aggregated regional or economy-wide outcomes (Coates and Humphreys 2008). We address this question by estimating our model on overall short-term regional employment and gross value added growth. Figure 5 provides a graphic representation of the results. We ensure the comparability of the effect size between figures 4 and 5 by using the scale of the legend. Figure 5 also indicates a small decrease in the regional growth rate at the cut-off, which points to total regional employment effects. However, in the case of the growth of total regional gross value added, the polynomial specification does not seem to indicate any effect of relegation.

Figure 5: RD plots using total regional development as outcome



Source: Authors own illustration.

The respective regression results are illustrated in table 7. In contrast to the outcomes observed above, these results become less conclusive. We find that the specifications addressing overall regional employment growth show small negative effects of about -1.3 percent. However, regional output growth is not affected by relegation. This implies that some negative effects might exist with respect to regional employment; but, in line with the literature, relegations seem to be events of minor importance for short-term regional output because sectoral GVA shocks roughly translate to aggregated outcomes.

Table 7: Estimation of the effects of a relegation on football related sectors in the region

Outcome	Overall regional employment (NUTS 3)	Overall regional gross value added (NUTS 3)
Relegation	-0.013*	-0.006
	(0.007)	(0.009)
N	1202	1202
BW type	Mserd	Mserd
Kernel	Triangular	Triangular
Number of obs (l|r)	180|1022	180|1022
Eff. Number of obs (l|r)	107|400	107|400
Order loc. poly. (p) (l|r)	1|1	1|1
Order bias (q) (l|r)	2|2	2|2
BW loc. poly. (h) (l|r)	7.1|7.1	7.5|7.5
BW bias (b) (l|r)	13.8|13.8	13.0|13.0
rho (h/b) (l|r)	0.5|0.5	0.6|0.6

Outcome: Growth of overall regional employment and gva between t-1 and t+1, t = year of relegation.
Notes: Standard errors in parentheses, * p<0.1, ** p<0.05, *** p<0.01.
Source: Authors own calculation.

4.2 Robustness analysis

Addressing outliers and potentially confounding events

In the next step of our robustness analysis we perform some data manipulations to ensure that certain outliers do not bias our results. We address this issue in three different ways. In the first specification, we remove the 1% smallest and 1% largest observations of the respective outcomes under analysis to exclude extreme events from our sample. In the second specification, we drop the upper 25% of the largest regions from our analysis. In this way, we follow the assumption that the effect of relegation should decrease with regional size and that effect size should respond positively to the presence of the relegation of clubs in smaller regions with a small-scale football-related economy. In a last step, we address the issue of potentially confounding major events that may also drive short-term regional sectoral employment in football-related sectors. Fedderson and Maenning (2012) demonstrate that large sporting events such as the FIFA World Cup exert a positive effect on some of the outcomes under analysis here. As these events are likely to rely on stadium capacity or may be located in the same regions as our premier league football clubs, this may produce biased results with respect to the presence of these events at the same time in the same region. In order to address this issue, we drop all NUTS3 regions that were hosts of large sporting events, including the UEFA European Football Championship in the UK in the years 1995 and 1996 and the FIFA World Cup in France (in the years 1997 and 1998) and Germany (in 2005 to 2006).

Table 8: Robustness analysis – regional, sectoral dimension

	Growth of regional sectoral employment (NUTS 3)				Growth of regional sectoral gross value added (NUTS 3)			
	Basic Specifi-cation	w/o outliers	w/o large regions	w/o WC / EC regions	Basic Specifi-cation	w/o outliers	w/o large regions	w/o WC / EC regions
Relegation	-0.027**	-0.022*	-0.025*	-0.026*	-0.030**	-0.029**	-0.036**	-0.022*
	(0.013)	(0.013)	(0.013)	(0.014)	(0.014)	(0.012)	(0.015)	(0.013)
N	1202	1177	902	1141	1202	1183	902	1141
BW type	Mserd	Mserd	Mserd	Mserd	Mserd	Mserd	Mserd	Mserd
Kernel	Triangular	Triangular	Triangular	Triangular	Triangular	Triangular	Triangular	Triangular
Number of obs (l|r)	180|1022	176|1001	156|746	175|966	180|1022	177|1008	156|746	175|966
Eff. Number of obs (l|r)	95|374	91|365	85|322	91|360	83|328	82|325	63|241	91|360
Order loc. poly. (p) (l|r)	1|1	1|1	1|1	1|1	1|1	1|1	1|1	1|1
Order bias (q) (l|r)	2|2	2|2	2|2	2|2	2|2	2|2	2|2	2|2
BW loc. poly. (h) (l|r)	6.3|6.3	6.6|6.6	6.8|6.8	6.4|6.4	5.1|5.1	5.7|5.7	4.7|4.7	6.1|6.1
BW bias (b) (l|r)	11.2|11.2	10.7|10.7	11.7|11.7	11.2|11.2	9.1|9.1	10.2|10.2	8.5|8.5	10.4|10.4
rho (h/b) (l|r)	0.6|0.6	0.6|0.6	0.6|0.6	0.6|0.6	0.6|0.6	0.6|0.6	0.6|0.6	0.6|0.6

Outcome: Growth of overall/sectoral regional employment and gva between t-1 and t+1, t = year of relegation.
Notes: Standard errors in parentheses, * p<0.1, ** p<0.05, *** p<0.01.
Source: Authors own calculation.

Table 8 presents the results of the regional-sectoral robustness analysis for the outcomes employment and gross value added growth. All specifications indicate that our finding is robust – regional sectoral growth of employment and gross value added is negatively affected by the relegation of a premier league football club in the short-term. The results remain fairly robust with the exclusion of several types of outliers as well as potentially confounding effects of other large sporting events. With respect to the growth of regional sectoral GVA, the effect becomes larger in smaller regions (-3.6 percent), highlighting the relevance of these events for smaller scale regions. However, regional employment growth does not respond in a similar manner but rather remains at levels similar to the basic specifications (-2.5 percent). Furthermore, these results reveal some sensitivity to the inclusion of World Cup and European Cup cities. This holds true especially for the regional sectoral GVA dynamics of cities that play host to large sporting events.

In the next step, table 9 illustrates the results for the overall regional effects of relegation of a premier league football team. Three of our specifications had small but significant effects of relegation on overall regional employment. If we approach overall regional effects without large regions or host cities of World or European Cups, the effect of relegation on overall regional employment or gross value added dynamics remains significant across the specifications. The contrary holds for the growth of overall regional GVA. Here, all specifications show no response in short-term regional development after relegation of a club in the region.

Table 9: Robustness analysis – overall regional dimension

	Growth of overall regional employment (NUTS 3)				Growth of overall regional gross value added (NUTS 3)			
	Basic Specifi-cation	w/o outliers	w/o large regions	w/o WC / EC regions	Basic Specifi-cation	w/o outliers	w/o large regions	w/o WC / EC regions
Relegation	-0.013*	-0.008	-0.011*	-0.012*	-0.006	-0.006	-0.008	-0.005
	(0.007)	(0.007)	(0.006)	(0.007)	(0.009)	(0.009)	(0.010)	(0.010)
N	1202	1136	902	1141	1202	1175	902	1141
BW type	Mserd	Mserd	Mserd	Mserd	Mserd	Mserd	Mserd	Mserd
Kernel	Triangular	Triangular	Triangular	Triangular	Triangular	Triangular	Triangular	Triangular
Number of obs (l|r)	180 | 1022	174 | 962	156 | 746	175 | 966	180 | 1022	177 | 998	156 | 746	175 | 966
Eff. Number of obs (l|r)	107 | 400	81 | 303	94 | 343	102 | 383	107 | 400	118 | 421	85 | 322	102 | 383
Order loc. poly. (p) (l|r)	1 | 1	1 | 1	1 | 1	1 | 1	1 | 1	1 | 1	1 | 1	1 | 1
Order bias (q) (l|r)	2 | 2	2 | 2	2 | 2	2 | 2	2 | 2	2 | 2	2 | 2	2 | 2
BW loc. poly. (h) (l|r)	7.1 | 7.1	5.6 | 5.6	7.6 | 7.6	7.3 | 7.3	7.5 | 7.5	8.1 | 8.1	6.4 | 6.4	7.0 | 7.0
BW bias (b) (l|r)	13.8 | 13.8	9.6 | 9.6	14.7 | 14.7	14.7 | 14.7	13.0 | 13.0	14.6 | 14.6	11.5 | 11.5	11.6 | 11.6
rho (h/b) (l|r)	0.5 | 0.5	0.6 | 0.6	0.5 | 0.5	0.5 | 0.5	0.6 | 0.6	0.6 | 0.6	0.6 | 0.6	0.6 | 0.6

Outcome: Growth of overall/sectoral regional employment and gva between t-1 and t+1, t = year of relegation.
Notes: Standard errors in parentheses, * p<0.1, ** p<0.05, *** p<0.01.
Source: Authors own calculation.

In the last step, table 10 reports estimation results with additional covariates. The set of covariates includes country fixed effects to account for potential heterogeneity of the treatment effects across countries in the sample. In addition, we include the overall regional population to account for potential moderating effects of regional size and the initial level of the respective outcome of analysis in t-1 before relegation. The results reveal that the inclusion of covariates does not alter the results. In the case of employment effects, the coefficients increase slightly with higher levels of significance. The opposite holds for the GVA. Here, the effect becomes somewhat smaller with slightly decreasing levels of significance.

Table 10: Robustness analysis – adding covariates

	Growth of sectoral regional employment (NUTS 3)		Growth of overall regional employment (NUTS 3)		Growth of sectoral regional GVA (NUTS 3)		Growth of total regional GVA (NUTS 3)	
	Basic Specifi-cation	With Covariates	Basic Specifi-cation	With Covariates	Basic Specifi-cation	With Covariates	Basic Specifi-cation	With Covariates
Relegation	-0.027**	-0.028**	-0.013*	-0.015**	-0.030**	-0.026*	-0.006	-0.004
	(0.013)	(0.013)	(0.007)	(0.007)	(0.014)	(0.014)	(0.009)	(0.009)
N	1202	1202	1202	1202	1202	1202	1202	1202
BW type	Mserd	Mserd	Mserd	Mserd	Mserd	Mserd	Mserd	Mserd
Kernel	Triangular	Triangular	Triangular	Triangular	Triangular	Triangular	Triangular	Triangular
Number of obs (l|r)	180|1022	180|1022	180|1022	180|1022	180|1022	180|1022	180|1022	180|1022
Eff. Number of obs (l|r)	95|374	95|374	107|400	95|374	83|328	83|328	107|400	95|374
Order loc. poly. (p) (l|r)	1|1	1|1	1|1	1|1	1|1	1|1	1|1	1|1
Order bias (q) (l|r)	2|2	2|2	2|2	2|2	2|2	2|2	2|2	2|2
BW loc. poly. (h) (l|r)	6.3|6.3	6.5|6.5	7.1|7.1	6.6|6.6	5.1|5.1	5.3|5.3	7.5|7.5	6.4|6.4
BW bias (b) (l|r)	11.2|11.2	11.7|11.7	13.8|13.8	12.5|12.5	9.1|9.1	9.3|9.3	13.0|13.0	11.2|11.2
rho (h/b) (l|r)	0.6|0.6	0.6|0.6	0.5|0.5	0.5|0.5	0.6|0.6	0.6|0.6	0.6|0.6	0.6|0.6
Covariates		Yes		Yes		Yes		Yes

Outcome: Growth of overall/sectoral regional employment and gva between t-1 and t+1, t = year of relegation.
Notes: Standard errors in parentheses, * p<0.1, ** p<0.05, *** p<0.01.
Source: Authors own calculation.

5 Conclusions

This study is the first to test for regional (sectoral) employment and gross value added effects of relegation of a premier league football club in four major countries in Europe. To our knowledge, it is also the first study to develop an RD design to identify the causal effects of changes in league membership on the development of a club's host region. Up to this point, studies have focussed mainly on regional, sectoral or temporal effects of mega sporting events such as the FIFA World Cup, the UEFA European Football Championship and the Olympic Games, or on regional effects of the arrival, presence and departure of American sports franchises in the NFL, NHL, MLB or NBA using modern panel approaches.

This paper follows a different estimation strategy. We make use of the system of relegation to develop a regression discontinuity design and we estimate the effects using local polynomial regression, as proposed by Calonico et al. (2014a, 2014b, 2015b, 2017). We find significant negative effects of the relegation of a premier league club on short-term sectoral employment and GVA growth. These results contribute to the literature on the economic relevance of major sporting events. Understanding the response of regions to premier league relegation shocks is important because regional shocks will be felt to a significant degree at the regional level. As far as football is concerned, the basic underlying mechanism is the spatial dimension in the expression of fan interest. Hence, not only players, fans and

club employees but also owners of pubs, restaurants and those in the accommodation sector in the region shoulder the burden of relegation.

These results further demonstrate that there are also small general effects of relegation on overall regional development. Total employment reacts more sensitively than total GVA growth, implying that in the short-term it is mainly unproductive jobs that disappear. To some extent this places relegation close to events such as the closure of large firms or adverse shocks to industries that have important regional effects. As a consequence, local policymakers often provide public support to private professional football clubs with the aim of keeping clubs in the premier league (e.g. provision of stadia and infrastructure as well as sponsorship from public enterprises) and of alleviating the effects for their electorates. Whether such support improves welfare depends on the effects and the persistence of the underlying relegation shocks. As we did not find output effects of relegation in our analysis, there is some doubt as to the effectiveness of such measures in the short-term. Rather, short-term sectoral labour market efforts could be one way of addressing this event.

While our results hold for the period 1995 to 2012, the question of whether these findings remain robust in cases of massive inflow of capital into this sector across Europe in recent times remains a subject for further research.

Literature

Baade, R. A. and Matheson, V. (2016) Going for the gold: The economics of the Olympics. *Journal of Economic Perspectives*. 30: 201-218.

Baade, R. A. and Sanderson, A. R. (1997) The employment effect of teams and sports facilities. In: R. G. Noll and A. Zimbalist (Eds.) *Sports, Jobs and Taxes: The Economic Impact of Sports Teams and Stadiums*, 92-118. Washington, D. C.: Brookings Institution.

Baade, R. A., and Dye, R. F. (1988) An Analysis of the Economic Rationale for Public Subsidization of Sports Stadiums. *Annals of Regional Science* 22: 37-47.

Baade, R. A., and Dye, R. F. (1990) The Impact of Stadiums and Professional Sports on Metropolitan Area Development. *Growth and Change* 21: 1-14.

Baade, R. A., Baumann, R. and Matheson, V. A. (2011) Big Men on Campus: Estimating the Economic Impact of College Sports on Local Economies. *Regional Studies* 45: 371-80.

Borland, J. and MacDonald, R. (2003) Demand for sports. *Oxford Review of Economic Policy* 19: 478-502.

Calonico, S. Cattaneo, M. D. Farrell, I. and Titiunik, R. (2017) rdrobust: Software for Regression Discontinuity Designs. *Stata Journal* 17: 372-404.

Calonico, S., Cattaneo, M. D. and Titiunik, R. (2014a) Robust data-driven inference in the regression-discontinuity design. *Stata Journal* 14: 909-946.

Calonico, S., Cattaneo, M. D. and Titiunik, R. (2014b) Robust nonparametric confidence intervals for regression-discontinuity designs. *Econometrica* 82: 2295-2326.

Calonico, S., Cattaneo, M. D. and Titiunik, R. (2015) Optimal data-driven regression discontinuity plots. *Journal of the American Statistical Association* 110: 1753-1769.

Cattaneo, M. D. and Escanciano, C. J. (2017) *Regression Discontinuity Designs: Theory and Applications*. Advances in Econometrics, Vol. 38, Emerald Group Publishing.

Carlino, G., and Coulson, N. E. (2004) Compensating differentials and the social benefits of the NFL. *Journal of Urban Economics* 56: 25-50.

Coates, D. (2015) *Growth Effects of Sports Franchises, Stadiums, and Arenas: 15 Years Later*. Mercatus Working Paper, Mercatus Center at George Mason University, Arlington, VA.

Coates, D. and Humphreys, B. R. (1999) The growth effects of sport franchises, stadia, and arenas. *Journal of Policy Analysis and Management* 18: 601-624.

Coates, D. and Humphreys, B. R. (2001) The economic consequences of professional sports strikes and lockouts. *Southern Economic Journal* 67: 737-747.

Coates, D. and Humphreys, B. R. (2003) The effect of professional sports on earnings and employment in the services and retail sectors in US cities. *Regional Science and Urban Economics* 33: 175-198.

Coates, D. and Humphreys, B. R. (2008) Do Economists Reach a Conclusion on Subsidies for Sports Franchises, Stadiums, and Mega-Events? *Econ Journal Watch* 5: 294-315.

Coates, D., Humphreys, B. R. and Zimbalist, A. (2006) Compensating differentials and the social benefits of the NFL: A comment. *Journal of Urban Economics* 60: 124-131.

DFL (2017) *Die wirtschaftliche Situation im Lizenzfussball*. Deutsche Fussball Liga. Frankfurt/Main.

European Commission (1998) *The European Model of Sport*. Brussels: Consultation Paper of DGX of the European Commission.

Feddersen, A. and Maennig, W. (2012) Sectoral Labour Market Effects of the 2006 FIFA World Cup. *Labour Economics* 19: 860-869.

Feddersen, A. and Maennig, W. (2013) Mega-Events and sectoral employment: The case of the 1996 Olympic Games. *Contemporary Economic Policy* 31: 580-603.

Hahn, J., Todd, P. and van der Klaauw, W. (2001) Identification and Estimation of Treatment Effects with a Regression-Discontinuity Design. *Econometrica* 69: 201-209.

Hausman, C. and Rapson, D. (2017) Regression Discontinuity in Time: Considerations for Empirical Applications. NBER Working Paper Series Number 23602.

Lee, D. S. (2008) Randomized Experiments from a Non-Random Selection in U.S. House Elections. *Journal of Econometrics* 142: 675-97.

Lee, D. S. and Lemieux, T. (2010) Regression Discontinuity Design in Economics. *Journal of Economic Literature* 48: 281-355.

MacDonald, G. (1988) The economics of rising stars. *American Economic Review* 78: 155-166.

Maennig, W. (2017) *Major Sports Events: Economic Impact*. Hamburg: Hamburg Contemporary Economic Discussions Nr. 58.

Neale, W. (1964) The Peculiar Economics of Professional Sports: A Contribution to the Theory of the Firm in Sporting Competition and in Market Competition. *The Quarterly Journal of Economics* 78: 1-14.

Rosen, S. (1981) The economics of superstars. *American Economic Review* 71: 845-858.

Siegfried, J. and Zimbalist, A. (2000) The Economics of Sports Facilities and Their Communities. *Journal of Economic Perspectives* 14: 95-114.

Simmons, R. (1996) The demand for English league football: a club-level analysis. *Applied Economics* 28: 139-155.

Szymanski, S. and Valletti, T. M. (2005) Promotion and Relegation in Sporting Contests. *Rivista di Politica Economica* 95: 3-39.

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ISSN 2194-2188

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