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The competitive evolution of European top football – signs of danger

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Abstract

This paper presents a relatively comprehensive study of how Uncertainty of Outcome has developed over time in major European football leagues. The findings are clear; excitement in football is degrading, closing up on levels that many should find unacceptable. The paper also discusses and proposes some simple means for reversing this development.

Keywords: Uncertainty of outcome, Regression analysis, Time series analysis, ARIMA modelling, Competitive balance, Football (soccer)

1 Introduction

A simple comparison between the UEFA club ranking [20] between the years 2006/07 AND 2016/17 shows that 9 out of ten teams[1] are on both lists. This indicates a certain (perhaps unwanted) stability among Europe's best football teams. Szymanski [16] discusses this development comparing Champions League (CL) with NFL. He argues that many European football leagues are imbalanced. That is, the same teams turn out to win almost every season, and uncertainty of outcome may move towards an unsatisfactory level.

In this paper, we conduct a fairly thorough empirical analysis of how Uncertainty of Outcome (UO) has developed over the last 50 years. Our primary analytic focus is Premier League (PL), but we also consider 3 other major European Leagues; Serie A (Italy), La Liga (Spain) and Bundesliga (Germany).

[1] Real Madrid, Barcelona, Bayern Munich, Sevilla, Arsenal, Benfica, Chelsea, Manchester United and Porto.

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Our basic underlying hypothesis is that UO is decreasing, and perhaps also at an accelerating rate. The reasons for such a hypothesis can be summed up by:

- The evolution of CL
- Increased TV-money
- UEFA Financial Fair Play (FFP)
- The introduction 3-1-0 point score system

CL was introduced in its present format in 1992. According to [19] the CL finalists received more than €100 million in prize money for the present (2017) season. The fact that almost the same teams occupy UEFAS club ranking over time, as well as the later stages in CL, should indicate a significant financial domination for a limited set of clubs. Such a domination should be expected to return competitive imbalance.

Introduction of significant TV-deals in European football has grown considerably the latter years. SKY sports paid more than £5 [21] billion to broadcast PL in the period 2016-2019 almost twice the sum they paid in the previous time period. When the system of club redistribution of this money is such that the best (and richest) clubs gets significant more than the not so good (and poor) clubs, it is to be expected that this mechanism also should induce competitive imbalance. (See for instance [22] for a thorough discussion of distribution of revenue from television rights among European football clubs.)

The UEFA-FFP system was fully implemented in European football in the 2013/2014 season. Originally, the systems' intention was to make it harder for rich clubs to overspend in order to buy talent. Such an intention may, at first sight, seem to have opposite effects (i.e. increased competitive balance). However, as many experts have pointed out [12], the risk of adverse outcomes of this system are significant. Hence, also this novelty may have competitive imbalance effects.

The 3-1-0 point score system was originally introduced with the aim of increasing offensive versus defensive play. The idea was that most football audiences would prefer many goals as opposed to "boring" 0-0 games. Again, for instance as pointed out in [12], this system may have adverse effects on competitive balance. But, also even lead to more defensive play.

The above arguments, together with few changes in balancing direction, support an evident hypothesis of decreased competitive balance in European football. The fact that the timing happened at different points in time, should (logically) also support an alternative hypothesis of accelerated competitive imbalance.

The rest of the article is outlined as follows: Section 2 discusses relevant literature, while section 3 presents our methodology for UO estimation. Sections 4 and 5 provide UO-estimates for Premier League (Section5) and for other major football leagues (Spain, Germany and Italy). Section 6 makes a quick side step and investigates the original UO-hypothesis on parts of our data. Section 7 concludes, and also provides a short discussion on possible measures to reverse the identified patterns.

2 Literature

The UO hypothesis, initially introduced by Rottenberg [13], is central in sports economic theory. The hypothesis, popularly stated as: Why would an audience be attracted to a sport contest if they know the outcome in advance? – has been widely discussed and analyzed. According to Szymanski [15], Borland and Macdonald [1] surveyed thirty-nine papers published between 1974 and 2003 – all aiming to test this hypothesis – do sports audiences enjoy uncertainty of outcome?

Again, according to [15], very few (in fact only 4) of these thirty-nine papers showed any trace of risk-loving spectators. After all, if football is the sport, we have all seen it, haven't we? In most big European leagues, the same teams enjoy repeated success, and are playing regularly in UEFA's money-making tournaments; Champion's and Europa League. Manchester United, Chelsea, Real Madrid, Barcelona, Juventus, Internazionale, Bayern Munich and Borussia Dortmund -- just to name a few.

Does this evidence falsify the UO-hypothesis? No, not at all. It is very difficult to isolate the effect of an uncertain outcome in the data. Szymanski [15] points out that the market for old football matches (DVDs, You-Tube, etc.) exists, but is rather small. The small market for old matches indicates that old matches are not substitutes for new matches. However, it does not follow that fans prefer new matches to old matches because the outcome of new matches is uncertain. Fans may prefer new matches to old matches for the same reason they prefer new football shirts to old football shirts. Nevertheless, the pure logic of the UO-hypothesis is compelling enough to deserve more attention.

Perhaps the traditional identification strategy is imperfect. Theoretically, we imagine a situation in which a marginal increase in the uncertainty of outcome will lead to a marginal increase in the demand. That is, if the probability of the favorite losing increases with one percentage point, we predict the demand to increase with *x* percent. The problem is that with only around 40 matches per season, such small changes in winning probabilities are largely undetectable to the sports empiricist, and even more so, to football fans who do not waste their time plundering around with confidence intervals and t-statistics. It may very well be the case that the relationship between uncertainty and demand is a step-function. A step-function in which you may need relatively large changes in winning probabilities before sport fans detect the change and respond to it. For example, if we look at the performance of the bottom five teams each season in England for the last 50 years. They have won approximately thirty percent of their home matches during the entire period. During the last 10 years, it is slightly less than thirty percent. During the first 10 years, it is slightly more than thirty percent. Do we really expect sport fans to respond to such tiny changes? It translates to almost one home-win less per season for each team. Szymanski [14] seems to have a similar view when he writes:

«Without a degree of competitive balance, fans will lose interest in a competition. However, it is less clear that every decline in competitive balance will lead to a falling off of fan interest.»

As pointed out in the introduction, the main topic of this paper is to calculate, observe and predict UO in significant European football leagues, not to test the classical UO hypothesis. Empirical analysis of such a type are less common. However, some of the articles discussing how UO could be measured do perform dynamic UO calculations, see for instance [17] and [18]. Dynamic UO calculations are also present in [2], although with a different purpose than ours.

3 Methodology

In order to introduce our "UO-measuring tool" (see also [2]), we pick a team sport where the lack of UO has been historically evident – Norwegian Female Handball. Furthermore, the extreme lack of competitive balance or the very low observed level of UO in this league may also be relevant for comparison with football leagues.

Here, one team, Larvik, has not lost matches for decades[2]. Let us reuse an example

[2] Larvik did in fact lose the first match in the 2017-season, but that is a different story.

(slightly corrected and updated) from [3]. The proposed "UO-measuring tool" also has some nice mathematical properties opposed to other tools normally used in UO-estimation. This is explained in [6].

Team	LCP_i	AP_i
Larvik	44	44
Nordstrand	40	31
Tertnes	36	31
Bækkelaget	32	30
Byåsen	28	27
Stabæk	24	21
Lunner	20	21
Vipers	16	19
Sola	12	17
Gjøvik	8	13
Gjerpen	4	8
Fjellhammer	0	2

Table 1: LCP_i and AP_i for the Norwegian female handball season 2001/2002

Table 1 contains a final table from the Norwegian female handball top league in the 2000/2001-season[3]. Apart from team names, it contains two columns; one marked AP_i and the other LCP_i. AP_i contains actual point scores achieved by each team, while LCP_i is constructed to obtain a minimally competitive point score. Such a situation is characterized by the best team winning all matches, the second best winning all matches but two (this is a double round robin tournament[4]) against the best one and so on.

With a 2-1-0 point score system, which was used in this in this handball season, this would give $2 \cdot 22 = 44$ points to the winner, $2 \cdot 20 = 40$ for the runner up and so on.

So, forming $AP_i - LCP_i$ squaring to take care of negative differences and summing up, produces a number representing the total deviation between the actual league point scores and an «idealized» uncompetitive league. If such a number is divided by another number, formed by similar squares but where the maximally competitive point score MCP substitutes the actual point score, the result should produce a number in [0,100] measuring UO. The maximally competitive point score (*MCP*) is calculated by assuming perfect performance equality among all teams in the league. Then, all matches should end in a draw. Mathematically, ρ_L can be expressed as[5]:

$$\rho_L = 100 \cdot \frac{\sum_{i=1}^{\frac{N}{2}+1}(AP_i - LCP_i)^2}{\sum_{i=1}^{\frac{N}{2}+1}(MCP - LCP_i)^2} \quad (1)$$

Now, if we calculate ρ_L in (1) for the data in table 1, we get $\rho_L \approx 8.7\%$. Szymanski argues strongly in [15] that the Premier League (PL) is imbalanced, and has been for some time. Still, as we will observe in subsequent paragraphs, even the lowest observed ρ_L in PL is more than twice as high as the observed value from Norwegian female handball. Could it be that PL has not reached a low enough level of UO for relevant demand effects to happen? We will not pretend to answer such a question in this paper. However, demand for Norwegian female handball is not substantial; to put it mildly. In 2014 [9] (on average) 630 persons attended each Norwegian female handball match. In the same year, more than 10 times more spectators visited Norwegian top football. Even level 2 as well as both ice hockey and male handball had larger spectator numbers than female handball. In addition, Norwegian female handball has competed at the highest international level in the entire period of time, long before 2000 and to date. Normally, such a fact should lead to a significant demand

[3] The choice of the 2000/2001 season is made more or less at random. The observed level of UO is consistently low in this league for the last 25 years, including this season.

[4] Each team played the others twice, giving a total of N=22 matches.

[5] Note that the number of teams in the league is found as $\frac{N}{2}+1$, and that the multiplication with 100 gives a percentage (a number in [0,100].)

increase. Hence, our question stated above may at least be of some relevance.

Surely, there is a lot more to the discussion of UO than what we have reflected above. Some authors point out that fans change, and that

different fan groups may have very different UO preferences. See for instance [5], [10] or [11]. Furthermore, UO is a concept which may be measured along many dimensions, see

[8]. A vivid debate on which tool to use is also present in [15].

As pointed out in the introduction, our main point in this paper is not related to the potential causality between UO and demand. We focus more on the time development of UO in football leagues by investigating the PL (primarily), as well as the 3 other major European leagues – La Liga, Serie A and Bundesliga.

4 Evolution of UO in The Premier League

As indicated in section 1, we have calculated UO by the suggested measure in equation (1) for the Premier League. In fact, as our time frame for analysis is chosen to be 1963 to 2017, significant parts of the data also include the previous version of PL, English division ONE. The data[6] are gathered through open internet sources, like www.worldfootball.net and www.emfootball.co.uk. Figure 1 sums up.

[6] All used data are available from the corresponding author upon request.

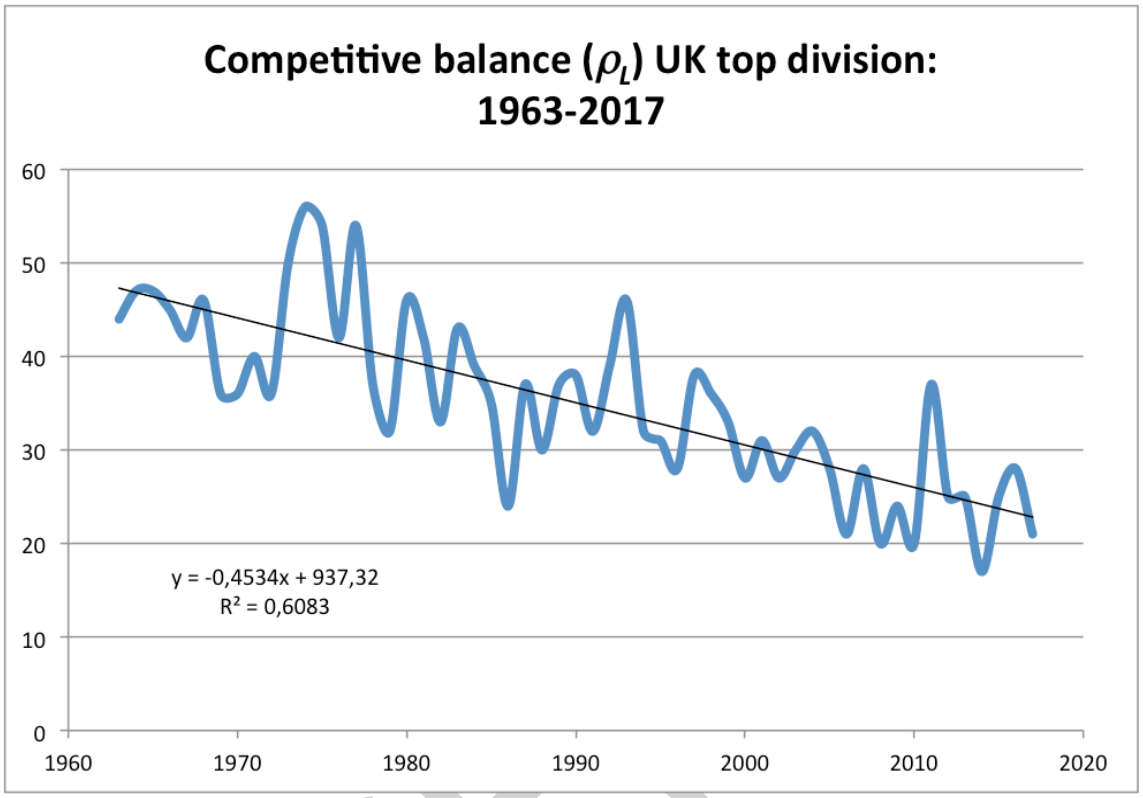

Figure 1: ρ_L: 1963-2017 in Premier League

As Figure 1 indicates, a strong downward sloping tendency is observable. A trained eye might also see (or maybe guess) that the fluctuations along the estimated regression over time are simply noise. In fact, a more formal time series approach by ARIMA modeling suggests an ARIMA(0,1,1) model which supports the ``trained-eye" hypothesis. The only explainable content in $\rho_{L,t}$ is the trend. In fact, the simple linear regression in Figure 1 give an R^2 of as much as 0.6.
Asking the following question seems relevant: Given everything else equal, when will ρ_L reach the competitive level of Norwegian female handball? The answer is readily available using the estimated regression line from Figure 1:

$$-0.4534 \cdot x + 937.32 = 8.7 \Rightarrow x \approx 2048 \quad (2)$$

2048 may seem far ahead, but a slightly altered perspective may be relevant and refine our argument. In the time period from the sixties up to today, several important changes have been imposed in English football. The introduction of PL by itself provided new and enhanced financial opportunities for the big clubs; mainly through the progress of TV-agreements. Furthermore, some years earlier than the PL introduction, a major change in point score system from 2-1-0 to 3-1-0 was introduced.

The potential negative effect the 3-1-0 system has had on competitive balance is already documented – see [2]. Finally, throughout the whole period (post 1992) the financial effect of UEFA club tournaments, especially CL, introduced in its present format in 1992) has grown stronger and stronger, obviously favoring the big clubs. Another more recent experiment, UEFA-FFP adds of course more wood to the «competitive imbalancing fire» – see [12]. The point score system change took place in 1981 in UK, the PL was established in 1992, while the financial effects of CL-participation has probably grown really significant the last 10-15 years.

So, it may be more sensible to split the time period from 1963 to 2017 into two separate time horizons, with an underlying hypothesis that the negative trend observed in Figure 1 may prove to be significantly different between the two time periods, and that the latter period should have a stronger negative trend than the first. This is indeed the case, as Figure 2 indicates:

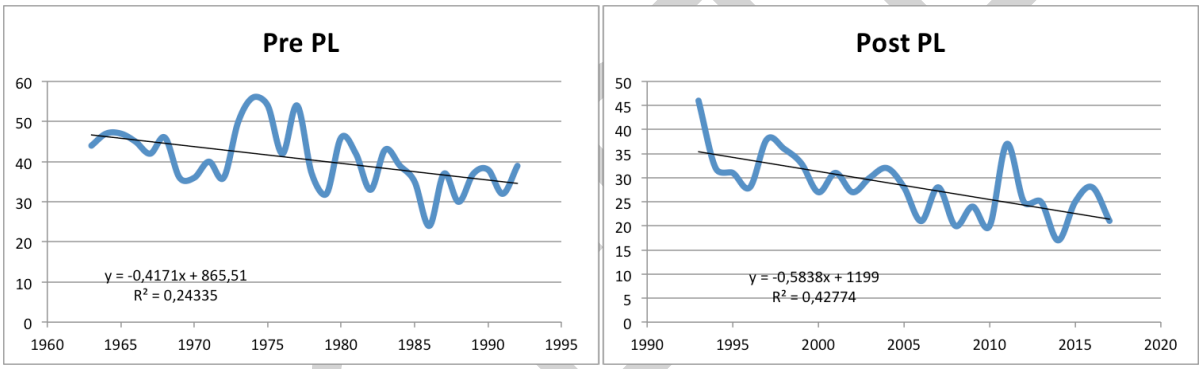

Figure 2: ρ_L: Pre and Post Premier League introduction

Now, asking the same question leading to equation (2) (using the regression equation to the right in Figure 2) gives

$$-0.5838 \cdot x + 1199 = 8.7 \Rightarrow x \approx 2039 \quad (3)$$

2039 comes definitely earlier than 2048, but it may still seem far ahead. However, we do not know when this effect may kick in, so some other percentages may be of interest to analyze, say 10%, 15% and 20%. This leads to: (All years are calculated by rounding up or down by normal rules.)

$$-0.5838 \cdot x + 1199 = 10 \Rightarrow x \approx 2037 \quad (4)$$

$$-0.5838 \cdot x + 1199 = 15 \Rightarrow x \approx 2028 \quad (5)$$

$$-0.5838 \cdot x + 1199 = 20 \Rightarrow x \approx 2020 \quad (6)$$

5 Evolution of UO in other relevant European football leagues

In the previous section (2), we investigated in what years various ρ_L's may emerge, given a very simple (although logical) time series analysis in PL. What about other European countries? Obviously, it is a matter of patience and computer time needed to repeat such a study in all interesting countries. Unfortunately, UEFA has many members, too many for our patience. As a consequence, we did repeat our analysis for 3 more countries, Spain, Italy and Germany. The reason for picking these countries ought to be evident, size, quality (football wise) as well as financial significance. The results (including PL) are shown in figure 3:

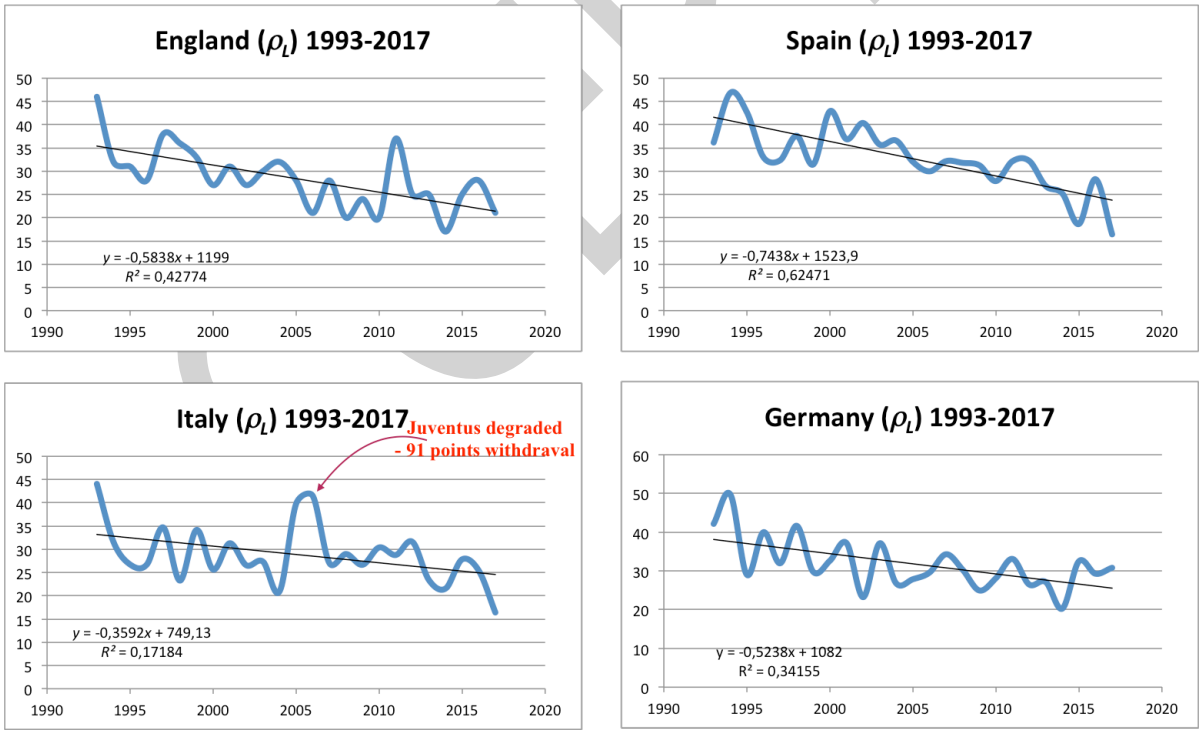

Figure 3: ρ_L in England, Spain, Italy and Germany

As Figure 3 indicates, similar patterns as in PL are found for all other three countries. Note the special bump (increase in UO) in Serie A around 2004-2006. This is obviously explainable from the so-called Calciopoli [7], a major match fixing scandal in Italy with severe consequences for several of the best teams in Italy (Juventus was for instance relegated in the 2006 season). Severe punishment of good teams should of course favor not so good teams and a temporary improvement in competitive balance in Serie A was to be expected.

Finishing up the analysis in the same manner as in section [2] gives information as displayed in Table [2]:

ρ_L	7.8%	10%	15%	20%
PL	2039	2037	2028	2020
La Liga	2037	2035	2029	2022
Serie A	2061	2058	2044	2030
Bundesliga	2049	2047	2037	2027

Table 2: Years when ρ_L reaches levels 7.8%, 10%, 15% and 20% for the 4 major European football leagues

Hence, depending on what ρ_L one might find acceptable, some of these predicted years may seem unpleasantly close. Furthermore, Table 2 indicates differences in development of competitive imbalance between countries.

The numbers indicate clearly that England and Spain are at similar levels, while Italy and Germany have smaller problems. Still, if an «acceptable» ρ_L is 20\%, all countries reaches this level in less than or equal to 13 years from now (2017). As a consequence, we might be discussing an urgent situation here.

6 A small sidestep back to UO and demand

Gathering all this UO-data without any attempt to investigate possible demand effects is obviously silly. Hence, we also looked briefly at demand in PL for the whole period 1963-2017. The two time-series are shown together in Figure 4:

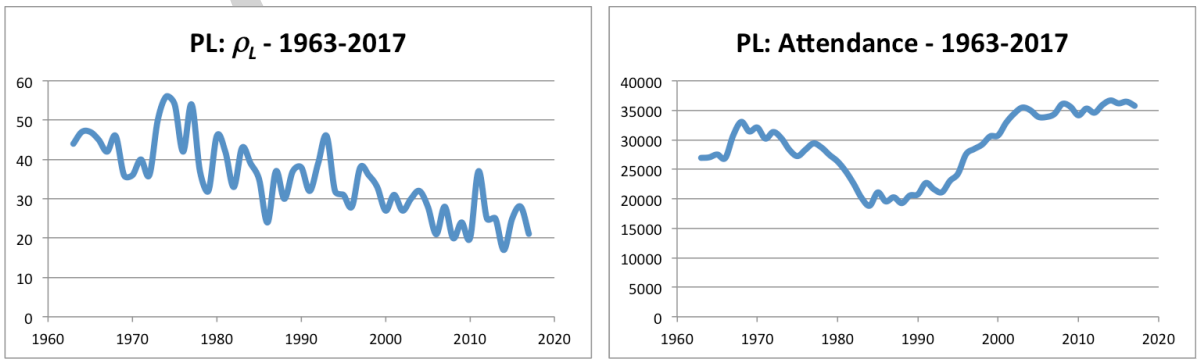

Figure 4: ρ_L and attendance in PL: 1963-2017

A simple visual inspection does immediately tell us that the PL-data does not support the UO-hypothesis[7]. As long as the ρ_L time series is monotonically decreasing, (roughly) while the attendance data has at least some kind of multi modal behavior, a simple causality between UO and demand should not be expected.

However, if we do the same time-split as we did above, looking at the data in two time periods, before and after the introduction of the PL, some interesting observations emerge, as indicated in Figure 5

[7] Obviously, this analysis oversteps the technological effect of substitution from stadium to TV. In the time period of analysis, TV coverage, quality and price has favored the TV-medium. As such, our analysis in this section, at best, is an approximation.

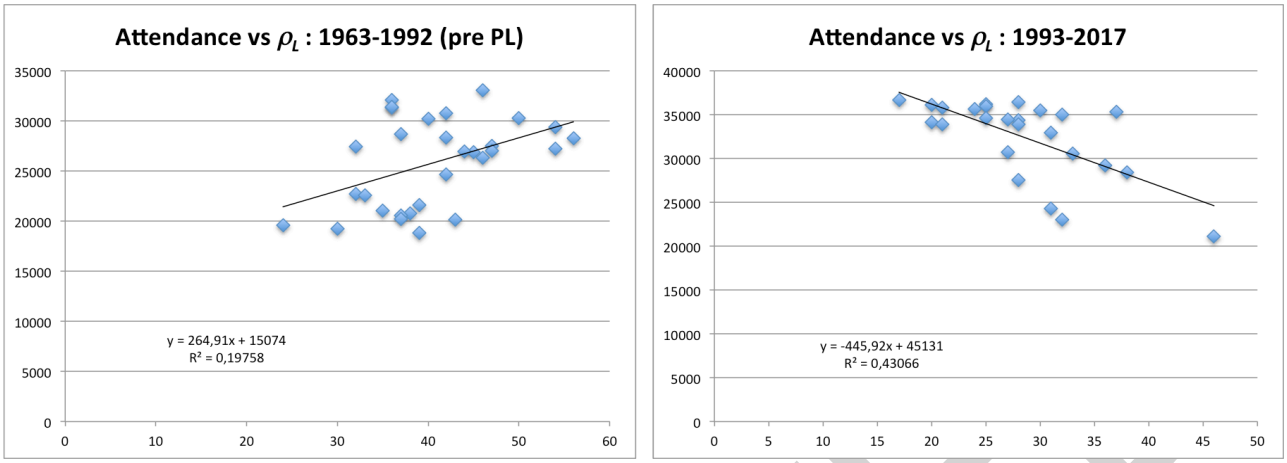

Figure 5: ρ_L and attendance in PL: 1963-1992 and 1993-2017

In the left part of Figure 5, everything is all right. The sign of the estimated regression coefficient (264.91) is positive, R^2 is a decent 0.2[8] and high significance in the estimate (98.6%[9]). However, the regression on the right is of course meaningless[10]. So, our efforts in finding a meaningful causality between UO and football demand fits nicely into what Szymanski [15] calls: (quote) «*results representing one of the most surprising findings* (or lack of such – our addition to the quote) *in the field of sports economics*.»

7 Conclusions

This paper has focused on analyzing time development of Uncertainty of Outcome in major European football leagues. Given that our measurement tool does provide reasonable measurement of UO, our initial hypotheses seem supported. Furthermore, given an assumption of a history that repeats itself, it is easy (by simple time series methods) to predict what the future might bring.

The fact that different countries have reached different levels of imbalance is perhaps not that surprising. It is also not very surprising that the level of danger" is clearly higher in Spain and UK. Still, the pattern of a continuing decrease in UO is common for all countries.

Such a future, where European football leagues ends up (competitively) like female handball leagues may not be the way neither football fans nor football officials may prefer. Surely, history almost never repeats itself. But still, our findings ought to raise some relevant questions to raise.

Do our findings indicate a development that is wanted? If not, what could be done to reverse and change European football into a more wanted, sustainable situation?

It is of course tempting to argue like climate researchers do, and use the «be prepared»

[8] After all, it would be very surprising if competitive balance was the only explanatory factor for demand.
[9] Estimation is done in *R* – see `https://www.r-project.org`.
[10] In fact, this regression is even more significant (99.96%) and R^2 is very much bigger. As such, this may serve as a very good example on the traps of statistical analysis.

principle. We know (logically), that at some point, UO will be too low for demand to be of any commercial interest. Presumably, such an outcome is not in the best interest of «the football family». However, we do not know when (or where) this point is. So, in order to prepare for such nasty outcomes, inducing a strategy of reversal or change (to be prepared) may be preferable.

We have already pointed out (see the Introduction) that the most important changes in the period; Champions League, TV-deals favoring the big teams, UEFA-FFP and the 3-1-0 point score system.

None of these topics are necessarily technically difficult to reverse, but removing or redistributing Champions League or TV-deal revenue will of course not be welcomed by football clubs. It is timely to remind about the simple fact that a potential treat about a super-league may come up quite quick if UEFA or FIFA starts experimenting with redistribution policies of revenue (fairly and squarely) earned by Europe's best football teams. As UEFA-FFP has limited effect (if any), it is of minor relevance.

However, the 3-1-0 point score system is easy to reverse, potential resistance from clubs or fans is at best minor, and it may have significant effects on UO. In fact, this system has proven to have many other negative effects – far beyond the negative impact on UO. For a very exotic example; see [4]. Obviously, changing the point score system back to the original 2-1-0 system is probably far from enough, if competitive balance is to be recovered. However, it is a cheap and uncontroversial option.

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