EVOLUTION OF THE COMPETITIVE BALANCE IN EUROPEAN FOOTBALL INDUSTRY THROUGH AN ANALYSIS OF STRUCTURAL BREAKS

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The competitive balance in the sports industry has been the subject of numerous studies since Rottenberg [1] emphasised the negative effects of unbalanced competitions on their own demands. The case of European football, probably the most important sport industry in Europe, has not been exempt from this interest and has been analysed by several authors.

Early studies (Mason [2] [3], Bain [4]), following the Structure-Conduct-Performance (SCP) paradigm indicate the existence of industries dominated by a very few companies which determine the behaviour of the market and the performance. As indicated by Szymanski [5], the football industry is not very different to other types of industry. Irrespective of their size, the majority of leagues have a similar composition in terms of dominance, whereby there are a few large clubs, the industry leaders, and unbalanced competitions (see for instance Michie and Oughton [6], Pawlowsky *et al.* [7], Borooah and Mangan, [8] or Lee and Fort [9], among others). As suggested by Buzzell [10], the distribution of market shares is asymmetric as a 'natural' phenomenon. Within a football industry context, Dobson and Goddard [11], Buraimo *et al.* [12], El-Hodiri and Quirk [13] or Quirk and Fort [14] suggest that the heterogeneity of firms in terms of demand, determines the lack of balance in domestic competitions and that, therefore, this competitive structure is, by nature, asymmetric.

According to Szymanski [15], the most successful clubs dominate the market, while the rest of the teams or the fringe of the competition account for a small share of the market. The explanation for this provided by Szymanski is based on Sutton's sunk cost theory[1], which forms part of the conceptual framework of the SCP paradigm. Both the size of the market and a successful early past have shaped an industry which, by nature, is asymmetrical. This indicates that a degree of dominance has always existed (Symanski [15]) and that a club's market size is positively affected by historic success (Sass [16]). An increasingly successful club can attract more and more supporters and thus yield higher revenues that lead to even more success and an ever-growing market share and dominance.

However, many studies analysing the competitive balance of European football and associating it with interventions by the regulators (Michie and Oughton [6], Pawlowski *et al.* [7], Carreras and Garcia [17] , Haugen and Heen [18], Plumley *et al.* [19], Ramchandani *et al.* [20], Poli *et al.* [21],

Triguero-Ruíz and Avila-Cano [22], Freestone and Manoli [23], Özaydin and Donduran [24], Penn and Berridge [25], Garcia-del-Barrio and Rossi [26], among others) indicate that there is a growing trend towards asymmetry, observing an overall increase in the imbalance which has worsened the competitive balance, particularly over the last two decades (Lee and Fort [9], Triguero-Ruíz and Avila-Cano [22], Penn and Berridge, [25]. For all these reasons, it would seem that the debate is still very open.

There is an intense debate in the sport economics field as to the possible causes of the policies that have tried to balance markets. First, some studies point to the increase in revenue derived from the marketing of the television rights and distribution policies, leading to the proposal of shared revenue and salary cap policies that seek to reduce the dominance of the powerful European teams. On the other hand, other studies point to the influence played by the main European regulator, UEFA, on the structure of the European football industry, signalling a recent concentration in the industry associated with the increase in the prize money received by the dominant teams (Pawlowsky *et al.* [7]). In this sense, it is considered that the changes in the format of UEFA Champions League have enabled the 'best clubs' to increase their revenues exponentially and therefore strengthen their dominant position in the industry. Furthermore, following other recent studies, it is interesting to analyse the effects of Financial Fair Play (FFP), which essentially also seeks to improve the competition in the industry. However, some authors such as Szymanski [27] believe the opposite is the case, in other words, that the FFP could have a negative effect on the competitive balance.

Within this context, this study examines the evolution of the competitive balance by using an analysis of structural breaks and the trend of the series, focusing on the moments in time when these structural shocks take place and seeking to associate them with the different policies that at some time have been able to modify the competition in the different European markets[2]. To do this, first the paper studies the stationary nature of the time series of competitive balance before determining the existence and characteristics of the structural break points and the changes in trend which from these points determine these shocks. Specifically, the study focuses on the last few decades and the effects that the changes in television revenues and sharing policies, the modification of the format of the Champions League in the year 2000 and the effect of introducing the FFP have generated. To carry out the study, 18 European leagues have been analysed from season 1992-93 to season 2018-19 which provides a very global vision that is not common in the studies of the field. The majority of these studies analyse the so-called 'Top 5 Leagues' (Spanish La Liga, English Premier League, Italian Serie A, German Bundesliga and French Ligue 1) with little attention being given to other leagues (some exceptions Goossens [28], who analyses 11 European leagues or Poli *et al.* [21] who study 24 European competitions). However, they do not offer the long-term approach that the present research proposes here.

In order to analyse the competitive balance, the Bradstreet Dutôt index is introduced as a measurement of sport activity. Compared to other measures of Competitive Balance, the Bradstreet Dûtot index is an unweighted complex indicator that considers all contributions to output in a homogeneous way. This index is appropriate as it measures the aggregate of the magnitude based on a point of reference, thereby analysing the competitive balance and the level of dominance in the industry. Our interest goes further and what is intended with the Bradstreet Dutôt index is to see how the level of competition has been affected by the regulation mechanism, hence an indicator outside these effects has been chosen in which only the agents' output is taken into account, not their distribution. An aspect worth highlighting in these types of activities is the fact that they are regulated and the sport output is measured under certain rules established by the regulator. These rules transform the activity of the teams into the sport output with a specific output allocation system.

Within this context, this study makes the following contributions to the literature. As pointed out by Garcia-del-Barrio and Rossi [26], further research could explore whether other types of structural breaks occur in the football industry. In our case, an analysis of structural breaks is carried out with the objective of not only analysing the evolution of the indicators of competitive balance but also to identify whether shocks occur in the trend of the series. Finally, the study examines a greater number of leagues than generally analysed by other authors, as it uses a sample of European 18 leagues over 26 seasons.

LITERATURE REVIEW: ASYMMETRICAL NATURE OF THE COMPETITIVE STRUCTURE OF EUROPEAN FOOTBALL

One of the first (and one of the most relevant) contributions to strategic analysis can be found in the studies by Mason [2] [3] and Bain [4]. The former carried out case studies of industrial companies and markets during the 1930s and 1940s while Bain [4] formalised the contributions of Mason through the Structure-Conduct-Performance (SCP) paradigm, which has been considered to be the basic core of industrial economics as a scientific discipline as it comprises a relatively compact body of concepts, hypotheses and evidence regarding the relationships between market structure, business conduct and business performance (Shepherd [29]).

The pioneering contributions of Mason and Bain established a one-way sequence, according to which the structural characteristics of the markets determine the conduct of companies and, finally the results obtained by the agents participating in the market.

TABLE 1
INDICATORS OF LONG-TERM COMPETITIVE DOMINANCE FROM SEASON 1964-1965 TO SEASON 2018-2019

	Number of Winners				Number of Wins for one team			
From Season:	1964-1965	1989-1990	1999-2000	2009-2010	1964-1965	1989-1990	1999-2000	2009-2010
To Season:	1988-1989	1998-1999	2008-2009	2018-2019	1988-1989	1998-1999	2008-2009	2018-2019
Austria	9	5	5	3	8	3	3	8
Belgium	5	4	4	3	11	4	5	5
Denmark	12	5	4	4	4	5	6	6
England		6	3	4	9	5	6	4
France	11	7	4	5	8	3	7	6
Germany	6	5	5	2	9	4	5	8
Greece	5	3	2	4	10	4	9	7
Italy	7	4	5	3	10	5	4	8
Netherlands	5	3	3	4	4	5	7	5
Norway	8	2	4	3	9	9	7	5
Portugal	4	2	4	2	3	8	6	6
Russia	7	2	5	4	11	7	3	4
Scotland	2	2	2	2	5	9	6	8
Spain	5	3	4	3	6	6	4	7
Sweden	6	4	7	4	9	6	3	5
Turkey	4	3	3	4	4	5	4	5
Ukraine	.	2	2	2	.	7	6	8

Source: Own elaboration

This paper considers that the classic SCP paradigm constitutes an appropriate theoretical basis for explaining the European football industry, highlighting the central importance of the size of the market for the early configuration of the structure of the competition in the local leagues (Buraimo *et al.* [12], El-Hodiri and Quirk [13], Quirk and Fort [14]. Very high concentration indices have existed in football since the 1950s. Thus traditionally highly concentrated structure has conditioned the results obtained in the industry, in line with the classic SCP paradigm. The dominant teams, with a higher budget, have easier access to talent, and, by paying higher salaries significantly condition the results in the industry. This naturally enables the asymmetry in the structure of the competition of this industry to be maintained. Furthermore, this pattern feeds back into itself due to the success of the clubs, which constitutes another fundamental barrier in the industry. For example, Bayern Munich, with a large difference with respect to the rest, has been the most successful team in Germany over the last 50 years and has the greatest market potential (number of fans). The same could be said of other clubs such as Real Madrid or FC Barcelona in Spain, Manchester United and Liverpool in England or Milan in Italy.

According to Szymanski [5], football is an industry characterised by dominance. The majority of the leagues reflect a similar configuration with a small number of large dominant clubs. The natural consequence of the dominance patterns gives rise to the competitive structure of football which is almost identical throughout the whole world. Following Sutton's sunk cost theory [30] [31], Szymanski [15] characterises the football industry by comparing it with the soft drinks industry, dominated by well-known brands. The asymmetric nature of the football industry is reflected in the existence of a dominance exercised by the successful teams that attract the largest number of fans, the early successes, etc., whereby the spiral of revenues, the recruitment of talent and new successes model the asymmetric nature of the industry.

Following Szymanski [5], the best way to analyse the evolution of the competitive balance sheet is to use long-term indicators. In this respect, simple measures of dominance, such as the maximum number of championships won by a team and the number of different teams that have won the championship in a period of time are used.

As Table 1 shows, from a global perspective, the long-term indicators show a highly concentrated industry, with a low number of teams that repeatedly win the competitions, win most of the points they play and accumulate victories in the competition. The data of the last three decades reveal that the number of winning teams in each league varies in the majority

of cases between 2 and 4, while the number of victories accumulated by the same team in the decade is more than 5 championships in almost all of the markets, which reflects a significant degree of concentration.

MATERIALS AND METHODS

Competitive Balance: Database and Bradstreet Dutôt Index

In order to analyse the evolution of the competitive balance in the European football industry, this study analyses 18 leagues over 27 years between the seasons 1992-93 and 2018-19.

The series of each of the 18 competitions has been constructed by generating an index for each of the leagues, similarly to the construction of market or sector indices or other economic variables.

As it concerns a magnitude series that does not introduce prices, the Bradstreet Dutôt Index has been used as the basic method for constructing the series. This index is appropriate as it measures the aggregate of the magnitude based on a point of reference. The point of reference is the first period of the competition and is considered as the production of the 'sector', that is the sport output period by period. It should be noted that the competitions in this industry are regulated in terms of the number of teams participating and the points assigned to the possible results of each match of the competition.

It is usual to use the Herfindahl index to measure the distribution of the result in a competition, but as is shown in Hay and Morris, ([32], p. 258 and following), citing Geroski [33], the index H is determined by the degree of collusion between the agents, which in turn determines the profit margin. Our interest goes further and what is intended with the Bradstreet Dutôt index is to see how the level of competition has been affected by the regulation mechanism, hence an indicator outside these effects has been chosen in which only the agents' output is taken into account, not their distribution. At the same time, given that the agents play a different number of games in the different leagues, being a relative indicator it is suitable for this analysis. Homogeneous capacities of the agents induce, in a competitive framework with regulated output, a more homogeneous distribution of output and therefore the regulatory measures should be aimed at achieving this objective of competition. To the extent that deviations are observed in the evolution of output, it is possible to induce undesired effects of the regulatory measures imposed.

In this sense, the points are considered as the product volume that each team generates in this competitive process, that is, their sport 'output' as this is what determines the final classification. The range of values that the production can take in each period is from 760 to 1140 points in leagues of 20 teams and from 612 to 918 in leagues of 18 teams. Of the matches played, if all of the results were draws, the minimum result possible of total production would be 20 points per day, so the whole period with the same result would add up to 760 or 612, depending on the number of teams. In the case where all of the results were wins, the maximum result possible of total production would be 30 points per day which would amount to 1140 or 918. The production of each period is between the maximum and minimum values, so the reference index measures the evolution of this production on the basis of the initial period.

From a production perspective, maximising the volume of sport output would be the desirable objective of each team. However, given that the result is obtained in competition, the output of the teams in each match is contingent. It does not solely depend on the capacity of a team but is also influenced by the efficiency of the competitive process between two teams at a time. If all of the matches ended in victory, the winner would obtain maximum efficiency and would achieve the maximum global output. However, each team, in turn, seeks to maximise its individual objective resulting in offensive strategies to obtain a win and defensive strategies in order not to lose the match. The latter do not contribute to the global maximum but generate positive output for the team implementing them. From the perspective of competition, more equal results would indicate similar capacities of the competitors, therefore, a greater balance in the competition and a lower global output, that is, more draws and less difference between the points of the teams in the classification would give rise to more competitive balances. On the contrary, a greater volume of output and a greater difference in points would indicate a lower level of competitive balance. In short, greater competitive balance is obtained when maximum homogeneity exists in the distribution of the maximum output.

The Bradstreet Dutôt expression is as follows:

$$BD_T = \frac{(\frac{1}{n}\sum_{i=1}^{n} q_{iT})}{\frac{1}{n}\sum_{i=1}^{n} q_{i1}}$$

Where:

q_{iT} indicates the accumulated sport output of each team at moment T;

q_{i1} indicates the accumulated sport output of each team at moment 1.

The evolution of the index reflects the output accumulated by the teams throughout the competition in relative terms to the initial output. The calculations are shown in the table 2.

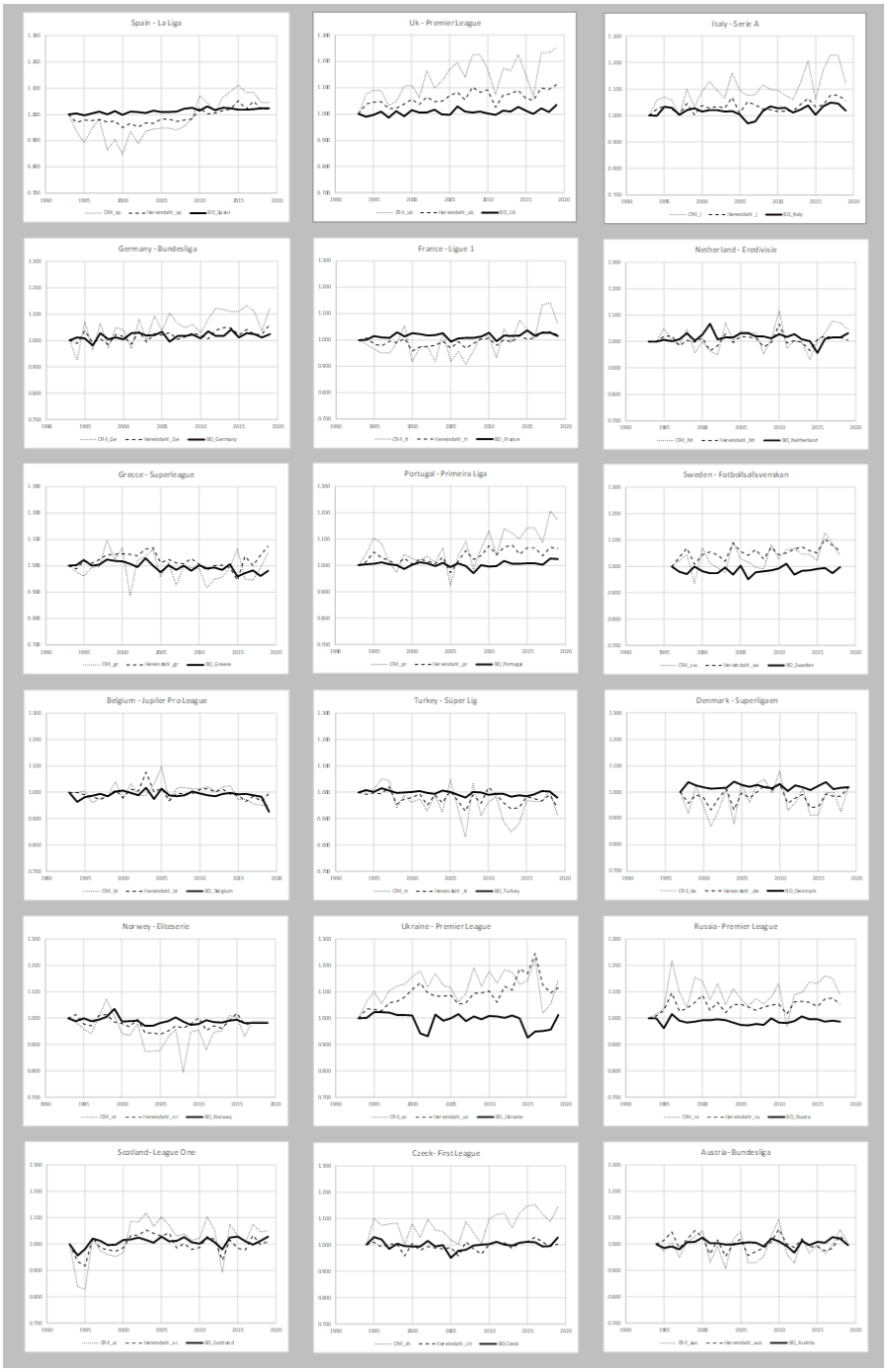
On average, the most productive competition in this period was the Liga followed by the Bundesliga and the Ligue1. The Bundesliga and the Liga also obtained

TABLE 2
BRADSTREET DUTÔT INDEX IN 18 EUROPEAN LEAGUES FROM SEASON 1 1992-93 TO SEASON 2018-19

Year	Austria	Belgium	Czech	Denmark	England	France	Germany	Greece	Italy
1993	…	1.000	…	…	1.000	1.000	1.001	1.000	1.000
1994	1.000	0.963	1.000	…	0.990	1.001	1.011	1.002	0.999
1995	0.986	0.981	1.029	…	0.997	1.016	1.007	1.021	1.033
1996	0.990	0.987	1,020	…	1.009	1.010	0.981	1.001	1.029
1997	0.980	0.994	0.985	1.000	0.985	1.009	1.027	1.005	1.002
1998	1.006	0.985	1.005	1.038	1.011	1.029	1.005	1.024	1.021
1999	1.008	1.002	0.995	1.024	0.992	1.014	1.011	1.019	1.028
2000	1.024	1.006	0.994	1.019	1.014	1.025	1.004	1.017	1.015
2001	1.002	0.998	0.994	1.013	1.006	1.022	1.028	1.008	1.020
2002	1.002	0.989	1.015	1.015	1.006	1.018	1.029	0.996	1.021
2003	0.998	1.018	0.994	1.017	1.016	1.019	1.018	1.030	1.015
2004	0.998	0.974	0.998	1.039	0.999	1.026	1.021	1.002	1.017
2005	1.002	1.013	0.951	1.026	0.997	0.993	1.033	0.976	1.004
2006	1.006	0.988	0.977	1.021	1.029	1.007	0.995	1.003	0.970
2007	1.004	0.985	0.982	1.026	1.009	1.009	1.016	0.985	0.977
2008	0.990	0.988	0.997	1.019	1.007	1.009	1.017	1.002	1.017
2009	1.020	1.004	1.002	1.015	1.010	1.013	1.022	0.982	1.034
2010	1.010	0.995	1.003	1.030	1.002	1.028	1.007	1.003	1.027
2011	0.992	0.989	1.011	1.004	0.996	0.995	1.035	0.989	1.029
2012	0.968	0.985	1.002	1.024	1.013	1.017	1.016	0.994	1.012
2013	1.012	0.994	0.997	1.019	1.009	1.015	1.017	0.985	1.022
2014	0.996	0.997	1.008	1.008	1.028	1.017	1.041	1.006	1.039
2015	1.008	0.992	1.011	1.023	1.013	1.036	1.012	0.960	1.002
2016	1.004	0.994	1.009	1.038	1.000	1.017	1.028	0.973	1.034
2017	1.026	0.988	0.994	1.010	1.022	1.028	1.024	0.983	1.049
2018	1.020	0.983	0.995	1.016	1.008	1.029	1.011	0.962	1.046
2019	0.996	0.926	1.027	1.018	1.035	1.015	1.023	0.980	1.018
Year	**Netherlands**	**Norway**	**Portugal**	**Russia**	**Scotland**	**Spain**	**Sweden**	**Turkey**	**Ukraine**
1993	1.000	1.000	1.000	1.000	1.000	1.000	…	1.000	1.000
1994	1.000	0.989	1.004	0.999	0.957	1.004	…	1.008	1.001
1995	1.007	0.998	1.006	0.961	0.981	0.997	…	1.002	1.023
1996	1.001	0.988	1.011	1.016	1.020	1.003	1.000	1.015	1,023
1997	1.008	0.994	1.004	0.991	1.012	1.012	0.980	1.006	1.021
1998	1.031	1.004	1.001	0.982	0.995	1.000	0.970	0.997	1.012
1999	1.004	1.035	0.986	0.987	0.997	1.013	1.000	0.999	1.012
2000	1.026	0.986	1.002	0.993	1.016	0.998	0.982	1.000	1.009
2001	1.069	0.988	1.011	0.991	1.018	1.011	0.974	1.005	0.943
2002	1.010	0.990	1.008	0.996	1.024	1.009	0.974	0.997	0.931
2003	1.017	0.970	0.996	0.993	1.016	1.005	0.996	0.995	1.014
2004	1.016	0.970	1.010	0.984	1.005	1.015	0.968	1.006	0.991
2005	1.032	0.982	0.993	0.975	1.027	1.010	1.002	1.000	0.998
2006	1.031	0.988	1.007	0.973	1.011	1.010	0.951	0.990	1.015
2007	1.019	1.002	0.997	0.978	1.013	1.012	0.978	0.979	0.988
2008	1.019	0.986	0.970	0.975	1.025	1.022	0.981	1.002	1.006
2009	1.012	0.975	1.000	0.999	1.007	1.026	0.986	0.999	0.995
2010	1.029	0.978	0.994	0.984	1.001	1.015	0.992	0.990	1.008
2011	1.018	0.993	0.997	0.981	1.024	1.030	1.010	0.995	1.006
2012	1.028	0.985	1.017	0.988	1.007	1.016	0.969	0.995	1.002
2013	1.010	0.984	1.005	1.007	0.979	1.025	0.983	0.984	1.009
2014	1.002	0.991	1.007	0.996	1.024	1.023	0.986	0.989	0.999
2015	0.957	0.994	1.007	0.996	1.027	1.018	0.990	0.985	0.926
2016	1.011	0.982	1.007	0.987	1.011	1.017	0.993	0.992	0.950
2017	1.016	0.981	1.002	0.990	0.998	1.020	0.974	1.005	0.952
2018	1.016	0.981	1.025	0.987	1.013	1.023	0.998	1.003	0.956
2019	1.031	0.981	1.024	…	1.027	1.023	…	0.979	1.011

Source: Own elaboration

FIGURE 1
COMPARATIVE EVOLUTION OF THE BRADSTREET DUTÔT INDEX IN 18 EUROPEAN LEAGUES, 1992-93 / 2018-19



Source: Own elaboration

the highest values of the index. The lowest minimum values were obtained by the Italian Serie A and the English Premier League. In terms of the variability of the results of the index, Serie A and the Liga exhibit a higher variability than the other competitions which were more stable.

With regard to the evolution of the indicator, an initial graphic analysis (see Figure 1) shows highly stable behaviour in most of the markets, although there are some changes in the indicator as shown in this Figure.

With the objective of giving greater robustness to the study, the values of the Herfindhal Index[3] and the indices of concentration CR_4 of the accumulated points for four dominant teams in the final ranking[4] have also been calculated following Lee and

Fort [9]. Figure 1 also shows the evolution of these measurements together with the BD index for the 18 leagues in the study.

By analysing these measurements, the results indicate that in many of the leagues there are variations but they occur at around the mean of the series. It is true that they are more volatile, particularly in the concentration index, but the pattern is similar to the one generated by the BD indicator. From a long-term perspective, can be concluded, therefore, that the asymmetry remains stable and no evident trend is observed in the competitive imbalance.

For the great majority of the cases studied, it can be seen that the series of the BD indicator do not show an increasing trend in asymmetry, which would contradict a large part of the literature produced to date. In some markets, for example, the Greek, Belgian or Turkish leagues, a decrease in the indicator and therefore an increase in their competitive balance can be seen. However, a more detailed statistical analysis is justifiable, given that, in some leagues, particularly in the big leagues (Spanish or German, among others) there does seem to be a slight increase in the indicator. The following section addresses these points in more detail.

Testing for changes in the competitive balance

The previous descriptive analysis (Tables 1 and 2 and Figure 1) has provided some debate about the existence of changes in the competitive balance of the European football leagues, which to some extent confirms our initial hypothesis. However, this is not the best approach for verifying this hypothesis. It seems more appropriate to apply the methodology proposed by Bai and Perron [34] [35] to the different indicators in order to test the existence of these breaks. These authors develop a procedure to detect and estimate multiple structural breaks, based on the estimation of the following linear model with *m* breaks. In our particular case, this model can be stated as follows:

$$y_t = \mu_j + v_t \quad t = TB_{j-1}, \ldots, TB_j \quad j = 1, 2, \ldots, m+1 \quad (1)$$

where μ_j are the parameters of the model, TB_j controls the period where the breaks appear ($T_o=1$ and $T_{m+1} = T$) and where v is an innovation that can follow a wide range of stationary models, including the general ARMA model. The Bai-Perron procedure is based on the recursive obtainment of Chow-type statistics. These authors also define the statistic WD_{max}, which tests for the null hypothesis of no structural breaks versus the presence of an unknown number of breaks. If this null hypothesis is rejected, the sequential F-seq statistics derived from Bai and Perron [34] or certain information criteria, such as the renowned SBIC, can be used in order to select the number of breaks. The use of this procedure has been discussed in papers such as Perron [36] or Cassini and Perron [37], amongst many others, and has been largely employed in the literature[5].

It is necessary to note that the Bai-Perron procedure only works correctly once stationarity is guaranteed. In this case, this is not a very restrictive assumption, given that the indices considered are bounded and, consequently, exhibit a finite variance, which casts serious doubts on the presence of a unit root in these variables. To confirm this point, some statistics for testing the unit root null hypothesis have been used. To this end, the standard unit root tests proposed in Dickey and Fuller [38] can be used. This statistic is obtained by estimating the following equation:

$$y_t = \mu + \rho y_{t-1} + \sum_{i=1}^{\ell} \varphi_i \Delta y_{t-i} + u_t$$

and, later, calculating the pseudo t-ratio $\tau_\mu = (t_{\hat{\rho}} - 1)/\hat{\sigma}_{\hat{\rho}}$. Given the lack of power of this statistic, the modifications proposed in Elliott *et al.* [39] have been considered, who based their results on the use of the Generalized Least Squares (GLS) estimation. This is obtained by first transforming the original variables as follows:

$$\bar{y}_t = (y_1, (1 - \bar{\alpha}L)y_t), \quad \bar{z}_t = (z_1, (1 - \bar{\alpha}L)z_t)$$

for $t = 2, \ldots, T$ with $\bar{\alpha} = 1 + \bar{c}/T$ where $\bar{c}$ is a non-centrality parameter that takes the value -13 for the case of a single intercept, and z_t reflecting the deterministic elements, a vector of those in this case. Later, it has been calculated the quasi-differenced variable $\bar{y}_t = y_t - z_t\hat{\beta}$, with $\hat{\beta}$ being obtained by regressing $\bar{y}_t$ on $\bar{z}_t$. Then, the following equation has been estimated:

$$\Delta\tilde{y}_t = b_0\,\tilde{y}_{t-1} + \sum_{j=1}^{k} b_j \Delta\tilde{y}_{t-j} + e_{tk}$$

and subsequently test for $H_0: b_0 = 0$. The value of *k* has been selected by using the MIC criterion suggested by Ng and Perron [40] with the modification proposed by Perron and Qu [41].

The inference on unit root may be distorted by the omission of changes in the deterministic elements. In this case, it is advisable to consider their presence. To this end, we have complemented the use of the DF-GLS statistics by employing the statistic developed in Perron and Vogelsang [42]. This is obtained from the estimation of the following model:

$$y_t = \mu + \rho y_{t-1} + \delta\, DAO_t + \gamma DU_t + \sum_{i=1}^{\ell} \varphi_i \Delta y_{t-i} + e_t$$

Where DAO_t= 1 if t=TB and 0 otherwise, DU_t = 1 if t=TB and 0, with TB being the period when the break occurs. This period has been estimated by minimising the value of the statistic $t_{\hat{\rho}} = (t_{\hat{\rho}} - 1)/\hat{\sigma}_{\hat{\rho}}$. The critical values of the min $t_{\hat{\rho}}$ are calculated in Perron and Vogelsang [42]. The value of the parameter ℓ has been estimated by analysing the significance of the estimation of the parameter ϕ, considering ℓ_{max} =3.

TABLE 3
TESTING FOR UNIT ROOTS

	DF-GLS	PV	TB1	CMR	TB1	TB2
Austria	-4.14**	-5.26**	2012	-5.07**	1996	2015
Belgium	-1.47	-5.91**	2018	-3.63	1997	2005
Czech	-2.66**	-3.14	2010	-5.53**	2003	2007
Denmark	-1.46	-6.38**	2009	-5.68**	2002	2006
France	-1.09	-2.53	2013	-6.22**	2003	2013
Germany	-1.52	-7.76**	2000	-7.82**	1999	2009
Greece	-0.76	-5.54**	2005	-9.17**	2003	2013
Italy	-3.06**	*-4.22**	2007	-7.42**	2004	2008
Netherlands	-3.90**	-4.94**	2015	-7.39**	2000	2014
Norway	-3.42**	-7.17**	1999	-7.89**	1998	2006
Portugal	-1.49	-4.15	2010	-5.49**	2006	2010
Russia	-2.14**	-5.49**	2008	-6.75**	2004	2007
Scotland	-3.75**	-4.63**	1999	-8.02**	1998	2012
Spain	-0.50	-3.84	2007	-9.17**	1995	2006
Sweden	-1.46	-7.98**	2011	-6.46**	2004	2008
Turkey	-2.09**	-4.47**	2007	-5.91**	1995	2004
UK	-1.90*	-2.85	2013	-7.01**	1998	2013
Ukraine	-2.98**	-3.69	2014	-4.97**	2001	2013

The Table presents the values of several unit root statistics. DF-GLS is the GLS version of the Dickey-Fuller standard statistics. PV and CMR take the extension of the latter, once 1 and 2 changes in the intercept are considered, respectively. TB1 and TB2 are the estimations of the period when the intercept changes.
** Means the rejection of the unit root null hypothesis at 5% significance level
* Means the rejection of the unit root null hypothesis at 10% significance level
Source: Own elaboration

Results and Discussion

Table 3 presents the results of the unit root statistics. First, it can be observed that the evidence against the unit root null hypothesis is moderate when no changes in the mean are considered. However, it is always rejected when the presence of changes in the intercept is considered.

Once stationarity has been proved for all the indices, the Bai-Perron methodology can be employed, the results of which are reflected in Table 4. As Table 4 shows, the use of the WDmax statistics allows to reject the non-structural break null hypothesis for just nine, half of the 18 leagues considered, even using a 10% significance level. In particular, the presence of changes in the intercept for the markets of France, Germany, Greece, The Netherlands, Norway, Portugal, Spain, Turkey and the UK can be rejected. In the rest of the cases, there is not enough evidence to reject the existence of changes in the evolution of the indices.

On the other hand, it is very important to highlight that a structural change is observed in only six of the markets, representing a jump to a lower level of competition (France, Germany, Netherlands, Spain, Portugal and England). If the estimated intercept before and after the first change is compared, it can be observed that the rank of values of the difference falls from -0.018 (Greece) to 0.015 (Netherlands and Germany). A negative variation can be observed in Greece, Turkey and Norway, while it is positive for the rest of the cases. Greece and Spain also exhibit a second break. In the case of Greece, the estimated intercept decreases to 0.993, while it increases in the case of Spain, confirming the path previously estimated for both countries.

Although a certain common pattern may be observed in the period between 1997 and 2003, when the majority of breaks occurred, if the periods when the breaks take place are analysed, there is no common pattern in the European industry. Rather, it could be characterised by a heterogeneous behaviour of the different leagues.

The examination of the results for the 5 Great Leagues, shows that the Spanish League, the English Premier League and the French Ligue I exhibit a break in 1997. The intensity of the change is quite large for the Spanish and French leagues, while it is somewhat smaller for the English Premier League. However, other jumps in the mean shown, for example in 2006-2009 and 2014-2015 are not

TABLE 4
BAI-PERRON METHODOLOGY

	WD_{MAX}	μ_1	TB1	μ_2	TB2	μ_3
Belgium	3.96					
France	12.43*	1.013	2003	1.025		
Germany	15.37*	1.006	2000	1.021		
Greece	29.35*	1.011	2003	0.993	2014	0.972
Italy	5.89					
Netherlands	16.04*	1.003	1997	1.018		
Norway	20.30*	1.001	1999	0.984		
Portugal	7.55	1.000	2011	1.012		
Scotland	4.04					
Spain	133.71*	1.003	2000	1.010	2007	1.022
Turkey	15.60*	1.002	2005	0.992		
England	19.85*	0.998	1999	1.011		
Ukraine	8.84					
Czech	7.60					
Austria	4.14					
Denmark	3.92					
Russia	58.10*					
Sweden	3.29					

This table presents the results of the estimation of the equation (1). WD_{max} tests for the non-structural break hypothesis. The column μi (i=1,2,3) are the estimated intercepts for each of the estimated segments, whilst TBi (i=1,2) are the periods where these breaks are estimated.
Source: Own elaboration

generalised and cannot be associated with a specific reason, such as the introduction of the FFP regulation in 2011 as debated in other studies.

Many studies, such as those by Pawlowski *et al.* [7], Mon-Friera and Rodríguez-Guerrero [43], Haugen and Heen [18], Plumley *et al.* [19], Poli *et al.* [21], Triguero-Ruíz and Avila-Cano [22], Özaydin and Donduran [24], Garcia-del-Barrio and Rossi [26], among others, show a decreasing trend in the competitive balance in European football leagues. This study, however, does not find any overall trend towards greater imbalance. Of the changes identified, no change in the overall trend in the industry can be observed. In order to study this aspect in greater depth, an analysis of the trend in the series has been carried out using the Perron and Yabu tests, which are presented in the table 5.

From the results of the change in trend tests carried out, the null hypothesis of no trend for Spain, Turkey and England may be rejected because, as it can be seen in the table, the critical value of 1.96 at 5% statistical significance is exceeded which therefore implies a change in trend in these markets. On the contrary, for the rest of the European leagues, the trend in a growing asymmetry frequently referred to in the literature does not exist.

Consequently, if there is a change in the structure of the competition in the markets, which is not widespread, this only occurs in nine of the 18 markets analysed. Furthermore, the change occurs in steps, 9 versus 3 markets, where the change also takes place in the trend. It is also worth highlighting that of the nine markets in which a change in steps takes place, the shock is negative on the level of competition in only six of them. Of the three markets that exhibit a change in trend, only in two (Spain and England) does this change translate into an increase in asymmetry.

CONCLUSIONS

This article studies the evolution of the competitive balance in the top European Football competitions. From a long-term perspective, the research concludes that the imbalance in competition has been permanent, exhibiting a stationary behaviour in the majority of the markets analysed. In line with the SCP paradigm the football industry shows an asymmetrical nature of the competitive structure, dominated by a very few companies which determine the behaviour of the market and the performance.

A clear pattern of interventions by the local and European regulators in the balance of the industry has been not found. The changes in the concentration

TABLE 5
PERRON AND YABU TESTS

	t1	t2
Austria	1.03	1.01
Belgium	-1.27	-1.27
Czech	0.46	0.43
Denmark	-0.40	0.14
France	0.64	0.64
Germany	1.80	0.86
Greece	-0.80	-0.80
Italy	1.11	1.01
Netherlands	0.95	0.95
Norway	-1.66	-1.61
Portugal	0.83	0.83
Russia	-0.23	-0.23
Scotland	1.38	1.38
Spain	2.90	2.06
Sweden	0.72	0.69
Turkey	-2.96	-2.92
England	4.27	4.27
Ukraine	-0.99	-0.73

This table presents the results of the estimation of Perron and Yabu test for trend analysis.
Source: Own elaboration

indicators, therefore, have not led to an increased imbalance, but it can be observed an increase in the level of competition in steps, but with no great change because policies, due to the asymmetric nature of these markets.

The findings of the study indicate that there are small groups of teams that dominate the national competitions. It seems that the relevant market for the domestic dominant clubs will be the international competitions and the national competitions will become the access gate to them. The institutions, therefore, should observe the generation of revenue of these competitions carefully and how this can influence the domestic leagues.

Another important result shows a reduction in the competitive balance in certain leagues, not in the large majority, and how it has occurred in steps and without a clear trend, which contradicts the widespread idea of other studies of the literature. To date, the majority of the literature (Pawlowski *et al.* [7], Mon-Friera and Rodríguez-Guerrero [43], Haugen and Heen [18], Plumley *et al.* [19], Poloi *et al.* [21], Triguero-Ruíz and Avila-Cano [22], Özaydin and Donduran [24], Garcia-del-Barrio and Rossi [26], among others) has focused on indicating the existence of an overall reduction in the competitive balance, but in general terms, they refer only to the trend without examining whether this change really occurs in this way or whether it takes place in steps. Within this context, this article covers this gap in the literature, analysing not only the evolution of the competitive balance in European football but also whether what is occurring is a change in the trend of the series or in steps. As indicated by Garcia-del-Barrio and Rossi [26], it is necessary to conduct further research in order to explore the structural breaks in the football industry and from the results obtained it can be concluded that there is no overall trend towards imbalance and that in the cases in which change occurs, it does so in steps.

The study of its evolution through structural change tests reveals the non-permanent nature of the shocks observed during the most repeated pattern (between the years 1997 and 2003). Furthermore, the findings of the analysis of the trend of the series carried out in this study show that the concept of a growing trend towards an imbalance in the European football markets is not a widespread phenomenon, but an isolated event in many of the markets. In any case, the temporary shock occurring due to the reform of the European competition in the principal leagues was noteworthy (4 of the 5 with the exception of Italy experienced a change in mean), but it was not a permanent shock given that it did not subsequently imply a change in the trend (this was only the case in two leagues, which are two of the largest - the Liga and the English Premier League). On the other hand, this seems logical, given that these markets are those with the most number of clubs in their principal target market, the European market.

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FOOTNOTES

[1] According to this theory, the existence of sectors characterised by a high degree of concentration is the result of the presence of high fixed irrecoverable costs (sunk costs). In the case of the football industry, the investment in players represents a barrier for the competition of the smaller clubs (Szymanski [5]).

[2] These factors are the format of the competition, that is, the number of teams that compete in the different leagues; the point system used, as the same rules have not always applied; and the broadcasting rights of the different leagues and the different ways of sharing the revenue.

[3] The Herfindhal-Hirschman Index: $HHI = \frac{(H - 1/N)}{1 - 1/N}$ being $H = \sum_{i=1}^{N} S_i^2$ the Herfindahl index and N the number of teams competing.

[4] Concentration Index; $\alpha_k = \frac{\sum_{i=1}^{k} P_i}{k2 \cdot (2N - k - 1)}$ P_k is the number of accumulated points by K teams during the season, where k is the two, three and four best teams and N the total number of teams.

[5] In this regard, we can cite the recent papers of Luo and Zhang [44], Yobom and Le Gallo [45] or Caporale and Gil-Alaña [46], just to mention some few examples.

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