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THE DEGREE OF COMPETITION IN THE EUROPEAN FOOTBALL LEAGUES: A STATISTICAL APPROACH

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Abstract

As a professional sport, professional football teams in a league compete in imperfect market conditions since every team in a professional football league may be known by their differentiated product (i.e. the quality of football they play). If the competition level increases, the quality of football being played may also increase. Thus, consumers` (i.e. football spectators) value of money spent on football should increase too.
Thus, this paper tries to implement the above mentioned economic principle through a statistical method on nine European countries football leagues, in an individual and comparative manner. During the estimation period, it is calculated that, on average, the highest level of football competition took place in France, whereas Turkish football came last.

I.INTRODUCTION

This paper examines the degree of competition in nine European First Division football leagues over seven seasons. It finds that the degree of football competition in these European countries varies at national and European level for the respective seasons.

The literature on the economics of professional team sports has increased rapidly since the appearance of Simon Rottenburg`s paper in 1956 (Cairns et al., 1986, 3,and Vrooman, 1995,972). The existing literature on the economics of professional team sports is by and large concentrated on the estimation of the demand for attendances at the sport matches.

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Consequently, econometric techniques are in wide-spread use (Cairns et al., 1986, 14-15). There have also been repeated attempts to measure the degree of uncertainty, which is regarded as one of the major factors in determining the attendances at football matches. Moreover, the uncertainty of outcome is directly related to the degree of competition in a football league. Obviously, the competition results in an increase in the quality of matches.

This paper is divided into five sections. Section II reviews briefly the relation between the uncertainty of outcome and the degree of competition in professional team sports.

Section III introduces a statistical method aiming at the measurement of the degree of football competition with the intention of determining the uncertainty of outcomes.

Section IV presents the measurement and results of the football competition in nine European countries, followed by the evaluations of the results and concluding remarks, Section V.

II.THE UNCERTAINTY OF OUTCOME AND THE DEGREE OF COMPETITION

For a long time there has been concern over the relation between the uncertainty of outcome and the degree of competition in professional team sports. The uncertainty of outcome is a direct function of the degree of competition. As the degree of competition increases, the uncertainty of outcome will increase. Consequently, the demand for professional team sports should increase too. As El-Hodiri and Quirk (1971) have argued, the gate receipts depend crucially on the uncertainty of outcome of the games played within the league. Since the probability of a team winning approaches one, gate receipts fall substantially (El-Hodiri and Quirk, 1971, 1313). Sloane (1971) points out that uncertainty as well as the quality of football creates interest (Sloane, 1971, 124). Sloane (1971) also implicitly identifies the

short- and long-run uncertainties (Jennet, 1984, 179 and Sloane, 1971, 124-138). Thus, short-run uncertainty of outcome basically concerns ìcompetitive balanceî within a season. Rottenburg (1956) argued that the closer the competition within a league and the longer the challengers are in contention for the championship, the larger will be the attendances (cited in Jennet, 1984, 179). On the other hand, the extent of domination over time of the number of league championship competitors by one or a few clubs where over-domination occurs,as Sloane (1971) has commented, means that spectator interest can be substantially reduced (Jennet, 1984, 179 and Sloane, 1971, 125). Although Jennet`s (1984) model confirms that uncertainty of outcome is a significant determination of attendances in certain matches but less important as a determinant of aggregate attendances, he also finds that the potential for generating attendances through increasing uncertainty of outcome is relatively small (Jennet, 1985, 193-194). On the other hand, Peel and Thomas (1988) have argued that ìany attempt to produce closer competition to increase match uncertainty of outcome with the intention of increasing gate attendances may be undesirable from the perspectives of individual clubs; supporters apparently like to watch high-placed teams particularly when their own team is likely to winî (Peel and Thomas, 1988, 248). Nevertheless, they also stressed that there should be an appropriate variable to measure the uncertainty of outcome in order to present the competitiveness of a league (Peel and Thomas, 1988, 248). Similarly, Cairns, et al. (1986) comment on the importance of the uncertainty of outcome but conclude that existing studies have failed to capture all the dimensions of the uncertainty of outcome (Cairns, et al., 1986, 17-21). There is a general tendency that the uncertainty of outcome is measured through econometric techniques: see Jennet (1984), Cairns, et al. (1986), Peel and Thomas (1988), Bainbridge et al. (1996). On the other hand, Karacan`s (1966) paper suggests a simple statistical variable for the

degree of competition in a football league which can be used also as an appropriate proxy for the uncertainty of outcome. Karacan (1966) argued that ìthe coefficient of variationî could be used as the sole explanatory variable to determine the competitiveness of a football league. According to Karacan (1966), dispersion of the final standing points of a football league is a direct result of the competitiveness that takes place between the football teams in a season. And the competition rules are determined the same by the league every year (Karacan, 1966, 83). Thus, this paper has adopted the model of Karacan (1966) with some modifications and extensions as a way of measuring the competitiveness in the nine European football leagues.

III.A STATISTICAL METHOD FOR COMPETITIVENESS

According to Karacan (1966), the competition method is based on a simple statistical relation. He assumes that i there is N team in a league, the number of total matches and total points are constant providing that all matches are played and no point is deducted. He also assumes that football clubs in a league within a season play normally two matches with each other. For a win, the winner gets two points; the loser gets nil; and one point is awarded to each team in the case of a draw. Consequently, the permutation ${}_NP_2$ represents the number of the total matches played in a league within a season. Obviously 2. ${}_NP_2$ represents the total points of the league within a season.

The mean of the total points $\bar{X}$ is:

$$\bar{X} = \frac{2._N P_2}{N} = 2(N-1)$$

He argued that the dispersion of (2. $_N$P$_2$) can be used as an appropriate variable to determine the competitiveness in a football league. Consequently, the closer the team's final standing points to $\bar{X}$, the higher the competitiveness. As competition increases, the probability of draws will be increasing too, indicating that the strengths of the teams are getting very close to each other. Moreover, standard deviation of the total points (s) will represent the effects of every point. Therefore, providing that the number of football teams in a league is constant $\bar{X}$ will be constant too. As a result, will be an appropriate proxy to determine the competitiveness. Nevertheless, it is very common practice to change the size of a league from one season to another for some reasons. Thus, if N is not constant, s allows us to determine just one season's competitiveness. In order to compare the level of competitiveness between the seasons, we need another proxy variable. Karacan (1966) suggests the use of the coefficient of variation (CV), which is equal to

s / $\bar{X}$. As indicated by Bancroft and O`Sullivan (1988), V is very useful to compare the different size sets to each other (Bancroft and O`Sullivan, 1988, 112). The values of V range between 1 and 0 which represent the degree of competition. In the first instance, let us assume that the teams in a league are separated from each other by their absolute strength and are ranked from 1 to N according to their strength. Obviously, there is no change factor involved in the matches. Thus, at the end of the season, the champion team would have won all its matches. The runner-up team would have beaten all the other teams in the league except for the champion. The other teams in the league will follow the similar process. For example, the team at

the bottom of the strength rank would have not won any matches in a season. Obviously, this extreme league does not allow any change for a draw. Assuming the winning team gets two points and each team plays two matches with the other teams in the league within a season, the total points of the winner will equal:

$$X_1 = (N-1)4.$$

Similarly, the second team`s total points will equal:

$$X_2 = (N-2)4.$$

And i th team total points is equal to:

$$X_i = (N-i)4.$$

Table 1 presents some calculated maximum V values regarding the size of a league.

Table 1
The Maximum V Values

Size (N)	V Maximum
2	1
4	0.745
6	0.683
16	0.614
18	0.609
20	0.607
22	0.604
28	0.598
30	0.596

This extreme case indicates that there is no competition at all amongst the teams of this league. Consequently, there is no uncertainty. The second extreme case concerning the value of V arises as it becomes regardless of the size of the league. This situation occurs, as all teams in a league would have exactly the same strength. Thus, each team either finishes all of its matches with a draw or will have equal wins and losses. As a result, all the teams would get exactly the same total points at the end of the season:

$$X_1 = X_2 = X_3 \ldots\ldots = X_N = \bar{X} = (N-1)2.$$

It is very clear that this extreme case presents a perfect competition between the teams of a league. Therefore, the uncertainty of outcome will be at the highest level. Thus, the possible values of V are:

$$0 \leq V \leq 1$$

As V gets nearer to 0, the level of competition increases or vice versa. One plausible solution to increase the competition is to increase the size of a league, as indicated by Neale (1964) and recommended by Chester and P.E.P. reports (Neale,
1964, 8 and cited in Sloane, 1971, 125). Nevertheless, there is not much room for this policy regarding the small changes in V as the size of league (N) changes; see Table 1. Moreover, for practical, economical and social reasons, it appears that the optimum size for a league consists of 16 to 22 teams. For example, the running of a league with 28 teams is not viable, since players need resting and pre-season preparations. Or the small-sized league with 2 to 6 teams may not be economical to run, as well as the possible lower level of competition.

IV.RESULTS

This section provides the statistical results of the degree of football competition in the first division leagues of nine European countries during the seasons 1990-91 to 1996-97.In the beginning of the measurement period, the English and Turkish leagues were based on a three points system whereby the winning team gets three points, a draw entails one point for each team and no point is given to the losing team. Gradually, the other European countries have also introduced the three points system to their national football leagues hoping that the competitiveness in the matches increases, as recommended by Newson (1984) (cited in Cairns, et al., 1986, 57). Statistically, a change in the point system of a league does not affect the

value of V providing that all the calculations are done with the same units. Nevertheless, in this study, all nine European countries` football leagues` final standing points are converted into the two points system for the convenience of calculations. The summary of the calculations has been presented in Table 2.

According to the respective values of V for each season, a National Football Competition Index (NFCI) has been formed too. The base year (season) for the NFCI is the season of 1990-91 for all the nine European countries. In order to make a clear comparison between the nine European countries` football competitiveness, a European Football Competition Index (EFCI) has been formed on the basis of each country`s value of V for the respective seasons. In forming the EFCI, firstly a country with the lowest value of V has been selected for each season. Then the other countries` values of V are compared to the base year (season) country's value of V accordingly; see Table 3. Moreover, in order to reduce competitiveness of the seven seasons into one average competitiveness figure, for each country's average, the coefficient of variation (AV) has been used and the countries have been ranked respectively in Table 4. And finally, to form a Composite European Football Competition Index (CEFCI), average values of the nine European countries` V (EAV) have been calculated for each season and have been presented in Table 5.

Table 2

Summarized Figures Used For the Measurement of the Nine European Countries Football Competition.

ENGLAND

Seasons	s	$\overline{X}$	V	AV	NFCI (1990-91=100)
1990-91	9.52	38	0.252		100
1991-92	8.50	42	0.202		80
1992-93	6.80	42	0.162		64
1993-94	3.56	42	0.227		90
1994-95	11.05	42	0.263		104
1995-96	3.79	38	0.257		102
1996-97	7.54	38	0.198		78
				0.222	

FRANCE

Seasons	s	$\overline{X}$	V	AV	NFCI (1990-91=100)
1990-91	6.51	38	0.171		100
1991-92	8.09	38	0.213		125
1992-93	6.69	38	0.228		133
1993-94	9.24	38	0.243		142
1994-95*	8.79	38	0.231		135
1995-96	7.27	38	0.191		112
1996-97	9.01	38	0.237		139
				0.216	

GERMANY

Seasons	s	$\overline{X}$	V	AV	NFCI (1990-91=100)
1990-91	7.98	34	0.234		100
1991-92	7.92	38	0.208		89
1992-93	7.44	34	0.218		93
1993-94	6.61	34	0.194		83
1994-95	9.82	34	0.288		123
1995-96*	6.94	34	0.204		87
1996-97	9.27	34	0.226		96
				0.224	

GREECE

Seasons	s	$\overline{X}$	V	AV	NFCI (1990-91=100)
1990-91	7.71	34	0.226		100
1991-92	8.25	34	0.242		107
1992-93*	10.26	34	0.301		133
1993-94	8.97	34	0.263		116
1994-95	11.65	34	0.342		151
1995-96	10.93	34	0.321		142
1996-97	11.26	34	0.331		146
				0.289	

HOLLAND

Seasons	s	$\overline{X}$	V	AV	NFCI (1990-91=100)
1990-91	8.60	34	0.253		100
1991-92	11.29	34	0.332		131
1992-93	10.19	34	0.299		118
1993-94	3.17	34	0.269		106
1994-95	11.22	34	0.331		131
1995-96*	11.08	34	0.326		129
1996-97	9.57	34	0.281		111
				0.284	

HUNGARY

Seasons	s	$\overline{X}$	V	AV	NFCI (1990-91=100)
1990-91	7.11	30	0.237		100
1991-92	8.42	30	0.280		118
1992-93	8.05	30	0.268		113
1993-94	8.73	30	0.291		123
1994-95*	5.33	30	0.177		75
1995-96	7.22	30	0.240		101
1996-97	11.31	34	0.322		136
				0.259	

ITALY

Seasons	s	$\overline{X}$	V	AV	NFCI (1990-91=100)
1990-91	8.67	34	0.255		100
1991-92	10.18	34	0.299		117
1992-93	7.90	34	0.232		91
1993-94	9.27	34	0.272		107
1994-95*	10.00	34	0.294		115
1995-96	8.44	34	0.248		97
1996-97	7.86	34	0.231		90
				0.261	

SPAIN

Seasons	s	$\overline{X}$	V	AV	NFCI (1990-91=100)
1990-91	7.20	38	0.189		100
1991-92	8.50	38	0.223		118
1992-93	10.02	38	0.263		139
1993-94	7.96	38	0.209		110
1994-95	9.02	38	0.237		125
1995-96*	9.48	42	0.225		119
1996-97	10.33	42	0.245		130
				0.227	

TURKEY

Seasons	s	$\overline{X}$	V	AV	NFCI (1990-91=100)
1990-91	7.85	30	0.261		100
1991-92	10.00	30	0.333		127
1992-93	9.83	30	0.327		125
1993-94	9.12	30	0.307		118
1994-95	11.04	34	0.324		124
1995-96	11.03	34	0.324		124
1996-97	12.22	34	0.359		137
				0.319	

Notes and Explanations:
s: Standard deviation of the total points

$$s = \sqrt{\frac{\left(x_i - \overline{x}\right)^2}{N}}$$

$\overline{X}$: mean of the total points

$$\overline{X} = \frac{\sum x_i}{N}$$

V: the coefficient of variation
V=s/ $\overline{X}$

AV: Average coefficient variation of the seven seasons.
NFCI: National Football Competition Index, the base year (season) for all the countries is the season of 1990-91. An increase in the NFCI in relation to base year indicates a decrease in the competitiveness or vice versa.
*: indicates the season of introducing three point system to a league for the first time.

Table 3
European Football Competition Index (EFCI) and Ranking

Seasons

	1990-91		1991-92		1992-93		1993-94		1994-95		1995-96		1996-97	
Rank	Country	EFCI	Country	EFCI	Country	EFCI	Country	EFCI	Country	EFCI	Country	EFCI	Country	EFCI
1	France	100	England	100	England	100	Germany	100	Hungary	100	France	100	England	100
2	Spain	110	Germany	103	Germany	134	Spain	101	France	135	Germany	107	Germany	114
3	Greece	132	France	105	France	140	England	109	Spain	139	Spain	118	Italy	117
4	Germany	137	Spain	110	Italy	143	France	117	England	149	Hungary	126	France	120
5	Hungary	139	Greece	120	Spain	162	Greece	126	Germany	168	Italy	130	Spain	124
6	England	146	Hungary	138	Hungary	165	Holland	129	Italy	172	England	134	Holland	142
7	Holland	148	Italy	148	Holland	184	Italy	131	Turkey	189	Greece	168	Hungary	163
8	Italy	149	Holland	164	Greece	186	Hungary	140	Holland	194	Turkey	170	Greece	167
9	Turkey	153	Turkey	165	Turkey	202	Turkey	148	Greece	200	Holland	171	Turkey	181

Table 4
Average Football Competitiveness
(1990-91 to 1996-97)

Rank	Country	AV
1	France	0.216
2	England	0.222
3	Germany	0.224
4	Spain	0.227
5	Hungary	0.259
6	Italy	0.261
7	Holland	0.284
8	Greece	0.289
9	Turkey	0.319

Table 5
Composite European Football Competition Index

Season	EAV	CEFCI (1990-91=100)
1990-91	0.230	100
1991-92	0.259	113
1992-93	0.255	111
1993-94	0.252	109
1994-95	0.276	120
1995-96	0.259	113
1996-97	0.270	117

V. EVALUATIONS AND CONCLUSIONS

Even though the calculations have been limited to only seven seasons due to lack of relevant data, this paper still provides some important conclusions for the degree of football competition in nine European countries, in addition to cross and average comparisons. For a start, let us look at Table 2: it presents the competition variables, V`s, for each individual country over seven seasons. As far as the values of V are concerned, they seem to be quite small and stable, implying that the degree of football competition in the European countries is very intense. For example, especially in the season of 1992-93 for England, in the season of 1990-91 for France and in the season of 1994-95 for Hungary, we can conclude that the degree of football competition reached almost near to the perfect competition level. As a result, the supporters in these countries for the respective seasons should have enjoyed very competitive matches that provided the highest value for money spent on these matches. Nevertheless, in all countries except England, Italy and Germany, the degree of football competition in relation to the season 1990-91 tends to decrease. In some cases, fluctuations are very noticeable, like England, Greece and Hungary. We can also conclude that German and Italian leagues seem to have a large number of football teams whose strength is very close to each other, since these countries had very little fluctuations in their competitive coefficient; whereas Turkish and Greek leagues seem to be getting dominated by few teams, as their competitive coefficient is getting increased all the time. The impact of introducing to a three point system to a football league is not necessarily positive as far as this paper is concerned. Some countries (Germany, Holland and France) appear to be benefiting from this policy, but some countries (Greece, Hungary and Spain) had negative impact of this policy. Considering Table 3, we see that the degree of football competition varies significantly in relation to the base country's competition coefficient. In this respect,

on average, English, German, French and Spanish leagues have outperformed the other leagues. Moreover, relatively the worst level of football competition took place in the leagues of Turkey, Greece and Holland.

The 1990-91-football season in the nine European countries seemed to achieve its peak level on average. In relative terms, the poorest season for all the countries was the season of 1994-95. Finally, Tables 4 and 5 present some aggregate degree of football competition at national and European level. According to Table 4, an average of the seven football seasons, French football performed at the highest level of competition, closely followed by English, German and Spanish football. Conversely, especially Turkish, Greek and Dutch leagues provided relatively the least competitive matches. On analysing the average level of the football competition for Europe (see Table 5), we can conclude that the level of football competition has been considerably competitive and stable over the seven seasons. Consequently, the spectators` football expenditures should have yielded a significant level of satisfaction. As a final word, this paper has tried to present a statistical competition variable, which can also be used to easily determine the degree of competition in other professional team sports.

REFERENCES

Baimbridge, M., Cameron, S. and Dawson, P. (1996). Satellite Television and Demand for Football: a Whole new Ball Game? *Scottish Journal of Political Economy*, 43, 3, pp.317-333.

Bancroft, G. and O Sullivan, P. (1988). Maths and Statistics For Accounting and Business Studies, second edition. Mc Graw-Hill, UK.

Cairns, J. , Jennet, N. and Sloane, P.J. (1986). The Economics of Professional Team Sports: a Survey of Theory and Evidence. *Journal of Economic Studies,* 13, 2, pp.3-81.

El-Hodiri, M. and Quirk, J. (1971). An Economic Model of Professional Sports Leagues. *Journal of Political Economy*, 33, November-December 1971, pp.1302-1319.

Jennet, N. (1984). Attendances, Uncertainty of Outcome and Policy in Scottish League Football. *Scottish Journal of Political Economy*, 33, 2, pp.176-198.

Jones, J.C.H. (1969). The Economics of the National Hockey League. *Canadian Journal of Economics*, February 1969.

Karacan, N. (1967). Turkiye Futbol Liginde Rekabet Derecesi Artıyor mu, Azalıyor mu? İstatistik Bir Yaklasim". *İktisat Fakültesi Dergisi*, 26, 1-4, pp.82-94.

Neale, C.W. (1964). The Peculiar Economics of Professional Sports. *The Quarterly Journal of Economics*, 78, 1, pp.1-14.

Newson, G. Three Points for a Win: Has it Made any Difference? *The Mathematical Gazette*, Vol.68, pp.87-91.

Peele, D. and Thomas, D. (1988). Outcome Uncertainty and the Demand for Football: an Analysis of Match Attendances in the English Football Leagues. *Scottish Journal of Political Economy*, 35, 3, pp.242-249.

Rothmans Football Yearbook, Editor: Glenda Rollin. Editions 22-28. Headline Book

Publishing, England.

Rottenburg, S. (1956). The Baseball Players` Labour Market. *Journal of Political Economy*, June, 1956.

Sabah, Turkish Daily newspaper, various issues, Istanbul.

Sloane, P.J. (1971). The Economics of Professional Football: the Football Club as Utility Maximiser. *Scottish Journal of Political Economy*, 18, 3, pp.121-146.

Vrooman, J. (1995). A General Theory of Professional Sports Leagues. *Southern Economic Journal*, 61, 4, pp.971-990