

An Alternative Approach to Ranking in Football Leagues

Measuring the Degree of Competition

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Abstract

Industry concentration measures have been widely used in the analysis of industry competition. However, no attempt has been made to extend these measures to the sport industry. This paper measures the extent to which there is a concentration of winning teams in the soccer leagues as well as the degree of competition among clubs in the major European soccer playing countries.

UEFA, the governing body of European soccer, seasonally ranks European countries. While this ranking serves to measure how 'good' is a country's football league, it fails to answer another question: how competitive is the country's domestic league? It is entirely possible that a country ranked very high by UEFA criteria, however has a fairly weak domestic league, dominated by a few clubs with the rest languishing.

Football teams, like firms, compete in a closed market (no entry and exit) for market share (points). This paper does a comparative analyses of domestic football leagues to see the extent to which there is 'market share domination' to the extent that a few football clubs have the greatest market share (points). Some measures of industrial concentration are used to measure the extent to which there is a 'club' concentration in these countries. Our paper analyses data from the 2002-2003 1st division domestic league competitions of the top ten UEFA ranked countries. A comparison is made with the results thus obtained with the UEFA ranking. This paper is innovative in its application of widely used industrial concentration techniques to the field of soccer. Our study points to an alternative measure of ranking football leagues using our competitiveness index.

JEL Classification: C60, D21, Z00,

Keywords: ranking measures, industry concentration, football leagues, market share

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1. Introduction

UEFA, the governing body of European football, seasonally ranks European countries, a ranking widely followed by sports buffs everywhere. This country ranking also determines the number of teams from each country that can participate in UEFA Champions Cup (Champion's League) competition and the UEFA cup competitions.

In the UEFA ranking, every country (overall there are 51 European countries that are ranked) receives two points for every victory of its team and one point for draw. Cups' qualification matches are counted half and bonus points are awarded for participation in Champions' League group stage and quarterfinals, semi-finals and final of all cups. The country coefficient for one year is the sum of all earned points in that year divided by number of participating clubs. The sum of five consecutive year coefficients gives value for country rank.

While this ranking serves to measure how 'good' is a country's football league, it fails to answer another question: how competitive is the country's domestic league? It is entirely possible that a country ranked very high by UEFA criteria, however has a fairly weak domestic league, dominated by a few clubs with the rest languishing.

This paper uses some concentration measures to explore the extent to which domestic football leagues are competitive. We try to answer a few questions such as to what extent is there domination by a few clubs in a country's domestic football league? Is there concentration of 'market power' as measured by team performance in domestic football? We use some measures of industry competition and apply it to the case of football.

The current analysis uses data from the 2002-2003 1st division domestic league competitions of the top ten UEFA ranked countries. In any given season, football teams, like firms, are competing for points (market share) in a closed market (no entry and exit). Some measures industrial concentration are used to measure the extent to which there is a 'club' concentration in these countries. A comparison is made with the results thus obtained with the UEFA ranking. We believe that this first attempt of its kind to apply economic measurement techniques of market power would enable us to quantify

and understand better how 'competitive' is a country, domestically, in the field of football. In this paper we do a cross section analyses of competitiveness and in subsequent research hope to see the evolution of competitiveness of football leagues as well. The paper is organized as follows. In section 2, provides an overview of the various industry concentration measures commonly used. In section 3, we give the summary of the statistical application of these measures in the various country football leagues being measured. We create our own index of competition, and compare it with the UEFA rankings for 2002. We conclude this paper in Section 4, where we also point toward directions for future research are indicated.

2. Industry Concentration Measures

The concentration of firms in an industry is of interest to economists, business strategists, and government anti monopoly regulatory bodies. The concentration measures give an idea of the degree of market power that firms enjoy in their respective industry. Two commonly-used methods of measuring industry concentration are the Concentration Ratio and the Herfindahl-Hirschman Index.

2.1 Concentration Ratio (CR)

The concentration ratio is the percentage of market share owned by the largest m firms in an industry, where m is a specified number of firms, often 4, but sometimes a larger or smaller number. The concentration ratio often is expressed as CR_m , for example, CR_4 ².

The concentration ratio can be expressed as:

$$CR_m = s_1 + s_2 + s_3 + \dots + s_m \quad (1)$$

where s_i = market share of the i^{th} firm.

In general, if the CR_4 measure is less than about 40 (indicating that the four largest firms own less than 40% of the market), then the industry is considered to be very competitive, with a number of other firms competing, but none owning a very large chunk of the market. On the other extreme, if the CR_1 measure is more than about 90, that one firm that controls more than 90% of the market is effectively a monopoly.

² If the CR_4 were close to zero, this value would indicate an extremely competitive industry since the four largest firms would not have any significant market share.

While intuitively appealing and simple to calculate, the concentration ratio presents an incomplete picture of the concentration of firms in an industry because by definition it does not use the market shares of all the firms in the industry. It also does not provide information about the distribution of firm size. For example, if there were a significant change in the market shares among the firms included in the ratio, the value of the concentration ratio would not change. Further, a more equal market share of the firms not in the index, would also not alter the ratio.

2.2 Herfindahl-Hirschman Index (HHI)

Unlike the concentration ratio, the Herfindahl-Hirschman Index (HHI) provides a more complete picture of industry concentration. The HHI takes into account the market shares of all the firms in the industry, and these market shares are squared in the calculation to place more weight on the larger firms. The HHI is given by:

$$\text{HHI} = s_1^2 + s_2^2 + s_3^2 + \dots + s_n^2 \quad (2)$$

where s_i is the market share of the i^{th} firm and n the number of firms in the industry.

One advantage over the concentration ratio is that HHI is sensitive to changes in market share among the larger firms. For instance normalized to 100, an HHI of 100 implies a monopoly market with a 100% market share. On the other hand, if the industry was characterized by a very large number of firms competing, each of which having nearly zero market share, then the HHI would be close to zero, indicating nearly perfect competition.

2.3 Entropy Measures

Entropy measures provide important tools to indicate variety in distributions at particular moments in time, for instance market shares and also to analyse evolutionary processes over time. There have been several applications of entropy in the realms of industrial organisation and innovation studies³.

³ See Koen (2003) for a complete description of the use of entropy measures for eliciting information regarding market concentrations.

From the n number of information values $h(p_i)$, the expected information content of a probability distribution, called entropy, is derived by weighing the information values $h(p_i)$ by their respective probabilities:

$$H = \sum_{i=1}^n p_i \ln\left(\frac{1}{p_i}\right) \quad (3)$$

where H stands for entropy in bits.

The entropy value H is non-negative. The minimum possible entropy value is zero corresponding to the case in which one event has unit probability:

$$H_{\min} = 1 \cdot \ln\left(\frac{1}{1}\right) = 0 \quad (4)$$

When all states are equally probable ($p_i = \frac{1}{n}$), the entropy value is maximum:

$$H_{\max} = \sum_{i=1}^n \frac{1}{n} \ln(n) = n \frac{1}{n} \ln(n) = \ln(n) \quad (5)$$

A popular application of the entropy formula in industrial organisation is in empirical studies of industrial concentration (see for instance Theil 1967). Probability measures are associated with market shares and applied to a distribution of market shares, entropy is an inverse measure of concentration. The entropy measure ranges from 0 in the case of monopoly to infinity in the case of markets characterized by perfect competition. Horowitz and Horowitz (1968) proposed an index of relative entropy by dividing the entropy by its maximum value⁴ $\log_2(n)$. This gives us a concentration index which lies between 0 and 1. In this paper, we use the normalized or relative entropy measure to measure the degree of concentration of points in the various national football leagues.

⁴ In physics, maximum entropy characterises distributions of randomly moving particles that all have an equal probability to be present in any state (like a perfect gas).

2.4 Inequality Measures of Competition

Besides the three measures of industrial concentration that we apply in our study, two particular inequality measures are of additional interest. In particular, these inequality measures illuminate the degree to which the points obtained by the teams are unequal. We use the Lorenz curve and the Gini coefficient to measure the extent of this 'unequal' distribution of points.

The Lorenz curve plots the cumulative % of points provided by the cumulative % of teams, starting from the team with the smallest point. Greater inequality in the points table results in the Lorenz curves lying further from the diagonal line, which represents an industry of equal size firms.

The Gini coefficient is the ratio of the area between the diagonal line and the Lorenz curve to the area of the triangle. The greater the inequality in the points table, the greater is the shaded area, and the greater is the Gini coefficient on a scale of zero (perfect equality) to one (theoretical maximum indicating everyone has zero share, except one)⁵.

The Gini coefficient is most easily calculated from unordered size data as the "relative mean difference," i.e., the mean of the difference between every possible pair of individuals, divided by the mean size \bar{X} .

$$G = \frac{\sum_{i=1}^n \sum_{j=1}^n \sum_{j \neq i}^n |x_i - x_j|}{2n^2 \bar{X}} \quad (6)$$

3. Measuring Competitiveness of National Football Leagues

While firms compete for market share, football teams compete for points. Unlike markets however, football leagues are not characterized by free entry and exit⁶, and furthermore, the total market size, the total points in the league tables, is not fixed. However the competition is for points, and often there is a dominance effect where a

⁵ For more on the use of Gini coefficient as an inequality measure, see Sen.

⁶ There is a relegation of some clubs (market exit) after the season. The number of clubs in the league remain the same since these clubs are replaced by top ranked lower division teams. The change in the total number of clubs in the league is determined by the national football federation.

few football teams rule the table. This dominance can be captured by the industry concentration measures that we have outlined above.

A domestic football league which is very competitive implies that the probability that any team will win over any other team in the league is very high. Translated from probabilistic measures, the outcome of such a high degree of competitive pressure is a more equal distribution of points in the league. Thus the inequality measures would capture the degree of competition in these football leagues.

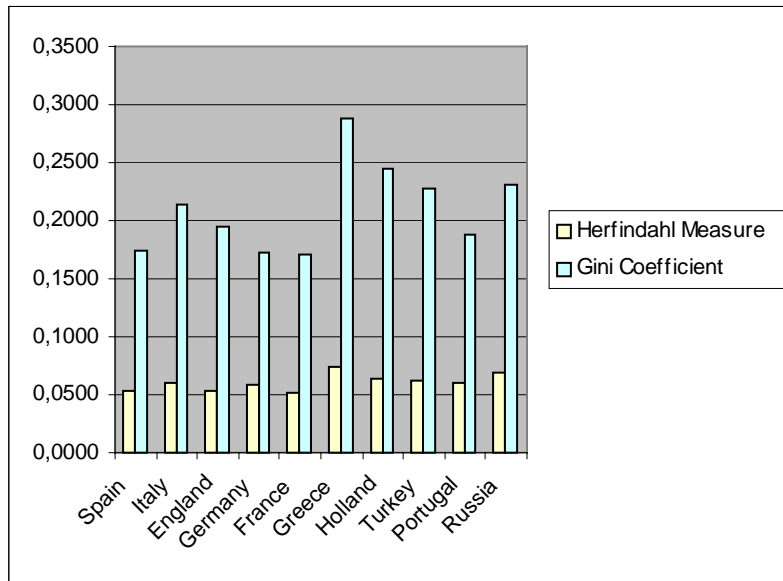
In this paper, using the three measures of industry concentration and inequality measures of competition. These are the HHI, the entropy values H and the Gini coefficient. We apply these measures to the league results of the top ten national leagues in Europe, as ranked by UEFA. The league data was obtained from the national league football federations.

The market share of any team is given by the point share, $s_i = \frac{x_i}{X}$ where x_i is the number of points scored by club i and X the total point score in the league and \bar{X} the average league score (for Gini coefficient calculations). The club point share s_i is also the probabilistic measure used for calculating the entropy values.

The countries selected for our analyses were Spain, Italy, England, Germany, France, Greece, Netherlands, Turkey, Portugal and Russia. These were the top ten countries ranked by UEFA.

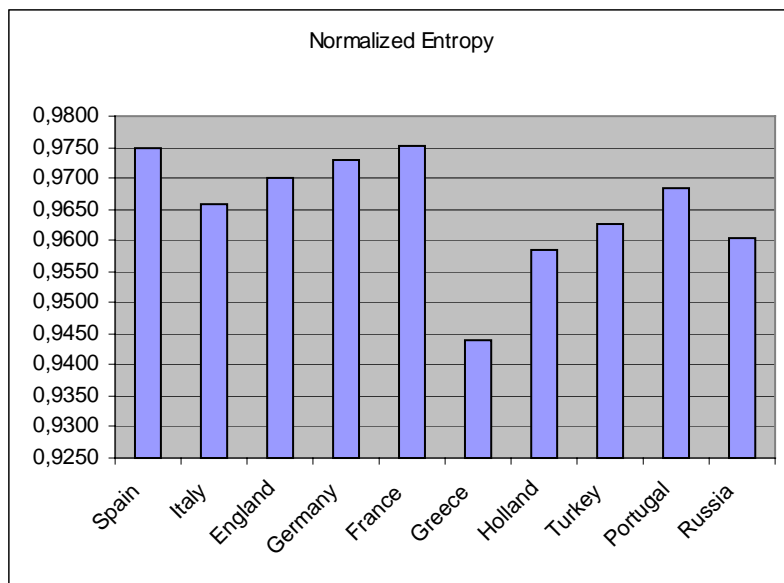
Graph 1 below give the values of the HHI and Gini coefficient for each of the ten countries.

Graph 1



Graph 2 illustrates the entropy values of the countries, which matches the overall concentration ranking that have been derived.

Graph 2



Based on the concentration and inequality measures, we then ranked the countries from 1 (least concentrated and most competitive) to 10 (most concentrated and least competitive), for each of the three measures. The total concentration score is the unweighted sum of the rankings that gave us our final concentration rankings. The table below gives the summary results of our concentration analyses.

Table 1: Summary Scores using Concentration and Inequality Measures

	HHI	Normalized Entropy	Gini Coefficient	Concentration Score	Competitiveness Ranking
France	1	1	1	3	1
Spain	2	2	3	7	2
England	3	4	5	12	4
Germany	4	3	2	9	3
Portugal	5	5	4	14	5
Italy	6	6	6	18	6
Turkey	7	7	7	21	7
Holland	8	9	9	26	9
Russia	9	8	8	25	8
Greece	10	10	10	30	10

The results are generally robust, with very little variation if only one of the measures had been chosen. The final ranking corresponds to the rankings determined by the normalized entropy values. This competitiveness ranking gives us a good measure of the degree of competitiveness as measured internally in each of the national football leagues for the ten chosen countries.

4. Conclusions

Industry concentration measures have been widely used in the analysis of industry competition. However, no attempt has been made to extend these measures to the sport industry. In this paper we study the concentration of winning teams in the soccer leagues as well as the degree of competition among clubs in the major European soccer playing countries.

While UEFA, the governing body of European soccer, seasonally ranks European countries in an attempt to measure how 'strong' is a country's football league, it fails to answer another question: how competitive is the country's domestic league? UEFA measures doesn't take into account the fact that a country can have a high ranking but at the same time be dominated by a few clubs. Thus another measure of a 'strong' football league, which is the degree of internal competition is not registered by the UEFA rankings. Thus it is entirely possible that a country ranked very high by UEFA criteria, however has a fairly weak domestic league, dominated by a few clubs with the rest languishing.

Football teams, like firms, compete in a closed market (no entry and exit) for market share (points). This paper does a comparative analysis of domestic football leagues to see the extent to which there is 'market share domination' to the extent that a few football clubs have the greatest market share (points). Some measures of industrial concentration are used to measure the extent to which there is a 'club' concentration in these countries. Our paper analyses data from the 2002-2003 1st division domestic league competitions of the top ten UEFA ranked countries. We then come up with our own ranking of the national divisions using the Herfindahl-Hirschman Index (HHI), the normalized entropy value and the Gini coefficient. Our ranking of the countries chosen has France as having the most competitive first division football league and Greece the least.

This paper is innovative in its application of widely used industrial concentration techniques to the field of soccer. It is intuitively appealing and we give an alternate way of measuring the strength of first division football leagues, by measuring the degree of internal competition. Future research would use time series analyses for country rankings and also do comparative analyses with the UEFA rankings. Our approach serves as an alternative approach to ranking national football leagues.

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