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Did the UEFA Champions League winners start in an easy group?

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ABSTRACT

Competitive balance indicates the degree of control participating teams have over a sports competition. Supporters look for excuses to justify their team's defeat and the triumph of their rivals. If the competition has required a preliminary qualifying group stage, they will argue that the winning team was in an "easy group" from the start, and their team was unlucky to be in a "difficult group". It is therefore of interest to determine what is an "easy group" and what is a "difficult group". This is directly related to the concept of competitive balance. We have a wide range of indices to measure competitive balance. We will use the Distance to Competitive Balance, a standardized index that complies cardinality property. The perfectly unbalanced distribution is the truncated cascade, which allows the maximum value of concentration to be obtained. We focus our attention on the UEFA Champions League, before and after competition, and we measure the competitive balance of the qualifying stage groups between the 1999/2000 and 2022/2023 seasons. The composition of the UEFA Champions League groups seems to be balanced and has no influence on which team will be the champion. A highly competitive group will be more "difficult" in terms of qualifying than a highly concentrated one. Supporters say that their team was unlucky to be in a "difficult" group, but the data does not prove them right.

KEYWORDS

Sports economics; competitive balance; UEFA Champions League; distance to competitive balance

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1. Introduction

Competitive balance has been one of the concepts central to sports economics research since the pioneering works of Rottenberg (1956) and Neale (1964). The competitive balance in a sports competition indicates the extent to which the dominant teams tend to accumulate wins. In other words, competitive balance signifies the level of control participating teams have over a sports competition (Szymanski, 2003; Koning, 2009). The relationship with the concept of concentration is inverse: a higher control of results by a few teams indicates less competitive balance. Conversely, when all teams in a competition achieve the same result, competitive balance is at its peak.

At the start of a competition, one can evaluate the strengths and weaknesses previously displayed by each participating team. For instance, in the case of football, these can be "summarized" by the points that UEFA or other confederations allocate to their associated clubs (Csató, 2023; Frick et al., 2023; Triguero-Ruiz & Avila-Cano, 2023). At the end of the competition, attention shifts to the distribution of the results obtained (Fort & Maxcy, 2003; Gerrard & Kringstad, 2021; Kringstad & Gerrard, 2004; Owen et al., 2007; Triguero-Ruiz & Avila-Cano, 2019).

In a league with n teams where ties are permitted and where teams have bilateral face-offs in a double round-robin system, it is intuitive that the league's competitive balance is at its maximum if all teams either tie every match or each team wins one encounter with another (locally, for instance) and loses the second one (in this case, as the visitor). The crucial point is that, in the end, all teams would have the same number of points, leading to a peak in competitive balance, with no group of teams monopolizing victories. Under such conditions, in sports that don't allow ties as match outcomes (volleyball, baseball, basketball, etc.), the highest competitive balance would occur if, in any direct confrontation, each team has an equal chance of winning. Therefore, a league demonstrates maximum competitive balance if, for every team pair i and j, the probability that team i will prevail is 50%. If a league showcases perfect competitive balance, every match would be unpredictable, and every team a potential champion. Conversely, in sports where ties are possible, intuition suggests that, before each game, the highest competitive balance corresponds to a situation where teams either tie or, if there's a victor, each of the teams has a similar winning probability. In any case, when competitive balance is at its peak, concentration is at its lowest, and the points distribution that generates it is uniform: this is the '*perfectly balanced distribution'*. Conversely, if concentration is at its peak (around a core group of teams accumulating victories), the competition's competitive balance is at its minimum, and the point distribution representing it is asymmetrical: this is the '*perfectly unbalanced distribution*' (Avila-Cano et al., 2021, 2023): that which generates the highest concentration index value for the given number of participating teams.

The relationship between the level of competitive balance and the demand made by sports event consumers has also been analyzed. Initially, there was a direct relationship assumed between competitive balance and demand. However, this hypothesis, known as the 'Uncertainty of Outcome Hypothesis' (El-Hodiri and Quirk, 1971; Quirk and Fort, 1992; Schmidt and Berri, 2001), has been either contested or, at the very least, not fully validated (Coates et al., 2014; Collins & Humphreys, 2022; Eckard, 2017).

In this sense, what is the fan interest? This is another theme. Obviously, a fan wants his/her team to win every competition. So, when a team wins a championship, there is no doubt that supporters of rival teams will disagree. It will be understandable that such supporters will look for and "find" excuses to justify the defeat of their team and the triumph of their rivals. In particular, if the competition has required a preliminary qualifying group stage, as is the case for the UEFA Champions League (UCL), they will argue that it was unfair and that, if anything, the winning team was in an "easy group" from the start. Obviously, they will say that their team was unlucky to be in a "difficult" group, which made it difficult for them to win in the end. Of course, there are also the referees... It is therefore of interest to determine what is an "easy" group and what is a "difficult" group. This is directly related to the concept of competitive balance. And how can we measure competitive balance?

We have a wide range of indices to measure competitive balance. When these indices are applied to the score

vector give us a number representing the level of competitive balance. These indices, related to those which measure levels of inequality and concentration (although the relationship of both these concepts with competitive balance is clearly inverted) must be standardized to incorporate specific concepts related to sports economics (possible changes in the number of teams between seasons and the bilateralism of the matches, which prevent any one team from ending up with all the points at stake). This standardization requires knowing the minimum and maximum values that an index can theoretically reach. However, determining these values has not been a contentious issue until recently, despite the fact that the scoring system and the number of teams affect the maximum value of the concentration index. Whatever the case, this article is centred in football, and within football this problem has been solved because the perfectly unbalanced distribution of points, which generates the maximum value of the concentration index, has been determined (Avila-Cano et al., 2021).

In this article we assume that a highly competitive group will be more "difficult" in terms of qualifying than a highly concentrated one and we analyze if the UCL winners started the competition in groups that could be considered easier than average.

Therefore, we will measure the competitive balance of the UCL qualifying stage groups between the 1999/2000 and 2022/2023 seasons. Since that date the format has been 32 teams grouped into 8 groups. How are these 8 groups formed? The 32 participating teams in the UCL group stage are seeded into four groups or “pots”, with eight teams in each. The composition of the first group (“Pot 1”) has changed over time. UEFA coefficients (based on historic performance in UEFA tournaments of clubs in their domestic leagues – UEFA club coefficients-, or historic performance of national teams -UEFA country coefficients) are used by UEFA to form the groups (Triguero-Ruiz & Avila-Cano, 2023).

After these four groups of eight have been ordered, a draw decides the formation of eight competition groups with four teams in each. The teams from the first group of eight head each one of the competition groups drawn; and in succession, the next eight teams from the second group are also assigned by a draw, to each of the eight competition groups. Likewise, the third and fourth. The one restriction is that teams from the same association cannot compete in the same group. Finally, in each competition group, the four teams play a double round-robin league with the score system of points for a (p_w), draw (p_t) and loss (p_l): $\{p_w, p_t, p_l\} = \{3,1,0\}$. The first two from each group qualify for round of sixteen according to the total score reached after this league. From then on, there are double elimination rounds apart from the final, which is single (UEFA, 2019). Our interest lies in the competition phase for groups.

For each season, we will construct a result concentration interval around the average of the 8 groups. Those groups that fall outside the lower end of the interval will be considered significantly more competitive and will constitute the "difficult" groups for that season. Conversely, groups that fall outside the upper end of the concentration interval will be considered the "easy" groups for that season. Note that, due to the competition system, the top two teams advance to the next round. Thus, if the UCL winning team was in one of these latter groups, they progressed to the next stage of the tournament more easily than if they had competed in a more closely contested group, with similar final scoring levels.

We will measure the competitive balance:

- Ex ante, based on the coefficients assigned to the teams by UEFA itself (UEFA, 2019). These coefficients are used by UEFA itself to form the groups. The groups are formed according to the degree of strength that the teams have displayed over the previous season, historically, and in terms of their corresponding national leagues. The coefficient summarizes these attributes (Avila-Cano & Triguero-Ruiz, 2023).
- Ex post, i.e., after the competition, based on the results obtained by each team in their matches against their rivals. This is the method commonly used to measure the competitive balance of a league (Fort & Maxcy, 2003; Gerrard & Kringstad, 2021; Kringstad & Gerrard, 2004; Owen et al., 2007; Triguero-Ruiz & Avila-Cano, 2019).

In this way, we identify the type of group in which the UCL winner began the competition, both based on their prior demonstrated strengths "synthesized" into the coefficient assigned by UEFA to each team (ex ante) and based on the performance of each team during the group stage (ex post). Significant coincidences in both cases would reinforce the claim that the winner was in an "easy" group.

The article is structured as follows: In Section 2 we define the methodology. Section 3 presents the results of the competitive balance indices applied, compares the results and analyses if the UCL winners started the competition in groups that could be considered easier than average. Finally, our conclusions are presented.

2. Methodology

The competitive balance of any competition is measured with a variety of indices associated with the concepts of inequality and concentration. In the sport economics literature, it is currently accepted that these indices must be standardized, which enables measurements to be compared to the extend that:

- They incorporate the possibility that the number of teams in the competition can vary, in such a way that the standardization can correct the possible variation in the minimum value of the index, which is reached when all teams have the same number of points.
- They reflect the impossibility of reaching a monopoly configuration, as the maximum value of concentration of results, given the bilateral nature of the games.

In this way the standardized index is constructed, relativising its value in terms of both the minimum that it can fall to, and the maximum distance (difference between the index's maximum and minimum values). Notable among these indices is the standardized Herfindahl-Hirschman (HHI_{Norm}) proposed by Owen, Ryan and Weatherston (2007): $HHI_{Norm} = \sqrt{\frac{HHI - HHI_{min}}{HHI_{max} - HHI_{min}}}$, where HHI is the index without standardization, defined as the sum of the square of the points quotas of the teams in the league; $HHI_{min} = 1/n$ the minimum value in a league of $n \in \mathbb{N}$ teams; and HHI_{max} is the maximum value (less than unity because it cannot reach the monopoly configuration). HHI_{max} is obtained from the perfectly unbalanced distribution, which will be calculated as a function of the number of teams and the championship scoring system (Triguero-Ruiz & Avila-Cano, 2019).

In this article, we use the Distance to Competitive Balance (DCB) proposed by Triguero-Ruiz and Avila-Cano (2019): $DCB = \sqrt{\frac{n \cdot \sum_{i=1}^{n} s_i^2 - 1}{n \cdot \sum_{i=1}^{n} (s_i^{max})^2 - 1}}$, where $s_i \in [0,1]$ is the i's team share of points; $\sum_{i=1}^{n} s_i = 1$; and s_i^{max} is the share of team i in the perfectly unbalanced distribution. This standardized index fulfills the cardinality property, that is, it has the unit interval as its range, and is represented by a mathematical distance. Therefore, DCB index is particularly useful in comparative studies, because: (i) The values obtained with the measurement have a meaning (the concentration percentage with respect to the maximum achievable); and (ii) the differences (and proportions) between such values also have a meaning. DCB can be expressed as a function of the standardized Herfindahl-Hirschman index: $DCB = \sqrt{HHI_{Norm}}$.

Calculating the DCB implies having to know the value of HHI_{max}. This is generated by the distribution which we call perfectly unbalanced. This distribution of the final points of a tournament is known as the complete cascade. In this distribution each team has beaten all teams below them in the final ranking and lost to all those above; the last in the ranking has lost to all: Fort and Quirk (1995); Gayant and Le Pape (2012, 2015); Horowitz (1997); Larsen, Fenn and Spenner (2006); Owen, Ryan, and Weatherston (2007); o Utt and Fort (2002). Avila-Cano et al. (2021) have demonstrated that, for UCL, the perfectly unbalanced distribution is a truncated cascade. In this distribution there are a group of teams who have a cascade of wins, and the rest draw all games that they have not lost against the former.

Since in each UCL competition group, the four teams play a double round-robin league with the score system

of points $\{3,1,0\}$, the truncated cascade distribution is as follows: the first team will have won all its matches (earning 18 points) whereas, each of the other three teams will have lost the two games, and drawn with the other teams; so, each of the three will have a total of 4 points. In total 30 points will have been shared out, and the quota distribution will be $(0.60, 2/15, 2/15, 2/15)$. This distribution generates the maximum concentration of results, so that the corresponding value of the HHI index in this distribution is: $HHI_{max} = 0.413$. The Distance to Competitive Balance index generates a unit value: $DCB = 1$. Avila-Cano et al. (2021) and Avila-Cano et al. (2023), in supplementary materials, provide a MS Excel spreadsheet, which achieves these results for different scoring systems.

For this reason, we have to identify when a group is easier or more difficult. The answer is found in the ease or difficulty with which a team qualifies for the next round. We must remember that, out of the four teams competing in the league by double round-robin and with the score system $\{3,1,0\}$ only the first two qualify, i.e., the two who accumulate the most points after playing every game.

When, therefore, can we consider a group to be more difficult? As we understand it, when the four teams have similar levels of strengths, competitive balance is greater. So, the toughest groups will be those where competitive balance is greater, i.e. the concentration of results is lower. We also believe that this should happen in a significantly different way to the rest of the groups in the round. Note that, the lowest concentration of results lies in the perfectly competitive distribution in which all the teams have a results quota of $s_i = ¼$, for all i and $HHI = ¼$. Therefore, the DCB index value will be null.

Consequently, once the DCB have been calculated for each group and season, and each case has been statistically analyzed to classify it in relation to whether or not the distance from the group average for each season is statistically significant, we can identify each group thus: “Easy”, with DCB significantly higher than average, or “difficult”, with DCB significantly lower than average.

Finally, the identification of each team's strengths can be understood from a viewpoint prior to the competition (“ex ante”) or after it (“ex post”). In the former case, the assessment of teams' strengths and weaknesses must necessarily be comprehensive and linked to the overall information they have displayed in previous encounters. In the latter, to understand their relative strengths and weaknesses, we simply need to look at the outcomes of the matches they've played during the competition. In this paper, we've addressed both aspects. Thus, on one hand, we've used the UEFA points or coefficients of each team right before the start of the UCL season (“ex ante”), and also, we've looked at the point distribution achieved by each participating team during the group phase (“ex post”). Therefore, we have two information sources that might not necessarily be correlated. Indeed, in the first case, we have a synthetic indicator summarizing each team's prior performance. In the second, we know how those strengths and weaknesses effectively played out against each specific opponent they faced.

Consequently, the methodology we've employed in the analysis focuses on the use of normalized concentration indices to measure competitive balance and, specifically, the Distance to Competitive Balance. We know the reference values for normalization, and we apply the analysis both before and after the group stage competition unfolds. Our interest lies in identifying, for each season, out of the 8 groups, those that are, apparently, "easy". We understand that the more competitiveness there is (more equality, given the number of teams in the group, more competitive balance among them, and less concentration), the harder the group will be in terms of qualifying for the knockout stage. Therefore, we calculate the competitive balance indices for each group in each season, and in each season, we identify those groups that statistically have a significantly lower competitive balance. These are the "easy" groups. The question is, did the UCL winner belong to one of them?

3. Is the UCL champion’s group easier?

We have calculated the *DCB* indices for each of the eight groups from the 1999/2000 seasons to 2022/2023.

This exercise has been done from both ex ante and ex post perspectives. Having done so, we count on 192 observations of ex ante competitive balance corresponding to each of the eight groups for each of the twenty-four seasons, and another 192 observations for the ex post competitive equilibrium. Table 1 shows this information.

Table 1. DCB index in the UCL group stage (1999-2018): EX ANTE → EX POST. Highlighted the champion's group (t - Student99% = 2.3646).

Group Season	A	B	C	D	E	F	G	H	Confidence interval (Ex ante)		Confidence interval (Ex post)	
									Lower	Upper	Lower	Upper
1999/00	0.7165→0.5682	0.6519→0.7171	0.4879→0.3780	0.6714→0.4660	0.6929→0.5689	0.5004→0.4509	0.4016→0.6993	0.3173→0.2893	0.430	0.680	0.392	0.642
2000/01	0.5848→0.6386	0.6799→0.6193	0.5759→0.4513	0.3976→0.1634	0.5235→0.2736	0.6351→0.3576	0.5056→0.4167	0.5091→0.3943	0.478	0.625	0.280	0.548
2001/02	0.6323→0.5576	0.3321→0.4374	0.3089→0.2916	0.3138→0.3001	0.4281→0.3919	0.5898→0.7715	0.5769→0.3636	0.5245→0.7336	0.351	0.575	0.324	0.638
2002/03	0.5002→0.2677	0.6943→0.8508	0.6963→0.3749	0.3601→0.3971	0.3466→0.4305	0.6856→0.5689	0.3363→0.5957	0.6066→0.8137	0.392	0.664	0.362	0.713
2003/04	0.3610→0.1948	0.5002→0.1634	0.3908→0.5446	0.4544→0.4902	0.5497→0.6882	0.7789→0.7171	0.3857→0.4420	0.4184→0.2218	0.366	0.594	0.250	0.616
2004/05	0.4592→0.5590	0.5332→0.6307	0.6046→0.7241	0.6427→0.6630	0.3753→0.5339	0.5814→0.4660	0.5580→0.8137	0.4292→0.4420	0.445	0.601	0.497	0.711
2005/06	0.6852→0.8267	0.6827→0.8375	0.6385→0.6550	0.3456→0.2736	0.5869→0.4020	0.5882→0.7241	0.4982→0.5342	0.7430→0.4969	0.491	0.701	0.425	0.763
2006/07	0.4853→0.7314	0.5557→0.4767	0.5928→0.4882	0.4459→0.5889	0.4600→0.7336	0.5715→0.2893	0.4858→0.4902	0.7307→0.3636	0.463	0.619	0.387	0.653
2007/08	0.4673→0.3001	0.5137→0.3943	0.4034→0.4158	0.4666→0.3791	0.3851→0.5867	0.4473→0.8518	0.3256→0.7528	0.5263→0.8330	0.386	0.498	0.378	0.750
2008/09	0.7826→0.4660	0.6355→0.2361	0.5153→0.6660	0.5284→0.7221	0.6538→0.3401	0.4110→0.7655	0.4257→0.5844	0.6258→0.6282	0.467	0.677	0.394	0.708
2009/10	0.6195→0.8330	0.6797→0.4882	0.5417→0.4902	0.6970→0.7809	0.7354→0.8267	0.7484→0.3807	0.6729→0.6088	0.6188→0.5682	0.607	0.721	0.478	0.766
2010/11	0.3613→0.3943	0.3881→0.4660	0.8215→0.7655	0.7363→0.6916	0.7220→0.5946	0.7754→0.7715	0.5667→0.6866	0.6224→0.7715	0.479	0.770	0.521	0.764
2011/12	0.5339→0.7314	0.6802→0.2361	0.4618→0.7336	0.6067→0.9291	0.7125→0.4767	0.5173→0.3919	0.4058→0.2617	0.9617→0.8110	0.463	0.757	0.351	0.792
2012/13	0.5109→0.8330	0.6288→0.5648	0.4312→0.3943	0.4564→0.7171	0.7072→0.6395	0.6522→0.6193	0.7231→0.5298	0.6601→0.4834	0.501	0.691	0.483	0.712
2013/14	0.6069→0.7064	0.6596→0.6903	0.4445→0.6550	0.6275→0.8248	0.5159→0.5016	0.2950→0.7143	0.5646→0.7171	0.6336→0.5342	0.441	0.646	0.580	0.756
2014/15	0.6886→0.5135	0.8413→0.8137	0.4756→0.3576	0.4567→0.7600	0.6267→0.6126	0.6487→0.8330	0.6955→0.6088	0.4927→0.5940	0.505	0.727	0.502	0.771
2015/16	0.7190→0.8267	0.2569→0.4305	0.7638→0.5682	0.3700→0.4427	0.7617→0.5797	0.6795→0.5832	0.6611→0.7314	0.5143→0.5946	0.431	0.750	0.483	0.706
2016/17	0.5046→0.8475	0.3865→0.3456	0.6121→0.7087	0.7769→0.7598	0.3485→0.4969	0.8358→0.7221	0.6101→0.7451	0.6189→0.7819	0.444	0.729	0.536	0.816
2017/18	0.2624→0.7715	0.6540→0.8248	0.6923→0.5906	0.5814→0.7299	0.9212→0.5533	0.5172→0.6521	0.5599→0.6569	0.7037→0.9507	0.454	0.769	0.607	0.826
2018/19	0.5108→0.7600	0.7441→0.6561	0.5669→0.3878	0.6787→0.7736	0.7114→0.8102	0.6655→0.6005	0.6982→0.2893	0.7089→0.4305	0.594	0.728	0.424	0.753
2019/20	0.8167→0.8951	0.7126→0.8447	0.6509→0.5468	0.5702→0.6882	0.4915→0.7143	0.6774→0.6569	0.2273→0.2458	0.6772→0.6307	0.453	0.753	0.486	0.819
2020/21	0.6060→0.7961	0.5963→0.2187	0.6661→0.8267	0.6651→0.6307	0.7149→0.8171	0.4717→0.6829	0.7673→0.8963	0.5621→0.5051	0.554	0.709	0.486	0.858
2021/22	0.4812→0.4660	0.4883→0.8137	0.3924→0.8748	0.6258→0.6866	0.5294→0.8883	0.4213→0.3943	0.6552→0.3943	0.6823→0.8330	0.444	0.625	0.487	0.851
2022/23	0.3643→0.8748	0.2274→0.4903	0.5829→0.9129	0.4095→0.3001	0.5566→0.5235	0.5036→0.6768	0.4771→0.6714	0.6259→0.8005	0.359	0.578	0.481	0.831

Additionally, the Table 1 have highlighted the data of the champion's group every season. We have constructed confidence intervals for a 99% probability from the value of the t-Student statistic. Therefore, for each season, we

can identify whether the value of the *DCB* index falls inside or outside the confidence interval. If it lies outside, below the lower limit, we infer that the empirical value of the *DCB* is significantly small, within the season as a whole, and that the group was very competitive and therefore "difficult". If the empirical value of the *DCB* is above the upper limit of the interval, the group will be uncompetitive and therefore "easy".

The following exercise is a straightforward application of the results above. Their rivals tend to stress the sporting weakness of the UCL champions group. Has this traditionally been true? This question is related to the competitive balance of this sporting championship and can be understood from a twofold perspective:

- Ex ante refers to the fact that, from the very beginning that the groups are formed, the team that will finally win the championship enjoys a relative advantage, given that the weakness of their group rivals facilitates their qualifying.
- Ex post, however, refers to the fact that, however tough a group may initially be, in the end, after the competition has been played, the group was easier than expected.

Figures 1 and 2 show the evolution of the competitive balance levels for each group in these years. In both figures, the UCL champion's group for each season is highlighted, with the letter identifying it (A, B, C, D, E, F, G, or H) emphasized in a square. The other points that appear in each of the columns (seasons) corresponding to the horizontal axis represent the other seven groups for each of the seasons. In both cases, we have identified using lines the levels that statistically imply, at 99%, higher and lower competitive balance probabilities than the average for each season. Therefore, when the champion's group is above the upper line, it is understood to have a results concentration statistically significantly higher than the average of the eight groups for that season, and therefore, it is an "easy" group. On the other hand, if the UCL winning team belonged to a group marked in a square below the lower line, this team started the competition in a group with a low concentration level in statistical terms compared to the average of the eight groups for that season. Thus, that group showed a statistically significantly high competitive balance level.

We can observe that, ex ante, there are ten champion groups with high relative concentration or a lower relative level of competitive balance (identified above the upper limit). However, after the championships unfolded, there are only five. Therefore, even though in ex ante terms, which is to say, based on the group formation method used by UEFA, in 10 of the 24 seasons the eventual UCL winning team started the competition in an "easy" group, it was found during the competition's progression that this was only the case in 5 seasons. Moreover, only in the 2003/2004 season did it coincide that both ex ante and ex post, the champion's group was "easy" (in 2018/2019 it coincided that it was "difficult").

These issues can be seen and identified in Table 2. So, firstly, we can see that, over the last two decades, only one season (2003/2004), and in the case of FC Porto, was the group apparently easier when it was formed, and after the competition it was clear this was indeed so. In another two cases, 2006/2007, with AC Milan and 2009/2010 with FC Internazionale, ex ante the groups appeared to be easy, but, ex post, turned out to be difficult.

Secondly, in 10 out the 24 seasons, the UCL winning team did start in an easier group. Except for the three, aforementioned cases, in the 7 remaining seasons it was found that as the competition progressed, these groups were in line with the average (2000/2001, FC Bayern; 1999/2000, 2001/2002, 2013/2014, 2016/2017, 2021/22, Real Madrid CF; and 2020/21, Chelsea).

Thirdly, except for the 2002/2003 and the 2018/2019 seasons, in which AC Milan and Liverpool FC were the only teams to start in a significantly more competitive (more difficult) group, the 12 remaining UCL winners started the season in groups similar to the average. In five of these cases, it was found that the progress of these groups over the competition was significantly easier (2007/2008, Manchester United FC; 2014/2015, FC Barcelona; 2015/2016 & 2017/2018, Real Madrid CF; and 2019/2020, Bayern). In another six cases, the groups were normal, both ex ante and ex post (2004/2005, Liverpool FC; 2005/2006, 2008/2009 and 2010/2011, FC Barcelona; 2011/2012, Chelsea

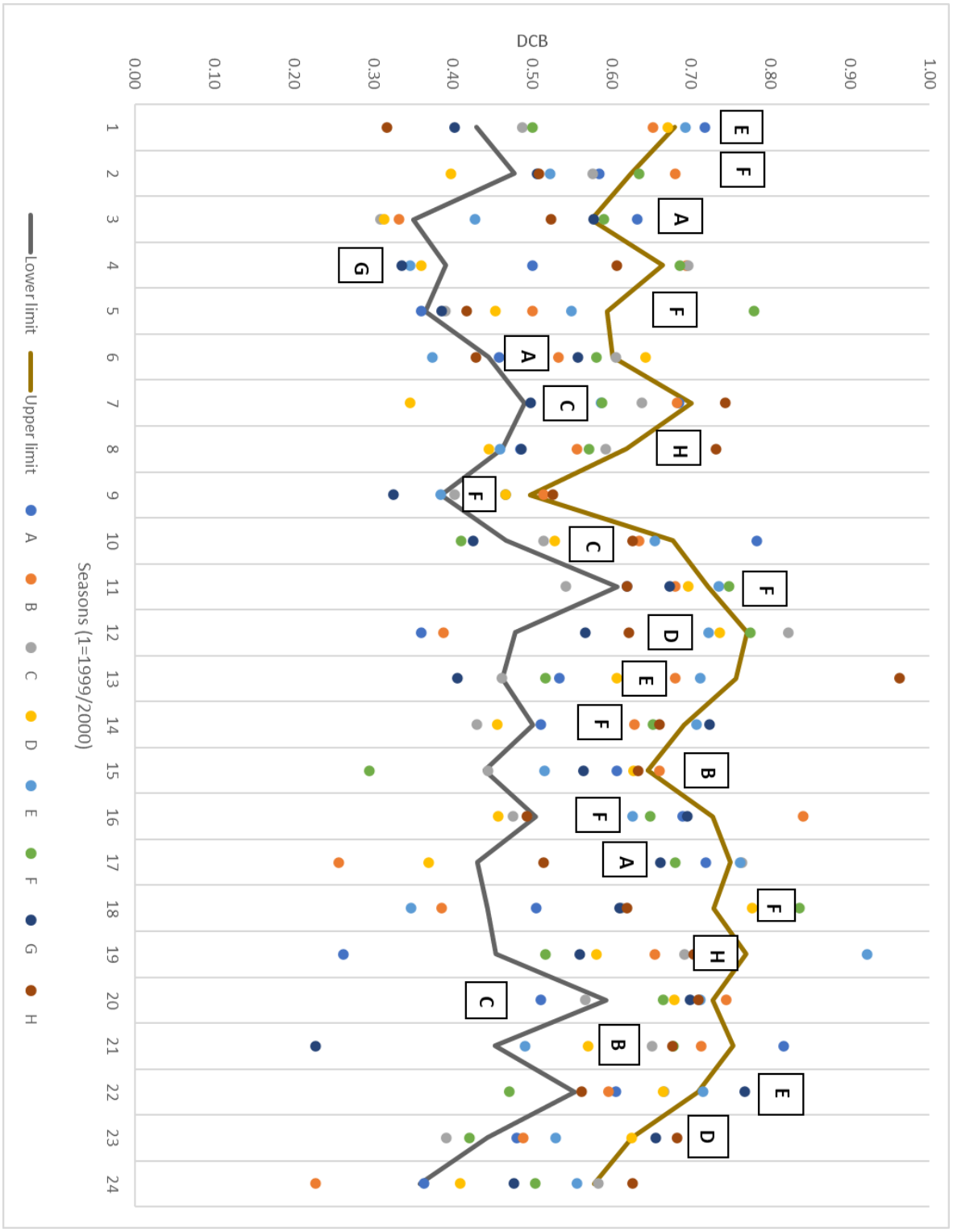

Figure 1. *DCB* indices in the UCL group stage (1999/2000-2022/23). EX ANTE analysis.

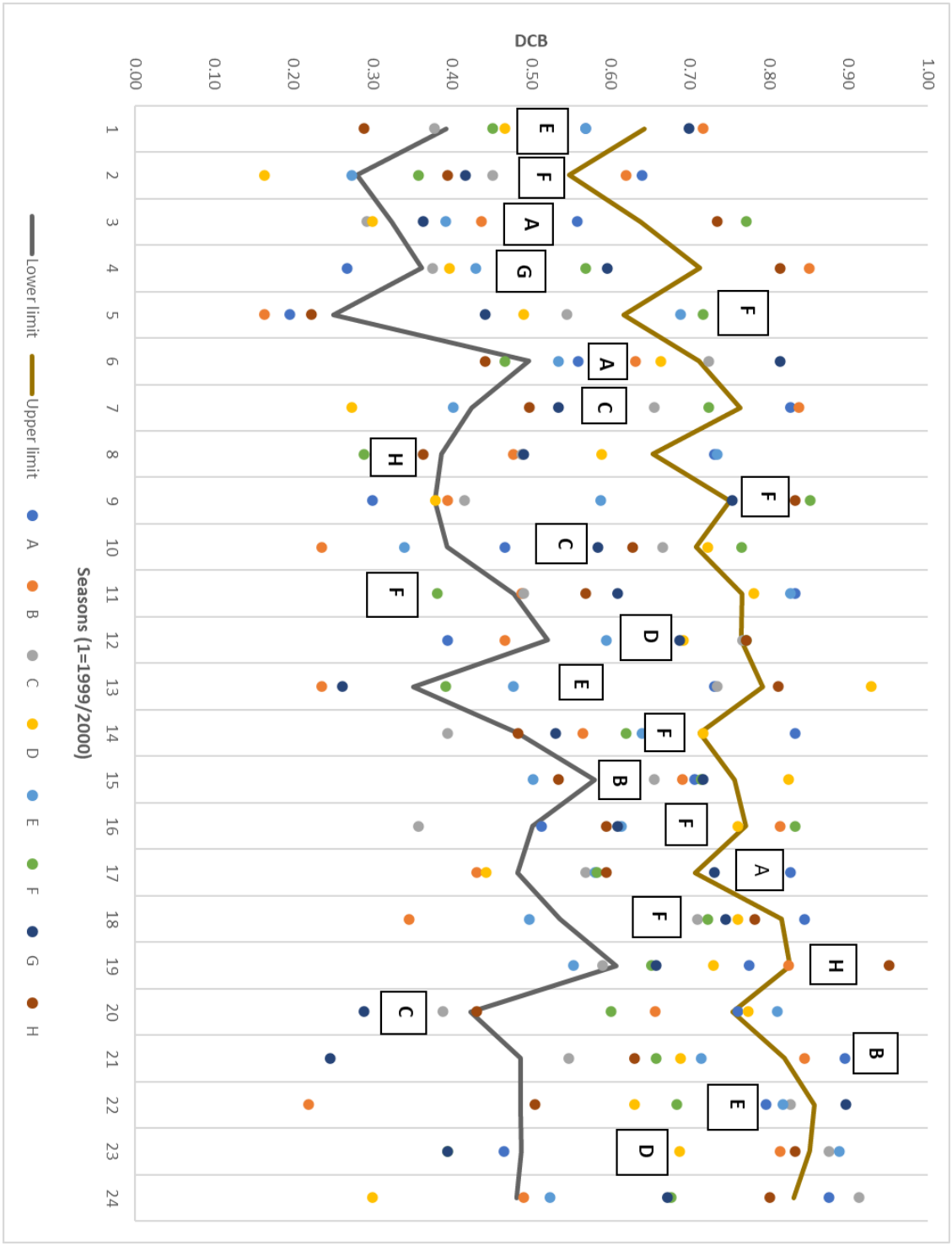

Figure 2. *DCB* indices in the UCL group stage (1999/2000-2022/23). EX POST analysis.

FC; 2012/2013, FC Bayern; and 2022/2023, Manchester City).

Thus, and in light of the data (Table 2) it does not seem that the original affirmation holds true i.e. the ease of the UCL starting groups of those teams who finally win. More than half of the time this is not true ex ante, without it being confirmed by the outcome of the competition (only five seasons). Moreover, in just one of the last 24 seasons, has this been proved to be true, with a reduced ex post competitive balance as well. Contrarily, in three seasons, the group of the team that finally won the UCL, in the end, proved to be difficult.

Table 2. UCL finalists (1999/2000-2022/23). DCB ex ante and DCB ex post of their groups in UCL group phase.

	UCL winner	Group	DCB ex ante	DCB ex post	Runner-up	Group	DCB ex ante	DCB ex post
1999/00	Real Madrid CF	E	**0.693**	0.569	Valencia CF	F	0.500	0.451
2000/01	FC Bayern	F	**0.635**	0.358	Valencia CF	C	0.576	0.451
2001/02	Real Madrid CF	A	**0.632**	0.558	Bayern Leverkusen	F	**0.590**	**0.772**
2002/03	A.C. Milan	G	0.336	0.596	Juventus FC	E	0.347	0.431
2003/04	FC Porto	F	**0.779**	**0.717**	AS Monaco FC	C	0.391	0.545
2004/05	Liverpool FC	A	0.459	0.559	AC Milan	F	0.581	0.466
2005/06	FC Barcelona	C	0.638	0.655	Arsenal FC	B	0.683	0.838
2006/07	A.C. Milan	H	**0.731**	0.364	Liverpool FC	C	0.593	0.488
2007/08	Manchester United FC	F	0.447	**0.852**	Chelsea FC	B	**0.514**	0.394
2008/09	FC Barcelona	C	0.515	0.666	Manchester United FC	E	0.654	0.340
2009/10	FC Internazionale	F	**0.748**	0.381	FC Bayern	A	0.619	**0.833**
2010/11	FC Barcelona	D	0.736	0.692	Manchester United FC	C	**0.822**	**0.766**
2011/12	Chelsea FC	E	0.712	0.477	FC Bayern	A	0.534	0.731
2012/13	FC Bayern	F	0.652	0.619	BV Borussia	D	0.456	**0.717**
2013/14	Real Madrid CF	B	**0.660**	0.690	Atlético de Madrid	G	0.565	0.717
2014/15	FC Barcelona	F	0.649	**0.833**	Juventus FC	A	0.689	0.514
2015/16	Real Madrid CF	A	0.719	**0.827**	Atlético de Madrid	C	**0.764**	0.568
2016/17	Real Madrid CF	F	**0.836**	0.722	Juventus FC	H	0.619	0.782
2017/18	Real Madrid CF	H	0.704	**0.951**	Liverpool FC	E	**0.921**	0.553
2018/19	Liverpool FC	C	0.567	0.388	Tottenham	B	**0.744**	0.656
2019/20	FC Bayern	B	0.713	**0.845**	Paris	A	**0.817**	**0.895**
2020/21	Chelsea FC	E	**0.715**	0.817	Manchester City	C	0.666	0.827
2021/22	Real Madrid CF	D	**0.626**	0.687	Liverpool FC	B	0.488	0.814
2022/23	Manchester City	G	0.477	0.671	FC Internazionale	C	**0.583**	**0.913**

Notes: EASY GROUP in bold (Out of the confidence interval, upper tail). DIFFICULT GROUP in underlined (Out of the confidence interval, lower tail).

4. Conclusions

Competitive balance in a sports competition is usually obtained from the distribution of points (or wins) achieved by each team at the end of the championship. We can also measure the competitive balance before the competition starts. Then, we should use information on the overall strengths of the teams. For the case of the UCL, a good summary can be found in the UEFA coefficients. From these distributions, indices such as the HHI and DCB are calculated, and require standardisation in order to take into account the special characteristics of sports competitions. Standardisation requires knowing the maximum and minimum theoretical values of the index.

The distribution that has usually been considered to generate the minimum competitive balance, which we have called the complete cascade distribution, is not valid for any points award pattern. So, measuring competitive balance is affected by the scoring system used. The perfectly unbalanced distribution under the {3,1,0} pattern is the truncated cascade, which allows the maximum value of concentration to be obtained.

In this article we have calculate the DCB indices, ex ante and ex post, for the stage group UCL between 1999/2000 and 2022/2023. We can reject the idea that the UCL groups are homogenous in terms of ex ante and ex post competitive balance, but can we say that the team that wins the UCL every season was in an easy group? We have considered that a group is easier when the competitive balance is minimal, i.e. the concentration of results is maximum. On the contrary, if the concentration is minimal, the competitive balance is high, and the group will be difficult as there is more competition.

The last two decades, only one season, the winner (FC Porto) was in an easy group ex ante and ex post. In other 9 seasons, the UCL winning team did start in an easier group: in 7 seasons it was found that as the competition

progressed, these groups were in line with the average, and in two cases ex ante the groups appeared to be easy, but, ex post, turned out to be difficult. Only two teams to start in a significantly more competitive (more difficult) group, and the 12 remaining UCL winners started the season in groups similar to the average. In five of these cases, it was found that the progress of these groups over the competition was significantly easier. In another six cases, the groups were normal, both ex ante and ex post. Therefore, the question: 'will the more sceptical supporters of the opposing teams have sufficient motives?' can be answered in the negative, and the composition of the UEFA Champions League groups seems to be balanced and has no influence on which team will be the champion.

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Conflict of interest

All the authors claim that the manuscript is completely original. The authors also declare no conflict of interest.

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