

She kicks: the state of competitive balance in the top five women's football leagues in Europe

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She kicks: The state of competitive balance in the top five women’s football leagues in Europe

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Abstract

Competitive balance remains a core component of sport economics literature and an important management consideration for league organisers. This paper analyses competitive balance in the 'top five' women's football leagues in Europe longitudinally between 1997/98 and 2018/19. Using recognised measures of league concentration and dominance, the results display a mixed picture in respect of competitive balance across the five major women's leagues in European football. The women's football industry has seen positive growth during the last ten years while competitive balance in most of the leagues examined has remained relatively stable. Some significant differences were detected in the levels of concentration between leagues. There was also some variation in terms of some leagues being dominated by a fewer number of teams. However, these two measures of competitive balance (concentration and dominance) were not necessarily correlated with each other. In a broader governance context, questions remain over the potential for further growth in the women's game as leagues are moving towards commercialisation of TV rights from 2021-22.

Keywords

Women's football, Competitive balance, Professional team sports, Concentration, Dominance

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1. Introduction

In its women’s football strategy document for 2019-2024, the Union of European Football Nations has issued the following statement in relation to the development of the game: “The development of women’s football and its foundations is fundamental to its success as a sport, both at amateur and professional levels. The game will go from strength to strength if we put the right foundations and direction in place for our members, clubs and stakeholders to capitalise on” (UEFA, 2018, p25). The industry of sport has expanded at a phenomenal pace in the last three decades and according to FIFA, the interest in women’s football is at an all-time high (FIFA, n.d). The FIFA Women's World Cup 2019 was viewed by 1.12 billion viewers across the globe on TV and digital platforms, breaking the previous record set in 2015 by 30% (FIFA, 2019).In the present day, there are approximately 30 million female footballers worldwide and despite this attendance in top-tier women's football league is low as compared to their male counterparts.

Sport has become a big business in its own right in the modern day and women’s football has become a big business in its own right in the present day. Back on the success of the FIFA Women’s World Cup 2019, Barclays announced a £10 million sponsorship for the FA Women’s Super League and the FA is willing to sell the broadcasting rights of WSL for 2021-22 (Aluko, 2019; Whyatt, 2020). Sport and business cannot be segregated from each other in modern day sport management, particularly in professional team sports. The aim of businesses, more often than not, is to try and eliminate the competition, but sport teams and leagues require competition among rivals to generate the product by pitching teams of equal quality against each other to deliver entertainment (Dobson & Goddard, 2011). However, the sport industry operates in a joint nature of production which does not make it ideal for a team to establish a position of dominance. Vrooman (2015) defines the perfect game as a symbiotic contest between opponents having equal playing talent, but the practical economic problem lies in the

fact that professional sport leagues behave as anti-competitive natural cartels, where teams with asymmetric market power compete against each other. The comparisons between the economic environment of professional sports teams and traditional commercial businesses have been well documented by sport economists (e.g. Dobson & Goddard, 2011; Leach & Szymanski, 2015).

The above paragraph outlines the importance of league organisers, operating as governing bodies, in maintaining a successful league and as such contributes to the broader literature on coopetition [defined as simultaneous cooperation and competition (Brandenburger, & Nalebuff, 1996)]. The concept of coopetition has been subject to intense research in the field of strategic management to measure its impact on performance (Le Roy & Czakon, 2016). Scelles, Mignot, Cabaud and Francois (2017) state that the concept of coopetition in sport is highly relevant in the sense that if opponents are competitors on the field, they need each other to produce the competition and, as such, they are economic partners. The concept of coopetition has been researched in professional football (Lardo et al., 2016; Robert et al., 2009) and is important for the framing of this study which is focused on a key economical function of professional team sports - competitive balance.

At the time of writing, the top 5 FIFA ranked women's football teams in Europe (FIFA.com, n.d) were Germany (2), Netherlands (3), France (4), Sweden (5) and England (6). However, the top division of Netherlands merged with Belgium between 2012/13 and 2015/16 and as a result has been excluded from the study to make way for the next best UEFA ranked nation, Norway (12). The five women's football leagues discussed in this paper have gone through changes in league structure as well as labour laws, that saw them move from an amateur model to a professional model. The primary aim of this paper is to measure competitive balance in the top 5 women's football leagues based on FIFA rankings under the aegis of UEFA between 1997/98 and 2018/19 and identify the effect of changes in structure, labour laws, with control

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for year and number of teams participating in the league on competitive balance in the five women’s football leagues.

The body of research on CB in professional team sports has grown exponentially since the turn of the millennium but are exclusive to the professional men's football in Europe and North America. This study attempts to provide a further contribution to this literature by considering CB in the context of women's football by focusing on the 'top five' women's leagues in Europe. The paper will proceed as follows; Section 2 explains the literature relating to the area and the theoretical framework of the study. Section 3 details the methodology and Section 4 outlines the results. Section 5 then discusses these results and the conclusions are drawn in Section 6.

2. The theory of competitive balance

2.1. Defining competitive balance

It is complex to accurately define competitive balance as various academics define the term differently. A league is likely to have a problem with its competitive balance when weak uncertainty of outcome leads to low interest among fans (Kringstad, 2018). According to Silva, et al. (2018), the balance between teams competing in a tournament, with uncertainty in final result driven by revenues generated by the ticket office, stadium operations, sponsorships and the broadcasting rights made by the league's participating clubs can be defined as competitive balance.

The importance of "closeness of competition" has been identified by Rottenberg (1956, p242) in his seminal paper and he further suggested that all competitors must be of approximately equal size to gain success, given the nature of the sport industry. The hypothesis became the foundation of Uncertainty of Outcome (UoH) and theoretical research questions focusing on North American leagues were discussed by Neale (1964), Jones (1969), El-Hodiri and Quirk (1971) and Noll (1974). The above quote focused on the sport of baseball and as identified by

Ramchandani, et al. (2018), the origins of competitive balance literature lie in North American professional team sports, with factors affecting competition such as revenue sharing, draft systems, salary caps and closed leagues being common mechanisms to maintain competitive balance. It has been further identified by Plumley et al. (2018) that the concepts of uncertainty of outcome, competitive balance and profit and utility maximisation are heavily linked to professional team sports (e.g. Buraimo et al., 2015; Fort, 2015; Késenne, 2015; Sloane, 2015). There are substantial differences between North American team sports and European team sports in terms of league structure and organisation, and these factors played a major role to shape the modern-day literature around sport economics. While El-hodiri and Quirk (1971) justified regulatory interventions to maximise welfare and improve competitive balance, other academics such as Budzinski and Pawlowski (2014) argue that consumers are likely to prefer some imbalance as emphasised in the economic theory of superstars and stardom (MacDonald, 1988; Rosen, 1981).

There are two possible behavioural assumptions about professional teams: clubs are supposed to maximize either their profits, mirroring the reality of North American professional leagues or the number of seasonal wins, more aligned to the nature of European team sports (Fort, & Quirk, 1995). In broader context, all the women's leagues in question employ a system of promotion and relegation in the present day and can be linked to the model of European team sports. The globalisation and commercialisation of sport on both sides of the Atlantic has led to a convergence between the European and US Model of Sport at all competitive levels (Blackshaw, 2017).

The proliferation of researchers working on CB (Késenne, 2006; Zimbalist, 2002) and narratives surrounding fan interest in relation to CB has led to two distinct strands of CB research, which define the theoretical framework for this study. Fort, & Maxcy (2003) identify the classification of the theoretical and empirical research on competitive balance in terms of:

(a) analysis of competitive balance (ACB) literature, which focuses on what has happened to competitive balance over time or as a result of changes in the business practices of professional sport leagues; and (b) literature on competitive balance that analyses its effect on fans, which tests the uncertainty of outcome hypothesis (UOH).

As the explicit emphasis of this paper is on the organisational structure of a sports league, the literature review is focused on the ACB strand of research. Extensive research has been conducted on the UoH strand of research, which shows that uncertainty of outcome does have an effect on viewership, gate receipts and overall demand (e.g. Borland, & MacDonald, 2003). The ACB strand of research can be distinguished further into two major aspects: (a) level of concentration; and, (b) level of dominance (e.g. Evans, 2014; Ramchandani et al., 2018). The extent of closeness between teams in the league in a season is measured in level of concentration, while the level of dominance focuses on the extent to which the same teams persist in winning the league over a number of seasons. Evans (2014) further identifies that the identity of a team does not matter in measures of concentration, but it does matter for measures of dominance.

2.2. Previous research on CB

A range of different studies have covered ACB with substantial research focusing on North American sport leagues (e.g. Maxcy, & Mondello, 2006; Mills, & Fort, 2014; Price, & Sen, 2003; Rocke, 2019; Zimbalist, 2002). This can be attributed to the origins of the concept in Baseball and Rottenberg's seminal paper in 1956. There has been limited academic research comparing both models of professional team sports and one such study was conducted by Buzzacchi, Szymanski and Valetti (2003). They analysed the number of teams that had the highest win percentages, in the regular season of the MLB, NFL and NHL, and the number of teams that won the league championships in football in England, Italy and Belgium between

1950 and 1999 and found that open leagues are less balanced than closed leagues in general. Curran, et al. (2009) identify the existence of limited academic research history on measuring across seasons competitive balance which is the scope of this paper.

The number of studies focusing on professional team sports in Europe has increased in recent years, with substantial research on football, but occasionally in other sports such as rugby union (Williams, 2012). A few studies such as Schreyer and Torgler (2016) and Corral (2009) focused on Formula One and lawn tennis respectively, but these studies are not relevant to this paper given the individual nature of these sports. Previous studies on CB in football focused almost exclusively on the aforementioned 'big five' leagues in Europe (English Premier League, La Liga, Bundesliga, Ligue 1 and Serie A) with a few focusing on other smaller leagues.

The paucity of CB literature outside Europe has been cited by Ramchandani (2012). There have been limited instances so far where competitive balance research has been conducted in women's football. Pollard and Gomez (2014) also did a comparative study of home advantage in men's and women's football leagues in Europe, but that relates more to uncertainty of outcome, which is outside the scope of this paper. Vales-Vazquez, Casal-Lopez, Gomez-Rodriguez and Blanco-Pita (2017) compared competitive balance between the top division of women's football against the top two divisions of men's football in Spain. Similarly, Kringstad (2018) analysed the competitive balance in the top division of women's football in Sweden, Denmark and Norway between 1996/97 and 2014/15 and compared it to men's football in these countries. Both these papers found that men's football leagues in these countries are more balanced than women's football in general. While this is a noble approach due to the lack of econometric studies to identify competitive balance in women's football, it is unrealistic to compare men's and women's football leagues as the latter has relatively become professional in the last 10 years as compared to men's football, which is professional for over 50 years now.

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Previous research on CB in football leagues reveals contradictory findings. Some studies have detected no changes in CB scores, while others report a decline in CB scores. The details of all the studies have been presented in table 1 below. A number of contemporary studies such as Montes, Sala-Garrido & Usai (2014): Spanish first division between 1928/29 - 2011/12; Ramchandani et al (2018): English first division between 1992/93 - 2015/16; Plumley et al (2018): English first division compared to the rest of the English football league industry; Plumley et al (2020): Iran first division between 1996/97 and 2017/18 have stated a decline in competitive balance as well. Some studies such as Buzzacchi, Szymanski, & Valletti (2003) analysed the impact of promotion and relegation, the point scoring system (Haugen, 2008) and revenue distribution within a league (Andreff, & Bourg, 2006) on CB in football league and found that they influence CB in football leagues in predictable ways.

<TABLE 1 ABOUT HERE>

A different angle of academic enquiry while retaining the focus on CB was conducted by Plumley and Flint (2015), and Ramchandani et al (2019). The former analysed the competitive balance in the group stages of the UEFA Champions League and found flaws in the ranking and seeding system used by UEFA and provided statistical evidence that, historically, the group stages of the Champions League have seen competitive imbalance. The latter looked at whether or not there is an optimum (or 'best') number of teams that should compete in a league to deliver better competitive balance (using the EPL as an example) and found that the current structure of 20 teams in the EPL comprises the overall level of competitive balance in the EPL and that the 'best' number of teams in that league would be somewhere between 10 and 19 (although they could not pinpoint precisely which league size would be the 'most' competitive).

The above findings have also stimulated interest in the articles analysing for levels of concentration and dominance within leagues as previously outlined by Evans (2014). Curran,

Jennings and Sedgwick (2009) formulated a “Top 4 Index” by counting the number of occasions that each team finished a league season in the top four places, summing the incidence of the four teams with the most occurrences and expressing the total as a proportion of the total number of available places over the period of the measure and focused their paper more on measures of dominance to track competitive balance over time in the EPL from the 1948/49 to 2007/08 seasons (inclusive) and for ten year intervals. Their findings suggested that competitive balance in the English top league has decreased and that the league is in danger of becoming a monopoly of the few.

A couple of academic studies with a different angle of enquiry examined the relationship of different generic economic variables such the GDP of the country and sport economic variables such as the attendance in sport leagues of the country against competitive balance scores for UEFA nations and the relationship between competitive balance and end of year FIFA rankings for CONCACAF nations (Rocke, 2019; Scelles et al., 2020). However, these studies are exclusive to men’s football and cannot be replicated in this study due to the lack of availability of attendance data and ticket prices for the women’s football leagues examined in this paper for the duration of the study. The paper however examines the relationship between competitive balance and other variables such as the structure and labour laws of the league, which are discussed in the following section.

The importance of CB has been downplayed by some of the others in contemporary research (e.g. Andreff & Scelles, 2015; Pawlowski, & Anders, 2012; Scelles et al., 2013) but these papers focused on analysing CB against the concept of UoH and fan attendances whereas this paper is concerned with the concept of ACB over time in respect of league structures. Despite the existing concerns and issues, it is clear that competitive balance research is still a fundamental part of sport economics research.

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2.3. The top 5 women’s football leagues in Europe

As the First World War began in Europe, women's football games began being played for charity , their profile helped by the way that, when women started to work in the munitions factories, they also began to be invited to join the remaining men's kick-arounds outside working hours (Doble, 2015). However, after the end of the First World War, the English FA banned all women's teams from playing on FA affiliated grounds because football damaged women's bodies (NewStatesman, 2014). For several decades, this decision meant that women's football virtually ceased to exist. It only reversed from 1969 when, after the increased interest in football caused by England's 1966 World Cup triumph, the Women's Football Association was founded, although it would take a further two years – and an order from UEFA – to force the (men's) Football Association to remove its restrictions on the playing rights of women's teams.

With women's football only growing slowly, the FA finally took a step further and brought all women's football under its direct control in 1993, although by this time the WFA had already created the Women's National League, which would become the Women's Premier League in 1992 to parallel the renaming of the top level of men's competition. As most professional men's clubs chose to create, or affiliate to, a women's team and with the sport gradually growing, in 2008 the league system received a shake-up with the announcement of a new top-level competition – the Women's Super League – which took the best eight teams following sixteen applications, placing them into a no-relegation single division, designed to draw greater exposure and money into the game (The FA, n.d).

The WSL and Premier League have operated on different season structures – the WSL conducted a summer season contained entirely within a calendar year, whilst the Premier League continues to operate on the traditional winter season spanning two calendar years.

Following an abbreviated spring season in 2017, women's football is moving to a parallel calendar to the premier league starting in the fall of 2017 (The FA, n.d).

The women's football pyramid was significantly reorganised in 2014. The WSL added a second division known as WSL 2, with the original WSL becoming WSL 1 (The FA, n.d). The Premier League's regional North and South Divisions became the third level of the pyramid, with the Combination Women's Football Leagues becoming the fourth level. Further changes came in 2015; the FA announced that both divisions of the WSL would expand by one team in 2016, and WSL 2 would also add a team in 2017. Significantly, the new WSL 2 entries will come via promotion from the Premier League, connecting the WSL to the rest of the pyramid for the first time (Garry, 2018).

In 1918, Alice Milliat created the Division 1 Féminine and placed it under the aegis of the Fédération des Sociétés Féminines Sportives de France (FSFSF) to organise women's football in France. However, much like England, the competition was disbanded in 1932 due to ban on women's football. The women's game was finally resurrected in 1975 with funds made available by the Fédération Française de Football (FFF). The Division 1 Féminine became professional from the 2009/10 season with all players being offered professional contracts (FootAmat, 2009). It operates in a promotion and relegation system with the Division 2 Féminine as on present day.

Women in Germany have been playing football since the turn of the 18th century, but females playing sports were frowned upon by the general population and citizens. The "Sports Girl" did not come into fashion until the 1920s when women started to form their own clubs (Bosley, 2007). In 1955 the German Football Association declared that they would not permit women into the association stating that women were frail and unable to perform in the sport without injuring themselves (Bosley, 2007). The DFB finally officially allowed women players on

October 30, 1970, but there were modifications to the rules. Firstly, women were only allowed to play in warm weather. Secondly, football boots with studs were banned and the ball was smaller and lighter. Lastly, the length of a match was reduced to seventy minutes (Bosley, 2007).

As a result of the national team's success in the 1989 European Competition, in 1990 the DFB founded the first women's Bundesliga with twenty teams divided into two groups, a Northern Conference and a Southern Conference. The Bundesliga was reduced to a single league of twelve teams in 1997. Yet, with the growing strength of Regionalliga compared to the Bundesliga the DFB founded Second Bundesliga in 2004. The Second Bundesliga contained twenty-four teams divided into two groups. Despite this, questions remain regarding the growth of women's football in Germany due to the lack of investment in the professional league, which has been linked to the poor performance of Germany in recent Women's World Cups (Veth, 2019).

The interest in women's football is high in Sweden compared to many other countries and Swedish Radio's expert football commentator, Richard Henriksson believes that the interest of women's football kicked off when Sweden reached the FIFA Women's World Cup 2003 Final against Germany and that coincided with Swedish club teams being successful in Europe as well (Radio Sweden, 2016). Kjær & Agergaard (2013) identify Sweden as the pioneers for development of women's football as professional contracts in women's football in Sweden have been awarded since 1969.

The top division of Swedish women's football is known as Damallsvenskan and operates in a promotion and relegation system with Elitettan. Like most of the top division women's leagues in Europe, the Damallsvenskan consists of 12 teams with each team playing the other twice in a home and away format.

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3 The Norwegian Women's Football Championship is a tournament reserved for women's
4 football teams divided into six levels, consisting of a national championship in the top three
5 under the aegis of the Norwegian Football Association (NFF), while the lower ones are
6 managed by various regional associations. Toppserien is the biggest football division in
7 Norway by importance and is followed by the 1st division hierarchy (Leighton, 2011). The
8 Norwegian football system consists of a series of alloys linked to each other by hierarchy
9 through promotions and relegations. It is also among the few countries where male and female
10 footballers are paid equally (The Guardian, 2017).
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22 The development from amateurism to professionalism in the last 10 years will have affected
23 the competitive balance especially since a number of these changes have been made to enhance
24 the sporting product and make the leagues more competitive. The key objective of this paper
25 is to measure competitive balance in top 5 women's football league in Europe. By analysing
26 the top five women's leagues in Europe, we can compare our findings with the existing research
27 in the European football market, heralded as the industrial benchmark. The paper also examines
28 the impact of moving from an amateur model to a professional model and whether a league
29 operated in a closed or open model on CB scores, which has been discussed further in the next
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43 To the author's knowledge, this is the first paper to measure within and between seasons
44 competitive balance in the women's football leagues in Europe. Consequently, we argue that
45 our study is timely given the growth of women's football in recent years. The current study also
46 contributes to the strand of competitive balance research in professional team sports by
47 analysing an industry and leagues, where there has been a shortage of empirical research in the
48 past.
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3. Methods

The measurement of competitive balance has been challenged thoroughly in the sport management industry, as doubts emerged regarding the accuracy of empirical evidence due to a long history of different measures used to measure competitive balance (Martinez, & Willner, 2017; Mills, & Fort, 2014; Owen, & King, 2015; Pawlowski, 2013). An extensive list of variables such as the HHI index, standard deviation of win percentages, surprise index, Gini co-efficient and Lorenz-curve, mean margin of victory, competitive balance ratio and different measures of concentration and dominance have been used to analyse competitive balance and their strengths and weaknesses have been identified by Evans (2004) and Goossens (2006). Ramchandani et al (2018) identify that scholars focusing their papers more on European sports use Herfindahl Index of Competitive Balance (HICB), which is a normalised version of HHI and other measures of dominance such as number of different teams to win the title and number of different top k finishes (k is the position in the league table) to measure competitive balance. A number of these measures are used by York and Miree (2018) to measure competitive balance in the National Hockey League (NHL) and are also used by a majority of papers covered in the literature review above.

However, there have been disagreements between scholars around variable selections to measure competitive balance and those arguments centre around the structure of the leagues. Each of the measures used have their respective strengths and weaknesses which revolve around an attempt to encapsulate a complex phenomenon within one summary measure (Mills, & Fort, 2014; Owen, & King, 2015). The standard deviation of win percentages has been identified by Fort, Maxcy and Diehl (2016) to measure competitive balance in North American sports given the rarity of drawn games, but the same cannot be argued about application in an European team sport context due to high frequency of tied matches, which makes the former method a biased indicator (Pawlowski et. al., 2010).

Our dataset covers the time period from 1997/98 to 2018/19 providing 22 seasons worth of data for the five biggest women's leagues in European football (England, France, Sweden, Germany, Norway). Table 1 shows the number of teams in each league over the 22 seasons.

<TABLE 2 ABOUT HERE>

Multiple measures of competitive balance have been employed in this study. To measure concentration, the Herfindahl Index of Competitive Balance (HICB) employed by Michie, & Oughton (2004) has been utilised. The use of HICB has been commonplace in previous academic research focusing on football leagues particularly in Europe (e.g. Lenten, 2008; Pawlowski et al., 2010; Plumley et al., 2018; Ramchandani et al., 2018). One of the major advantages of using HICB is the fact that it takes the number of teams into consideration to measure the CB score and can be used within and between leagues with different number of teams across multiple seasons.

HICB scores were calculated by using the formula listed below:

$$HICB = [HHI / (1/N)] \times 100$$

HHI is the sum of the squares of the points share for each club contesting a league in a given season and N is the number of teams in that particular league and season. For example, if there are three teams in a league, say A, B and C, with A winning 4 points, B winning 3 points and C winning 1 point, the HICB score is calculated as:

$$HICB = \{[(4/8)^2 + (3/8)^2 + (1/8)^2] / [1/3]\} \times 100 = [0.40625 / (1/3)] \times 100 = 121.87$$

The HICB score is 100 for a perfectly balanced league of any size. As the score rises, CB declines. However, the upper bound is sensitive to the number of teams in the league. For a league with only 8 teams (as in the case of the England between 2010/11 and 2014/15 - see

Table 1) the upper bound is around 143, whereas for a league with 12 teams (e.g. in the case of France and Germany - see Table 1) the upper bound is around 139.

Because the upper bound of HICB can vary according to the number of teams in a league, we also calculated a standardised version of this measure (SHICB) for each season within each league. SHICB was calculated using the formula $(HICB / \text{Max HICB (N)}) \times 100$, where HICB is the Herfindahl Index of Competitive Balance in a league in a given season (as described previously) and Max HICB is the upper bound HICB score for that league in that season and N refers to the number of teams. So, for example in 2010/11 the HICB score for the English women's league was 119.48 and the league was made up of 8 teams in that particular season. The Max HICB score for a league with 8 teams is 142.86. Therefore, the SHICB in the English women's league in 2010/11 is 83.64 (i.e. $(119.48 / 142.86) \times 100$). A score of 100 for SHICB represents the least balanced position (i.e. in a completely unbalanced league). As the value of SHICB declines, competitive balance improves. This approach allowed for a more like-for-like comparison between leagues comprising different number of teams.

In addition, we also calculated the win dispersion ratio in each league. Win dispersion is usually measured by the ratio of standard deviation (RSD) (Fort, 2007). This measure is attributed to Noll (1988). The RSD measure can be calculated by:

$$RSD = ASD/ISD$$

where ASD is the actual standard deviation of the win percentages at the end of a season. ISD is the idealised standard deviation and is calculated by $0.5/\sqrt{m}$ where m is the number of matches played by each team in the league (e.g. Fort, & Quirk, 1995). As discussed previously, the win dispersion ratio is a biased measure to calculate CB in football due to the high proportion of drawn games and to mitigate the biasness, the traditional way is followed by treating draws as half-wins. A low RSD score implies a higher competitive balance in a league.

A third measure, called the Draw% which has been used by Kringstad (2018) has been used.

The Draw% can be measured by

$$\text{Draw\%} = \Sigma \text{Draws} / (m \times N)$$

where the nominator is the aggregated number of draws for team 1 to team N, m is the number of games for each team in the league, and N is the number of teams in the league. A higher Draw% implies that teams are closely matched with each other and as such, the presence of better competitive balance in the league.

In addition, we also considered the level of team dominance in each league. In order to examine the levels of dominance we considered the following indicators across the 22 seasons examined: the number of different teams to win the league title; and the maximum number of league titles won by a single team. The use of these indicators was informed by previous research in the context of European football (Curran, et al., 2009; Ramchandani et al, 2018) as well professional ice hockey (York & Miree, 2018).

Two types of statistical procedures were performed on the data. First, differences in HICB and SHICB scores between leagues were examined using one-way analysis of variance (ANOVA) and relevant post hoc tests. Second, the pattern of HICB, SHICB, RSD and Draw% within each league over time was analysed using Pearson's correlation coefficient (r). Each season is assigned a numerical code in an incremental format, where 1 represented 1997/98 and 22 represented 2018/19, thereby representing the time trend as a continuous variable with equal variances. A co-relation test was conducted between the time trend and each statistical measure, with the significance, p, set at 0.05. For HICB, SHICB and RSD measures, a negative Pearson's correlation coefficient with statistical significance, and a positive Pearson's correlation coefficient with statistical significance for Draw% suggests an improvement in competitive balance scores. The aforementioned method of calculating Pearson's correlation coefficient

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and identifying correlation between time-trend and measures of concentration have been used by a number of journals discussed in this article including Plumley et al (2018, 2020), Ramchandani et al (2018), and Rocke (2019), thereby establishing the reliability and validity of the method.

We further try to establish a relationship between competitive balance and the various factors affecting it through multiple linear regression. The factors examined in this paper affecting competitive balance are whether the league is amateur or professional, and whether it employs promotion and relegation to the division below itself, with control for year and number of teams in the league. The equation is

$$SHICB \text{ or } RSD \text{ or } Draw\% = \beta_0 + \beta_1 \times O + \beta_2 \times P + \beta_3 \times Y + \beta_4 \times T + \epsilon$$

O is a dummy variable and takes a value of 0 if there is no promotion and relegation and 1 if there is promotion and relegation. P is a dummy variable and takes a value of 0 for amateur and 1 for professional. Y represents the time trend and T is the number of teams in the league. The three concentration measures used to calculate CB, i.e., SHICB, RSD and Draw% are used as dependent variables in the multiple linear regression.

4. Results

4.1 HICB and SHICB

Figure 1 shows the mean HICB and SHICB scores across the 22 seasons for each league. Both HICB and SHICB scores for each league were normally distributed as determined by the Shapiro-Wilk test ($p > 0.05$).

<FIGURE 1 ABOUT HERE>

When analysing concentration within each league over time (see table 3), we found no significant variation in HICB over the 22 seasons examined in England, France, Sweden and

Germany (England: $r=-0.29$, $p=0.19$; France= 0.27 , $p=0.23$; Sweden: $r=-0.38$, $p=0.08$; Germany: $r=0.33$, $p=0.13$). However, the HICB scores of Norway showed a moderate decline in HICB scores, which is indicative of an improvement in league concentration (Norway: $r=-0.52$, $p=0.01$). A similar statistically insignificant time trend was observed for SHICB, with the exception of Norway, for which there was a moderate decline in SHICB scores, which is indicative of an improvement in league concentration (England: $r=-0.32$, $p=0.14$; France= 0.26 , $p=0.23$; Sweden: $r=-0.38$, $p=0.07$; Germany: $r=0.33$, $p=0.13$; Norway: $r=-0.43$, $p=0.04$).

<TABLE 3 ABOUT HERE>

A one-way ANOVA was then employed to test for significant differences in concentration levels between leagues. The Brown-Forsythe test of equality of means for both HICB and SHICB ($p > 0.05$) and the Welch test of equality of means was also statistically significant for each concentration measure (HICB: Welch's $F(4, 52.361) = 5.530$, $p = 0.001$; SHICB: Welch's $F(4, 52.219) = 4.987$, $p = 0.002$).

A Games-Howell post-hoc test revealed that the mean HICB scores Sweden is better than that of England and France, and that of Germany is better than France ($p<0.05$). By contrast, no statistically significant differences in mean HICB scores were observed between the leagues in Sweden, Norway and Germany ($p>0.10$). The mean SHICB scores for each of the Sweden and Germany is better than that of France ($p<0.05$).

4.2 Ratio of standard deviation

The distribution RSD measure is non-parametric for England as determined by Shapiro-Wilk Test ($p<0.05$), and is distributed normally for France, Sweden, Germany and Norway ($p>0.05$).

<TABLE 4 ABOUT HERE>

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When analysing RSD within each league over time (see table 4), significant improvement in concentration levels have been found in England and Sweden (England: $r=-0.45$, $p=0.33$; Sweden: $r=-0.48$, $p=0.03$). This suggests that the gap between teams within England and Sweden decreased with time. However, a statistically insignificant time trend has been observed for France, Germany and Norway.

4.3 Measuring Draw percentage

The Draw% score for each league were normally distributed as determined by the Shapiro-Wilk test ($p > 0.05$).

<TABLE 5 ABOUT HERE>

When analysing Draw% within each league over time (see table 5), a statistically insignificant time trend has been observed in each league with the exception of Norway, where a moderate increase in Draw% has been found (England: $r=0.29$, $p=0.18$; France: $r=0.01$, $p=0.97$; Sweden: $r=0.18$, $p=0.41$; Germany: $r=0.04$, $p=0.85$; Norway: $r=0.47$, $p=0.03$). This suggests that the gap between teams in Norway decreased with time, as the number of draws increased with each season.

4.4 Measure of dominance

Figure 2 plots the number of different teams in all five leagues to have won the domestic league title in all seasons analysed (on the horizontal axis) against the maximum number of domestic league titles secured by the most successful team in each league in the same time frame on the vertical axis. In respect of Figure 2, the top left quadrant would depict less competition for the title whilst the bottom right quadrant would depict more competition for the title. The axes intersect at the median values for the two indicators (6 on horizontal axis and 7 on vertical axis).

<FIGURE 2 ABOUT HERE>

Figure 2 fails to determine the most competitively balanced league in terms of dominance for the title in our sample. A total of six different teams in England, Germany and Norway have won the league title as compared to 10 different teams in Sweden. However, in England, Arsenal has won the most number of title (12), followed by FFC Frankfurt in Germany (7) and LSK Kvinner in Norway (6). An ideal way of comparing the most balanced league in this situation is to multiply the two datasets and determine the most competitive league. Based on the suggestion, Norway has the most competitive league ($6 \times 6 = 36$), followed by Germany ($6 \times 7 = 42$), France ($4 \times 14 = 56$), Sweden ($10 \times 7 = 70$) and England ($6 \times 12 = 72$).

4.5 Regression models

The results of all the regression tests are presented in table 6. It has been identified through the results of the multiple linear regression tests that the model employed by the league and the fact that whether players were given amateur or professional contracts only had impacts on SHICB and not RSD or Draw%.

<TABLE 6 ABOUT HERE>

The first model predicts the SHICB using economic factors affecting the league such as the existence of promotion and relegation in the league, and whether the teams in the league recruit players on amateur or professional contracts, with controlling for the number of teams within each league and year. It has been found out that the model was able to significantly predict the SHICB scores ($R^2 = 0.072$, $p < 0.05$). As the SHICB measures competitive imbalance (high scores imply less competition), the beta-values are reversed. The results further show that recruiting players on amateur or professional contracts do not have any significant impact on the SHICB scores ($p > 0.05$), but open leagues were less balanced than closed leagues in general ($\beta = 0.262$, $p < 0.05$) for the duration of this study.

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The model used to predict the RSD scores using the same economic factors and controlling for the number of teams within each league and year was not able to significantly predict the CB factors ($p > 0.05$). The third model predicts the Draw% using the factors and control variables used above. It has found out that the model was able to significantly predict the Draw% scores ($R^2 = 0.167$, $p < 0.01$). It has been found out that Draw% is inversely linked to the factor on whether players are recruited on amateur or professional contracts ($\beta = -0.308$, $p < 0.05$), implying that professional leagues are less balanced than amateur leagues for the duration of this study.

5. Discussion

To date, there has been limited research on the state of CB in women's football leagues. Previous attempts to analyse CB in the context of women's football leagues by Kringstad (2018), Pollard, & Gomez (2014), and Vales-Vazquez, et al. (2017) only considered comparative studies between men's and women's football, thereby limiting meaningful conclusions. As such, our study presents a more thorough and longitudinal analysis of CB in women's football leagues in Europe compared with previous efforts. Our study also incorporates measures of league concentration and dominance to provide a more holistic view of CB in women's football.

Our analysis presents a mixed picture of competitive balance in the top five women's football leagues in Europe. While we did not find any statistically significant fluctuations for HICB and SHICB scores of time in England, France, Sweden and Germany, a moderate improvement in HICB and SHICB scores have been observed in Norway. We also observed statistically significant fluctuations in RSD scores of England and Sweden, suggesting that women's leagues in those countries have become more balanced with time. There has been also a statistically significant improvement in Draw% scores in Norway, suggesting an improvement

in competitive balance. Significant differences in league concentration levels between the five leagues under consideration has also been observed in this study. These findings resonate with previous findings in European football, where there is a larger body for research. Our results are opposite to the findings of Goossens (2006), Groot (2008), Koning (2000), Mitchie, & Oughton (2004), Ramchandani et al., (2018) and, Szymanski (2001), all of whom report a decline in competitive balance in the football leagues across Europe between 1964 and 2017.

In relation to measures of dominance, our findings resonate with the work of Ramchandani et al. (2018), who analysed dominance in European football. Ramchandani et al. (2018) highlighted that certain leagues in Europe were more dominant than others in respect of individual club success (e.g. Juventus in Italy and Bayern Munich in Germany). Our findings present a bold case of dominant women's league in England and France, which have been dominated by Arsenal and Olympique Lyonnais, respectively. However, we also found that the Swedish women's league had 10 different champions in the 22 seasons examined. This has been a case despite a relatively stable case of competitive balance in the leagues examined.

Concentration and dominance are distinct measures of CB. The former is a measure of CB for the league as a whole whereas the latter is a more restrictive measure and fewer teams are taken into consideration (i.e. those winning the league or qualifying for continental competitions). In theory, it is possible for a league with a high level of concentration to also have a high level of dominance and vice versa. However, we did not find any such cases in the women's football leagues examined in this paper.

While the measures of concentration do not acquaint for the identification of the top teams in the league, this might present a problem for league organisers in the future while exploring the opportunities for expansion through broadcasting rights outside their respective countries. However, league organisers might look to bridge the gap between the leaders and the teams

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fighting for continental qualifications through resource distribution mechanisms such as equal distribution of television revenues or prize money as the skill gap between the strongest teams and the weakest teams does not matter for consumer utility (Budzinski, & Pawlowski, 2014).

The results of the regression analysis are consistent with the results of Scelles et al. (2020) and Rocke (2019). Using the multiple linear regression models in this paper, we were able to significantly predict the relationship between economic factors affecting the league and competitive (im)balance scores. The economic factors used in this paper, which are the sports model adopted by the league and whether the players are given amateur or professional contracts, are significantly related to both SHICB and Draw% scores. We also found out that closed leagues were more balanced than open leagues in general, which are consistent with the findings of Buzzacchi et al. (2003).

The results of this study might have impact on the governance of women’s leagues within and outside Europe as more leagues are moving towards a model of professionalism, starting with Japan in 2022 (The Telegraph, 2020). The top division of the newly introduced professional league in Japan is set to be a closed league in the initial years to improve the quality and the competitiveness of the league, which shows that the ideas of the league organisers are consistent with the academic studies comparing open and closed leagues (Buzzacchi et al., 2003).

The case of English Women's league is an interesting one. In 2010, the FA formed the Women's Super League to professionalise the game of football and the league operated in a closed format, consistent with the North American model of professional teams sports, for the first 5 seasons. The average HICB, SHICB, RSD and Draw% scores of the women's league in England improved after the professionalisation of the women's game in 2010. This is in contrast with

the women's league in France, which saw a decline in concentration levels after professionalisation.

It is clear that women's football across the world has seen growth in the last 10 years with 13.3 million girls and women play organised football worldwide (FIFA, n.d). With the Women's Super League in England likely to move to commercial television from 2021-22, there remains a question if the stakeholders of the women's game in England are commercialising the game too soon, which might lead to decline in the rising popularity of the women's game.

6. Conclusion

To our knowledge, this is the first study of its kind to look at competitive balance in a longitudinal way in women's football in Europe in more than 3 leagues and as such our study provides a clear contribution to knowledge. Competitive balance is a vital component in assessing the viability and competitiveness of a football league which may have direct impacts on the marketing revenue streams and spectator attractions. In conclusion, our study indicates that it may be the case that competitive balance does not necessarily present a problem for league organisers to consider at the current time. Our evidence points to a generally stable state of CB for the top five women's football leagues in Europe, while also identifying the CB has improved in some of the leagues analysed in this paper, thereby not posing a problem to league organisers at this moment in time. This study also provides a substantial starting point to analyse the trends of competitive balance and factors affecting competitive balance in women's football leagues.

While this paper also identifies relationship between competitive (im)balance variables and economic factors affecting a sports league, there are certain limitations in the study. The economic factors such as league attendance and ticket prices, which were used in other papers analysing CB (see Scelles et al., 2020), these data were not available for the leagues analysed

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in this paper for the entire duration of the study. Another limitation of this study is that while it has identified a relatively stable or improvement in competitive balance in the examined leagues over time, this does not address whether the improvement is significant enough to move towards a balanced league. There are scopes for future studies in this area to identify a benchmark for good and bad competitive balance scores using the measures of inequality.

Sporting competition and integrity is still at the heart of any debate around the structure of sport leagues and despite the theoretical debate around the measures and relevance of competitive balance there is little doubt that it remains an important component of modern day sport. Given the increasing number of imports of foreign players in the Women’s Soccer League (England), Frauen-Bundesliga (Germany), and Division 1 Féminine (France), future studies should look to analyse how the decrease in the number of home grown players in the first team of the top division teams have played a role in the improvement or decline of competitive balance in these leagues. Future research should also attempt to consider analysing competitive balance in the wider women's football industry across the world as there are multiple women's leagues having different sizes and operating in different formats.

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Table 1: Previous research on Competitive Balance

Author(s)	Leagues examined	Timeframe	Findings of CB
Szymanski (2001)	English first division (men)	1978-1998	No changes in CB
Mitchie and Oughton (2004)	French first division (men)	1948-2004	No changes in CB
Feddersen and Maennig (2005)	German first division (men)	1969-2004	No changes in CB
Goossens (2006)	Top 5 European leagues (men)	1964-2005	Decline in English and Italian first divisions
Groot (2008)	Top 5 European leagues (men)	1946-2006	Decline in English, German, Italian and Dutch first divisions
Jabari et al. (2013)	All leagues in Asia (men)	2009	Significant difference between Western Asian nations and Eastern nations
Kringstad (2018)	Top divisions of Sweden, Denmark and Norway (men and women)	1995-2015	Significant difference between men's and women's football
Montes et al. (2014)	Spanish first division (men)	1928-2011	Decline in top 5 European leagues
Ramchandani et al. (2018)	Top 5 European leagues (men)	1995-2018	Decline in top 5 European leagues
Plumley et al. (2018)	English Premier Division (men)	1992-2016	Decline in English Premier Division
Plumley et al. (2020)	Top 5 Asian football leagues (men)	1996-2017	Decline in Iranian top division
Vales-Vazquez et al. (2017)	Top divisions of Spain (men and women)	2015	Significant difference between men's and women's football

Table 2: League sizes by season

Season	England	France	Sweden	Germany	Norway
1997-98	10	12	12	12	10
1998-99	10	12	12	12	10
1999-00	10	12	12	12	10
2000-01	10	12	12	12	10
2001-02	10	12	12	12	10
2002-03	10	12	12	12	10
2003-04	10	12	12	12	10
2004-05	10	12	12	12	10
2005-06	10	12	12	12	10
2006-07	12	12	12	12	10
2007-08	12	12	12	12	12
2008-09	12	12	12	12	12
2009-10	12	12	12	12	12
2010-11	8	12	12	12	12
2011-12	8	12	12	12	12
2012-13	8	12	12	12	12
2013-14	8	12	12	12	12
2014-15	8	12	11	12	12
2015-16	9	12	12	12	12
2016-17	9	12	12	12	12
2017-18	10	12	12	12	12
2018-19	11	12	12	12	12

Table 3: Correlation between HICB and SHICB scores to season (1997/98 = 1 and 2018/19 = 22)

League	HICB			SHICB		
	Pearson correlation	p-value (2-tailed)	N	Pearson correlation	p-value (2-tailed)	N
England	-0.292	0.188	22	-0.324	0.141	22
France	0.268	0.228	22	0.268	0.228	22
Sweden	-0.387	0.081	22	-0.387	0.075	22
Germany	0.332	0.131	22	0.332	0.131	22
Norway	-0.524	0.012	22	-0.434	0.044	22

Table 4: Correlation between RSD scores and season (1997/98 = 1 and 2018/19 = 22)

League	RSD		
	Pearson correlation	p-value (2-tailed)	N
England	-0.457	0.033	22
France	0.141	0.532	22
Sweden	-0.476	0.025	22
Germany	0.336	0.127	22
Norway	-0.129	0.566	22

Table 5: Correlation between Draw% and season (1997/98 = 1 and 2018/19 = 22)

League	Draw%		
	Pearson correlation	p-value (2-tailed)	N
England	0.295	0.182	22
France	0.008	0.972	22
Sweden	0.184	0.412	22
Germany	0.042	0.852	22
Norway	0.467	0.028	22

Table 6: Multiple Linear Regression model analysing relationship between CB and other sport economic variables.

Variables	SHICB		RSD		Draw%	
	β	p-value	β	p-value	β	p-value
O	0.262	0.020	0.189	0.062	-0.186	0.080
P	0.103	0.316	0.154	0.100	-0.308	0.002
Y	-0.119	0.247	-0.206	0.029	0.289	0.004
T	-0.085	0.448	0.351	0.001	-0.136	0.201
Constant	-	0.000	-	0.000	-	0.000

Note: O is the league model (0 for closed leagues, 1 for open leagues), P is the labour laws in place in the league (0 for amateur/semi-professional contracts, 1 for professional contracts), Y represents the time trend, T is the number of teams in the league

Figure 1: Mean HICB and SHICB scores by country/league (1997/98 - 2018/19)

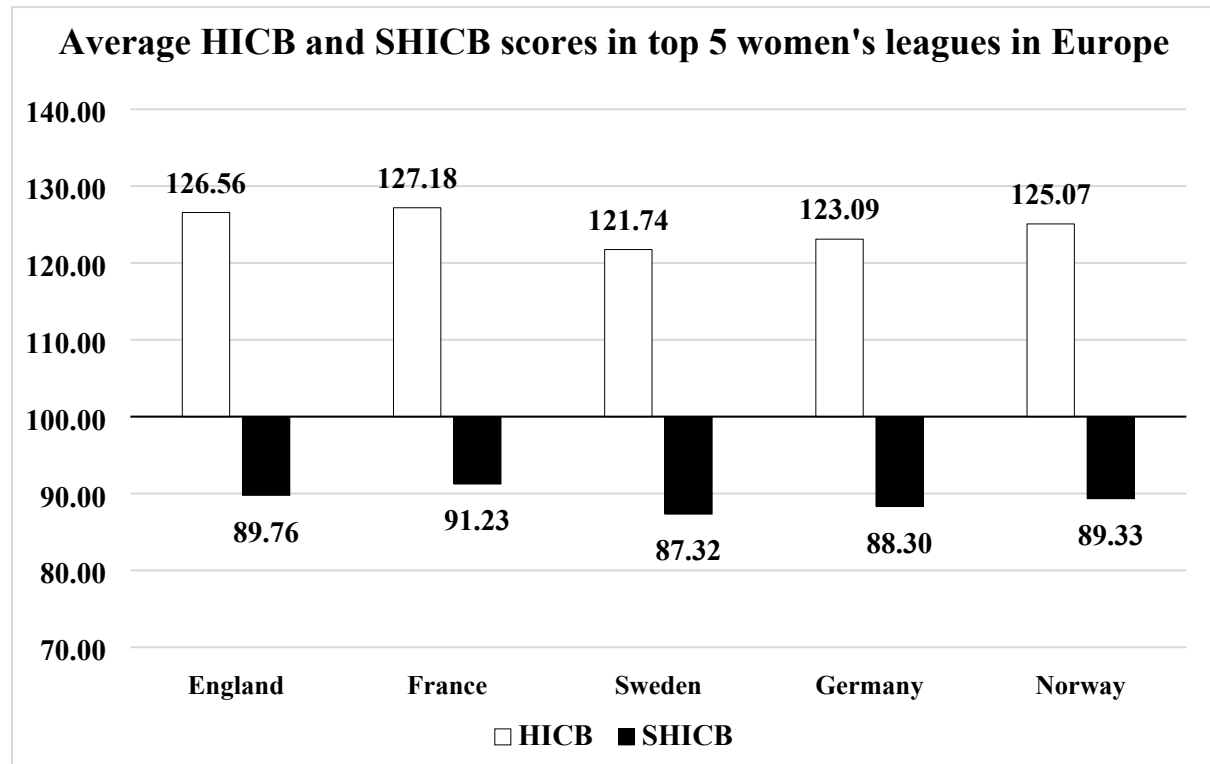


Figure 2: Dominance for winning the league title by country/league

