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Article

Gender Inequality in European Football: Evidence from Competitive Balance and Competitive Intensity in the UEFA Men's and Women's Champions League

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Abstract: Competitiveness of sporting contests is key to attract fan interest. However, limited research compared levels of competitiveness in men's and women's sports. This study focuses on the evolution of intra-match competitive balance (IMCB) and competitive intensity (IMCI) in the UEFA Men's and Women's Champions League (UMCL and UWCL). Data were initially collected for 3299 games over 2001–2019 (2314 in UMCL; 985 in UWCL) to analyse the evolution within and between each tournament. In addition, 989 matches played in UMCL over 1955–1973 were added to compare both competitions in their early stages. Results show a deterioration in IMCB and IMCI between 2001–2009 and 2009–2019 for the UMCL. Conversely, the UWCL benefitted from an increase in IMCB but not in IMCI, except for the final. The UWCL is still less competitive than the UMCL. This result holds true even when comparing the early stages of both competitions, i.e., replacing 2001–2019 by 1955–1973 for the UMCL. However, the UWCL has become closer to the UMCL in terms of IMCB and IMCI over time, a result linked to the development of women's football. From a theoretical perspective, this article advances knowledge of IMCB and IMCI, appropriate for competitions with knockout stages. It underlines the role of the pool of players as an explanatory factor for the gap in competitiveness between European men's and women's football.

Keywords: men's football, women's football, competitiveness, uncertainty of outcome, competition format

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1. Introduction

Competitiveness in sport is key to attract teams, players and fans (Scelles et al. 2021) as part of a broader marketing strategy (Zsigmond et al. 2020). Past academic studies highlighted differences in competitiveness between men's and women's sports, including men's and women's football (Kringstad 2021; Zamboni-Ferraresi et al. 2018). In its strategy document for the period 2019–2024, the European governing body of football, Union of European Football Associations UEFA (2019, p. 13), identifies competitiveness as one of the five pillars for the future of the sport and emphasises that competitiveness is needed to make its men's and women's tournaments “dynamic, entertaining and effective”. Since its inception, UEFA has a long tradition of organising a wide range of football events. Within the club continental competitions held by the European football institution, the most prestigious is the UEFA Champions League. The ‘Champions League’ is the flagship tournament for both men's and women's elite football in the continent as it gathers under the same umbrella the top-ranked men's and women's clubs in two distinct competitions, namely the UEFA Men's Champions League (UMCL) and the UEFA Women's Champions League (UWCL). Both tournaments are considered as the most important club football

competitions in elite men's and women's football, and therefore represent relevant terms of comparison to analyse the competitiveness of the sport. Taking these two competitions into account, the present paper aims to evaluate how the competitiveness of football has evolved and compared over time across genders.

The concepts of competitive balance (CB) and competitive intensity (CI) are employed to assist evaluation of competitiveness in the UMCL and the UWCL. In line with the seminal articles in sports economics (Neale 1964; Rottenberg 1956), CB can be defined as "a league structure which has relatively equal playing strength between league members" (Forrest and Simmons 2002, p. 229). This is supposed to lead to a close championship race within a season (Szymanski 2003), as well as league championships divided as equally as possible between teams over time (Powell 2003). Following the idea of game (championship or relegation) significance introduced by Jennett (1984), Kringstad and Gerrard (2004) suggested and defined CI as "the degree of competition within the league/tournament with regards to its prize structure" (Kringstad and Gerrard 2004, p. 120). CI is concerned with the different sporting prizes in a league or tournament, the number of teams competing for each of them, and the intensity of the competition depending on how close the different teams are from each other for each prize. A limited number of studies focused on CB and CI in the UMCL and UWCL. Exceptions include articles having explored either the UMCL (Scelles and Durand 2010; Wills et al. 2022) or the UWCL (Valenti et al. 2020). However, the literature has not compared CB and CI between the UMCL and the UWCL yet. Such comparison is useful to assess whether any differences exist between men's and women's football and to evaluate whether both tournaments are competitive.

This study contributes to the advancement of the line of research concerned with gender comparison in sport. Moreover, the results of this research provide practitioners and stakeholders with original insights on the competitiveness of two of the most prestigious elite men's and women's tournaments worldwide. Data on indicators of CB and CI were collected over the 2001–2019 period, i.e., from the beginning of the UWCL. Attention was drawn on the impact that the format changes implemented by UEFA in 2009–2010 have had on indicators of CB and CI in both competitions. Data were also collected over the 1955–1973 period for the UMCL—i.e., from its beginning—and compared to the 2001–2019 period for the UWCL. The rationale is to control for the two competitions having started at different times, which may make the comparison over the same period biased in favour of the UMCL since it had more time to develop its competitiveness. Overall, the study aims to answer two research questions:

1. How has the competitiveness of the UMCL and UWCL evolved over time following the format changes in 2009–2010?
2. How has the competitiveness compared between the UMCL and UWCL over time?

2. Literature Review and Background Context

2.1. Determinants of Competitive Balance

The concept of CB is well documented in the sports economics literature (see e.g., Rodriguez et al. 2020; Scelles et al. 2022). One of the key issues identified is how to reach a sporting equilibrium between teams in a competition, i.e., what determines CB. Its primary determinant is the underlying population of talent. This is consistent with evolutionary biology and the so-called Gould hypothesis (Gould 1983, 1986, 1996). Applied to the context of sport, it predicts a positive relationship between available playing talent and CB (Schmidt and Berri 2003). Assuming that the underlying populations of talent for the UMCL and the UWCL are a function of the number of registered male and female players worldwide, respectively, a better CB is expected in the UMCL compared to the UWCL. This is because the number of registered female players worldwide was estimated between 4 and 5 million in the FIFA Women's Football Survey in 2014 and 2019 (FIFA 2014, 2019); while the number of registered male players worldwide already reached 11.6 million in 1975 and grew to 38.3 million in 2013 (Arcioni et al. 2018). The Gould hypothesis

and its impact on CB are consistent with academic works having pointed out differences in the pool of female and male athletes resulting in differences in competitiveness between genders (Frick 2011a, 2011b; Frick and Moser 2021).

In addition to the underlying population of talent, its distribution between countries and teams also impacts CB (Scelles et al. 2022). Countries and teams generating the highest revenue have access to the best players supposed to be close in sporting ability, while the other countries and teams have access to the next best players supposed to be of lower sporting ability than the best players. As such, a high CB is expected if the competition includes a large proportion of countries and teams generating the highest revenue and thus a large proportion of the best players who are close in sporting ability. By contrast, a lower CB is expected if the competition aims for a better representativeness of the different countries and teams. This is because, compared to the previous situation, fewer teams with the best players face more teams with the next best players who are of lower sporting ability than the best players. This refers to the following determinants of CB developed here, namely the number and identity of the teams in the competition.

A high number of teams should be avoided when this induces the presence of teams with lower sporting ability than others. In other words, a league organiser should set an optimal number of teams to ensure CB (Szymanski 2003). In the cases of the UMCL and the UWCL, this optimal number is impacted by the number of slots offered to champions and non-champions from the different countries. The UMCL was first introduced in 1955–1956 as the European Champion Clubs' Cup and only 16 teams took part in the competition, these teams being invited for this first edition and mainly but not only domestic champions. For 41 seasons from the second edition, only domestic champions and the current title holder took part in the competition. The number of teams in the UMCL gradually reached 31 then 32 teams in the main rounds in 1963–1964 and 1967–1968, respectively. In 1997–1998, UEFA opened participation in the UMCL to non-champions, with up to four clubs from the best nations from 1999–2000 (even five later). This resulted in better CB, appeal, and increased revenue over 1999–2008 than previously (Scelles and Durand 2010). In 2009–2010, separate routes were created for champions of smaller domestic leagues and (some) non-champions of bigger domestic leagues in the UMCL preliminary round. This change was consistent with the then President of UEFA Michel Platini aiming for returning the balance in favour of national champions and enabling more nations to take part (Scott 2006). However, this format change may have decreased CB in the latter stage if champions of smaller domestic leagues from 2009 onwards were not as close in ability to champions of bigger domestic leagues as non-champions of bigger domestic leagues before 2009.

The UWCL was inceptioned much later, reflecting the obstacles faced by women's football historically (Williams 2011). Initially launched under the name UEFA Women's Cup in 2001–2002, the UWCL was only opened to domestic champions in its first seasons. In 2009–2010, the UWCL adopted a new format including runners up from the top 8 nations (extended to 12 in 2016–2017) and was renamed as 'UEFA Women's Champions League' (UEFA 2008). This change aimed at increasing the competitiveness, appeal and revenue of women's football at the European level.

2.2. Competitive Balance and Gender Studies

CB has been originally studied in men's competitions. Nevertheless, women's competitions in Europe have gained increasing attention from scholars over the last years. This has led to cross-gender comparisons of CB indicators between men's and women's competitions. In a seminal contribution, Kringstad (2018) found lower CB in women's football leagues based on end-of-season tables in Norway, Sweden and Denmark. The author indicated that similar structural rules (e.g., physical structure of the game such as size of the field and goals or length of the games) for both genders may be a reason for his finding, arguing that the rules in women's football follow the ones of men's football instead of being specifically designed for the women's game. Zambom-Ferraresi et al. (2018)

used the Herfindahl-Hirschman Index at the seasonal and championship levels in Spain, and found that top-tier men's football league is more balanced than its women's counterpart. This was explained as one of the consequences of the synergies established between professional men's clubs and women's teams, with women's teams from professional men's clubs dominating independent women's teams due to the former benefitting from the infrastructure and staff of the male professional section. Moreover, Haugen and Guvag (2018) found a similar result using a win dispersion indicator to assess men's and women's European football and handball leagues.

More recently, Kringstad (2021) compared the level of CB (measured through win dispersion, performance persistence and championship concentration) between genders in the football and handball championships from three European countries (England, France and Germany), while extending the scope of his study to North American basketball, i.e., the men's National Basketball Association (NBA) and its women's counterpart (WNBA). Results show significantly lower CB for women than men in football and, to a lesser extent, in handball, consistent with the previous literature. To explain differences in CB, the attention was directed towards the Gould hypothesis. Importantly, the participation of girls and women in football has been constrained historically by socio-cultural attitudes. Therefore, as the available playing talent in the women's game is smaller compared to the men's game, weaker CB is expected in women's football. By contrast, the WNBA seems to be more balanced than the NBA, despite more males playing basketball than females in North America. Kringstad (2021) suggested that this is due to the lower number of teams in WNBA (12 vs. 30 in NBA), consistent with the need for an optimal number of teams to ensure CB.

2.3. *Competitive Intensity and the Champions League*

While providing interesting insights, the aforementioned studies focused solely on CB and did not tackle CI. CI assumes that, apart from the degree of equality between team playing strengths, audiences are also interested in the prizes that may be distributed in the league or tournament (Kringstad and Gerrard 2004). For example, the current UMCL group stage includes the following prizes: teams that end 1st qualify to the round of 16 and gain the possibility to play at home during the return leg of the match; teams that end 2nd qualify to the round of 16; and teams that end 3rd rather than 4th and last qualify to the next round of the UEFA Europa League. The knockout phase of both the UMCL and the UWCL are played over two legs (except the final, which has always been played as a single leg in the UMCL while this has been the case for the UWCL in 2001–2002 and since 2009), with the prize being the qualification for the next round. Hence, the outcome of the first leg affects the level of CI before the start of the second leg: it is high if the first leg ends with a draw, while much lower if the first leg ends with a large margin in favour of one of the competing teams. With a single leg, CI is automatically optimal at the start of the game. These examples highlight the importance of competition format to generate CI, suggesting that a high number of prizes during the group stage (as opposed to only the teams ranked first in groups of four qualifying for the next round in the UWCL over 2001–2004) and one leg over two legs in the knockout phase favour CI.

By contrast, two games against each team instead of only one may favour CI in the group stage. As an illustration, let us consider the games between the two weakest teams in a group of four teams, with only the top two qualifying for the next round. If the two weakest teams lost their first two games against the two strongest teams before playing against each other, they are already eliminated if there are no return games, i.e., there is no CI in the game between them. If there are return games and they play against each other in the third and fourth games, they are not eliminated, i.e., there is CI in both games between them. This is an important consideration, as there were no return games in the group stage in the UWCL over 2001–2009, as opposed to return games in the group stage in the UMCL over 2001–2019. Another important consideration is that a group stage without return games (UWCL over 2001–2009) may still be better than knockout games with

two legs (UWCL over 2009–2019). This is because the two weakest teams in our example are still in contention at the start of the second of their three games in a group stage, as opposed to being already out of contention very early in the first of the two legs in a knockout game (e.g., after only 10 out of the 180 min) if they face the strongest teams.

To the best of the authors' knowledge, there is no research that compared CI between genders in football. However, a few studies investigated CI in either the UMCL or the UWCL separately. In the UMCL, Scelles and Durand (2010) found an improvement in both CB and CI at the intra-match level (i.e., within a game) over the 1955–2008 period. The authors interpreted it as the consequence of the development and professionalisation of men's football over time, higher number of teams from the most competitive nations accessing the competition, as well as the changes in rules. For example, the introduction of a group stage in 1991 led to a higher percentage of game time with CI compared to the two-legged knockout games used at similar stages of the competition before 1991, as teams were found to be in contention for longer. This suggests that the CI of the UWCL may have suffered from the move to a group stage to two-legged knockout games only (except in final) from 2009. Moreover, in the UMCL, Wills et al. (2022) tested the impact of CI on TV audience demand over the 2013–2019 period. These authors focused on six markets: France, Germany, Italy, the Netherlands, Spain and the UK. While no significant impact of CI was found in knockout stages (measured as the possibility of score reversals after the first leg game), either a positive impact or no impact of CI in group stages (measured through a dummy variable capturing whether at least one team had something to compete for) was evidenced in some of the markets considered. In the UWCL, Valenti et al. (2020) found a significant positive impact of CI (measured as the possibility of score reversals after the first leg game) on stadium attendance over the 2009–2018 period.

3. Methodology

3.1. Hypotheses

From the two research questions provided in introduction (evolution within and between competitions), as well as the literature review and background context, seven hypotheses are derived:

H1.1. *Competitive balance and competitive intensity decreased in the UEFA men's Champions League between 2001–2009 and 2009–2019.*

It is expected that the champions of weaker domestic leagues that replaced some non-champions of stronger domestic leagues are less close in ability to champions and other non-champions of stronger domestic leagues.

H1.2. *Competitive balance increased in the UEFA women's Champions League between 2001–2009 and 2009–2019.*

It is expected that the non-champions of stronger domestic leagues that replaced some champions of weaker domestic leagues are closer in ability to champions of stronger domestic leagues. H1.1 and H1.2 relate to the determinant of CB and CI 'identity of the teams in the competition'.

H1.3. *Competitive intensity did not increase in the UEFA women's Champions League between 2001–2009 and 2009–2019.*

It is expected that moving from a group stage to two-legged knockout stages only (except in final) negatively impacted CI, counterbalancing the positive impact expected from H1.2. H1.3 relates to the determinant of CI 'competition format'.

H2.1. *Competitive balance and competitive intensity were lower in the UEFA women's Champions League than in the UEFA men's Champions League over 2001–2019.*

This is because of the lower available playing talent in women's football compared to men's football, in line with the Gould hypothesis. It is also consistent with academic works having pointed out differences in the pool of female and male athletes resulting in differences in competitiveness between genders (Frick 2011a, 2011b; Frick and Moser, 2021). H2.1 relates to the determinant of CB and CI 'underlying population of talent'.

H2.2. *The competitive balance and competitive intensity of the UEFA women's Champions League became closer to the competitive balance and competitive intensity of the UEFA men's Champions League over 2009–2019 compared to 2001–2009.*

This is in line with H1.1, H1.2 and H1.3.

H2.3. *Competitive balance and competitive intensity were lower in the UEFA women's Champions League over 2001–2009 than in the UEFA men's Champions League over 1955–1963.*

This is because a higher number of teams or countries took part in the UWCL over 2001–2009 than in the UMCL over 1955–1963, which is expected to lead to more teams with lower sporting ability than others, supposed to be close in such ability. It is assumed that the number of registered players was equivalent or slightly higher for males over 1955–1963 than females over 2001–2009. Moreover, it is assumed that the presence of a group stage in the UWCL over 2001–2009 did not affect positively CI and might even have affected it negatively due to only the teams ending 1st in groups of four qualifying for the next round in the UWCL over 2001–2004.

H2.4. *Competitive balance and competitive intensity were similar in the UEFA women's Champions League over 2009–2019 and the UEFA men's Champions League over 1963–1973.*

This is because of the similarities in the number of teams (31 or 32) and format (only two-legged knockout stages except one-legged final), while it is expected that runners up from the bigger domestic leagues entering the UWCL from 2009 (positive impact) compensated the number of registered female players over 2009–2019 (4 to 5 million in 2014 and 2019) assumed to be lower than the number of registered male players over 1963–1973 (11.6 million in 1975). H2.3 and H2.4 relate to the determinants of CB and CI 'number of teams in the competition', 'underlying population of talent' and 'competition format'.

3.2. Definition and Measurement of Intra-Match Competitive Balance and Intensity

In the literature, indicators of CB and CI are usually calculated at a national league level. Most studies have applied seasonal measures of CB and CI to domestic leagues, calculated from the league tables (Bond and Adessa 2020; Scelles et al. 2022; Wagner et al. 2020). However, such indicators are inappropriate when analysing CB and CI in competitions such as the UEFA Champions League as it includes only a small number of games in the group stage(s), if any. In addition, the tournament includes a knockout stage, making usual measures at seasonal level irrelevant. Instead, intra-match measures are more appropriate for competitions that include knockout stages. If they can be applied to a domestic league (Scelles et al. 2011), they seem particularly suitable to a tournament including knockout stages, as recently done in studies on the FIFA women's World Cups (Scelles 2021a) and UEFA men's national team competitions (Scelles 2021b), and earlier in an article on the UMCL (Scelles and Durand 2010). Thus, the present research relies on intra-match CB (IMCB) and intra-match CI (IMCI) measures.

IMCB and IMCI capture the excitement of fans during the game. This is assumed to derive from close and uncertain score lines. Accordingly, IMCB is defined as a relatively

balanced score that generates high uncertainty about the possible winner until the end (e.g., a score enabling a team to take the lead or equalise if this is to score the next goal). IMCB is high when a team either scores an equaliser (e.g., from 0–1 to 1–1) or takes the lead with only one goal difference (e.g., from 0–0 to 0–1). In line with this, we consider that there is uncertainty when the difference between competing teams is no more than one goal. Falter and Pérignon (2000) found that the probability of winning becomes far higher and, subsequently, outcome uncertainty far lower when a team leads by at least two goals. Moreover, fluctuations in the ‘state’ of score need to be considered for a better assessment of how exciting a game is for fans. To illustrate, a game with a score of 3–3 with six fluctuations is likely to be more exciting than a game with a score of 0–0 with no fluctuation. Importantly, Alavy et al. (2010) showed that 0–0 or a sustained game-time without fluctuation is associated with lower TV viewership in football. However, because fluctuations cannot occur when there is no uncertainty (i.e., at least a two goals difference between teams), the latter is considered of prime importance over the former.

In addition to IMCB, at least one team needs to have a prize to compete for to make the game meaningful and, as such, competitively intense. Accordingly, IMCI is defined as a score where the next goal can change the situation of at least one team in relation to a prize (e.g., qualification to the next round). Like IMCB, fluctuations need to be considered for IMCI. However, for IMCI, fluctuations are related to the changes in the context of the competition that are determined by a change in match score (e.g., the team that scores a goal moves from being eliminated to being qualified). There is some evidence in the literature that CI may be more important than CB in explaining stadium attendance (Andreff and Scelles 2015) and TV audience (Scelles 2017), although the indicators chosen did not measure the intra-match level.¹

IMCB and IMCI measures used here follow the methods applied in previous literature. For IMCB, we calculated both the intra-match uncertainty (IMU) and the intra-match fluctuations (IMF) defined as follows:

- IMU refers to the percentage of game-time with a score difference of no more than one goal between the competing teams. For example, if the score moves from 0–0 to 1–0, 1–1, 2–1, then 3–1 at the 81st minute of the game (a football game lasting 90 min), there is uncertainty during 81 min and IMU is 90% (= 81/90). Values can range from 0% to 100%. However, 0% is theoretical since even if team A scores within seconds after the kick-off, there is still uncertainty as team B is only one goal away from equalising.
- IMF refers to the number of times a goal determines a change on the ‘state’ of the score. Values are expressed in absolute terms. Adopting the example described above for IMU, the value of IMF would be equal to 3: 1 from 0–0 (draw) to 1–0 (team A leading); 1 from 1–0 to 1–1 (draw); and 1 from 1–1 to 2–1 (team A leading again). No additional fluctuation is considered from 2–1 to 3–1 since team A would remain the leading one.

The same indicators were selected for IMCI, renamed as IMU’ and IMF’. Definitions of these indicators are equivalent to those of IMU and IMF, but contextualised with regard to the prize(s) the two teams compete for. In the previous example, if both teams have nothing to compete for (e.g., team A is sure to end first in its group and team B is already eliminated) or the game is the return game of a two-legged tie and team A won the first leg 3–0, IMU’ = 0% and IMF’ = 0. By contrast, if team A needs to win with a two goals margin and team B needs a draw, IMU’ = 100%, since, even at 3–1, team A is under the threat of not having a two goals margin anymore in the case of team B scoring a goal. IMF’ would be equal to 4: 1 from 0–0 to 1–0 (no draw anymore for team B); 1 from 1–0 to 1–1 (draw again for team B); 1 from 1–1 to 2–1 (no draw anymore for team B); and 1 from 2–1 to 3–1 (two goals margin for team A).

3.3. Data Collection and Analysis

To test the first five hypotheses, data were collected at match level both for the UMCL and the UWCL over the 2001–2019 period. As important changes occurred in 2009 in the formats of both competitions, the data were split into two sub-periods, 2001–2009 and 2009–2019. Over this period, 3299 matches were analysed: 2314 in UMCL, respectively 1064 between 2001 and 2009 and 1250 between 2009 and 2019; and 985 in UWCL, respectively 375 between 2001 and 2009 and 610 between 2009 and 2019.

To test the last two hypotheses, 989 UMCL matches analysed between 1955 and 1973 were added and also divided in two sub-periods—1955–1963 (393 matches) and 1963–1973 (596 matches)—to make possible the comparison with the 2001–2009 and 2009–2019 sub-periods in UWCL. In total, 4288 matches are included in the dataset. Table 1 provides information for each sub-period analysed on the total number of matches analysed, the average numbers of clubs and associations involved in the competition, the stages selected and the number of matches for each stage.

To verify whether the hypotheses are valid or not, the evolution of IMCB and IMCI in each tournament separately over 2001–2019 was first analysed by considering the two sub-periods identified (2001–2009 vs. 2009–2019) within the two competitions. Then, cross-comparisons on the level of IMCB and IMCI between both genders over the same period were undertaken. Additionally, a similar comparison between men and women was applied, but based on the first 18 years of the competition in UMCL (i.e., 1955–1973) and UWCL (i.e., 2001–2019) under the rationale that it is necessary to control for the two competitions having started at different times.

The different analyses were conducted both for the overall competition and specific rounds. As an example, over the 2001–2019 period, the analysis not only overall but also from the quarter-finals allowed to test not only the impact of the format changes implemented in 2009 but also examine the evolution of both IMCB and IMCI between the best eight teams. For the UMCL, the impact of the introduction of the champions and non-champions paths in the qualifying rounds was tested. For the UWCL, the impact of the transition from a group stage to home-and-away knockout games in the round of 32 with more teams from the highest ranked associations was tested. The evolution of IMCB and IMCI of both competitions for both sub-periods analysed was also compared to assess whether any differences existed between the men's and women's competitions and how these evolved before and after the format changes under consideration.

A last important methodological consideration is that, to conduct relevant calculations from a longitudinal and comparative perspective, it was chosen to consider games from the round the best teams enter the competitions over 2001–2019. In the UWCL, the focus was on the 16 teams that participated in the second qualifying round over 2001–2009, and the 32 teams that entered the round of 32 over 2009–2019. In the UMCL, the 32 teams that took part in the group stage were selected for the 2001–2019 period. Over 1955–1973, most of the time, many teams took part in the preliminary round when there was one, if not all except the previous winner. Thus, it was decided to include the preliminary round in the analysis, except in 1996–1967 (only four teams involved). All 16 teams were covered in the first edition of the competition in 1955–1956, extending to 22 teams in 1956–1957 and gradually a few more the following years, until reaching 32 teams in 1967–1968.

Comparisons were undertaken through one-paired or two-paired *t*-tests, depending on whether a specific direction (one-paired) was expected (i.e., H1.1, H1.2, H2.1 and H2.3) or not (i.e., H1.3, H2.2 and H2.4).

Table 1. Dataset for UEFA Men’s and Women’s Champions Leagues.

	Matches Analysed	Average Number of Clubs Represented	Average Number of Associations Represented	Stages Selected	Number of Matches Analysed Per Stage
UMCL	1955–1963	393	28	27	Preliminary (when there was one) and knockout stages Preliminary rounds: 148 Round of 16: 136 Quarter-finals: 67 Semi-finals: 34 Final: 8
	1963–1973	596	31	30	Preliminary (when there was one, except 1966–1967) and knockout stages Preliminary rounds: 126 Round of 32: 179 Round of 16: 157 Quarter-finals: 83 Semi-finals: 41 Final: 10
	2001–2009	1064	73	49	Group and knockout stages Group stage: 864 Round of 16: 96 Quarter-finals: 64 Semi-finals: 32 Final: 8
	2009–2019	1250	77	53	Group and knockout stages Group stage: 960 Round of 16: 160 Quarter-finals: 80 Semi-finals: 40 Final: 10
UWCL	2001–2009	361	41	40	2nd qualifying round and knockout stages 2nd qualifying round: 264 Quarter-finals: 64 Semi-finals: 32 Final: 15
	2009–2019	624	56	46	Knockout stages Round of 32: 320 Round of 16: 160 Quarter-finals: 80 Semi-finals: 40 Final: 10

4. Results

4.1. UMCL 2001–2019

IMCB results in the UMCL are displayed in Table 2. IMU significantly deteriorated between 2001–2009 and 2009–2019, with a drop in the percentage of game-time with a difference of no more than one goal from 84.5% to 80.9% overall. This is consistent with the assumption that champions of smaller domestic leagues from 2009 onwards did not perform as well as non-champions of bigger domestic leagues before 2009. However, the decrease is also significant from the quarter-finals, indicating a decreasing IMU even between the best teams. The deterioration for uncertainty did not translate into a decrease in the number of fluctuations. IMF went from 1.58 to 1.64 fluctuations overall, although this increase is not statistically significant.

Table 2. Intra-match competitive balance and intensity–UEFA Men’s Champions League 2001–2019.

		Overall			From Quarter-Finals		
		2001–2009	2009–2019	<i>p</i> -Value	2001–2009	2009–2019	<i>p</i> -Value
Intra-match competitive balance (IMCB)	Intra-match uncertainty (IMU)	84.5%	80.9%	<0.001 ***	88.4%	82.0%	0.018 **
	Intra-match fluctuations (FIM)	1.58	1.64	0.119	1.81	1.72	0.294
Intra-match competitive intensity (IMCI)	Intra-match uncertainty (IMU’)	80.1%	74.7%	<0.001 ***	76.6%	63.8%	0.004 ***
	Intra-match fluctuations (FIM’)	1.49	1.41	0.055 *	1.42	1.24	0.126

*, ** and *** mean significant at 10%, 5% and 1%, respectively; *p*-values based on one-tailed *t*-tests (direction specified).

IMCI results considering the prizes in the UMCL are also shown in Table 2. Like IMU, IMU’ decreased between 2001–2009 and 2009–2019. Overall, this deterioration was even more prominent, from 80.1% to 74.7%. Like IMCB, IMCI suffered from a significant decrease in IMU’ not only overall but also from the quarter-finals. However, IMF’ for IMCI did not follow the same path as IMF for IMCB. There was a significant decrease in IMF’ overall, from 1.49 to 1.41 fluctuations, aligning this result with the significant decrease in IMU’. Overall, both IMCB and IMCI significantly decreased in the UMCL between 2001–2009 and 2009–2019. This result is in support of H1.1.

4.2. UWCL 2001–2019

IMCB results in the UWCL are shown in Table 3. Overall, there was a significant improvement in IMU, with the indicator going from 64.3% of game-time with a score difference of no more than one goal over 2001–2009 to 71.1% over 2009–2019. This result is in support of H1.2. However, there was no significant improvement when looking at IMU from the quarter-finals. These results are consistent with the assumption that the runners up from top nations included from 2009 onwards are better than the champions from lower ranked nations, rather than an overall development of women’s football over time that would also translate in better CB between the best teams. Although the UWCL became more balanced overall from 2009, IMF followed the opposite direction. IMF showed a significant decrease from 1.59 to 1.46.

Table 3. Intra-match competitive balance and intensity–UEFA Women’s Champions League 2001–2019.

		Overall			From Quarter-Finals			Finals		
		2001–2009	2009–2019	<i>p</i> -Value	2001–2009	2009–2019	<i>p</i> -Value	2001–2009	2009–2019	<i>p</i> -Value
Intra-match competitive balance (IMCB)	Intra-match uncertainty (IMU)	64.3%	71.1%	<0.001 ***	73.6%	75.5%	0.313	72.7%	82.2%	0.214
	Intra-match fluctuations (FIM)	1.59	1.46	0.043 **	1.66	1.31	0.008 ***	1.47	1.4	0.453
Intra-match competitive intensity (IMCI)	Intra-match uncertainty (IMU’)	50.9%	49.9%	0.687	52.7%	53.5%	0.444	52.4%	82.2%	0.033 **
	Intra-match fluctuations (FIM’)	1.13	0.90	0.001 ***	1.14	0.87	0.038 **	0.73	1.4	0.094 *

*, ** and *** mean significant at 10%, 5% and 1%, respectively; *p*-values based on one-tailed *t*-tests (direction specified) for IMCB; two-tailed *t*-tests (direction not specified) for IMCI.

Looking at the IMCI results in the UWCL, it can be observed that IMU’ deteriorated from 50.9% to 49.1% overall between 2001–2009 and 2009–2019. However, the difference is not statistically significant. This is consistent with the assumption that moving from a group stage to two-legged knockout stages only (except in final) negatively impacted CI, counterbalancing the positive impact related to the significant increase in CB. This result is in support of H1.3. The only significant difference between both periods is for the final,

which shows a significant improvement in IMU' from 52.4% to 82.2%. This result can be directly linked to the change in the format of the final, played as a single leg since 2009. A single leg avoids a return match potentially without IMCI after an unbalanced first leg, as this was often the case over 2001–2009. The statistical tests conducted for IMF' are all significant. They show a decrease in the number of fluctuations since 2009, except for the final that benefitted from a significant increase, with the indicator going from 0.73 to 1.4 fluctuations. This confirms the positive impact of the format change implemented for the UWCL final since 2009.

Overall, the fact that the significant increase in IMU did not translate in a significant increase in IMU' casts doubt about the overall relevance of the format change, with in particular a move from a group stage to knockout rounds only. This suggests the need to include a group stage, consistent with Scelles and Durand (2010).

4.3. UWCL vs. UMCL 2001–2019

By adopting a cross-analysis perspective, indicators of IMCB and IMCI were compared for each stage in the UWCL and UMCL. IMCB results are presented in Tables 4 and 5 for the overall competitions and from the quarter-finals, respectively. Over each of the two sub-periods studied, the differences in IMU between women and men were statistically significant overall, with IMU being lower for women than men. This is consistent with the lower available playing talent in women's football compared to men's football, in line with the Gould hypothesis. However, the improvement of IMU for women and its deterioration for men between 2001–2009 and 2009–2019 led to a reduction in the gap between the UWCL and the UMCL. The overall difference between the two competitions reduced from 20.2 percentage points (64.3% in the UWCL and 84.5% in the UMCL) to 9.8 percentage points (71.1% in the UWCL and 80.9% in the UMCL) across the two sub-periods. The same applies to the difference between the two competitions from the quarters-finals, which reduced from 14.8 percentage points (73.6% in the UWCL and 88.4% in the UMCL) to 6.5% (75.5% in the UWCL and 82.0% in the UMCL). The difference between the two competitions from the quarter-finals over 2009–2019 is significant at the 5% level instead of the 1% level over 2001–2009. This is with a one-tailed test; if the assumption would have been that IMU for women and men from the quarter-finals over 2009–2019 should not have been different (two-tailed test), the difference would have been significant at the 10% level only.

Table 4. Intra-match competitive balance and intensity—UEFA Women's vs. Men's Champions Leagues 2001–2019—Overall.

		2001–2009			2009–2019		
		Women	Men	<i>p</i> -Value	Women	Men	<i>p</i> -Value
Intra-match competitive balance (IMCB)	Intra-match uncertainty (IMU)	64.3%	84.5%	<0.001 ***	71.1%	80.9%	<0.001 ***
	Intra-match fluctuations (FIM)	1.59	1.58	0.481	1.46	1.64	<0.001 ***
Intra-match competitive intensity (IMCI)	Intra-match uncertainty (IMU')	50.9%	80.1%	<0.001 ***	49.9%	74.7%	<0.001 ***
	Intra-match fluctuations (FIM')	1.13	1.49	<0.001 ***	0.90	1.41	<0.001 ***

*** means significant at 1%; *p*-values based on one-tailed *t*-tests (direction specified).

Table 5. Intra-match competitive balance and intensity—UEFA Women's vs. Men's Champions Leagues 2001–2019—From the quarter-finals.

		2001–2009			2009–2019		
		Women	Men	<i>p</i> -Value	Women	Men	<i>p</i> -Value
Intra-match competitive balance (IMCB)	Intra-match uncertainty (IMU)	73.6%	88.4%	<0.001 ***	75.5%	82.0%	0.028 **
	Intra-match fluctuations (FIM)	1.66	1.81	0.199	1.31	1.72	0.002 ***
Intra-match competitive intensity (IMCI)	Intra-match uncertainty (IMU')	52.7%	76.6%	<0.001 ***	53.5%	63.8%	0.017 **
	Intra-match fluctuations (FIM')	1.14	1.42	0.052 *	0.87	1.24	0.004 ***

*, ** and *** mean significant at 10%, 5% and 1%, respectively; *p*-values based on one-tailed *t*-tests (direction specified).

Overall IMF was slightly higher for the UWCL than for the UMCL over 2001–2009 (1.59 vs. 1.58, difference not significant), before this was reversed over 2009–2019 (1.46 vs. 1.64, significant difference).

IMCI results are also presented in Tables 4 and 5. They are similar to IMU for IMU' over both 2001–2009 and 2009–2019, and both overall and from the quarter-finals, i.e., IMU' was significantly lower in the UWCL than the UMCL but the difference reduced. These results are in support of H2.1 and H2.2. The overall difference between the two competitions reduced from 29.2 percentage points (50.9% in the UWCL and 80.1% in the UMCL) to 24.8 percentage points (49.9% in the UWCL and 74.7% in the UMCL) across the two sub-periods. The same applies to the difference between the two competitions from the quarters-finals, which reduced from 23.9 percentage points (52.7% in the UWCL and 76.6% in the UMCL) to 10.3% (53.5% in the UWCL and 63.8% in the UMCL).

Over 2001–2009, both differences between women and men overall and from the quarter-finals are significant for IMF' (lower IMF' for women than men) while they were not significant for IMF. This indicates that the format was less suitable to generate IMF' in the UWCL than in the UMCL over 2001–2009. This format included a group stage with only one game against each of the other teams in the group and only the top teams over 2001–2004 (top two teams over 2004–2009) qualifying for the next round (vs. two games against each of the other teams in the group and the third ranked team qualifying for the UEFA Cup in the UMCL), as well as a two-legged final. The format being less suitable in the UWCL than the UMCL was also true over 2009–2019. Indeed, IMF' displays similar results to IMF over 2009–2019, i.e., significantly lower IMF' for women than men, with a larger overall difference for IMF' (0.51; 0.90 in the UWCL and 1.41 in the UMCL) than for IMF (0.18; 1.46 in the UWCL and 1.64 in the UMCL). This result is consistent with the need to include a group stage in the UWCL. However, the result over 2001–2009 suggests that this is not enough. The group stage must include enough prizes, i.e., at least two teams qualifying with an incentive to be ranked first rather than second; and enough games, i.e., two games against each of the other teams in the group rather than one.

4.4. UWCL 2001–2019 vs. UMCL 1955–1973

Table 6 presents IMCB and IMCI in the UWCL over 2001–2019 and the UMCL over 1955–1973. IMCB and IMCI were lower in the UWCL over 2001–2009 than in the UMCL over 1955–1963. This result is in support of H2.3. IMCB and IMCI were also lower in the UWCL over 2009–2019 than in the UMCL over 1963–1973 (not significant for FIM). This result does not support H2.4. This may mean that runners up from the bigger domestic leagues entering the UWCL from 2009 did not compensate the number of registered female players over 2009–2019 assumed to be lower than the number of registered male players over 1963–1973. However, it must be noted that the differences between the UWCL over 2001–2019 and the UMCL over 1955–1973, i.e., when considering their first 18 seasons, are far lower than when both competitions are considered over 2001–2019. This comparison seems fairer for the UWCL since the competition had not the same opportunity to develop its competitiveness over time as the UMCL. Moreover, IMU was 71.1% in the UWCL over 2009–2019 vs. 73.9% in the UMCL over 1963–1973. Although significant at the 10% level, the difference corresponds to less than three minutes: does it really make a difference in terms of perceived uncertainty by fans?

Table 6. Intra-match competitive balance and intensity—UEFA Champions Leagues—Women 2001–2019 vs. Men 1955–1973.

		Women 2001–2009	Men 1955–1963	<i>p</i> -Value	Women 2009–2019	Men 1963–1973	<i>p</i> -Value
Intra-match competitive balance (IMCB)	Intra-match uncertainty (IMU)	64.3%	72.0%	<0.001 ***	71.1%	73.9%	0.093 *
	Intra-match fluctuations (FIM)	1.59	1.79	<0.001 ***	1.46	1.50	0.515
	Intra-match uncertainty (IMU')	50.9%	56.4%	0.023 **	49.9%	57.8%	<0.001 ***

Intra-match competitive intensity (IMCI)	Intra-match fluctuations (FIM')	1.13	1.41	0.002 ***	0.90	1.12	<0.001 ***
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*, ** and *** mean significant at 10%, 5% and 1%, respectively; *p*-values based on one-tailed *t*-tests (direction specified) for UWCL 2001–2009 vs. UMCL 1955–1963; two-tailed *t*-tests (direction not specified) for UWCL 2009–2019 vs. UMCL 1963–1973.

5. Discussion

The present study aimed to answer two research questions:

1. How has the competitiveness of the UMCL and UWCL evolved over time following the format changes in 2009–2010?
2. How has the competitiveness compared between the UMCL and UWCL over time?

From these two research questions, as well as the literature review and background context, seven hypotheses were tested. The first six hypotheses were supported by the results:

- H1.1. CB and CI decreased in the UMCL between 2001–2009 and 2009–2019.
- H1.2. CB increased in the UWCL between 2001–2009 and 2009–2019.
- H1.3. CI did not increase in the UWCL between 2001–2009 and 2009–2019.
- H2.1. CB and CI were lower in the UWCL than in the UMCL over 2001–2019.
- H2.2. The CB and CI of the UWCL became closer to the CB and CI of the UMCL over 2009–2019 compared to 2001–2009.
- H2.3. CB and CI were lower in the UWCL over 2001–2009 than in the UMCL over 1955–1963.

By contrast, H2.4 was not supported by the results, i.e., CB and CI were *not* similar in the UWCL over 2009–2019 and the UMCL over 1963–1973. Instead, CB and CI were lower in UWCL, although the difference in CB (IMU) was significant only at the 10% level and corresponded to less than three minutes.

5.1. More Balanced European Women's Football: The Consequence of an Increased Professionalisation?

Results show an overall improvement in CB measured through IMU in the UWCL between 2001–2009 and 2009–2019. The first sub-period comprised 16 teams from 15 to 16 countries, while the second sub-period relied on 32 teams with two teams from up to the 12 best countries (even three teams for Germany in 2009–2010) based on the UEFA coefficients. The improvement in CB (IMU) can be interpreted as a positive consequence of allowing more than one team from the best UEFA countries. This suggests that the second-best teams in these countries are better than the best teams in the countries with lower UEFA coefficients. A similar result would likely be found if extended to the third-best teams in the best countries, consistent with the new UWCL format implemented in 2021–2022 that includes three teams for each of the six best-ranked countries (UEFA 2019). Nevertheless, the improvement does not hold anymore when looking at CI measured through IMU'. Findings show that a group stage is more appropriate than a knockout stage with two legs. This is logical as a group stage is supposed to keep most teams in contention until late, especially if most positions are associated with a prize (as in the UMCL with three positions out of four being in contention for a prize). In contrast, a two-legged knockout stage game may be decided early (e.g., in the first leg of the game), thus leading to reduced fan interest towards the second leg. The new UWCL format, implemented in 2021–2022, includes a group stage qualifying 50% of the teams to the next round. This is a format change that is directly supported by our findings.

If the move from a group stage to a round of 32 was not the best choice in terms of CI (IMU'), the move from a two-legged to a one-legged final was wise, as confirmed by the significant improvement in CI (IMU' and IMF'). The significant improvement in IMF' for the final is in contrast with the significant decreases in IMF and IMF' overall and from the quarter-finals.

When comparing the UWCL and the UMCL, it appears that the former still lags behind the latter in terms of CB and CI. Following the so-called Gould hypothesis, this was expected due to the relatively limited amount of available playing talent in the women's game as compared to the men's, despite its increase over time (Scelles 2021a). Yet, the gap between the UWCL and the UMCL was reduced, in particular from the quarter-finals, i.e., when it comes to the eight best teams. This reduced gap between women and men may be partly explained by the progressively larger involvement of professional men's clubs in women's football. The collaboration between men's and women's clubs enables a scenario in which players can benefit from the infrastructure of the male counterparts and dedicate full-time to training and football activities thanks to professionalisation and associated payments (Valenti 2019). As demonstrated by Frick (2011a, 2011b), gender differences in competitiveness of professional distance running considerably narrowed over the years following larger financial incentives for the women's races. Remarkably, the composition of the UWCL started to see an increasing number of women's teams that are associated with a men's club following the introduction of prize money in 2010 (Valenti et al. 2019). Thus, findings of the present research do not support the hypothesis that differences in CB between the UWCL and the UMCL reflect different physical capabilities between the two genders (Kringstad 2018). Instead, they show that gradual improvements in CB and CI in the UWCL are in line with the increasing returns to success and the professionalisation it has favoured, suggesting that UEFA should pursue its efforts and investments in this area.

However, given the still low available playing talent in women's football, the integration of women's teams with men's clubs also risks creating imbalances in the concentration of talent (Zamboni-Ferraresi et al. 2018), thus potentially undermining the chances of both independent clubs and clubs based in smaller market leagues to reach sporting success. Under the new format, the UWCL rights are centralised from the group stage onwards instead of the final only (UEFA 2019), with at least 11 associations represented in the group stage. If coupled with a strong solidarity in revenue sharing, this centralisation may favour CB and CI between more clubs and countries in the UWCL, although the potential consequences on CB and CI in domestic leagues would need to be considered.

5.2. Less Balanced European Men's Football: A Super League Is Not the Panacea?

Given recent events that occurred in European football with the announcement of the European Super League (The Super League 2021), further considerations relating to the future of the game can be derived from the findings of this study. If there is some evidence of improvement in CB and CI in the UWCL, there is instead some evidence of deterioration in the UMCL. Interestingly, this holds true not only overall—i.e., including when the best teams play against lower teams—but also at the later stages of the competition, i.e., when the best teams play each other. This finding can help assess the opportunity of a European Super League in men's football. The rationale usually provided for its organisation is the ever-increasing gap between the best teams and the other teams, leading to a deterioration of CB in European men's football. Yet, our results show that CB between the best teams is not as strong as it used to be. This questions the idea that a European Super League would solve the issue of a deteriorating CB in European men's football. Moreover, a European Super League may struggle to generate a high CI if structured as a closed competition without promotions and relegations, i.e., without the prize of avoiding relegation. In other words, it appears as a potential move without clear benefits for fans and football in general, consistent with recent research (Brannagan et al. 2022; Wagner et al. 2021); by contrast, it raises a clear threat on the sustainability of European men's football as it has been organised since the late 19th century.

The threat of a European Super League in men's football can be considered as well in women's football. This may lead to the same format and be played by the same clubs as in its men's counterpart. This underlines the moves that may happen in both European women's and men's football, and their potential synergies. Although a broader economic

approach combined with more managerial and socio-cultural perspectives would be necessary to explore this research direction further, this avenue may still be usefully informed by a reflection on the potential impact on CB and CI in European women's and men's football.

5.3. Limitations and Future Research Directions

In addition to the last suggestion, other future research directions can be identified following the limitations of the present research. A first limitation is identified in the lack of longitudinal data to account for the differences in available playing talent between women's and men's football and their evolution in European football over 2001–2019. Official figures over the entire period are not available. However, with this information now being collected more regularly by UEFA, it is suggested that future research investigate further the impact of these differences and their evolution on CB and CI. A second limitation is that a regression model was not tested to confirm the results while controlling for the different explanatory variables at the same time. Testing a regression model with the data available in the dataset collected would not allow to include an explanatory variable enabling to make a distinction between the different games played during the same leg or matchday of the same round for the same competition during the same season. Yet, the data show that there can be important differences between such games in terms of CB and CI. For this reason, it was decided not to include a regression model. Future research could address this limitation by identifying additional data that enable to test a regression model with at least one explanatory variable (e.g., differences in UEFA coefficients between clubs/countries) that distinguishes between the different games. A third limitation is that the impact of CB and CI on fan demand has not been tested. The reason is that the focus was on the analysis of CB and CI rather than their impact on fan demand. Future research could explore the latter, extending from Valenti et al. (2020) in the UWCL. This could also help identify differences in terms of how fans perceive CB and CI for similar levels between men's and women's football, while the present research assumed that they are equivalent (e.g., a game with 80% of uncertainty is considered as exciting for both men's and women's football). A fourth limitation is that the perceptions of key European football stakeholders have not been included in the analysis. Yet, such perceptions based on interviews and surveys may help understand further the reasons behind the past evolution of CB and CI, as well as better anticipate their future evolution in the context of the European football model.

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Note

- ¹ IMCB and IMCI can be equivalent in some situations (e.g., single leg or early games in a group stage, when all teams can still qualify for the next round), while they differ in others (e.g., in a second leg after 5–0 in the first leg or when both teams have nothing to compete for anymore in the group stage), depending on the competition format.

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