SHORT REPORT

Is crowd support a significant factor in home advantage on the highest level of competition in football?

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Abstract

Introduction. Home advantage is an important factor in determining the result of a football game. Crowd support is considered to be a major factor influencing home advantage, but it has not been verified individually on the professional level. Due to the COVID-19 pandemic, football matches started to be held without the participation of an audience, which gave an opportunity to examine crowd effects. In this article the impact of crowd effects was examined on the highest level of competition, in four best European leagues. **Aim of Study.** The aim of the study was to check if crowd support is an important factor in home advantage in four best European football leagues and to examine tendencies in home advantage in those leagues from 2015 to 2020. **Material and Methods.** Football match results from 2015 to 2020 in the Spanish, English, German and Italian leagues were collected and used in the analysis. Two coefficients: Home Advantage Rate and Difference between percentage of home team wins and losses were used. Statistical calculations were carried out using the STATISTICA software package. **Results.** It was noticed that in Spain and in Germany home teams performed worse in matches without an audience than in those with crowd support. However, in England and in Italy the results of home teams with and without crowd presence were similar. Moreover, home advantage has been decreasing in recent years in the best European leagues. **Conclusions.** There is a statistically significant impact of crowd support on home advantage on the highest level of competition in football.

KEYWORDS: football, home advantage, crowd effects.

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Introduction

Home advantage has been established as an important factor in determining the result of a football game at least since the start of organized football at the end of the 19th century. It is observed around the world, but varies depending on the country and level of competition. Although home advantage is a factor determining results not only in football, but also in other team sports, in European football (soccer) it tends to have a greater impact and for this reason the scope of this article is limited to this particular sport.

The first report of home advantage in football was written by Morris [3] in 1981. Then there were articles released by Dowie [2] and by Pollard [5], who later updated his researches [6, 11]. Many researchers followed the subject later [10] as home advantage is an extensive topic and can be examined in many different ways – depending on the level of competition in leagues, location and time, in which a given competition took place.

According to a study by Pollard [4], explanations for home advantage in football include crowd effects, travel effects, familiarity, referee bias, psychological factors, to name just a few. Crowd support is the most obvious factor related to home advantage [4, 12]; while many researchers examined its relationship with crowd size [6, 10, 11], this aspect is still unclear. Moreover, crowd support can influence home advantage directly through its effect on the players as a psychological factor, while it may also impact the referee's decisions.

Although researchers acknowledged crowd effects as an obvious factor having impact on home advantage,

there were limited opportunities to examine this factor individually in professional leagues, especially on the highest level of competition, as almost all games were played with the participation of the audience of fans. Due to the COVID-19 pandemic, most professional leagues stopped playing and then finished the 2019/2020 season with matches played without an audience, which provided a rare opportunity to examine how home advantage has changed without the crowd support and if it is clearly a significant factor in home advantage on the highest level of competition in football.

The impact of home advantage has been declining over years. One of the reason for this decrease is the fact that players are becoming less familiarised with the home ground, as we are in the era of free agency, as a result professional players can change teams easier and do it more often. Increased professionalism and market culture in football are also reasons for reducing the impact of home advantage. There are also other explanations of this decline, such as advances in technology and medicine, which make players better prepared for away matches. The downward trend for the impact of home advantage was also verified in this particular paper.

Europe is considered the best continent in football (soccer), as this is the most popular sport in many countries there. It is also seen in the FIFA ranking, where among the 20 best countries, 14 are European. As a result, the best European leagues are considered the best in the world and should be considered as the highest level of competition in football.

In this article four best European leagues (according to the UEFA ranking) were investigated. Those four European leagues have been the top 4 in the ranking for more than a decade and have built their reputation as the best European leagues for many years. Furthermore, according to the UEFA rules four best European leagues have the highest number of their teams in the Champions League and the Europa League every year, which further confirms their prestigious status.

Aim of Study

The purpose of the study was to check if crowd support is an important factor in home advantage in four best European football leagues and to examine tendencies in home advantage in those leagues from 2015 to 2020. This information was used to verify a well-established hypothesis concerning the crowd support's impact on home advantage in football matches on the highest level of competition. Moreover, it was checked whether even without the crowd effects, home advantage could still be observed in the best European leagues.

Material and Methods

Results from football matches played from the 2015/2016 to the 2019/2020 seasons both with and without crowd support (in the 2019/2020 season) in four best European leagues: the English Premier League, the Spanish La Liga, the German Bundesliga and the Italian Serie A were included in the analysis in this particular paper.

Data was presented as qualitative data (number of wins, draws, losses) and in tables (also percentage-wise depending on the season, country and presence of crowd). Two coefficients were used – the Home Advantage Rate (HAR), which is counted as the proportion (percentage) of points scored by the home teams to all points by the home and away teams, and the Difference between the percentages of home team Wins and Losses (DWL).

The threshold value for HAR is 50%, while for DWL it is 0 percentage points (p.p.), which means that there is no difference in the results between home and away matches. Bigger values of both coefficients indicate better results in matches played at home, while smaller values means better results for the teams which played away matches.

A structural test was also used to check if the difference between the results of games played with and without the crowd presence is statistically significant. This statistical analysis was conducted using Dell Inc. (2016) Dell Statistica (data analysis software system), version 13. software.dell.com. The level of significance for the statistical test was set at $p \leq 0.05$.

Results

It was observed that in Spain the home teams performed worse in matches played without crowd support, as they won only 40.9% of those games compared to over 47% in four out of the five seasons from 2015/2016 to 2019/2020. In the 2018/2019 season, in which home teams won 44.2% games, there were more draws (28.9% of games), which led to a similar HAR to that for the other seasons – in every season in the matches with the audience presence the HAR value was higher than 59%, in contrast to 55% in the 2019/2020 season in the matches without fans present. The same conclusions were reached for DWL – it was higher in the seasons with the crowd effects, as the average value was almost 19 p.p. and it dropped to 9.1 p.p. in the matches without crowd support (Table 1).

In England the home teams had similar results in the matches both with and without the audience, as 46.7% matches were won by the home teams without crowd

Table 1. Results in four best European leagues from 2015/2016 season to 2019/2020 season depending on country, season and crowd presence
[a] games in 2019/2020 season without crowd presence; [b] all games from 2015 to 2020 (with and without crowd presence)

Country of league	Season	Games	Wins [%] (N)	Draws [%] (N)	Losses [%] (N)	HAR [%]	DWL [p.p.]
Spain (La Liga)	2015/2016	380	48.2 (183)	24.2 (92)	27.6 (105)	61.2	20.6
	2016/2017	380	47.6 (181)	23.4 (89)	28.9 (110)	60.1	18.7
	2017/2018	380	47.1 (179)	22.6 (86)	30.3 (115)	59.1	16.8
	2018/2019	380	44.2 (168)	28.9 (110)	26.8 (102)	59.6	17.4
	2019/2020	270	47.8 (129)	27.8 (75)	24.4 (66)	62.9	23.4
	2015-2020	1790	46.9 (840)	25.3 (452)	27.8 (498)	60.4	18.9
	2019/2020[a]	110	40.9 (45)	27.3 (30)	31.8 (35)	55.0	9.1
England (Premier League)	2015/2016	380	41.3 (157)	28.2 (107)	30.5 (116)	56.0	10.8
	2016/2017	380	49.2 (187)	22.1 (84)	28.7 (109)	61.1	20.5
	2017/2018	380	45.5 (173)	26.1 (99)	28.4 (108)	59.4	17.1
	2018/2019	380	47.6 (181)	18.7 (71)	33.7 (128)	57.4	13.9
	2019/2020	288	44.8 (129)	25.0 (72)	30.2 (87)	58.0	14.6
	2015-2020	1808	45.7 (827)	23.9 (433)	30.3 (548)	58.4	15.4
	2019/2020[a]	92	46.7 (43)	21.7 (20)	31.5 (29)	58.2	15.2
Germany (Bundesliga)	2015/2016	306	44.1 (135)	23.2 (71)	32.7 (100)	56.2	11.4
	2016/2017	306	49.0 (150)	24.2 (74)	26.8 (82)	62.1	22.2
	2017/2018	306	45.4 (139)	27.1 (83)	27.5 (84)	59.9	17.9
	2018/2019	306	45.1 (138)	23.9 (73)	31.0 (95)	57.6	14.1
	2019/2020	224	43.8 (98)	21.4 (48)	34.8 (78)	54.8	9.0
	2015-2020	1448	45.6 (660)	24.1 (349)	30.3 (439)	58.3	15.3
	2019/2020[a]	82	30.5 (25)	24.4 (20)	45.1 (37)	42.0	−14.6
Italy (Serie A)	2015/2016	380	46.1 (175)	25.0 (95)	28.9 (110)	59.3	17.2
	2016/2017	380	48.4 (184)	21.1 (80)	30.5 (116)	59.6	17.9
	2017/2018	380	43.2 (164)	21.8 (83)	35.0 (133)	54.4	8.2
	2018/2019	380	43.7 (166)	28.4 (108)	27.9 (106)	58.7	15.8
	2019/2020	256	40.2 (103)	22.7 (58)	37.1 (95)	51.7	3.1
	2015-2020	1776	44.6 (792)	23.9 (424)	31.5 (560)	57.1	13.1
	2019/2020[a]	124	44.4 (55)	21.8 (27)	33.9 (42)	55.7	10.5
All four leagues	2015/2016	1446	45.0 (650)	25.2 (365)	29.8 (431)	58.3	15.2
	2016/2017	1446	48.5 (702)	22.6 (327)	28.8 (417)	60.7	19.7
	2017/2018	1446	45.3 (655)	24.3 (351)	30.4 (440)	58.1	14.9
	2018/2019	1446	45.2 (653)	25.0 (362)	29.8 (431)	58.4	15.4
	2019/2020	1038	44.2 (459)	24.4 (253)	31.4 (326)	57.0	12.8
	2015-2020	6822	45.7 (3119)	24.3 (1658)	30.0 (2045)	58.6	15.7
	2019/2020[a]	408	41.2 (168)	23.8 (97)	35.0 (143)	53.3	6.2
	2015-2020[b]	7230	45.5 (3287)	23.3 (1755)	30.3 (2188)	58.3	15.2

support and this was 1 p.p. higher than the average wins percentage presented in those played with the crowd presence from 2015 to 2020. It was also shown by similar values of HAR and DWL – in both coefficients the value for the matches without the audience was only 0.2 p.p. lower than that for the five seasons played with fans present (Table 1).

In Germany the home teams had surprisingly bad results in the matches played without fans, as they won only 30.5% matches, significantly fewer than they lost (45.1%), which resulted in the only negative value of DWL in Table 1. This was also shown by the lowest value of HAR (42%), which confirmed that the away teams performed better than the home teams in those 82 games played with the crowd absence. Meanwhile, in the seasons with the crowd presence the home teams performed better than the away teams, winning at least 43.8% of the matches and with the DWL higher or equal to 9 p.p. (Table 1).

It was noticed that in Italy the home teams performed similarly in the matches with and without the presence of an audience. In the games without fans present the home teams won 44.4% matches, which is 0.2 p.p. smaller than the results from 2015 to 2020, in which there was a crowd effect. Furthermore, HAR (55.7%) and DWL (10.5 p.p.) in the matches without fans present did not differ much (being by 1.4 p.p. and 2.6 p.p. lower) from the results in the matches with crowd support between 2015 and 2020 (Table 1).

A greater variability was also observed in Italy and Germany in the HAR depending on the season compared to in Spain and England. Moreover, it was noticed that

Figure 1. Home Advantage Rate in each of four best European leagues in between 2015/2016 to 2019/2020 seasons

ᵃ games in 2019/2020 season without crowd presence

in England and Italy the results in the matches played without fans were similar to those played with the crowd presence, in contrast to Spain and Germany, where the home teams performed worse with the audience absence, as shown by the value of their smallest coefficients in the 2019/2020 season in the matches without fans (Table 1, Figure 1).

Results of HAR in all the four leagues in every season included in the analysis were presented in Figure 1. The home advantage trends are shown in five most recent seasons depending on the country and the absence of the audience impact on HAR in each of the top 4 European leagues.

Looking at all the four leagues, in the matches without the crowd support, a decrease was recorded in the home teams' winning percentage (41.2% compared to over 44% in the other seasons), HAR (53.3% compared to min. 57% in the seasons with the audience presence) and DWL (6.2 p.p. compared to over 12 p.p. in every other season) (Table 1). That tendency was confirmed by the statistically significant result ($p = 0.0349$) of the structural test, which compared all the matches with and without fans present, considered in this article.

Discussion

Although the HAR value changes from season to season, with some unexpected one-year spikes, a downward trend was observed for this coefficient, which means that the home advantage is declining. This coefficient was examined in many studies [7, 8, 9] in different time periods in the European leagues, including this paper.

A drop of HAR was observed especially in Spain, where between 1929 and 1983 HAR was almost continuously above 70% (reaching as much as 75% several times in the 1970s), but then decreased significantly to as little as slightly over 60% in the early 2000s. Also in Italy a decrease of HAR was observed over the years, from over 70% after the Second World War to just slightly above 60% in the early 2000s [9].

Moreover, HAR was examined in six straight seasons from 1997/1998 to 2002/2003 in every European league [7]. According to the UEFA ranking from the 2002/2003 season the four best leagues were exactly the same as they are now (Spanish, Italian, English and German). In each of those leagues the average HAR from those 6 seasons was over 60%. The lowest value was recorded in the English league (61.19%) and the highest – in the Spanish league (63.90%).

HAR was also examined between 2006 and 2012 worldwide [8]. In each of the four best European leagues the values of HAR were smaller than the aforementioned
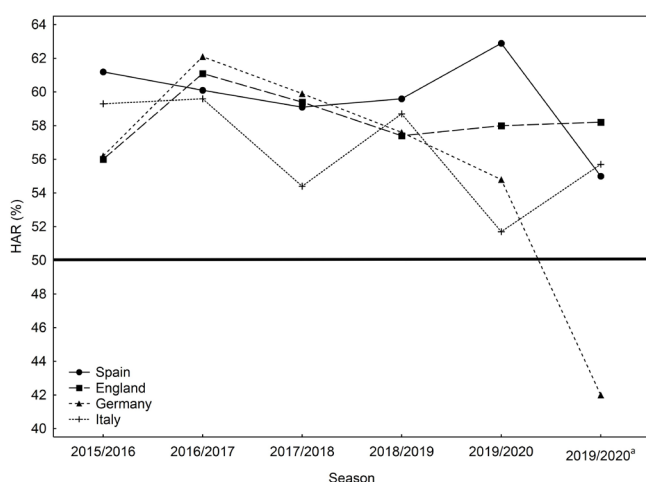
from 1997 to 2003. The highest HAR value from those four leagues during the 6-season period was held by the Italian league (62.25%), while the lowest – by the German league (58.35%), which was the only result below 61% in the four best European leagues.

Comparing this above-mentioned results with those examined in this article (5 seasons between 2015/2016 and 2019/2020 in matches with fans present) another decrease of HAR was observed as the highest value was recorded in the Spanish league (60.4%) and the lowest – in the Italian league (57.1%). That means the downward trend for the home advantage was also seen in recent years (Table 1).

Furthermore, HAR in each analysed league in those average results from 2015 to 2020 in matches with the crowd presence was higher than that in games without the crowd effects in the 2019/2020 season. Although the difference in England was really small (0.2 p.p.), in the other countries it was more significant (1.4 p.p. in Italy, 5.4 p.p. in Spain and 16.3 p.p. in Germany), which shows the crowd support's impact on the home advantage (Table 1).

According to a study by Bray [1], home advantage exists if the difference between the home team's wins percentage and the home team's losses percentage (in this article presented as DWL) is higher than 5 p.p. It was not observed only in two cases (in Germany in the 2019/2020 season in matches without fans and in the 2019/2020 season in those with the crowd support in Italy) and there were only three more cases in those leagues, in which DWL was smaller than 10 p.p. (Table 1).

Looking at the results from all the four leagues, in the matches with the crowd presence the lowest DWL value was 12.8 p.p., in the 2019/2020 season before the pandemic and in the years 2015-2020 the average DWL was over 15 p.p. Then a drop by over 50% in the matches without fans was noticed, as the value of DWL in this case was 6.2 p.p., meaning that in the matches without the crowd presence the home advantage still existed, but it was significantly smaller than in the matches with fans in the audience (Table 1).

That also was observed considering HAR (which is dependent on DWL), as it also decreased in games without fans from 57.0% (the lowest value of a single season with the crowd effects in HAR from 2015 to 2020) to 53.4% (HAR from the matches without fans in the 2019/2020 season). Taking in consideration 50% as the threshold value, this decrease could be seen as a little over 50% drop in home advantage (Table 1).

Considering a reduction bigger than 50% without the crowd effects, it could have been assumed that the crowd support has the biggest impact among all the factors of home advantage. This hypothesis was not yet examined, as we would need check the impact of other factors on the results of football matches. For example, to verify the effect of familiarity, matches with the crowd effects similar to those played at home, but played in neutral venues, should also be examined. While it will be difficult to obtain a big sample size and do it especially for the highest level of competition, if possible it would be of great interest.

The sample size of matches without the crowd presence is a slight limitation in this study, as not every possible match-up between every pair of teams was played and also every match-up appeared at maximum once. It would have been preferable to have a bigger sample size, with the full season (every possible match-up played twice) played without the crowd presence. Understandably it was an unprecedented circumstance to have matches without fans present on the highest level of competition, so nothing can be done in this case. Nevertheless, in the opinion of the author the sample size of over 400 matches is sufficient to consider the results significant. It is possible that the full 2020/2021 season will be played without the crowd effects, then the results of the home teams in this full season would be an interesting topic to examine in further studies.

This paper is based on the four best European leagues, which might not be fully representative for all types of football leagues considering specific conditions in other countries and different levels of competition. Still the main topic of this study was to check if the crowd effect is a significant factor in home advantage on the highest level of competition.

Conclusions

In conclusion, this study shows that there is a statistically significant impact of crowd support on home advantage on the highest level of competition in European football (soccer). Although home advantage still exists without this factor, it is significantly smaller. Moreover, home advantage shows a tendency to decrease over the recent years and it raises a question whether in the next 30 years or so it would still be a significant factor in determining match results in football.

Conflict of Interests

The authors declare no conflict of interest.

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