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Home advantage in European soccer without crowd

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ABSTRACT

The presence of spectators in sport is considered a factor that leads to home advantage (HA). The objective of this research was to analyse the difference of wins, points and goals both at home and away depending on the presence or absence of a crowd and other possible covariates such as budget or average attendance at the stadium in times post COVID. The sample is made up of eight football leagues (soccer) from Germany, Spain, Italy, England and Austria. The results show that there are no significant differences between playing with or without a crowd, except in the German and Spanish top leagues. Even so, there is a tendency in most competitions to play worse at home and better away from home when there are no spectators. These findings do not generally support the theory of social facilitation; so it is concluded that there must be other factors that explain HA.


Introduction

The consistently better performance seen by teams in various sporting contexts when playing at home is known as the ‘Home Advantage’ (HA).¹ This advantage is well documented in a wide range of team sports, including association football or soccer.² Some authors point out that the advantage of playing at home is more pronounced in indoor sports such as ice hockey and basketball and less pronounced in outdoor sports such as baseball and soccer.³ However, other researchers point to professional football as the sport where the local advantage is bigger.⁴

Some relevant research on HA at the football level shows how this has happened in Spain⁵ or in the English Premier League,⁶ and in several other European leagues.⁷ It can also be observed by continent,⁸ and for tens of years in some of the major European leagues,⁹ and even in the women’s discipline, although a lower rate of local victories has been observed compared to men.¹⁰ Thus, although there are differences between gender, country, quality of the teams, decade or sport, the data researched generally and solidly corroborate the relationship between the location and the performance of the teams. Furthermore, observations made in the wake of the HA show that the local football team is more likely to score the first goal, and that the team that scores this first goal is more likely to score others, thus reinforcing the home team’s advantage by increasing the number of goals scored in its favour.¹¹ In turn, this advantage is given more in the home games that correspond to the second round or second match¹² in knockout competitions.

Therefore, one of the main lines of study is the causes that affect this superiority. Four main causes are conventionally established: travel, crowds, familiarity and/or learning with the

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environment and rule-related factors.¹³ But there are also other elements of great interest such as psychological factors, expert decisions, team identity or territoriality.¹⁴

The established approach is that these variables would each intervene to a greater or lesser extent in the HA depending on whether the team is local or visiting. Thus, home wins would be explained by a greater increase in playability and sometimes also by functional aggressiveness in the home team, hypotheses that are supported both by the careful analysis of the game elements¹⁵ and even by the levels of certain hormones such as cortisol or testosterone,¹⁶ while tactical behaviour turns out to be more offensive for home teams than the selection of more defensive tactics by the visitors.¹⁷ In short, it is suggested that these differences in performance would be caused by numerous contextual variables that would benefit local teams to the detriment of the visitors,¹⁸ with the social support of the crowd being the most decisive factor in favour of most of these authors.

Theories about this influence of the public date back to the origins of social psychology, and have since been thoroughly researched and largely taken up both by academic textbooks¹⁹ and by society (e.g. with the inclination of sports betting towards HA). One of these authors is Triplett in 1898²⁰ who focussed on dynamogenic factors by showing that the presence of other competitors increased the arousal and improved the performance of professional cyclists. Later, Allport²¹ would call 'social facilitation' the effect that the presence of other people has on an individual's performance. To this theory, Zajonc²² would add that performance influenced by the crowd (increased activation) would depend on the experience of the performer, the better the more qualified and the lower the less qualified. Applied to sports, when there is an increase in crowd pressure on athletes (either positive or negative), those players who have more experience and more control in these situations will have better performance; however, the novice players will be more likely to make a greater number of mistakes.²³

Cox makes it clear that influence not only benefits the home team, but also harms the opposition. Thus, with a big number of supporters, we can perceive more home wins, and in turn, the hostility of the crowd can disorientate the opponent by making it difficult for them to play their natural game. But also, crowd pressure can be detrimental to the home team, either because of high expectations on the players to win and play well, or because of an excessive increase in activation due to a crowd that shouts and cheers excessively, stressing and distracting the cheering team.²⁴

Thus, although most team sports correct this bias through round-robin matches or matches on neutral ground, the effect of the crowd will vary in each match both in quantity and quality²⁵ towards one or the other team, causing small differences between them and their HA due to this crowd factor. Nevill, Newell and Gale²⁶ found that home advantage was associated with average stadium attendance, while studies such as those by Dowie or Pollard²⁷ found no difference in favour of the home team in terms of absolute numbers of spectators and their density.

Finally, the public could not only influence the players, but also the decisions of the experts. Nevill, Balmer and Williams²⁸ noted that a large audience and noise generation can lead to an imbalance in referees' decisions in favour of the home team. Lehman and Reifman²⁹ showed that stars players were sanctioned less at home than away. Regarding the relationship between location and expert decisions, Nevill, Newell and Gale³⁰ confirmed refereeing imbalances in favour of the home teams

Although social facilitation has been widely theorized, few experimental studies have been carried out due mainly to the difficulty of recreating natural environments in which to test the theory, either by experimentally simulating an event with a large audience or by organizing official sports events without an audience and thus being able to analyse the possible differences of playing with or without crowds, separating the home factor from the possible incidence of the audience, since historically these variables have occurred together, as if they were one.

However, the global COVID-19 pandemic has caused many sporting events to be played without an audience, a move that has affected major football leagues. Some of them ended the 2019–2020 season after going into quarantine, while others were left waiting to resume months later and end

the season by playing the remaining matches; but this time they were held without the attendance of mass spectators. Thus, this situation allows a unique and natural scenario with which to check the influence of the public, being able to contrast within the same league and by teams the HA before (with spectators) and after (without them).

Therefore, the objective of this research is to analyse the possible differences in the HA of those leagues and teams depending on the presence or absence of the public. The main hypothesis is that the HA will be lower (fewer points) without the presence of supportive fans at the stadium, and that visitors will benefit from this because they no longer have a crowd against them. Finally, according to Zajonc's social facilitation,³¹ there may be differences between the teams, with a favourable HA for the lower ranked teams when they play without an audience, and with a lower HA in this situation for the higher ranked teams, as they no longer have the massive support and pressure from their fans, while the lower ranked teams, having less regular attendance in their stadiums, would have less of an effect by playing without an audience. The results will allow to clarify if the HA is intimately linked to the public, or on the other hand, if this crowd variable acts independently of the home factor.

Methodology

Eight European leagues were analysed whose final matches of the 2019–2020 season were played without an audience. These included the German Bundesliga in the first and second divisions, the Austrian Bundesliga, the Spanish la Liga Santander and la Liga Smartbank (first and second divisions in Spanish professional football), the Italian in both categories (Serie A and B) and the English Premier League. The English second Division was not chosen because it was terminated in the face of the pandemic, and neither was the second Austrian league because it was of lesser importance and public. As it was the same season and not a new one, each league continued to be made up of the same teams, without changing their squads and their objectives remained the same as when they stopped playing with the public. This happened at the beginning of March 2020, with a two-month break approximately, and resumed at the end of May and beginning of June in these countries (with some exceptions).

Among the different leagues in this situation, those with a high percentage of matches played behind closed doors were selected in order to have a wide sample at a general level (more than nine matches per team in this situation) and to study the differences between teams and the field factor (four or five matches at home or away). At the same time, teams with different levels and of different nationalities are taken into consideration in order to compare possible similarities and differences.

The units of analysis are all the matches played by each team. For example, if the German Bundesliga first division had 306 matches, this makes a total of 612 (18 teams played 34 matches), half of which were played at home and half abroad (17 in each field). In other words, even if the total number of matches is 306, the result for each of them is different for one or another team (playing at home or away), that is why the analysis units are the results for each team (18 for 34) and not half, even if this corresponds to the total number of matches played in that league (306 at home for some but also 306 away for others).

For this work, we created a table at the end of each competition containing technical data (name of the league, team, match day and date), those regarding the dependent variables (goals, points [3 won/1 tied/0 lost], position in the ranking) and independent ones: public (with [before]/without [after] and field [home/away]). In addition, we added covariates that could be related to the quality of the team and that could explain the number of points obtained. These factors are the average attendance to the stadium (without counting when there were no spectators), the performance of each stadium (Attendance/Capacity), the budget or value of the team at the end of the season, the number of foreigners per team, the percentage of players (nationals/foreigners) lined up in the total number of games of each team, the average experience of the players (number of games in that

Table 1. Descriptive of each league I.

| Descriptive (Sums, averages, d.t., %) | Bundesliga Germany 1 | Bundesliga Germany 2 | LaLiga Spain 1 | LaLiga Spain 2 |
|--|-----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|
| Teams | 18 | 18 | 20 | 22 |
| Matches Total | 612 | 612 | 760 | 922 |
| Matches Before (with audience) | 446 (72.9%) | 450 (73.6%) | 538 (70.8%) | 680 (73.7%) |
| Matches after (no audience) | 166 (27.1%) | 162 (26.4%) | 222 (29.2%) | 242 (26.3%) |
| Rounds | 34 | 34 | 38 | 42 |
| Points (t.d.) | 1.39 (1.3) | 1.34 (1.2) | 1.36 (1.2) | 1.33 (1.2) |
| Goals (t.d.) | 1.6 (1.3) | 1.4 (1.2) | 1.2 (1.1) | 1.1 (1) |
| Points total (t.d.) | 47.2 (15.7) | 45.5 (8.9) | 51.7 (15.7) | 55.7 (8.2) |
| Stadium attendance (t.d.) | 40,940 (18,047) | 20,211 (12,851) | 29,136 (19,166) | 9,870 (5,277) |
| Stadium Performance (Attendance – Capacity) | 92% | 74% | 76% | 56.40% |
| Budget in millions of Euros (t.d.) | 236 (204) | 18 (12) | 258 (268) | 14 (10) |
| No. of foreigners per team (%) | 16 (51%) | 6.5 (25%) | 10.3 (38%) | 5.8 (27.1%) |
| Players lined up | Foreigners: 58% Nationals: 42% | Foreigners: 32% Nationals: 68% | Foreigners: 40% Nationals: 60% | Foreigners: 24% Nationals: 76% |
| Experience (t.d.) (Matches played per player) | 65.2 (24) | 51 (16) | 91 (29) | 82 (20) |
| Reserve Teams players experience (t.d.) | 244 (183) | 55.1 (41) | 463.2 (466) | 121.4 (138) |
| Admonitions by match (t.d.) | 2.1 (1.5) | 2.2 (1.5) | 2.7 (1.7) | 2.9 (1.6) |

category), the experience of the youth players or players taken from the academy of the club itself (number of games with the first team), and finally, the fairness (yellow cards plus red).

The descriptions obtained are shown below. The main highlight is the equality in points among the various leagues but with slight differences in the number of goals; another highlight is the big difference in attendance and performance ranging from 40,000 spectators and a performance of 96.8% in the Italian Premier League to almost 6000 in Serie B with a performance of 42.7%; and also notable discrepancies between the other variables (budget, number of foreigners, youth players, experience and sportsmanship).

All this makes it possible to speak of stronger leagues and more humble ones. Although the budget could be the main indicator, the rest of the characteristics should be taken into account in order to understand the possible differences. For example, the budget of the German second division Bundesliga and the Austrian Bundesliga Budget are similar (18 and 20 million € respectively), which could lead to think that they are similar leagues, however, the average attendance of their stadiums differs significantly (20,000 compared to almost 7000), as well as the experience of their players or the use of youth players, which determines that both leagues should not be valued in the same way (Tables 1 and 2). All the information was extracted from three main sources: <https://es.soccerway.com/>, www.espn.com and www.transfermarkt.es.

Once all the information was collected, we worked with the statistical program SPSS (version 23 for Windows). The tests used were Pearson's Chi-square, t-Student, Pearson's correlation and the general univariate linear model ($p < .05$). The general purpose was to analyse the relationship between the points, goals for and goals against obtained by each team in each encounter with respect to the field and public factors. At the same time, these variables are contrasted with the others already mentioned (attendance at the stadium, budget, fairness, etc.) to detect possible interrelations that may explain the various data obtained with respect to the object of study.

Results

Before presenting the main analyses it is necessary to mention a series of fundamental correlations (Pearson, $p < .05$). Thus, in a generalized and bidirectional way, a better position in the classification, more goals in favour and points are correlated with a bigger budget of the team, more average attendance to the stadium, more number of foreigners and use of them (lined up), more fairness (less cards), more experience of the players (matches played in that category) and less record of the

Table 2. Descriptive of each league II.

| Descriptive (Sums, averages, d.t., %) | Serie A Italy 1 | Serie B Italy 2 | Premier League England | Bundesliga Austria |
|--|-----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|
| Teams | 20 | 20 | 20 | 12 |
| Matches Total | 760 | 760 | 760 | 384 |
| Matches Before (with audience) | 499 (65.7%) | 528 (69.5%) | 576 (75.8) | 264 (68.8%) |
| Matches after (no audience) | 261 (34.3%) | 232 (30.5%) | 184 (24.2) | 120 (31.2%) |
| Rounds | 38 | 38 | 38 | 32 (22 + 10) |
| Points (t.d.) | 1.39 (1.3) | 1.37 (1.3) | 1.38 (1.3) | 1.38 (1.3) |
| Goals (t.d.) | 1.5 (1.2) | 1.2 (1) | 1.3 (1.2) | 1.6 (1.5) |
| Points total (t.d.) | 52.7 (17.9) | 51.8 (12.1) | 52.4 (17.3) | Not applicable |
| Stadium attendance (t.d.) | 27,195 (13,950) | 6,135 (2,492) | 39,366 (16,027) | 6,687 (4,622) |
| Stadium Performance (Attendance – Capacity) | 70.8% | 42.7% | 96.8% | 48% |
| Budget in millions of Euros (t.d.) | 229 (172) | 15 (5) | 415 (287) | 20 (25) |
| No. of foreigners per team (%) | 17 (61.2%) | 7.4 (26.1%) | 18.3 (62.8%) | 8 (29%) |
| Players lined up | Foreigners: 62% Nationals: 38% | Foreigners: 22% Nationals: 78% | Foreigners: 64% Nationals: 36% | Foreigners: 30% Nationals: 70% |
| Experience (t.d.) (Matches played per player) | 88.3 (23) | 80 (19) | 72.7 (30) | 72 (16) |
| Reserve Teams players experience (t.d.) | 136.1 (122) | 52 (83) | 201.5 (161) | 147.5 (169) |
| Admonitions by match (t.d.) | 2.9 (1.7) | 2.8 (1.6) | 1.8 (1.3) | 2.4 (1.6) |

Table 3. Pearson's correlations between covariates and points as a function of the league.

| Correlations (sig) | Cards | Value (Budget) | Average assistance | Foreigners | Foreigners playing | Experience | Experience reserve team players |
|------------------------------|-------------|-------------------|-----------------------|-------------|-----------------------|-------------|------------------------------------|
| Germany1 N = 612 | .112** .006 | .313** .000 | .179** .000 | .086* .033 | .080* .049 | .272** .000 | .165** .000 |
| Germany2 N = 612 | .116** .004 | .107** .008 | .067 .098 | .047 .247 | .036 .374 | .070 .084 | .005 .898 |
| LaLiga1 N = 760 | .113** .002 | .259** .000 | .229** .000 | .193** .000 | .157** .000 | .103** .005 | .150** .000 |
| LaLiga2 N = 922 | .090** .006 | .104** .002 | .016 .626 | .080* .016 | .024 .464 | -.027 .417 | .012 .712 |
| Serie A N = 760 | -.061 .091 | .295** .000 | .246** .000 | .181** .000 | .254** .000 | .196** .000 | .089* .014 |
| Serie B N = 760 | -.064 .078 | .011 .758 | -.002 .952 | .023 .534 | .011 .764 | -.053 .146 | -.028 .453 |
| Premier League N = 760 | .077* .033 | .291** .000 | .167** .000 | .081* .026 | .084* .021 | .098** .007 | .029 .425 |
| Austria N = 384 | .240** .000 | .263** .000 | .197** .000 | .157** .002 | .159** .002 | .113* .027 | .019 .708 |

Notes: *p ≤ .05. **p ≤ .01.

youth players. These correlations have discrepancies depending on the league analysed, and it is necessary to know them to understand later the results found (see appendix). We show the correlation of these aspects with the points (with and without audience and at home and abroad) to have an approximate orientation of the behaviour of each competition, where it is observed that not all of them respond in the same way (Table 3). With this point clarified, the relationships between the results (win, draw and defeat), points and the field and audience factors are shown (Table 4).

As can be seen, there are no significant differences with respect to the results (wins, draws and losses) and the audience, but there are with respect to the points obtained. Therefore, it will be necessary to take into account both aspects and not just one in order to be able to go deeper into what happened, as well as to further evaluate the trends shown by the statistics and not just focus on those significant data.

Table 4. Differences according to the field and the public. Chi-square for won (W), drawn (T) or lost (L) matches. General univariate linear model for the relationship between points, field and audience.

| League | Home | | Chi (Sig) | Linear Model (DV = Points) | |
|------------------------|-----------|-----------|-----------------|-----------------------------|--|
| | % Before | % After | | Field Average, F (Sig) | Field and Audience F (Sig) |
| German Bundesliga 1 | W = 43% | W = 32.5% | 3.172 (.205) | Home = 1.43 | F = 6.172 (.013) With no audience, fewer points at home and more out |
| | T = 22% | T = 22.9% | | Out = 1.35 | |
| | L = 35% | L = 44.6% | | F = .524 (.470) | |
| German Bundesliga 2 | W = 41.3% | W = 43.2% | .139 (.993) | Home = 1.58 | F = .259 (.611) |
| | T = 32% | T = 32.1% | | Out = 1.1 | |
| | L = 26.7% | L = 24.7% | | F = 22.095 (.000) | |
| LaLiga Santander | W = 48% | W = 40.5% | 2.986 (.225) | Home = 1.65 | F = 5.463 (.020) With no audience, fewer points at home and more out |
| | T = 27.9% | T = 27% | | Out = 1.07 | |
| | L = 24.2% | L = 32.4% | | F = 39.455 (.000) | |
| LaLiga Smartbank | W = 39.7% | W = 44.3% | 1.916 (.384) | Home = 1.56 | F = .144 (.704) |
| | T = 35.6% | T = 28.7% | | Out = 1.1 | |
| | L = 24.7% | L = 27% | | F = 33.497 (.000) | |
| Serie A (Italy) | W = 40.2% | W = 44.3% | .598 (.741) | Home = 1.47 | F = 1.174 (.279) |
| | T = 22.9% | T = 21.4% | | Out = 1.31 | |
| | L = 36.8% | L = 34.4% | | F = 2.921 (.088) | |
| Serie B (Italy) | W = 46.2% | W = 41.4% | 1.586 (.453) | Home = 1.61 | F = 2.176 (.100) |
| | T = 27.3% | T = 25.9% | | Out = 1.12 | |
| | L = 26.5% | L = 32.8% | | F = 1.640 (.000) | |
| Premier League | W = 44.2% | W = 46.7% | .404 (.817) | Home = 1.6 | F = .007 (.932) |
| | T = 25% | T = 21.7% | | Out = 1.16 | |
| | L = 30.2% | L = 31.5% | | F = 21.759 (.000) | |
| Austrian Bundesliga | W = 35.6% | W = 30% | 1.356 (.508) | Home = 1.26 | F = 2.246 (.135) |
| | T = 25% | T = 21.7% | | Out = 1.51 | |
| | L = 39.4% | L = 48.3% | | F = 3.429 (.065) | |

Generally speaking, there are more wins at home than losses, except in the Austrian league where there are almost as many wins as losses on home soil. However, when matches are played without an audience, the situation changes in the cases of the German Bundesliga and LaLiga first division, with fewer points at home and more away. There are no significant differences in the other competitions, although there is a trend towards this result in the cases of the Austrian and Italian Serie B leagues. These data are striking enough to determine that in most cases analysed the audience factor can be detached from playing in one or another field. Since it was traditionally played with an audience, it was difficult to know if the HA was due to social facilitation or other reasons. However, the new data about playing without spectators do not allow to confirm the hypotheses raised in their totality, because although it has been found that the audience influences the HA in some competitions, it can do so for either good or bad. It would be necessary to offer more detailed analysis and to investigate other covariates that can explain the contradiction with what the proposed theories raise.

The focus therefore should be on points and goals scored per game (Table 5). As Table 5 shows, the only significant difference found is that fewer home goals have been scored in the Austrian league without an audience. Moreover, the trend in the Bundesliga and La Liga Santander is for fewer points and goals to be scored at home without spectators, while in the case of the Italian Serie B it is for more goals to be scored at this juncture. Finally, it is striking that there is no difference in the number of goals conceded, suggesting that the reduction in points at home in the absence of

Table 5. Relationship between points, goals, field factor and audience. B = Before (with audience)/A = After (without audience).

| League | Points: Before/After | | Goals: Before/After (Home) | | Goals: Before/After (Total) |
|---------------------|---|--|--|---|---|
| | Home Average t-Student (Sig) | Outside Average t-Student (Sig) | Pro Average t-Student (Sig) | Against Average t-Student (Sig) | Pro Average t-Student (Sig) |
| German Bundesliga 1 | B = 1.51 A = 1.20 t = 1.779 (.076) | B = 1.27 A = 1.57 t = -1.734 (.084) | B = 1.74 A = 1.43 t = 1.736 (.084) | B = -1.51 A = -1.66 t = .892 (.373) | B = 1.63 A = 1.54 t = -.665 (.506) |
| German Bundesliga 2 | B = 1.56 A = 1.62 t = -.348 (.728) | B = 1.12 A = 1.06 t = .372 (.710) | B = 1.56 A = 1.67 t = -.707 (.480) | B = -1.29 A = -1.30 t = .018 (.985) | B = 1.43 A = 1.48 t = -.482 (.630) |
| LaLiga Santander | B = 1.72 A = 1.49 t = 1.583 (.114) | B = 1 A = 1.24 t = -1.680 (.095) | B = 1.51 A = 1.26 t = 1.838 (.067) | B = -1.03 A = -1.26 t = .474 (.636) | B = 1.27 A = 1.17 t = 1.067 (.287) |
| LaLiga Smartbank | B = 1.55 A = 1.61 t = -.511 (.610) | B = 1.1 A = 1.1 t = -.013 (.990) | B = 1.28 A = 1.25 t = .258 (.796) | B = -1.03 A = -.98 t = -.496 (.620) | B = 1.15 A = 1.11 t = .524 (.600) |
| Serie A (Italy) | B = 1.43 A = 1.54 t = -.746 (.456) | B = 1.34 A = 1.23 t = .787 (.432) | B = 1.54 A = 1.77 t = -1.649 (.100) | B = -1.37 A = -1.5 t = 1.026 (.134) | B = 1.47 A = 1.62 t = -1.565 (.118) |
| Serie B (Italy) | B = 1.66 A = 1.5 t = 1.094 (.275) | B = 1.07 A = 1.24 t = -1.240 (.216) | B = 1.43 A = 1.35 t = .618 (.537) | B = -1.06 A = -1.21 t = 1.276 (.203) | B = 1.25 A = 1.28 t = -.350 (.726) |
| Premier League | B = 1.59 A = 1.62 t = -.162 (.871) | B = 1.16 A = 1.16 t = -.044 (.965) | B = 1.51 A = 1.54 t = -.244 (.807) | B = -1.22 A = -1.17 t = -.287 (.774) | B = 1.36 A = 1.36 t = .023 (.982) |
| Austrian Bundesliga | B = 1.32 A = 1.12 t = .987 (.325) | B = 1.43 A = 1.67 t = -1.131 (.259) | B = 1.77 A = 1.32 t = 2.074 (.040) | B = -1.68 A = -1.77 t = .341 (.734) | B = 1.72 A = 1.56 t = .973 (.331) |

spectators is mainly due to the lower number of goals scored by the home team rather than by the opposition, and although the goals conceded are almost the same, this fact is sufficiently decisive to ensure that clubs playing abroad benefit to the detriment of the home team. Thus, the hypothesis that without an audience the HA is reduced and foreign teams are favoured cannot be fully confirmed, but it is possible to speak of a trend towards this, namely in the German, Spanish and Austrian top leagues.

Given these results, it is pertinent to take into account the rest of the variables and their relationship with the field and public factors. In the following tables, the corresponding data can be seen, where only the meanings lower than .05 have been pointed out and not the approximate ones to this figure, since the analysed matches without the public depending on the field (four or five at home and equally outside by each team) are considered scarce enough to show possible trends (Tables 6 and 7).

As can be seen, correlations are only found in two competitions. On one hand, we can observe in the Italian Serie B in a similar way that playing at home and with spectators has benefited the best teams, related to the high budget, attendance, foreigners, etc. It is worth mentioning that none of these variables correlates with the points, which indicates a very balanced league where the best or worst classified teams are not determined by the budget and other aspects, but that nevertheless, the influence of the local public has turned out to be a relevant factor in the performance of the players

Table 6. Univariate general linear model I. Dependent variable: points. B = before/A = after.

| Variables and teams | Field | Bundesliga 1 | Bundesliga 2 | LaLiga 1 | LaLiga 2 |
|--------------------------------|---------------|------------------|------------------|------------------|------------------|
| Budget | Home (B&A) | F = 1.216 (.251) | F = 1.563 (.074) | F = .687 (.832) | F = 1.149 (.294) |
| | Outside (B&A) | F = 1.398 (.136) | F = .725 (.776) | F = 1.397 (.125) | F = .599 (.920) |
| Assistance | Home (B&A) | F = 1.268 (.218) | F = 1.563 (.074) | F = .687 (.832) | F = 1.149 (.294) |
| | Outside (B&A) | F = 1.272 (.215) | F = .725 (.776) | F = 1.397 (.125) | F = .599 (.920) |
| Foreigners footballers | Home (B&A) | F = .997 (.446) | F = 1.515 (.116) | F = .689 (.785) | F = 1.620 (.107) |
| | Outside (B&A) | F = 1.746 (.071) | F = .688 (.736) | F = 1.318 (.194) | F = .380 (.944) |
| Foreigners footballers playing | Home (B&A) | F = 1.216 (.251) | F = 1.563 (.074) | F = .687 (.832) | F = 1.149 (.294) |
| | Outside (B&A) | F = 1.398 (.136) | F = .725 (.776) | F = 1.397 (.125) | F = .599 (.920) |
| Experience | Home (B&A) | F = 1.169 (.293) | F = 1.563 (.074) | F = .687 (.832) | F = 1.149 (.294) |
| | Outside (B&A) | F = 1.497 (.100) | F = .725 (.776) | F = 1.397 (.125) | F = .599 (.920) |
| Footballers from reserve team | Home (B&A) | F = 1.292 (.201) | F = 1.563 (.074) | F = .735 (.758) | F = 1.122 (.330) |
| | Outside (B&A) | F = 1.494 (.101) | F = .725 (.776) | F = 1.033 (.421) | F = .554 (.924) |
| Fairness | Home (B&A) | F = 1.177 (.293) | F = 1.122 (.340) | F = .778 (.710) | F = .905 (.573) |
| | Outside (B&A) | F = 1.411 (.147) | F = .828 (.630) | F = 1.453 (.115) | F = .677 (.835) |

according to these characteristics. On the other hand, in the Austrian league, significant differences can be observed more in the opposite field, where the clubs with fewer points have played worse with spectators than without. In other words, these teams seem to be more affected by the presence of the public on the opponent's pitch.

Finally, in order to rule out that these results are not due to the effects of the second round, we made an analysis of the previous season, taking as a reference the same number of match days with and without an audience, although in the latter case there was an audience last year, but they still belonged to the last match days analysed for each league. Thus, in the 2018–2019 season of the German Bundesliga 1 there were no significant differences in the home results (win, draw or lose) between the first 25 match days and the last nine ($\chi^2 = .071$; $p = .965$), nor in the average points ($t = -.166$; $p = .808$), while the year investigated (see [Tables 4 and 5](#)) does present some more differences with respect to the previous one, especially with more defeats and fewer points in the local field ($\chi^2 = 3.172$; $p = .205$ and $t = 1.779$; $p = .076$). As for the German Bundesliga 2, the figures from last season ($\chi^2 = .353$; $p = .838$ and $t = -.562$; $p = .574$) are not much different from this year 2019–2020 ($\chi^2 = .139$; $p = .993$ and $t = -.348$; $p = .728$).

La Liga Santander seems not to have had differences in the last match days of the previous year ($\chi^2 = 2.422$; $p = .298$ and $t = -1.351$; $p = .177$) compared to the season analysed in the local matches ($\chi^2 = 2.986$; $p = .225$ and $t = 1.583$; $p = .114$). However, it does present a great difference because while this year without a public more matches and points have been lost at home, last year it was the opposite, in the last match days more home matches were won. In the case of the Spanish second division, the previous season ($\chi^2 = 1.469$; $p = .480$ and $t = .795$; $p = .427$) was similar in terms of significance to the year under analysis ($\chi^2 = 1.916$; $p = .384$ and $t = -.511$; $p = .610$), although this season there was a slight increase in wins and points at home without a public, in the last match days of the previous year these indicators were reduced.

Italian Serie A performed similarly to the year under review, with a slight increase in home points in both seasons at the end (before): $\chi^2 = .442$; $p = .802$ and $t = -.559$; $p = .577$ /now: $\chi^2 = .598$; $p = .741$ and $t = .746$; $p = .456$). Serie B did not present differences in the last days of the previous year ($\chi^2 = .277$; $p = .871$ and $t = -.076$; $p = .940$) while now it had slightly less points at home without an audience, although not significantly ($\chi^2 = 1.586$; $p = .453$ and $t = 1.094$; $p = .275$).

Regarding the Premier League, there are no differences between the previous year ($\chi^2 = .123$; $p = .941$ and $t = .058$; $p = .954$) and the one studied ($\chi^2 = .404$; $p = .817$ and $t = .162$; $p = .871$). The Austrian Bundesliga in the final rounds of the previous season ($\chi^2 = 2.923$; $p = .232$ and $t = .291$; $p = .771$) did offer more changes compared to the year under review ($\chi^2 = 1.356$; $p = .508$ and $t = .987$; $p = .325$), while both seasons saw an increase in home defeats in the final rounds, the average number of points earned at home fell further this past season in the matches without a home crowd (although not significantly).

Table 7. Univariate general linear model II. Dependent variable: points. B = before/A = after.

| Variables and teams | Field | Serie A | Serie B | Premier League | Austria |
|-------------------------------|---------------|---|---|--------------------------------|--|
| Budget | Home (B&A) | F = 1.032 (.423) | F = 1.933 (.013); R² adjusted = .063 Home, worse without an audience to bigger budget | F = 1.071 (.381) | F = 1.558 (.123) |
| | Outside (B&A) | F = 1.048 (.405) | F = 1.138 (.313) | F = 1.478 (.088) | F = 2.392 (.011); R² adjusted = .138 Outside, worse without an audience to bigger budget F = 1.356 (.205) |
| Assistance | Home (B&A) | F = 1.032 (.423) | F = 1.933 (.013); R² adjusted = .063 Home, worse without an audience to bigger average audience | F = 1.070 (.381) | |
| | Outside (B&A) | F = 1.048 (.405) | F = 1.138 (.313) | F = 1.483 (.088) | F = 2.378 (.012); R² adjusted = .138 Outside, worse without an audience to bigger average audience F = .868 (.554) |
| Foreigners | | F = 2.041 (.017); R² | footballers adjusted = .043 Home, worse without an audience to bigger number of foreigners | Home (B&A) F = 1.324 (.209) | F = 1.459 (.185) |
| Outside (B&A) | | F = 1.197 (.296) | F = .991 (.460) | F = .904 (.536) | F = .914 (.497) |
| Foreigners | | F = 1.933 (.013); R² | footballers playing adjusted = .063 Home, worse without an audience to bigger number of foreigners | Home (B&A) F = 1.113 (.337) | F = 1.032 (.423) |
| Outside (B&A) | | F = 1.048 (.405) | F = 1.138 (.313) | F = 1.524 (.079) | F = 1.768 (.106) |
| | | | | | F = 2.154 (.019); R² adjusted = .128 Outside, worse without an audience to bigger number of foreigners footballers playing F = 1.589 (.106) |
| Experience | Home (B&A) | F = 1.032 (.423) | F = 1.933 (.013); R² adjusted = .063 Home, worse without an audience to bigger experience | F = 1.070 (.381) | |
| | Outside (B&A) | F = 1.048 (.405) | F = 1.138 (.313) | F = 1.483 (.088) | F = 2.154 (.019); R² adjusted = .257 Outside, worse without an audience to bigger experience F = 1.760 (.071) |
| Footballers from reserve team | Home (B&A) | F = 1.032 (.423) | F = 2.027 (.018); R² adjusted = .056 Home, worse without an audience to bigger experience of reserve team footballers | F = 1.070 (.381) | |
| | Outside (B&A) | F = 1.048 (.405) | F = .602 (.853) | F = 1.483 (.088) | F = 2.265 (.016); R² adjusted = .124 Outside, worse worse without an audience to bigger experience of reserve team footballers F = 1.749 (.074) |
| Fairness | Home (B&A) | F = 1.084 (.367) | F = 2.029 (.010); R² adjusted = .063 Home, worse without an audience to bigger fairness | F = 1.077 (.374) | |
| | Outside (B&A) | F = .925 (.545) | F = 1.152 (.303) | F = 1.546 (.072) | F = 2.387 (.011); R² adjusted = .136 Outside, worse without an audience to bigger fairness |

In short, we cannot talk about significant changes caused by the second-round effect or last matches in the previous season, while in the year studied the absence of the public in the last few rounds has generated changes in some competitions analysed. Even so, a more precise study of what happened last season and in other years would be necessary to rule out that the data obtained in this research are not due to the effects of the last matches in the second round.

Discussion

As the data show, it is not possible to confirm the hypothesis that without spectators there will be a tendency to play worse at home and better away, but neither can it be said in its entirety that the audience do not influence the results, points or goals according to the field of play. The closest cases are the German Bundesliga 1, Spanish La Liga Santander (fewer points and goals at home and more points on away ground without a crowd) and Austrian first division (fewer goals at home), but no apparent pattern can be found between these competitions or between the leagues where the same thing is not happening to answer why this is so. It would be pertinent to study in depth other aspects related to the public, such as the involvement in encouraging their team, the aggressiveness towards the opponents, their intensity, or the reception by which players in the presence or absence of spectators.

In any case, it is worth mentioning that these results should be taken as generalizations and not to contrast some specific teams with respect to others, since it is recalled that the volume of matches by teams analysed (9 or 10 without an audience and about half of them at home) is relatively low to give categorical answers to the behaviour of each one in this new situation. Nevertheless, the total volume of data analysed may be a sufficient sample to speak, not of specific clubs, but of groups that react differently when playing without an audience, according to certain patterns such as those observed in this research.

So, if the presence and volume of spectators do not significantly affect most competitions, one might ask why many teams continue to win more at home. Among the various explanations mentioned in the introduction on the HA, the identity factor could be one to consider.³² Teams with a larger budget in the first division have a greater number of foreigners, players who, because of their foreign status, might have a different perspective on what it means to play at home or abroad, since somehow they, both in one or another field, are outside their national context. On the contrary, in the second division the use of national players predominates, who could have a different approach, fighting to win at home and with a more defensive position in the opposite field. Similarly, the sense of belonging in those players coming from the youth system should also be carefully studied, and how this would affect their performance when playing on the field where they grew up.

Another aspect is the decision of experts,³³ a subject that remains to be analysed carefully,³⁴ and if the public were to affect them,³⁵ it would be necessary to know to what extent refereeing decisions are so decisive in all matches. At the same time, there is also aggressiveness and territoriality, factors that are more of an evolutionary type but that could interact with the social aspect studied. Research on this³⁶ showed how players who play at home have an increase in testosterone (better performance) and at the same time generates dysfunctional aggressiveness in rivals (worse play and more fouls), which could explain HA even without the presence of spectators. However, it would be necessary to analyse if this sense of territoriality also occurs in the public, in what way and in what cases, since then the crowd could be an incident factor in the HA. Thus, the results of this research have shown a trend towards a reduction in goals at home without spectators, something that could be caused by this reduction in aggressiveness in the local teams due to having less public, or by other reasons such as poor form and the accumulation of matches during the last rounds.

Related to this, the factor of fatigue on the part of visitors due to the fact of travelling and which would cause them to lose more outside,³⁷ is shown to be an option with little support, since while the general dynamic continues to be more of a victory than a defeat at home, the geographical extension varies notably between the countries analysed, and even some with almost the same territory such as Austria and its neighbour Hungary show different figures for local victories

(Hungary more similar to Germany or Spain), data which would not support this theory. In short, the displacement factor is still to be studied in detail, since although its effects are more evident in international meetings, it would be necessary to go deeper into each country to clarify the issue,³⁸ and to study something like this, not only should the number of kilometres travelled by visitors be taken into account, but also the quality of the trip, since many teams, especially first-rate ones, use the plane for long distances, others more modest ones go by bus, and some even have to arrive at the rival city a day earlier, thus generating different types of fatigue and effectiveness in the game.

Finally, there would be the aspects of familiarity and learning.³⁹ Factors such as the change of grass,⁴⁰ field length,⁴¹ geographical altitude as in some Andean leagues⁴² or differences in humidity⁴³ may be relevant to explain the HA. Therefore, there are multiple and complementary reasons that would respond to the best performance on local ground despite playing without spectators.

Conclusion

The local advantage studied depends little on the so-called crowd advantage (CA),⁴⁴ which hardly correlates with other variables as this research has analysed. Moreover, while the HA is compensated by the return matches, the possible biases of the CA are not so easy to avoid, acting to the benefit of some teams and to the detriment of others. While the HA is not something that would occur in all leagues as a soccer rule, with the absence of an audience in certain competitions, the reduction of local wins would lead to a rethinking of the HA itself. In this sense, not only would it be necessary to prepare psychologically and tactically the teams (and even referees) to face the consequences of a match without spectators, but also to cover other affected sectors such as sports betting, which should no longer take for granted so easily that the result is most likely to be a local victory. It is hoped that this research has been relevant enough to continue with more studies of this type and thus gradually clarify the relationship between the HA and the CA more precisely.

Notes

1. Neave and Wolfson, 'Testosterone, territoriality, and the home advantage'.
2. Goumas, 'Home advantage and referee bias in European football'; Page and Page, 'The second leg home advantage: Evidence from European football cup competitions'; Pollard and Gómez, 'Components of home advantage in 157 national soccer leagues worldwide'.
3. Schwartz and Barsky, 'The Home Advantage'.
4. Pollard, 'Home advantage in soccer: A retrospective analysis'.
5. Lago-Peñas and Lago-Ballesteros, 'Game location and team quality effects on performance profiles in professional soccer'; Sánchez, García-Calvo, Leo, Pollard and Gómez, 'An Analysis of Home Advantage in the Top Two Spanish Professional Football Leagues'.
6. Tucker, Mellalieu, James and Taylor, 'Game Location Effects in Professional Soccer: A Case Study'.
7. Goumas, 'Home advantage and referee bias in European football'; González-García and Martínez-Martínez, 'Análisis de la influencia de los goles encajados en la clasificación final de las principales ligas de fútbol europeas'.
8. Pollard, 'Worldwide regional variations in home advantage in association football'.
9. Pollard and Gómez, 'Home advantage in football in South-West Europe'; Rodríguez-Quijada, 'Existe la ventaja de jugar en casa?'; Saavedra-García, Gutiérrez-Aguilar, Fernández-Romero and Sa-Marques, 'Measuring home advantage in spanish football (1928–2011)'.
10. Pollard and Gómez, 'Components of home advantage'.
11. González-García and Martínez-Martínez, 'Análisis de la influencia de los goles encajados'.
12. Lidor, Bar-Eli, Arnon and Bar-Eli, 'On the advantage of playing the second game at home in the knock out stages of European soccer cup competitions'; Page and Page, 'The second leg home advantage'.
13. Courneya and Carron, 'The home advantage in sport competitions'; Calvo, Miguel, Marcos, Clemente and Leal, 'Análisis de la ventaja de jugar en casa en el fútbol profesional español'; Jacklin, 'Temporal changes in home advantage in English football since the Second World War'.
14. Calvo et al., 'Análisis de la ventaja de jugar en casa'.

15. McGuire, Courneya, Widmeyer and Carron, 'Aggression as a potential mediator of the home advantage in professional ice hockey'.
16. Fothergill, Wolfson and Neave, 'Testosterone and cortisol responses in male soccer players'; Furley, Schweizer and Memmert, 'Thin Slices of Athletes' Nonverbal Behaviour Give Away Game Location'; Neave and Wolfson, 'Testosterone, territoriality, and the home advantage'.
17. Glamser, 'Contest location, player misconduct, and race'; Schwartz and Barsky, 'The Home Advantage'; Seçkin, 'Home Advantage in Association Football'.
18. Inan, 'The effect of crowd support on home-field advantage'.
19. Arias-Orduña, Domínguez, Pallejà and Rubio, *Psicología social aplicada*; Crespo-Suárez, *Introducción a la psicología social*; Myers, *Social Psychology*.
20. Triplett, 'The Dynamogenic Factors in Pacemaking and Competition', 516.
21. Allport, *Social Psychology*.
22. Zajonc, 'Social facilitation'.
23. Cox, *Psicología del deporte*; Olmedilla-Zafra, *Manual de psicología de la actividad física y del deporte*.
24. Baumeister and Steinhilber, 'Paradoxical effects of supportive audiences on performance under pressure'; Butler, and Baumeister, 'The trouble with friendly faces'.
25. Guschwan, 'Performance in the stands'.
26. Nevill, Newell and Gale, 'Factors associated with home advantage in English and Scottish soccer matches'.
27. Dowie, 'Why Spain should win the World Cup'; Pollard, 'Home advantage in soccer'.
28. Nevill, Balmer, and Williams, 'Crowd influence on decisions in association football'.
29. Lehman and Reifman, 'Spectator influence on basketball officiating'.
30. Nevill, Newell and Gale, 'Factors associated with home advantage'.
31. Zajonc, 'Social facilitation'.
32. Gómez-Bantel, 'Football clubs as symbols of regional identities'.
33. Unkelbach, and Memmert, 'Crowd Noise as a Cue in Referee Decisions Contributes to the Home Advantage'.
34. Webb, 'The future of officiating: analysing the impact of COVID-19 on referees in world football'.
35. Picazo-Tadeo, González-Gómez and Guardiola, 'Does the crowd matter in refereeing decisions?'.
36. Fothergill, Wolfson, and Neave, 'Testosterone and cortisol responses in male soccer players'; Furley, Schweizer, and Memmert, 'Thin Slices of Athletes' Nonverbal Behaviour Give Away Game Location'; Neave and Wolfson, 'Testosterone, territoriality, and the home advantage'; Pollard, 'Worldwide regional variations in home'.
37. Courneya and Carron, 'The home advantage in sport competitions'.
38. Ibid.; Calvo, Miguel, Marcos, Clemente and Leal, 'Análisis de la ventaja de jugar en casa'; Jacklin, 'Temporal changes in home advantage in English football since the Second World War'.
39. Loughhead, Carron, Bray and Kim, 'Facility familiarity and the home advantage in professional sports'; Schwartz and Barsky, 'The Home Advantage'.
40. Barnett and Hilditch, 'The effect of an artificial pitch surface on home team performance in football (soccer)'.
41. Dowie, 'Why Spain should win the World Cup'.
42. Pollard, 'Worldwide regional variations in home advantage in association football'.
43. Pollard, Armatas and Sani, 'Home advantage in professional football in Iran'.
44. Nevill, Balmer and Williams, 'Crowd influence on decisions'.

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Appendix

Pearson's correlation between variables by countries:

<https://drive.google.com/drive/folders/1fsBzRaYldBW0dJoMK3q58cCmRi4qlLEt?usp=sharing>