Has The Home Advantage in English Premier League Vanished due to Covid-19?

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Abstract

Background: In professional football the existence of home advantage is addressed thoroughly by researchers. It's effects play a key role while modelling the probabilities of results and are influenced by a range of different factors such as crowd effect, special tactics, referee bias, travel effect, familiarity with territoriality, local conditions, etc. **Methods**: This paper aims to recognize the result of zero crowds on home advantage by considering the English Premier League 2019-20 season in a cross-sectional study, while controlling for factors such as ranking in the previous edition and the winning margins of the team in the current season. **Conclusion:**A look at previous results suggests that the home advantage between the top ranked and the bottom ranked teams have increased following the interruption due to Covid-19 resulting in games played behind closed doors.

1.   Introduction:

The world is currently in the midst of a global pandemic, which has led more than 25 million active cases worldwide [1] and brought the global sports industry to a halt. Initially suspended for two weeks in the second week of March, English Premier League came to a standstill for approximately three months and there was a real danger of the remainder of the league being decided by Points Per Game (PPG). A number of financial broadcasters withheld the payments for the broadcasting revenue instalments [2] and noticed the effects of the lack of revenue streams lower down the pyramid with Wigan Athletic being placed into administration [3].

While some of the leagues in Europe such as the Scottish Premiership and Ligue 1 were curtailed, others such as the Bundesliga, Serie A, La Liga and the English Premier League resumed with strict social distancing protocols in place and without any spectators cheering for them in the stands [4]. However, keeping the financial concerns aside of not playing without fans in the stadium, there are concerns that playing behind closed doors have an impact on the home

advantage of teams especially the ones who are not the top teams in the league. Studies conducted by the CIES Football Laboratory suggested that the home advantage for teams increased behind closed doors [5]. There are concerns that these reports did not consider the full scenario of the league and suggested the results in percentages without accounting for other factors.

In professional football the presence of home advantage is addressed thoroughly by researchers [6]. It's effects play a key role while modelling the probabilities of results and are influenced by a range of different factors like special tactics, crowd effect, referee biasness, travel effect, familiarity with territoriality, local conditions, etc [7]. This paper aims to recognize the result of zero crowds on home advantage by considering the English Premier League 2019-20 season in a cross-sectional study, while controlling for factors such as ranking in the previous edition and the winning margins of the team in the current season.

Home advantage is a dominant effect in football where the home team secures a win with more goals than the away team. The first literature describing this theme of the study was introduced in 1981 [8] followed by a Dowie [9] and Pollard, who hypothesized causes of home advantage including psychological factors [10]. In North America and England the effect was more impactful at starting of the professional leagues. The decline of the effect in basketball, football and ice hockey in England was noticed in the last two decades. Especially for football, there was a wide decline due to the suspension of the league for 7 years during the Second World War [11].

Several causes contribute to the loss of the away team but the dominance of a particular cause that is crowd effect plays a major role as it is perceived by fans that they are responsible for the victory of the team. Although statistical evidence proves that familiarity and travel effect contributes more to the success of the home team [11,12,13]. The crowd effect can arouse the opponent team players to make forced mistakes and also influence the biased decision of the by crowd noise. This effect would be seen in a small crowd also therefore the crowd size is not certain[14,15].

Another directly affecting cause is travel effects which play a negative role on the away team. This effect prevails within international leagues as well as domestic leagues but with inconsistent conclusions because of the large size of the country. Despite that, a low travel effect is observed during local team matches where traveling is excluded[10,16,17].

The advantage that home team gets as they are aware of the playing surface, surroundings and the layout of the ground are the concept of "familiarity" observed in American sports[18]. A low ranked team benefits when a high ranked team is not familiar with the environment and thus contributes to home advantage. As a team is comfortable with their familiar facility and fans it becomes unsettling for a visiting team. After a pause due to the second world war, the home field advantage dropped in Italy and England. Hence it is obvious that if a team is playing in an unfamiliar stadium,

it will face some disadvantages. Furthermore, familiarity with climatic conditions of the location has a positive impact on the home team. [10,11,17,19]

English Premier League is the most appropriate league for the study because of the high magnitude of competitiveness, relatively balanced home and away matches every season and involvement of highly experienced referees. Previous studies highlight referee decisions can be influenced by crowd effects biased towards the home team. This was analysed by the crowd size and frequency of referees decisions including penalties, disciplinary cards and home wins. Confounding factors have to be controlled carefully which favours referee decisions implying that they also might be a key factor to influence decisions of the referee. [15,20]

The idea of territoriality among football players was proposed as an one of the drivers of home advantage. This is a protective response seen among animals and humans portraying agonistic behaviour while defending home territory. Thus, studies indicating possible relationship between testosterone, changes in performance in humans and perceived territoriality. Also, observing players experiencing significantly higher level of testosterone while playing a home match compared topractice match and an away match. History of intense rivalry matches in between teams raised the high level of testosterone compared to less rivalry matches [8,21]

Psychological factors are a key role in effecting the theme of home field advantage. For example, confidence and positivity are identified as variables that help an individual player achieve a home-field advantage. It shows players are more likely to be confident and positive when they play at home that results in a favourable outcome [22]. It is not always the psychological factors that play a role but also physiological factors that have an impact on home advantage [23].

As the previous body of research explains the existence of this themehome advantage for several leagues, countries and sports. However, the prominent factor that plays a key role in its existence is not clear, thus can be a combination of several factors that can influence home advantage. Without fans in the stadium, some concerns playing behind closed doors has an impact on the teams, thus this paper aims to recognize the result of zero crowds on home advantage.

Multiple measures were used in the previous body of research where the percentage of number of wins by each team is expressed. If the number is more than 50% then we can state that the home advantage is strong [10]. Usage of two alternative approaches are done, either including or excluding draws games depending on the sport. The quality of teams matters here because a strong team has more chances to win against a weak team in any game whether it is a home or away match. The team's ability hence overshadows the home advantage effect that has been explored for football and basketball[24, 25].

Another drawback that is considered while calculating home advantage is an unbalanced schedule that restricts straightforward and biased calculation. Most of the football leagues follow the balanced schedule that include equal number of home and away matches played by every team against each other. This potential problem that unbalance schedule might disturb the interpretation of the effect is likely to be minimal since the English Premier League is the most balanced league [15].

2. Material & methods:

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2.1. Selection of Sample

The sample selected for the study were the results table of 20 football teams in English Premier League 2019-2020 season. To check the home advantage in pre and post covid matches, this table included matches which were held before the 3 month standtill and after the restart of the league that was used for correlation. All the data was collected from the official website of English Premier League[26].

2.2. Selection of Variables

The variables selected for this study was to check the change of home advantage over 380 matches were as follows :

1. Home Team Win as a dependent variable.
2. Match Number, rank in previous season, goal difference, pre or post covid matches as the independent variables

2.3. Data Collection

Our dataset cover 380 matchesof 20 teams in the English Premier League 2019-2020 season. In this cross-sectional study controlling for factors such as ranking in the previous edition and the winning margins of the team in the current season. After a standstill halt for almost 3 months due to the global pandemic, the matches were resumed with certain social distancing protocols and no spectators. In this paper, the focus is on the impact of home advantage in the English Premier League due to closed-door matches.

Multiple Linear regression equation using formula below :

$$\text{Home team win} = \beta_0 + \beta_1 \times \text{Match Number} + \beta_2 \times \text{Goal Difference} + \beta_3 \times \text{Home Team Rank In the Previous Season} + \beta_4 \times \text{Pre or Post Covid Break Match} + C$$

2.4. Statistical Technique

Two types of statistical procedures were performed on the data. First, to identify the relationship between home advantage and pre-post pandemic matches were examined by using simple multiple linear regression model with dummy variable for home team (1 if the home team wins and 0 if there is a draw or defeat). In this study dependent variable is home team win and the independent variables are match number, goal difference between home and away team, home team rank in previous season and pre or post Covid break match. Second, to measure differences in groups of teams in pre and post pandemic matches was examined using one-way analysis of variance (ANOVA) and relevant post hoc test.

3. Results and Discussion:

Table 1 shows the results for the multiple linear regression tests. The results of the multiple linear regression using home team win to measure home advantage, with control for match number, home team rank in previous year and season goal difference. The individual measure of pre or post Covid break matches are not statistically significant ($p > 0.05$) to identify if there was an increase or decrease in home advantage.

Table 1: Model Test Results of Multiple Linear Regression

Model	Variables Entered	R Sq.	R sq. change	F change	Df1	Df2	Sig F Change
1	Match number, Home Team rank in previous Season, Goal Difference	0.266	0.266	45.381	3	376	0.000
2	Pre or post Covid Break	0.268	0.02	1.069	1	375	0.302

A one way Anova was conducted to identify significance differences in pre or post Covid break matches. The levene test of homogeneity of variance measures ($p > 0.05$) was not significant for pre-Covid matches but was significant for post-Covid matches ($p < 0.05$). However, the welch test of equality of means was significant for each significant measure (Pre-Covid : Welsh's $F(3,154.675) = 8.533$, $p<0.05$; Post-Covid: Welsh's $F(3,47.405) = 17.904$, $p<0.05$).

Table 2 : Results of ANOVA Over The Course of The Season

Group 1	Group 2	Mean difference	Level of significance
1-5	6-10	0.164	0.472
1-5	11-15	0.435	0.000
1-5	16-20	0.382	0.000
6-10	11-15	0.271	0.084
6-10	16-20	0.218	0.232
11-15	16-20	-0.053	0.859

Table 3 : Result of ANOVA Over The Course of Pre-CovidMatches

Group 1	Group 2	Mean difference	Level of significance
1-5	6-10	0.073	0.955
1-5	11-15	0.353	0.000

1-5	16-20	0.320	0.001
6-10	11-15	0.280	0.205
6-10	16-20	0.247	0.313
11-15	16-20	-0.033	0.975

Games Howell post hoc test on pre-Covid matches shows the mean difference in teams ranks between 1 to 5 that are Manchester City, Liverpool, Chelsea, Tottenham Hotspur and Arsenal have no significant difference with 6 - 10 (p > 0.05). In addition, team ranked between 6 – 10 shows no significant difference with 11 -15 and 16-20. Similarly, team ranked between 11- 15 show no significance difference with 16 – 20. Teams like Manchester City, Liverpool, Chelsea, Tottenham Hotspur and Arsenal shows a slight significant difference as compared to others (p < 0.05). This proves that the top teams ranked between 1 - 5 have a dominant effect of home advantage over the bottom teams who are ranked 11-15 and 16-20. This can be shown in table 3.

Table 4 : Result of ANOVA Over The Course of Post-CovidMatches

Group 1	Group 2	Mean difference	Level of significance
1-5	6-10	0.458	0.472
1-5	11-15	0.696	0.000
1-5	16-20	0.580	0.000
6-10	11-15	0.237	0.339
6-10	16-20	0.121	0.841
11-15	16-20	-0.116	0.816

In table 4 it was revealed in through Games-Howell post-hoc test that the mean difference in teams with ranks 1 to 5that are Manchester City, Liverpool, Chelsea, Tottenham Hotspur and Arsenal have a significantly lower score when they play against 6th to 10th ranked teams (p < 0.05). The mean difference is significantly higher when they play against ranked teams of 11 to 15 as compared to the teams ranked 16 to 20(p < 0.05).The mean difference of ranked 6 to 10 teams such as Manchester United, Wolverhampton Wanderers, Everton, Leicester City and West Ham have no significant differences between 11 to 15 and 16th to 20th ranked teams (p > 0.05). No significant difference was observed between 11 to 15 ranked teams namely Watford, Crystal Palace, Newcastle, AFC Bournemouth and Burnley and

16to 20 ranked teams (p > 0.05). It has been identified over the course of the season that teams ranked 1 to 5 in the previous season held a significant advantage over teams ranked between 11 to 15 and 16 to 20. A look at previous results suggests that the home advantage between the top ranked and the bottom ranked teams have increased following the interruption due to Covid-19 resulting in games played behind closed doors.

To date, there has been huge number of research on the state of home advantage in English football Turkish League and Spanish leagues. Previous attempts to understand the trends of home advantage in comparing North American sports leagues including several sports and English football leagues in their 4 Division Leagues [11]. Research explaining home advantage in English soccer teams for 10 seasons and another for 27 seasons of Spanish football division 1 and 2 with English football division 1 and 2 are not directly related to our study [25,27]. As such, our study is a thorough cross sectional analysis of home advantage in context to pre and post Covid-19 break matches due to games played behind closed doors without spectators. Crowd is one of the important factor that drives home advantage in professional leagues thus, absence of this factor is studied in German football divisions observing the increase or decrease of the effect [28].

Our analysis presents the trend of home advantage before Covid-19 matches and post Covid-19 between top ranked and bottom ranked teams. It is observed that there was a presence of home advantage in between higher and lower ranked teams. After the 3 months break due to the global pandemic the home advantage effect seems to increase even though without spectators. It is important to note that the top 1-5 ranked teams show significantly higher home advantage with 11-15 ranked team than with the lest ranked teams (16-20).

Our approach resonate with the study of no spectators on German football divisions which identified a decline in home advantage and no such significant result on referee biased decision. Here our findings present a bold case in the increase of this effect even without the presence of spectators.

United Kingdom's Government had proposed games behind closed doors in neutral venues for the rest of the matches in order to restrict the spread and risk of the virus. This was opposed by several teams and hence delayed the restart procedure. Teams like Brighton and Aston Villa raised their objection due to the fear of losing home advantage in the rest of their crucial games [29] .

4. Conclusion:

Due to the global pandemic all the events have come to a standstill as people were home quarantined and several countries went through lockdowns. After 3 months leagues have started to restart with strict social distancing protocols and no spectators in the stadium. As discussed before

home advantage has several factors, one of the biggest driver is crowd effect. As per several Country's Government rules and regulations the biggest factor that is crowd effect was eliminated from the professional leagues. Previous research observes the effect of the crowd that is seen on referee decision and on players. Playing in an empty stadium would not affect the performance of the players as the skilled and experienced players would focus on the games and block all the distraction including the crowd's noise but in some way home crowd helps in releasing the adrenaline in players[30] .

 To our knowledge, this is the first study of its kind to look at the increase or decrease of home advantage in post Covid-19 matches in context to English Premier League and as such our study provides contribution to knowledge. The limitation of this study is including the economic factors that affect the game such as attendance numbers and stadium capacity due to restrictions in the time frame of the study. The future research may include of psychological factors can be considered. Along with that comparison of no crowd effect on home advantage in other leagues can be compared.

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