Predicting in-play match decisions: Evidence from a closed-door environment.

Leighton **Vaughan Williams** and Joe **Kennedy**
Nottingham Business School, Nottingham Trent University

Abstract

We investigate the effect of the crowd on the decisions of match officials within a professional sports environment. We do this using data from 9,835 football (soccer) matches, comparing matches played behind closed doors because of the COVID-19 pandemic with those played before a crowd. We find that home advantage in terms of in-play decisions by match officials is significantly reduced in the absence of crowds. Examining the decisions of football referees, we find that away teams receive fewer yellow and red cards when playing in an empty stadium compared to matches with a crowd. This suggests the decisions of officials are influenced by the social pressure on match officials of a crowd, and that forecasts of match-related events and outcomes should be adjusted accordingly.

Introduction

Home advantage is one of the most well documented phenomena across sport in general. The main causes traditionally put forward for this home advantage phenomenon are the effects of crowd support, travel fatigue for participants, and location familiarity (Dowie, 1982). Subsequently, the effect of referee bias (conscious or otherwise) has been highlighted as an important factor in the home advantage effect. For example, Nevill et al. (2002) found that the decisions of referees favoured the home team, while Unkelbach and Memmert (2010) found that the effect increases as crowd size and density increases. Recent studies focusing on games played behind closed doors as a result of the COVID-19 pandemic have, however, reached mixed conclusions - see, for example, Bryson et al. (2021) and Jimenez Sanchez and Lavin (2021).

In this paper, we add to the literature by exploring a range of match statistics to examine the impact of crowds on the decisions of match officials. Using data on fouls and cards awarded, we investigate whether the behaviour of referees changed significantly during games played behind closed doors.

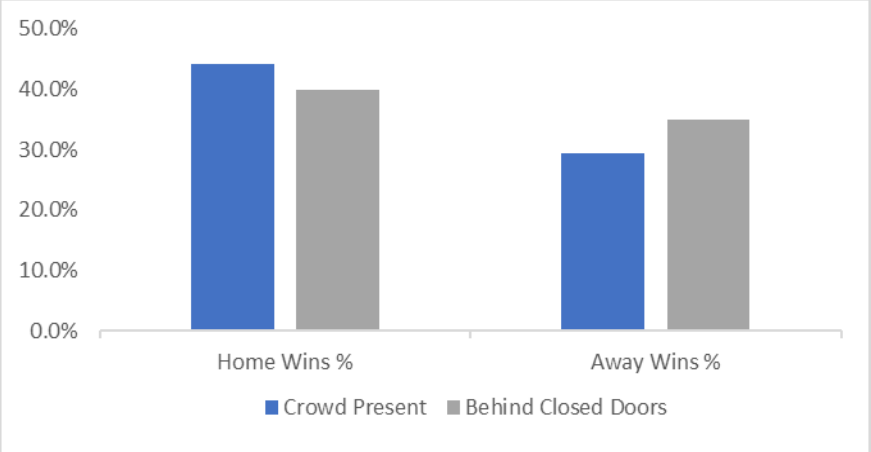
Data

We use data from the beginning of the 2010/11 season for the top two divisions in English football, the Premier League and the Championship. This means that our dataset includes matches involving teams with a range of abilities and which were played across a significant time period. Data have been collected from the football statistics website www.football-data.co.uk. Matches played in the 2020/21 season in front of a significantly reduced crowd have been excluded from our main results analysis.

In total, we have data for a total of 9,835 games covering the period detailed above. Excluding the partially attended games, our games sample covers 9,799 matches. For these matches, we collect data on the result of the match and the number of goals scored and goals conceded. In total, we focus on 680 matches in the Premier League and the Championship which have taken place behind closed doors and compare these to all matches which took place with supporters present since the beginning of the 2010/11 season.

In Figure 1, we see how the percentage of games won by the home team has fallen from 44% in games where crowds were present, to 40% in the behind closed doors matches. The reverse effect can be observed for away wins, with a significant increase in away team victories across our sample period (29% to 35%).

Figure 1: Comparison of Home Win and Away Win Percentages with supporters present and in the behind closed doors matches.



Notes – Based on calculations using data obtained from www.football-data.co.uk.

Methodology and Results

We take the number of points achieved by teams as the measure of home advantage. We take the goal difference between home and away teams as our dependent variable, helping to analyse the dominance and attacking play of home teams, rather than solely the advantage. We consider the outcome of each match twice, once for the home team and once for the away team, clustering the standard errors on a match level (Endrich and Gesche, 2020). We estimate with an Ordinary Least Squares (OLS) estimator taking *Points* as our dependent variable.

We focus on statistics related to the referee's decisions (fouls recorded, yellow cards (cautions), and red cards (sendings off). Our hypothesis is that the number of fouls, yellow cards, and red cards against the away team will reduce when the potential pressure of a supportive home crowd on the referee's behaviour is absent.

Table 1 shows that the impact of playing behind closed doors is positive and statistically significant on the number of fouls committed by the home team. Away team fouls are also reported to be significantly higher. We find that the difference between home and away fouls recorded increases significantly (Column 3) for matches played without fans. This indicates that the home team are found to have committed more fouls in absolute and relative terms without a crowd.

Table 1: Referee Performance Indicators: Dependent Variable *Fouls Committed*

	(1) Home Fouls Committed	(2) Away Fouls Committed	(3) Fouls Difference
Closed Doors	1.450***	0.515***	0.935***
	(0.138)	(0.143)	(0.187)
Constant	10.765***	11.314***	-0.549***
	(0.036)	(0.038)	(0.050)
Observations	9799	9799	9799
Adjusted R^2	0.011	0.001	0.002

Notes - Dependent variable is reported as column heading. Source: Author's calculations using data obtained from www.football-data.co.uk; accessed 08 February 2021. Significance level denoted by symbols ***, **, *, which indicate statistical significance at 1%, 5%, and 10%, respectively. Standard errors in parentheses and corrected for heteroskedasticity.

Following the approach in Table 1, we take the number of yellow cards issued by a referee as our dependent variable. We observe from Table 2, column 1, that yellow cards issued to the home team are almost identical across both periods, whilst in column 2 there is a significant reduction in the yellow cards issued to players from the away team. The difference in yellow cards between the home and away teams has increased by

0.353, which is strongly significant. Therefore, a greater proportion of the total yellow cards issued are to home team players.

Table 2: Referee Performance Indicators: Dependent Variable *Yellow Cards*

	(1) Home Yellow Cards	(2) Away Yellow Cards	(3) Yellow Card Difference
Closed Doors	-0.003	-0.356***	0.353***
	(0.046)	(0.051)	(0.062)
Constant	1.455***	1.771***	-0.316***
	(0.012)	(0.013)	(0.016)
Observations	9799	9799	9799
Adjusted R^2	0.000	0.005	0.003

Notes - Dependent variable is reported as column heading. Source: Authors calculations using data obtained from www.football-data.co.uk; accessed 08 February 2021. Significance level denoted by symbols ***, **, *, which indicate statistical significance at 1%, 5%, and 10%, respectively. Standard errors in parentheses and corrected for heteroskedasticity.

Table 3: Referee Performance Indicators: Dependent Variable *Red Cards*

	(1) Home Red Cards	(2) Away Red Cards	(3) Red Card Difference
Closed Doors	0.008	-0.026**	0.033**
	(0.010)	(0.012)	(0.015)
Constant	0.059***	0.088***	-0.028***
	(0.003)	(0.003)	(0.004)
Observations	9799	9799	9799
Adjusted R^2	-0.000	0.000	0.000

Notes - Dependent variable is reported as column heading. Source: Authors calculations using data obtained from www.football-data.co.uk; accessed 08 February 2021. Significance level denoted by symbols ***, **, *, which indicate statistical significance at 1%, 5%, and 10%, respectively. Standard errors in parentheses and corrected for heteroskedasticity.

Consistent with estimates for yellow cards, Table 3 shows there has been no significant change in the number of red cards issued to home team players (0.008). Conversely, column 2 shows a significant reduction in away team red cards (-0.026). In fact, we find that in games played behind closed doors, the number of red cards issued to the home team is very similar to the number issued to the visiting team (0.068 red cards per game for the home team, compared to 0.062 red cards for the away team).

Conclusions

Assessing the overall findings on referee bias, we see that there has been little change in the behaviour of the referee directly towards home teams; yellow cards and red cards issued to the home team are little affected in matches played behind closed doors. However, from the increase in home team fouls recorded, documented in Table 1, we

should expect an increase in cards. As for away teams, they are receiving more favourable decisions in matches played behind closed doors, with significantly fewer yellow and red cards. This is despite an increase also in fouls recorded. Without crowd influence, therefore, referees are less likely to issue further punishment to away team players.

We conclude that the presence of the crowd does have a significant influence on in-play decisions by match officials and that forecasts of match-related events and outcomes should be adjusted accordingly.

References

Bryson, A., Dolton, P., Reade, J., Schreyer, D., and Singleton, C., 2021. Causal effects of an absent crowd on performances and refereeing decisions during Covid-19. Economics Letters, 198, 1-5.

Dowie, J., 1982. Why Spain should win the World Cup. New Scientist, 10 June, 693-695.

Endrich, M., and Gesche, T., 2020. Home-bias in referee decisions: Evidence from ''Ghost Matches'' during the Covid19-Pandemic. Economics Letters, 197, 1-4.

Jiménez Sánchez, A., and Lavín, J.M., 2021. Home advantage in European soccer without crowd. Soccer and Society, 22 (1-2), 152-165.

Nevill, A.M., Balmer, N.J., and Williams, A.M., 2002. The influence of crowd noise and experience upon refereeing decisions in football. Psychology of Sport and Exercise, 3, 261-272.

Unkelback, C., and Memmert, D., 2010. Crowd Noise as a Cue in Referee Decisions Contributes to the Home Advantage. Journal of Sport and Exercise Psychology, 32, 483-498.