Referee bias in Scottish football – a statistical analysis of red cards, 2016-2024.

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Abstract: In a recent paper, Professor Michael A. Garrett of University of Manchester conducted an analysis of penalty kicks conceded in the top tier of the Scottish Professional Football League (SPFL) in which he concluded that referees were biased towards Rangers Football Club giving them "privileged treatment". When considering how a referee could realistically be biased towards a team, we assume the majority of football fans would recognize the easiest way to cheat would be: 1) Penalty kicks for and against. 2) Red cards for and against. Whilst a penalty kick offers the chance of a goal, there is no certainty the opposing team will take that opportunity and any advantage ends immediately. A red card on the other hand has an absolute outcome in that a particular team will play the rest of the match with 1 less player in the team. This study presents a statistical analysis of ALL red cards in the top tier of the Scottish Professional Football League (SPFL) from seasons 2016/2017 - 2023/2024. In particular, claims online that the number of red cards given to Glasgow Celtic players is statistically anomalous are considered. A test analysis of the red cards given to Glasgow Celtic players versus other SPFL premier league clubs, reveals a statistically significant difference, with Celtic having fewer red cards. This result is even more pronounced for Celtic if the analysis is restricted to red cards at home. By comparison, the number of red cards given to Glasgow Rangers do not diverge significantly from the league's average. The study concludes that the number of red cards given to Celtic over this period is formally a statistical outlier, lending significant weight to concerns over the impartiality of match officiating in Scottish football.

Keywords: football; soccer; bias; referee.

1. Introduction

In the realm of Scottish football, the impartiality of match officials is frequently challenged, particularly within the top competition, the Scottish Professional Football League (SPFL).

In recent years, there has been a number of accusations of referees showing Rangers bias including the article referenced below. The paper was written by self confessed Celtic supporter Professor Michael A Garrett though we do feel its important to point out that his allegiance to Celtic was not declared as a conflict of interest in his study, unlike the clear conflict declared on this paper.

To counter the paper by the Celtic supporting Professor, in recent years, there has been growing scrutiny online regarding the small number of red cards given to Celtic in the SPFL premier league. Since season 2016/2017, Celtic have been given fewer red cards than any other SPFL club, and this has also raised questions about the impartiality of match officials. Some have claimed that this demonstrates a positive bias in favour of the club. Unconscious referee bias and the effects of home advantage (e.g. Pollard 2008, Pollard 2014) are two well-documented phenomena in professional sports, especially in association football.

Until now, a proper statistical analysis of the red cards given in the SPFL has not been conducted. Online attention has focused on alternative, agenda driven figures, especially since 2021 onwards. This paper seeks to address these claims by analysing an extensive data set from all SPFL premier league clubs over a much longer period of time – from season 2016/2017 to season 2023/2024.The main aim is to properly establish whether the low number of red cards conceded by Celtic during this extended period is statistically significant or not. In section 2, we describe the data, and in section 3 statistical tests on the data are performed and the results presented. In section 4, we draw our conclusions.

Please note where relevant, we have deliberately mirrored the language of the previous study as we feel this is important in looking at the conclusion as a whole, rather than looking at a narrow event.

2. Data Sources

The data were sourced from https://footystats.org/   https://www.fctables.com/ https://www.transfermarkt.co.uk/scottish-premiership-relegation-round/fairnesstabelle/wettbewerb/SCPA/plus/?saison_id=2022 https://www.transfermarkt.co.uk/scottish-premiership/fairnesstabelle/wettbewerb/SC1/plus/?saison_id=2023

https://www.transfermarkt.co.uk/scottish-premiership-meisterrunde/fairnesstabelle/wettbewerb/SCPM

- all the data are in the public domain. For each season (2016/2017-2023/2024) we have recorded for each club participating in the SPFL premier league, the number of red cards given (total, home and away), for the season. Table 1 presents the full data for all seasons based on the teams in the current Top 12.

Table 1. Red cards given for the SPFL (2016/2017-2023/2024).

	Red Cards Home	Home Games Per Red	Red Cards Away	Away Games Per Red	Red Cards Total	Total Games Per Red
Celtic	3	48.0	15	9.7	18	16.1
Hibs	4	31.8	16	7.8	20	12.6
Dundee	9	9.8	6	15.2	15	11.9
Aberdeen	12	11.8	16	9.0	28	10.2
Livingston	11	9.5	10	10.8	21	10.1
Rangers	11	13.1	18	7.9	29	9.9
St Johnstone	16	9.1	13	10.7	29	9.8
Motherwell	16	9.1	14	10.1	30	9.6
Kilmarnock	18	7.0	10	12.6	28	9.0
Ross County	16	7.3	12	10.2	28	8.5
St Mirren	15	7.0	11	9.6	26	8.1
Hearts	12	10.4	19	6.6	31	8.1

3. Statistical analysis

We perform a standard statistical analysis on the data. The total number of red cards by all current Top 12 clubs is 308 across all 8 seasons. We initially split the sample into 2 groups – Celtic vs the other premier league clubs. The total number of reds given to Celtic is 18 and the mean number of games played per red is 16.1. The mean number of games played per red for the other premier league clubs is 9.6. We performed a statistical test on the data - this reflects the degree to which the data for Celtic differ in terms of the other clubs. The calculated value is that players who do not play for Celtic are 40% MORE likely to be given a red card.

Indeed, the average games per red card between Celtic and the other clubs is statistically significant at the > 95% confidence interval (CI). The null hypothesis (Celtic are given the same amount of red cards as the average of all clubs) can therefore be rejected. The analysis demonstrates that Celtic show a significant statistical deviation from what would be expected in terms of red cards in the SPFL premier league.

The result becomes even more significant if we restrict ourselves to red cards at home. The total number of red cards given to Celtic at home is 3 and the average games per red card increase from 16.1 overall to 48.0. This compares to the average of all other teams in the data getting a red card every 9.8 games, meaning the other teams in the SPFL are almost FIVE times more likely to receive a red card when playing at home in comparison to Celtic.

We repeated this statistical analysis for Rangers. The total number of reds given to Rangers is 29 and the mean number of games played per red is 9.9. With the mean average for the rest of the league being 9.6, we conclude that the number of reds received by Rangers is not significantly different from the rest of the premier league.

Our data also shows that between 3rd January 2016 and 28th January 2022, a period of 6 years and 25 days, Celtic played 109 League Games at home and never received a red card. In addition to these 109 League games, there was also a further 29 Cup games, none of which resulted in a red card for the Home Team.

Crucially for the comparison of both papers, over the entire period, when Rangers or Celtic receive a red card, they typically drop 0.44 points per game (2.33 v 1.89 ppg). This compares to a drop of 0.1 points per game (2.25 v 2.15 ppg) when a penalty is conceded. In conclusion, Rangers additional 11 red cards have cost Rangers 4.84 points. Celtics additional 8 penalties conceded have cost them 0.8 points. This emphatically proves red cards cost more than penalties conceded.

4. Conclusions

The analysis performed confirm that Celtic receive less red cards than other SPFL premier league clubs, and that this is a highly significant statistical result – the probability that this phenomenon occurs by chance is much less than 5%. It is also observed that the this is not the case for Rangers– even though they also dominate SPFL premier league matches in terms of essentially all statistical measures, including possession. The results support many anecdotal claims that Celtic enjoy privileged treatment by referees and other SPFL match officials, and this formally raises questions about the reputation and integrity of the SPFL.

The results also act as a complete counter argument to another online study in which a Celtic supporter negated to declare a clear conflict of interest and refused to look at other factors involved in measuring any potential bias in the game of football, instead focusing on 1 single measurement, in 1 small timeframe, in order to paint a picture of bias. Our findings clearly show there is a far greater statistical bias in a far more important game statistic and we conclude that the previous report claiming bias, was in itself heavily biased.

In conclusion, whilst our study gives an indication that Celtic receive privileged treatment, we find the figures from both studies adequately prove there is no bias for one or the other. A "potential" point swing of 4.84 points over 8 seasons, does not indicate to us referees are biased towards Celtic. A "potential" point swing of 0.8 points as presented in the previous paper does not even merit a consideration in our findings.

References

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