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Evidence from Spanish football "

Andrés J. Picazo-Tadeo Francisco González-Gómez, Jorge Guardiola ,

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The importance of time in referee home bias due to social pressure. Evidence from Spanish football

Andrés J. Picazo-Tadeo. Universidad de Valencia. Campus de Tarongers. 46022 Valencia, Spain. E-mail: ajpicazo@uv.es; Web: <http://www.uv.es/ajpicazo/Investigacion.htm>

Francisco González-Gómez. Universidad de Granada. Campus de Cartuja. 18071 Granada, Spain. E-mail: fcojose@ugr.es; Web: <http://www.ugr.es/~fcojose/Investigacion.htm>

Jorge Guardiola. Universidad de Granada. Campus de Cartuja. 18071 Granada, Spain. E-mail: jguardiola@ugr.es

Abstract. This paper analyses referee home bias due to social pressure with data from the matches played in the First Division of the Spanish football league between the 2002/03 and 2009/10 seasons. Finally, our main conclusion is that the time the referee has to make a decision does affect the final outcome; while there is no referee home bias when a free kick is awarded, in the case of booking players, when the referee has more time to make a decision, social pressure can influence the final outcome in favour of the home team.

Keywords. Social pressure; crowd effect; referee home bias; sports economics.

1. INTRODUCTION

Examining the performance of a referee to determine whether or not there is a referee home bias is not an easy task. Some incidents during a match can be interpreted very differently. Occasionally, when a player falls to the ground after an incident, some interpret there has been a foul and others that the player did so intentionally to earn a free kick. As regards free kicks, the referee has a certain degree of discretionary power to decide whether or not to book a player and, when applicable, whether the card shown is yellow or red. Further evidence that during the course of a match there are incidents that are difficult to interpret is when the same incident is repeated several times on television and commentators and viewers alike discuss the referee's decision without, on many occasions, reaching an agreement.

The referee must be impartial and make decisions by applying the rules. However, the interpretation of some situations during a match and the lack of precision of the human eye leave room for either conscious or unconscious referee bias in favour of the home team. Such referee bias is largely due to social pressure.

In football, researches agree that referee bias is yet another factor that is part of a home-advantage effect. The majority of studies that have addressed this issue to date analyse the English case (Nevill *et al.*, 1996; Boyko *et al.*, 2007; Dawson *et al.*, 2007; Rickman and Witt, 2008; Buraimo *et al.*, 2010), although there is also evidence on the German league (Sutter and Cochera, 2004; Dohmen, 2008; Buraimo *et al.*, 2010), the Italian league (Scoppa, 2008; Pettersson-Lidbom and Priks, 2010) and the Spanish league (Garicano *et al.*, 2005). In addition, there have been studies based on data from European competitions (Dawson and Dobson, 2010) and also some that combine information from different competitions (Page and Page, 2010).

Two main types of approaches have been employed to study referee home bias. In the first place, the relationship between social pressure and the injury time added on by the referee is analysed (Domen, 2008; Rickman and Witt, 2008). When the home team is losing and by a short margin, the referee tends to prolong injury time. In the second place, some papers have examined the relationship between social pressure and the disciplinary measures taken by the referee (Boyko *et al.*, 2007; Dawson and Dobson, 2010). In this case, we would expect social pressure to tilt the balance of disciplinary measures taken in favour of the home team.

This article follows the second line of research and aims to study whether social pressure can explain referee bias in favour of the home side when it comes to awarding free kicks and booking players. Prior knowledge of systematic behaviour on behalf of referees in favour of home teams due to social pressure is important, as it can condition a manager's strategy and also players' attitude on the pitch.

The research is carried out using data from the First Division matches of the Spanish Professional Football League played between the 2002/03 and 2009/10 seasons, both inclusive. In Spanish football, the home advantage effect seems to be important (Pollard and Gómez, 2009) and, which could be related to the existence of a home bias. Our first contribution to the literature is the way in which we analyse referee home bias, distinguishing whether it exists in the number of free kicks awarded or the cards players are shown. In the second place, we incorporate variables to control for certain features of the style of play of the teams that may influence the referee's decision to award a free kick, which have not been considered in previous papers. The main conclusion is that the time a referee has to make a decision could be a relevant factor in the explanation of referee home bias.

The rest of the paper is organised as follows. Section 2 reviews the literature on referee bias in football. Section 3 explains the methodology. Section 4 presents the data and results, while Section 5 summarises and concludes.

2. BACKGROUND

According to the literature, referee bias is one of the causes of the home-advantage effect. There are two main ways the referee may favour the home team and/or jeopardise the away team, namely penalties and bookings (Nevill *et al.*, 1996; Downward and Jones, 2007; Boyko *et al.*, 2007) and the time added on at the end of a match (Garicano *et al.*, 2005; Sutter and Cochera, 2004). In addition, referee bias could also influence match results, for which reason some papers have studied goal difference to analyse this bias (Page and Page, 2010).

Furthermore, referee home bias can be due to social pressure from two points of view. The first factor is psychological, whereby the referee may be influenced unconsciously by home team supporters. Referee bias is influenced by home spectators' ability to intimidate and the

different way that each referee reacts to social pressure (Boyko *et al.*, 2007; Page and Page, 2010).

Secondly, from an economic perspective, the Agency Theory explains that a referee could favour a home team consciously (Sutter and Koecher, 2004; Rickman and Witt, 2008) for two reasons. On the one hand, referees would seek to content their employer, the Football Association in each country, which is responsible for appointing referees for matches, taking decisions regarding the division referees should be in and, moreover, is authorised to take disciplinary action against referees. On the other hand, during the match the referee may try to please the crowd, which will exert pressure in order to obtain the best result for their team. In this scenario, permissive or imperfect monitoring on behalf of the Football Association can be an incentive for referees to take decisions that favour the home team.

In previous research, several variables have been employed to measure social pressure and explain its influence on referee bias. Some studies uphold that the larger the crowd, measured by the number of spectators at matches, the greater the social pressure on the referee (Scoppa, 2008; Page and Page, 2010). For other authors, however, the most relevant variable is crowd density, measured by the number of spectators in relation to the capacity of the stadium (Boyko *et al.*, 2007); in this case, the important aspect would be the psychological effect that empty seats could have (Smith, 2003). One extreme case is that analysed by Pettersson-Lidbom and Priks (2010) when some Italian football teams had to temporarily play home matches in empty stadiums in 2007.

Similarly, some studies have used crowd noise to measure social pressure, considering that this variable is a better indication of home team supporters' powers of intimidation (Nevill *et al.*, 2002). Finally, the closeness of spectators to the pitch, measured by the presence of an athletics track between the crowd and the pitch, has also been used to approximate social pressure (Dohmen, 2008; Buraimo *et al.*, 2010; Dawson and Dobson, 2010).

The papers that have analysed referee bias in terms of free kicks awarded have also included representative control variables, in the majority of cases, to cater for the difference in quality of the teams playing each other. The reason is that managers could transmit to players the unsporting strategy of committing more fouls to stop opposing team attacks and reduce the amount of time the ball is in play, as the latter normally enjoy more possession of the ball (Dawson *et al.*, 2007; Boyko *et al.*, 2007). In order to account for the difference in quality, some papers introduce historical data that have nothing to do with the competition in each match. One option is to construct a variable that compares goals scored and received by the rival teams (Boyko *et al.* 2007; Page and Page, 2010). However, Dawson *et al.* (2007) and Buraimo *et al.* (2010) opt for a measure of the probability of the home team winning, drawing or the away team winning. Finally, Dawson and Dobson (2010) build up an index that follows the UEFA seeding and drawing procedures in the two European competitions.

3. DATA AND MODEL SPECIFICATION

This study is based on a set of data obtained from the Football Year-book (Guía de la Liga) by *Marca*, the leading sports newspaper in Spain according to market share, published between 2003 and 2010. The data refer to matches in the First Division of the Spanish Football League played between the 2002/03 and 2009/2010 seasons, both inclusive. During this period, 3,040 matches were played, although due to a lack of information, our sample only includes 2,651 matches. Furthermore, we have obtained written permission to use the data and the study has been approved by the Ethics Committee in Research of the University of Granada in Spain. Table 1 presents the descriptive statistics of the variables.

Please, insert table 1 around here

In order to analyse the possible existence of referee home bias due to social pressure, two variables have been constructed, both representing the disciplinary measures taken by referees. It is important to clarify that, as in Boyko *et al.* (2007) and Page and Page (2010), both variables are expressed as the difference between the home and away teams in order to ascertain whether or not referees treat two teams in the same match differently. Other papers have studied the determinants of free kicks awarded to the home team separately, on the one hand, and those awarded to the away team, on the other. The drawback of this method is, however, that it fails to take into account the different attitude the referee has towards the two rival teams in the same match.

The first of our variables to measure referee home bias expresses the difference in the number of home team fouls and away team fouls in one same match. The variable is called *FOUL DIFFERENCE*. As far as we know, only Pettersson-Lidbom and Priks (2010) have used this variable. The second variable is the *RATIO DISCIPLINARY POINTS DIFFERENCE*, which measures the difference between the ratio of disciplinary points of the home team and the away team. At the same time, the ratio of disciplinary points is defined as:

$$\text{Ratio disciplinary points}_i = \frac{\text{Disciplinary points}_i}{\text{Fouls}_i},$$

whereby for a team i , the numerator is constructed by adding one point per yellow card received and two points per red card received (Dawson *et al.*, 2007 and Dawson and Dobson, 2010), while the denominator denotes the number of fouls committed by the team.

As far as we are aware, considering this variable to explain referee home bias constitutes a contribution to the literature that makes it possible to implicitly consider that there are two stages in the process of showing a card. Firstly, the referee must indicate a foul and then decide whether or not to book the player who committed it. Our variable *RATIO DISCIPLINARY POINTS DIFFERENCE* does not analyse the direct relationship between social pressure and cards

shown, but rather the influence of social pressure when, after a free kick has been awarded, the referee must decide whether or not the foul warrants a card. Directly analysing the relationship between social pressure and bookings could lead to incorrect results due to ignoring that the number of bookings and fouls might be correlated.

In order to capture the possible influence of social pressure on referee decisions, we have included three variables. The number of spectators at the stadium, variable *CROWD*, the percentage of the stadium that is occupied, variable *OCCUPANCY*, and the variable *ATHLETICS TRACK*, which is a dummy variable equal to 1 if there is an athletics track between the crowd and the pitch and 0 otherwise. Initially, a larger crowd, a higher stadium occupancy rate and less distance between the spectators and the pitch could be expected to increase the social pressure on the referee. Likewise, in order to capture how easily influenced the referee is by social pressure, we have included a variable that represents referee experience, variable *EXPERIENCE*. As in Boyko *et al.* (2007), referee experience is measured by the number of matches refereed in the First Division of Spanish football. A more experienced referee should be less submissive to social pressure (Pollard and Gómez, 2009).

Furthermore, other factors apart from the possible difference in referee criteria for the home and away team could influence referee decisions in a match. Our paper further contributes to the literature by including a series of control variables that, as far as we know, have not been used in previous studies. Instead of the variables based on historical data used in other studies, we include a couple of variables representing how the match unfolds to capture the type of football the teams play.

In the first place, the variable *POSSESSION SCORE DIFFERENCE* which represents the difference in the percentage of ball possession between the home team and the away team. It is reasonable to believe that the more time a team has the ball, the less fouls it will commit and, more than likely, the more fouls the players from the opposing team will commit. In the sec-

ond place, the variable *SHOTS SCORE DIFFERENCE* represents the difference in shots at goal between the home team and the away team and aims to capture the differing attacking tendencies of both teams. Occasionally, a more attacking mentality is not reflected by having greater ball possession, but can also explain why that team commits less fouls.

4. METHODOLOGICAL NOTE, RESULTS AND DISCUSSION

4.1. Methodological note and results

In order to analyse the possible existence of referee home bias in Spanish professional football and given the characteristics of our sample, we have estimated a panel data linear regression model. In particular, in view of the fact that some of our explanatory variables do not change over time, we have estimated two random effects panel data regressions for the determinants of *FOUL DIFFERENCE* and *RATIO DISCIPLINARY POINTS DIFFERENCE*, respectively. In both cases we consider a model with home team effects and another model with referee effects. The estimations have been performed with Stata 11 software and the results are presented in Tables 2 and 3.

The results in terms of possible referee home bias where the number of fouls are concerned reveal that none of the variables representing social pressure exerts a statistically significant influence on the number of free kicks a referee awards the home and away team (Table 2). Referee experience does not appear to influence the number of free kicks awarded either. Only the control variables *POSSESSION SCORE DIFFERENCE* AND *SHOTS SCORE DIFFERENCE* are statistically significant and register the expected sign. Therefore, having more possession of the ball and being more attacking on the pitch results in a team incurring in less fouls than its rival. Consequently, there does not appear to be a referee bias in favour of the home team in terms of free kicks awarded.

Please, insert table 2 around here

Notwithstanding, after indicating a foul, the referee must decide whether or not the foul warrants a card and, where applicable, whether the card is yellow or red. It is reasonable to believe that, once a foul has been indicated, and due to social pressure, there might be a referee home bias in terms of the cards players are shown. Normally, the referee has more time to decide whether or not to book a player than to indicate a foul. Due to play having been interrupted, the referee can consult the line judge, but can also be more greatly influenced by the pressure from home team players and supporters.

Table 3 presents the results of the estimations performed to analyse the possible existence of a referee home bias in bookings per free kick awarded (variable *RATIO DISCIPLINARY POINTS DIFFERENCE*). It is worth clarifying that in this case, the explanatory variables *POSSESSION SCORE DIFFERENCE* and *SHOTS SCORE DIFFERENCE* have been excluded as ball possession and an attacking strategy can influence the number of free kicks awarded, but never how a player is penalised with a yellow or red card once a foul has been indicated. These results show that the variable *CROWD*, which reflects the number of people at a match, is statistically significant and has the expected sign. In other words, this result suggests that once the referee has indicated a free kick, there is a referee bias in favour of the home side, and a referee is therefore more likely to book a player from the away team. None of the remaining variables considered in the model is statistically significant at the standard confidence levels.

Please, insert table 3 around here

4.2. Discussion

The results of this research cannot confirm, at least in the period under analysis, that Spanish football referees have been biased, due to social pressure, in favour of the home team when it comes to awarding free kicks. However, once a free kick has been awarded, there does appear

to be a referee home bias in the punishment a player receives for committing a foul. Our results suggest that when there is a large crowd in the stadium, the referee tends to find it easier to book away team players than home players.

Together, both results suggest that there may be differences in the decision making process of the referee that are dependent on reaction time. When the decision has to be taken immediately, that is, in the case of indicating a foul, social pressure does not influence the referee's decision. The referee is probably too involved in following play to be influenced by the crowd in such a short space of time. Conversely, when the referee has more time to take a decision, as in the case of punishing players with a card, the probability of social pressure having an influence increases.

Evidence of a referee home bias where bookings are concerned had already been found in the research by Boyko *et al.* (2007), Dawson *et al.* (2007), Downward and Jones (2007) and Dawson and Dobson (2010). However, the results of our research go one step further. At least in the Spanish case, we know that referee bias towards booking away team players is not brought about by a bias in the number of free kicks awarded, but occurs after a foul is indicated. What happens during the moments after a free-kick is awarded and particularly, the pressure the crowd is capable of exerting can have a significant effect on the referee's decision so that it favours the home side.

The recommendation for football team executives is therefore straightforward: they must do everything they can to get supporters to come to the stadium. This could be crucial when the home team does not have high quality players. Due to there being signs of a referee home bias towards showing cards to away team players for the fouls they commit, when the home side is weaker, it would be in their best interests for the match to be scrappy with a lot of free kicks being awarded. A match in which there are many bookings could negatively affect the

strategy of the potentially stronger team, the visiting team, especially if one of their players is sent off.

Finally, it is worth highlighting that referee experience is not a significant variable when explaining referee home bias in either of the two relationships studied. This result could be interpreted as a sign of a good referee selection and promotion policy on behalf of the Spanish Football Association. When a decision is made to promote a referee to the First Division of Spanish football, referees are mature enough not to be influenced by social pressure, or at least not to a greater extent than their more experienced colleagues.

5. SUMMARY AND CONCLUSIONS

This research analyses referee home bias due to social pressure with data from the First Division of Spanish football between the 2002/03 and 2009/10 seasons. The aim is to assess whether the pressure exerted by local supporters who go to football matches influences two referee decisions: free kicks awarded and players booked.

Our contribution to the existing literature in this field of research is two-fold. In the first place, home referee bias in terms of bookings is analysed taking into account the prior indication of a foul. Previous research has analysed referee bias in bookings directly, ignoring the possibility of there being a relationship between fouls indicated and cards shown. The second contribution is the inclusion of control variables representing the amount of ball possession that teams enjoy and whether they are more or less attacking, instead of variables based on the past behaviour of home and away teams considered by previous studies.

The main result obtained is that the time a referee has to take a decision can be an important factor when explaining referee home bias. While we find no empirical evidence to support referee bias in the number of free kicks awarded, after a foul is indicated there does appear to be a referee home bias in terms of penalising the player that has committed the foul by

booking him. The pressure that local supporters exert moments after a foul has been indicated can be a relevant factor in the referee's final decision.

Finally, one recommendation for football team executives is to encourage their supporters to fill their stadiums, particularly when facing teams that are initially higher quality. Fans should exert social pressure, particularly during the moments after a referee indicates the away team has committed a foul. Likewise, from the point of view of those responsible for organising the referees, it would be recommendable for this decision to be taken by a referee far from the place where the pressure is being exerted. New technologies make it possible for this type of solution to be applied in practice. As a result, bias in the decision to book a player, which can change the result of a match, could be avoided.

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Table 1. Sample description

Variable	Mean	Standard deviation	Maximum	Minimum
<i>FOULS DIFFERENCE</i>	0.167	6.469	26.000	-24.000
<i>RATIO DISCIPLINARY POINTS DIFFERENCE</i>	-0.029	0.139	0.916	-0.700
<i>CROWD (thousand)</i>	28.2	17.9	98.0	5.0
<i>OCCUPANCY (%)</i>	0.742	0.184	1.000	0.167
<i>RUNNING TRACK (dummy)</i>	0.150	0.357	1.000	0.000
<i>EXPERIENCE (games)</i>	99.6	65.2	262.0	0.0
<i>POSSESSION SCORE DIFFERENCE (%)</i>	3.267	16.498	58.600	-62.500
<i>SHOTS SCORE DIFFERENCE (%)</i>	2.920	6.873	31.000	-21.000

Table 2. Referee home bias in fouls indicated (the dependent variable is *FOUL DIFFERENCE*)

Variable	Home team effects	Referee effects
<i>CROWD</i>	0.00252 (0.02215)	0.01340 (0.00778)
<i>OCCUPANCY</i>	-0.18524 (1.15055)	-0.09562 (0.76408)

<i>RUNNING TRACK</i>	0.12978 (0.92223)	0.05868 (0.36034)
<i>EXPERIENCE</i>	0.00189 (0.00181)	0.00181 (0.00186)
<i>POSSESSION SCORE DIFFERENCE</i>	-0.08772 ^{***} (0.00834)	-0.09328 ^{***} (0.00841)
<i>SHOTS SCORE DIFFERENCE</i>	-0.05009 ^{**} (0.01964)	-0.05665 ^{***} (0.02003)
<i>CONSTANT</i>	0.32161 (0.79147)	0.13976 (0.57907)
Wald χ^2	169.72 ^{***}	199.70 ^{***}
R ²	0.099	0.180
Observations	2,651	2,651

*** Significant at 1%; ** Significant at 2.5%; * Significant at 5%.

Standard errors are in brackets.

Table 3. Referee home bias in bookings (the dependent variable is *RATIO DISCIPLINARY POINTS DIFFERENCE*)

Variable	Home team effects	Referee effects
<i>CROWD</i>	-0.00047*** (0.00017)	-0.00047*** (0.00017)
<i>OCCUPANCY</i>	0.00856 (0.01695)	0.00811 (0.01672)
<i>RUNNING TRACK</i>	-0.01341 (0.00823)	-0.01294 (0.00799)
<i>EXPERIENCE</i>	-0.00001 (0.00004)	-0.00001 (0.00004)
<i>CONSTANT</i>	-0.01858 (0.01288)	-0.01820 (0.01273)
Wald χ^2	10.3*	9.70*
R ²	0.211	0.042
Observations	2,651	2,651

*** Significant at 1%; ** Significant at 2.5%; * Significant at 5%.

Standard errors are in brackets.