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The Influence of Social Pressure and Nationality on Individual Decisions: Evidence from the Behaviour of Referees

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Abstract

This study considers the influences on agents' decisions in an international context. Using data from five seasons of European cup football matches it is found that referees favour home teams when awarding yellow and red cards. Previous research on referee decisions in national leagues has identified social pressure as a key reason for favouritism. While social pressure is also found to be an important influence in this study, the international setting shows that nationality is another important influence on the decision-making of referees. In considering principal-agent relationships account needs to be taken not only of how agents (referees) decide under social pressure but also of how national identity shapes agents' decision making.

Keywords: social pressure, nationality, decision-making, referee home bias, football
PsycINFO Classification: 3720
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1. Introduction

Team sports are (almost) unique in that the final stage of production (contest between two teams) is observed. This feature presents numerous opportunities for studying the behaviour of agents in sporting contests. One aspect that has received attention is managerial decision making in the form of team selection, substitutions or interchanges (Clement and McCormick, 1989). Another area of interest is the testing of economic hypotheses concerning strategic behaviour by players. In the case of penalty-kicks in football (soccer) for example, a number of studies have found evidence that goalkeepers and penalty-takers adopt mixed strategies (Chiappori et al. 2002; Palacios-Huerta, 2003; Coloma, 2007).

Attention has also focused on the behaviour of match officials (referees). Referees are assigned the task of implementing the laws of the game and ensuring that players abide by the regulations. Research based on match analysis from the European Football Championship in 2000 suggests that a top official makes 137 observable interventions on average during a game, including awarding free-kicks, penalties, corners, throw-ins, and halting play for serious injury (Helsen and Bultynck, 2004). In the case of free-kicks and penalties, the referee has the discretion to decide whether a foul merits a caution, in the form of a yellow or red card. Since some of this decision making is guided by subjective judgment, football referees are often accused of being inconsistent and biased in their decision making (Dawson et al., 2007, Buraimo et al., 2007, Boyko et al., 2007).

Studies of referee decision making in football tend to focus on two decisions: the decision to add on time at the end of matches and/or the decision to award red and yellow cards. Research on a number of domestic European leagues suggests a home team bias in referee decision making

and identifies social pressure (influence of the crowd) as one of the main reasons for the bias. In contrast, research on North American sports has recently focused on (racial) discrimination in decision making by match officials (see, for example, Price and Wolfers, 2007).

Though referee behaviour has received attention from academics in recent years, little is known about the influences on decisions in an international context[1]. This paper fills a gap in the literature by analysing the decision to award yellow and red cards in European cup football (UEFA Cup and UEFA Champions League). In particular, the study addresses the extent to which social pressure influences the award of red and yellow cards (incidence of disciplinary sanction). In doing this, the roles played by absolute and relative size of the crowd, and the architecture of the stadium (in terms of running tracks and fencing) are considered. The international dimension to the study is exploited by examining the role of nationality in the incidence of disciplinary sanction. To the best of our knowledge, this is the first study to examine the influence of nationality on individual decisions.

Consistent with previous studies, our findings suggest social pressure in the form of crowd density and stadium architecture (presence of a running track) is an important influence on behaviour. The incidence of disciplinary sanction is also influenced by the type and stage of competition. The novel contribution of the paper is its focus on nationality and the finding that referee nationality, team nationality and league reputation influence individual decisions. In particular, it appears that there is a tendency for referees from countries with 'smaller' associations to favour home teams.

[1] In a study of the FIFA World Cup, Torgler (2004) observes that a team's probability of winning is increased when a referee is from the same (football) region. However, the impact is only marginally significant and appears to be non-robust.

The reminder of the paper is structured as follows. Section 2 reviews the previous academic literature. Section 3 describes the data and considers the empirical methodology. Section 4 provides the results and Section 5 concludes.

2. Literature Review

Evidence of inconsistency and bias in decision making by referees has been found in a number of European domestic leagues. Garicano et al. (2005), using Spanish data, find a tendency for referees to add on more time at the end of matches when the home team is trailing by one goal compared to when the home team is leading, particularly when contests are close. Similar findings have been demonstrated for the German premier league (1st Bundesliga) by Sutter and Kocher (2004) and Dohmen (2008), and for the Italian league by Scoppa (2008).

One potential source of bias by referees is social pressure (influence of the crowd). Dohmen (2008) finds that architectural conditions play a key role in the refereeing bias observed, namely: the size of the crowd (absolute size), the attendance-to-capacity ratio (relative size) and the proximity of supporters to the pitch (the presence of a running track). He finds that there is more added time in close matches when the crowd is physically close to the field of play. Also, home teams are significantly more likely to be awarded a disputed penalty, with the physical distance between the crowd and the playing field important to this decision. Petersson-Lidbom and Priks (2007) find similar results for Italian football following the Italian government's decision to enforce clubs with sub-standard stadiums to play home games behind closed doors.

Buraimo et al. (2007) and Dawson et al. (2007) consider the impact of social pressure on disciplinary sanction. Buraimo et al. (2007) find the size of the crowd has no statistically significant effect on sanctions awarded to either the home or away team in the English Premier League or in the German Bundesliga. In contrast, Dawson et al. (2007) show that home teams

playing in front of larger crowds incur more disciplinary sanctions. Buraimo et al. (2007), in the context of the German Bundesliga, find the presence of a running track increases the number of yellow and red cards awarded to the home team. Neither study, however, considers the impact of relative crowd size.

In a laboratory style setting, Nevill et al. (2002) showed videotapes of tackles to referees who, having been told the identities of the home and away teams, were asked to classify the tackles as legal or illegal. One group of referees viewed the tape with the soundtrack (including the crowd's reaction) switched on, while a second group viewed silently. The first group was more likely to rule in favour of the home team (calling, on average, 15.5% fewer fouls). The first group's decisions were also more in line with those of the original match referee.

Recent research also suggests that match officials respond to incentives. Rickman and Witt (2008) apply a natural experiment to assess the introduction of professional referees in the English Premier League. They find that home team bias in adding on time at the end of matches essentially disappears following the introduction of professionalism. This is explained in terms of the higher remuneration associated with professional status, which, together with increased monitoring, acts as a disincentive to show (implicit) favouritism.

A popular notion of refereeing inconsistency is the same offence being treated differently by different referees. The fact this occurs suggests officials use prior information to inform the decisions they make. Research has found this to be important both prior to contests taking place and as contests unfold. Plessner and Betsch (2001) observe that officials are less likely to award a penalty to a team if they have previously awarded the same team a penalty but are more likely to award a penalty if they have awarded a penalty to the opposing team. Furthermore, Jones et al. (2002) suggest that a player's aggressive reputation can influence the number of red and yellow cards awarded. For example, on observing a bad challenge by a player with an aggressive

reputation, the referee may be more inclined to dismiss that player because he interprets the challenge as a deliberate attempt to injure an opponent. In contrast, a similar challenge made by a player with little or no aggressive reputation may only lead to a caution because the referee believes in this instance, and based on prior knowledge of the player, the tackle was mis-timed rather than intentional[2].

By exploiting data on referee and team nationality it is possible to extend previous work in an interesting way. Accordingly, we examine the extent to which decision-making is influenced by the nationality of the clubs (and referees) and the reputation of the league. The notion of identity and how it impacts on decisions is well established in sociology and psychology and has recently gained prominence in the economics literature (Akerlof, 1997; Akerlof and Kranton, 2000, 2005). Akerlof and Kranton (2005) argue that when account is taken of identity utility becomes situation dependent rather than fixed. This seems to have particular relevance in the present context: a referee of one nationality interacts with two teams of a different (and sometimes the same) nationality. Therefore, in an international setting we may expect to find referee and team (national) identity influence the decision-making of the referee.

3. Data and Empirical Methodology

The empirical analysis relates to matches played in the UEFA Champions League and the UEFA Cup over the period 2002-03 to 2006-07[3]. Match data on home (away) club name, home

[2] The reputation of athletes has also been found to influence the behaviour of judges in individual sports such as boxing (Balmer et al., 2005), ice skating (Findlay and Ste-Marie, 2004) and gymnastics (Ste-Marie and Valiquette, 1996).

[3] Both tournaments have undergone a number of format changes in recent times. Currently, both competitions adopt a mix of elimination rounds and round-robin group stage matches, with both using a seeding system to protect the stronger teams from being eliminated in earlier rounds. The total number of teams and the total number of matches played in these competitions has also grown considerably. Prior to 1992, 32 teams competed and a total of 73 matches were played in the European Cup (former name of the Champions League). The corresponding figures for the UEFA Cup were 64 and 126, respectively. By the start of the 2006-07 season, the number of teams competing in

(away) club nationality, number of yellow and red cards, referee name, referee nationality, date and time of contest, and attendance was provided by UEFA and the UEFA Documentation Center. Data was also gathered for the construction of team rankings (details of which are described below)[4] and for stadium information pertaining to ground capacity and architecture[5]. In the analysis, all matches played at neutral venues (including finals) are excluded[6]. Following the removal of missing values, there are 1,717 useable observations.

Tables 1 and 2 show the distribution of yellow and red cards by home and away team. In only 4.63% of Champions League matches and 3.78% of UEFA Cup matches were no yellow cards issued to either team. More significantly, in only 24.3% of Champions League and 26.67% of UEFA Cup matches did the home team incur more yellow cards than the away team. It is also notable that the number of yellow cards tends to be higher in the UEFA Cup. Red cards, in contrast, are observed less frequently: less than 20% of matches in either competition generated one or more red card.

Tables 1 and 2 about here

Table 3 provides information on the average number of yellow and red cards awarded to the home and away team by referee nationality. Significant differences are observed. For example, Greek referees tend to issue more yellow cards to the home team compared to other nationalities, averaging nearly two cards per game. They also tend to issue more yellow cards to the away team, averaging 2.6 yellow cards per game. Portuguese referees provide the widest

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the Champions League had more than doubled (to 76 teams) and the total number of games nearly trebled (to 213 games). The number of teams (157) competing and the number of matches played (353) in the UEFA Cup has also increased, although part of this increase is the result of the amalgamation of the UEFA Cup with the European Cup Winners' Cup in 1999.

[4] http://www.xs4all.nl/~kassiesa/bert/uefa/data

[5] http://www.worldstadiums.com/europe/maps/europe.shtml

[6] Examples of matches played at neutral venues include a number of matches involving Israeli teams in 2002-03 and 2006-07. A number of other matches were played in empty stadiums as punishment for crowd trouble. These matches remain in the sample.

difference, with the away team being issued with 0.96 more yellow cards than the home team on average.

As mentioned above, red cards are observed less frequently but there are some notable differences across referee nationalities. For example, English referees on average issue more red cards to both the home team and the away team. Belgian officials appear to be extremely lenient, issuing a home team with a red card on average once in every 62 matches and on average once in every 15 matches for the away team. In general, the frequency of red cards awarded to the away team tends to be higher and in a number of cases (e.g. referees from France, Russia, Scotland, Slovakia and Switzerland) it is between two and three times higher.

Table 3 about here

In order to establish whether there is systematic bias in either the distribution or incidence of disciplinary sanction, it is necessary to control for relative team quality. In this study, a team quality measure is constructed using historical match data and follows the method of UEFA in the seeding and drawing procedures of the two cup competitions. The average coefficient (hereafter referred to as the coefficient index) from the previous five years is used as a measure of team quality. One weakness of this method is that it does not weight performance according to competition. Further, it is less sophisticated than forecasting models, including ones based on betting data (e.g. Buraimo et al. 2007). Whilst a detailed evaluation of forecasting models is beyond the scope of this study, preliminary analysis found that the team coefficient index does a reasonably good job at predicting match outcomes[7].

[7] Binary probit and ordered probit models were constructed with the team coefficient index as the explanatory variable. In the majority of cases it was found that a one unit increase in rank difference is predicted to increase the probability of a home win by approximately 2%, which seems intuitively plausible. Also, with the exception of Dawson et al. (2007) and Buraimo et al. (2007), previous studies have used relatively simple measures to capture team quality.

In addition to team quality, a variety of other controls are also included, based on the discussion in Sections 1 and 2. These include variables relating to crowd size, crowd density (attendance to capacity ratio) and stadium architecture (i.e. presence of a running track and/or fencing), competition (Champions League or UEFA Cup) and stage of competition. The nationality of the referee, club nationality and league reputation (as measured by whether the team plays in one of the top five leagues) are also considered. As discussed earlier, the inclusion of these effects allows us to determine whether there are significant differences in referee behaviour across nationalities, whether the nationality of the club is important and whether league reputation acts as a signalling device. Definitions of the variables used in this study are provided in the Appendix.

Measurement of the dependent variable follows the approach of Dawson et al. (2007). In the estimations below, the dependent variables are the total numbers of disciplinary 'points' incurred by the home and away teams in each match, calculated by awarding one point for a yellow card and two points for a red card. Two points are also awarded when a player is dismissed as a result of two cautionable (yellow card) offences in the same match[8].

The number of disciplinary points per match takes the form of count data, which suggests the use of a count data regression model[9]. However, it is also possible to model count data using discrete choice methods that recognise the sequential nature of the data (Cameron and Trivedi, 2005)[10]. One such candidate is the ordered probit model, hence:

[8] Preliminary investigations also considered other constructions for the dependent variable (such as a higher weighting for red cards) but this did not change the results in any meaningful way. Moreover, we also present results based on yellow cards only, see Table 6, Model (1).

[9] For example, Dawson et al. (2007) use zero-inflated Poisson and negative binomial regression models.

[10] A further justification for favouring the ordered probit approach over a Poisson model is that in the case of the latter we implicitly assume the observations are based on the same time interval. This is clearly not the case in most football matches since the amount of time added-on at the end of each half varies from match to match. Also in the case of the knock-out stages of the Champions League and the UEFA Cup the outcome of a number of matches are only decided after extra-time (which involves an additional 30 minutes of play).

$$y_h^* = \mathbf{X}'\boldsymbol{\beta}_h + \boldsymbol{\varepsilon}_h$$
$$y_a^* = \mathbf{X}'\boldsymbol{\beta}_a + \boldsymbol{\varepsilon}_a \quad (1)$$

Where the subscripts "h" and "a" refer to the home team and away team, respectively. y_h^* and y_a^* are constructed according to the following criteria:

$$y_h = \begin{cases} 0 \text{ if } y_h^* = 0 \\ 1 \text{ if } y_h^* = 1 \\ 2 \text{ if } y_h^* = 2 \\ 3 \text{ if } y_h^* = 3 \\ 4 \text{ if } y_h^* = 4 \\ 5 \text{ if } y_h^* \geq 5 \end{cases} \qquad y_a = \begin{cases} 0 \text{ if } y_a^* = 0 \\ 1 \text{ if } y_a^* = 1 \\ 2 \text{ if } y_a^* = 2 \\ 3 \text{ if } y_a^* = 3 \\ 4 \text{ if } y_a^* = 4 \\ 5 \text{ if } y_a^* \geq 5 \end{cases} \quad (2)$$

The choice of outcomes for both the home team equation and the away team equation is determined in ordered to minimise identification problems associated with outcomes with few observations and is based on the distributions observed in Tables 1 and 2. As equation (2) indicates there are six outcomes in both equations, but the number does not need to be equal for the two dependent variables.

Each endogenous discrete variable is associated with **X** exogenous variables and coefficients $\boldsymbol{\beta}_h$ $\boldsymbol{\beta}_a$ as described above. If ε_h and ε_a are assumed to be independent and normally distributed, (1) can be estimated using a univariate ordered probit model. A bivariate ordered probit model is appropriate if ε_h and ε_a are assumed to be joint normal[11] and $\text{Cov}(\varepsilon_h, \varepsilon_a) = \rho$.

[11] $E(\varepsilon_h) = E(\varepsilon_a) = 0, \text{Var}(\varepsilon_h) = \text{Var}(\varepsilon_a) = 1$

Thus, the univariate model can be considered a special case of the bivariate model, where $\rho=0$. Both univariate and bivariate models are estimated using the method of maximum likelihood.

4. Results

Table 4 presents results for the determinants of disciplinary points based on univariate and bivariate ordered probit models. In the univariate model, the home team equation shows that the difference in the team coefficient index (home coefficient index minus away coefficient index) is negative and statistically significant. This implies that a strong home team will incur fewer disciplinary points. For the away team, the coefficient is correctly signed (positive) but is not statistically significant. In both the home and away equations it appears that, on average and other things unchanged, the number of disciplinary points is lower in the Champions League. However, there is also evidence, for both teams, that the number of disciplinary points increases as the competitions enter the final phases. In terms of the influence of the crowd and the architecture of the stadium, it appears that relative size of the crowd matters more than the absolute size: both the home team and the away team are likely to incur more disciplinary points the closer the stadium is to capacity. The presence of a running track has the effect of increasing the number of disciplinary points awarded to the home team[12].

Table 4 about here

[12] A priori, there is no reason to believe the effect of a running track should be symmetric (equal but opposite signs) between the home and away teams. For example, a track makes the atmosphere less intense, and this makes it easier for the referee to punish either team for foul play but the size of the effect differs between the two teams. Punishment of the home team increases by more than punishment of the away team because refereeing bias favouring the home team is greater (the home team gets away with more foul play than the away team) when the crowd is close to the pitch. In the case of stadium density the effect is symmetric (and positive) but the marginal effect indicates the magnitude is larger for the away team (details available from first named author on request). In preliminary investigations we also interacted crowd size and crowd density with stadium architecture but this had no significant effect on the results.

The findings associated with the impact of the crowd and the architecture of the stadium are consistent with previous research. The presence of a running track increases the distance between the pitch and the crowd. This works to increase the number of disciplinary points awarded to the home team, implying less implicit favouritism towards the home team when the influence of social pressure is weaker. On the other hand, the relative size of the crowd appears to increase the number of disciplinary points awarded to both the away team and the home team. The absolute size of the crowd and the presence of fencing have no impact.

One criticism of the univariate approach is that it assumes no interdependence between the disciplinary points awarded to the home and away teams. Possible contemporaneous correlation between the disturbances of the home and away team equations can be captured by a bivariate ordered probit model. It is also possible to use the bivariate model, along with suitable additional controls, to examine whether referees 'even up' decisions. Buraimo et al. (2007), in their study of the German Bundesliga and the English Premier League, find that a yellow card previously awarded to the home (away) team increases the probability of the away (home) team receiving a similar sanction. As the authors suggest, this could reflect retaliation by players or the tendency for referees to 'even-up' decisions[13]. The significance of the ρ statistic and the LR test of independent equations provides evidence that the error terms in the two equations are correlated, and justifies the use of a bivariate model.

A unique feature of this study is the opportunity to test for the influence of nationality on decisions. In European cup football, referees are assigned to matches according to Article 19.02 of the Regulations of the Champions League and UEFA Cup[14]. Generally, referees cannot be

[13] We consider this issue further in Table 6.

[14] The Referees Committee, in cooperation with the UEFA administration, appoints a referee, two assistant referees and a fourth official for each match. Only referees whose names appear on the official FIFA list of referees are

from the same football association as the two teams competing in the contest. Given this, home nation bias should be of limited concern. However, this does not preclude the possibility of variation in referee behaviour by nationality (as Table 3 suggests). Nor does it preclude the possibility that referees form judgements about teams and nations[15].

Table 5 reports bivariate ordered probit estimates under different specifications with the specific intention of trying to capture league/nation reputation effects. Model (1) includes club nationality fixed effects alongside referee nationality effects. The inclusion of club nationality results in the team coefficient index becoming insignificant, so it appears that club effects are capturing some (perhaps, most) of the impact of team quality. The stage of the competition becomes insignificant in the home team equation and less significant in the away team equation. Champions League matches (home equation and away equation), the presence of a running track (home equation only), and the relative size of the crowd (in both the home and away equations) remain important determinants of the incidence of disciplinary sanction.

Model (2) includes all the variables in Model (1) plus three new variables denoting whether the home team, away team or both teams is from one of the 'big five' leagues (England, Italy, Germany, Spain and France). The idea here is to capture possible 'league reputation' effects, whereby a team from one of the big five leagues is likely to incur fewer disciplinary points. As expected, a home team from the 'big five' incurs fewer disciplinary points if playing a team from outside the 'big five'. The effect is significant for an away team from one of the big

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eligible. The fourth official and assistant referees are, in principle, proposed by the national association of the referee, in accordance with criteria established by the Referees Committee.

[15] In the 2006 World Cup Finals there were numerous complaints and allegations of referee bias in favour of the larger, well-established teams. During the 2002 tournament, held jointly by South Korea (Korea Republic) and Japan, there were allegations of favouritism towards the host nations - specifically when South Korea played, and subsequently defeated, Italy in the Second Round. During the European 2004 Championship the Portuguese media criticised the appointment of the German referee Merkus Merk for a game involving Portugal and Greece, claiming that he would favour Greece because they were coached by a German national. The Romanian Football Association has also claimed discrimination against their national team (and other Eastern European countries) when involved in games against teams from more established associations.

five leagues. Also, more disciplinary points are awarded to the home team and away team if they are both drawn from one of the big five leagues.

Table 5 about here

Model (2) also includes a dummy variable, capturing whether the referee officiated at the 2004 European Championships (defined here as an 'elite' referee). A positive, and statistically significant, impact is found in the home team equation. Similarly, a positive impact is found in the away equation but the coefficient is insignificant. A possible interpretation is that elite referees compensate for inherent (implicit) favouritism by issuing more disciplinary sanctions to the home team, though this conclusion must be tentative as there may be problems associated with sample selection effects.

Our findings regarding league reputation may be somewhat blurred if team quality is correlated with the level of the league. In an attempt to disentangle league reputation from team quality, we excluded from the sample teams from the 'big five' leagues who have been more successful in European competition (teams with a coefficient index greater than five). Therefore, in Model (3) of Table 5 the sample is restricted to teams from the 'smaller' leagues together with the weaker teams from the 'big five' (clubs who have either been less successful in Europe or who have qualified less often). In general, the 'big five' league dummies in both home and away equations are insignificant. The one exception is the significance (at the 10% level) of the 'big five' home coefficient. The negative sign appears to confirm a reputation effect, rather than a pure quality effect, particularly since the difference in team coefficient index is now significant.

Sensitivity analysis, in the form of a separate analysis for yellow cards, is presented in Table 6, Model (1). In general, the coefficients are less significant compared to the disciplinary points models. However, it is possible to control for an additional feature in these specifications, namely the extent to which red card offences relate to yellow card offences. Here evidence is

found of simultaneity between the award of red cards and yellow cards: teams that are punished for red card offences also tend to incur more yellow cards. There is also some evidence to support the assertion that referees 'even-up' contests: the propensity for the home (away) team to incur yellow cards increases when the away (home) team receives a red card (where a red card follows from a second yellow card offence).

Table 6 also provides a further sensitivity test through the inclusion of within game parameters for Champions League matches only. Model (2) in Table 6 presents the corresponding results of Model (2) from Table 5 for the Champions League only and Model (3) in Table 6 adds the within game factors. A series of variables are included relating to possession, shots on goal and number of fouls committed. With the exception of number of fouls, none of these factors are significant. Moreover, previous variables remain reasonably robust to the inclusion of these additional variables.

Table 6 about here

Finally in Table 7 we provide more detail on the significance of the referee nationality and club nationality effects (using the results from our preferred specification, Model (2) in Table 5). A priori, and in the light of the above discussions, it may be expected that referees from the larger associations (England, France, Germany, Italy and Spain) will be less prone to implicit favouritism compared to referees from other associations. There appears to be some evidence to support this. Officials from Holland, Norway, Russia, Scotland and Sweden tend to award fewer disciplinary points to the home team. However, Belgian, Dutch, Russian and Swedish referees also tend to issue fewer disciplinary points to the away team. There are also some interesting anomalies in the data. Portuguese officials issue more disciplinary points to the away team. On the other hand, Greek officials tend to issue more sanctions (to both the home and away teams).

Some of the patterns observed in Table 7 are consistent with the descriptive analysis presented in Table 3.

In terms of the club nationality effects, Romanian, Italian and Spanish clubs playing at home (or away) tend to incur more disciplinary sanctions. Furthermore, teams playing against Italian opposition tend to be issued with fewer sanctions. Some of these effects tend to offset some of the benefits associated with league reputation identified earlier. However, it is also apparent that when a team is from Spain or Portugal there is a tendency for the opposition to incur more disciplinary sanctions. It is also possible that some of these effects are capturing playing styles rather than implicit favouritism on the part of the referee.

Table 7 about here

The precise role of nationality in influencing referee decisions is difficult to identify not least because of the difficulties involved in disentangling the interplay between referee nationality, team nationality, and team reputation. Akerlof (1997) and Akerlof and Kranton (2000) suggest that individual decisions are influenced by one's own identity and the perception of others. This notion seems particularly relevant in the present context since football referees, much like officials in many other sports, are required to make split-second decisions under uncertainty. The results of this study suggest that when faced with a key (and possibly contentious) decision, a referee is likely to be influenced by his (national) identity and the nationality of the team, and his perception of team quality and league reputation.

5. Conclusion

This study has considered the influences on agents' decisions in an international setting. Using data from European cup football matches, it is found that referees tend to favour home teams when disciplining players. Consistent with previous work, social pressure is an important

influence on behaviour, with crowd density and stadium architecture playing important roles. The incidence of disciplinary sanction is also influenced by the type and stage of the competition.

The international context for this study allows a new dimension to decision-making to be investigated, namely the role played by nationality. Referees are required to make split-second decisions. Faced with significant time pressure, individuals tend to focus on salient cues in forming a decision. Dohmen (2008) and Sutter and Kocher (2004) argue that in the case of football referees, crowd noise is the salient cue. This analysis confirms that crowd noise is important but also suggests that decisions are influenced by referee and team nationality, and league reputation.

The finding that (national) identity helps shape the decisions of referees ties into the theoretical work on identity and individual decision-making within a utility maximising framework. The role played by (national) identity in influencing agents' decisions ought to be a major concern of economists and this research on referees may help stimulate further work in this area. The results are also of relevance for agency theory. It has been noted by Dohmen (2008) that if social forces manipulate the agent (referee) to take actions that result in undesired outcomes (favouritism) it can be optimal for the principal (football association) to deprive the agent of his discretion. In designing rule structures that may limit the discretion of the agent (as is done in large organisations) account needs to be taken not only of how agents decide under social pressure but also of how national identity shapes agents' decision making.

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Table 1: Cross-Tabulation of Yellow Cards Issued to Home and Away Teams (by Competition)

Home Yellow	Away Yellow							Total
	0	1	2	3	4	5	6	
0	4.63	6.52	5.67	2.27	0.95	0.76	0	20.79
1	3.59	9.64	11.15	6.52	3.31	0.38	0.19	34.78
2	2.46	6.43	8.98	5.48	1.98	1.13	0.09	26.65
3	1.23	2.74	3.12	3.40	1.13	0.38	0.09	12.10
4	0.66	0.76	0.95	0.95	0.57	0.19	0	4.16
5	0	0.09	0.38	0.09	0.19	0.28	0	1.04
6	0	0	0.19	0	0.19	0	0	0.38
7	0	0	0	0	0	0	0	0
8	0	0	0	0.09	0	0	0	0.09
Total	12.57	26.18	30.43	18.81	8.32	3.12	0.57	100.00

Panel (a): Champions League

Home Yellow	Away Yellow									Total
	0	1	2	3	4	5	6	7	8	
0	3.78	6.10	5.35	2.52	0.94	0.25	0.06	0	0	19.01
1	3.84	9.88	7.17	5.98	2.83	0.88	0.13	0.06	0.06	30.84
2	2.45	7.05	8.75	6.23	2.83	1.13	0.31	0.06	0.06	28.89
3	0.63	3.65	4.47	3.52	2.14	0.94	0.19	0.06	0.06	15.67
4	0.25	0.76	1.83	0.88	0.44	0.38	0.19	0	0	4.72
5	0	0.25	0.25	0.13	0.06	0.06	0	0	0	0.76
6	0	0	0.13	0	0	0	0	0	0	0.13
Total	10.95	27.69	27.94	19.26	9.25	3.65	0.88	0.19	0.19	100.00

Panel (b): UEFA Cup

Table 2: Cross-Tabulation of Red Cards Issued to Home and Away Teams (by Competition)

	Champions League				UEFA Cup			
Red Card Home	Red Card Away				Red Card Away			
	0	1	2	Total	0	1	2	Total
0	82.89	9.74	0.95	93.57	81.31	9.13	0.82	91.25
1	5.10	0.85	0	5.95	6.54	1.57	0.13	8.24
2	0.19	0.28	0	0.47	0.13	0.25	0.06	0.44
3	0	0	0	0	0.06	0	0	0.06
Total	88.19	10.87	0.95	100.00	88.04	10.95	1.01	100.00

Table 3: Disciplinary Sanctions by Referee Nationality

Nationality	Yellow Cards (home team)	Yellow Cards (away team)	Red Cards (home team)	Red Cards (away team)
Austrian	1.594	1.953	0.125	0.094
Belgian	1.295*	1.803*	0.016*	0.066*
Danish	1.529	1.814*	0.029*	0.114
English	1.705	2.098	0.143*	0.205*
French	1.513	2.139	0.070	0.157
German	1.401	2.007	0.080	0.153
Greek	1.930*	2.614*	0.088	0.123
Italian	1.508	2.054	0.108	0.115
Dutch	1.380*	1.848	0.051*	0.076*
Norwegian	1.314*	1.986	0.057	0.100
Portuguese	1.620	2.577*	0.085	0.141
Russian	1.517	1.600*	0.05	0.15
Scottish	1.388	2.082	0.041*	0.122
Slovakian	1.698	2.189	0.075	0.189
Spanish	1.457	1.672*	0.138*	0.121
Swedish	1.424	1.803*	0.076	0.106
Swiss	1.625	2.25	0.018*	0.036*
Average	1.542	2.048	0.085	0.122

Notes: To qualify N >50. Values represent the average number of cards awarded.
* Denotes statistically significant from average (10% level or better).

Table 4: Univariate and Bivariate Ordered Probit Estimates

	Univariate Ordered Probit		Bivariate Ordered Probit	
	Home Team	**Away Team**	**Home Team**	**Away Team**
Variables				
Difference in Team Coefficient Index	-0.006** (0.003)	0.004 (0.003)	-0.007** (0.003)	0.004 (0.003)
Stage of Competition	0.112* (0.061)	0.150** (0.060)	0.112* (0.061)	0.149** (0.060)
Champions League	-0.209*** (0.069)	-0.201*** (0.068)	-0.210*** (0.069)	-0.201*** (0.068)
Attendance / 1000	-0.001 (0.002)	0.0001 (0.002)	-0.001 (0.002)	0.0001 (0.002)
Attendance to Capacity Ratio	0.264** (0.131)	0.480** (0.130)	0.263** (0.131)	0.477** (0.130)
Track	0.210*** (0.060)	0.049 (0.060)	0.210*** (0.060)	0.048 (0.060)
Fence	0.105 (0.066)	-0.012 (0.066)	0.105 (0.066)	-0.012 (0.07)
Referee Nationality Fixed Effects	INCLUDED	INCLUDED	INCLUDED	INCLUDED
Rho (ρ)			0.238*** (0.025)	
Thresholds				
Cut1	-0.853*** (0.085)	-1.079*** (0.086)	-0.854*** (0.084)	-1.081*** (0.086)
Cut2	0.041 (0.083)	-0.220*** (0.082)	-0.044 (0.083)	-0.219*** (0.082)
Cut3	0.801*** (0.084)	0.483*** (0.083)	0.802*** (0.084)	0.486*** (0.083)
Cut4	1.439*** (0.086)	1.061*** (0.085)	1.437*** (0.089)	1.062*** (0.085)
Cut5	1.922*** (0.097)	1.583*** (0.089)	1.915*** (0.097)	1.580*** (0.089)
Pseudo-R^2	0.014	0.014		
LR test (joint significance of covariates)	74.42	82.70	74.23	
LR test (independent equations)			85.43	
N	1717	1717	1717	

Notes: Standard errors in parentheses. ***, **, *, significant at 1%, 5% and 10% levels, respectively (two-tailed tests. The model used is assumed to be identified without an exclusion restriction. In our view, it is difficult to justify an exclusion restriction as there does not appear to be a sound (theoretical) reason for it. A priori, we have no strong reason to believe that the determinants of disciplinary sanctions for the home and away teams should be different. Therefore, we assume identification of the model is achieved through functional form and distributional assumptions. Nonetheless based on the results of the univariate ordered probit model, we did run the model excluding track and fence from the away team equation. The findings, available from the first named author on request, are consistent with those reported here.

Table 5: Referee Nationality, Club Nationality and 'League Reputation' Effects

Bivariate Ordered Probit Estimates			
Variables	(1)	(2)	(3)
Home Team			
Difference in Team Coefficient Index	0.002 (0.004)	0.002 (0.004)	-0.015** (0.006)
Stage of Competition	0.071 (0.065)	0.038 (0.066)	0.132 (0.093)
Champions League	-0.236*** (0.074)	-0.291** (0.077)	-0.123 (0.111)
Attendance / 1000	-0.002 (0.002)	-0.002 (0.002)	-0.004 (0.004)
Attendance to Capacity Ratio	0.411*** (0.148)	0.426*** (0.148)	0.365* (0.192)
Track	0.166** (0.066)	0.168*** (0.066)	0.210** (0.083)
Fence	0.024 (0.072)	0.024 (0.072)	0.060 (0.094)
Big Five Home		-0.396***(0.116)	-0.272* (0.151)
Big Five Away		0.109 (0.112)	0.026 (0.345)
Big Five Home x Big Five Away		0.283***(0.105)	0.168 (0.239)
Elite Referee		0.175** (0.088)	0.093 (0.139)
Away Team			
Difference in Team Coefficient Index	0.003 (0.004)	0.004 (0.004)	-0.006 (0.006)
Stage of Competition	0.111* (0.060)	0.087 (0.065)	0.118 (0.092)
Champions League	-0.235*** (0.073)	-0.272*** (0.076)	-0.167 (0.109)
Attendance / 1000	-0.001 (0.002)	-0.001 (0.002)	-0.004 (0.004)
Attendance to Capacity Ratio	0.650*** (0.147)	0.661*** (0.147)	0.551*** (0.191)
Track	0.094 (0.065)	0.094 (0.065)	0.098 (0.082)
Fence	0.017 (0.071)	0.018 (0.071)	0.014 (0.093)
Big Five Home		0.184 (0.113)	0.085 (0.149)
Big Five Away		-0.363*** (0.112)	-0.051 (0.345)
Big Five Home x Big Five Away		0.268** (0.104)	0.313 (0.240)
Elite Referee		0.101 (0.086)	0.252* (0.137)
Referee Nationality Fixed Effects	INCLUDED	INCLUDED	INCLUDED
Team Nationality Fixed Effects	INCLUDED	INCLUDED	INCLUDED
Rho (ρ)	0.250*** (0.025)	0.246*** (0.025)	0.278*** (0.031)
LR test (joint significance of covariates)	173.63	165.35	127.67
LR test (independent equations)	93.74	90.30	70.46
N	1717	1717	1048

Notes: As Table 4. In Model (3) the sample is restricted to teams from the 'smaller' leagues together with teams from the 'big five' leagues who have either been less successful in Europe or who have qualified less often.

Table 6: Sensitivity Analysis

	Model 1: Yellow Cards Only		Model 2: Champions League		Model 3: Champions League and 'Within Game' Dynamics	
Variables	Home Equation	Away Equation	Home Equation	Away Equation	Home Equation	Away Equation
Difference in Team Coefficient Index	0.0001 (0.004)	0.003 (0.004)	0.006 (0.006)	0.007 (0.006)	0.009 (0.006)	0.004 (0.006)
Stage of Competition	0.023 (0.066)	0.093 (0.065)	-0.083 (0.115)	0.010 (0.114)	-0.143 (0.116)	-0.037 (0.115)
Champions League	-0.269*** (0.077)	-0.242*** (0.076)				
Attendance / 1000	-0.002 (0.002)	-0.001 (0.002)	-0.002 (0.003)	-0.005 (0.003)	-0.003 (0.003)	-0.005 (0.003)
Attendance to Capacity Ratio	0.359** (0.149)	0.522** (0.148)	0.370 (0.337)	0.919*** (0.337)	0.281 (0.342)	1.095*** (0.343)
Track	0.121* (0.066)	0.092 (0.065)	0.113 (0.125)	0.223* (0.125)	0.124 (0.127)	0.194 (0.127)
Fence	0.040 (0.072)	0.004 (0.072)	0.085 (0.130)	-0.190 (0.129)	-0.003 (0.133)	-0.114 (0.132)
Big Five Home	-0.489*** (0.117)	0.145 (0.114)	-0.202 (0.217)	-0.266 (0.216)	-0.154 (0.222)	-0.289 (0.221)
Big Five Away	0.076 (0.113)	-0.377*** (0.113)	0.384* (0.216)	0.530** (0.216)	0.292 (0.221)	0.563** (0.221)
Big Five Home x Big Five Away	0.332*** (0.106)	0.296*** (0.127)	0.541*** (0.185)	0.195 (0.183)	0.529*** (0.188)	0.085 (0.185)
Elite Referee	0.096 (0.088)	0.059 (0.087)	0.213** (0.106)	0.185* (0.106)	0.142 (0.108)	0.840 (0.107)
Home Red	0.314** (0.128)	0.314** (0.127)				
Away Red	0.032 (0.103)	0.131 (0.102)				
Home Red / Yellow	-0.151 (0.126)	0.231* (0.124)				
Away Red / Yellow	0.293*** (0.104)	-0.114 (0.103)				
Home shots on goal					-0.049 (0.055)	0.032 (0.055)
Away shots on goal					0.039* (0.020)	0.004 (0.020)
Ratio of home possession to away possession (HPAP)					0.079 (0.369)	0.153 (0.368)
HPAP x Home shots on goal					0.029 (0.045)	-0.007 (0.045)
Home fouls					0.086*** (0.010)	0.015 (0.010)
Away fouls					0.017** (0.009)	0.080*** (0.009)
Referee Nationality Fixed Effects	INCLUDED		INCLUDED		INCLUDED	
Club Nationality Fixed Effects	INCLUDED		INCLUDED		INCLUDED	
Rho (ρ)	0.224*** (0.027)		0.239*** (0.042)		0.207*** (0.043)	
LR test (joint significance of covariates)	176.26		89.64		172.84	
LR test (independent equations)	71.18		29.77		21.40	
N	1717		650		650	

Table 7: Referee Nationality and Club Nationality Effects

Panel (a): Home Team Equation

Referee Nationality	Home Club Nationality	Away Club Nationality
Belgian (+ve)	Greek (+ve)	Italian (-ve)
German (-ve)	Italian (+ve)	Portuguese (+ve)
Greek (+ve)	Romanian (+ve)	Spanish (+ve)
Dutch (-ve)	Spanish (+ve)	Swiss (+ve)
Norwegian (-ve)	Swiss (-ve)	
Russian (-ve)		
Scottish (-ve)		
Swedish (-ve)		

Panel (b): Away Team Equation

Referee Nationality	Home Club Nationality	Away Club Nationality
Belgian (-ve)	Belgian (+ve)	Czech (-ve)
Danish (-ve)	English (-ve)	German (+ve)
Greek (+ve)	German (-ve)	Italian (+ve)
Dutch (-ve)	Greek (+ve)	Romanian (+ve)
Portuguese (+ve)	Italian (-ve)	Spanish (+ve)
Russian (-ve)	Portuguese (+ve)	
Spanish (-ve)		
Swedish (-ve)		

Note: Variables are significant at the 10% level or better. Based on Model (2), Table 5.

Appendix: Variable Definitions

Variables	Definition
Difference in Team Coefficient Index	Team Coefficient Index of Home Team Minus Team Coefficient Index of the Away Team.
Stage of Competition	= 1 if Round of 32 onwards (Round of 16 in the case of the Champions League), 0 otherwise
Champions League	= 1 if Champions League Match, 0 otherwise (i.e. UEFA Cup match)
Attendance / 1000	Attendance scaled by 1000
Attendance to Capacity Ratio	Attendance divided by stadium capacity
Track	= 1 if stadium has a running track, 0 otherwise
Fence	= 1 if stadium has fencing, 0 otherwise
Home Cards	Total disciplinary "points" issued to the home team
Away Cards	Total disciplinary "points" issued to the away team
Referee Nationality	Dummy Variables which represent referee nationalities (minimum of 50 observations required for inclusion).
Home Club Nationality	Dummy Variables which represent home club nationality (minimum of 70 observations required for inclusion).
Away Club Nationality	Dummy Variables which represent the away club nationality (minimum of 70 observations required for inclusion).
'Big Five' Home	=1 if home club from one of the "big five" leagues[a], 0 otherwise
'Big Five' Away	=1 if away club from one of the "big five" leagues[a], 0 otherwise.
Elite Referee	=1 if match official officiated at the 2004 European Championship, 0 otherwise.

Notes: [a] Club from England, France, Germany, Italy or Spain.