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FRANZISKA K. KRUSE / WOLFGANG MAENNIG

YELLOW CARDS AND SUSPENSION BY CHOICE: DETERMINANTS AND ASYMMETRIES

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Chair for Economic Policy

Von-Melle-Park 5

20146 Hamburg | Germany

Tel +49 40 42838 - 4622

Fax +49 40 42838 - 6251

<https://www.wiso.uni-hamburg.de/en/fachbereich-vwl/professuren/maennig/home.html>

Editor: Wolfgang Maennig

Franziska K. Kruse

University of Hamburg

Faculty of Business, Economics and Social Sciences

Chair for Economic Policy

Von-Melle-Park 5

20146 Hamburg | Germany

Tel +49 40 42838 - 4628

Fax +49 40 42838 - 6251

franziska.kruse@uni-hamburg.de

Wolfgang Maennig

University of Hamburg

Faculty of Business, Economics and Social Sciences

Chair for Economic Policy

Von-Melle-Park 5

20146 Hamburg | Germany

Tel +49 40 42838 - 4622

Fax +49 40 42838 - 6251

wolfgang.maennig@uni-hamburg.de

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Franziska K. Kruse, Wolfgang Maennig

Yellow Cards and Suspension by Choice: Determinants and Asymmetries

Abstract: This study demonstrates that psycho-economic determinants are significant in the awarding of yellow cards in a soccer match. This is the first multivariate analysis of the number of yellow cards given to a team in a match, and the study concludes that the characteristics of the referee, a home match effect, a derby match effect, and whether a team wins are crucial. The absolute point difference in relation to the current opponent can play a role as well. This is also the first work to analyze the probability of a team's player collecting his fifth yellow card. We find that the probability is not determined by the characteristics of the referee but by whether a team wins, by whether a team plays at its home pitch and by the quality of the teams participating in the subsequent matches. Soccer players tend to collect their fifth yellow card and their suspension by choice when playing against a better opponent in the next match. For teams in the lower range, the opponent after next plays a role as well.

Keywords: yellow cards, fifth yellow cards, soccer, Bundesliga, psycho-economic determinants, suspension by choice

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Introduction

The issuance of yellow cards (warnings for unfair offenses) is regularly one of the most debated issues in soccer matches. However, there have been few attempts to empirically analyze any potential systematics of yellow cards. As one of these few attempts, (Unkelbach and Memmert 2008; Memmert et al. 2008) determine that referees who watch scenes in the context of the game award fewer cards than those who see a random order of scenes from the game. They apply the psychological consistency model of (Haubensak 1992) and show that referees calibrate a judgment scale within each game for suspension decisions.

Our study adds to the literature by focusing on athletes and their psycho-economic surroundings in addition to the characteristics of referees. For example, we test for the quality of the player's own team, whether a team wins, a derby match effect, and a home match effect. To the best of our knowledge, our paper presents the first multivariate analysis on the number of yellow cards per match.

As a second innovation, we analyze whether athletes are subject to incentives to collect (fifth) yellow cards to induce a suspension on purpose. For example, players could intentionally collect their fifth (or tenth) yellow card to rest before an upcoming game. Such incentives may arise if athletes want to avoid likely defeats or if they want to rest for a later potentially more promising or more important game. We also test for differences in the behavior of team members depending upon the ranking of the team. Members of better teams at the top of the table that are playing for the national championship may have different motivations, characteristics and behaviors than those on teams at the lower end of the rankings.

This paper adds to strands of the literature that analyze behavioral and moral divergences from the ideal of fairness in sports and the maximum and unbiased performance of athletes (among others, (Bredemeier 1995), (Bredemeier and Shields 1996), (Doty 2006) and (Monacis et al. 2013)) and referees (among others, (Sutter and Kocher 2004)). Our study also adds to the literature that analyzes the effect of the home field advantage on referee behavior (Schwartz and Barsky 1977)), (Nevill et al. 2002), (Boyko et al. 2007), (Dawson et al. 2007), (Dawson and Dobson 2010), (Page and Page 2010), and (Anderson et al. 2012). Our study also relates to studies that analyze the psycho-strategic behavior of goalkeepers and players, for example, on the occasion of penalty kicks (Chiappori et al. 2002; Coloma 2007).

We also contribute to the literature concerning productivity maximization, especially the maximization of (labor) productivity through scheduling rest breaks in an optimal manner. In theoretical and experimental contexts, (Bechtold et al. 1984) develop two models for setting rest-breaks, distinguishing between more productive and less productive employees and find that more productive employees should be assigned

fewer and shorter rest breaks than less productive employees, if they are paid on a piece rate. In an experimental study (Dababneh et al. 2001), results from (Henning et al. 1997) showing the timing of rest breaks during the working day might be beneficial to labor productivity and to workers' well-being were confirmed. Collecting the fifth yellow card might represent the (perceived) optimally chosen rest-break in order to maximize the team's productivity.

Finally, we add to the literature concerning the interaction of psychology and delinquency from a moral perspective as well as from an economic view. Aiming for a fifth yellow card by choice could be regarded as a delinquency in the context of the principle of expending the best efforts to win a competition. Economic analysis of (moral) crime assumes that individuals choose delinquent behavior if the respective net utility, which equals the difference between the perceived benefits and the perceived costs, crosses their individual moral threshold ((Becker 1968) and (Maennig 2002), for the first application of delinquent behavior in sports). Note that there is evidence for potential delinquent behavior that differs from the economic theory of crime. For example, the probability of deterrence does not seem to be rationally taken into account (Sunstein et al. 2000).

The outline of the paper is as follows. Section 2 describes the regulations of yellow cards, the potential psycho-economic incentives and the data. Section 3 presents the empirical strategy of the study and the results, and Section 4 concludes.

Yellow cards: Regulation, psycho-economic incentives and data

The yellow card and the red card are the main instruments of the referee to sanction players who commit unfair offenses within a soccer game. Red cards have an immediate effect: players receiving a red card must leave the pitch, and the National Sports Council decides afterwards whether and for how many games a player will be suspended. Yellow cards, however, are counted throughout the season and for each championship. If a player collects two yellow cards in one game, he is forced to leave the match immediately and is suspended for the next game. Players are also suspended for the subsequent game

if they collect their fifth or tenth yellow card during a season in a given competition, but they are not forced to leave the pitch early in that match after collecting the card. Further, no sports council will decide how long the suspension will be. This regulation was introduced before the 1979/1980 season in Germany.

Average cards awarded per match and for five seasons, from 2013/2014 to 2017/2018, for the German “Bundesliga” are displayed in Table 1, calculated based on data from the (kicker 2018) database. In all seasons except 2015/2016, referees awarded at least 3 cards per game on average.

Table 1 Awarded yellow cards (average per season), minimum and maximum

Awarded cards (average per season)	Observations	Mean (Std. Dev.)	Minimum	Maximum
Season 2013/2014	612	3.69 (0.37)	3.1	4.48
Season 2014/2015	612	3.72 (0.36)	3.14	4.56
Season 2015/2016	612	3.76 (0.43)	2.63	4.5
Season 2016/2017	612	3.97 (0.33)	3.21	4.67
Season 2017/2018	612	3.97 (0.34)	3.37	4.93

One season includes 34 match days, each with 18 teams and nine matches. In total, we analyze the described behavior of 23 different teams that were part of the Bundesliga during our observation period. Thirteen of these clubs were part of the Bundesliga throughout all the seasons included in the analysis; three teams were part of the Bundesliga for only one season (Table A1).¹

For each club and each match day of every season, we count the quantity of yellow cards awarded to each player (variable name: match cards), as well as the number of fifth and tenth yellow cards awarded. We additionally collect data for points won on each match

¹ After 34 match days, the two clubs at the bottom of the ranking are relegated to the Second Bundesliga. In exchange, the two best teams from the Second Bundesliga are promoted to the first division. Further, the 16th team of the first Bundesliga and the third team of the second Bundesliga are matched against each other for the right to participate in next season’s first division.

day, whether it is a home or away game (home = 1), the ranking position of the current opponent, and the ranking position of the next opponent.

We include data for individual referees who are in charge of each specific game. Referees may differ in their pedagogical/psychological approach or “strictness” in awarding yellow cards. Whether a player is penalized by being awarded a yellow card could therefore depend on the attitudes of a referee. As a first operationalization of individual strictness, we calculate the average number of cards awarded by each referee in each respective season, excluding the particular game (variable name: `referee_cards`). To smooth potential outliers, we used as an alternative specification the weighted three-year average of yellow cards per game awarded by the specific referees (variable name: `referee_average`).² In a third specification, we used the three-year average value for each referee and calculated the median number of yellow cards of all referees per match for each season. We calculated a dummy variable, “referee” which is set to 1 if a referee represents the median or a higher value and zero otherwise. In sum, we controlled for 33 referees; 32 of these referees were male, and one was female.

Table A2 displays details of the referees. There are, for example, six referees who have a three-year average above the median throughout all included seasons. In 2017/2018, one referee awarded nearly 5 yellow cards per game on average, indicating that individual characteristics of referees may affect the probability of yellow cards.

We included a local derby variable (`derby` = 1) if the opponent is a local rival. Table A1 in the appendix displays the derby matches in the Bundesliga.³ We added a dummy variable for whether a club won the relevant match (`win` = 1).

A player who has previously collected four or nine yellow cards during a season may have incentives to strategically seek a fifth or tenth yellow card, depending on individual

² Bundesliga referees can be appointed for the first, second and third divisions of the Bundesliga as well as for the League Cup (DFB-Pokal) or the Champions League. First division Bundesliga referees generally begin their careers in the lower divisions; all three divisions are now considered “professional” (in contrast to grassroots sports).

³ Except for Hertha BSC, SC Paderborn and RB Leipzig, each club had at least one local rival, defined by either spatial proximity or Bundesliga history (for example, Bayern München – VfB Stuttgart).

characteristics and the circumstances of the match. For example, the incentives may be reduced in a derby match. Or, a player on a weaker team with an upcoming match against a perceived unbeatable opponent may have additional incentives to collect a yellow card that leads to suspension. She/he might want to sit out against these (perceived) unbeatable teams to avoid a suspension at a later stage against a team in the same range of the table that might potentially be beaten. Players on higher ranked teams playing for a National Championship and in international competitions may want to induce a suspension against weaker opponents to play against stronger teams (and therefore, for example, commend themselves for the National team or other [better] international teams).

We use three alternative proxies for the quality of the team(s). In the first specification we included a dummy variable “position” (= 1) if the team’s position in the ranking was 10th or worse. In the second specification, we generated variables that provide the relative ranking of the team’s own position compared to the ranking of the next opponent and then the following opponent. We calculated the difference between the team’s own position in the rankings and the position of its next opponent. This variable ranged from 17 to -17, and we split this variable into positive (difference: 1 ... 17) and negative (difference: -17 ... -1) variables. A positive difference indicates that the team’s own ranking is worse than its opponent’s ranking; a negative difference shows the opposite. We also generate a variable displaying the difference between the team’s own position and the position of its second upcoming opponent, splitting this variable in the same way as the variable before.

In some periods during the seasons, table positions (and differences) might not be a relevant measure. Thus, in a third specification, we use the (absolute) point difference between the teams (own team vs. current opponent; next opponent; opponent after next) as the difference in the absolute points between the respective teams. We allow for asymmetries by separately controlling for positive absolute point difference and negative point difference. A negative difference indicates that a team’s absolute points are lower than those of its opponent; a positive points difference shows the opposite

(variable: point_difference_positive and point_difference_negative). In some more detailed estimations regarding yellow cards in general, we include more specific dummy variables for the absolute point difference. This helps us to investigate whether there are different results between larger and smaller point differences.

Table 2 Descriptive statistics of endogenous and exogenous variables, panel season 2013/2014 – 2017/2018

Variable	Observations	Mean (Std. Dev.)	Minimum	Maximum
Match Cards (MC)	3,060	1.809804 (1.235482)	0	7
MC Bayern München	170	1.288235 (1.148388)	0	5
MC Borussia Dortmund	170	1.358825 (1.128207)	0	4
MC Eintracht Frankfurt	170	2.423529 (1.258124)	0	6
Win	3,060	0.3784314 (0.4850752)	0	1
Home	3,060	0.5 (0.5000817)	0	1
Derby	3,060	0.0862745 (0.2808149)	0	1
Position (=1 if worse than 9 th)	3,060	0.4849673 (0.4998556)	0	1
Absolute point difference to current opponent	2,969 ⁴	-0.0259347 (12.80192)	-60	60
Referee_cards per match, season average	3,060	3.96185 (0.7556723)	2.375	8.363636
Referee_cards 3- year average	3,060	3.826114 (0.3896873)	2.63	4.93
Referee 1 = referee awards more cards than three-year average	3,060	0.4620915 (0.4986424)	0	1

The minimum number of collected yellow cards in a match is zero, and the maximum is seven. The descriptive statistics for the cards for the three clubs Bayern München, Borussia Dortmund and Eintracht Frankfurt are enlightening. The first two clubs, which

⁴ The reduction of observations results from the first match day: on this match day, the absolute point difference between the opponents does not exist because all teams have zero points.

are regularly at the top of the rankings, collect an average of 1.2 to 1.35 yellow cards per game while the mean number of yellow cards collected per game for Eintracht Frankfurt (regularly ranked lower, the team with the most yellow cards) is approximately 2.42.

The position variable is close but not equal to 0.5 because of the first match days in the Bundesliga. Several teams are then ranked in the same position in the table while some other ranks are not assigned at all. The three-year average of awarded cards of referees varies between 2.63 and 4.93. The seasonal averages of awarded cards (excluding the respective game), `referee_cards`, show that there is one referee who awarded an average of 8.36 cards per game (Markus Schmidt, in the 2016/2017 season). The absolute point differences range between 60 and -60. This point difference occurred in the season 2015/2016 between Hannover 96 (rank 18) and FC Bayern München (rank 1) on Match Day 34; Hannover was relegated to the Second division at the end of the season. The mean deviates from zero due to the reduced sample size.

For the analysis of suspensions by choice (i.e., the receipt of 5th or 10th yellow cards), our analyzed sample had to be reduced: For each season, the sample had to start on Match Day 5, the first match day on which players are able to collect their fifth yellow card. The sample ends at Match Day 33 because on Match Day 34, a fifth yellow card does not have any effect on a subsequent game.⁵ The maximum number of players on a team who have collected their fifth or tenth yellow card in a match is five.⁶

⁵ Even if players collect a fifth / tenth yellow card on Match Day 34, this suspension is not transferred to the next season.

⁶ The value of five players collecting their fifth yellow card belongs to Darmstadt 98, in 11th position in the rankings on the 21st match day in the 2015/2016 season. This occurred before a game against Bayern München, the leading team at that time.

Figure 1 Absolute number of suspensions per match day for each season

Figure 1 shows the suspensions per match day for each team due to fifth or tenth yellow cards collected across the five seasons for all teams. In both seasons 2014/2015 and 2015/2016, there was one match day in which nine suspensions were awarded. The first match day in the sample on which a player was suspended was the sixth (season 2013/2014, player: Granit Xhaka from Borussia Mönchengladbach).

Analysis and results

We begin our analysis with a regression regarding determinants of the number of yellow cards per team and per match. For this analysis, we use the panel throughout the 5 seasons from 2013/2014 to 2017/2018 and subsequently include the variables win, home, derby, position and the three specifications of the referee variables. We follow (Sutter

and Kocher 2004) and estimate an OLS model in the form of a random effects panel model (Long, 1997).

$$\begin{aligned} matchcards_{it} = & (\beta_0 + u_{it}) + \beta_1 win_{it} + \beta_2 home_{it} + \beta_3 derby_{it} + \beta_4 position_{it} \\ & + \beta_5 referee_{it} + \beta_6 pointscurrent_{it} + \varepsilon_{it} \end{aligned} \quad (1)$$

Variable names are explained above. The variable *referee* is used as a placeholder in this equation for our three referee specifications, as explained above (referee_cards per match, season average; referee_cards [three-year average]; and the referee dummy). The results can be found in Table 3.

Table 3: Determinants of Yellow Cards per match, random effects estimates

Match Cards	Model 1	Model 2	Model 3	Model 4	Model 5
Constant	1.94552*** (0.0663601)	1.609314*** (0.1208912)	1.961362*** (0.563455)	1.374289*** (0.2269788)	1.334789*** (0.2228003)
Win	-0.1415273*** (0.0505884)	-0.1428505*** (0.0526039)	-0.1505631*** (0.0529887)	-0.1496868*** (0.0533031)	-0.1453358*** (0.0510568)
Home	-0.2640823*** (0.0523572)	-0.2637038*** (0.0534645)	-0.2610117*** (0.0520204)	-0.2611003*** (0.051466)	-0.254574*** (0.0499152)
Derby	0.0806525** (0.0867067)	0.202809** (0.0868078)	0.203223** (0.0873305)	0.2009215** (0.0537993)	0.1870265** (0.0888268)
Position (=1 if worse than 9 th)	0.0806525 (0.0516278)				
Referee dummy		0.0571523 (0.0349687)			
Referee_cards per match, season average			0.0953504*** (0.0260776)		
Referee_cards 3- year average				0.1603516*** (0.0537993)	0.1633403*** (0.0526579)
Points_5_neg: Dummy (=1 if point difference negative and >=-5)					0.11614083** (0.0588441)
Number of observations	3,060	3,060	3,060	3,060	2,969
Wald Chi ²	39.90	44.22	57.63	84.30	75.46
Prob > Chi ²	0.0000	0.0000	0.0000	0.0000	0.0000
R ²	0.3594	0.3893	0.4259	0.4976	0.4354

Robust standard errors in parenthesis. ***/**/* = significant at the 1%, 5% and 10% levels.

In the model (1) specification, the variables win, home and derby are significant and show the expected direction. Winning teams often have more possession of the ball and, therefore, have less incentives to commit a foul to gain possession. Winning a game may therefore lead to fewer yellow cards for the winning team. There are significantly more yellow cards awarded in a derby match. If the match is held on the home pitch, the home team tends to collect fewer cards. This is consistent with (Boyko et al. 2007) and (Dawson and Dobson 2010), who showed that home teams receive fewer disciplinary sanctions due to a home field advantage (with their own crowd) or a home bias from the referee. The position dummy is not significant. In the second model, we include the referee

dummy, which turns out to be insignificant. Nevertheless, referees' characteristics do play a role: the referees' average number of yellow cards per match (as included in Model 3) and the three-year average of referees (included in Model 4) are highly significant. The model specification with the three-year average referee variable results in a higher R^2 than the other specifications.

Consequently, we build on model (4) and include a dummy regarding the absolute point difference (before the match) in relation to the current opponent as a further explanatory variable in model (5). The dummy accounts for matches between teams within a similar performance range. Dummies that simply control for positive and negative point differences were not significantly different from zero (not reported in Table 3)⁷. Therefore, we report an estimate including a dummy for the negative point difference which is negative -5 at most. This dummy is significant, at least at the 5% level. Teams do collect more yellow cards if the opponent is of a similar strength but is slightly better. An explanation could be that when playing these opponents, the team might be more motivated to close the point gap with this opponent.⁸

We now turn to the estimation of the probability of a fifth yellow card as a dependent variable. We estimate a random effects logit panel model, which is widely used in sports economics, for example in (Kokolakakis et al. 2012) and (Price et al. 2010):

$$\begin{aligned} \text{logit}(P_{fifth}) &= \log\left(\frac{P_{fifth}}{1 - P_{fifth}}\right) \\ &= \beta_0 + \beta_1 \text{matchcards}_{it} + \beta_2 \text{win}_{it} + \beta_3 \text{home}_{it} + \beta_4 \text{derby}_{it} + \beta_5 \text{matchday}_{it} \\ &\quad + \beta_6 \text{position}_{it} + \beta_7 \text{referee}_{it} \\ &\quad + \varepsilon_{it}, \end{aligned} \tag{2}$$

Variable names are given as in equation (1), but we exclusively use two significant proxies for the referees' characteristics, referee_cards and referee_average. Additionally, as suggested by Figure 1, we include the match day, as there seems to be an increase in fifth yellow cards as the number of match days increases. Error terms are assumed to be independent and normally distributed (Long 1997). We use robust standard errors.

Our first estimations include all significant variables – except for the referee variables – from the yellow cards estimation in Table 3. Regarding fifth yellow cards, we find that the local rivalry variable is not a significant determinant. None of the referee variables was determined to be significant. Further, we included a position dummy and examined whether the relative strength variables of the next opponent have a significant effect.

⁷ Details are available from the authors on request.

⁸ The R^2 in model specification (5) is slightly lower than in the other specifications. This might result from fewer observations in this specification and the fact, that the R^2 in random effects estimations is calculated as squared correlations and might suffer from measurement errors (Baltagi (2013); StataCorp (2017), p. 425).

Soccer players may have incentives to sit out a match against certain opponents to rest for games that are more important or to avoid losing to much better opponents. We included the positive and negative ranking variables in relation to the next opponent but did not identify any significant effect.

Our (insignificant) results from the position variables may suffer from population heterogeneity (Xie 2013). Table A3 indicates that the average positive ranking position with respect to the next opponent of the top teams (0.77) is much lower than that for the lower ranked teams (5.44). Table A3 also shows the point difference variables with respect to the next opponent and the opponent after the next, used for the robustness check of the regression. The heterogeneity within the population is also apparent by using this specification.

To analyze more homogenous groups, we subdivided the analysis for teams with rankings at the top and at the bottom of the rankings table.

Teams playing against relegation

We begin with an analysis of teams with a lower ranking in positions 10-18. We include the significant variables for yellow cards as indicated by MP1-MP5 as well as a relative position variable with a positive/negative difference. Due to the subdivision of the two groups, the number of observations is reduced.

Regression results for the lower ranked teams can be found in Table 4. In the first model for lower-ranking teams ML1, we find that “win” is no longer a significant determinant of the probability of collecting a fifth yellow card, but “home,” “match day,” and “match cards” are significant determinants as in the model specifications MP1-MP4. The negative difference with respect to the next opponent is insignificant in ML1, and we focus on the positive difference in the following specifications. The positive ranking variable may take values between 1 and 17; our positive estimate in the specifications ML1–ML4 therefore indicates an increasing probability of collecting a fifth yellow card with better competing teams for the next match. Table 4 also displays the odds ratios (e.g., (Hu and Lo 2007; Arenius and Minniti 2005), which confirm our earlier results as well.

In table A4 of the appendix, we report several robustness checks with the absolute point difference with respect to the next opponent and the opponent after the next, as described above. We split the sample with respect to the position dummy as before in order to separately test for the lower-ranked teams. As with the ranking variables, we find that a negative difference with respect to the next opponent has a significant effect on the receipt of fifth or tenth yellow cards.

Teams from the top of the ranking

We conduct the same analysis for teams that are in the top 9 of the ranking. As a starting point, we chose the same model specification as before (with cards, win, home and match day as explanatory variables) (model specification MT1 in Table 5). We test with both ranking difference variables for potential asymmetries in the player's behavior and subsequently add other ranking difference variables.

The variable "home" is no longer significant in MT1 and was excluded for all subsequent estimations. Match cards and match day are highly significant throughout all model specifications. In contrast to the case of lower ranking teams, "win" reduces the probability of strategically collecting a fifth yellow card for teams in the upper half of the table. As argued above, winning a game is often accompanied with more ball possession. Teams that win may have less incentive to commit fouls to gain possession of the ball. The opponent after next does not have any significant effect. Additionally, for the higher ranked teams, the calculated odds ratios confirm the direction of the estimated β -coefficients.

Table 4 (Probability of a) fifth yellow card, teams in lower rankings, logit estimates and odds ratios

Fifth(Pr=1)	ML1		ML2		ML3		ML4	
	Logit	Odds Ratio	Logit	Odds Ratio	Logit	Odds Ratio	Logit	Odds Ratio
Constant	-4.975626*** (0.3696987)	0.006904 2*** (0.00255 25)	- 4.967225 *** (0.36740 75)	0.0069 624*** (0.0025 581)	- 4.871172 *** (0.36149 05)	0.007664 4*** (0.00277 06)	- 5.054514 *** (0.36256 84)	0.0063805* ** (0.0023134)
Match Cards	0.607453*** (0.0646944)	1.83575* ** (0.11876 28)	0.633304 8*** (0.07657 25)	1.8838 26*** (0.1442 493)	0.643275 *** (0.07500 78)	1.902702 *** (0.14271 75)	0.634848 6*** (0.07478 48)	1.886737*** (0.1410992)
Win	-0.1525512 (0.159515)	0.858514 9 (0.13694 6)						
Home	0.3295286*** (0.112494)	1.390313 *** (0.15640 18)	0.266496 1* (0.15356 29)	1.3053 83* (0.2004 584)	0.269860 7* (0.14953 93)	1.309782 * (0.19586 38)	0.272312 * (0.15241 99)	1.313009* (0.2001287)
Match day	0.072884*** (0.0105401)	1.075606 *** (0.01133 7)	0.064236 4*** (0.01033 63)	1.0663 44*** (0.0110 221)	0.063887 7*** (0.01065 38)	1.065973 *** (0.01135 67)	0.063898 1*** (0.01050 06)	1.065984*** (0.0111935)
Positive difference of ranking toward next opponent	0.028317** (0.0124592)	1.028722 ** (0.01281 71)	0.038681 1* (0.01994 34)	1.0394 39* (0.0207 3)	0.032616 9* (0.12840 38)	1.033155 * (0.19335)	0.036596 3* (0.01966 55)	1.037274* (0.0203985)
Negative difference of ranking toward next opponent	-0.0807816 (0.0584361)	0.922395 1 (0.05390 12)						
Negative difference of ranking toward the opponent after next					0.128403 8** (0.05735 95)	1.137012 ** (0.06521 85)		
Positive difference toward the opponent after next							0.01759 (0.01313 01)	1.017746 (0.0133631)
Log pseudolikelihood	-446.55695		-337.64557		-336.21393		-337.293	
Wald(Chi²)	128.99		119.89		127.83		133.74	
Prob >Chi²	0.0000		0.0000		0.0000		0.0000	
AIC	909.1139		687.2911		686.4279		688.586	
BIC	950.2121		716.4927		720.4964		722.6545	

Robust standard errors are in parentheses. ***/**/* = significant at the 1%, 5% and 10% levels.

Table 5 Logit estimates and odds ratios, inclusion of rank differences for teams from the top of the ranking

Fifth(Pr=1)	MT1		MT2		MT3		MT4	
	Logit	Odds Ratio	Logit	Odds Ratio	Logit	Odds Ratio	Logit	Odds Ratio
Constant	-5.555073*** (0.5247674)	0.0038678*** (0.0020297)	-5.361109*** (0.3499957)	0.0046957*** (0.0016435)	-5.370277*** (0.3653895)	0.0046528*** (0.0017001)	-5.356113*** (0.3467181)	0.0047192*** (0.0016362)
Match cards	0.6710685 *** (0.093743)	1.956326*** (0.1833918)	0.663384*** (0.0858604)	1.941351*** (0.1666852)	0.6638294*** (0.0860248)	1.942216*** (0.1670787)	0.6649636 *** (0.0874474)	1.94442* ** (0.1700344)
Win	-0.3492523 ** (0.1527787)	0.7052152** (0.1077418)	-0.3575433* (0.1564451)	0.6993924** (0.1094165)	-0.3574481** (0.1555172)	0.699459** (0.1087779)	-0.3611704** (0.1564734)	0.6968602** (0.1090401)
Home	-0.0172171 (0.1888008)	0.9829303 (0.185578)						
Match day	0.1050246 *** (0.009422)	1.110738*** (0.0104654)	0.0820428 *** (0.013949)	1.110776*** (0.0105687)	0.1050688*** (0.0095243)	1.110787*** (0.0105795)	0.1052351*** (0.0096087)	1.110972*** (0.010675)
Negative difference of ranking toward next opponent	-0.0277662 (0.0307635)	0.9726158 (0.0299211)						
Positive difference of ranking toward next opponent	0.1539559*** (0.0538268)	1.166439*** (0.0627857)	0.1152874*** (0.0392588)	1.122196*** (0.044056)	0.1157951*** (0.0389351)	1.122766*** (0.043715)	0.1170206*** (0.0414803)	1.124143*** (0.0466298)
Negative difference of ranking toward opponent after next					-0.0014043 (0.0154392)	0.9985967 (0.0154175)		
Positive difference toward opponent after next							-0.0151477 (0.0527034)	0.9849664 (0.051911)
Log pseudolikelihood	-409.6001		-410.33624		-410.3337		-410.29303	
Wald(Chi²)	192.29		167.15		171.76		180.69	
Prob >Chi²	0.0000		0.0000		0.0000		0.0000	
AIC	835.2001		832.6725		834.6674		834.5861	
BIC	876.3047		863.5009		870.6339		870.5526	

Robust standard errors are in parentheses. ***/**/* = significant at the 1%, 5% and 10% levels.

Conclusion

We analyze determinants of the number of yellow cards and conclude that winning the game negatively affects the number of cards collected, as does playing on the home pitch. The latter confirms results from existing studies regarding home field advantage. Further, playing against a local rival has a positive impact on the number of yellow cards issued. The characteristics of the referee play a significant role: a “stricter” referee increases the number of cards awarded in a match. The relative point difference with respect to the current opponent can play a role as well. When the current opponent is slightly better than the team under consideration, there are significantly more yellow cards awarded, possibly indicating the motivation of players to close the gap in absolute points between the teams.

We also analyzed the probability of collecting a fifth yellow card and found that winning a match reduces the probability of receiving a fifth yellow card, and playing on the home pitch increases this probability. We investigate a potential asymmetry between top-ranked teams and lower-ranked teams. For both groups, a better ranking position of the next opponent positively affects the probability of collecting a fifth or tenth yellow card. For lower ranked teams, the opponent following the next opponent also plays a significant role in cards issued when that team is ranked lower than the respective team.

This research indicates incentives for suspensions by choice in the cases of lower-ranked teams. Future research in sports economics and sports psychology should conduct a deeper analysis of these motives. A potential psychological explanation may be that players prefer winning to losing and choose to rest against better teams to avoid experiencing a potential defeat. Our finding that members of lower-ranked teams seem to be timing their suspensions to ensure that they may play in the match after next against a weaker team may support this idea. In addition, a more direct economic motivation should also be examined: players may be timing their suspensions in a productivity-maximizing manner; they may seek to sit out matches that will likely be lost regardless of their deployment, i.e., when their expected productivity is low. In this case, collecting their fifth yellow card and their suspension by choice may be regarded as a contribution to maximizing team productivity.

Appendix

Table A1: List of included clubs, numbers of seasons in the first German Bundesliga and rivalries among clubs

Club	Seasons included in analysis	Derby
FSV Mainz 05	5	Eintracht Frankfurt, SV Darmstadt 98
TSG 1899 Hoffenheim	5	SC Freiburg, VfB Stuttgart
Bayer 04 Leverkusen	5	Borussia Mönchengladbach, 1. FC Köln
Borussia Dortmund	5	FC Schalke 04
Borussia Mönchengladbach	5	Bayer 04 Leverkusen, 1. FC Köln
Eintracht Frankfurt	5	FSV Mainz 05, SV Darmstadt 98
FC Augsburg	5	VfB Stuttgart, FC Bayern München, FC Ingolstadt 04, 1. FC Nürnberg
FC Bayern München	5	FC Augsburg, VfB Stuttgart, FC Ingolstadt, 1. FC Nürnberg
FC Schalke 04	5	Borussia Dortmund
Hamburger SV	5	Werder Bremen
Hertha BSC Berlin	5	/
Werder Bremen	5	Hamburger SV
VfL Wolfsburg	5	Hannover 96, Eintracht Braunschweig
Hannover 96	4	Eintracht Braunschweig, VfL Wolfsburg
VfB Stuttgart	4	FC Augsburg, FC Bayern München, SC Freiburg, 1899 Hoffenheim
SC Freiburg	4	VfB Stuttgart, 1899 Hoffenheim
1. FC Köln	4	Borussia Mönchengladbach, Bayer Leverkusen
RB Leipzig	2	/
FC Ingolstadt 04	2	FC Augsburg, FC Bayern München, 1. FC Nürnberg
Darmstadt 98	2	Eintracht Frankfurt, FSV Mainz 05
Eintracht Braunschweig	1	Hannover 96, VfL Wolfsburg
1. FC Nürnberg	1	FC Augsburg, FC Bayern München, FC Ingolstadt 04
SC Paderborn 07	1	/

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Season	2013/2014	2014/2015	2015/2016	2016/2017	2017/2018
	Cards (No. of games) / 3-year average; median: 3,69	Cards (No. of games) / 3-year average; median: 3,79	Cards (No. of games) / 3-year average; median: 3,93	Cards (No. of games) / 3-year average; median: 4,00	Cards (No. of games) / 3-year average; median: 3,97
Aytekin, Deniz	67 (22) / 3,97 (referee = 1)	73 (21) / 3,67	72 (18) / 3,55	88 (23) / 3,51	78 (20) / 3,77
Brand, Benjamin*	60 (14) / 3,85 (referee = 1)	54 (14) / 4,00 (referee = 1)	104 (24) / 3,98 (referee = 1)	84 (23) / 4,16 (referee = 1)	62 (19) / 3,95
Dr. Brych, Felix	91 (23) / 3,45	96 (24) / 3,59	101 (25) / 3,91	101 (23) / 4,00 (referee = 1)	70 (20) / 4,14 (referee = 1)
Cortus, Benjamin	63 (15) / 3,51	64 (17) / 4,00 (referee = 1)	58 (14) / 4,01 (referee = 1)	72 (22) / 4,04 (referee = 1)	101 (26) / 3,73
Dankert, Bastian	87 (21) / 3,10	80 (22) / 3,58	90 (23) / 3,65	96 (23) / 3,90	72 (21) / 3,91
Dingert, Christian	101 (24) / 4,03 (referee = 1)	97 (25) / 3,91 (referee = 1)	125 (26) / 3,96 (referee = 1)	95 (24) / 4,30 (referee = 1)	77 (21) / 4,22 (referee = 1)
Dr. Drees, Jochen	82 (23) / 4,00 (referee = 1)	83 (19) / 3,74	52 (12) / 3,73	67 (19) / 4,09 (referee = 1)	End of career
Fritz, Marco	89 (23) / 3,71 (referee = 1)	84 (23) / 3,79 (referee = 1)	105 (24) / 3,69	80 (23) / 3,97	52 (17) / 3,84
Gagelmann, Peter	78 (25) / 3,19	97 (25) / 3,21	End of career		
Gräfe, Manuel	101 (24) / 4,48 (referee = 1)	100 (24) / 4,56 (referee = 1)	85 (26) / 4,35 (referee = 1)	84 (25) / 3,88	61 (29) / 3,60
Hartmann, Robert	81 (23) / 3,69 (referee = 1)	73 (21) / 3,80 (referee = 1)	82 (24) / 3,68	79 (23) / 3,47	90 (23) / 3,44
Ittrich, Patrick	56 (12) / 3,85 (referee = 1)	68 (15) / 4,10 (referee = 1)	66 (17) / 4,07 (referee = 1)	108 (22) / 4,36 (referee = 1)	68 (22) / 4,44 (referee = 1)
Jablonski, Sven*	44 (10) / 3,55	47 (14) / 3,83 (referee = 1)	65 (14) / 3,72	51 (13) / 4,13 (referee = 1)	59 (21) / 3,97 (referee = 1)
Dr. Kampka, Robert	62 (16) / 4,84 (referee = 1)	81 (16) / 4,65 (referee = 1)	86 (17) / 4,53 (referee = 1)	103 (22) / 4,67 (referee = 1)	117 (23) / 4,93 (referee = 1)
Kienhöfer, Thorsten	103 (24) / 4,29 (referee = 1)	112 (26) / 4,35 (referee = 1)	End of career		
Kircher, Knut	73 (23) / 3,35	62 (22) / 3,38	73 (24) / 3,08	End of career	
Meyer, Florian	107 (24) / 3,60	120 (25) / 3,94 (referee = 1)	98 (27) / 4,35 (referee = 1)	End of career	
Osmers, Harm	53 (14) / 3,84 (referee = 1)	65 (15) / 3,77	62 (15) / 4,09 (referee = 1)	83 (23) / 4,08 (referee = 1)	87 (23) / 4,03 (referee = 1)
Perl, Günther	91 (24) / 3,35	99 (25) / 3,64	92 (25) / 3,96 (referee = 1)	78 (21) / 3,81	End of career
Petersen, Martin	46 (13) / 3,15	43 (13) / 3,36	37 (11) / 3,57	63 (12) / 3,40	72 (22) / 3,97 (referee = 1)
Schmidt, Markus	58 (21) / 3,79 (referee = 1)	98 (23) / 3,39	38 (9) / 3,49	92 (22) / 3,75	82 (20) / 4,22 (referee = 1)
Siebert, Daniel	107 (23) / 3,47	67 (19) / 3,89 (referee = 1)	126 (26) / 3,90	98 (25) / 4,34 (referee = 1)	78 (23) / 4,10 (referee = 1)
Sippel, Peter	74 (23) / 3,41	96 (23) / 3,29	79 (24) / 3,69	End of career	
Stark, Wolfgang	117 (25) / 3,28	98 (25) / 3,88 (referee = 1)	111 (27) / 4,13 (referee = 1)	103 (26) / 4,24 (referee = 1)	End of career
Stegemann, Sascha*	38 (14) / 3,35	66 (24) / 3,14	104 (25) / 2,63	87 (27) / 3,21	70 (25) / 3,38
Steinhaus, Bibiana	70 (16) / 3,69 (referee = 1)	44 (13) / 4,04 (referee = 1)	49 (15) / 3,97 (referee = 1)	53 (15) / 3,68	64 (19) / 3,39
Stieler, Tobias	80 (23) / 3,51	96 (25) / 3,19	99 (25) / 3,59	106 (26) / 3,76	77 (23) / 3,96
Storks, Sören**	40 (9) / 4,10 (referee = 1)	34 (10) / 4,27 (referee = 1)	64 (13) / 3,98 (referee = 1)	64 (15) / 4,26 (referee = 1)	79 (22) / 4,20 (referee = 1)
Weiner, Michael	96 (19) / 4,20 (referee = 1)	71 (15) / 4,37 (referee = 1)	56 (17) / 4,50 (referee = 1)	End of career	
Welz, Tobias	73 (22) / 3,51	56 (17) / 3,44	88 (23) / 3,29	18 6) / 3,48	25 (8) / 3,37
Willenborg, Frank	55 (13) / 4,19 (referee = 1)	57 (13) / 3,97 (referee = 1)	54 (12) 4,12 (referee = 1)	74 (22) / 4,37 (referee = 1)	65 (23) / 4,08 (referee = 1)
Winkmann, Guido	82 (23) / 4,05 (referee = 1)	93 (23) / 3,76	92 (23) / 3,74	96 (24) / 3,87	74 (19) / 4,01 (referee = 1)
Zwayer, Felix	95 (24) / 3,88 (referee = 1)	100 (23) / 4,02 (referee = 1)	119 (25) / 4,13 (referee = 1)	109 (27) / 4,36 (referee = 1)	78 (22) / 4,38 (referee = 1)

Table A2 List of included referees and three-year weighted average of awarded yellow cards (in alphabetical order)

Note: The numbers given are the cards and number of games in the respective season included above. The 3-year average is the average of awarded cards for the three years before the respective season, which is then used as a measurement for a stricter or more liberal referee. The median in the first row for each season represents the median value of the three-year average of awarded cards from which we distinguish between referees who award more (referee = 1) or fewer (referee = 0) cards.

** These referees only began their careers in the 2011/2012 season, which is why the first average value in 2013/2014 is a two-year average only.*

*** This referee began his career in the 2012/2013 season, which is why the first average value in 2013/2014 is the average of awarded cards in 2012/2013. In the 2014/2015 season, we can then only calculate the average of the two previous years.*

Table A3 Descriptive statistics of ranking variables for lower ranked and top teams

Variable	Observations	Mean (Std. Dev.)	Minimum	Maximum
Lower-ranked teams (Position in ranking worse than 9 th)				
Positive difference of ranking toward next opponent	1,258	5.444356 (4.681299)	1	17
Negative difference of ranking toward next opponent	1,258	-0.7988871 (1.731848)	-8	-1
Positive difference of ranking toward opponent after next	1,258	5.375994 (4.701356)	1	17
Negative difference of ranking toward opponent after next	1,258	-0.7758347 (1.713066)	-8	-1
Positive difference of absolute points toward next opponent	1,260	1.098413 (2.697599)	1	19
Negative difference of absolute points toward next opponent	1,260	-7.69127 (8.805862)	-56	0
Positive difference of absolute points toward opponent after next	1,260	1.034127 (2.551072)	1	16
Negative difference of absolute points toward opponent after next	1,260	-7.615079 (8.858894)	-59	0
Top ranked teams (Position better than 10 th)				
Positive difference of ranking toward next opponent	1,259	0.7720413 (1.694369)	1	8
Negative difference of ranking toward next opponent	1,259	-5.407466 (5.407466)	-17	-1

Positive difference of ranking toward opponent after next	1,259	0.7855441 (1.685083)	1	8
Negative difference of ranking toward next opponent	1,259	-5.365369 (4.700906)	-17	-1
Positive difference of absolute points toward next opponent	1,395	7.707527 (9.032091)	0	56
Negative difference of absolute points toward next opponent	1,395	-1.63871 (4.811058)	-41	1
Positive difference of absolute points toward opponent after next	1,395	7.727599 (9.127209)	0	59
Negative difference of absolute points toward opponent after next	1,395	-1.630824 (4.756094)	-39	1

Robust standard errors are in parentheses. ***/**/* = significant at the 1%, 5% and 10% levels

Table A4: (Probability of a) fifth yellow card, teams in the lower rankings, logit estimates and odds ratios – robustness check with absolute point difference

Fifth(Pr=1)	AL1		AL2		AL3		AL4	
	Logit	Odds Ratio	Logit	Odds Ratio	Logit	Odds Ratio	Logit	Odds Ratio
Constant	-4.867426*** (0.3379431)	0.0076931*** (0.0025998)	-4.805418*** (0.3372716)	0.0081853*** (0.0027607)	-4.797964*** (0.328142)	0.0082465** (0.0027885)	-4.79131*** (0.3419916)	0.0083016 (0.0028391)
Match Cards	0.6123633*** (0.0655866)	1.844786*** (0.1209933)	0.6084306*** (0.0663461)	1.837545** (0.121914)	0.6078776*** (0.0668167)	1.836529** (0.1227108)	0.608928*** (0.0663372)	1.838459*** (0.1219583)
Home	0.2932645** (0.1214903)	1.340797** (0.1628939)	0.2952879** (0.1192058)	1.343513* (0.1601545)	0.2965789** (0.1184783)	1.345249** (0.1593828)	0.2929612* (0.1190409)	1.340391** (0.0112859)
Match day	0.0663482*** (0.0104572)	1.068599*** (0.0111746)	0.0700895*** (0.010784)	1.072604** (0.011567)	0.071157*** (0.0111363)	1.07375*** (0.0119577)	0.0706857** (0.105157)	1.073244*** (0.0112859)
Negative difference of absolute points toward next opponent	-0.0163435* (0.0062557)	0.9837893* (0.0061543)	-0.0094403* (0.005467)	0.9906041* (0.02073)	-0.0096978* (0.0055653)	0.9903491* (0.0055116)	-0.0088411 (0.0055609)	0.9911979 (0.005512)
Positive difference of absolute points toward next opponent	0.0568455 (0.0383149)	1.058492 (0.040556)						
Negative difference of absolute points toward the opponent after next					0.0037884 (0.00722)	1.003796 (0.0072474)		
Negative difference of absolute points toward the opponent after next							-0.0206415 (0.0323768)	0.97957 (0.0317154)
Log pseudolikelihood	-444.46291		-446.11543		-446.0339		-445.93457	
Wald(Chi²)	125.82		118.11		118.85		120.37	
Prob >Chi²	0.0000		0.0000		0.0000		0.0000	
AIC	902.9258		904.2309		906.0678		905.8691	
BIC	938.8979		935.0641		942.0399		941.8412	

Robust standard errors are in parentheses. ***/**/* = significant at the 1%, 5% and 10% levels

References

- Anderson, M.; Wolfson, S.; Neave, N. (2012): Perspectives on home advantage: A comparison of football players, fans and referees. In *Psychology of Sport and Exercise* 13, pp. 311–316.
- Arenius, Pia; Minniti, Maria (2005): Perceptual Variables and Nascent Entrepreneurship. In *Small Business Economics* 24, pp. 233–247.
- Baltagi, B. H. (2013): *Econometric Analysis of Panel Data*. Chichester, UK: Wiley.
- Bechtold, Stephen E.; Janaro, Ralph E.; Sumners, De Witt L. (1984): Maximization of Labor Productivity Thorough Optimal Rest-Break Schedules. In *Management Science* 30 (12), pp. 1442–1458.
- Becker, Gary S. (1968): Crime and punishment: An economic approach. In Nigel G. Fielding, Robert Witt (Eds.): *The Economic Dimensions of Crime*. London: Palgrave Macmillan, pp. 13–68.
- Boyko, R. H.; Boyko, A. H.; Boyko, M. G. (2007): Referee bias contributes to home advantage in English Premiership football. In *Journal of Sports Science* 25 (11), pp. 1185–1194.
- Bredemeier, B. J. (1995): Divergence in children's moral reasoning about issues in daily life and sport specific contexts. In *International Journal of Sport Psychology* 26 (4), pp. 453–463.
- Bredemeier, B. J.; Shields, D. L. (1996): Moral development and children's sport. In *Children and youth in sport: A biopsychosocial perspective*, pp. 381–401.
- Chiappori, P.-A.; Levitt, S. D.; Groseclose, T. (2002): Testing Mixed-Strategy Equilibria When Players Are Heterogeneous: The Case of Penalty Kicks in Soccer. In *American Economic Review* 92, pp. 1138–1151.
- Coloma, G. (2007): Penalty Kicks in Soccer. An Alternative Methodology for Testing Mixed-Strategy Equilibria. In *Journal of Sports Economics* 8, pp. 530–545.
- Dawson, P.; Dobson, S. (2010): The influence of social pressure and nationality on individual decisions: Evidence from the behavior of referees. In *Journal of Economic Psychology* 31 (2), pp. 181–191.
- Dawson, P.; Dobson, S.; Goddard, J.; Wilson, J. (2007): Are football referees really biased and inconsistent? Evidence on the incidence of disciplinary sanction in the English Premier League. In *Journal of the Royal Statistical Society: Series A (Statistics in Society)* 170 (1), pp. 231–250.
- Doty, J. (2006): Sports Build Character ?! In *Journal of College and Character* 7 (3), pp. 1–10.
- Haubensak, G. (1992): The consistency model: A process model for absolute judgements. In *Journal of Experimental Psychology* 18, pp. 303–309.

- Henning, Robert A.; Jacques, Pierre; Kissel, Geroge V.; Sullivan, Anne B.; Alteras-Webb, Sabina M. (1997): Frequent short rest breaks from computer work: effects on productivity and well-being at two field sites. In *Ergonomics* 40 (1).
- Hu, Zhiyong; Lo, C. P. (2007): Modeling urban growth in Atlanta using logistic regression. In *Computers, Environment and Urban Systems* 31, pp. 667–688.
- kicker (2018): 1. Bundesliga - Spieltag / Tabelle. Available online at <http://www.kicker.de/news/fussball/bundesliga/startseite.html>., checked on 10/12/2018.
- Kokolakakis, T.; Lera-López, F.; Panagouleas, T. (2012): Analysis of the determinants of sports participation in Spain and England. In *Applied Economics* 44 (21), pp. 2785–2798.
- Long, J. S. (1997): Regression models for categorical and limited dependent variables. 7th ed.: Sage.
- Maennig, Wolfgang (2002): On the Economics of Doping and Corruption in International Sports. In *Journal of Sports Economics* 3 (1).
- Memmert, D.; Unkelbach, C.; Ertmer, J.; Rechner, M. (2008): Gelb oder kein Gelb? Persönliche Verwarnungen im Fußball als Kalibrierungsproblem. In *Zeitschrift für Sportpsychologie* 15 (1), pp. 1–11.
- Monacis, L.; Estrada, O.; Sinatra, M.; Tanucci, G.; Palo, V. de (2013): Self-determined Motivation, Sportpersonship, and Sport Orientation: A Mediatlional Analysis. In *Procedia - Social and Behavioral Sciences* 89, pp. 461–467.
- Nevill, A. M.; Balmer, N. J.; Williams, A. M. (2002): The influence of crowd noise and experience upon refereeing decisions in football. In *Psychology of Sport and Exercise* 3, pp. 261–272.
- Page, K.; Page, L. (2010): Alone against the crowd: Individual differences in referees' ability to cope under pressure. In *Journal of Economic Psychology* 31 (2), pp. 192–199.
- Price, J.; Soebbing, B. P.; Berri, D.; Humphreys, B. R. (2010): Tournament Incentives, League Policy and NBA Team Performance Revisited. In *Journal of Sports Economics* 11 (2), pp. 117–135.
- Schwartz, B.; Barsky, S. F. (1977): The Home Advantage. In *Social Forces* 55 (3), pp. 641–661.
- Sunstein, Cass R.; Schkade, D.; Kahnemann, D. (2000): Do people want optimal deterrence? In *Journal of Legal Studies* XXIX, pp. 237–253.
- Sutter, M.; Kocher, M. G. (2004): Favoritism of agents - The case of referees' home bias. In *Journal of Economic Psychology* 25 (4), pp. 461–469.
- Unkelbach, C.; Memmert, D. (2008): Game Management, Context Effects, and Calibration: The Case of Yellow Cards in Soccer. In *Journal of Sport & Exercise Psychology* 30, pp. 95–109.

Xie, Yu (2013): Population heterogeneity and causal inference. In *Proceedings of the National Academy of Sciences (PNAS)* 110 (16), pp. 6262–6268.

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