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Misconduct and Leader Behaviour in Contests - New Evidence from European Football*

Karol Kempa† and Hannes Rusch‡

March 2018

Abstract

This paper provides an empirical investigation of severe misconducts in contests based on data from European football championships. We extend previous studies by differentiating between two types of misconducts both resulting in a yellow card, namely dissents with the referee and other misconducts. Confirming the existing literature, we find that teams with lower ability are more likely to commit sabotage, i.e. fouls, to reduce the opponent's chances for success. Sabotage is also more likely when the outcome of the contests is still open. In addition, we find that dissents with the referee are significantly more likely in the case of an unfavourable score. We introduce a new perspective to the study of football data by distinguishing misconducts of team captains from those of other players. We find that captains engage more in sabotage during important matches and challenge referees' decisions in direct reaction to sanctions awarded to teammates. In contrast to regular players, however, captains do not participate in the escalation of series of retaliative misconducts. Finally, our analyses indicate that all types of misconduct have a negative effect on the likelihood of success.

Keywords: Contest; Dissent; Leadership; Sabotage; Football.

JEL-Codes: D74, D91, M54, Z22.

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1. Introduction

Contests are situations in which competing individuals or teams exert costly efforts to win prizes. Winning economic contests is of obvious importance in our highly competitive market economy. Therefore, much previous research has tried to identify individual and team-level factors affecting the likelihood of contest success. Most theoretical work on tournaments and contests, e.g., assumes that exerting higher effort than the opponent increases the own probability of winning (see, e.g., Tullock, 1980; Dechenaux et al., 2015).[1] In addition to increasing their own chances to win by exerting more effort, however, contestants often also have a potentially cheaper means at hand: reducing their opponents' chances to win through sabotage (Lazear, 1989). Such destructive behaviour can be observed, e.g., in comparative advertising or political smear campaigns (Chowdhury and Gürtler, 2015).

However, because sabotage is either illegal and/or committed covertly in many economic contests, empirical studies on such destructive behaviour are rather rare. Notable exceptions are studies analysing data from sports contests, most prominently in professional football (soccer), and laboratory experiments with students (Chowdhury and Gürtler, 2015). An advantage of studying behaviour in sports is the observability of the attributes and actions of the competing contestants. In particular, destructive actions against the opponent can be observed openly and rather reliably, allowing for an operationalisation of sabotage as any action that violates the rules of the respective game. Multiple previous studies using football data, e.g., use disciplinary sanctions awarded to players by the referee as measures of sabotage (del Corral et al., 2010; Deutscher and Schneemann, 2017; Deutscher et al., 2013; Garicano and Palacios-Huerta, 2014).

In this paper, we analyse a new dataset on professional football matches. Our analysis adds to the existing literature on misconducts in sports contests as follows. In contrast to previous studies, we differentiate between two types of misconducts that are both sanctioned with a yellow card, namely dissents with the referee and other misconducts. According to FIFA's official *Laws of the Game*, a player is to be cautioned and shown a yellow card for any dissent by word or action against the referee. The important point is that dissent targets the referee, while other cautioned misconducts, such as severe and repeated fouls or delaying the restart of play, are aimed at opponent players, i.e. the opposing team. As only the latter is sabotage as defined by contest theories, our differentiation allows for a more precise empirical analysis of sabotage in sports contests.

Complementarily, the differentiation we introduce allows for a distinct analysis of dissents against the authority in charge of the interpretation and enforcement of the contest's rules, i.e. the referee. Thus, in addition to sabotage, we are able to study a second route which contestants might take towards influencing the outcome of a contest: trying to influence how the rules of the game are implemented.

Further, we add a new perspective to the literature by explicitly distinguishing between the

[1] In the case of great heterogeneity of players, the theoretical research on contests has shown that weaker players may be discouraged from exerting effort (Dechenaux et al., 2015).

behaviour of team captains and other players. According to previous survey-based studies, team captains are typically older and more experienced team members taking on leadership tasks, such as on-field motivation and encouragement, and seem to have specific skills, such as remaining positive and controlling their emotions (Dupuis et al., 2006; Elgar, 2016; Fransen et al., 2014). By incorporating this second distinction, we are able to investigate whether players in a leadership role within a team in competition make different use of dissent and sabotage than regular players.

Our main results are that, in line with previous findings, destructive actions against the opponent increase with lower team ability. However, dissents with the referee are not affected by ability. Rather, the current state of the match, e.g. an unfavourable goal difference, increases the occurrence of dissent. Differentiating between player types shows that captains, in contrast to other players, do not seem to participate in the escalation of series of retaliative misconducts. Furthermore, captains are more likely to protest and to use sabotage during important matches. In addition, they are more likely to challenge referees' decisions in direct reaction to sanctions awarded to their teammates. Finally, we analyse the impact of misconducts on match outcome and find that this kind of sabotage likely reduces a team's chances of success.

The paper is organised as follows. Section 2 provides a brief overview of previous literature. In Section 3 the dataset and its variables are introduced. Section 4 presents our econometric analysis. Section 5 discusses the results and Section 6 concludes.

2. Overview of Previous Literature

Sabotage in contests has been investigated in numerous experimental studies (see, e.g., Carpenter et al., 2010; Harbring and Irlenbusch, 2011; for reviews see Chowdhury and Gürtler, 2015; Dechenaux et al., 2015). However, studies on sabotage outside the lab are rare. One obvious reason is that sabotage is usually associated with disreputable and/or illegal activities. Hence, individuals engaging in sabotage try to conceal such actions, rendering them difficult to observe in the field (Balafoutas et al., 2012).

The main body of observational research on sabotage in contests uses sports data (Chowdhury and Gürtler, 2015). An exception are, e.g., Jirjahn and Kraft (2007), who use intra-firm wage dispersion data and hence face smaller challenges in generalising their results to labour market contexts. A disadvantage of such analyses, however, is their very indirect measurement of sabotage. Jirjahn and Kraft (2007), e.g., find effects of wage-dispersion and promotions on employees' efforts and then argue that sabotage caused the outcome they observe. A main advantage of data from sports tournaments is that destructive actions against the opponent athlete or team aiming to reduce the opponent's chances to win can be observed directly and quite reliably.

Balafoutas et al. (2012) analyse the effect of contestants' relative skill levels on sabotage as well as the cost of engaging in such in Judo world championships. As a measure of sabotage, the authors use *shido*, a sanctioning mechanism against mild violations of the spirit of Judo.

Their results show that contestants with lower ability use sabotage more often than contestants with greater ability. Furthermore, Balafoutas et al. (2012) examine the effect of a rule change in Judo introduced in 2009. Prior the rule change, every shido was penalised with one point for the opponent. After the rule change, the first *shido* merely results in a caution, but subsequent *shidos* still increase the opponent's score. Using this rule change as a natural experiment, the authors show that sabotage significantly increased after the rule change that decreased the cost of sabotage.

Garicano and Palacios-Huerta (2014) and del Corral et al. (2010) study a similar natural experiment. They analyse the effect of changing the reward for winning a football match from two to three points. Using match-level data, Garicano and Palacios-Huerta (2014) find that the increase in prize spread, i.e. the difference between the prize received by the winner and the loser of a contest, led to significantly more sabotage compared to the period before the rule change. Similarly, del Corral et al. (2010) examine the change in the probability of red cards being awarded after the increase in prize spread. Controlling for within-match dynamics, such as the minute of the match and the goal score, they find an increased probability for sabotage in teams that are in a losing position.

Frick et al. (2008) analyse how sabotage is affected by the difference in ability of two competing teams, determined based on betting odds prior to the respective match. They find that sabotage, measured as the number of yellow and red cards, increases when teams of similar ability compete. Using data from football and basketball, Stulp et al. (2012) find similar results. Measuring differences in ability as the absolute difference in table ranks for football and as the share of won games per season in the case of basketball, they find that the smaller the difference in the ability of two teams, the higher the number of fouls per match (basketball and football) and the more yellow cards are given per match (football).

Deutscher et al. (2013) explicitly differentiate between effort compliant with the rules of the game (fair tackles) and sabotage (fouls) in football matches. Their results indicate that weak contestants engage more in sabotage, while contestants with greater abilities exert more compliant effort. Deutscher and Schneemann (2017) further refine this analysis by using information on the ex-ante heterogeneity of competing football teams, based on betting odds, and within-game information, namely the goal difference. Like del Corral et al. (2010), the authors control for within-game dynamics and show that both a lower ex-ante ability as well as a negative goal difference increase sabotage (measured as severe misconduct penalised by a yellow card).

Previous research on leadership in sports has mainly concentrated on coaches. However, team members can also take on leadership roles (Loughead et al., 2006). In the present study, we focus on formally appointed or elected leaders, namely team captains.[2] Team leaders typically are more experienced team members taking on tasks such as on-field team motivation (Fransen et al., 2014). Also, as Elgar (2016) show using data from the London 2012 Olympics and Par-

[2]Captains typically are the peer leaders within teams, although other team members might simultaneously take on specific leadership roles.

alympics, team captains are often considerably older than their teammates and their influence on team discipline increases with age. Psychological research on captains has found them to have specific skills such as remaining positive and controlling their emotions (Dupuis et al., 2006). In their study on adolescent football players, Price and Weiss (2011) found that peer leaders are characterised by higher peer acceptance, behavioural conduct, and intrinsic motivation. However, the specific role team leaders play in contests has become a focus of theoretical and empirical interest in economics only very recently (Eisenkopf, 2014; Gauriot and Page, 2015). As previous evidence on team captains' characteristics is largely based on interviews and surveys of athletes, it seems worthwhile to investigate whether differences between team captains and other players in sports contests can be observed in our behavioural data as well.

3. Empirical Framework

3.1. Data

For our analysis, we use data from live tickers that provide (almost) real-time coverage of an event, in our case football matches.[3] We used data from the German football portal *weltfussball.de*, which covers football games of many European football leagues by live tickers and usually contains information on the causes of yellow cards in the respective posts. The advantage of this portal compared to most of its alternatives is that ticker texts remain online after the match. League games with dissents were identified by searching the texts of the available live tickers for yellow cards and German terms for *dissent*.[4] This procedure resulted in a dataset containing 227 matches in 10 European football leagues from the seasons 2004/2005 to 2013/2014. The dataset includes 1,345 yellow cards. Whenever the cause of at least one caution was not identifiable, the websites *kicker.de*, *transfermarkt.de*, and *fussballoesterreich.at* were used to identify the missing reason(s) and to cross-check the data. Furthermore, these sources were used to identify the captains of the respective teams in all matches.

In contrast to previous studies using football data, our dataset is not a balanced panel covering only one league over one or several seasons. Both del Corral et al. (2010) and Garicano and Palacios-Huerta (2014) use data on all matches from two seasons of the Spanish First Division (*Primera División*, while Deutscher et al. (2013) as well as Deutscher and Schneemann (2017) use data from the first division in Germany (*Bundesliga*) covering three seasons. In our dataset, the distribution of matches across the 10 European leagues is very unbalanced (see Table 5 in the Appendix). As the data is drawn from a German website, leagues in German speaking countries, i.e. Austria and Germany, are overrepresented. Hence, there is a possibility that our

[3] Live tickers are usually offered by online news/sports media. The tickers consist of stenotype short comments in varying degrees of frequency (also based on the type of broadcasted sport) with information on decisive game events as well as important plays. In individual cases, live tickers are enriched with statistical materials (lineups, player data, etc.).

[4] These terms are "meckern", "protestieren", and "beschweren"; typical German expressions for protesting in football.

data gathering process introduced biases. We address this potential issue by providing a replication of previous results in our new dataset prior to presenting our main original results. As we will show below, we replicate all core findings of previous empirical studies which applied a similar methodology. Thus, although our dataset contains fewer observations and a larger and less balanced distribution of matches across leagues than those used in previous studies, we are confident that it does not differ from previously used data in the relevant respects. In fact, our contribution complements previous studies, because it contains data from divisions below the first league and covers countries not studied before.

3.2. Methodology and Variables

In our analysis, we use the minute of the match as the unit of observation, which is a relatively new approach in the analysis of football matches (Buraimo et al., 2010; Buraimo et al., 2012; del Corral et al., 2010). In contrast to analyses based on matches as the unit if observation, e.g. Frick et al. (2008) and Stulp et al. (2012), this approach allows for capturing within-game dynamics in detail, because the order of all events of interest occurring throughout the game is included in the analysis. Our binominal dependent variable takes the value 1 when a yellow card (of specific type) is awarded to a player of a given team in the respective minute and 0 otherwise. In contrast to previous studies that analysed all yellow cards jointly, we extend the analysis of illegal behaviour in contests in two directions. First, we differentiate between dissents and other misconducts. Second, we separately analyse the cautioned illegal behaviour of captains and of other players. Descriptive statistics are reported in Table 1.

For the analysis we use the following set of independent variables. The variable *goal difference* measures the current difference in goals from the respective team's perspective. It is expected that teams lagging behind in score increase their effort and that this leads to an increase in illegal activities, hence to an increased propensity of receiving yellow cards (Buraimo et al., 2010; Deutscher and Schneemann, 2017). However, it is also possible that with high goal differences, i.e. when a match is almost certainly decided, players' efforts and hence the likelihood of yellow cards decrease. In order to capture these potentially non-linear effects of the goal difference on players' behaviour and on awards of yellow cards, we introduce the control *goal difference squared*.

The variable *minute* captures the minute of the regular playing time. For all events that occurred in the stoppage time of the first and the second half of a match, *minute* takes the values 45 and 90, respectively. Hence, the 45th and 90th minute are 'longer' minutes compared to the other minutes in the dataset. Although the exact minutes in the respective stoppage time are available in the dataset, it is problematic to use this information in this analysis. If a yellow card is given in the first minute of stoppage time at the end of the first half, *minute* would take the value 46. The value would be the same for events in the first minute of the second half, although the situation is considerably different. Hence, *minute* contains only the minutes of the regular game time. Following Buraimo et al. (2010) and Buraimo et al. (2012), the information

Table 1: Descriptive statistics differentiated by captains and other players and dissents and other misconducts

	Captain		Other Player		Dissent		Other Misconduct	
	mean	sd	mean	sd	mean	sd	mean	sd
Minute	58.70	22.67	56.57	24.11	59.71	22.86	55.90	24.23
Minute squared	3955.62	2507.78	3781.17	2604.71	4085.76	2571.15	3711.20	2596.51
45th Minute	0.01	0.12	0.01	0.08	0.01	0.10	0.01	0.08
90th Minute	0.06	0.23	0.05	0.22	0.07	0.25	0.05	0.21
Yellow cards last 3 min	0.15	0.38	0.12	0.35	0.17	0.39	0.11	0.34
Opponent yellow cards last 3 min	0.14	0.35	0.15	0.38	0.13	0.34	0.16	0.39
Yellow cards prior	1.29	1.34	1.23	1.26	1.31	1.27	1.21	1.27
Opponent yellow cards prior	1.52	1.45	1.33	1.30	1.34	1.30	1.36	1.32
Goal difference	-0.25	1.15	-0.14	1.12	-0.47	1.15	-0.06	1.10
Goal difference squared	1.37	2.13	1.28	2.18	1.54	2.68	1.21	1.99
Difference in bookmaker probability	-0.01	0.32	-0.04	0.34	-0.01	0.35	-0.05	0.33
Difference in bookmaker probability squared	0.10	0.15	0.12	0.15	0.12	0.17	0.11	0.15
Competitiveness	0.38	0.49	0.56	0.99	0.55	0.92	0.54	0.96
Attendance	9.55	1.30	9.48	1.28	9.46	1.27	9.49	1.29
Derby	0.09	0.29	0.09	0.29	0.09	0.28	0.10	0.30
Observations	139		1206		316		1029	

on minutes in stoppage time is captured by two dummy variables, *45th minute* and *90th minute*, where *45th minute* takes the value 1 whenever a yellow card was given in the stoppage time of the first half while *90th minute* is 1 for all yellow cards in the stoppage time of the second half.

The variables *yellow cards prior* and *opponent yellow cards* prior were included in order to control for the potential effects of previous cautions on players' misconducts. The former gives the number of yellow cards a team has received before the respective caution, whereas the latter measures the number of yellow cards the opponent team has received. As proposed by Buraimo et al. (2010), the variables *yellow cards last 3 min* and *opponent yellow cards last 3 min* are also included to capture potential dynamics in players' direct reactions to previous cautions. They contain the number of cautions received by the team of the cautioned player and the opposing team, respectively, within the last 3 minutes before an event and are separated from the number of yellow cards received prior to this time horizon. The direction of a potential effect of previous sanctions on dissents and sabotage is not clear. With respect to the incentive to protest against the referee, the number of previously received yellow cards might increase the probability of dissent by players of this team. A large number of cards could be perceived by players as unfair treatment by the referee and hence cause them to challenge his decisions.

However, a high number of previous yellow cards might also be a consequence of an escalation of illegal contest behaviour between the competing teams and hence increase the likelihood of further sabotage against the opposing team. Yet, at the same time, numerous previous cautions for both the own and the opposing team might increase the perceived risk of punishment, which could deter further misconducts.

To control for difference in team quality, we use the difference in the winning probabilities of both teams. We calculate the *difference in bookmaker probability* from betting odds available on the website *betexplorer.de*, which provides a comprehensive data base of historical betting odds covering all leagues and seasons in our dataset. The higher the *difference in bookmaker probability*, the higher is a team's ability relative to its opponent. Betting odds have been used frequently in previous studies as a measure of relative team strength and have proven to be a good predictor of the match outcome (Buraimo et al., 2010; Forrest et al., 2005). A particular advantage of this measure is that it does not only consider the respective teams' latest results, but also other relevant and recent information, such as injuries and fitness of (key) players, dismissals of coaches, etc. Similar to goal difference, the variable's square, *difference in bookmaker probability squared*, is included to account for potential non-linearities (Buraimo et al., 2012).

We also include a variable to account for the competitiveness of the respective match. Similar to Witt (2005), we calculate the variable *competitiveness* as the absolute difference in table positions of the competing teams prior to the match of interest weighted by the number of remaining matches in the season. Note that the smaller the value of *competitiveness*, the higher the importance of the match. The advantage of this measure, compared to relying on the difference in table positions, is that it accounts for the fact that matches against neighbouring teams in the table gain importance towards the end of the season.[5]

Another factor that might affect the behaviour of contestants is the atmosphere in the stadium (Deutscher and Schneemann, 2017). Hence, we include the log of the number of spectators at the respective match into our models (*attendance*).

Furthermore, strong rivalries among teams might increase the intensity of aggressive behaviour in the respective matches. Following Buraimo et al. (2012), we control for this potential effect by including the variable *derby* that takes the value of 1 if both teams are either local rivals (e.g. Manchester City and Manchester United) or harbour historical rivalries (e.g. FC Barcelona and Real Madrid) and 0 otherwise.

Finally, as previous evidence shows that referees on average award more yellow cards to away teams, i.e. are home biased (see, e.g., Dohmen, 2008; Page and Page, 2010), we include the dummy variable *away* taking the value of 1 if the team under consideration is the away team and 0 for the home team.

[5]In many European football leagues, disbursements from TV rights to the clubs are increasing with a better table position in the previous season. Furthermore, finishing on one of the first table positions might lead to qualification for European competitions (in case of first divisions) or promotions to a higher league (in case of lower divisions). Teams in the lowest positions in the table get relegated to a lower league.

4. Results

For our analysis we combine the method of Deutscher and Schneemann (2017) with the minute-by-minute approach (Buraimo et al., 2010; Buraimo et al., 2012; del Corral et al., 2010). As the latter three studies investigate referee bias, they separately model the probability of cards awarded to the home team and cards the away team using a bivariate probit model framework. Following Deutscher and Schneemann (2017), who also investigate misconducts in a within-match framework, we estimate the probability of receiving a yellow card (of respective type) jointly for home and away teams. As the respective dependent variables are bivariate, we use probit models to estimate this probability. As Buraimo et al. (2010) and Deutscher and Schneemann (2017), we cluster the data by match to account for dependencies of observations within matches. To capture fixed effects of seasons and the different leagues, two respective sets of dummy variables are included in all specifications. Prior to presenting our main analyses, we provide estimation results based on all yellow cards, i.e. not distinguishing between protests and fouls, and compare these to those of previous studies. We then estimate two models to analyse the drivers of dissenting behaviour and other misconducts. Subsequently, we distinguish between the behaviour of team captains and other players. Our analysis of the impact of misconducts on the likelihood of winning a match concludes this section.

4.1. Replication of previous findings

In this subsection we jointly analyse all yellow cards. The following results provide a validation of our new dataset and add to the previous literature by replicating its main results using new data from across various European leagues including lower divisions. The results of our probit model for all yellow cards are displayed in Table 3 (Model 0).

We find significant negative effects of both *goal difference* and *goal difference squared*. The negative coefficient of goal difference implies that the probability of a yellow card of any kind increases in the case of an unfavourable score from the perspective of the offending player's team. The result for *goal difference squared* indicates that the probability of yellow cards decreases the more a team is leading or lagging behind, i.e. there is an inverted U-shaped relationship between *goal difference* and the likelihood of a yellow card. Both results are in line with the findings of Buraimo et al. (2010), whereas in Buraimo et al. (2012) only the squared term is significant. Deutscher and Schneemann (2017) and del Corral et al. (2010) do not consider a squared term, but also find a significant negative effect of the match score.

The positive and significant coefficient of *minute* and the negative coefficient of *minute squared* indicate that the probability of severe misconduct increases in the course of a match, however, at a decreasing rate, which is similar to the findings of Buraimo et al. (2010), Buraimo et al. (2012), del Corral et al. (2010), and Deutscher and Schneemann (2017). The dummy variables *45th minute* and *90th minute* are both positive and significant, as found by Buraimo et al. (2010) and del Corral et al. (2010). Buraimo et al. (2012) find significant negative effects of

Table 2: Probit Regressions with yellow card awarded for dissent, other misconduct, and all yellow cards as dependent variables

	(0) All		(1) Dissent		(2) Other Misconduct	
Goal difference	-0.0625***	(4.98)	-0.1488***	(5.06)	-0.0246*	(1.86)
Goal difference squared	-0.0179***	(2.82)	-0.0193	(1.50)	-0.0193***	(2.59)
Minute	0.0173***	(8.37)	0.0190***	(4.54)	0.0153***	(7.04)
Minute squared	-0.0001***	(3.58)	-0.0001*	(1.95)	-0.0001***	(3.09)
45th Minute	1.8595***	(31.18)	1.5099***	(4.35)	1.5199***	(6.87)
90th Minute	1.3106***	(18.92)	1.0369***	(6.83)	1.1275***	(12.77)
Yellow cards last 3 min	-0.0173	(0.44)	0.0992*	(1.85)	-0.0652	(1.47)
Opponent yellow cards last 3 min	0.1489***	(4.61)	0.0325	(0.50)	0.1699***	(4.76)
Yellow cards prior	-0.1042***	(7.55)	-0.0917***	(4.07)	-0.0960***	(6.30)
Opponent yellow cards prior	0.0005	(0.03)	-0.0342*	(1.67)	0.0134	(0.89)
Difference in bookmaker probability	-0.1429***	(3.52)	0.0872	(1.34)	-0.2102***	(4.83)
Difference in bookmaker probability squared	-0.1208	(0.97)	-0.0726	(0.61)	-0.1275	(0.96)
Competitiveness	-0.0098	(0.99)	-0.0053	(0.52)	-0.0101	(0.97)
Attendance	0.0041	(0.16)	0.0218	(1.00)	-0.0010	(0.03)
Derby	0.0728	(1.36)	-0.0002	(0.00)	0.0845	(1.41)
Away	0.0398	(1.52)	0.0892**	(2.00)	0.0186	(0.66)
Constant	-2.5464***	(10.43)	-3.3617***	(15.08)	-2.5337***	(9.21)
Observations	41088		41088		41088	
Pseudo R^2	0.054		0.070		0.044	

Notes: Absolute *t*-statistics in parentheses. Standard errors are clustered at the match level to account for within-match dependences of observations. Significance: * p<0.10, ** p<0.05, *** p<0.01.

both dummies for the Spanish First Division. For matches in the UEFA Champions League, they find a significant positive effect of *45th minute* and an insignificant effect of *90th minute*.

We included the four controls *yellow cards prior*, *opponent yellow cards prior*, *yellow cards last 3 min*, and *opponent yellow cards last 3 min* as proposed by Buraimo et al. (2010) and Buraimo et al. (2012). In line with both studies and Deutscher and Schneemann (2017), we find that the number of yellow cards a team has received previously (except the last 3 minutes), yellow cards prior, negatively affects the likelihood of a yellow card. Furthermore, the positive effect of opponent yellow cards last 3 min we find is in line with Buraimo et al. (2010) and Buraimo et al. (2012). The other two control variables have the same sign as in these two studies, but are not significant in our model. However, in one specification in Buraimo et al. (2012) as well as in Deutscher and Schneemann (2017) the effect of the number opponent yellow cards prior is also not significant.

In line with previous findings, we find that difference in bookmaker probability has a sig-

nificant and negative effect on the probability of a yellow card (Buraimo et al., 2010, 2012; Deutscher and Schneemann, 2017). The effect of attendance is not significant in our study like in del Corral et al. (2010), Deutscher and Schneemann (2017), Witt (2005). Finally, derby has no effect on the probability of any type of cautioned misbehaviour, which supports the results of Buraimo et al. (2010) for the German *Bundesliga* and Buraimo et al. (2012) for the Spanish *Primera División*.

Thus, by and large, we replicate the main results of relevant previous studies. Therefore, we consider our new dataset validated. In the remainder of this section, we present our main original results.

4.2. Dissents vs. Other Misconducts

In order to differentiate between dissents and other misconducts, we estimate two models. The dependent variable in Model 1 only contains yellow cards awarded for dissents, whereas Model 2 covers the remaining yellow cards.

The negative coefficients of *goal difference* in Models 1 and 2 imply that the probability of both dissents against the referee and misconducts aimed at the opponent increase as the goal difference decreases. Players in teams lagging behind are more likely to protest against referee decisions as well as to engage in severe foul play. In the latter case, however, the coefficient is only significant at the 10%-level. While the coefficient of *goal difference squared* is not statistically significant for dissents, it is significant (at the 1%-level) and negative for other misconducts.

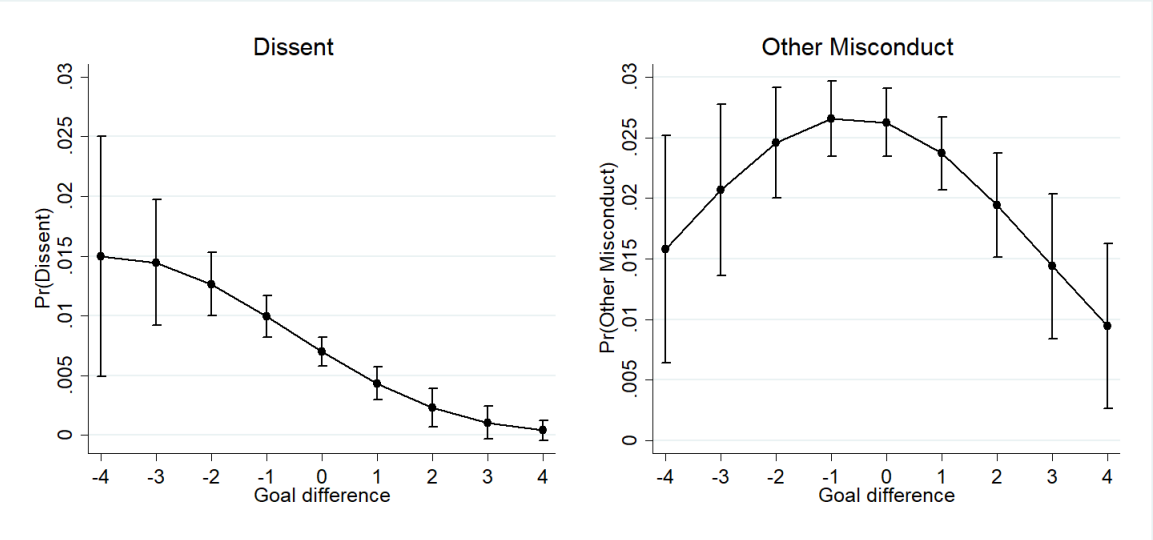
The differences between the effects of the current score on dissent and other misconducts are depicted in Figure 1. The figure shows the probability of dissent (per minute) as well as the probability of other misconduct (per minute) for different goal differences as predicted by Models 1 and 2, respectively. For other misconducts, there is an obvious inverted U-shaped relationship as indicated by the coefficients. As long as the match is tight, i.e. the absolute goal difference is small, the probability of sabotage is high.

For dissents against the referee, however, the effect of *goal difference* is substantially different. As can be seen in Figure 1, the probability of protesting against the referee increases, when the goal difference decreases. In teams leading by a large margin, almost no dissents with the referee can be observed, while protesting against the referee becomes substantially more frequent when the team is lagging behind.

Another essential difference between dissents and other misconducts is the effect of the difference in teams' abilities. According to Model 2, *difference in bookmaker probability* has a significant and negative effect on the probability of a severe foul. The more inferior a team is with respect to its ability compared to the opponent, the more sabotage is used to compensate this disadvantage. In contrast, *difference in bookmaker probability* does not affect dissenting behaviour of contestants.

The effects of the difference in ability on dissent and misconduct aimed at the opponent are

Figure 1: Adjusted predictions of Dissent (left) and Other Misconduct (right) per minute at different goal differences and the means of other covariates with 95% confidence intervals.



illustrated in Figure 2. For the latter, we find a relationship as predicted by theories on sabotage in contests: the lower the ability of a team compared to its opponent, the higher the probability to engage in sabotage (Lazear, 1989). For dissents, the probability is almost identical across different values of *difference in bookmaker probability*. The difference in the abilities of the contestants does not significantly affect the probability to protest against the referee's decision.

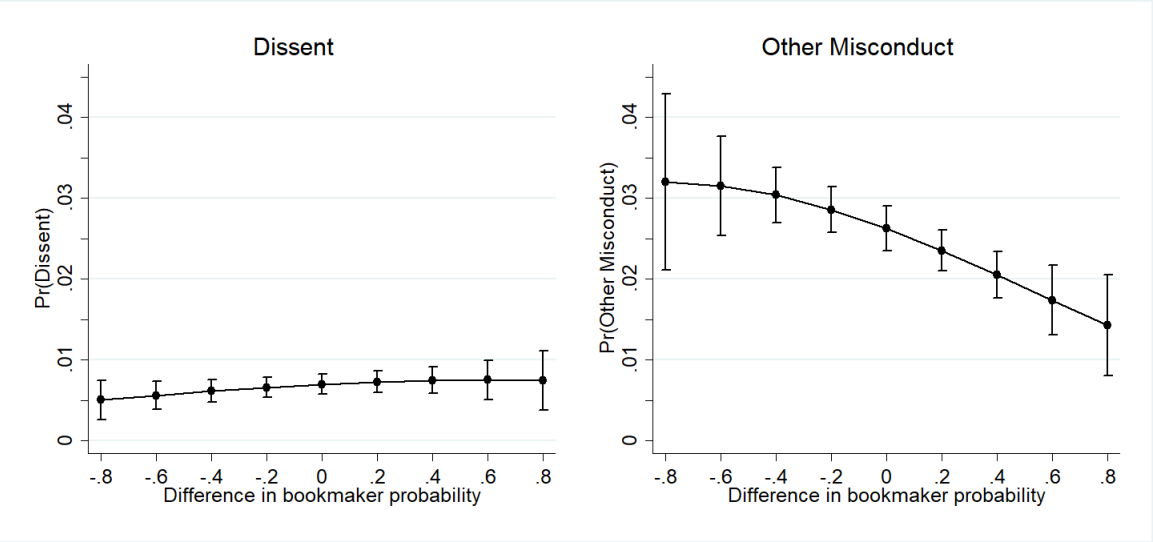
Further noteworthy differences between dissents and other misconducts include the following. Previous sanctions have a differentiated effect. In Models 1 and 2, the number of yellow cards a team received prior to the last three minutes of the subject minute reduces the probability of both dissents and severe fouls. However, while the number of prior cards the opponent team received does not affect other misconducts, it affects the likelihood of dissents negatively.

Dissents and foul plays are reversely affected by yellow cards that the competing teams were awarded recently. In the case of dissents, the coefficient of *yellow cards last 3 min* is positive and weakly significant. This indicates that immediately after a cautioned sabotage of a player from the own team, there is an increased probability for protesting behaviour. In contrast, the number of yellow cards the opponent team received in the last three minutes (*opponent yellow cards last 3 min*) does not affect dissents. With respect to other misconducts, the results are reversed. While recently received yellow cards by the own team are statistically insignificant, the number of yellow cards the opponent received in the last three minutes positively affects the likelihood of other misconducts. Finally, for away teams, we only find an increased probability for dissents, but not for other misconducts.

4.3. Captains vs. Other Players

We now analyse the behaviour of captains and other players by further disaggregating the dependent variables. We divide yellow cards for dissents into dissents of captains and dissents

Figure 2: Adjusted predictions of Dissent (left) and Other Misconduct (right) per minute at different levels of the difference in ability and the means of other covariates with 95% Confidence Intervals.



of other players. Cautions for misconducts aimed at the opponent are similarly divided. The independent variables remain the same as above. Table 3 summarises the results.

Most of the pre-match and within-match covariates have qualitatively the same effects on sabotage behaviour of captains and regular players. There are, however, some notable differences between the two player types. Regular players' sabotage behaviour is affected by the number of yellow cards the opponent team has received in the last three minutes prior to the subject minute (positive and significant coefficient of *opponent yellow cards last 3 min*). If the opponent just engaged in severe foul play, players of the fouled team are more likely to engage in sabotage themselves, which indicates retaliative foul play. Team captains, however, do not participate in such retaliatory escalations of misconducts during the match. The number of yellow cards recently awarded to the own team (*yellow cards last 3 min*) increases captains' propensity to dissent, while it has no effect on the dissenting behaviour of other players.

Finally, only team captains' behaviours seem to be affected by the competiveness of the match, i.e. the absolute difference in the table rank of competing teams relative to the remaining matches in the season (negative and significant coefficients of *competitiveness* in Models 3 and 5). The more important a match is, the higher is the likelihood of misconducts by captains.

Table 3: Probit Regressions with yellow cards for dissents and yellow vards for other misconducts awarded to captains and other players, respectively, as dependent variables

	Dissent		Other Misconduct	
	(3)	(4)	(5)	(6)
	Captain	Player	Captain	Player
Goal difference	-0.1311**	-0.1447***	-0.0433	-0.0213
	(2.16)	(5.26)	(1.39)	(1.52)
Goal difference squared	-0.0198	-0.0186	-0.0111	-0.0194**
	(0.69)	(1.57)	(0.79)	(2.50)
Minute	0.0345***	0.0152***	0.0096*	0.0153***
	(3.61)	(3.49)	(1.66)	(6.95)
Minute squared	-0.0002***	-0.0000	-0.0000	-0.0001***
	(2.60)	(1.10)	(0.57)	(3.11)
45th Minute	0.0000	1.5797***	1.6422***	1.2186***
	(.)	(4.49)	(4.90)	(4.67)
90th Minute	0.9629***	0.9641***	0.6933**	1.1038***
	(3.66)	(6.44)	(2.57)	(12.05)
Yellow cards last 3 min	0.1851**	0.0623	-0.1241	-0.0563
	(2.00)	(1.05)	(1.08)	(1.23)
Opponent yellow cards last 3 min	-0.0360	0.0412	0.1233	0.1671***
	(0.27)	(0.62)	(1.31)	(4.48)
Yellow cards prior	-0.0810*	-0.0879***	-0.0864**	-0.0924***
	(1.65)	(3.83)	(2.07)	(5.99)
Opponent yellow cards prior	-0.0421	-0.0294	0.0632*	0.0054
	(0.91)	(1.35)	(1.91)	(0.36)
Difference in bookmaker probability	0.0643	0.0883	-0.0902	-0.2128***
	(0.48)	(1.26)	(0.70)	(4.82)
Difference in bookmaker probability squared	-0.4656	0.0313	-0.3814	-0.0909
	(1.26)	(0.29)	(1.41)	(0.66)
Competitiveness	-0.1130*	0.0064	-0.0749*	-0.0047
	(1.67)	(0.60)	(1.79)	(0.43)
Attendance	0.0435	0.0143	0.1099*	-0.0129
	(0.62)	(0.55)	(1.75)	(0.43)
Derby	-0.2337	0.0481	0.0439	0.0838
	(1.09)	(0.73)	(0.43)	(1.31)
Away	0.0703	0.0882*	-0.0439	0.0252
	(0.76)	(1.85)	(0.57)	(0.86)
Constant	-4.4540***	-3.2761***	-4.4834***	-2.4383***
	(6.53)	(12.98)	(7.10)	(8.55)
Observations	41070	41088	40360	41088
Pseudo R^2	0.087	0.065	0.061	0.042

Notes: Absolute *t*-statistics in parentheses. Standard errors are clustered at the match level to account for within-match dependences of observations. Significance: * p<0.10, ** p<0.05, *** p<0.01. The variable 45th Minute is omitted in Model (3) as there were no yellow cards awarded for dissent to captains in the stoppage time of the first half in our dataset.

4.4. Impact of Sabotage and Dissents on Team Success

We now turn to the analysis of the impact of dissents and sabotage on teams' outcomes. For the dependent variable, the match-level success of a team, two alternative measures are used. *Final score* is measured as the goal difference between a team and its opponent at the end of the match. Alternatively, the *match outcome* – loss, draw, win – is used as dependent variable. Both measures have been used in similar previous studies (Anders and Rotthoff, 2011; Deutscher and Schneemann, 2017; Franck and Nüesch, 2010).[6] As measures for the intensity of dissents and sabotage behaviour of a team in a match, we use the difference between dissents and other misconducts of the respective team and its opponent. To control for the relative ability of both teams, which is an important determinant of the outcome of a match, we include *difference in bookmaker probability*. We further include *attendance*, *derby*, and length of the stoppage time (*minutes stoppage time*) as controls.

Table 4 contains the results of OLS regressions for the models with final score as dependent variable and ordered probit regressions for the case of match result. When considering the difference in all yellow cards that the teams received (Models 7 and 8), the estimation results show that the intensity of a team's illegal behaviour negatively affects that team's outcome, while such illegal behaviour by the opponent team positively affects chances for success (negative coefficient of *difference in all yellow cards*). These findings are in line with Deutscher and Schneemann (2017), who use a very similar model specification with data from the German *Bundesliga*. Furthermore, there seem to be no qualitative differences between the effects of dissents and other misconducts, when these are considered separately (Models 9 and 10).

We repeated the analyses as presented above with controls for the actual performance of both contestants in the match by including the number of shots on target by both teams.[7] The results of these regressions are shown in Table 6 in the Appendix. Even after including these controls, we still find indications of detrimental effects of misconducts on team success. Hence, there seems to be either a negative or no impact of illegal team behaviour on team outcome, irrespective of whether it takes the form of dissents or other misconducts. This finding is in line with previous results (Anders and Rotthoff, 2011; Carmichael and Thomas, 2005; Carmichael et al., 2000; Deutscher and Schneemann, 2017).

5. Discussion

Our differentiation between sabotage aimed at the opponent and dissent against the referee provides valuable new insights. For misconducts aimed at the opposing team directly, i.e. fouls, we find that contestants with lower ability engage more in sabotage, which is in line with previous

[6] As two teams compete in a match, the match result – goal difference or match outcome – can be expressed from both teams' perspectives. We expressed all variables from the perspective of the home team. This, however, does not affect our analysis as expression the variable from the away team's perspective would yield symmetric results.

[7] The data for shots on target and opponent team shots on target were obtained from *football-data.co.uk*, *sport1.de*, and *bundesliga.at*.

Table 4: OLS Regressions with final score (goal difference at the end of the match) and ordered probit regressions with match result (loss, draw, win) as dependent variables

	(7) Final Score	(8) Match Result	(9) Final Score	(10) Match Result
Difference in bookmaker probability	1.6037***	1.3441***	1.7382***	1.4754***
	(4.89)	(4.65)	(5.26)	(4.97)
Attendance	-0.1562	-0.1841	-0.1522	-0.1738
	(0.97)	(1.29)	(0.95)	(1.21)
Derby	0.4189	0.5309	0.3072	0.4422
	(1.35)	(1.48)	(1.05)	(1.24)
Minutes stoppage time	-0.0979	-0.0393	-0.1129*	-0.0440
	(1.51)	(0.67)	(1.85)	(0.76)
Difference in all yellow cards	-0.2189***	-0.2058***		
	(4.54)	(4.78)		
Difference in dissents			-0.4284***	-0.3973***
			(5.53)	(5.08)
Difference in other misconducts			-0.1105*	-0.1139**
			(1.85)	(2.38)
Observations	227	227	227	227
R^2	0.285		0.322	
Pseudo R^2		0.157		0.180

Notes: Absolute *t*-statistics (OLS) and *z*-statistics (ordered probit) in parentheses. Robust standard errors. Significance: * p<0.10, ** p<0.05, *** p<0.01.

findings (Balafoutas et al., 2012; Deutscher and Schneemann, 2017; Deutscher et al., 2013). In contrast, the likelihood of misconducts aimed at the contest's referee, i.e. dissents, seems to be independent of ability. As only the former is sabotage as defined by contest theories, we provide a more precise analysis of sabotage in contest compared to previous studies. Further, we find that the marginal effect of difference in bookmaker probability on the probability of sabotage is stronger than its effect on the probability of any misconduct.[8] These results show that estimates based on all sanctioned misconducts, as Deutscher et al. (2013), Deutscher and Schneemann (2017), and our Model 0, are driven by foul plays and underestimate the effect of ability on the likelihood of sabotage.

Further, we find an inverted U-shaped relationship between *goal difference* and sabotage. An explanation lending itself is that a realistic chance to improve the outcome of the match provides incentives to exert effort, both 'positive' effort aimed at increasing the own team's productivity as well as 'negative' effort, i.e. sabotage. When the match is mostly decided, however, sabotage is reduced, because players have lower incentives to engage in costly sabotage if the expected pay-off decreases. This result could be partly driven by referee behaviour. The observation of more frequent misconducts, e.g. in close matches, might induce stricter refereeing. This could, to a certain extent, further increase the number of yellow cards for any type of misconduct in tight matches. The effect of player behaviour, however, seems to be stronger as such an increase

[8]The marginal effect of *difference in bookmaker probability* on the probability of sabotage per minute is -.011 (Model 2), while its marginal effect on the probability of any misconduct per minute is -.009 (Model 0).

in sanctions in close matches cannot be observed for dissents.

Our finding that the likelihood of dissents against the referee increases in the case of an unfavourable score could indicate self-serving (or team-serving) attribution as, e.g., predicted by the attributional theory of motivation and emotion (Weiner, 1985, 1986; for a review, see Allen et al., 2012). One main prediction of this theory is that individuals attribute success to internal factors, e.g. abilities, and failure to external factors, e.g. bad refereeing (Rees et al., 2005). Lau and Russell (1980) provide evidence on the team-serving bias by analysing comments of players and coaches in newspaper articles on major sports events. In a meta-analysis of 22 questionnaire-based studies in sports settings, Mullen and Riordan (1988) found evidence for the self-serving bias, with its magnitude being larger for teams than individual athletes. Martin and Carron (2012) compared studies using questionnaires based on the attribution dimensions of Weiner's theory and those using the team-oriented attribution scale developed by Greenlees et al. (2005). They confirmed the robustness of the team-serving bias. While most of the previous evidence on the attribution effect in sports is based on surveys of athletes after competitions, we also find behavioural evidence supportive of this effect during competitions. Our results further show that the likelihood of dissents decreases with the number of prior cards the opponent team received. This finding could be explained by the fact that motives for dissents include misconducts by the opposing team that are not sanctioned by the referee. Hence, the more often the opponent is sanctioned, the lower the incentive for dissents against the referee.

The higher likelihood of dissent for away teams we observe in our data could indirectly hint to a home bias of referees, i.e. a favourable treatment of the home team by the referee, which has been found in numerous studies (Buraimo et al., 2010; Buraimo et al., 2012; Dawson and Dobson, 2010; Dawson et al., 2007; Dohmen, 2008; Garicano et al., 2005; Page and Page, 2010; Sutter and Kocher, 2004) . In experimental studies, van Prooijen et al. (2008) and Verboon and van Dijke (2011) show that the procedural fairness of an authority implementing a sanction system increases compliance with the authority. In the context of our study, this could lead to away team players perceiving the favourable treatment of the home team by the authority (the referee) as unfair, and result in their reduced compliance with the authority (more protests against the referee's decisions).

We find that all misconducts are negatively affected by the number of yellow cards the team has previously received, which could be interpreted as a deterrence effect of previous sanctions of the own team (Buraimo et al., 2010). This indicates that (severe) punishment might mitigate illegal behaviour, as predicted by theory (Gilpatrick, 2011).

We also find some noteworthy results on the behaviour of captains and regular players. Regular players are more likely to engage in sabotage when the opponent team has recently conducted a severe misconduct. Such retaliative foul plays, however, cannot be observed for captains. An explanation could be, e.g., that team leaders are more capable of controlling their emotions (Dupuis et al., 2006). The result is also in line with the finding of Price and Weiss (2011) that peer leaders are characterised by better behavioural conduct. Furthermore, captains seem to re-

act quickly to sanctioning of their teammates by challenging the referee's decision. Although captains do not have any privileges allowing them to challenge the referee according to FIFA's Laws of the Game, they are often seen to be responsible for their team's behaviour and as a spokesman for their team before the referee. Our data indicate that captains live up to this role by challenging unfavourable referee decisions more frequently, even though it increases their own chances of being cautioned.

Furthermore, the likelihood of captains challenging referees' decisions and engaging in sabotage increases in important games. This finding could be related to the effect of prize spread on the behaviour of contestants: the wider the prize spread, the higher the incentives to engage in sabotage (Chowdhury and Gürtler, 2015). Garicano and Palacios-Huerta (2014) and del Corral et al. (2010) provide evidence for increased sabotage after the points for winning a football match were increased from two to three. The covariate competitiveness could measure a similar effect. A match against a neighbouring team in the table, particularly towards the end of the season, not only provides the chance to receive three points for the own team, but also to deny three points to a direct competitor in the table (making the game a so called 'six-pointer'), which is a widening of the prize spread compared to other matches. In this regard, increased sabotage is a rational strategy in the case of a high prize spread. In this vein, the higher experience and age of team captains as well as their higher capability to control their emotions (Dupuis et al., 2006; Fransen et al., 2014) might result in 'more rational' behaviour compared to regular players.

In line with previous evidence, our findings show that the impact of illegal behaviour on team outcome likely is negative or non-existent at best. Nonetheless, players do engage in both dissents and sabotage. Deutscher and Schneemann (2017) argue that this self-damaging behaviour could be driven by players perceiving any action as better than inaction, as the latter could be interpreted as giving-up by observers (Grund et al., 2013). Hence, particularly weaker teams could use sabotage too extensively in order to signal effort.[9]

6. Conclusion

We examined sanctioned misconducts in sports contests. The analyses presented here extend previous insights into behaviour in contests in two ways: (i) we explicitly differentiate between destructive actions directly aimed at the opposing team, i.e. fouls sanctioned with a yellow card, and (ii) protesting behaviour aimed at the authority responsible for enforcing the rules of the contest, i.e. dissents sanctioned with yellow cards. This differentiation allows for a more precise analysis of sabotage in sports contests. A main result of our analysis of misconducts against the opposing team is that contestants with lower ability engage more in sabotage than stronger teams. This confirms theories on sabotage in contests and is in line with previous empirical

[9] In addition to the direct effect on match success, severe misconducts might negatively affect success in future matches. Typically, players are suspended for at least one match if they received a certain amount of yellow cards in the previous matches of that season. Hence, misconducts can negatively affect team performance in more than just the current match.

findings. However, we do not find this effect of ability on dissent with the referee.

With respect to dissents, we find that protesting against the referee increases in the case of an unfavourable score. An explanation for this behaviour could be self-serving (or team-serving) attribution. In contrast, we find an inverted U-shaped relationship between the goal difference and the probability of sabotage. Furthermore, away teams dissent more, which could be due to home-biased referees.

We further distinguish between the behaviour of captains and other players in the team. Our results indicate that captains are more likely to dissent with the referee and engage in sabotage in particularly important matches. Also, captains do not seem to participate in escalations of foul play, which is in line with previous findings that team captains seem more capable to control their emotions. However, captains are more likely to dissent with the referee if their own team has recently been sanctioned.

Tournaments in other contexts, e.g. tournaments within firms, are often installed to provide incentives to exert effort or to select the best contestants. However, in line with previous findings, our results show that contests also incentivise undesirable sabotage. At the same time, illegal behaviour seems to be detrimental for team success. A possible measure to prevent or at least to reduce sabotage is punishment. Our results show that previous sanctions of illegal activities of a team, i.e. the number of yellow cards a team received prior to the subject minute, reduce the probability of misconduct. This indicates that punishments of team members, at least if they can be observed, also lead to a reduction of illegal activities in non-punished individuals.

In spite of its detailed controls for within-match dynamics, our study has limitations. Analyses based on misconducts actually sanctioned only contain illegal activities observed and interpreted as illegal by the referee. Hence, our data include wrong referee decisions (false positives), lack activities not sanctioned by the referee (false negatives). Thus, one interesting aim for further research is to include information on wrong referee decisions and unpunished sabotage. This information could further prove meaningful in explaining players' dissents with the referee and provide insights into how the effectiveness and fairness of punishment of sabotage affects behaviour in contests.

A. Appendix

Table 5: Allocation of all 227 matches across European leagues

Country	No. of matches in the respective league		
	first league	second league	third league
Austria	15	15	4
England	13	-	-
Germany	60	38	42
Spain	16	-	-
Switzerland	21	-	-
Turkey	3	-	-

Table 6: OLS Regressions with final score (goal difference at the end of the match) and ordered probit regressions with match result (loss, draw, win) as dependent variables

	(1)	(2)	(3)	(4)
	Final Score	Match Result	Final Score	Match Result
Difference in bookmaker probability	0.9038**	0.9583**	1.0275**	1.0528***
	(2.24)	(2.38)	(2.58)	(2.66)
Attendance	-0.4211	-0.1769	-0.4959	-0.2413
	(1.40)	(0.61)	(1.65)	(0.83)
Derby	0.5124	0.4126	0.4843	0.3847
	(1.24)	(0.93)	(1.19)	(0.86)
Minutes stoppage time	0.0021	0.0898	-0.0279	0.0688
	(0.03)	(0.99)	(0.38)	(0.75)
Difference in shots on target	0.1879***	0.1226***	0.1841***	0.1244***
	(4.90)	(3.11)	(5.21)	(3.25)
Difference in all yellow cards	-0.1457**	-0.1603***		
	(2.59)	(2.64)		
Difference in dissents			-0.3040***	-0.3176***
			(2.90)	(2.84)
Difference in other misconducts			-0.0753	-0.0878
			(1.21)	(1.40)
Observations	117	117	117	117
R^2	0.516		0.535	
Pseudo R^2		0.270		0.285

Notes: Absolute *t*-statistics (OLS) and *z*-statistics (ordered probit) in parentheses. Robust standard errors. Significance: * p<0.10, ** p<0.05, *** p<0.01.

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