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The Iron Curtain and Referee Bias in International Football

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Abstract

Using the assignment of referees to European international association football matches played between 2002 and 2016, we ask whether judgements were biased according to the legacy of the Cold War. Referees from post-communist states favoured teams from non-communist states, but there was no evidence of favouritism in the other direction. The out-group bias of referees born behind the Iron Curtain was more significant for less important decisions (e.g., yellow cards vs red cards). The bias was particularly large among referees from the former Soviet Union. It has also diminished over time, perhaps due to increased professionalism in European refereeing, or because memories of the Cold War era have diminished among active referees.

Keywords: home advantage, social pressure, international relations, sports economics
JEL Codes: D91, F59, Z20

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1 Introduction

On 10 September, 1997, on the last but one matchday of the qualification tournament for the 1998 FIFA World Cup, the Bulgarian men's national football team played at home in Sofia against Russia. A win would have been good enough for Bulgaria to secure first place in their qualifying group and direct qualification for the finals tournament, taking place the next summer in France. Russia was hoping for at least a draw the match, because a home win over Bulgaria on the last matchday in October would then have been enough for Russia instead to top the group and qualify for the finals. The September match finished 1-0, a tight victory for Bulgaria, who successfully qualified for the 1998 World Cup finals. Russia finished second in the group and subsequently lost a playoff against Italy in their final chance of qualification. In Russia, the aforementioned match is widely regarded by football fans and the media as the most biased match of the post-Soviet era in terms of referee decisions.¹ The common Russian view is that the referee, Václav Křondl from the Czech Republic, ignored at least five fouls in the Bulgarian penalty area, any one of which would have allowed Russia a 75-80% chance of scoring a goal from the resulting penalty kick.² In the aftermath of the match, the analysis of these non-awarded penalty kicks by the Russian media included the idea that the choice of referee had been wrong:

*"... You don't have to be a sophisticated politician to understand that it was too risky to appoint a referee from the Czech Republic for our game with Bulgaria. After all, these countries were both offended by the Soviet Union, which is now reflected in the attitude towards Russia..."*³

The number of international competitive football matches in the past two decades involving Russia and referees from other Warsaw Pact countries is too small to directly test

¹For example, see the interview of the former President of the Russian Football Union Vyacheslav Koloskov <https://www.championat.com/football/article-4030893-kak-cheshskij-sudja-kroncl-ubil-sbornuju-rossii-v-bolgarii-v-1997.html> (in Russian; retrieved 26 June, 2021), or the opinion of Igor Kolyvanov, the Russian national team player in this match https://www.eurosport.ru/football/story_sto7753580.shtml (in Russian; retrieved 26 June, 2021).

²See <https://www.gambling.com/news/who-has-the-best-premier-league-penalty-conversion-record-2336400> for penalty kick conversion rates for the English Premier League in the 15 seasons to 2020/21.

³*Sport-Express*, the main Russian sports newspaper in 1990s, 12 September, 1997: https://www.sport-express.ru/newspaper/1997-09-12/2_1/, retrieved 13 June, 2021.

the reality of the bias suggested by this quote. However, motivated by this anecdote, we can test for broader referee biases related to the influence of the Cold War period. We compare the decision-making patterns in international football of referees from post-communist European states and referees from states with no history of a communist government, and how these patterns depend on the communist history of the teams playing. In contrast to most of the previous literature that has used quasi-experimental settings in professional sport to document in-group favouritism (e.g., [Price and Wolfers, 2010](#); [Zitzewitz, 2006](#)), we find evidence of an out-group favouritism, or bias, whereby the decisions of referees from post-communist states tend to favour national football teams from the other side of the Cold War's Iron Curtain.⁴

For each match between teams representing two different Union of European Football Associations (UEFA) member countries, a committee assigns match officials from a third country. However, political tensions and historically close cultural connections between states can still lead to concerns about referee neutrality. Recently, the UEFA Referees Committee has tried to avoid such unnecessary complications.⁵ Typically, the international career of a football referee starts in his or her late 20s/early 30s and ends in their late 40s. Therefore, the European referees who worked internationally in the 2000s and 2010s were born into and lived a significant part of their lives on a bipolar continent. They also lived through the collapse of the Soviet Union in 1991. We ask whether these events and lived experiences, from either side of the Iron Curtain, could lead to biased decision making by football officials when adjudicating contests between European nations. The potential direction of this bias is ex ante unclear. On the one hand, if a referee belongs to the same bloc of countries as one of the teams, then it may lead to an in-group bias, due to sympathising with the team that has stronger cultural, mental or emotional connections with him/herself. On the other hand, the FIFA World Cup 1998 qualifying anecdote described earlier suggests a potential out-of-group bias, wherein a referee sympathises less with ex-communist countries and their football teams, due to the psychology associated

⁴The 'Iron Curtain' describes the geographical and political separation between communist Eastern European states, i.e., the Warsaw Pact countries and Yugoslavia, and the rest of Europe, as popularised by Winston Churchill in a speech, 5 March, 1946, in Fulton, Missouri.

⁵For example, since the Crimean events of 2014, Russian referees have not been assigned to matches involving Ukrainian teams, and vice-versa. See the profiles of Russian and Ukrainian referees at WorldReferee.com.

with growing up in a communist state themselves. The purpose of this work is to identify the direction of the bias.

We find a significant out-group bias for the number of yellow cards awarded to the away team within a football match-up, between the same two teams. In the 2000s and in the first half of the 2010s, when a referee from a post-communist state was assigned to a match-up, 14% fewer yellow cards were awarded to the away country if they were a non-communist state. If the home country was non-communist, then 15% more yellow cards were awarded to the away team. However, we found no similarly significant biases when a non-communist referee was assigned to matches involving post-communist countries. There is also weak evidence that referees from post-communist countries favoured non-communist teams when making decisions about red cards. When the away team was from a non-communist country, the probability that a referee from a post-communist country awarded a red card to the home team was 6% higher than when the referee was from a non-communist country. Similarly, having a post-communist referee increased the probability of a red card being awarded to the away team by 7% when the home team was from a non-communist state. There is no evidence that the final match outcomes and the potentially important decision of awarding a penalty kick were affected by the Iron Curtain relationship between the referee and the teams involved.

Our results show that the legacy of the Iron Curtain can lead to bias in individual decision making decades later. The statistical significance and estimated magnitude of the bias decreases with the importance of the decision: highest for less important decisions (yellow cards), much less for important decisions (red cards), and insignificant for decisions that are highly likely to have a direct impact on the final score (penalty kicks). The good news for football's policymakers is that the post-communist out-group bias had no statistically significant influence on the final outcomes of matches. Also, the evidence suggests that these biases have decreased over time. This could mean that either the influence and memories of communism in Europe have diminished rapidly or the standard and professionalism of European refereeing increased through the 2000s and 2010s.

The remainder of the paper proceeds as follows: Section 2 briefly discusses some closely related literature; Section 3 describes the data and setting; Section 4 explains our methodology; Section 5 presents the results; and Section 6 concludes.

2 Related literature

Our research primarily contributes to the previous literature on the decision making and bias of referees and other adjudicators. Social forces and pressure can affect the behaviour and decision making of individuals, and thus affect economic outcomes (e.g., [Akerlof, 1980](#); [Bernheim, 1994](#); [Becker and Murphy, 2000](#)). There is experimental evidence that individuals make different and potentially biased decisions when there is some form of salient group membership (e.g., [Charness et al., 2007](#); [Charness and Sutter, 2012](#)). There is evidence from real-life settings that a crowd can bias the decision making of an individual toward its preferred outcome. Specifically, home team support in a professional sports contest can impact on the officials' decisions ([Dohmen and Sauermaun, 2016](#)). Fans in an association football crowd actually believe that they do influence officials' decisions and affect match outcomes in favour of the team they support ([Wolfson et al., 2005](#)).

Throughout the history of professional team sports, there has been a tendency for a team to win more often when playing in their home stadium, city or country (e.g., [Schwartz and Barsky, 1977](#); [Courneya and Carron, 1992](#); [Nevill and Holder, 1999](#); [Koyama and Reade, 2009](#); [Peeters and van Ours, 2020](#)). As summarised in the review by [Dohmen and Sauermaun \(2016\)](#), referee bias may be one significant cause of this home advantage, with much of the evidence on this coming from professional football. [Sutter and Kocher \(2004\)](#) revealed the presence of a home-away referee bias in the German Bundesliga in two types of decisions: the number of added minutes at the end of a match (referees awarded more additional minutes at the end of a game when a home team was losing by one goal compared to the matches when an away team was losing by one goal) and the number of awarded penalty kicks (home teams are more likely to win a legitimate penalty kick compared to away teams). [Garicano et al. \(2005\)](#) similarly demonstrated a home-away referee bias in the Spanish La Liga, expressed by referees awarding more additional minutes at the end of a game when a home team was losing by a close margin, giving them a greater chance to recover. For the English Premier

League and German Bundesliga, [Buraimo et al. \(2010\)](#) discovered a home-away referee bias in terms of disciplinary sanctions (yellow and red cards), performing a minute-by-minute analysis that took into account the score and other in-game characteristics. [Buraimo et al. \(2012\)](#) found that the home-away referee bias decreased when a match was played in a stadium with a running track around the pitch, increasing the distance from the action of the mostly home team supporting crowd compared to in a regular football stadium. These results suggests that the social pressure coming from fans in the stadium is a factor affecting referee decision making and potentially bias. Several recent studies have confirmed that the audience plays an important role in producing the home-away bias in professional team sports by studying what happened during the COVID-19 pandemic. In matches played behind closed doors or with a substantially restricted audience, home advantage decreased and referees were less biased (e.g., [Bryson et al., 2021](#); [Endrich and Gesche, 2020](#); [Fischer and Haucap, 2021](#); [McCarrick et al., 2021](#); [Reade et al., 2020](#); [Scoppa, 2021](#), and the review by [Leitner et al., 2021](#)).

Some studies have attempted to identify particular group biases that may affect referee decision making and judgements in professional sports. Focusing on football, [Dawson and Dobson \(2010\)](#) found that the magnitude of the home-away bias varies across referees from different national associations. They also provided some evidence that the national association of the club matters. However, the authors concluded that detecting the role of nationality in referee bias is challenging. [Pope and Pope \(2015\)](#) partly overcame these difficulties by studying the relationship between the referees and players within a match. They found that players officiated by a referee of the same nationality received 10% more calls in their favour, and this advantage, or bias, was greater at home and at the elite level of football. In this paper, we propose a specific dimension of nationalistic bias, related to having experienced a communist past.

As another form of in-group bias, [Hlasny and Kolaric \(2017\)](#) showed that the frequency of interactions between a referee and a team could predict favouritism in the lower leagues of English professional football. In the top leagues, the familiarity of a referee with a team had less of an effect on decision making, but the distance between the referee's hometown and the stadium did matter. In a similar study, looking at in-group bias in Swiss football,

Faltings et al. (2019) found that the linguistic proximity between a football referee and a team negatively correlated with the referee's likelihood of punishing the team. In the National Basketball League, referees were biased against players with the opposite skin colour (Price and Wolfers, 2010). However, this bias disappeared after the research results attracted a lot of attention (Pope et al., 2018).

Nationalistic in-group bias has also been documented in some other sports settings. Coupe et al. (2018) revealed that experts vote for the players from their own country when selecting the winner of the prestigious Ballon d'Or award for the best football player of the year. Frank and Krabel (2013) demonstrated that professional chess players from the Warsaw Pact countries were favoured by jurors also from the bloc, during the annual voting for the most beautiful game of the year. This favouritism disappeared after 1989 and the same in-groups bias was not present for jurors not from Warsaw Pact countries. The significant favouritism by judges toward athletes with the same nationality has been documented in sports where performance scores and outcomes are dependent on some degree of subjectivity (for ski jumping see Zitzewitz, 2006; Krumer et al., 2021, for figure skating see Zitzewitz, 2006, and for dressage see Sandberg, 2018). In these sports, nationalistic bias should be separated from the strategic or block voting of the judges. Zitzewitz (2006) provides evidence that judges in figure skating competitions engage in strategic voting behaviour but not in ski jumping. As an extreme example of block voting in dressage, Sandberg (2018) found that individual judges sympathised with the athletes performing for any country that had a representative on the panel of judges.

The literature on violence in sports reveals that national identities are important determinants of aggression on the football pitch. Players are less aggressive (in terms of punishments issued by the referee) if they come from countries without a long history of civil wars (Miguel et al., 2008) and if they play against a tightly connected nation (Caruso et al., 2017). These studies acknowledge possible biases related to the referee's personality, including xenophobia against the players from a specific region of the world. However, Caruso et al. (2017) found that many of the results in these studies become insignificant after introducing referee fixed effects to the models. This suggests that not only the teams but also referees and their characteristics affect the recorded level of aggression on the pitch.

In contrast to [Caruso et al. \(2017\)](#), we put referees' decision-making at the centre of our study. Motivated by the common football fans' stereotype that a referee's connections with the teams may have an impact on the decision making, we focus on the specific recent historical case of a Europe separated into two blocs by the Cold War. Whereas [Caruso et al. \(2017\)](#) analysed how the numbers of yellow and red cards issued at international football tournaments depended on the various characteristics of the teams, we investigate the role of the three-sided relationship between the teams and a referee.

3 Data & Setting

UEFA organises several international football competitions for men at the club, national team and junior levels. In this paper, we focus on the national team tournaments, namely, the two qualification tournaments for the FIFA World Cup and the European Championship, each on a four-year cycle, between 2002 and 2016. Within each qualification group, teams played each other twice (home and away). Some of these tournaments were concluded by a decisive play-off round, also played over two legs, home and away.

To guarantee the neutrality of refereeing, the UEFA Referees Committee assigns a squad of officials from a third country to each match. Before 2009, this referee team included the referee, two assistant referees and the fourth official. The referee is responsible for all decisions during the match and can overrule the decisions of the other officials. The assistant referees are mainly responsible for offside/onside decisions, but they can also help the referee in other situations that occur close to them. The fourth official is responsible for various duties outside the field, and he should be ready to substitute the referee in case of an injury. In 2009, UEFA began to assign two additional assistant referees to monitor incidents close to the penalty area. However, this practice was used mainly in club competitions and was later abolished in the second half of the 2010s. Video assistant referees (VAR) were introduced to UEFA competitions from 2018.

Usually, the whole referee team represents the same country, making communication between the officials easier.⁶ Due to the non-uniform introduction of video assistance

⁶However, there do exist rare exceptions of mixed nationality teams: for example, a top European referee, Pavel Kralovec from the Czech Republic, was often assigned to matches with assistant referee Roman Slysko from Slovakia.

technologies across European countries, it is considered normal practice for the the VAR and the match referee to represent different countries. For this reason we will restrict our analysis to the period before the era of the VAR.

In the 21st century, refereeing inside UEFA became more professional and highly competitive. Each national association – the UEFA member – submits yearly a list of candidates to FIFA for inclusion on their list of referees. After approval by FIFA, the referees are allowed to work in international matches. In Europe, all referees are classified by UEFA. As of 2021, there are five categories for referees in the men’s game: Elite, 1st, 2nd, 3rd, 4th. Most referees start from the 4th category except those from the top national associations (England, Spain, Germany, Italy, and France), who start from the 3rd category. UEFA updates the referee categories twice a year based on the performance principle; only international tournaments count for promotions and demotions. The assessment of referees is performed at every match by an assigned UEFA referee observer.

Though payments to referees are not disclosed officially by UEFA, numerous sources indicate that the category of the referee determines his remuneration. Sergey Karasev, a UEFA Elite category referee, mentioned in an interview that a top referee gets 4,500-5,000 euros per regular club competition match, with this sum increasing at the concluding stages of the tournaments, starting from the quarterfinals.⁷ Unofficial sources reveal that, starting from 2016, Elite, 1st, 2nd, and 3rd category referee received 5,000, 2,700, 1,300, and 1,200 euros per match in the club competitions, respectively.⁸ These remuneration and assessment schemes create performance incentives, due to substantial differences not only in the rate of pay but also the likelihood of being assigned to more valuable and prestigious matches.

We collected information on the international football matches between UEFA member national teams from the beginning of the 2002/03 season to the end of the 2015/16 season. We used worldfootball.net to gather the final scorelines of the matches, where they took place and in what tournament, the numbers of yellow cards, red cards and penalty kicks awarded, and stadium attendances. To construct the form-based [Elo \(1978\)](#) ratings of

⁷See https://www.gazeta.ru/sport/news/2021/06/29/n_16172072.shtml (in Russian; retrieved 30 June, 2021).

⁸See <https://fudbalskisudija.wordpress.com/2016/07/15/salary-rise-for-uefa-referees/> (Retrieved 30 June, 2021).

teams before each match, we used the entire history of international football match results on worldfootball.net. As in many other research studies, we use Elo ratings as measures of relative team strengths, and their implied match outcome probability forecasts, instead of UEFA world ranking coefficients.⁹ We obtained the identity of match referees and their nationalities from WorldReferee.com.

The final sample includes the matches of men's senior UEFA competitive international football played at non-neutral venues, i.e., at home for one of the teams and away from home for the other. The sample covers 1,332 matches played between 51 national associations and officiated by 295 referees. Table 1 presents the summary statistics for the variables used in the main analysis. The average stadium attendance in these matches was almost 25,000, and ranged between zero and over 88,000. The statistics for home and away wins, yellow cards and penalties demonstrate the well-known and substantial home advantage in professional football. The share of home wins was 45.5% compared with 31.5% for away wins, with an associated average goal difference in favour of home teams of 0.38. The mean number of home yellow cards in a match, 1.69, was less than the mean number of away yellows, 2.04. Figure 1 shows the sample distributions of yellow cards awarded to the home and away teams. The distribution of home yellow cards is more right-skewed compared to the away yellows. At least one penalty kick was awarded to the home team in 12.2% of matches, compared with 6.8% for away teams.

Table 1 also describes six indicators for the 'Iron Curtain status' of a match according to the relationships between the referee's nationality and the teams playing at home or away. We assign the 51 countries to two blocs: 'post-communist' countries with a substantial history of communist governments since World War II, and other 'non-communist' countries without such a past. Around 13% of matches involved a referee from a post-communist country but took place in the home stadium of a non-communist country. A similar proportion of matches involved a post-communist referee and a non-communist team playing away from home. 51% of matches took place with a home team and a referee from the same side of the Iron Curtain.

⁹See [Hvattum and Arntzen \(2010\)](#) for discussion on the strengths of Elo ratings for predicting football matches. In this application, we use the standard Elo ratings system, based only on match results, and with an updating factor of 40. See eloratings.net/ for an illustration of international football Elo ratings.

TABLE 1: Sample descriptives, men’s senior UEFA competitive international football, non-neutral venues, 2002-2016

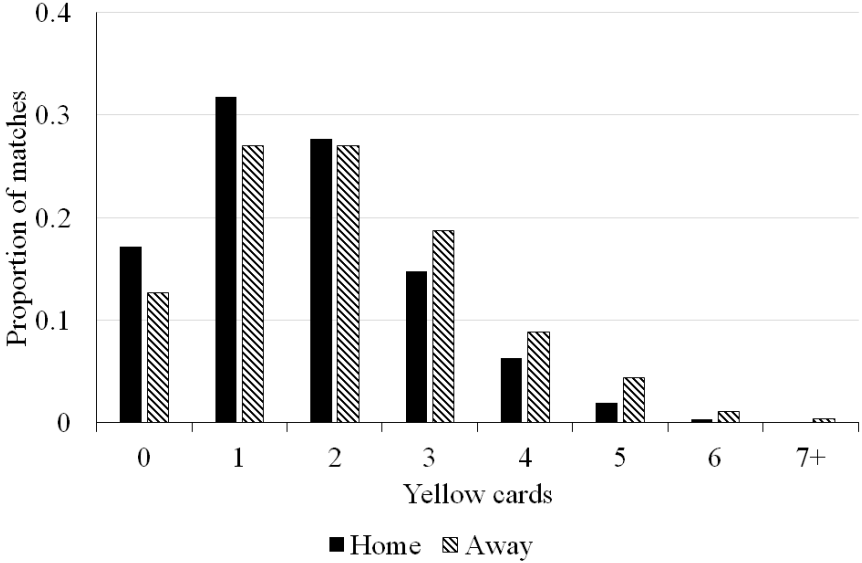
	Mean/Share	St. Dev.	Min.	Median	Max.
Home win (=1 if yes)	0.455	-	-	-	-
Draw (=1 if yes)	0.231	-	-	-	-
Away win (=1 if yes)	0.315	-	-	-	-
Goal difference (=H-A)	0.377	1.993	-7	0	8
Elo pred. (1=certain home win)	0.501	0.304	0.006	0.497	0.993
Stadium attendance (1,000s)	24.62	18.83	0	20	88.09
Home yellows	1.689	1.25	0	2	7
Away yellows	2.036	1.413	0	2	9
Home red cards (=1 if > 0)	0.073	-	-	-	-
Away red cards (=1 if > 0)	0.098	-	-	-	-
Home penalties (=1 if > 0)	0.122	-	-	-	-
Away penalties (=1 if > 0)	0.068	-	-	-	-
<i>Historical Communism:</i>					
Home team and ref. from same bloc	0.512	-	-	-	-
Ref. is comm., home is non-comm	0.127	-	-	-	-
Ref. is non-comm., home is comm	0.360	-	-	-	-
Away team and ref. from same bloc	0.503	-	-	-	-
Ref. is comm., away is non-comm	0.131	-	-	-	-
Ref. is non-comm., away is comm	0.366	-	-	-	-
<i>N</i> of countries			51		
<i>N</i> of match-ups			483		
<i>N</i> of referees			295		
<i>N</i> of matches			1,332		

Notes.- Men’s senior internationals in the 2002/03-2015/16 seasons between UEFA members, competitive and excluding tournament finals.

Source.- worldfootball.net & worldreferee.com; accessed 14 March 2020.

Our sample is skewed relative to the set of all matches played between UEFA national teams. First, we exclude friendly matches and non-official tournaments, since the importance of the outcome of such games is low and players, for example, are less likely to make potentially risky tackles to avoid unnecessary injuries. As a consequence, referees issue fewer yellow and red cards in these matches, and the pressure or incentives to make correct decisions are lower. Also, the decisions of referees in friendly matches have no significant impact on their promotion. Second, we exclude matches played on neutral ground (e.g., tournament finals), to separate out any differences in referee bias toward the home or away teams, which may be affected by the social pressure from the mostly home-team-supporting stadium crowds.

FIGURE 1: Sample distribution of yellow cards awarded over matches: men’s senior UEFA competitive international football, non-neutral venues, 2002-2016



Notes.- All main analysis sample matches.
 Source.- worldfootball.net; accessed 14 March 2020.

Table 2 shows the statistics for the number of referees, matches, and yellow cards awarded according to the nationalities of the referees in the analysis sample. Great Britain and Russia had the highest numbers of referees and matches officiated within the non-communist and post-communist blocs, respectively.¹⁰ The mean difference between the numbers of yellow cards awarded to home and away teams was greater among post-communist referees, but not significantly different, at standard levels, to the same difference among non-communist referees. For almost all nationalities where there was a statistically significant difference in the number of yellow cards awarded by referees to home and away teams, this was in the favour of the home teams, with the only exception being among Romanian referees.

¹⁰Great Britain includes referees and matches from four UEFA member associations: England, Northern Ireland, Scotland and Wales. Representatives of the Faroe Islands are classified as having Danish nationality.

TABLE 2: Mean yellow cards awarded, by nationality of the referee, men’s senior UEFA competitive international football, non-neutral venues, 2002-2016

Referee nationality	Home	Away	Diff. (=H-A)	N matches	N referees
<i>Communist</i>	1.68	1.96	-0.27***	319	92
Albania	2.00	0.00	2.00	1	1
Armenia	0.50	1.50	-1.00	2	2
Azerbaijan	1.67	1.33	0.33	3	3
Bulgaria	1.44	1.89	-0.44	9	5
Bosnia-Herzegovina	2.00	1.50	0.50	2	2
Belarus	1.14	2.00	-0.86	7	2
Czech Republic	1.48	2.40	-0.92**	25	7
Estonia	1.83	1.17	0.67	6	3
Georgia	1.00	1.67	-0.67	3	2
Croatia	1.79	2.24	-0.45	29	5
Hungary	1.96	1.76	0.20	25	4
Kazakhstan	3.00	2.00	1.00	2	2
Lithuania	2.43	2.14	0.29	7	2
Latvia	1.00	1.80	-0.80**	5	2
Moldova	2.50	1.00	1.50	2	1
North Macedonia	1.00	2.75	-1.75**	8	2
Poland	1.57	1.57	0.00	35	8
Russia	1.73	2.15	-0.43	40	10
Romania	1.93	1.25	0.68*	28	7
Serbia	1.67	2.56	-0.89**	18	4
Slovakia	1.19	1.81	-0.63*	16	5
Slovenia	1.71	2.04	-0.32	28	4
Ukraine	2.00	2.33	-0.33	18	9
<i>Non-communist</i>	1.69	2.06	-0.37***	1,013	203
Austria	1.54	2.26	-0.71*	35	8
Belgium	1.51	1.95	-0.44*	39	6
Switzerland	1.60	1.80	-0.20	30	10
Cyprus	1.78	1.89	-0.11	9	4
Denmark	1.23	1.63	-0.40	43	9
Finland	0.70	2.90	-2.20***	10	5
France	1.63	2.01	-0.38*	68	15
Germany	1.84	2.01	-0.17	92	15
Great Britain	1.83	2.28	-0.45***	138	31
Spain	1.74	1.87	-0.13	94	16
Greece	1.88	2.62	-0.74**	34	8
Ireland	2.33	1.67	0.67	6	1
Iceland	0.86	2.14	-1.29*	7	2
Israel	1.57	2.04	-0.48	23	6
Italy	1.63	1.95	-0.32**	106	17
Luxembourg	1.43	2.36	-0.93*	14	3
Malta	2.00	1.00	1.00	2	2
Netherlands	1.89	2.09	-0.20	64	12
Norway	1.52	1.60	-0.08	50	7
Portugal	1.87	2.32	-0.45*	53	8
Sweden	1.73	2.20	-0.47**	64	10
Turkey	1.72	2.16	-0.44	32	8

Notes.- ***, **, * indicate significance from zero of the mean Home-Away yellow cards at 1%, 5% and 10% levels, respectively, two-sided tests.

Men’s senior internationals in the 2002/03-2015/16 seasons between UEFA members, competitive and excluding tournament finals.

Source.- worldfootball.net & worldreferee.com; accessed 14 March 2020.

4 Methodology

Our empirical strategy exploits the way in which referees are assigned to matches. The ideal setting for identification would be one where referees were assigned to matches completely at random. If this were the case, then we could estimate the Iron Curtain effects by comparing average match outcomes according to the different referee-team relationships in the data. However, the assignment of referees is not completely random. Referees are not assigned to matches involving their own country or one they have some notable affiliation with. Referees may be assigned to particular types of matches because of characteristics correlated with their nationality. For example, better or more experienced referees may tend to be assigned to matches involving teams with a history of rivalry, aggression or indiscipline against one another, e.g., England vs Germany, France vs Italy, or Denmark vs Sweden. As [Bryson et al. \(2011\)](#) discuss, the performance or ability of a referee is related to how well they control a football match, indicated by fewer yellow or red cards being awarded. If referees from non-communist countries are generally better, perhaps due to the higher quality domestic leagues in those countries, then it is plausible that they are assigned to high-profile games more often than referees from post-communist countries. Similarly, better referees may be assigned to matches that are expected to be more competitive than others. Patterns of referee assignment such as these could bias our estimates. To address this, we estimate regression models which control for some fixed and time-varying characteristics of football matches. In this way, we identify the referee-team relationship effects on match outcomes by assuming that, conditional on the controlled for match characteristics, the assignment of referees to matches was approximately random.

Specifically, we assume that the conditional mean for some outcome, y_i , of a football match, i , is given by:

$$E [y_i | \mathbf{z}_i, \mathbf{x}_i, \theta_{J(i)}] = F(\mathbf{z}_i, \mathbf{x}_i, \theta_{J(i)} ; \boldsymbol{\beta}) , \quad (1)$$

where $\boldsymbol{\beta}$ gives a vector of model parameters, and $\theta_{J(i)}$ is a fixed effect for a specific match-up between two teams, e.g., England playing against Russia, where $J(i) = j$ is an indicator function. By including these match-up fixed effects in the model, we exploit the variation from how different referees were assigned to matches played between the same teams. The

variables of interest are in the vector \mathbf{z}_i . They are indicators for the relationships between the referee’s background and the teams playing at home or away. For example, one element of \mathbf{z}_i indicates whether the referee was from a post-communist country but the home (away) team was non-communist. The excluded category in \mathbf{z}_i is when the referee and home (away) team were from the same side of the Iron Curtain. This formulation allows us to estimate whether the Iron Curtain status of a match, with respect to either the home or away teams, affected outcomes, which may also suggest that any referee bias was affected by social pressure from the mostly home-team-supporting stadium crowd.

We consider the following match outcomes for y_i : the match result ($y_i \in \{1 \text{ (home win)}, 0.5 \text{ (draw)}, 0 \text{ (away win)}\}$), goal difference (home goals scored minus away), whether there was at least one red card awarded to the home team ($y_i \in \{1 \text{ (yes)}, 0 \text{ (no)}\}$), whether there was at least one penalty kick awarded to the home team ($y_i \in \{1 \text{ (yes)}, 0 \text{ (no)}\}$), the equivalent two variables for the away team, and the numbers of yellow cards awarded to the home and away teams, including any awarded to a player for a second bookable offence that led to a red card.

We estimate Equation 1 using Poisson regression for the yellow card counts and linear least squares for all the other dependent variables.¹¹ We considered the following control variables in \mathbf{x}_{ij} : the Elo predicted probability of a home win; the stadium attendance at a match; the distance travelled by the referee to the match, approximated using the capital city of a referee’s nation; year fixed effects, to address any potential trends in match outcomes; and the match outcome for the home (away) team where the dependent variable was for the away (home) team, and vice versa, to control for the inter-dependence of foul play and punishments - an ill-tempered or poorly controlled football match may feature reciprocated aggression and foul play. After allowing for the match-up fixed effects in the models, we find that only the Elo prediction and the opposite home/away punishment variables are significant predictors for y_i , so the remaining control variables are omitted.

¹¹The match result model can be interpreted as a linear probability model for the home win, but it is also equivalent to having the points gap between the home and away team as the dependent variable, where the winning team in football is awarded three points, and one point is awarded to both teams in the case of a draw (i.e., $y_i = \{3, 0, -3\} = \{\text{Home win}, \text{Draw}, \text{Away win}\}$). We estimate linear probability models for red cards and penalties because there are very few matches where a team was awarded more than one.

5 Results

The six columns of results in Table 3 show the linear regression estimates of Equation (1) for match results (I), goal differences (II), whether a red card was awarded to the home and away team (III & IV), and whether a penalty kick was awarded to the home and away teams (V & VI), using the 1,332 men’s senior competitive international fixtures between 2002 and 2016 described in Section 3. There is no statistically significant evidence that the final match outcomes and the potentially important decision of awarding a penalty kick were affected by the Iron Curtain relationship between the referee and the teams involved. Focusing on red cards in columns (III) & (IV), which can be decisive as they significantly and substantially affect the goal scoring rates of teams (Cervený et al., 2018; Ridder et al., 1994), there is weak evidence that post-communist referees favoured non-communist teams when making decisions about punishments. When the away team was non-communist, the assignment of a post-communist referee increased the probability of at least one red card being awarded to the home team by 0.06 (p -value=0.058), compared with a non-communist assignment. Similarly, having a post-communist referee increased the probability of a red card being awarded to the away team by 0.07 when the home team was non-communist (p -value=0.089). Although the magnitude of these two effects is similar, the marginally greater bias in favour of non-communist home teams than away teams by post-communist referees would be consistent with the effects of social pressure from the home crowd. This evidence of out-group bias for post-communist referees is not mirrored by non-communist referees, for whom there is no evidence of bias that depends on their Iron Curtain relationship with the teams involved in a match.

TABLE 3: The effects of international football referees and teams being from post-communist or non-communist countries, men's senior UEFA competitive international football, 2002-2016

	Result (I)	Goal diff. (II)	Home red card (III)	Away red card (IV)	Home penalty (V)	Away penalty (VI)
<i>Excluded: home team and ref. from same bloc</i>						
Ref. is comm., home is non-comm	-0.018 (0.609)	0.010 (0.958)	-0.041 (0.192)	0.066 (0.089)	-0.016 (0.642)	-0.013 (0.705)
Ref. is non-comm., home is comm	-0.014 (0.668)	0.139 (0.396)	0.004 (0.877)	-0.003 (0.907)	-0.020 (0.503)	-0.023 (0.371)
<i>Excluded: away team and ref. from same bloc</i>						
Ref. is comm., away is non-comm	-0.003 (0.924)	0.250 (0.162)	0.061 (0.058)	-0.049 (0.183)	0.050 (0.158)	-0.014 (0.684)
Ref. is non-comm., away is comm	-0.004 (0.895)	0.009 (0.958)	-0.023 (0.328)	-0.006 (0.847)	-0.014 (0.642)	-0.001 (0.975)
Elo pred. (1=certain home win)	0.892 (0.000)	4.238 (0.000)	-0.071 (0.003)	0.041 (0.180)	0.162 (0.000)	-0.120 (0.000)
Home value of dependent variable				0.106 (0.024)	(0.000)	0.051 (0.115)
Away value of dependent variable			0.079 (0.026)		0.084 (0.111)	
Constant	0.133 (0.000)	-1.834 (0.000)	0.105 (0.000)	0.071 (0.011)	0.042 (0.116)	0.134 (0.000)
match-up fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.593	0.589	0.395	0.382	0.389	0.372
N match-ups	483	483	483	483	483	483
N matches	1,332	1,332	1,332	1,332	1,332	1,332

Notes.- **bold** indicates significance from zero at least at 10% level, two-sided tests, p -values in parentheses, with robust standard errors.

Column (I): linear regression estimates of Equation (1), where the dependent variable is $\{1, 0.5, 0\} = \{\text{Home win, Draw, Away win}\}$

Column (II): linear regression estimates, where the dependent variable is home goals minus away goals scored

Columns (III-VI): linear probability model estimates of Equation (1), where the dependent variable is whether at least one of the column heading was awarded in a match

Table 4 shows Poisson regression estimates of Equation (1) for the numbers of home and away yellow cards awarded. A referee’s decision to award a yellow card is far less decisive for a match’s final outcome than awarding a red card or penalty kick (Titman et al., 2015). Column (I) shows there is no significant evidence that the Iron Curtain relationship between referees and teams affected the numbers of home yellow cards awarded. However, column (II) shows that a post-communist referee significantly favoured non-communist home and away teams when deciding whether to award yellow cards to the away team, increasing the number awarded by 15% when the home team was non-communist (p -value=0.023) and 14% when the away team was non-communist (p -value=0.017). Taken together, a post-communist referee being assigned to a match between two non-communist teams marginally increased the home advantage, through more yellow cards being awarded to the away team, but not significantly so. As per the other match outcomes, we find no significant evidence of bias by non-communist referees because of which side of the Iron Curtain the teams were from.¹²

Column (III) of Table 4 shows the results from testing whether the out-group biases were potentially influenced by the size of the stadium crowd. The bias in favour of a non-communist away team by a post-communist referee significantly decreased as the size of the crowd increased, within a match-up. This would be consistent with the notion that a larger crowd, and the associated social pressure in favour of the home team, helped to reduce the bias of post-communist referees toward non-communist away teams. In column (IV), we reduce the estimation sample to only matches that took place before 2010, such that on average the referees were older and spent more of their lives with the Iron Curtain as an everyday reality. The estimated magnitude of the bias by post-communist referees in favour of non-communist teams was greater before 2010 than over the whole sample period. This suggests that the out-group favouritism of post-communist referees has diminished over time.

¹²We considered including (subsets) of referee-specific or referee-nation fixed effects in these models, to control for the general tendency of some referees or nationalities to award more or less cards irrespective of the teams playing (see Table 2). Despite the small sample sizes for some referee nationalities, the large number of parameters already being estimated, and the likely collinearity of these sets of fixed effects with the Iron Curtain relationship indicators, the results were nonetheless qualitatively and quantitatively similar.

TABLE 4: Poisson regression estimates for the number of yellow cards awarded, men’s senior UEFA competitive international football, 2002-2016

	Home yellows (I)	Away yellows		
		(II)	(III)	pre-2010 (IV)
<i>Excluded: home team and ref. from same bloc</i>				
Ref. is comm., home is non-comm	-0.014 (0.848)	0.149 (0.023)	0.104 (0.118)	0.212 (0.038)
Ref. is non-comm., home is comm	0.031 (0.584)	0.002 (0.974)	-0.016 (0.746)	-0.019 (0.751)
<i>Excluded: away team and ref. from same bloc</i>				
Ref. is comm., away is non-comm	0.105 (0.147)	-0.142 (0.017)	-0.112 (0.059)	-0.183 (0.042)
Ref. is non-comm., away is comm	0.007 (0.907)	0.057 (0.257)	0.043 (0.387)	-0.112 (0.059)
Ref. is comm., away is non-comm × att. (1,000s)			0.008 (0.008)	0.003 (0.602)
Elo pred. (1=certain home win)	-0.581 (0.000)	0.533 (0.000)	0.519 (0.000)	0.579 (0.000)
Home value of dependent variable		0.088 (0.000)	0.090 (0.000)	0.060 (0.006)
Away value of dependent variable	0.090 (0.000)			
Constant	1.257 (0.000)	0.510 (0.000)	0.537 (0.000)	0.751 (0.000)
match-up fixed effects	Yes	Yes	Yes	Yes
Pseudo R^2	0.129	0.121	0.122	0.145
N match-ups	478	481	481	315
N matches	1,320	1,325	1,325	733

Notes.- **bold** indicates significance from zero at least at 10% level, two-sided tests, p -values in parentheses, with robust standard errors.

Column (I): Poisson regression estimates of Equation (1), where the dependent variable is the number of yellow cards awarded to the home team

Column (II): Poisson regression estimates of Equation (1), where the dependent variable is the number of yellow cards awarded to the away team

Column (III): adding a stadium attendance (centred) interaction to column (II)

Column (IV): restricting the model from column (III) to matches before 2010

Effects shown are $\exp(\beta) - 1$, where β is the regression model coefficient estimate. They should be interpreted as the (%/100) effect on the number of yellow cards awarded.

Columns (II)-(IV) of Table 5 re-estimate the model from column (II) of Table 4, but respectively using only matches officiated by non-communist referees along with those from either the former Soviet Union, the Balkans (Yugoslavia (SFRY) and Albania), or other post-communist countries (i.e., the Warsaw Pact minus Albania and the Soviet Union). The results show that the out-group bias was markedly greater for former Soviet Union referees than those from the other post-communist countries. The ex-Soviet referees awarded 33% more away yellow cards when the home team was non-communist (p -value=0.014), and 27% fewer away yellow cards when the away team was non-communist (p -value=0.008).

TABLE 5: Poisson regression estimates for the number of yellow cards awarded to the away team, men’s senior UEFA competitive international football, 2002-2016: referees from the former Soviet Union, Yugoslavia+Albania and other communist countries

	All (I)	Ex-Soviet (II)	SFRY+ALB (III)	C-East (IV)	EU Enlarge. (V)
Excluded: home team and ref. from same bloc					
Ref. is comm., home is non-comm	0.149 (0.023)	0.327 (0.014)	0.236 (0.054)	-0.056 (0.574)	0.075 (0.346)
Ref. is non-comm., home is comm	0.002 (0.974)	0.095 (0.283)	-0.091 (0.292)	0.015 (0.805)	-0.011 (0.832)
Excluded: away team and ref. from same bloc					
Ref. is comm., away is non-comm	-0.142 (0.017)	-0.268 (0.008)	0.054 (0.642)	-0.212 (0.030)	-0.164 (0.030)
Ref. is non-comm., away is comm	0.057 (0.257)	0.142 (0.113)	-0.042 (0.638)	0.071 (0.266)	0.046 (0.441)
Elo pred. (1=certain home win)	0.533 (0.000)	0.582 (0.000)	0.548 (0.000)	0.534 (0.000)	0.511 (0.000)
Home yellow cards	0.088 (0.000)	0.102 (0.000)	0.106 (0.000)	0.089 (0.000)	0.084 (0.000)
Constant	0.510 (0.000)	0.361 (0.001)	0.597 (0.000)	0.508 (0.000)	0.549 (0.000)
match-up fixed effects	Yes	Yes	Yes	Yes	Yes
Pseudo R^2	0.129	0.127	0.121	0.127	0.124
N match-ups	478	393	386	419	441
N matches	1,320	1,018	1,011	1,093	1,182

Notes.- **bold** indicates significance from zero at least at 10% level, two-sided tests, p -values in parentheses, with robust standard errors.

Column (I): all post-communist countries included (column (II) of Table 4)

Column (II): only matches with a referee from a former Soviet Union or non-communist country

Column (III): matches with a referee from Albania, Bosnia-Herzegovina, Croatia, North Macedonia, Serbia, Slovenia or a non-communist country

Column (IV): only matches with a referee from Bulgaria, Czech Republic, Hungary, Moldova, Poland, Romania, Slovakia or a non-communist country

Column (V): only matches with a referee from Bulgaria, Czech Republic, Hungary, Poland, Romania, Slovakia, Slovenia, Croatia, Latvia, Lithuania, Estonia (EU Enlargement countries) or a non-communist country.

Effects shown are $exp(\beta) - 1$, where β is the regression model coefficient estimate. They should be interpreted as the (%/100) effect on the number of yellow cards.

To further address the potential heterogeneity over referees in the Iron Curtain relationship effects for the awarding of yellow cards to an away team, we estimate a version of Equation (1) with referee fixed effects, ψ_k , instead of match-up fixed effects:

$$E[y_i|z_i, \mathbf{x}_i, \psi_{K(i)}] = F(z_i, \mathbf{x}_i, \psi_{K(i)}; \boldsymbol{\beta}), \quad (2)$$

where $K(i)$ is an indicator function that match i was assigned to referee K . We estimate Equation (2) for separate nationality groups of referees, which allows us to indicate with $z_i \in \{1, 0, -1\}$ whether the home and/or away teams were from the other side of the Iron Curtain to the referee’s nationality. z_i is equal to 1 (-1) when only the home (away) team is from the other side of the Curtain, and is 0 otherwise. A positive coefficient for this variable would suggest out-group favouritism. From the wider set described earlier, we only include significant control variables in \mathbf{x}_i , which are again the Elo predicted match result probability and the number of home yellow cards awarded.¹³ Due to the relatively small sample sizes of matches in the groups of referee nationalities, we cannot reliably control for both match-up and referee fixed effects together. The results in Table 6 confirm that there is no significant average out-group bias among referees from non-communist countries. They also show that, after controlling for fixed referee heterogeneity, only the referees from the former Soviet Union countries showed a marginally significant tendency to favour countries from the other side of the Iron Curtain (p -value=0.098).¹⁴ However, we prefer the model results presented earlier, which can better address the high likelihood that some international football match-ups had characteristics that affected UEFA’s choices of which referees to assign.

¹³As for the match-up models, we find no significant evidence of bias in the awarding of yellow cards to the home team using this model specification, across all considered nationality groups of referees, and so we only show results for away yellow cards.

¹⁴Motivated by the circumstances of the anecdote in the Introduction, we also considered an anti-Russian bias effect in Equation (2). The estimated effect was large, positive and significant only for the “C-East” grouping, consistent with the anecdote. But on closer inspection, it identified over just two matches in the estimation sample involving Russia and referees from the C-East countries, so we do not take this seriously.

TABLE 6: Poison regression estimates for the number of yellow cards awarded to the away team, men's senior UEFA competitive international football, 2002-2016: models with referee fixed effects

	All non-comm. (I)	All post-comm. (II)	Ex-Soviet (III)	SFRY+ALB (IV)	C-East (V)	EU Enlarge. (VI)
Iron Curtain out-group [†]	-0.038 (0.194)	0.048 (0.316)	0.137 (0.098)	-0.042 (0.615)	0.096 (0.307)	0.033 (0.587)
Elo pred. (1=certain home win)	0.627 (0.000)	0.574 (0.000)	1.078 (0.001)	0.601 (0.090)	0.372 (0.140)	0.565 (0.005)
Home yellow cards	0.120 (0.000)	0.130 (0.000)	0.125 (0.000)	0.106 (0.105)	0.079 (0.095)	0.100 (0.011)
Constant	0.388 (0.000)	0.325 (0.000)	-0.074 (0.735)	0.533 (0.038)	0.442 (0.031)	0.363 (0.021)
Referee fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Pseudo R^2	0.075	0.071	0.077	0.048	0.083	0.073
N referees	158	54	18	11	25	36
N matches	1,049	312	86	85	141	216

Notes.- **bold** indicates significance from zero at least at 10% level, two-sided tests, p -values in parentheses, with robust standard errors.

[†] Iron Curtain out-group: =1 if the home team is from the opposite side of the Curtain to the referee; =-1 if vice versa; =0 if both teams are from the same side of the Iron Curtain. Column (I): only referees from non-communist countries

Column (II): all post-communist countries

Column (III): only matches with a referee from a former Soviet Union country

Column (IV): matches with a referee from Albania, Bosnia-Herzegovina, Croatia, North Macedonia, Serbia or Slovenia

Column (V): only matches with a referee from Bulgaria, Czech Republic, Hungary, Moldova, Poland, Romania or Slovakia

Column (VI): only matches with a referee from Bulgaria, Czech Republic, Hungary, Poland, Romania, Slovakia, Slovenia, Croatia, Latvia, Lithuania, or Estonia (EU Enlargement countries).

Effects shown are $exp(\beta) - 1$, where β is the regression model coefficient estimate. They should be interpreted as the (%/100) effect on the number of yellow cards.

6 Conclusion

In this paper, we asked whether the decision making of referees in the past two decades of European international football matches was biased by the legacy of the Cold War. By exploiting how referees with different nationalities were assigned to matches, we found evidence of significant out-group bias among post-communist referees, who particularly favoured non-communist teams in the number of yellow cards awarded to away teams. There was also some weaker evidence of this bias in the awarding of red cards, but not for the awarding of penalties or for final match outcomes. These results are consistent with the notion that referees who grew up in communist states have since developed a relative affinity toward countries on the other side of the Iron Curtain and their football teams, which subsequently affected the less important decisions that they made during a match. We found that this bias was stronger in the earlier matches we studied and among referees from the former Soviet Union compared with those from other post-communist states. There was no evidence of an equivalent out-group bias among referees from non-communist states.

One caveat to these findings is that we cannot be overly confident that referee bias is the only factor at play. Our methodology does not address the possibility that the playing style of teams, the behaviour of players, and the decisions of managers, could all be endogenous to the assignment of a referee to a match-up. Unfortunately, we don't have measures of player aggressiveness, for example, that would allow us to address this issue. However, this is a common concern in the literature that prescribes changes or differences in the punishments of teams to referee bias. More research and better data are needed, to control for any changes in the behaviour of all the other agents involved in a sporting event, thus getting even more robust estimates of the nature and magnitude of referee bias.

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