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Social pressure in football matches: An event study of "Remote Matches" in Japan *

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Abstract

We examine the effect of social pressure on the outcomes of football matches by assessing those matches that did not have spectators as a result of the COVID-19 pandemic. From the results of 768 matches with 43 unattended matches in Japan's top two divisions for the 2020 season, we find significant evidence of referee bias due to social pressure by the home team's supporters. With spectators in the stadium, the number of fouls awarded to home teams decreases significantly by about 1.05. In addition, we find that the absolute number of spectators is more dominant as a cause of referee bias than the share of the home team's supporters in the stadium, by estimating a model that considers the restricted stadium capacity amid the pandemic.

Keywords: Social pressure, football, COVID-19, natural experiment, no spectators.

JEL classification: C90, D91, L83, Z20.

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1 Introduction

Economics has been concerned with exploring behavior under social pressure since the pioneering work of Akerlof (1980). As one strand of the literature, some studies have reported that the social pressure of spectators may affect match outcomes in professional sports (e.g., Garicano et al., 2005; Dohmen, 2008; Pettersson-Lidbom and Priks, 2010; Dohmen and Sauermann, 2015). The key to identifying social pressure in sports matches is to exploit a situation where spectators are exogenously removed. The ongoing COVID-19 pandemic is a natural experiment that provides us with an exogenous, as well as not one-off, situation where no spectators can watch the match in the stadium unexpectedly. In this paper, we contribute to the literature by using the data for the 2020 season in the top two divisions of Japanese professional football league (the J1 and J2 leagues) during the COVID-19 pandemic. In the 2020 season, 43 out of 768 games (5.6% of all games) were played without spectators, meaning that an average of 21,000 spectators per match in J1 and 7,000 spectators per game in J2, referring to the 2019 season, were disappeared in the stadium during this period. By taking advantage of this unprecedented situation, we examine whether the match outcomes are affected by social pressure of spectators.

We estimate the difference-in-differences regression to access the effect of social pressure on the outcomes in the football match. The main findings are as follows. With spectators in the matches, the number of fouls awarded to home team significantly decreases by about 1.05, while the number of yellow cards received by home team seems to be unaffected. Moreover, we conduct the additional analyses by exploiting the detailed information about attendance cap in the matches after the pandemic. Then, we find evidence that the number of spectators in the stadium is more important than the percentage of spectators in determining the referee bias by social pressure. Our evidence supports, at least for fouls, the referee bias stemming from social pressure by spectators, as in consistent with the literature.

Many studies address the issues on the social pressure in the football match by regarding the COVID-19 pandemic as a natural experiment (e.g.,McCarrick et al., 2020; Ferraresi and Gucciardi, 2020; Endrich and Gesche, 2020; Cueva, 2020; Bryson et al., 2021; Scoppa, 2021). Our results basically compliment those in the literature by using the Japanese data. The salient difference between this paper and the previous studies is to explore the source of referee bias in the matches. We use the information on the detailed difference in the attendance cap in the matches during 2020 season and examine a main source of the referee bias: the absolute number of spectators or the share of home team's supporters in the stadium. Endrich and Gesche (2020) also argue the effect of presence of away team's supporter on the referee bias, but we believe our analysis advances theirs by exploiting more precise information regarding audience cap.

2 Data

We use the data only from the 2020 season of J1 and J2 League, the top two divisions of the Japan's professional football league. This is because the use of between-season may allow factors rather than social pressure to compound the match outcomes, as noted in Bryson et al. (2021). For example, some teams got promoted (relegated) to the upper (lower) division from 2019 to 2020 and the video assistant referees were newly introduced in 2021 season. There are 768 games, with 18 teams playing against 17 teams twice in J1 and 22 teams playing against 21 teams twice in J2. The season started in February and ended in December but was suspended until June due to the spread of COVID-19, after the first section in late February was held as usual. The matches resumed on July 4 for J1 and June 27 for J2, but were held without spectators, along with the next section in early July. In the J league, a match without spectators is named as "Remote Match". Some restrictions were relaxed after July 10, allowing a maximum of 5,000 people or 50% of the stadium capacity, but three games were still played without spectators due to the infectious status in the area where the games were held.[1] Overall, 43 out of 768 matches are categorized into "Remote Match" in our benchmark analysis.

Table 1 summarizes the means and standard deviations of fouls and yellow cards, by home and away and with and without spectators. We only focus on fouls and yellow cards as the match outcomes to access the referee bias. The number of red cards might be also considered as another measure for the bias, but that is at most one per match, so

[1]The matches held in Okinawa, located south of Japan, on August 12, 19, and 29 were without spectators due to the infection situation in the area.

we judge it unsuitable as a dependent variable in the linear regression. The numbers of fouls and yellow cards in Table 1 indicate those awarded to the team by the referee. For each value, we also test for a statistically significant difference between with and without spectators by home and away, according to the Student's t-test. The data are all collected from the J. League Official Site (https://www.jleague.jp/) and the J. League Data Site (https://data.j-league.or.jp/SFTP01/).

Table 1 indicates that although not significant, home teams tended to be called for fouls fewer than away team in the matches with spectators, while the result is reversed in the remote match. Also, we confirm that home team received yellow cards fewer significantly than away team in the matches with spectator. The findings from these raw data vaguely suggest that social pressure from the home team's supporters induces the referee to make decisions in favor of the home team, but the difference between columns (c) and (f) (i.e., difference-in-differences) corresponds to the effect of social pressure by spectators on the referee decisions. Hence, we perform the formal difference-in-differences regression to assess its effect statistically in the next section.

Table 1: Sample means of outcome variables and their differences in the matches with and without spectators

	w/ spectator			w/o spectator (Remote)		
	Home	Away	Diff.	Home	Away	Diff.
	(a)	(b)	(c)	(d)	(e)	(f)
Fouls	12.257	12.274	−0.018	12.209	11.465	0.744
	[3.988]	[4.132]	[4.063]	[3.973]	[3.680]	[3.829]
Yellow cards	0.946	1.048	−0.1021*	0.977	1.047	−0.070
	[0.994]	[1.043]	[1.019]	[0.859]	[1.234]	[1.063]
# of matches		725			43	

Notes: This table summarizes the average number of outcome variables and their standard deviations, by home and away and with and without spectators. The values in square brackets indicate the standard deviation. The 1%, 5% and 10% significant levels against the null hypothesis of no difference between home and away spectators are denoted by $***$, $**$ and $*$, respectively.

3 Empirical analysis

3.1 Model

We use the difference-in-differences regression with control variables to examine the effect of social pressure of spectators, proceeding from the direct access to raw data above. Our model can be described as:

$$y_{i,m} = \alpha + \beta_1 Home_{i,m} + \beta_2 Spectators_m + \beta_3 Home_{i,m} \times Spectators_m + \gamma Controls_m + u_{i,m}, \tag{1}$$

where $y_{i,m}$ is an outcome variable for team i in match m. Note that each match is counted twice, once from the perspective of the home team and once from the perspective of the away team (see Garicano et al., 2005; Ponzo and Scoppa, 2016; Endrich and Gesche, 2020), so that we cluster standard errors on the match level. The variables $Home_{i,m}$ and $Spectators_m$ are indicators for the home team and for the matches with the spectators, respectively. In this specification, the outcomes of the away team in the remote match are regarded as the control group, and thereby interpreting β_1 as the gap of the outcome between the control group and the home match without spectators; β_2 as the gap between the control and the away matches with spectators; and β_3 as the treatment effect of most interest to us. Equivalently, the coefficient β_3 represents home advantage effect stemmed from playing the matches in front of spectators (see Pettersson-Lidbom and Priks, 2010). As for the $Controls_m$, we follow Bryson et al. (2021) and add a fixed effect for each team i, opponent dummies, referee dummies, and the number of spectators. The opponent dummy is assigned to each opponent which plays against the team i in the match m, and the referee dummy is assigned to all 40 referees. We also add the number of fouls in the control when the dependent variable is yellow cards.

3.2 Estimated Results

Table 2 shows the estimated coefficients on equation (1). The estimation results of the model with and without control variables are displayed in the first and third columns (1a and 2a) and in the second and fourth columns (1b and 2b), respectively. The signs and approximate magnitude on the coefficients are all the same across the specifications, but the estimates tend to be significant with control variables. Hence, we discuss on the results with control variable below.

Column 1a in Table 2 presents the result for the number of fouls. The coefficient β_1 indicates that the home teams were issued by 1.012 more fouls in the remote matches than the away teams, while the estimate for Remote (β_2) indicates that fouls awarded to the away teams are significantly increased by 1.391 in the matches in front of spectators compared with the remote matches. Most importantly, the treatment effect β_3 is estimated to be -1.046, meaning that the presence of spectators in the stadium causes the home team to be called for 1.046 fewer fouls. This estimate is likely to support the referee bias for home teams stemming from social pressure. As for the result for yellow cards in column 2a, we find that home teams received 0.147 yellow cards fewer significantly than away teams when no spectators were in the stadium. However, the coefficients on spectator dummy and the interaction term are not significantly estimated.

In sum, our empirical evidence supports the existence of social pressure from spectators in Japan's professional football league. The referees issue fouls more against the home teams and fewer against away teams in remote matches compared with the matches with spectators.

Table 2: Effect of Remote Matches on match outcomes

	Fouls		Yellow cards	
	(1a)	(1b)	(2a)	(2b)
Home (β_1)	1.012*	0.744	−0.147**	−0.133
	(0.594)	(0.704)	(0.233)	(0.225)
Spectators (β_2)	1.391***	0.809	−0.034	−0.066
	(0.419)	(0.576)	(0.181)	(0.187)
Home× Spectators (β_3)	−1.046*	−0.762	0.048	0.032
	(0.623)	(0.732)	(0.240)	(0.231)
Fouls			0.071***	0.084***
			(0.008)	(0.007)
Controls	yes	no	yes	no
R^2	0.368	0.001	0.228	0.114
Obs. (# of Remote)	1536 (86)	1536 (86)	1536 (86)	1536 (86)

Notes: This table shows the OLS estimates with the robust standard error clustered on the match level in round brackets. The 1%, 5% and 10% significant levels are denoted by $***$, $**$ and $*$, respectively.

3.3 Subdivision of the matches with spectators

In the analysis above, all the matches except for the remote matches are categorized into the match with spectators. However, apart from the first section before the COVID-19 outbreak, there were some attendance limits even though the matches were not completely remote matches. To be concrete, after the second and third sections held without spectators, the attendance cap was set to be 30% of the stadium capacity or 5000, whichever is larger, until September 30. Then, after a transition period until October 30, the attendance limit was relaxed to 50% of the stadium capacity after October 30. In addition, after October 30, the installation of the seats for the supporters of away team became mandatory. Based on the strength of these attendance limits, we subdivide the match with spectators into three groups: Pre_Covid, $\text{Limit}^{\leq 30\%}$, and $\text{Limit}^{\leq 50\%}$. Notably, the comparison with $\text{Limit}^{\leq 30\%}$ and $\text{Limit}^{\leq 50\%}$ period allows us to reveal which of the share of home team supporting spectators or the absolute number of spectators is the more important factor in causing social pressure on the referee decision. A small number of spectators, who all support the home team, ware in the stadium during Limit$^{\leq 30\%}$ period, while, during Limit$^{\leq 50\%}$ period, the number of spectators has increased, but the share of spectators supporting the home team decreased due to the installation of seats for supporters of the away team. Hence, we can interpret that the ratio between β_6 and β_7 represents the relative importance of the share of home team supporters on the referee's decision with the absolute number of spectators in the stadium.

The model can be rewritten as follows:

$$
\begin{aligned}
y_{i,m} = \alpha + &\beta_1 Home_{i,m} + \beta_2 Pre\_COVID_m + \beta_3 Limit_m^{30\%} + \beta_4 Limit_m^{50\%} \\
&+ \beta_5 Home_{i,m} \times Pre\_COVID_m + \beta_6 Home_{i,m} \times Limit_m^{30\%} \\
&+ \beta_7 Home_{i,m} \times Limit_m^{50\%} + \gamma Controls_m + u_{i,m},
\end{aligned}
\tag{2}
$$

where Pre_Covid, Limit$^{\leq 30\%}$, and Limit$^{\leq 50\%}$ are the indicator variables which take one for the matches held before COVID-19 outbreak, after the fourth section until October 30, and after October 30, respectively.

In this specification, the control group is the outcomes of the away team in the remote match, as in the benchmark, and the coefficient on each interaction term represents the treatment effect on the match outcomes of home teams in matches with no attendance cap (β_5), tight restriction (β_6), relaxed restriction (β_7), respectively. In other words, the estimates of β_5 to β_7 reflect the extent to which the difference in the number of spectators affects the home team's match outcomes. Hence, our interest centers on the values of these interaction terms in this subsection.

Table 3 shows the estimated results for equation (2). The results for fouls (yellow cards) with and without control variables are, respectively, displayed in column 1a (2a) and 1b (2b). First, we cannot find a significant effect of remote matches on the number of fouls and yellow cards in the specification without the control variables. Hence, as in the benchmark, we treat the specification in columns 1a and 2a as preferred ones in the sense of inclusion of potential confounders as the control variables.

Column 1a in Table 3 presents the result for the number of fouls received. As discussed above, we focus on the estimates β_5 through β_7 because of these representing the spectator effect on home team caused by the difference in attendance limit. The point estimate of β_5

is 0.117, but it is not statistically significant, due to the small number of matches before the COVID-19 epidemic in the sample. The estimate β_6 is -0.755 with not statistically significant while the parameter β_7 is estimated to be -1.384 with 5% significant level. Judging from the comparison between β_6 and β_7, we can conclude that the number of spectators is more important than the percentage of spectators. This is because the referees' decisions were more likely to be in favor of the home team in a match with a large number of home team supporter spectator along with fewer away team supporters than in a match only with a small number of home team supporters in the stadium. We also attempt the difference-in-differences regressions for the number of yellow cards, but the coefficients of interest are all not significantly estimated, as seen in column 2a in Table 3. This suggests that spectators' pressure has not affected the yellow card decision.

Table 3: Effect of Remote Matches on match outcomes

	Fouls		Yellow cards	
	(1a)	(1b)	(2a)	(2b)
Home (β_1)	0.900	0.775	−0.171	−0.190
	(0.610)	(0.728)	(0.248)	(0.240)
Pre_COVID (β_2)	−0.575	−1.050	−0.187	−0.012
	(0.834)	(0.870)	(0.371)	(0.330)
Limit$^{\leq 30\%}$ (β_3)	1.015**	0.691	−0.096	−0.100
	(0.426)	(0.612)	(0.193)	(0.199)
Limit$^{\leq 50\%}$ (β_4)	1.582***	0.930	−0.163	−0.156
	(0.493)	(0.637)	(0.202)	(0.204)
Home × Pre_COVID (β_5)	0.117	−0.375	−0.423	−0.394
	(1.160)	(1.387)	(0.420)	(0.393)
Home × Limit$^{\leq 30\%}$ (β_6)	−0.755	−0.561	0.097	0.116
	(0.650)	(0.768)	(0.256)	(0.247)
Home × Limit$^{\leq 50\%}$ (β_7)	−1.384**	−1.331	0.064	0.084
	(0.694)	(0.814)	(0.263)	(0.255)
Fouls			0.071***	0.084***
			(0.008)	(0.007)
Controls	yes	no	yes	no
R^2	0.372	0.007	0.232	0.117
Obs.	1536	1536	1536	1536

Notes: This table shows the OLS estimates with the robust standard error clustered on the match level in round brackets. The 1%, 5% and 10% significant levels are denoted by ∗∗∗, ∗∗ and ∗, respectively.

4 Conclusion

By regarding the Remote Matches in Japan as a natural experiment, we have investigated whether the presence of spectators affects the referee's decisions in the football matches. As a salient feature of this study, we exploit the detailed information of audience limits during the pandemic and uncover the possible source of referee bias: the absolute number of the home team's supporters or the share of the home team's supporters in the stadium.

Our benchmark results are consistent with the findings in the literature, presenting that the number of fouls for the home teams becomes fewer in the matches with spectators. Our evidence also shows that the number of home team's supporters may be a possible source of referee bias, such that fewer fouls are issued against the home team in the matches with spectators.

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