Behavior under Social Pressure: Empty Italian Stadiums and Referee Bias

Per Pettersson-Lidbom[a] and Mikael Priks[bc*]

April 11, 2010

Abstract

Due to tightened safety regulation, some Italian soccer teams had to temporarily play home matches in empty stadiums in 2007. We exploit this event and find that referees exhibited home bias caused by social pressure when spectators were present.

Key words: Social Pressure, Natural Experiments, Referee Bias
JEL Codes: D8, J2

1. Introduction

People experience social pressure in one form or another. But it is typically very difficult to empirically quantify this effect. The contribution of this paper is to provide such evidence using a natural experiment from the Italian soccer league. We use a unique source of exogenous variation in the number of spectators due the drastic tightening of safety requirement in the stadiums following a hooligan incident in Sicily.

We find surprisingly large and significant effects that the home teams are favored in games with spectators compared to games without spectators. Depending on the type of punishment, the bias effects are in the order of 20 to 70 percent. We find no evidence for the hypothesis that home and away players have asymmetric behavioral responses due to social

[a] Stockholm University, Sweden
[b] Stockholm University, Sweden
[c] CESifo, Germany
[*] Corresponding Author. Department of Economics, Stockholm University, S-106 91 Stockholm, Sweden, e-mail: mikael.priks@ne.su.se, Tel.: +46 8 161351; fax: +46 8 159482.

pressure from the crowd. Our results therefore suggest that the effect from social pressure stems from the behavior of the referee rather than the players.[1]

2. Data and empirical framework

On February 2, 2007, supporters from the Italian football clubs Calcio Catania and Palermo Calcio clashed with each other and the police in Catania in serious acts of hooligan violence. Following the riots, the Italian government forced teams with stadiums having deficient safety standards to play their home games without spectators.[2] We will use the drastically tightened regulation as an exogenous variation in the number of spectators to evaluate the hypothesis that referees may be biased due to social pressure.

We use data from Serie A and Serie B for the season 2006/2007 up to the point where all teams apart from Catania played in front of spectators again. The season consists of altogether 842 games. Excluding the Catania games, 21 games have been played without spectators.[3]

Referees control the games by having the possibility to adjudicate fouls, yellow cards, and red cards. Committing a foul implies that the opposing team gets possession of the ball. If one player receives two yellow cards, or one instant red card, then he is sent off the pitch. 41 different individuals have refereed the games in the two leagues.[4] Apart from the referee, there are two linesmen and one fourth referee in each game. However, they cannot make binding decisions, and the linesmen are only rarely involved in the decision variables that we are interested in. The fourth referee has an administrative duty.

The data is obtained from the Italian newspaper La Gazzetta dello Sport's home page. Because the number of fouls per game differs across sources, we also use data on fouls from the home page of the broadcasting network ESPN.

To test whether referees are biased due to social pressure we construct the following specification. Let Y_{ij} denote referee *i*'s behavior in game *j* (fouls, yellow cards, and red cards) and let X be an indicator variable for if the game was played without spectators. Then, the average change in the behavior of referees' toward the home team in games with and without spectators is

$$\beta^{Home}=\mathrm{E}[Y \mid X=0, Home=1] - \mathrm{E}[Y \mid X=1, \mathrm{Home}=1],$$

where Home is an indicator variable. The average change in the behavior of referees' toward the away team in games with and without spectators is

$$\beta^{Away}=\mathrm{E}[Y \mid X=0, Home=0] - \mathrm{E}[Y \mid X=1, Home=0].$$

The bias of a referee is defined as $\beta^{Bias} = \beta^{Home} - \beta^{Away}$ since we argue that one must take into account the behavioral response of a referee towards *both* the home team and the away

[1] The results are related to Price and Wolfers (2007) who find evidence of racial discrimination among NBA referees. The paper is also related to Garicano et al. (2005) who show that soccer referees systematically favor the home team by shortening close games where the home team is ahead, and lengthening close games where the home team is behind (see also Sutter and Kocher 2004, Scoppa 2007 and Dohmen 2008).

[2] This was the only reason for the regulation and there is no clear relationship between teams that were affected by the regulation and those that were not. For example, when comparing the final outcome of the position in the league in the previous season the teams failing to meet the standards were similar to the other teams.

[3] Because the hooligan event took place in Catania, Calcio Catania had to play all of its home fixtures at a neutral venue and most games without spectators. Since the hooligan event may be correlated with the club's outcomes, we exclude this club's home games without spectators from our analysis. However, our results are not affected qualitatively by the inclusion of these games.

[4] The referees are highly paid (earning 35 000 to 70 000 euro per year plus 2000 to 3500 euro per game), highly skilled and they work under exceptional scrutiny.

team in games with and without spectators in order to test whether the referee is biased or not. An equivalent way of stating the identification strategy is to express it in the form of a regression model, i.e.,

$$(1) \qquad Y_{ij} = \alpha + \theta Home_{ij} + \lambda X_{ij} + \beta X_{ij} \times Home_{ij} + v_{ij},$$

where *Home* is again an indicator for the home team. In other words, this is a difference-in-difference set up since it consists of a group fixed effect, *Home*, a treatment indicator X_{ij} (i.e., absence of spectators) and an interaction between the treatment indicator and the group effect.[5] The coefficient associated with the bias of the referee is β since $\beta = \beta^{Home} - \beta^{Away}$. The identifying assumption is therefore that $E[v| X \times Home]=0$. Thus, this difference-in difference design allows the outcome Y_{ij} to differ systematically between the home team and away team due to the inclusion of the group fixed effect. The outcome Y_{ij} is also allowed to differ in games with and without spectators due to the inclusion of X_{ij}. The identifying assumption is therefore that any remaining variation in the outcome after controlling for a group fixed effect and a treatment effect can be attributed the behavior of the referee.

The largest threat to the identifying assumption is if it is plausible to assume that players of the home and away team are similarly affected in games without spectators. If home and away players are differently affected in these games, then this would mean that the estimate of β would reflect the combined change in behavior of both referees and players in games without spectators.

One way of empirically assessing the plausibility of the identifying assumption, $E[v|X \times Home]=0$, is to estimate β on a number of different outcomes of players such tackle success rate. In other words, since we have argued that the estimate of β should reflect the behavior of the referee rather than behavior of the players we could use outcomes of players and estimate equation (1) to test whether home and away players are affected differently in games without spectators. If we cannot reject that β is significantly different from zero, then this would lend credibility to the identifying assumption.

Another way of addressing whether the estimate of β is likely to be biased is to add a number of confounding factors and to see to what extend the estimated effect is affected. If it is insensitive, then this will lend more credibility to the identifying assumption.[6] We will include a full set of referee fixed effects (there are 41 referees) and a full set of team fixed effects (there are 20 teams in Serie A and 22 teams in Serie B). The referee fixed effects and team fixed effects will also be allowed to differ between the home and away teams.[7] It is important to note that the parameter β is identified *only* by the within referee variation when we include referee fixed effects. In other words, we compare the behavior of the *same* referee when he is a referee in a game with no spectators compared to a game with many thousands of spectators.[8]

3. Results

In this section we provide evidence on the behavior of Italian referees. Before presenting the results from the regressions, Table 1 displays the averages for the three outcomes: number of fouls (panel A), number of yellow cards (panel B), and the number of red cards (panel C), in the games played *with* spectators (column 1) and in the games played *without* spectators

[5] See Meyer (1995) for a discussion of identifying assumptions in these types of difference-in-difference models.
[6] See, for example, Altonji et al. (2005) for a discussion of this approach.
[7] This is the same as running two separate regressions for the home and away team.
[8] The average number of spectators is 19,551 in Serie A and 8,250 in Serie B.

(column 2). The outcomes are further divided into outcomes for home team (rows a, c and e) and away team (rows b, d and f), respectively. Table 1 shows some intriguing results. First, the home team is punished *less* harshly than the away team across all outcomes in games with spectators (e.g. compare row (a) and (b) in column 1). In contrast, the home team is punished *more* harshly than the away team across all outcomes in games without spectators (e.g. compare row (a) and (b) in column 2). Consequently, there is clear evidence that the referee is biased: the estimate for the number of fouls is 3.96 (i.e., $\hat{\beta}^{Bias} = \hat{\beta}^{Home} - \hat{\beta}^{Away}$ =1.17-(-2.79)), the estimate for the number of yellow cards is 0.63 (i.e., -0.5-(-1.13)), and the estimate for the number of red cards is 0.086 (i.e., -0.041-(-0.127)). These effects are quite substantial: the estimated bias effect is 23 percent for fouls since the average number of fouls is 19 per team and game. Similarly, the estimated referee bias effect is 26 percent effect for yellow cards, and 70 percent for red cards (i.e., the average number of yellow and red cards is 2.62 and 0.11, respectively).

Table 2 shows the results from the regression approach. Panel A shows the results for the number of fouls, Panel B shows the results for the number of yellow cards, and Panel C shows the results for the number of red cards. Column 1 shows the results without any additional control variables except for the two indicator variables, which makes these results identical to those displayed in Table 1. As can bee seen in all three tables, the estimated bias effect is statistically significant for all the outcomes in Column 1.[9]

We add referee fixed effects interacted with the indicator variable for being the home team in Column 2. In Column 3, we also include a full set of controls for individual teams, both when playing home and away. These fixed team effects are also interacted with the indicator for being a home team. The point estimates of the bias effect are strikingly unaffected (the standard errors are of course becoming larger when adding more control variables). Thus, this lends credibility to that the estimated effect is caused by the behavior of the referee rather than the behavior of individual teams.[10]

Finally, we test whether home and away players are affected differently in games with and without spectators by estimating equation (1) on a number of outcomes of players. Table 3 shows the results from the following six outcomes: number of shots on target (Column 1), number of shots off target (Column 2), number of tackles (Column 3), tackle success rate (Column 4), passing accuracy rate (Column 5), and ball possession (Column 6).[11] There is no indication that the players are differently affected in games with and without spectators. Hence, this lends strong support to that the referees, rather then the players, are affected by social pressure.[12]

4. Conclusions

Soccer referees are supposed to be neutral. Yet, we find evidence that Italian referees change their behavior significantly in games played without spectators. The evidence we provide is consistent with the idea that individuals are likely to change their behavior under influence of social pressure. We test a number of outcomes of home and away players and

[9] The standard errors are clustered at the level of the referees. Clustering the standard errors at the level of the teams yields similar results.

[10] In the working paper version (Pettersson-Lidbom and Priks 2007), we study serie A and serie B separately. As expected, since there are approximately twice as many spectators in serie A compared to serie B, the referee bias effect is also about twice as large.

[11] The data on the number of shots on and off target is taken from the Italian newspaper La Gazzetta dello Sport's home page and the other players' outcomes are taken from Eurosport's home page. La Gazzetta dello Sport has data both from Serie A and Serie B while Eurosport only reports data from Serie A.

[12] As an alternative robustness check, we control for the players' outcomes in the regressions and this does not affect the results.

find no evidence for that they are affected differently by pressure from the spectators. This strongly suggests that it is the referee that changes his behavior in games without spectators rather than the players.

Acknowledgements

We thank an anonymous referee, Robin Boadway, Ethan Kaplan, Torsten Persson, and numerous seminar participants for useful comments.

References

Altonji, J.G., Elder, T.E., and Taber C.R., 2005. Selection on Observed and Unobserved: Assessing the Effectiveness of Catholic Schools. Journal of Political Economy 113, 151-184.
Dohmen T. J., 2008. The Influence of Social Forces: Evidence from the Behavior of Football Referees. Economic Inquiry 46, 411-424.
ESPN, http://soccernet-assets.espn.go.com, accessed June 1, 2007.
Garicano, L., Palacios-Huerta, I., Prendergast, C., 2005. Favoritism under Social Pressure. Review of Economics and Statistics 87, 208-216.
La Gazzetta dello Sport, www.gazzetta.it/Calcio/, accessed June 1, 2007.
Meyer, B.D., 1995. Natural and Quasi-Experiments in Economics. Journal of Business and Economic Statistics 13, 151-161.
Price, J., Wolfers J., 2007. Racial Discrimination among NBA Referees. Forthcoming, Quarterly Journal of Economics.
Pettersson-Lidbom P., Priks M., 2007. Behavior under Social Pressure:
Empty Italian Stadiums and Referee Bias CESifo Working Paper No. 1960.
Scoppa, V., 2007. Are Subjective Evaluations Biased by Social Factors or Connections? An Econometric Analysis of Soccer Referee Decisions. Empirical Economics 1, 123-140.
Sutter M., Kocher M.G., 2004. Favoritism of Agents – The Case of Referees' Home Bias. Journal of Economic Psychology 25, 461-469.

Table 1.
The behavior of referees in games with and without spectators

	Games with spectators (1)	Games without spectators (2)	Difference (2)-(1)
	Panel A: Number of fouls		
Home team (a)	19.26	20.43	1.17
	(0.26)	(0.87)	(0.85)
Away team (b)	19.41	16.62	-2.79
	(0.26)	(0.88)	(0.81)
Difference (a)-(b)	-0.15	3.81	3.96
	(0.26)	(1.10)	(0.99)
	Panel B: Number of yellow cards		
Home team (c)	2.45	1.95	-0.50
	(0.61)	(0.17)	(0.23)
Away team (d)	2.84	1.71	-1.13
	(0.69)	(0.21)	(0.17)
Difference (c)-(d)	-0.39	0.24	0.63
	(0.08)	(0.31)	(0.31)
	Panel C: Number of red cards		
Home team (e)	0.089	0.048	-0.041
	(0.012)	(0.048)	(0.048)
Away team (f)	0.127	0	-0.127
	(0.015)	(0)	(0.015)
Difference (e)-(f)	-0.038	0.048	0.086
	(0.019)	(0.05)	(0.048)

Note: Standard errors are in parentheses.

Table 2.
Regression estimates of the referee bias effect

	Panel A: Number of fouls		
Referee bias effect	3.96***	4.36***	4.56***
	(0.99)	(1.01)	(1.12)
	Panel B: Number of yellow cards		
Referee bias effect	0.63**	0.68**	0.61
	(0.31)	(0.32)	(0.39)
	Panel C: Number of red cards		
Referee bias effect	0.085*	0.068	0.078
	(0.049)	(0.064)	(0.092)
Referee fixed effects	No	Yes	Yes
Team fixed effects	No	No	Yes

Note: Standard errors clustered at the level of referee. Each entry is a separate regression. The number of observations is 1156 in Panel A, 1164 in panel B and 1164 in panel C. * Significant at the 10 percent level, ** Significant at the 5 percent level, *** Significant at the 1 percent level.

Table 3.
Estimates of the behavioral response of players

	Number of shots on target	Number of shots off target	Number of tackles	Tackle success %	Passing accuracy %	Ball possession %
	(1)	(2)	(3)	(4)	(5)	(6)
Referee bias effect	-0.44	-0.43	2.77	4.96	-3.29	2.16
	(0.40)	(0.58)	(4.66)	(6.44)	(3.06)	(3.71)
R^2	0.0545	0.0278	0.0097	0.0051	0.0096	0.0061
Observations	1160	1160	546	546	546	546

Note: Standard errors clustered at the level of referee. The data on the number of shots on and off target is taken from the Italian newspaper La Gazzetta dello Sport's home page and the other players' outcomes are taken from Eurosport's home page. Eurosport only reports data from Serie A, while La Gazzetta dello Sport has data both from Series A and B. * Significant at the 10 percent level, ** Significant at the 5 percent level, *** Significant at the 1 percent level.