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Social pressure and home bias in football: evidence from Italy

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Abstract

In this paper, we follow an Instrumental Variable (IV) estimation strategy to assess the impact of crowd effects on the outcomes of the Italian Serie A matches. We use weather conditions to instrument for crowd attendance. We verify the validity of our identification strategy by taking advantage of matches played during the COVID-19 outbreak in Italy. We find that crowd effects have a positive impact on the home team performance.

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1 Introduction

Home advantage in sports is a well-documented fact.[1] It could be defined as "the tendency for home teams in (sport) competitions to win more than half of games played under a balanced home and away scheduled"(Courneya and Carron, 1991).

The causes of home advantage are still debated. Four factors seem to have a significant role: (i) crowd effects, (ii) travel effects, (iii) familiarity conditions, and (iv) referee bias.[2]

This paper aims to assess the relevance of the crowd effects in explaining the home advantage in Serie A, the top professional league competition for football clubs in Italy.

Crowd support represents one of the most intuitive factors of football teams' performances. From one side, performing in front of a supportive audience could increase the players' motivation (Ponzo and Scoppa, 2018). On the other side, the high level of pressure that friendly spectators induce could be associated with low performances, leading to the so-called "choking under pressure" effect (Sanders and Walia, 2012). Choking under pressure has been defined as an anxious desire to perform at a high level in a competitive environment (Cao et al., 2011; Ferraresi and Gucciardi, 2021). In such cases, the friendly audience could become a foe for the performances.

Overall, the empirical evidence about the relationship between crowd effects and home team performances is mixing (Pollard, 2008). Belchior (2020) and Ponzo and Scoppa (2018) found that increasing crowd attendance improves outcomes in football, while Ferraresi and Gucciardi (2021) found adverse effects supporting the choking under pressure hypothesis. Finally, Braga and Guillén (2012) showed that the crowd does not affect team performances.

We contribute to this debate by implementing an Instrumental Variable (IV) strategy to assess the impact of crowd effects on match outcomes. The COVID-19 outbreak provides an ideal test for the soundness of our identification strategy. Indeed, on 9 March 2020, the Italian government ruled that all sporting events in Italy be suspended. On 28 May, Italian Minister for Sport Vincenzo Spadafora announced that Serie A would resume starting 20 June. Since then, Serie A matches have been played behind closed doors.[3] There-

[1]See Pollard (2008) for a detailed survey.

[2]For an extensive discussion see also Dobson et al. (2001), Anders and Rotthoff (2014), Endrich and Gesche (2020) Bryson et al. (2021)

[3]Starting from the sport season 2021/22, Serie A stadiums return to the 50% of capacity.

fore, we can split the sample into two parts: Pre and Post-Covid. During Pre-Covid, the matches were played with a crowd while Post-Covid's attendance exogenously drops to zero. Post-Covid matches allow us to test the soundness of our estimation strategy. Following well-known contributions, we claim that weather conditions explain attendance at social events such as sports events (Matsusaka and Palda, 1999; Persson et al., 2014; Cellini and Cuccia, 2019). An excellent instrumental variable affects the outcome only through the explanatory variable of interest. Therefore, we validate the weather conditions as an instrument for attendance by showing that weather conditions have a statistically significant role in explaining match outcomes only in matches played Pre-Covid.

We find evidence that crowd support increases the home teams' performances in the major Italian football league.

The remaining of the paper is organized as follows: Section 2 discusses our empirical strategy and provides an exploratory analysis of the data. Section 3 reports our results. Section 4 concludes.

2 Data and empirical strategy

We take advantage of a rich dataset describing relevant statistics about Italian Serie A matches in four sports seasons (2017/18-2020/21). The match outcomes are computed as the difference between the number of goals scored by home and away teams[4]. The choice of regressors reflects the pre-existent literature. However, we avoided the inclusion of referee-based variables such as red and yellow cards because of possible bad controls (e.g. see Reilly and Witt, 2013; Bryson et al., 2021)[5]. Table 1 reports descriptive statistics for the main variables used in this study.

[4]see, e.g. Braga and Guillén (2012), Ponzo and Scoppa (2018) and Belchior (2020)

[5]Although these variables have been excluded from the empirical analysis shown in the following section 3, their inclusion do not affect final results.

Table 1: Descriptive Statistics

Name	Variable description	N	Mean	St. Dev.
Dependent variable				
Δ *Goal*	Difference in goal btw home and away team	1387	0.2335	1.81
Explanatory variables				
Attendance	Number of people attending the match	1003	25713.23	14814.58
Travel times	Travel times from home to away stadium (minutes)	1350	240.9837	165.015
Δ *Value*	Difference in players market value btw home and away team	1387	.116871	289.71
IV				
Tmax	Maximum daily temperature	1185	17.677	7.762

2.1 Identification Strategy

Our baseline specification is given by:

$$\Delta Goal_{m,s} = \alpha + \beta \text{Attendance}_{m,s} + \theta X_{m,s} + \phi_{m(HA),s} + u_{m,s} \tag{1}$$

Where m identifies the match and s the season, the variable `Attendance` is the number of supporting attending the match, X represents controls. The variable $\phi_{m(HA),s}$ captures the season fixed effects of the Home team and the Away team involved in the match, and it is introduced to capture the differences between the same team in different seasons. Finally, u is an error term.

In estimating the effect of attendance on match outcomes by (1), a problem of endogeneity could arise (Braga and Guillén, 2012). The number of friendly supporters attending the match could be affected by the home team's results in previous matches. Moreover, we know that a higher crowd attendance can be driven by unobserved factors such as the importance of the game or the degree of rivalry with the away team. To overcome these issues, we follow an IV approach. As an instrument, we consider weather conditions registered during the match-day. This choice is motivated by several studies that used weather conditions as an instrument for the attendance of many social events (e.g. see Matsusaka and Palda, 1999; Persson et al., 2014; Cellini and Cuccia, 2019). In the case of football matches, we argue that meteorological factors

affect team performances indirectly by influencing attendance. In detail, we choose the maximum temperature registered during the match-day to instrument the attendance. Beside temperature, there are other whether factors that could affect attendance, as rain. However, rain could also have direct effects on the matches' outcomes. Heavy rain could affect the pitch making anomalous results more likely.
We aim to estimate equation (1) employing IV regression. In doing so, we consider the following equations:

$$\begin{aligned} \text{Attendance}_{m,s} &= \varphi + \delta Tmax_{m,s} + \gamma X_{m,s} + +\phi_{m(HA),s} + \epsilon_{m,s} \\ \Delta Goal_{m,s} &= \alpha' + \beta' \hat{\text{Attendance}}_{m,s} + \theta' X_{m,s} + +\phi_{m(HA),s} + u'_{m,s} \end{aligned} \tag{2}$$

Where $Tmax$ is the maximum temperature and X the set of controls described in Table 1. Since we are in the presence of a just identified model, equation (2) is estimated with 2SLS.
To test the instrument validity, we take advantage of the gathering ban imposed by the Italian government following the Covid-19 pandemic. From 4 March 2020, all sporting events in Italy are played behind closed doors. Following Endrich and Gesche (2020), we define such events *ghost matches*.

3 Results

3.1 First-stage results

Table 2 shows the estimates of the First Stage for different specifications (with/without controls and with/without constant). In all specifications, the maximum temperature registered during the match day is statistically significant in explaining the number of people attending the match. The positive sign of the coefficient suggests that the higher is the maximum temperature registered during the match-day, the higher will be the attendance. The F-statistic allows us to rule out weak-instrument issues.

Table 2: First stage results

	(1) Attendance	(2) Attendance
Tmax	70.5209***	73.2616***
	(25.8885)	(22.4317)
$\Delta Value$		-12.6507***
		(1.1139)
Traveling times		-3.9125***
		(1.4976)
Constant	16781.16***	16985.58***
	(495.3564)	(583.3051)
No. of Obs.	858	854
Adj. R-Squared	0.8617	0.8900
Fixed Effects	YES	YES
F-Statistic	230.89***	184.11***

Robust standard error in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Results in Table 2 capture the impact of temperature, traveling times and Δ Value on the attendance. All signs are consistent with our expectations. Traveling times captures the distance between home and away teams. Therefore, the smaller is the traveling time, the higher is the likelihood of a derby match[6]. Higher rivalry between two teams should attract more fans at the stadium. Thus, we expect a negative relationship between traveling times and attendance. The difference in players' market value between home and away team also plays an important role. A large value of Δ Value means that the home team's strength is virtually higher than the away team. Therefore, we can argue that larger Δ Value implies a larger, ex-ante, probability of win for the home team. Therefore, since the fans are more likely to attend the match, also in this case we expect a negative sign between this variable and the attendance. Conversely, the maximum daily temperature have a significantly positive effect on attendance. This result is also not surprising, since it well known that good wheater attracts people in social events (e.g. see Matsusaka and Palda, 1999; Persson et al., 2014; Cellini and Cuccia, 2019).

[6]For example, some derby matches corresponds to a zero traveling time (e.g. Rome and Lazio, Juventus and Turin, i.e. teams in the same city), whereas other derbies are associated to low distances (e.g. Bologna and Parma, i.e. teams in the same region).

We have to highlight that its associated coefficient has the highest value.
Our specification assumes linear relationship between temperature and attendance. However, it could be also assumed that - beyond a certain threshold - high temperatures discourage attendance. To test this possibility, we introduce a quadratic term in our model. Nevertheless, we do not find any statistical significance. For readers' convenience, the results are not reported here[7].

3.2 Second-stage results

Table 3 shows the estimates for the Second Stage. The inference is based on standard errors robust to heteroskedasticity. The constant term is never statistically significant. Moreover, our findings are consistent with the previous contributions in terms of sign and magnitude.
In particular, Tab. 3 highlights that one hundred more people at the stadium increases - one average - the difference between the Home and Away team number of goals by 0.01. Thus, we can assess that in Italian Serie A, the social pressure increases the motivation of football players, and there is no evidence supporting choking under pressure.
Furthermore, we also observe that the difference in value between the opposing teams is one of the most crucial variables in terms of the impact on the match results, confirming that team strength is the main factor explaining matches outcome.

[7] Results are available on request.

Table 3: Second stage results

	(1)	(2)
	$\Delta Goal$	$\Delta Goal$
Attendance	0.00026*	.00023**
	(0.00016)	(0.00012)
$\Delta Value$		0.00554***
		(0.00164)
Traveling times		0.00105
		(0.00072)
Constant	-4.2022	-3.4938
	(2.9011)	(2.332)
No. of Obs.	858	854
Fixed Effects	YES	YES

Robust standard error in parentheses
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Traveling times is always not statistically significant, meaning that for the Italian Serie A this variable has not effects on matches outcome. This evidence could be explained by the limited territorial extension of the country and the modern and fast means of transports currently used.

3.3 Instrument validation

Table 4 provides empirical evidence supporting our identification strategy. Our primary assumption is that the meteorological conditions affect match outcomes only through attendance. If this assumption is correct, we should observe a significant impact of meteorological conditions on ΔG *only when* the crowd is present in the stadium. The meteorological condition is not a good instrument if it correlates with the match outcome without the supporters.
In detail, we estimate the following specification:

$$\Delta Goal_{m,s} = \alpha + \beta \text{Tmax}_{m,s} + \theta X_{m,s} + \phi_{m(HA),s} + u_{m,s} \tag{3}$$

In Column (1), we report estimates for model (3) in crowd matches. The maximum temperature is positive and statistically significant. However, the same coefficient becomes not statistically significant once we consider ghost matches (Column (2)). The same happens by controlling for additional covariates (Columns (3) and (4)). This evidence suggests that meteorological conditions are likely to mainly affect match outcomes through attendance.

Table 4: Reduced form: results

	(1) Pre COVID $\Delta Goal$	(2) Pre COVID $\Delta Goal$	(3) Post COVID $\Delta Goal$	(4) Post COVID $\Delta Goal$
Tmax	0.0190**	0.0170**	-0.0093	-0.0136
	(2.23)	(2.10)	(-0.41)	(-0.61)
$\Delta Value$		0.00261***		0.00247***
		(9.16)		(5.28)
Traveling times		0.00015		0.00133*
		(0.36)		(2.30)
Constant	0.324	0.449	1.840*	1.803*
	(0.96)	(1.46)	(1.99)	(2.10)
No. of Obs.	858	854	321	310
Adj. R-Squared	0.1896	0.2628	0.2198	0.3236
Fixed Effects	YES	YES	YES	YES
F-Statistic	4.52***	5.90***	3.00***	4.89 ***

Robust standard error in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

4 Conclusions

The role of the crowd in explaining home advantage in sports is still debated. A strand of literature argues that social pressure induced by a friendly audience can increase motivation, leading to better results. However, another part of the literature documents the opposite effect known as *choking under pressure*.

When we measure the effect of attendance on match outcome, the endogeneity issues have to be appropriately addressed. For this reason, we propose an empirical strategy based on IV, where the meteorological condition is used as an instrument. We found empirical evidence that crowds are a critical factor in explaining the match outcome and, therefore, the home bias.

This paper turns out to be the first step of a more detailed discussion on the role of fan support in explaining match outcomes. For example, future studies could be devoted to analysing different national leagues. Furthermore, it might be interesting to test if the choking under pressure effects arise only in specific match moments, like penalties or free kicks.

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