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# An analysis of consumer response to corruption: Italy's Calciopoli scandal

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# An analysis of consumer response to corruption: Italy's *Calciopoli* scandal

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**Abstract**

The literature on economics of corruption is lacking in evidence on consumer responses to identifiable scandals. The *Calciopoli* episode affecting Italian football in the 2005/06 season serves as an opportunity for an empirical investigation into consumer (fan) behaviour following punishments imposed by the Italian league on clubs whose officials were found guilty of corrupt practices. Using a difference-in-difference estimation method, where the convicted teams are the treatment group, we find that home attendances for treated teams fell by around 16%, relative to control group teams defined as those clubs not subject to league-imposed punishment. We show further that the fall in attendances identified with *Calciopoli* punishment resulted in non-trivial gate revenue reductions. Our results suggest that a sizeable number of fans of the punished clubs were subsequently deterred from supporting their teams inside the stadium. We explore alternative explanations of this adverse fan response.

Keywords: Corruption; consumer demand; Calciopoli; football; attendances.
JEL Classification: L83

## 1 Introduction

The purpose of this paper is to identify, using a difference-in-difference methodology, a possible consumer response to a specific episode of corruption. The literature on corruption has hitherto focussed on the supply-side, examining incentives and consequences of corrupt behaviour. This literature has not surprisingly covered the behaviour of Governments and

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other public sector organisations such as the police, the judiciary and publicly owned companies. The various chapters in edited volumes such as Jain (1998) and Rose-Ackerman (2005) and survey articles such as Aidt (2003) tend to deal with issues of corrupt practices performed by civil servants, public representatives and private company executives. This emphasis on public sector corruption matches the definition of corruption provided by Jain (2001), as an action in which the power of public office is used for personal gain in a manner that contravenes the rules of the game. Examples of corrupt practices are bribes to politicians to influence the award of tenders in public procurement.

Absent so far from the literature on economics of corruption is any study demonstrating the impacts on consumers of revealed episodes of corruption. This important research question is not covered at all in the edited volumes of Jain (1998) and Rose-Ackerman (2005). It can be argued that products or services whose delivery has been revealed to be subject to corrupt practices may be seen as tainted in the views of some consumers.

The principal reason for the absence of studies on consumer (or voter) response to corrupt practices is surely a lack of data. The sports industry offers a setting where corrupt episodes are accurately recorded, where punishments are administered by sports governing bodies and where audience demand, in the form of gate attendance at sporting fixtures, is observable and systematically recorded. The particular setting for our analysis is the top division of Italian football, Serie A.

Our paper will identify, using the now-standard difference-in-difference estimator, an adverse impact on consumer (fan) demand from a clear example of corrupt practices in professional team sports: Italy's *Calciopoli* scandal of 2006. In this scandal, officials employed by five Italian clubs were found guilty of attempting to influence referee behaviour so as to enhance the winning potential of their teams in particular League fixtures. Prominent in these illegal dealings was one of Italy's top clubs, Juventus, which has a tradition of large support and high levels of success. The five guilty clubs were punished and some officials were given jail sentences while others were banned from further involvement in football. The key point of our identification strategy is the possibility to compare attendances of punished clubs (our treatment group) and unpunished clubs (our control group) in the years before and after *Calciopoli*.

It is worth stressing that Italian football is a severe test bed for identification of significant consumer impacts from scandal. This is because the history of Italian football is littered with episodes of match-fixing and corruption, not all of which can be stereotypically traced to links with Italian organised crime. Foot (2007) documents the long trail of corruption in Italian football. Given that corruption is actually a part of Italian football culture one might expect Italian football fans to be reconciled to the existence of corruption even if they dislike

it. In such a context, one might expect to find no significant effect of the Calciopoli episode on Italian club attendances. On the other hand, this episode was so widely publicised and condemned that an adverse effect on attendances would appear to be plausible. We shall offer substantial empirical evidence in support of economically and statistically significant adverse effects of Calciopoli on club attendances. We also offer some partial evidence to suggest that fans response to *Calciopoli* was driven by disillusionment rather than moral disapproval.

Our paper proceeds as follows. Section 2 explains how the *Calciopoli* episode developed and demonstrates the punishments given to the guilty clubs. This section also highlights the product market context for the *Calciopoli* scandal. Section 3 explains our difference-in-differences estimation method. Section 4 details our data set and our model of consumer demand. Section 5 offers our empirical results and section 6 concludes.

# 2 The *Calciopoli* Scandal

Italian professional football is organised in two divisions, Serie A which has 20 teams and Serie B which has 22 teams. At the end of each season, the three bottom teams are demoted from Serie A and replaced by three promoted teams from Serie B. The title winners from Serie A plus the next two teams qualify for the UEFA Champions' League. The next three teams qualify for less prestigious UEFA Europa League (formerly the UEFA Cup). In any league match, three points are awarded for a win and one for a draw.

Allegations of corrupt practices in Italian football predate the *Calciopoli* scandal which involves the 2004/05 season, when Juventus was the League winner with 86 points, seven ahead of nearest rival, AC Milan. Garlando (2005) suggests that 20 matches involving Juventus could be linked to suspicious referee decisions or even outright match-fixing over the period 1994-2004.

The *Calciopoli* scandal was first alerted to the Italian football authorities when prosecutors investigated allegations of player doping at Juventus. A full account of the *Calciopoli* scandal can be found in Boeri and Severgnini (2011), who also emphasise the subtle nature of the corruption that was practised.[1] Referees were encouraged to make unwarranted decisions, not necessarily directly favouring a prosecuted team in a current game but which would impact on the implicated teams in future games.

The process of influence exerted by certain club officials took three forms. First, some referees known to be favourable to Juventus were allocated to important games of Cham-

[1] In a sequel paper, Boeri and Severgnini (2013) discuss the more common form of match-fixing expressed through betting markets, specifically the Scomessopoli scandal that followed the Calciopoli episode.

pionship significance. Second, some referees were encouraged to give beneficial decisions to Juventus in important games. Third, and more subtly, players in matches not involving Juventus received unjustified cautions and dismissals that led to suspensions and hence their unavailability for a forthcoming match against Juventus. Distaso et al. (2012) offer empirical evidence at match level suggesting a lack of referee bias towards *Calciopoli*-punished teams playing in the 2004/05 season covered by the inquiry. This is still consistent with the revelations of corruption.

Although the investigation initially focused on Juventus, several other teams' officials were found to be undertaking similar corrupt practices. The implicated clubs were Arezzo, Fiorentina, Juventus, Lazio, AC Milan and Reggina. In July 2006, the Italian Football Federation's prosecutor recommended that Juventus be stripped of its 2004/05 and 2005/06 League titles and be demoted two divisions to the regional division C1, Italy's third tier made up of small semi-professional teams. Arezzo was in Serie B (second tier) at the time but the other five implicated clubs were in Serie A. The original recommended and final punishments, awarded after appeal, are set out in Table 1. Appeal cases centred around the attempts to manipulate match results in the case of Juventus as opposed to allegedly more minor offences by the other clubs. Points deductions were applied at the beginning of the 2006/07 season.

In addition to the club-level punishments set out in Table 1, several club officials were banned from taking positions at any level in Italian football for specified periods. Table 1 reveals that the actual punishments imposed on the five guilty Serie A clubs were much less severe than those initially proposed. In particular, only Juventus was demoted and the actual points penalties were sharply reduced upon appeal. The exclusions from UEFA competitions (Champions' League and UEFA Europa Cup) were agreed after consultation between the Italian Football Federation and UEFA. Faced with a nine point deduction, rather than 30 as recommended initially by the League's prosecutor, Juventus won the Serie B Championship in the 2006/07 therefore giving them promotion back to Serie A at the first opportunity. Juventus lost several star players who joined other European teams. Fiorentina suffered a 15 point deduction but overcame this penalty to finish sixth in Serie A in 2006/07 leading to qualification for the 2007/08 UEFA Europa Cup.

The economic and financial context for *Calciopoli* was one of declining gate attendances and revenues, only partially offset by rising income from sales of television broadcast rights. As reported by Baroncelli and Lago (2007), Baroncelli and Caruso (2011) and Boeri and Severgnini (2012), Italian Serie A clubs after 2000 faced a difficult combination of rising payrolls, needed to attract and retain star players in a competitive European market for player talent, and sluggish growth of revenues compared to other European Leagues such

as England, Germany and Spain. Gate revenues actually declined reflecting reduced attendances in turn affected by hooliganism in and around stadia, restrictions on away fans to attend matches, introduction of identity cards to deter hooliganism, poor quality stadia and poor quality of play as several top stars migrated way from Italy to other European Leagues (Boeri and Severgnini, 2012; Di Domizio, 2007). This led to deteriorating balance sheets for many clubs.

Boeri and Severgnini (2012) observe that nine out of 37 Serie A clubs had at least one episode of bankruptcy between 2001/02 and 2010/11. Baroncelli and Caruso (2011) note that for the 2006/07 season, Serie A player payrolls were 62 per cent of total turnover, up from 58 per cent in 1997 and greater than equivalent ratios for other European leagues. This financial pressure may have induced clubs such as Juventus to engage in corrupt practices so as to illegally sustain their positions at the top of the Italian League, win domestic titles and qualify for the lucrative UEFA Champions' League. However, Juventus was one of only two Serie A clubs to post a pre-tax operating profit in the 2002/03 financial year, although as a quoted company on the Italian stock exchange it suffered a reduction in market capitalisation from €430m in 2001 to €183m in 2004 (Baroncelli and Lago, 2006).

# 3 Econometric Model

Our purpose is to identify the causal effect of corruption (*Calciopoli*) on attendance. Analysis of corruption in sports such as Forrest and Simmons (2003) and Forrest and McHale (2008) uses an economics of crime model. We exploit instead the fact that some teams have been found guilty, and punished, as a natural experiment. This is possible because we have panel data available before and after *Calciopoli*, and not all the teams received the punishment.

Knowing that the corruption took place during the season (s) 2005-06 but punishment was handed out for the season 2006-07, we define the binary variable

$$C_{is} = 0 \quad \text{if team } i \text{ played in s<2006-07}$$
$$C_{is} = 1 \quad \text{if team } i \text{ played in s>2006-07.}$$

This is our variable of interest, which excludes the season 2006-07 because we want to estimate the effect of corruption on attendance from a pre-treatment period (2002-03 to 2005-06) to a post-treatment period (2007-08 to 2010-11).[2] We observe a drop in attendance in the season 2006-07, and we assume this is mainly due to the lower competitiveness of the punished teams and the absence of Juventus from Serie A. This may have caused a loss of

[2]A similar approach is used in Di Tella and Schargrodosky (2004) who study the causal effects of police on crime, using the Buenos Aires terroristic attack in 1994.

interest in some supporters, at least those defined lukewarm ("tiepidi") and hot ("caldi") by an Italian survey[3], which showed that Juventus accounted for more than 50% of all football supporters. Our treatment variable is

$P_i$ =1 if team $i$ has been punished in 2006-07

$P_i$ =0 if team $i$ has not been punished in 2006-07.

To estimate the treatment effect we could simply compare the treated teams before and after *Calciopoli*. However, this might pick up the effects of other factors that changed during the post-treatment period. Therefore, we use a control group (teams unaffected by *Calciopoli*) to "difference out" these confounding factors and isolate the treatment effect.

We have four categories: 1) teams not punished before *Calciopoli* that will be punished afterward, 2) teams not punished before *Calciopoli* that will remain unpunished, 3) teams punished after *Calciopoli*, 4) teams unpunished after *Calciopoli*. Since we are using panel data, the teams in categories 1) and 3) and categories 2) and 4) are the same observed before and after *Calciopoli*.

If we take the average attendance of a team $i$ in each category, $\overline{Y}_i$, and compute the change in outcome for the i*th* team treated $[\overline{Y}_{ia} - \overline{Y}_{ib}|P_i = 1]$ and that for the untreated $[\overline{Y}_{ia} - \overline{Y}_{ib}|P_i = 0]$. A simple *difference-in-differences estimator* of the treatment effect is given by

$$[\overline{Y}_{ia} - \overline{Y}_{ib}|P_i = 1] - [\overline{Y}_{ia} - \overline{Y}_{ib}|P_i = 0] \tag{1}$$

where $a$ and $b$ denote 'after' and 'before' *Calciopoli* .

The same result can be obtained in a regression framework, which uses the level of the attendance in each round (t) as dependent variable

$$Y_{it} = \alpha + \beta_1 P_i + \beta_2 C_{is} + \beta_3 \mathbf{X_{it}} + \phi P_i \times C_{is} + \epsilon_{it} \tag{2}$$

The DID estimator is the pooled OLS estimate of $\phi$, the coefficient of the interaction between $P_i$ and $C_{is}$. The regression based estimator is more flexible, allowing us to add controls (i.e. vector $\mathbf{X}_{it}$) and exploits the fact the we have panel data. Our dependent variable is log of attendance.

We estimate equation 2 together with equation 3, which includes team fixed effects, time dummies and first-order autoregressive errors (an AR(1) error model).

$$Y_{it} = \alpha_i + \delta_t + \beta_1 P_i + \beta_2 C_{is} + \beta_3 \mathbf{X_{it}} + \phi P_i \times C_{is} + \epsilon_{it} \tag{3}$$

[3]Sondaggio Demos, September 2011.

In general, the validity of the DID estimator relies on the assumption that the underlying 'trends' in the outcome variable (i.e. time effects $\delta_t$ in equation 3) are common across treated and untreated teams. To get some idea of the plausibility of this assumption we provide some graphical evidence below (see Figure 1) and we perform a falsification test (see Section 5).

# 4 Data

Attendance data for Italian clubs were obtained from 'StadiaPostcards', which provides since 2001 a complete report of all matches in Italian Football Serie A, B and Lega Pro on a match-by-match, club-by-club basis.[4] The sources of 'StadiaPostcards' are the main Italian sports newspapers (La Gazzetta dello Sport, TuttoSport, Corriere dello Sport) but also DataSport and the clubs' official websites.

We have data from the season 2002-03 to 2010-11. We exclude the season 2006-07 for the reasons explained in the previous Section. This gives us four seasons of data before *Calciopoli* and four seasons afterwards.

In our analysis, at match level, the initial panel includes 2892 observations, where the time dimension is the weekly round of Serie A during a given season, while the cross-sectional dimension is the team. During the seasons 2002-3 and 2003-4 Serie A contained 18 teams and we observe 306 matches per season. From 2004-05 the number of teams increased to 20, and the matches played per season that we observe are 380.

The teams included in our treatment group are: Juventus, Milan, Fiorentina, Lazio and Reggina. They all played in Serie A. Arezzo is the only team punished that was playing in Serie B. We have excluded it, and consequently all of Serie B, because we did not have enough observations to perform our estimation in both leagues.

In our control group we can only include teams that have played in Serie A for at least one season before *Calciopoli* and at least one season after *Calciopoli*. This restriction is necessary in order to be able to perform a DID estimation. Moreover, some matches were played behind closed doors due to punishments imposed in response to outbreaks of hooliganism and these matches are excluded from the data set. We therefore end up with a control group formed by 15 teams, that did not play consistently in Serie A from 2002-03 to 2010-11[5]. Thus our final sample is an unbalanced panel, and it includes 20 teams for a total of 2292 matches played over 8 seasons. For each team we observe from a minimum of 72 matches to a maximum of 167 (i.e. a team that has always played in Serie A from 2002-03 - e.g. AC Milan or Roma).

[4]Information on Cagliari is not available on match-by-match basis and we only have aggregate season attendance for this team.

[5]This because some teams have been promoted to Serie A and other relegated to Serie B.

The teams in our sample represent more than 90% of the total supporters. According to a survey[6] the distribution of supporters among the "top" teams in Italy was unchanged for many years. Juventus has around 30% of match-day supporters[7], then Inter (19%) and Milan (16%). Following with percentages between 10 and 4.5 were Napoli, Roma and Fiorentina, respectively. The same survey reports that two out of three fans consider '*Calciopoli* scandal' either as a case of sport justice 'affected by many errors'. Or manifestly unfair because the investigation was limited to a few teams. Almost half of the fans in the survey believed that the title of the season 2005-06 should not have been assigned to anyone.

As we have already mentioned in Section 2, Juventus was relegated in Serie B for the season 2006-07, as punishment for *Calciopoli* scandal. The team was weakened, because some of its top players moved to other teams. Nevertheless, Juventus was promoted at the earliest opportunity to Serie A in 2007-08, which is the first season in our post-treatment group. Knowing that Juventus always had the highest number and share of fans in Italy, we decide to perform our estimations both including and excluding Juventus. This is a robustness check to verify whether our results are mainly driven by the importance of this team and its attraction of supporters when it plays.

In Table 2 we report the teams included in both treatment and control group and the average attendance for all the period 2002-03/2010-11. Figure 1 shows the pattern of attendance at match level, for the treated teams and some controls. We can observe, for example, that Inter, Roma, Udinese, teams that always played in Serie A during the period of our analysis, have similar trend before and after *Calciopoli* . This could provide some evidence that our assumption of common trends across treated and untreated teams has some plausibility.

In general, Serie A has registered a declining attendance trend from the 1990s. The average attendance in the season 1991/92 was 34,205 per game which dropped to 29,883 in 1993-94 with the introduction of the pay-TV. There is a continuous decline down to 26,098 supporters in 2004-05. We should mention important changes in the Italian legislation that have also affected attendance. In 2003 the first Pisanu decree[8] allowed the police to arrest a

[6]Demos & Pi Survey, September 2010.

[7]Although Juventus has the greatest number of self-reported supporters in Italy, its matchday attendances are some way behind those of the Milan clubs, AC Milan and Internazionale. Juventus has traditionally drawn large support from all over Italy because it is the most successful team in Serie A. Juventus has won 27 scudetti. Since 1923, it has always been controlled by the industrial Agnelli family (founder and owner of FIAT) and its support has traditionally mainly comprised blue collar workers and Southern Italian immigrants to Turin, although local people from Turin have tended to give greater support to the rival team, Torino. Thus, Juventus has generated lower attendances for historical and cultural reasons. An additional reason for low crowds at Juventus home games was the uncomfortable and somewhat ugly old stadium, Delle Alpi. In 2011/12, outside our sample period, Juventus moved to a new 41,000 capacity stadium which attracted sell-out crowds during the 2011/12 season.

[8]Decree no. 28 of 24 February 2003.

supporter for up to 36 hours after the offence they are accused of, as if they were caught in the act. In 2005, a second Pisanu decree[9] introduced turnstiles and match tickets bearing the user's name. During the season 2005/06 the attendance dropped to 22,476 fans per game. The lowest level of attendance, 19,711, was registered during the season 2006-07, when the teams involved in *Calciopoli* scandal were punished. In 2007, following some incidents that saw the death of a police officer and later of a Lazio football fan, a law imposed bans on fans travelling to away games, increased the punishment for those who throw missiles and extended the possibilities of expelling non-Italian nationals.[10] The mean attendance in the season 2007-08 slowly increased to 23,887 and up to 25,570 in 2009/10. We take into account all those shocks that affected treated and untreated teams in the same way by including in our models team and round fixed effects. We are assuming that the effects of hooliganism and poor stadia are the same before after Calciopoli and so these effects do not affect the identification of the treatment effect of Calciopoli.

## 4.1 Control variables

Our match-level models have several control variables which might represent confounding effects in our difference-in-difference model. We include previous season performance, measured here by *previous season position*, to control for between-season variation in team performances. This captures habit persistence in attendance between seasons. We expect that the higher the previous season's average home attendance for the home team, the greater will be match attendance this season (Forrest and Simmons, 2006).

We use previous season position rather than previous season points to permit inclusion of promoted teams, which are given ranks of 21 to 24 underneath the Serie A ranks of 1 to 20, where 1 denotes Champions. Promoted teams from Serie B might be predicted to have poorer prospects of retaining Serie A status than incumbent clubs. To allow for this possibility, we include a dummy variable for promoted clubs, *promoted*.

The home and away teams' current performances, *home* and *away points per game*, as measured by the ratio of points to games played prior to the match, are included to control for current form of the opposing teams in a given match. In Serie A, three points are awarded for a win, one for a draw and zero for a loss. As points per game cannot be computed for the first set of matches in each season, these matches are excluded from the analysis. We predict positive coefficients on *home points per game* and *away points per game*. In the latter case, an away team with more points per game is likely to be more attractive to marginal home fans and will also bring more away fans to the stadium, ceteris paribus.

[9]Decree no. of 17 August 2005.

[10]Law 41/2007 and Amato decree 1 November 2007.

To further capture other aspects of team performance and strength, the probability of the home team winning, as derived from the bookmaker fixed-odds betting market, (*home win probability*) is included. We also include home win probability squared to capture any non-linearity in the attendance-home win probability relationship.

Betting odds on match outcomes were extracted from files in www.football-data.co.uk and transformed into probabilities for each match outcome. The correlation of odds between bookmakers is very high (around 0.95) and we opt for the odds supplied by William Hill, as the source that gives us the greatest coverage of matches. The sum of these probabilities will always exceed unity due to the bookmaker's margin. This margin, or 'over-round' is typically around 12 per cent. We adjust the probability of each match outcome by dividing by the sum of probabilities. The advantage of using betting odds is that these should capture characteristics that are not easily observed such as player injuries, suspensions and dressing room morale. If the betting market is efficient then betting odds should incorporate all relevant public and private information on the two teams in a match.

There are two hypotheses giving different predictions as to the shape of non-linearity of the attendance-win probability relationship. The first, much discussed in the North American sports economics literature (Humphreys and Watanabe, 2012) postulates that fans want their teams to win but dislike excessively uneven contests. This is known as the uncertainty of outcome hypothesis and proposes that match attendance will rise with home win probability at a decreasing rate. Eventually, for high levels of home win probability, match attendance may even fall. An alternative hypothesis is that the prospect of an easy win will draw more fans to the game and so the match attendance-home win probability relationship will be convex; attendances rise with home win probability at an increasing rate.

Previous research from other European leagues has shown that the match attendance-home win probability relationship exhibits a U-shape as home team *ex ante* win probability increases (see Forrest and Simmons, 2002, 2006; Buraimo and Simmons (2008) for England; Buraimo and Simmons (2009) for Spain). In European football betting markets, which are far more open and less restricted than North American sports betting markets, we expect to find that bookmaker betting odds, and hence win probabilities, converge to market efficiency (Forrest, 2008). Hence, home win probabilities taken from bookmaker odds are the best available estimates of likelihood of a home team winning.

We lack specific information on ticket prices in Italian football, although these are known to show small within-season intra-team variation relative to inter-team variation through a given season. We therefore follow convention in the sports attendance demand models by using team fixed effects.

We also include *derby*, a dummy variable intended to capture matches of historical rivalry

between teams located closer to each other, in the same city or region. Previous studies (e.g. Forrest and Simmons, 2002) have shown that such matches tend to attract greater audiences, *ceteris paribus*, and the coefficient on *derby* is therefore expected to be positive and significant.

Our final control variables are log of real regional income, *log gdp*, and regional population, *log population*. We are agnostic on the predicted sign of coefficient on the income variable as attendance could be higher or lower if there is a greater share of low-income fans in a city or province. Population captures potential market size and we predict a significant positive coefficient on this variable.

# 5 Results

Table 3 reports raw difference-in-difference estimates of the effect of *Calciopoli* on the five punished (treated) teams in the sample, both at season level and match level. We find a clear reduction in attendances of punished clubs relative to unpunished clubs. This reduction, attributable to *Calciopoli*, is of the order of 20 per cent representing a substantial effect.

Our match level regression results[11], incorporating potentially confounding control variables and including season fixed effects are shown in Table 4. Model (1) reports OLS results with robust standard errors, this corresponds to estimation of equation 2. Models (2) to (6) correspond to the estimation of equation 3 and all employ an autoregressive error term of order one to capture habit persistence in the dependent variable. Model (2) includes home team fixed effects, season dummies and a team time trend, whereas Models (3) to (6) include round fixed effects. We prefer the latter four models since these do not constrain the time-effect coefficients to lie on a straight line for each team. Model (4) and (6) are both omitting Juventus as a special case since this team bore the brunt of the *Calciopoli* punishment.

The use of match as unit of observation enables us to test for a potentially negative externality on home teams. Gate attendances might be lower if a punished team is the visitor. Some home fans may express disapproval of a punished away team by staying at home while away fans may be more reluctant to travel. We assess this negative externality by means of a t test on the coefficient of the interaction term, *Calciopoli* times punished away team, $C \times P_{away}$ in models (5) and (6), which otherwise match the estimates in models (3) and (4).

F-tests of joint significance reject the null hypothesis of zero coefficients in each model.

[11] We have estimated seasonal level models, but due to the small sample size, evident from Table 3, we have discarded this analysis. However, in the fixed effect model the DiD effect attributable to *Calciopoli* is a statistically significant reduction of attendance of about 12 per cent. We do not report these results, but they are available upon request.

Similarly, the fixed effects models always deliver jointly significant team coefficients. Round fixed effects are also always jointly significant at least at 5% confidence level. A Hausman test rejects the null hypothesis that the fixed effects are uncorrelated with the regressors. We therefore retain the OLS estimates for comparison and focus on the fixed effects estimates in columns (2) to (6). Our most general and preferred model is (5), which includes the away team *Calciopoli* interaction term and Juventus.

Our match-level control variables perform much as expected. Game attendances are higher for matches of local rivalry (*derby*). Attendances are greater the higher is previous season league position, the greater are home and away team points per game just prior to the match, the lower is regional income (though imprecisely estimated) and the greater is regional population as proxy for potential market size.

We find that attendance falls with ex ante win probability for the home team as assessed by fixed odds bookmakers. But attendance falls at an increasing rate with home win probability as shown by the significant positive coefficient on home win probability squared. The turning point for home win probability is 0.61 in model (5) (0.6 excluding Juventus) and this is within sample.[12] This estimated U-shaped relationship between home win probability and attendance is consistent with match attendance results for England and Spain (Buraimo and Simmons, 2008, 2009). Games in Italy's Serie A appear to attract larger numbers of fans where the home team has a very low probability of winning or a very high probability of winning. At low home win probabilities there is a 'David and Goliath' effect where fans turn up to games expecting their team to lose but hopeful that they can witness a surprise result in overcoming an ex ante superior opponent. At high home win probabilities fans turn up to games to enjoy the prospective thrill of winning, preferring this to be by a large margin. At intermediate home win probabilities, the Goliath effect is wearing off while the dominant home team strength effect has yet to be revealed.[13]

Turning to our *Calciopoli* focus variables, we find a substantial negative treatment effect on home teams from *Calciopoli* - related punishments. A Chow test, reported at the bottom of Table 4, confirms the presence of a structural break in attendances after 2006. Point estimates of reduction in match attendances are between 15 and 16 per cent with Juventus included and around 15 per cent with Juventus excluded.[14] This reinforces the descriptive

[12]Turning points are 3.313/(2*2.733) from column 5 and 3.348/(2*2.772) from column 6.

[13]This result is inconsistent with -indeed diametrically opposed to- the uncertainty of outcome hypothesis suggested for North American sports leagues. For these leagues it is sometimes argued that fans prepared to enjoy a higher ex ante winning probability for the home team but at a diminishing rate, thus implying an inverse U-shaped relationship between game attendance and home win probability rather than the U-shaped relationship found for Italy and other European football leagues.

[14]We adopt the formula $\exp(\beta) - 1$ to obtain the percentage impact of a dummy variable with coefficient $\beta$.

results shown in Table 3. As noted above, gate attendances might be lower if a punished team is the visitor. The interaction term for *Calciopoli* and away team punished has an insignificant coefficient in the fixed effects estimates, regardless of whether or not Juventus is included. This suggests that the *Calciopoli* effects on attendance are attributable to fan responses to home team misdemeanours and not away team punishments.

## 5.1 Interpretation and Robustness Checks

So far we have shown that attendances among the treated clubs, those teams which were penalised as a consequence of the *Calciopoli* corruption scandal, fell significantly compared to the control group. The treatment group comprises five clubs that were exposed to have been engaged in corrupt practices and received punishments. There are at least two plausible interpretations of the results shown in Table 4. First, football fans do not like corruption (they are morally upset) and they penalise the clubs that were punished by staying away from games. Alternatively, fans perceive the effects of the punishment as harming their teams' prospects. The punishments might lead to star players leaving and make it difficult for convicted teams to recruit players. These effects both lead to reduction in team quality. More generally, fans stay away from games because of disillusionment with the team. Some fans may even take the view that all teams were corrupt to some extent and 'their' team was just unlucky enough to be exposed. This latter interpretation is certainly consistent with the notion of inherent corruption highlighted by Foot (2007) in his account of numerous episodes of corruption in the Italian football dotted throughout the 20th century.

The difficulty of disentangling consumer responses to corruption into distaste (viewing corruption as unethical) and practical concerns over efficiency and competence of principals affects other studies of corruption. For example, Ferraz and Finan (2008) show how Brazilian voters punished politicians by voting for opponents when these officials were revealed and publicised to be corrupt following audits disseminated in local media. Ferraz and Finan use a similar difference-in-difference methodology to ours. In their case, it is not clear whether voters disapproved of politicians' unethical behaviour or whether they were just concerned that corrupt politicians would be more likely to mismanage tax revenues.

As a partial attempt to separate the 'moral disapproval' and 'disillusionment' explanations of reduced attendance for treated teams, we make use of the fact that *Calciopoli* investigations were initiated within-season i.e. during the 2005/06 season. These investigations were not publicly revealed but a key date appears to be February 12, 2006. On this day, Internazionale hosted Juventus and lost 1-2. Both teams were in contention for the title. The referee was subsequently formally involved in the *Calciopoli* investigations. He was crit-

icised in the media for making several dubious decisions against Internazionale including the award of a gratuitous free-kick that led to a Juventus goal. Following this important game, rumours of the imminent scandal started to circulate. In the *Calciopoli* proceedings it later transpired that the chief executive of Juventus had previously[15] intimidated the referee by entering his dressing room and asking for particular favours to be granted towards Juventus. We use the significant date of February 12, 2006 to investigate attendances before and after the key match using the same treated and control groups as for our main analysis. Panel A in Table 5 reports estimates from just the 2005/06 season. We find that the effect of the interaction term for *Calciopoli* and home team punished on attendances is large and significantly positive; there is a 17 per cent increase in attendance with Juventus and 16 per cent increase without Juventus. These results are inconsistent with the first 'moral disapproval' explanation (or announcement effects). Supporters continued to follow their teams in the 2005/06 season even though rumours of a corruption investigation were circulating in the media. In the second part of the 2005/06 season, from February to May, fan support at stadia actually grew.

Next, to evaluate whether there is an immediate reaction of fans to the punishment of their supported teams, we test for *Calciopoli* effects by focusing on the seasons directly before and after the punishments were imposed. Our pre-treatment period is then 2005/06 and our treatment period is 2006/07, the season of the punishment. Juventus was relegated to Serie B for the 2006/07 and is thus excluded in these estimates, shown in Table 5 Panel B. We also show estimates excluding Internazionale since this was the team that won the Scudetto and benefitted the most from the punishments of direct rivals including Juventus. Table 5 Panel B reveals that the effect of Calciopoli punishment is a reduction of matchday attendance by about 7 per cent. This effect is essentially unchanged when we exclude Internazionale.

We test for persistence effects of *Calciopoli* by restricting the post-*Calciopoli* period to one, two and three seasons, respectively. This facilitates a test for time-varying effects of *Calciopoli* on the treated teams. The pre-*Calciopoli* period is four seasons as before. The estimates reported in Table 5 Panel C are for the fixed effects model with autoregressive errors, equivalent to Model 3 in Table 4. Restricting the data to one year after the *Calciopoli* punishment, i.e. the 2007/08 season, we obtain difference-in-difference estimates of home team attendance reductions of 20.5 per cent with Juventus included and 11.6 per cent with Juventus excluded (coefficients of -0.229 and -0.124 respectively). We find evidence of persistent effects of smaller magnitudes two years after *Calciopoli* punishment with coefficients of -0.152 and -0.108. For three years after *Calciopoli*, the same declining pattern in attendance of treated clubs is confirmed and gets slightly stronger. The coefficients are -0.176

[15] At the end of the match Reggina - Juventus played on November 4 2004 and lost by Juventus for 2-1.

and -0.144. The estimates in Table 5 Panel C suggest that in the initial post-*Calciopoli* period, the publicity surrounding the malfeasance of officials from Juventus and four other clubs led to a stronger effect on attendances of Juventus than on the other treated clubs. Over a longer post-*Calciopoli* period, the gap in attendance effects between Juventus and the other punished clubs narrows. This result is consistent with increasing adverse effects on teams other than Juventus suggesting that fan disillusionment with the smaller punished clubs actually increased.

We also re-estimate the fixed effects model with autoregressive errors, equivalent to Models (3) and (4) in Table 4 but with the addition of interactions between rounds (weekends in the season) and seasons. The difference-in-difference effect of *Calciopoli* on treated teams is -0.17 with Juventus and -0.13 without, only slightly lower than the main estimates in Table 4, suggesting robustness to these additional interactions. One possible concern is that team quality may have worsened for treated teams through the departure of star players and their replacement by more mediocre players. Inspection of team squad lists provided by ESPN soccernet does not reveal any unusual transfer activity for players of treated and non-treated teams over the 2005/06 and 2006/07 seasons, except for Juventus which during the season 2006/07 played in Serie B and lost some top players. Moreover, the average after-tax basic player salaries reported each year by Gazetta dello Sport show little variation over this period and actually grew slightly for the treated teams, by five per cent, while they were static for non-treated teams. Earlier, we suggested that fan disillusionment with a treated team's prospects might have been behind the loss of attendance post-*Calciopoli* but it seems that if such disillusionment existed it was not directly related to player turnover or changes in player quality, at least as proxied by player salaries.

We finally perform a falsification test to check whether there are any other pre-existing differences in trends. We are aware that the failure of the parallel trend assumption may cause our difference-in-difference estimators to be biased. We therefore run the same regressions in equation 2 and 3, considering only the seasons before *Calciopoli* scandal really happened:

$$C_{is} = 0 \quad \text{if team } i \text{ played in s=2002-03, 2003-04}$$
$$C_{is} = 1 \quad \text{if team } i \text{ played in s=2004-05, 2005-06}$$

We redefine our treatment variable as follows:

$$P_i = 1 \quad \text{if team } i \text{ has been punished in 2004-05, 2005-06}$$
$$P_i = 0 \quad \text{if team } i \text{ has not been punished in 2004-05, 2005-06.}$$

In this way we can test if the outcomes in the two comparison groups had a parallel

trend before the teams involved in *Calciopoli* scandal were punished. Significant difference-in-difference coefficients would cast doubts on the adequacy of our comparison groups. The falsification tests reported in Table 6 show that most of the control variables behave in the expected direction, except the coefficient of the interaction between the 'false' *Calciopoli* and the punished team which is never significant. This suggests that our results are robust.

## 5.2 Economic significance

It is useful to assess the economic significance of our results by means of a simple simulation. From Table 4, a 16.3 per cent loss of attendance for treated teams means 6,115 fewer fans for a treated team in the post-*Calciopoli* period, on average, compared to before. Assuming an average ticket price of €28, the loss of attendance for treated (punished) teams converts into a total loss to these teams of €3.25m per team in a given post-*Calciopoli* season. In the whole post-*Calciopoli* sample period the revenue loss is computed at €65m across five punished clubs and four seasons. This is clearly a non-trivial sum.

Of course, our calculation represents ex post costs only. To evaluate whether corruption was actually beneficial in net terms, we would need to assess whether the benefits (revenues) during the years before the Calciopoli punishments were outweighed by the losses after the penalties were enforced. This assessment would need to consider gains in gate revenues and prize money due to Juventus winning Serie A and competing in the UEFA Champions' League before 2006. The financial situation is different for AC Milan as the other 'big' club to be punished: they played in the Champions' League in 2006/07 and went on to win the competition. AC Milan's loss of gate attendance was only for domestic league and cup games.

The simulated revenue loss is actually understated since it only considers the loss of gate attendance attributable to *Calciopoli* punishment and excludes loss of other sources of revenue such as merchandise sales (replica shirts), loss of sponsorship income as businesses may not wish to give their names to clubs tainted by corruption, and loss of sales of broadcast rights as television companies will expect to pay less for a competition that may be undermined by undetected corruption. Moreover, star players may wish to leave punished clubs due to lower expected performances by these clubs and diminished career prospects. However, only a few top players left Juventus in the 2006/07 season as they did not wish to play in the inferior Serie B, and in general we found that Calciopoli itself did not produce any substantial impact on teams' turnover of players.

# 6 Conclusion

The *Calciopoli* episode affecting Italian football in the 2005/06 season serves as an opportunity for an empirical investigation into consumer (fan) behaviour, following punishments imposed by the Italian league on clubs whose officials were found guilty of corrupt practices. Using a difference-in-difference estimation method, where the convicted teams are the treatment group, we find that home attendances for treatment teams fell relative to control group teams defined as those clubs not subject to league-imposed punishment. The strong advantage of the difference-in-difference method applied here is the identification of *Calciopoli* effects in a context of declining attendances affecting all Italian clubs and not just the punished clubs. Both the raw difference-in-difference and the regression-adjusted results support the conjecture of declining attendances for the five punished teams over and above a trend decline in the Italian league as a whole.

Our use of match-level data facilitates a test of a potential adverse effect of punished opposing teams on home teams' attendances. The data do not support the presence of this particular externality.

We show further that the fall in attendances identified with *Calciopoli* punishment resulted in non-trivial gate revenue reductions. Our results suggest that a sizeable number of fans of the punished clubs were subsequently deterred from supporting their teams inside the stadium. Hence, our analysis of the *Calciopoli* episode shows that harmful effects follow for clubs that are detected and punished for engagement in corrupt practices, over and above the direct punishments meted out. Team sports competitions are vulnerable to a number of sources of potential corruption, including explicit match-rigging.

Our results suggest that sports leagues can perhaps highlight the additional adverse consequences of punishments as a deterrent for future corrupt practices by club officials who may be open to temptation. The analysis here also serves as a helpful methodology for identifying the consequences of punishments for clubs found guilty of corrupt behaviour. In addition to the punishments imposed on producers (clubs) it appears from our results that consumers (fans) inflicted further punishments in later periods.

We should stress that our finding of a substantial negative effect of *Calciopoli* on attendances of punished clubs is not necessarily due to moral disapproval by the home fans. Indeed, the within-season analysis, reported in Table 5 and discussed above, points against this explanation. A number of alternative explanations are possible. Fans of punished teams may observe that the prospects for success of their clubs are reduced by the punishment, which typically took the form of points deductions. These deductions could have led to a process of downward momentum for the team as it slips down the league standings not just

in the punishment season but in later seasons too. Alternatively, fans of punished teams might stay away in protest at the punishments inflicted by the League authorities. Either way, the end result is the same. The punished club loses gate attendances and associated revenues and is in a weaker position to compete effectively against rivals.

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Figure 1: Punished and Unpunished Teams - Attendance Trends

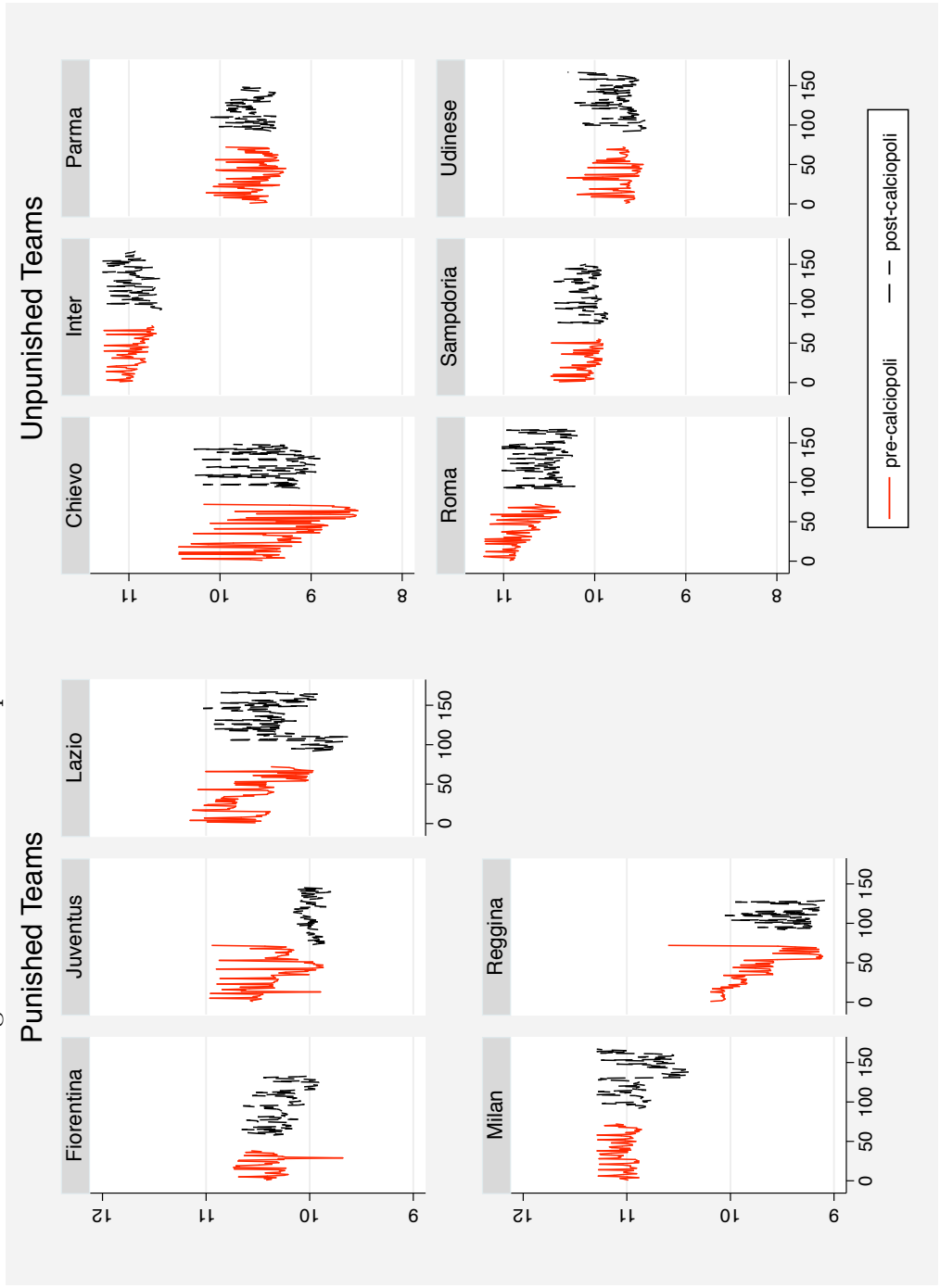

Table 1: *Calciopoli* Punishments

| *Team* | *Original Punishment* | *Final Punishment* |
|---|---|---|
| ***AC Milan*** | | |
| | Relegated to Serie B | No relegation |
| | Deduction of 15 points 2006/07 | Deduction of 8 points 2006/07 |
| | | Ex post deduction of 30 points 2005/06 |
| | | 1 home game to be played behind closed doors |
| ***Fiorentina*** | | |
| | Relegated to Serie B | No relegation |
| | Deduction of 12 points 2006/07 | Deducted 15 points 2006/07 |
| | | Excluded from UEFA Champions' League 2006/07 |
| | | 2 home games to be played behind closed doors |
| ***Juventus*** | | |
| | Removal of 2004/05 and 2005/06 Serie A titles | Removal of 2004/05 and 2005/06 Serie A titles |
| | Relegated to Serie C1 | Relegated to Serie B |
| | Deduction of 30 points | Deducted 9 points 2006/07 |
| | | Exclude from UEFA Champions' League 2006/07 |
| | | 3 games to be played behind closed doors |
| ***Lazio*** | | |
| | Relegated to Serie B | No relegation |
| | Deduction of 7 points | Deducted 3 points 2006/07 |
| | Excluded from UEFA Cup 2006/07 | 2 games to be played behind closed doors |
| ***Reggina*** | | |
| | No relegation | No relegation |
| | Deduction of 15 points | Deducted 11 points 2006/07 |
| | | £68,000 fine |

Table 2: Average attendance at match level

| *Team* | *Seasons from 2002-03 to 2010-11* *Average attendance* | *N. matches* |
|---|---|---|
| ***Punished*** | | |
| Fiorentina | 30109 | 132 |
| Juventus | 27177 | 147 |
| Lazio | 33614 | 167 |
| Milan | 56368 | 167 |
| Reggina | 15652 | 129 |
| ***Unpunished*** | | |
| Atalanta | 13024 | 110 |
| Bologna | 21002 | 110 |
| Brescia | 11238 | 72 |
| Chievo | 12077 | 147 |
| Empoli | 7291 | 90 |
| Inter | 55411 | 167 |
| Lecce | 13523 | 93 |
| Livorno | 11404 | 94 |
| Palermo | 26222 | 133 |
| Parma | 15263 | 148 |
| Roma | 43321 | 163 |
| Sampdoria | 23134 | 150 |
| Siena | 9974 | 131 |
| Torino | 18142 | 74 |
| Udinese | 16524 | 167 |
| Total | 25191 | 2591 |

Season 2006-07 excluded.

Table 3: DID - Average Attendance

| | Punished | Unpunished | diff | N |
|---|---|---|---|---|
| | | *Seasonal data* | | |
| *Attendance* | | | | |
| post-calciopoli | 31182 | 21953 | 9229 | 61 |
| s.d | 14054 | 13567 | 3849 | |
| pre-calciopoli | 37719 | 22687 | 15032 | 63 |
| s.d | 16201 | 15947 | 4467 | |
| did | | | -5803 | 124 |
| s.d | | | 4175 | |
| *Log Attendance* | | | | |
| post-calciopoli | 10.253 | 9.845 | 0.408 | 61 |
| s.d | 0.451 | 0.535 | 0.144 | |
| pre-calciopoli | 10.442 | 9.834 | 0.608 | 63 |
| s.d | 0.468 | 0.606 | 0.159 | |
| did | | | -0.200 | 124 |
| s.d | | | 0.152 | |
| | | *Match level data* | | |
| *Attendance* | | | | |
| post-calciopoli | 31208 | 21967 | 9241 | 1,157 |
| s.d | 15606 | 14560 | 959 | |
| pre-calciopoli | 37503 | 22462 | 15041 | 1,135 |
| s.d | 17439 | 16441 | 1098 | |
| did | | | -5800 | 2,292 |
| s.d | | | 1030 | |
| *Log Attendance* | | | | |
| post-calciopoli | 10.233 | 9.813 | 0.419 | 1,157 |
| s.d | 0.484 | 0.597 | 0.036 | |
| pre-calciopoli | 10.414 | 9.792 | 0.622 | 1,135 |
| s.d | 0.506 | 0.664 | 0.041 | |
| did | | | -0.203 | 2,292 |
| s.d | | | 0.039 | |

Table 4: Models for *Serie A* Attendance - Match level

| *Dep var: Log attendance* | *Mod.1* | *Mod.2* | *Mod.3* | *Mod.4* | *Mod.5* | *Mod.6* |
|---|---|---|---|---|---|---|
| $C \times P_{home}$ | -0.148*** | -0.163*** | -0.179*** | -0.160*** | -0.178*** | -0.159*** |
| | (0.040) | (0.033) | (0.032) | (0.037) | (0.032) | (0.037) |
| $C \times P_{away}$ | | | | | 0.013 | 0.015 |
| | | | | | (0.019) | (0.020) |
| teamtrend | | 0.003*** | | | | |
| | | (0.001) | | | | |
| promoted | -0.482*** | 0.023 | -0.017 | 0.002 | -0.014 | 0.005 |
| | (0.038) | (0.031) | (0.036) | (0.041) | (0.036) | (0.041) |
| position$_{prev\ seas}$ | -0.045*** | -0.005** | -0.007*** | -0.006** | -0.007*** | -0.006** |
| | (0.003) | (0.003) | (0.003) | (0.003) | (0.003) | (0.003) |
| home points game | 0.263*** | 0.096*** | 0.093*** | 0.095*** | 0.092*** | 0.093*** |
| | (0.025) | (0.014) | (0.015) | (0.016) | (0.015) | (0.016) |
| away points game | 0.256*** | 0.056*** | 0.062*** | 0.059*** | 0.063*** | 0.060*** |
| | (0.023) | (0.010) | (0.011) | (0.011) | (0.011) | (0.011) |
| home win prob | -1.656*** | -3.476*** | -3.475*** | -3.526*** | -3.313*** | -3.348*** |
| | (0.346) | (0.156) | (0.162) | (0.172) | (0.165) | (0.174) |
| home win prob$^2$ | 2.379*** | 2.798*** | 2.823*** | 2.872*** | 2.733*** | 2.772*** |
| | (0.360) | (0.163) | (0.170) | (0.183) | (0.170) | (0.183) |
| derby | 0.139*** | 0.143*** | 0.144*** | 0.151*** | 0.143*** | 0.150*** |
| | (0.053) | (0.019) | (0.020) | (0.020) | (0.020) | (0.020) |
| log gdp | 0.014 | -0.634*** | -0.382 | -0.390 | -0.410* | -0.419* |
| | (0.026) | (0.168) | (0.235) | (0.239) | (0.233) | (0.237) |
| log pop | 0.125*** | 1.078*** | 0.729*** | 0.726*** | 0.747*** | 0.746*** |
| | (0.028) | (0.060) | (0.262) | (0.267) | (0.261) | (0.265) |
| N | 2178 | 2158 | 2158 | 2018 | 2158 | 2018 |
| F | 233.335 | 785.434 | 78.664 | 73.764 | 79.165 | 74.390 |
| $F_\alpha$ | | 164.517 | 161.052 | 151.147 | 158.941 | 149.184 |
| $F_\delta$ | | | 1.39 | 1.27 | 1.34 | 1.24 |

Std.err. in parenthesis. Significance levels: *10% **5% ***1%.

$F_\alpha$: F test that all $\alpha_i = 0$. $F_\delta$: F test that all $\delta_t = 0$

Chow test of structural break after 2006 Mod.1: Chow=6.215 > F(18; 2134)=1.608.

Model 1, OLS with robust std. err.

Model 2, AR(1) with Home Team fixed effects, team time trend and Season dummies

Model 3, AR(1) with Home Team fixed effects, Round fixed effects and Season dummies

Model 4 similar to 3 but excludes Juventus. Model 5 similar to 3 and include Away Team effect.

Model 6 similar to 5 but excludes Juventus.

Table 5: Models for *Serie A* Attendance - Match level

| | *Panel A: Moral Disapproval* | | *Panel B: Calciopoli year Effect* | |
|---|---|---|---|---|
| | | $^{\star}$ | | $^{\star\star}$ |
| $C \times P_{home}$ | 0.189*** | 0.176*** | -0.076** | -0.076** |
| | (0.043) | (0.046) | (0.033) | (0.033) |
| N | 293 | 275 | 563 | 526 |
| F | 54.005 | 52.806 | 49.088 | 48.502 |
| $F_{\alpha}$ | 167.624 | 159.801 | 191.487 | 194.898 |

| | *Panel C: Persistence Effect* | | | | | |
|---|---|---|---|---|---|---|
| | *1 year* | *1 year* $^{\star}$ | *2 years* | *2 years* $^{\star}$ | *3 years* | *3 years* $^{\star}$ |
| $C \times P_{home}$ | -0.229*** | -0.124** | -0.152*** | -0.108** | -0.176*** | -0.144*** |
| | (0.051) | (0.057) | (0.039) | (0.043) | (0.035) | (0.040) |
| N | 1339 | 1254 | 1628 | 1525 | 1903 | 1782 |
| F | 94.295 | 91.023 | 85.500 | 80.872 | 87.098 | 82.076 |
| $F_{\alpha}$ | 114.012 | 116.870 | 133.289 | 128.849 | 146.215 | 137.692 |

Std.err. in parenthesis. Significance levels: *10% **5% ***1%. $F_{\alpha}$: F test that all $\alpha_i = 0$

$^{\star}$ Juventus and $^{\star\star}$ Internazionale excluded from the sample, respectively.

Moral Disapproval: Home Team FE model - only 2005/06 before and after 12 February.

Calciopoli year effect: Home Team FE model - 2005/06 vs 2006/07.

Persistence of the Effect: AR(1) with Home Team FE Models.

First year after Calciopoli is 2007/08. Before Calciopoli from 2002/03 to 2005/06.

Table 6: Falsification Tests Models for *Serie A* Attendance- Match level

*Pre-Calciopoli assumed in 2002-03 and 2003-04*
*Post-Calciopoli assumed in 2004-05 and 2005-06*

| | *Mod.1* | *Mod.2* | *Mod.3* | *Mod.4* | *Mod.5* |
|---|---|---|---|---|---|
| $C \times P_{home}$ | -0.007 | 0.039 | 0.055 | 0.035 | 0.051 |
| | (0.160) | (0.031) | (0.034) | (0.031) | (0.034) |
| $C \times P_{away}$ | | | | -0.041 | -0.043 |
| | | | | (0.028) | (0.029) |
| promoted | -0.369 | 0.047 | 0.068 | 0.048 | 0.070 |
| | (0.250) | (0.043) | (0.044) | (0.043) | (0.044) |
| $\text{position}_{prev\,seas}$ | -0.057*** | -0.018*** | -0.016*** | -0.018*** | -0.016*** |
| | (0.019) | (0.003) | (0.003) | (0.003) | (0.003) |
| home points game | 0.174** | 0.059*** | 0.057*** | 0.058*** | 0.055*** |
| | (0.083) | (0.017) | (0.017) | (0.017) | (0.017) |
| away points game | 0.310*** | 0.074*** | 0.071*** | 0.070*** | 0.066*** |
| | (0.062) | (0.016) | (0.016) | (0.016) | (0.016) |
| home win prob | -0.774 | -3.415*** | -3.534*** | -3.292*** | -3.400*** |
| | (1.260) | (0.254) | (0.267) | (0.260) | (0.273) |
| home win $\text{prob}^2$ | 1.719 | 2.799*** | 2.956*** | 2.717*** | 2.864*** |
| | (1.378) | (0.258) | (0.277) | (0.261) | (0.281) |
| derby | 0.168* | 0.133*** | 0.149*** | 0.132*** | 0.148*** |
| | (0.097) | (0.031) | (0.031) | (0.031) | (0.031) |
| log gdp | -0.047 | -2.011** | -2.208** | -1.915** | -2.110** |
| | (0.156) | (0.955) | (0.955) | (0.952) | (0.952) |
| log pop | 0.241 | 5.545*** | 5.322*** | 5.570*** | 5.345*** |
| | (0.209) | (0.983) | (0.980) | (0.980) | (0.976) |
| N | 1065 | 1065 | 997 | 1065 | 997 |
| F | 51.107 | 16.539 | 15.859 | 16.349 | 15.717 |
| $F_\alpha$ | | 236.647 | 201.379 | 235.750 | 200.677 |

Std.err. in parenthesis. Significance levels: *10% **5% ***1%. Fu: F test that all $\alpha_i = 0$

Models 1 OLS with robust std. err.

Models 2, 3, 4 and 5 Home Team Fixed effects, Round and Season dummies.

Models 3 and 5 exclude Juventus. Models 4 and 5 include Away Team effect.