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A decade of violence and empty stadiums in Egypt: When does emotion from the terraces affect behaviour on the pitch?

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Abstract

In less than a decade, the Egyptian Premier League has experienced three distinct changes between periods of competition in either crowded or empty stadiums. We exploit this unique sequence of natural experiments, to answer two questions neglected by the still emerging literature on the effects of social pressure on behaviour and decision-making. First, does reinstating a supportive crowd after a long period of absence affect performances on the pitch? Second, is any reduced home advantage from competing in empty stadiums robust to repeating such an experiment? We find that eliminating social pressure from crowds decreased or even reversed home advantage after an incident of extreme crowd violence in 2012, but there were no significant effects when crowds were reinstated in 2018 and once more excluded in 2020. These results suggest that not all home crowds benefit the home team.

Keywords: Attendance; COVID-19; Football, Home advantage; Natural Experiments; Referee Bias; Social Pressure

*JEL Code*s: C90, D91, L83, Z2

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1. Introduction

On February 1, 2012, at the conclusion of an Egyptian Premier League (EPL) fixture between Al Masry Sporting Club of Port Said and Cairo's Al Ahly Sporting Club (SC), a massive riot erupted at Al Masry Club Stadium, formerly known as Port Said Stadium, in which seventy-four people were killed and many hundreds more were injured.[1] The event sparked a period of civil unrest over the following weeks. As a result, the Egyptian Government cancelled the remainder of the EPL's 2011-12 season. The EPL returned for the 2012-13 season with empty stadiums, only for that season also to be cancelled due to a coup d'état (Reuters, 2013). The EPL restarted for a full season in 2013-14 behind closed doors, i.e., in empty stadiums without any crowds. Spectators were to be allowed back into stadiums in early 2015 (Reuters, 2014), before further violence led to another suspension and the continuation of the stadium ban (Reuters, 2015). Eventually, the ban was lifted for the beginning of the 2018-19 season, though with restricted numbers, typically about 5,000 spectators, and those attending had to provide their personal details to security services. In March 2020, the EPL was suspended because of COVID-19, like most football leagues were (see Tovar, 2021),[2] before ultimately resuming, once again with empty stadiums for the remainder of the 2019-20 season and the entirety of the 2020-21 season. In this way, between 2012 and 2020, the EPL experienced three distinct changes between periods of either having crowds in attendance or playing in empty stadiums – twice when fans were shut out and once when at least some of them could return.

We exploit this series of natural experiments, occurring over a decade, to shed some first light on the question of what happens when spectators, who typically favour the team playing at home, not only leave the stands but also return after a relatively long period of absence. While the COVID-19 pandemic has induced a global natural experiment motivating economists and psychologists alike to study the causal effects of an absent crowd on performances in professional sports, including by the officials (e.g., Bryson et al., 2021; Endrich & Gesche, 2020; Ferraresi & Gucciardi, 2021; Fischer and Haucap, 2021; McCarrick et al., 2021; Scoppa 2021; see also Reade et al., 2020, for a summary), two natural follow-up questions have so far been largely neglected. First, does reinstating a supportive crowd after a long period of absence also affect performances? Second, is any reduced home advantage from competing in empty stadiums robust to repeating the experiment?

[1] For a more detailed summary of the events that night, we refer to Wikipedia (bit.ly/portsaidriotw). For video footage of the riots, including players being attacked by fans on the pitch (bit.ly/portsaidriots), and how the event sparked violence on the same night in other football stadiums (bit.ly/cairostadium), we refer to the YouTube channel of the national British daily broadsheet newspaper The Telegraph.

[2] In Europe, a minority of football leagues, including the Danish Superliga, the Swiss Super League, and the Russian Premier League, eventually returned to complete their campaigns with strictly restricted stadium attendances (e.g., Cueva, 2020). See Reade et al. (2021) for a study of an exceptional professional football league in Belarus that continued with fans in stadiums throughout the early stages of the Covid-19 pandemic.

Answering these two questions can help us to better understand how social forces affect individual economic behaviour (e.g., Akerlof & Kranton, 2000; Becker & Murphy, 2000; Bursztyn & Jensen, 2017), which is relatively easy to assess in the regulated and controlled context of sports competition (Bar-Eli et al., 2021; Chan et al., 2021; Singleton, Bryson, et al., 2021). There is already an extensive and continuously growing economic literature on the potential effects of the social environment in sports on decision making, not least on the relationship between social pressure and the behaviour of referees and judges (see the survey by Dohmen & Sauermann, 2016). The underlying dynamics though, alternating between periods of inducing or removing social pressure, are hardly understood. There is also an open question about the cultural and context-specific consistency of social effects on behaviour, especially about the effects caused by a large crowd of spectators who are invested in a particular outcome in sport or at other types of events. For instance, from the already more than twenty peer-reviewed studies constituting the still-emerging literature on how COVID-19 affected home advantage in professional association football, to the best of our knowledge not one has included observations from matches played in Africa,[3] despite the evidence so far suggesting that the observed effects might be highly context-sensitive (e.g., Benz & Lopez, 2021; Bryson et al., 2021; Fischer & Haucap, 2021).

2. Background and data

Although the Egypt's men's national football team, also known as the Pharaohs, has only qualified for the FIFA World Cup three times, the country has a rich football pedigree and history. At the men's senior international level, Egypt is the most successful football nation in the African continent's history, having won the Africa Nations Cup seven of the thirty-two times it was held between 1957 and 2019, more than any other nation. Egypt's dominance is even greater at the club level, where an Egyptian team has won the top continental club competition sixteen times since the first edition in 1964, including the last two editions in 2020 and 2021, and where the next most successful nations are currently tied on six successes each. Egypt has also had a notable recent impact on the elite European professional football leagues. For example, the "best player in the world" as of November 2021, Mohamed Salah currently of Liverpool F.C., is Egyptian and began his career with Al Mokawloon Al Arab SC in the EPL.[4]

[3] The tendency to ignore African observations in this context is by no means surprising, given that most previous research in the field of sports economics has focused on exploring either European or US settings (e.g., Gomez-Gonzalez et al., 2021; Schreyer and Ansari, 2021).

[4] At the time of writing, November 2021, European football pundits and professionals were commonly referring to Mo Salah as the "best player in the world" (e.g., Daily Mail, 2021; Eurosport, 2021; Guardian, 2021).

However, when it comes to "Egyptian football", perhaps the second thing that the average football fan thinks about, after Mohamed Salah, is violence. Despite filling large stadiums with tens of thousands of emotive fans in the past,[5] more EPL games have taken place in empty stadiums than with fans in attendance in the last decade. Table 1 briefly summarises the recent history of this competition since the beginning of the 2009-10 season. As described in the introduction here, the Egyptian ultras, and all other football supporters, were first banned from the stadiums in February 2012 after the Port Said Stadium Riot, followed by an extension of that ban in 2015 because of more violence and a reinstatement in 2020 because of COVID-19.

To use this period of variation in the presence or not of a stadium crowd, testing whether the social pressure derived from it affects outcomes and behaviour on the pitch, either consistently or differently depending on the context, we collected data on the outcomes of all EPL football matches between the beginning of the 2009-10 season and the end of the 2020-21 season.[6] Like much of the literature that has used the experience of COVID-19 and professional football without crowds to infer their impacts (e.g., Bryson et al., 2021), we focus on a few high-level outcomes of football matches that normally show an advantage to the team playing at home: (1) the match outcome and the difference this implies between teams in league points earned (home win$\Rightarrow$ 3 points diff., draw$\Rightarrow$ 0 points diff., away win$\Rightarrow -3$ points diff.); (2) the goal difference between teams according to the final match score line; (3) the total numbers of yellow cards awarded to each team; and (4) the difference in these numbers of cards between the teams.[7] The last of these outcomes captures the different extent to which the teams involved were punished for foul play and is often used in the literature to point toward referee bias (e.g., Dohmen and Sauermann, 2016). The outcomes based on final match score lines are normally used to measure overall home advantage in football. Table 2 summarises the descriptive statistics for these match outcomes as well as stadium capacities in the EPL.

[5] Unfortunately, we were unable to find reliable match-level data or even season-level averages for Egyptian stadium attendances before the Port Said disaster in 2012. However, Egypt currently has 18 football stadiums with at least a capacity of 20,000. The modern Borg el Arab stadium in Cairo holds 86,000, and before it became an all-seater, the Cairo International Stadium could hold 120,000 standing, doing so for the 1986 Africa Nations Cup final in 1986.

[6] We collected these data from worldfootballdata.net.

[7] Throughout, the analysis, we group yellow cards awarded to players for their first offence in a match with those awarded for a second offence that would also result in a red card.

TABLE 1: Egyptian Premier League (EPL), seasons 2009-10 to 2020-21

Period	Season	Teams	Number of EPL matches…			Remarks
			…played…	…with crowds	…without crowds	
A	2009-10	16	240	240	0	
A	2010-11	16	240	240	0	EPL was suspended in January 2011 for over 3 months due to the Egyptian Revolution, but then restarted and completed by mid-July 2011.
A	2011-12	16	143	143	0	EPL was suspended following the 1/2/2012 Port Said disaster and then not completed.
B	2012-13	18	136	0	136	EPL split into two and two teams added. Was suspended in July 2013 due to Egyptian coup d'état and not completed.
B	2013-14	22	227	0	227	EPL remained split in two and four more teams were added, with relegation and championship playoff games.
B	2014-15	20	379	0	379	Fans were supposed to be allowed back into stadiums in early 2015, after the end of the Africa Cup of Nations (8/2/2015) but excluding matches involving 6 teams. However, there was a deadly incident at a match in Cario when fans attempted to force access to the stadium on 8/2/2015 – thereafter, the season was completed with empty stadiums.
B	2015-16	18	306	0	306	EPL returned to a single division and no play-off games.
B	2016-17	18	305	0	305	Zamalek did not show up for a match at Misr Lel Makkasa.
B	2017-18	18	306	0	306	
C	2018-19	18	306	306	0	Up to 5,000 fans allowed back into stadiums, after providing personal details to security services.
C/D	2019-20	18	305	156	149	Zamalek refused to play away at Al Alhy. EPL was suspended in March 2020 due to Covid-19 and later completed in empty stadiums.
D	2020-21	18	306	0	306	EPL season was completely played in front of empty stadiums.

Notes: information collected and verified using worldfootballdata.net, accessed 10/11/2021, and various other sources, including Wikipedia and news articles. 'Period' refers to differences over time in whether matches took place behind closed doors (see also Figure 1).

TABLE 2: Sample descriptive statistics for matches in the Egyptian Premier League, August 2009 to August 2021

	Mean/share	S.E.	Min.	Median	Max.
Home win	0.373	0.009			
Draw	0.330	0.008			
Away win	0.297	0.008			
Points diff. (Home – Away)	0.229	0.043	-3	0	3
Goal diff. (Home – Away)	0.171	0.026	-6	0	6
Yellow cards diff. (Home – Away)	-0.081	0.029	-6	0	6
Home yellow cards	1.746	0.022	0	2	7
Away yellow cards	1.827	0.023	0	2	7
Stadium capacity (000s)*	30.918	21.537	1	25	86
N of all matches			3,195		
N of closed doors matches			2,112		
N of open stadium matches			1,083		

Notes: author calculations using data from worldfootballdata.net, accessed 10/11/2021. All matches played in the sample period, with the earliest match being played on 6/8/2009 and the latest being played on 28/8/2021. * We were only able to collect the stadium location and capacity data for 2,874 of the matches.

Figure 1 illustrates the development of home advantage in the EPL from the beginning of the 2009-10 season to the end of the 2020-21 season, with the shaded areas covering the periods of empty stadiums. Largely reflecting of a tendency observed in European football (e.g., Peeters and van Ours, 2021), as well as in Cricket (Reade, 2019) and the Olympics (e.g., Singleton, Reade, et al., 2021), among other sports and competitions, we note a slight decline in home advantage over time. In the first two years in our sample period, about 41 percent of matches were won by the team playing at home, compared with 35 percent of matches in the last two years. Despite the series in Figure 1 displaying centred moving averages of outcomes over one hundred EPL matches, there is stark and substantial variability over time in the differences between home and away teams in the numbers of goals and yellow cards awarded.

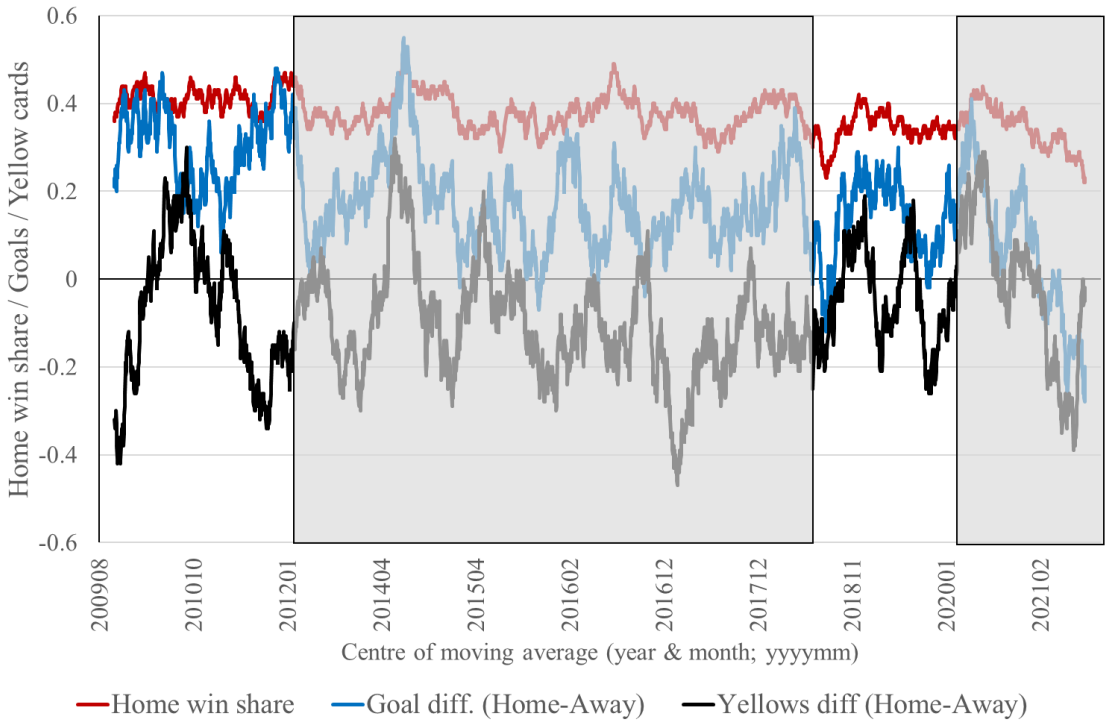
3. Estimation

To estimate the effects of playing football in an empty stadium, we assume that the conditional mean of the outcome y_{ijm}, in match *m*, involving home team *i* and away team *j*, is given by:

$$E\left[y_{ijm} \mid C_{ijm}, h_i, a_j\right] = F\left(C_{ijm}, h_i, a_j ; \beta\right), \quad (1)$$

where C_{ijm} is a dummy variable taking the value of one when a match was played behind closed doors and zero otherwise. Here, h_i and a_j are fixed effects for the home and away teams, respectively, consistent with an assumption that in some period there are general tendencies for some football

FIGURE 1: Average outcomes in football matches of the Egyptian Premier League, August 2009 to August 2021



Notes: author calculations using data from worldfootballdata.net, accessed 10/11/2021. Series show a centred moving average over 100 football matches of outcomes: share of matches ending in a home win; the average final match goal difference between the teams (home minus away); and the average difference between home and away teams in the total numbers of yellow cards awarded by referees within matches. Shaded areas denote the periods where matches were played in empty stadiums - see main text and Table 1 for descriptions of these periods.

teams to be relatively stronger than others when playing at home or away (e.g., Peeters and van Ours, 2021; Pollard, 1986; Pollard, 2006). These fixed effects also address the unbalanced sets of matches played with and without fans in attendance in the estimation samples (Bryson et al., 2021). The parameter β, to be estimated, measures the effect of playing behind closed doors on the football match outcome. In the ideal experiment to identify β and interpret it as a causal effect, we would repeatedly hold the same football matches, involving the same players, officials, and other participants, and in the same conditions, except for varying the presence or not of fans in the stadiums. Although this is impractical, the fact that the stadium bans, and their later rescindments, were not driven by football reasons, could still allow for a causal interpretation of our estimates of β. This is the case so long as the home and away-team fixed effects can plausibly address the non-random variation in match outcomes, and in particular home advantage, driven by differences in the types of matches played with and without fans. As we discuss later, this is partly why we prefer to estimate Equation (1) over relatively short periods of matches, as any football fan knows that the relative home and away strengths of teams tends to vary a fair amount over longer periods of time.

Nonetheless, we considered including on the right-hand side of Equation (1) some other well-known determinants of the variation in football match home advantage that the fixed effects would not necessarily soak up, such as the distance travelled by the away team to a match (Clements et al., 2021; specifically for association football see Oberhofer et al., 2010),[9] the precise scheduling of the match (e.g., Goller and Krumer, 2020), and the recent form of the teams playing (e.g., Zhao and Zhang, 2017). However, we found that variables addressing the former two of these potential determinants were generally statistically insignificant when included in the estimation of Equation (1). We prefer to omit time-varying variables capturing the recent form of teams as there is no possibility that these could determine whether a match was played behind closed doors. We would also be concerned that form variables, e.g., the dynamic Elo ratings or recent win percentages of teams, could become contaminated by the effects of playing behind closed doors, especially close to the times in the EPL when the ability of fans to attend matches changed.

We estimate Equation (1) using least squares when y_{ijm} is either the points difference achieved by the teams in a match, the goal difference, or the difference between the home and away teams in the numbers of yellow cards issued to them by the referee. We also estimate Equation (1) using Poison regression when y_{ijm} is either the number of yellow cards awarded to the home or away team.[10] We estimate Eicker-Huber-White heteroskedasticity robust standard errors for all models.

We select four different estimation periods: (I) whole sample period: August 2009 to August 2021; (II) before/after the Port Said Stadium riot, 2011-12 and 2012-13 seasons; (III) 2018, letting fans back in, 2017-18 and 2018-19 seasons; (IV) 2020, shutting fans out due to Covid-19, 2019-20 season only. Period (I) covers all three distinct changes in the presence or not of fans in the stadiums (see Figure 1). Periods (II)-(IV) each cover one distinct change in the presence or not of fans in the stadiums. The choices of estimation periods were guided by the scheduling of EPL seasons and having enough matches to generate some reasonable statistical power, with the trade-off in the latter regard being the strength of the fixed home and away team effects assumptions then implied by the regression models.

[9] Typically, the literature suggests that fatigue, particularly following considerably long air travel and jet lag, tends to increase home advantage. As a counterexample, though not from football, Zak (2021) finds that Chess players perform significantly better when they travel abroad for tournaments, pointing toward the greater incentives to perform after investing in costly travel.

[10] We prefer Poisson (QMLE) to negative binomial regression because the former is efficient in the class of consistent estimators with under or overdispersion (variance/mean ratio is constant) for effects on the conditional mean, provided it is correctly specified (Wooldridge, 2010). We also considered a Skellam distribution for the differences between two dependent Poisson or general count random variables (i.e., goals or yellow cards) (see Karlis and Ntzoufras, 2003), but this also appears to offer no overriding benefits to estimate the effects of interest on the conditional mean outcome.

4. Results

Table 3 shows the estimated effects from Equation (1) of playing in empty stadiums in the EPL instead of with fans in attendance, $\hat{\beta}$, varying the estimation period and the dependent variable. Specifically, the columns give estimates of the effects for the four different sample periods of matches described above, and the rows give the effects for each of the five different outcome variables that we focus on. In column (I), for the whole period, the estimates point to reduced home advantage in terms of the points gap and goal difference between teams when fans were absent from the stadiums, though not statistically different from no effect at the 5% level. Over the whole period between 2009 and 2021, playing behind closed doors was also associated with significantly fewer yellow cards being awarded to both the home and away teams, by 5-6%, or around one card fewer awarded to each team every ten matches. Column (II) shows the estimates of Equation (1) considering only the EPL seasons either side of the Port Said Stadium riot in 2012. The estimated reduction in home advantage associated with this event and playing football behind closed doors was large, with a large but statistically insignificant reduction in the points gap by 0.5 and a significant reduction in the goal difference by 0.4, which effectively turned the normal home advantage into an away advantage. Despite this, there appears to have been no significant effect of the empty stadiums in this period on the numbers of yellow cards awarded to either the home or away teams.

Columns (III) and (IV) of Table 3 respectively focus on the two periods around letting fans back into stadiums for the start of the 2018-19 season and shutting them out because of COVID-19 within the 2019/20 season. Around both these events, the estimates of Equation (1) suggest that playing without fans increased home advantage within matches for points earned and goals scored, but these effects are not statistically significant at standard levels. Compared with the previous season, the 2018-19 season saw significantly more yellow cards awarded to home teams when fans returned to the stadiums (column (III), rows 4 & 5), (column (III), row 3), which also points towards a positive effect of empty stadiums on home advantage in these later periods.

Over the period that we study, several matches in EPL were played in neutral stadiums or even neutral cities, even though they still had a designated home and away team. It is also a concern for the interpretation of the results in Table 3 that the EPL has a few teams with substantially larger supporter bases than others, to the extent that some away fixtures could have had greater numbers of supporters of the away team in attendance than for the home team (e.g., Al Ahly SC playing away against other teams who are also based in Cairo), especially since we understand that stadiums were far from filled to capacity before the bans. We would expect these characteristics of EPL to bias the estimates of Equation (1) toward no effects on home advantage from playing behind closed doors.

TABLE 3: Estimated effects of playing football in empty stadiums in the Egyptian Premier League, August 2009 to August 2021

	Dependent Variable	Whole period (I)	2012: Before/after Port Said Stadium riot (II)	2018: Letting fans back in (III)	2020: Shutting fans out due to COVID-19 (IV)
Least squares ($\hat{\beta}$):	1. Points diff. (Home – away)	-0.102 (0.092)	-0.521 (0.268)	0.280 (0.221)	0.271 (0.253)
	2. Goal diff. (Home – away)	-0.093 (0.054)	**-0.408** (0.163)	0.029 (0.127)	0.100 (0.150)
	3. Yellows diff. (Home – away)	-0.008 (0.066)	0.225 (0.181)	-0.284 (0.155)	0.110 (0.190)
Poisson: exp($\hat{\beta}$)-1	4. Home yellows	**-0.057** (0.027)	0.054 (0.083)	**-0.273** (0.05)	-0.029 (0.073)
	5. Away yellows	-0.050 (0.026)	-0.070 (0.067)	-0.123 (0.060)	-0.093 (0.070)
Estimation sample sizes:					
N of all matches		3,195	279	612	175
N of closed doors		2,112	136	308	149
N of open stadiums		1,083	143	304	156

Notes: author calculations using data from worldfootballdata.net, accessed 10/11/2021. See main text, Tables 1-3, & Figure 1 for descriptions of the data and estimation periods covered by the column headings. Rows 1-3 show least squares estimates of Equation 1 for the effect of playing in empty stadiums. Rows 4 & 5 show Poisson model equivalent estimates of Equation 1 for the numbers of yellow cards, where the estimates displayed should be interpreted as the % reduction in cards awarded to either the home or away team when matches took place in empty stadiums. All models have home-team and away-team fixed effects. Robust standard errors for the estimates are shown in parentheses. Bold indicates estimates that are significantly different from zero at least at the 5% level, using two-sided tests.

We could find no reliable data on attendances by home and away team supporters for the EPL. Therefore, as a robustness check in Table 4, we use only matches where the home team was playing in their home city and the away team travelled outside the city where they were based, to estimate all the same variants of Equation (1) as summarised in Table 3. In theory, this sub-sample of matches ought to have featured on average a greater preference toward the home team among the fans attending the stadiums, thus partially addressing the aforementioned bias to the estimated effects of playing behind closed doors. The results in Table 4 confirm this, especially for the period around the Port Said Stadium riot. After dropping the matches where home teams were not playing in their home cities and away teams were not travelling between cities, the estimated reductions in home advantage from playing in an empty stadium are greater (column (II), rows 1-3).

TABLE 4: Robustness checks – only matches where home team played in home city and away team travelled to the city & the size of the stadium

	Dependent Variable	Whole period	2012: Before/after Port Said Stadium riot	2018: Letting fans back in	2020: Shutting fans out due to COVID-19
		(I)	(II)	(III)	(IV)
Least squares ($\hat{\beta}$):	1. Points diff. (Home – away)	-0.205 (0.128)	**-0.885** (0.410)	0.417 (0.359)	0.274 (0.367)
	2. Goal diff. (Home – away)	**-0.148** (0.075)	**-0.507** (0.250)	0.060 (0.209)	0.185 (0.214)
	3. Yellows diff. (Home – away)	0.070 (0.092)	0.549 (0.299)	-0.333 (0.255)	0.135 (0.280)
Poisson: exp($\hat{\beta}$)-1	4. Home yellows	0.000 (0.040)	0.212 (0.141)	**-0.206** (0.081)	0.055 (0.113)
	5. Away yellows	-0.038 (0.036)	-0.118 (0.095)	-0.009 (0.098)	-0.029 (0.112)
Estimation sample sizes:					
N of all matches		1,716	156	317	171
N of closed doors		1,053	60	163	80
N of open stadiums		663	96	154	91

Notes: See Table 3. All models have home-team and away-team fixed effects. Robust standard errors for the estimates are shown in parentheses. Bold indicates estimates that are significantly different from zero at least at the 5% level, using two-sided tests.

We also check whether the empty stadiums effects are heterogeneous according to stadium capacities. A larger capacity suggests higher attendances before the stadium bans, potentially greater social pressure from the home crowd, and thus the possibility of a larger loss in home advantage behind closed doors. However, most of the stadiums in the EPL, especially the larger ones, have a running track, which increases the distance between the fans and the pitch. This fact has the potential to reduce home advantage (e.g., Buraimo et al., 2010) and thus the effects of playing behind closed doors as capacity increases. When we include a variable for the interaction between the stadium capacity and C_{ijm} in the regression models, focused on the period around the Port Said Stadium riot, and also still dropping the matches where home teams were not playing in their home cities and away teams were not travelling between cities, we find no statistically significant differences in the empty stadiums effects on the points gap, goal difference or yellow cards difference according to stadium capacity.[11]

[11] Full results are available on request. Interestingly, although there is no significant effect of $Capacity_{ijm} \times C_{ijm}$ on the yellow cards difference, it does have a positive effect on the numbers of home and yellow cards (p-values<0.01) – an

5. Discussion and conclusions

Adding to the still-emerging literature on the causal effects of social pressure on human behaviour and decision-making, our findings indicate that eliminating social pressure by banning emotional crowds from the stands seems to reduce home advantage (c.f., Reade et al., 2020), at least initially. When playing behind closed doors in the aftermath of the 2012 Port Said Stadium riot, EPL's teams experienced a significant reduction in both the previously positive points gap and the goal difference when playing at home. This finding is generally consistent with or even somewhat greater in magnitude than what recent studies have found from exploring European association football played behind closed doors, either occasionally (e.g., Pettersson-Lidbom & Priks, 2010) or regularly (e.g., Bryson et al., 2021). However, there was no significant increase in the points gap or goal difference in favour of the home teams once the (limited) crowds were let back in at the beginning of EPL's 2018-19 season. Similarly, we observe no further reduction in home advantage once spectators were banned due to COVID-19 in 2020. This suggests that, ultimately, not all home crowds seem to benefit the home team,[12] perhaps because the degree of social pressure from once very emotional crowds might cool down while under observation and scrutiny.[13] An alternative and related explanation might point to changes in the composition of EPL crowds over the studied period. As Rommel (2021) observes, by 2018 and before the return of (restricted) crowds in EPL's stadiums, both Egyptian masculine fan groups and ultras movements had largely dissolved, which may have resulted in a substantial reduction in social pressure on the performances of the referee and other officials from the less vocal remaining home-team supporters in the crowds.[14]

Our findings also add to the discussion of whether home advantage in football and other professional sports was eroded during COVID-19. While most previous authors have documented an often-substantial decline in home advantage after March 2020 across numerous European football competitions, the reported effect sizes tend to vary significantly across studies. This may not only reflect different estimation techniques but even more so potential sample selection biases (e.g., Benz & Lopez, 2021). As Fischer and Haucap (2021) have noted, among others, one such confounding factor might relate to heterogeneity of crowd sizes before COVID-19. They found that the home advantage of German clubs from lower tiers, and thus with relatively small crowds, was largely

increase in the stadium capacity of 1,000 and playing behind closed doors increases the number of yellow cards awarded by 1.3% for home teams and 1.0% for away teams.

[12] Somewhat related, Colella (2021) observes a significant increase in the performances of non-white players, relative to white players, when Italian supporters were banned from stadiums due to COVID-19 in the 2019-20 season.

[13] Note that, as indicated in Table 1, those (few) fans that were allowed to enter the stadiums in 2019 had to provide personal details to security services.

[14] Related, Goumas (2014) concluded that for European club continental football the density of a crowd affected referee decisions, and not the size of the crowd nor its proximity to the pitch once density was controlled for.

unaffected by the COVID-19 induced spectator ban, whereas the impact on home advantage in the top tier appeared to be substantial. Our findings echo these previous ones (e.g., Reade et al., 2020), as well as pointing to another explanation for some of the observed heterogeneity in the effects of empty stadiums - the potential for substantial variance in crowd composition, not only across leagues but also over time within leagues.

References

Akerlof, G. A., & Kranton, R. E. (2000). Economics and identity. *The Quarterly Journal of Economics*, 115(3), 715-753.

Bar-Eli, M., Krumer, A., & Morgulev, E. (2020). Ask not what economics can do for sports – Ask what sports can do for economics. *Journal of Behavioral and Experimental Economics*, 89, 101597.

Becker, G. S., & Murphy, K. M. (2000). Social Economics: Market Behavior in a Social Environment. Harvard University Press.

Benz, L. S., & Lopez, M. J. (2021). Estimating the change in soccer's home advantage during the Covid-19 pandemic using bivariate Poisson regression. *AStA Advances in Statistical Analysis*.

Bryson, A., Dolton, P., Reade, J. J., Schreyer, D., & Singleton, C. (2021). Causal Effects of an Absent Crowd on Performances and Refereeing Decisions during COVID-19. *Economics Letters*, 198, 109664.

Buraimo, B., Forrest, D., & Simmons, R. (2010). The 12th man?: refereeing bias in English and German soccer. *Journal of the Royal Statistical Society: Series A (Statistics in Society)*, 173(2), 431–449.

Burstztyn, L., & Jensen, R. (2017). Social Image and Economic Behavior in the Field: Identifying, Understanding, and Shaping Social Pressure. *Annual Review of Economics*, 9(1), 131–153.

Chan, H. F., Savage, D., & Torgler, B. (2021). Sport as a behavioral economics lab. CREMA Working Paper Series 2021-20, Center for Research in Economics, Management and the Arts (CREMA).

Clements, E., Fowler, P. M., & Duffield, R. (2021). The Influence of Travel in the Home Advantage Effect. In *Home Advantage in Sport* (pp. 118-130). Routledge.

Colella, F. (2021). Who benefits from support? The heterogeneous effects of supporters on athletes' performance by skin color Cahiers de Recherches Economiques du Département d'économie 21.12, Université de Lausanne, Faculté des HEC, Département d'économie.

Cueva, C. (2020). Animal Spirits in the Beautiful Game. Testing social pressure in professional football during the COVID-19 lockdown. OSF Preprints. DOI: 10.31219/osf.io/hczkj.

Daily Mail. (2021). CHRIS SUTTON: Mo Salah IS the world's best player right now... so Liverpool must agree a new deal fast. Retrieved from: https://bit.ly/3odYJ9I. Assessed on October 21, 2021.

Dohmen, T., & Sauermann, J. (2016). Referee Bias. *Journal of Economic Surveys*, 30(4): 679–695.

Endrich, M., & Gesche, T. (2020). Home-Bias in Referee Decisions: Evidence from 'Ghost Matches' During the COVID-19 Pandemic. *Economics Letters*, 197, 109621.

Eurosport. (2021). Ballon d'Or winner? Mohamed Salah is currently the best player in the World, Jurgen Klopp is right – Opinion. Retrieved from: https://bit.ly/3c4EpSq. Assessed on November 11, 2021.

Ferraresi, M., & Gucciardi, G. (2021). Who chokes on a penalty kick? Social environment and individual performance during Covid-19 times. *Economics Letters*, 203, 109868.

Fischer, K., & Haucap, J. (2021). Does Crowd Support Drive the Home Advantage in Professional Football? Evidence from German Ghost Games during the COVID-19 Pandemic. *Journal of Sports Economics*, 22(8), 982-1008.

Goller, D., & Krumer, A. (2020). Let's meet as usual: Do games played on non-frequent days differ? Evidence from top European soccer leagues. *European Journal of Operational Research*, 286(2), 740–754.

Gomez-Gonzalez, C., del Corral, J., & Rodríguez, P. (2021). The Who and the What of the Journal of Sports Economics – 20th Anniversary Edition. *Journal of Sports Economics*. DOI: 10.1177/15270025211049797.

Goumas, C. (2014). Home advantage and referee bias in European football. *European Journal of Sport Science*, 14(sup1), S243-S249.

Guardian (2021). 'He is the best': Klopp hails Salah as the world's premier player. Retrieved from: https://bit.ly/3qu7bUT. Assessed on November 11, 2021.

Karlis, D., & Ntzoufras, I. (2003). Analysis of sports data by using bivariate Poisson models. *Journal of the Royal Statistical Society: Series D (The Statistician)*, 52(3), 381–393.

McCarrick, D. J., Bilalic, M., Neave, N., & Wolfson, S. (2021). Home advantage during the COVID-19 pandemic: Analyses of European football leagues. *Psychology of Sport and Exercise*, 56, 102013.

Oberhofer, H., Philippovich, T., & Winner, H. (2010). Distance matters in away games: Evidence from the German football league. *Journal of Economic Psychology*, 31(2), 200-211.

Peeters, T., & van Ours, J. C. (2021). Seasonal Home Advantage in English Professional Football; 1974–2018. *De Economist*, 169, 107–126.

Pollard R. (1986). Home advantage in soccer: a retrospective analysis. *Journal of Sports Sciences*, 4(3), 237–248.

Pollard, R. (2006). Worldwide regional variations in home advantage in association football. *Journal of Sports Sciences*, 24(3), 231–240.

Pettersson-Lidbom, P., & Priks, M. (2010). Behavior under social pressure: Empty Italian stadiums and referee bias. *Economics Letters*, 108(2), 212–214.

Reade, J. J. (2019). Officials and Home Advantage. In The SAGE Handbook of Sports Economics (pp.219–230). Sage Publishing.

Reade, J. J., Schreyer, D., & Singleton, C. (2020). Eliminating supportive crowds reduces referee bias. Economics Discussion Papers em-dp2020-25, Department of Economics, Reading University.

Reade, J. J., Schreyer, D., & Singleton, C. (2021). Stadium attendance demand during the COVID-19 crisis: Early empirical evidence from Belarus. *Applied Economics Letters*, 28(18), 1542-1547.

Reuters. (2012). More than 70 die in Egyptian soccer pitch invasion. Retrieved from: https://reut.rs/3B26NyT. Assessed on November 11, 2021.

Reuters. (2013). Soccer-Egypt league cancelled because of security concerns. Retrieved from: https://reut.rs/3jGX1wj. Assessed on November 11, 2021.

Reuters. (2014). Egypt to allow limited number of fans at league matches. Retrieved from: http://reut.rs/13Ueice. Assessed on November 11, 2021.

Reuters. (2015). Egypt postpones all soccer matches following Cairo deaths. Retrieved from: https://reut.rs/3E4Deyf. Assessed on November 11, 2021.

Rommel, C. (2021). Egypt's Football Revolution: Emotion, Masculinity, and Uneasy Politics. University of Texas Press.

Scoppa, V. (2021). Social pressure in the stadiums: Do agents change behavior without crowd support? *Journal of Economic Psychology*, 82, 1023.

Schreyer, D., & Ansari, P. (2021). Stadium Attendance Demand Research: A Scoping Review. *Journal of Sports Economics*. DOI: 10.1177/15270025211000404.

Singleton, C., Bryson, A., Dolton, P., Reade, J. J., & Schreyer, D. (2021). What Can We Learn About Economics from Sport during Covid-19? Economics Discussion Papers em-dp2021-01, Department of Economics, Reading University.

Singleton, C., Reade, J. J., Rewilak, J., & Schreyer, D. (2021). How big is home advantage at the Olympic Games? Economics Discussion Papers em-dp2021-13, Department of Economics, Reading University.

Wooldridge, J. M. (2010). Econometric Analysis of Cross Section and Panel Data, The MIT Press, Cambridge, MA44.

Zak, U. (2021). The performance advantage of traveling. *Journal of Economic Psychology*, 87, 102431.

Zhao, Y., & Zhang, H. (2017). Study on the Hot Match Effect in Professional Football Leagues. In International Symposium on Computer Science in Sport (pp. 14-20). Springer, Cham.