Demand for Public Events in the COVID-19 Pandemic: A Case Study of European Football

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March 2020

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Abstract

We use data from elite-level European football matches to suggest how people responded to the initial COVID-19 outbreak. Unsurprisingly, in Italy, France and England, stadium attendances were negatively affected by the previous day's newly confirmed domestic cases or deaths. In Germany, there was no response to the early stages of the domestic or worldwide outbreak. Spain poses a puzzle, as attendances appear to have increased substantially in response to the initial domestic deaths related to the virus.

Keywords: Demand for sport, Coronavirus, European Economy, Public Health
JEL codes: D90, I10, L83, Z20

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1 Introduction

On 11th March 2020, the World Health Organisation declared that the COVID-19 novel coronavirus had become a global pandemic. As we write this on 24th March, health systems in numerous countries are being overwhelmed by the impact of this outbreak, and over 18,000 people have lost their lives to the virus. The world economy is set for an exceptionally sudden and deep economic recession due to the measures being taken to suppress or mitigate the pandemic.

We look at the early outbreak period of the virus in Europe, specifically in England, France, Germany, Italy and Spain, up to the first full weekend of March 2020, to generate insights on the effect this continuing shock may have on the demand for public events. We use attendance data from elite-level association football matches, which is the most popular sport in the world.[1] In the midst of a global pandemic this severe, a focus on sport may seem trivial, or even in poor taste. However, the demand for attending sports events in these countries may tell us something about how populations respond to a public health emergency, especially one which requires social distancing, under different policy regimes. There is also little doubt that sport, and football in particular, forms a central part of the social fabric of the European regions most affected so far. Indeed, Bergamo, the epicentre of the European coronavirus outbreak, is home to Atalanta, who this year reached for the first time in their history the quarter finals of the premier European competition, the UEFA Champions League, even as the outbreak took hold.[2] During both World Wars, regional football continued in Europe, a testament to its social importance in troubled times. But since the second weekend in March 2020, European professional sport, including football, has largely shut down for the foreseeable future.

This paper relates to two principal strands of literature. First, it contributes microeconomic evidence on the impacts of a pandemic or a public health emergency (e.g., Keogh-Brown et al., 2010, for a macroeconomic analysis, or Kuo et al., 2009; Page et al., 2012; Rassy and Smith, 2013, for studies focused on the tourism sector). There is a vast literature modelling the demand for professional sports and specifically football stadium attendances (e.g., Garcia and Rodríguez, 2002; Simmons and Forrest, 2006; Buraimo, 2008; Pawlowski and Anders, 2012), but little on the effects of shocks like COVID-19 (see Gitter, 2017 for an exception studying Mexican baseball attendance during the H1N1 'Swine flu' outbreak).

[1] For example, see the Nielsen World Football Report, 2018, https://www.nielsen.com/uk/en/insights/report/2018/world-football-report/.

[2] Indeed, it has been suggested that a match between Atalanta and Valencia was ground zero for the spread of the virus in Spain as well as in Italy; see https://rep.repubblica.it/pwa/generale/2020/03/20/news.

2 Data

We collect data on match attendances and results from www.worldfootball.net for the big five European football leagues, i.e., the English, Italian, French, Spanish and German top leagues. We use the entire history of European domestic and continental professional football result outcomes to construct the Elo ratings of teams, as measures of their time-varying strengths.[3] But for the actual analysis we focus on relatively recent data, since the 2015/16 season. The dataset is summarised in Table 1. It represents between 24 and 29 teams in each of the five leagues over this period. The number of matches covered varies from 1,447 in France to 1,808 in England. We exclude all matches that were played behind closed doors, i.e., in approximately empty stadiums, for whatever reason, including some due to COVID-19. Over this period, there is substantial variation in matchday attendances in all five countries. Germany and England have the highest attendances on average, and these are also the two countries where matches are more likely to sell out, with an implied excess demand (Cox, 2018). The variance of match attendances is highest in Spain. Stadium capacities rarely bind in Spain, Italy or French domestic football over this period.

We collect information on the numbers of daily confirmed cases from COVID-19 and related deaths from 'Our World in Data' (ourworldindata.org/coronavirus-source-data). Figure 1 summarises this data, showing the pace of the outbreak in the five major European countries studied here and worldwide. These numbers relate to what had been recorded and published by midnight on the day listed, and hence they were public information by the time football matches kicked off on the same day.

3 Estimation

We estimate the relationship between the COVID-19 outbreak and football match attendances using a two-step strategy, which we apply individually for each country. This two-step approach is chosen to produce the most conservative standard errors, given that the COVID-19 information does not vary over matches played on the same day (see Donald and Lang, 2007 or Angrist and Pischke, 2009). It is also transparent with an unbalanced panel (home team and matchdays). The identification of the outbreak's impacts is based on variation over time in matchday average attendances.

[3]Elo ratings are commonly used to estimate the relative strengths of football teams, both in practical applications (e.g., https://www.eloratings.net/) and in academic research (e.g., Hvattum and Arntzen, 2010).

In the first step, we estimate the following using least squares and separately for each country:

$$\ln(Attendance_{it}) = \alpha_i + \beta_1 HomeElo_{it} + \beta_2 AwayElo_{it} + d_t + \varepsilon_{it} \ , \tag{1}$$

where i denotes the identity of the home team and t is the matchday. We regress the log attendance in matches on fixed effects for the identity of the home team, α_i. We also control for the time-varying Elo ratings of the home and away teams, with coefficients β_1 and β_2. Fans are likely to prefer watching their team when it is doing well and also the best visiting teams. d_t are matchday fixed effects, which provide a measure of the average daily attendance at elite-level football in each country, adjusting for the nature of the matches that took on each day. The remaining heterogeneity in attendances is in the residual, ε_{it}.

In the second step, we take the point estimates of d_t from the first step and estimate the following using least squares:

$$\Delta\widehat{d_t} = \gamma + \lambda_1 NewDomestic_{it} + \lambda_2 NewWorldwide_{it} + \zeta_{it} \ , \tag{2}$$

where Δd_t gives the day-to-day change in the adjusted average log attendance within a country. The coefficients λ_1 and λ_2 provide approximate estimates of the percentage change in stadium attendances due to additional domestic and worldwide confirmed cases (or deaths), respectively, of COVID-19 over the previous day.

To adjust the average matchday attendances, the estimation period chosen for the first step is chosen from the beginning of the 2015/16 season to the last matches played with spectators before the outbreak-induced shutdown. Importantly, this was before any major suppression measures were implemented by the national governments.[4] In the second step, we only use the matchday fixed effect point estimates from 1st January 2020, i.e., $\widehat{d_{t \geq 1Jan2020}}$. This substantially reduces the sample size but makes the results more transparent. We prefer to estimate the second step in first differences, with the daily change on the left-hand side and the number of new confirmed cases (deaths) over the previous day on the right-hand-side to address potentially spurious estimates if the time series are integrated. However, exploiting this day-to-day variation in matchday attendances and the COVID-19 outbreak, while being more robust, reduces the sample size in the second step to just sixteen or seventeen consecutive daily periods in each of the five countries. We estimate the second step using ordinary least squares as there is no significant evidence of heteroskedasticity.[5]

[4] The last rounds of matches with spectators in all five countries were played before the nationwide lock down in Italy on 10th March.

[5] A modified Breusch-Pagan test, where we regress the squared residuals from the second step, Equation (2), on the inverse of the number of matches per matchday, returns non-significant coefficient estimates for all countries

4 Results

Table 2 shows the second-step estimation results for each country, with separate columns for each specification, beginning with confirmed COVID-19 cases. In Italy (column IV), where the virus outbreak was initially more severe, attendances reduced by 6% (p-value < 0.05) for each additional 100 domestic cases or 1% (p-value < 0.01) for each additional 1,000 cases worldwide. The equivalent responses in Germany and Spain were insignificant from zero (columns III & V). In France (column II), attendances had a negative 16 log point (p-value < 0.05) response to 100 new domestic cases the day before. In England (column II), which was somewhat behind the outbreak curve of all the other countries by the time professional football was stopped, there was no attendance response to domestic cases but a small negative response to the worldwide picture (p-value < 0.01)

Table 3 shows an equivalent set of results to Table 2, except using the numbers of new COVID-19 related deaths instead of confirmed cases as the regressors in the second step. Across all five countries, there was no significant matchday attendance response to the number of new worldwide virus deaths on the previous day. Germany up to this period had not experienced any domestic deaths from the virus. In Italy, each additional death in this period was associated with a 1.5% (p-value < 0.05) reduction in stadium attendances. In England and France, the negative responses to each new death were considerably greater, around 6% (p-value < 0.05) and 10% (p-value < 0.01), respectively. However, the estimated response to the initial stages of the outbreak in Spain is somewhat puzzling. with each domestic death having been accompanied by a 12 log point increase in attendances. It is plausible, though impossible to confirm, that Spanish football fans responded to the outbreak by anticipating that matches would soon be played behind closed doors, as was happening in Italy by the final round of Spanish league matches. This effect may have been present in the other countries, though not fully observed, since English and German stadiums typically sell out, unlike in Italy and Spain.

5 Conclusion

In this paper, we provide an early analysis of the impact of COVID-19 on the demand for attending major public events, in this case elite-level football matches. We document the generally negative impact that the outbreak had on revealed spectator demand during the initial outbreak in Europe.

(p-value < 0.1). Regardless, when we do estimate using weighted least squares, with the number of matches per matchday as weights, all our main results are qualitatively unchanged.

Turning to future research, the nature of the reporting of the virus, and of football, affords a more thorough regional demand and response analysis to the outbreak, that may even guide policy makers in managing suppression measures going forward. But applying these results too far beyond the initial outbreak period would be speculative because, if nothing else, a pent-up demand effect might be expected once football matches and other public events resume. Two of the most sustained attendance increases in the history of English football came after the suspensions brought about by each World War (Dobson and Goddard, 1995).

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TABLE 1: Summary statistics over football matches, 2015/16-2019/20

	Mean	St. Dev.	Min.	Median	Max.
English Premier League					
Attendance (1000s)	37.5	16.4	10.0	32.0	83.2
Home Elo rating	1153	124	855	1129	1548
Away Elo rating	1147	121	871	1119	1552
N of (home) teams			29		
N of matches			1,808		
French Ligue 1					
Attendance (1000s)	22.0	12.8	1.1	17.6	65.4
Home Elo rating	1115	109	847	1102	1465
Away Elo rating	1110	106	858	1090	1436
N of (home) teams			27		
N of matches			1,791		
German Bundesliga					
Attendance (1000s)	42.9	17.7	13.2	41.5	81.4
Home Elo rating	1087	105	867	1075	1432
Away Elo rating	1083	103	824	1068	1400
N of (home) teams			24		
N of matches			1,447		
Italian Serie A					
Attendance (1000s)	24.2	14.2	0.5	19.8	79.2
Home Elo rating	1140	125	829	1114	1498
Away Elo rating	1138	126	857	1110	1470
N of (home) teams			28		
N of matches			1,768		
Spanish La Liga					
Attendance (1000s)	27.6	19.3	3.3	19.9	99.2
Home Elo rating	1143	119	897	1123	1471
Away Elo rating	1142	121	896	1119	1476
N of (home) teams			27		
N of matches			1,787		

Notes.- statistics are calculated over all matches in the top domestic leagues of England, France, Germany, Italy, and Spain since the beginning of the 2015/16 season. Excludes matches with no spectators, i.e., played 'behind closed doors'. Source.- worldfootball.net; accessed 14 March 2020.

TABLE 2: Second step regression model estimates: effects of the previous day's COVID-19 new confirmed **cases** on log stadium attendances in elite-level European football, 1st January to 9th March 2020

	England (I)	France (II)	Germany (III)	Italy (IV)	Spain (V)
Dependent variable: day-to-day change in log stadium attendance†					
New domestic cases (100s)	0.004	-0.160**	-0.015	-0.061**	0.139
	(0.061)	(0.071)	(0.056)	(0.023)	(0.093)
New worldwide cases (1000s)	-0.004***	0.026	-0.030	-0.011***	0.013
	(0.001)	(0.039)	(0.022)	(0.003)	(0.027)
N of consecutive match days	17	17	17	16	17

† Point estimates of daily fixed effects from the first-step regression models as per Equation (1), with log match attendance as the dependent variable and controls for the Elo ratings of both the home and away teams, as well as home team fixed effects. First step estimated over matches since the beginning of the 2015/16 season. First-step *Ns*: England, 1,808; France, 1,791 ; Germany, 1,447; Italy, 1,768; Spain, 1,787. Excludes games played behind closed doors.

***,** indicate significance from zero at 1% and 5% levels, respectively, two-sided tests, robust standard errors are displayed in parentheses.

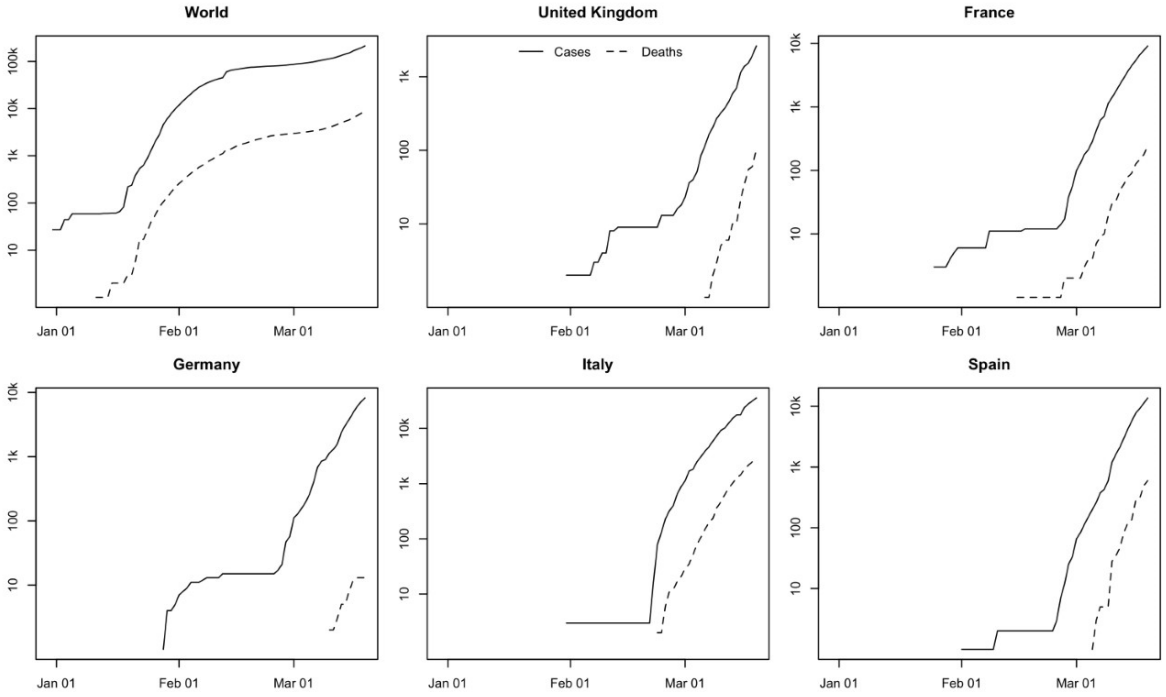
TABLE 3: Second step regression model estimates: effects of the previous day's COVID-19 new **deaths** on log stadium attendances in elite-level European football, 1st January to 9th March 2020

	England (I)	France (II)	Germany (III)	Italy (IV)	Spain (V)
Dependent variable: day-to-day change in log stadium attendance†					
New domestic deaths	-0.063**	-0.095***		-0.015**	0.117***
	(0.022)	(0.024)		(0.005)	(0.021)
New worldwide deaths (100s)	0.006	0.131	-0.041	0.015	0.043
	(0.025)	(0.101)	(0.058)	(0.072)	(0.060)
N of consecutive match days	17	17	17	16	467

† See Table 2.

***,** indicate significance from zero at 1% and 5% levels, respectively, two-sided tests, robust standard errors are displayed in parentheses.

FIGURE 1: Total numbers of confirmed cases and deaths from COVID-19 to March 2020



Source.- ourworldindata.org/coronavirus-source-data; accessed 14 March 2020