Department of Economics

Group for Economic Analysis at Reading (GEAR)

Large Sporting Events and Public Health and Safety

by J. James Reade

Discussion Paper No. 2023-04

Department of Economics
University of Reading
Whiteknights
Reading
RG6 6AA
United Kingdom

www.reading.ac.uk

Large Sporting Events and Public Health and Safety

J. James Reade* †

27 January 2023
Forthcoming chapter in H. A. Solberg, R. Storm & K. Swart (Eds.), Research Handbook on Major Sporting Events

Abstract

Large sporting events have non-trivial externalities, where net social benefits can differ from net private benefits. In this chapter we particularly explore the relationship between large sporting events and public health and safety considerations, surveying the relevant literature. The Covid-19 Pandemic has provided a particularly clear example of the manner in which sporting events interact with the wider health and safety infrastructure, where sporting events were postponed, cancelled, and their formats dramatically altered in light of the Pandemic. This in turn then influenced outcomes, and arguably reduced the commercial value of the sporting product being produced via its impact on the production process. We consider these two directions of interaction between sporting events and public health and safety before concluding with some policy-related considerations.

JEL Classification: Z18, Z23, Z28.
Keywords: Mega events, Olympic Games, public health and safety, sport, organisation.

1 Introduction

Sport is about events, and hierarchies of events. Players and teams compete to reach the pinnacle of a sport. Most sport fits within a system of qualification, be it direct through competition (e.g. qualifying for the Olympic Games), or less direct through labour market movements (transferring to a team in a major league), for that pinnacle event. All sporting events require some degree of planning, forecasting, and resources for their running, implying a non-trivial impact of any sporting event. Such pinnacle events, more commonly known as large or mega events, command greater levels of public interest, affecting both the demand and supply of such events. Large events by their nature will be sets of individual events, usually organised to be in a particular location in a relatively short period of time.

This Chapter is concerned with such large events, and particularly with regard to their wider context, in light of Covid-19. In the classic economic treatment of sporting events, Neale (1964) emphasises the net social benefits of sporting events over and above the net private benefits that accrue to the organisers and participants. As such, it is well established that large events have externalities. In the Covid-19 Pandemic many large events were cancelled, others postponed, and in time, many were run with significant restrictions on attendance. This points to an understanding that such events, or mass

*j.j.reade@reading.ac.uk
†The author would like to thank the editors, and Mark Casson, Dominik Schreyer and Carl Singleton for their comments.

gatherings, might aid the spread of communicable diseases and hence pose a threat to public health. Even aside from well-known communicable diseases, the collection of many thousands of people must present significant risks of hospitalisation; the Sports Grounds Safety Authority document a consistent ratio of around one injury per 19,000 spectators at football matches in England and Wales each year since 2016 (see Figure 1).[1] The mass gathering of people in a particular place for an event undoubtedly presents a threat to public safety; stadium disasters have been all too frequent throughout the history of mass participation viewing of sporting events, as have terrorist threats, and indeed public health emergencies. Some stadium disasters have been primarily due to poor behaviour on the part of spectators (e.g. Heysel in 1985), but many have been the result of a grievous failure of public planning and policing, with the Hillsborough Stadium disaster of 1989 being perhaps the best example of the latter.[2] Related to fan behaviour and disorder, the UK government collects data on the number of arrests at football matches in England and Wales; in Figure 2 the ratio of arrests to attendance per season since 2010/11 is plotted, showing that since the Pandemic the number of arrests have risen dramatically — by 59% in absolute terms, and 57% relative to total attendance at football matches. The International Disaster Database, maintained by EM-DAT, lists four football stadium events since the Second World War (Bolton in 1946, Piraeus in 1981, Bradford in 1985, and Hillsborough in 1989), and Wikipedia's page on 'stadium disasters' contains 40 entries.[3] That list includes the Manchester Arena Bombing in 2017, but does not include well-known terrorism incidents as major sporting events, such as the attack on Israeli athletes at the 1972 Olympics Games in Munich, and the attack at Stade de France in Paris during a football match between France and Germany in 2015. While the impact of the Covid-19 Pandemic is well known on sporting events, the SARS Pandemic of 2003 influenced a number of sporting events, while the 1920 Olympic Games in Antwerp took place after the worst of the Spanish Flu Pandemic, but still before a vaccine had been developed, and against the backdrop of the devastation of the First World War on the country.

The development of mega events leads inevitably to a discussion regarding their future; will the scale and scope of large events affect future hosting decisions, and how broader considerations such as public health threats like climate change, terrorism and the Covid-19 Pandemic will interact with such discussions. Large sporting events will undoubtedly influence the development of public health and safety threats, and equally, those different types of health and safety threats will shape sporting events. Considering the first, as gatherings of people, communicable diseases may spread, but also disorderly behaviour may occur as a result of the manner in which attendees interact with public events, and such concentrations of people may present a target for terrorist activity. The second is the impact of a public health threat on sporting events. In the context of such a threat, events may be cancelled, postponed, or organised differently, and the threat may impact the demand for an event. A common thread of discussion throughout the pandemic in relation to government responses has been regarding the distinction between voluntary and compulsory actions, in particular whether people should be left to make their own decisions regarding attendance at mass gatherings. Mega events are collections of mass gatherings, and hence offer an interesting context in which to consider this debate. Another aspect of the impact of a public health threat on sporting events is the impact of the actual threat itself on sporting events — in the case of a disease like Covid-19, catching it may affect players and their productivity.

[1] See https://sgsa.org.uk/spectator-injuries-at-sports-grounds-data/ for more information.

[2] It is worth noting that the problems of hooliganism in football in the 1980s were multi-faceted, and in many cases reflected the neglect at large in the game that allowed many fans to behave extremely poorly, but also laid the foundations for terrible events like the Heysel Disaster, which occurred in a very old stadium.

[3] See www.emdat.be for the EM-DAT database, and en.wikipedia.org/wiki/Category:Stadium_disasters for the Wikipedia list of disasters.

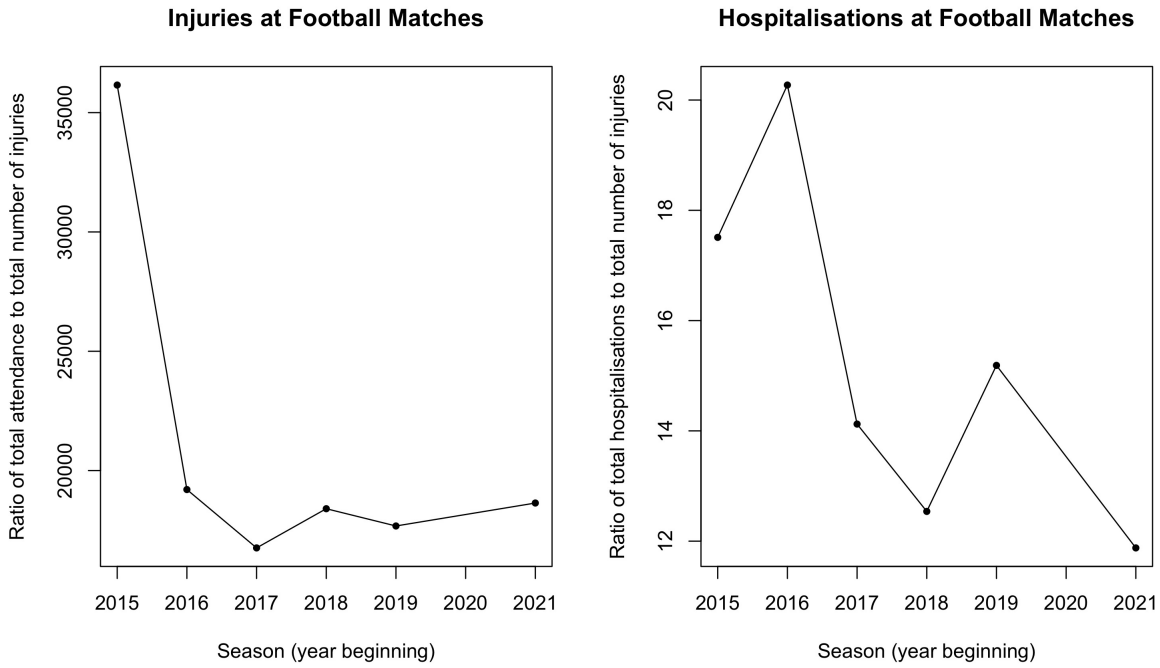

Figure 1: The ratio of total attendees to total injuries reported, and the ratio of hospitalisation to total injuries, at football matches in England and Wales, since 2015/16 season. Source: Sports Grounds Safety Authority, sgsa.org.uk/spectator-injuries-at-sports-grounds-data.

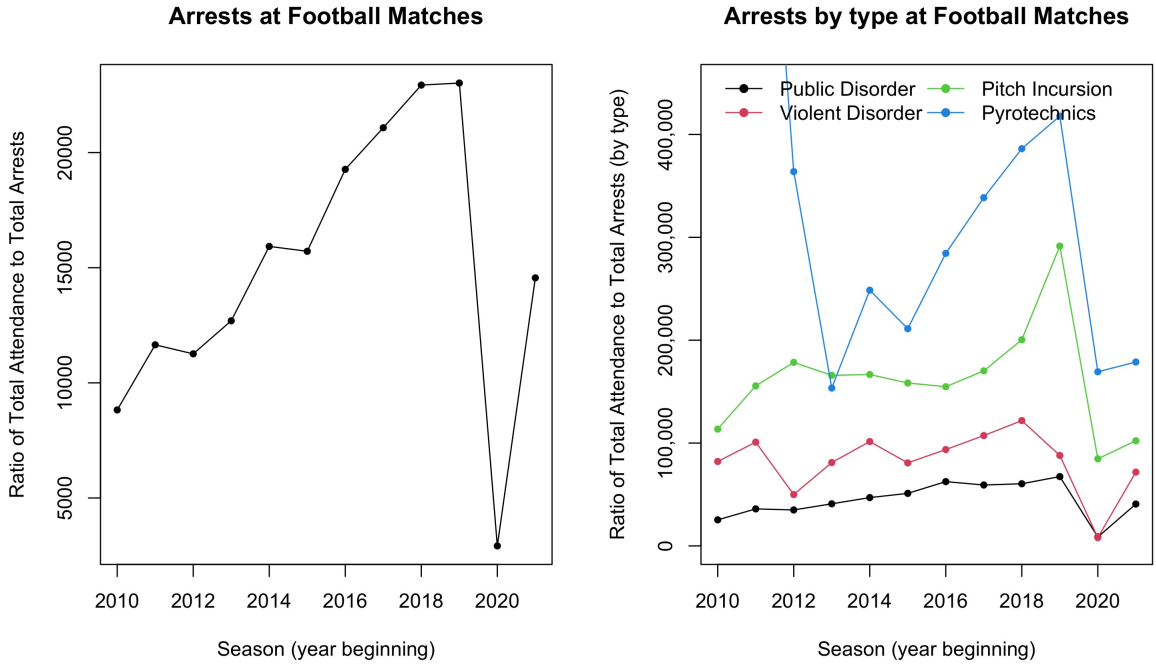

Figure 2: The total number of arrests (left plot) and the number of arrests by particular categories of arrest (right plot), since the 2010/11 season. Note that seasons 2019/20 and 2020/21 were severely impacted by Covid-19. Source: Home Office, UK Government, www.gov.uk/government/statistics/football-related-arrests-and-banning-orders-england-and-wales-2021-to-2022-season.

A final consideration of a public health threat's impact on sport is a direct impact on participants. Participants themselves may fall ill, or be the subject of violence; Cary and Stephens (2023) considers withdrawals from tennis tournaments during Covid-19, finding that female athletes were more likely to withdraw than male ones.[4] Spectator behaviour may change, too, in terms of willingness to take risks, and indeed simply to attend events; as the data in Figure 2 suggest.

In this Chapter we discuss these aspects of large sporting events in the following way.[5] Section 2 introduces large, or mega events, before Section 3 details their development over the last century and more. Section 5 then considers the relationship between large sporting events and public health and safety, before Section 6 concludes by considering policy implications in light of the amassed evidence regarding large events and public health.

[4]Related is the non-withdrawal of players too, most notable tennis player Novak Djokovic in the Australian Open in 2022. public health and safety threats will affect eligibility criteria for sporting participants as well as the general public.

[5]Our focus will be primarily on the stadium itself, rather than events taking place en route to an event, or in a location remote to it. This is not to diminish these aspects of the social costs and benefits of sporting events, it simply reflects that much of the cumulated evidence has focused on the stadium.

2 The Economics of Large Events

Sport is 'peculiar' (Neale, 1964), with the output that is produced being a service fundamentally (the sporting action), but yet with significant goods production involved. For an individual event, a venue needs to be provided, usually with physical equipment. Even for individual events, the cost of production goes beyond the procurement of a venue and equipment due to the public nature of the event: transport infrastructure needs to be organised such that participants and attendees can enter and leave the venue. Furthermore, public services such as health and policing need to be engaged in order to ensure that events occur without threat to either those attending, or those nearby. Planning and public safety are thus paramount concerns for the organisation of such events, as evidenced by the many regrettable stadium-related tragedies documented in Section 1.[6] This description of a sporting event also makes clear the opportunity cost; the other best uses of public and private resources that were devoted to the event's organisation.

Large events are multiple sporting events, linked sportingly via sporting outcomes leading to qualification or elimination, linked geographically, either within a single city, or within a country or region, and linked practically via the sporting organisations running and hosting the event. As such, the production costs are considerably expanded; a tournament structure needs to be determined, and fit within a broader tournament plan for ensuring participants and attendees can attend the multiple events. Such tournament plans, for entire cities and even nations, may involve the development of significant public infrastructure such as public transit systems and stadiums. Large events require hosts, and require hosts to make non-trivial investments and plans. There are also, undoubtedly, non-trivial benefits that can accrue to hosts of such events; most fundamentally the regional and global significance of the events attracts attention, and demand for attendance.

Some hosts of large events are fixed, for example where particular large venues host tournaments; famous golf courses like Augusta and Wentworth, and large tennis centres like Wimbledon and State Roland Garros, for example, and these places usually host events that form part of a larger circuit of events making up their respective sporting calendars. But other events, such as continental or global tournaments within sports, will have hosts that vary with each edition, usually every two or four years apart.

Related to the fixing or otherwise of a host is the scale of events; Müller (2015) proposes a method of classifying the size of events, suggesting four criteria for judging whether an event is a 'major', 'mega' or even 'giga' event. These criteria are visitor attractiveness, mediated reach, costs and transformative impact. Such a definition spans wider than simply sporting events, but is applied to them. Müller (2015) provides thresholds and scoring mechanisms, and determines that the Summer Olympics are a 'giga event', and the FIFA men's football (soccer) World Cup, the UEFA men's football European Championships, the Asian Games and the Winter Olympics are 'mega events'. A number of other events, including the Commonwealth Games, the Pan American Games, the men's Rugby Union World Cup and the Super Bowl, are 'major events'.

Müller (2015) supports the conventional wisdom regarding large events, namely that while every sport has its own World Cup, or World Championship, the football, or soccer, World Cup is distinctly larger

[6] The most recent of these in the public consciousness are Kanjuruhan Stadium disaster in Indonesia and the Yaoundé stadium disaster in Cameroon. The latter of these occurred in January 2022 during the 2021 African Cup of Nations, a major sporting event. See en.wikipedia.org/wiki/Yaound%C3%A9_stadium_disaster for more context on Yaoundé, and www.theguardian.com/world/2022/oct/02/indonesia-football-fans-killed-east-java-arema-malang for more context on Kanjuruhan.

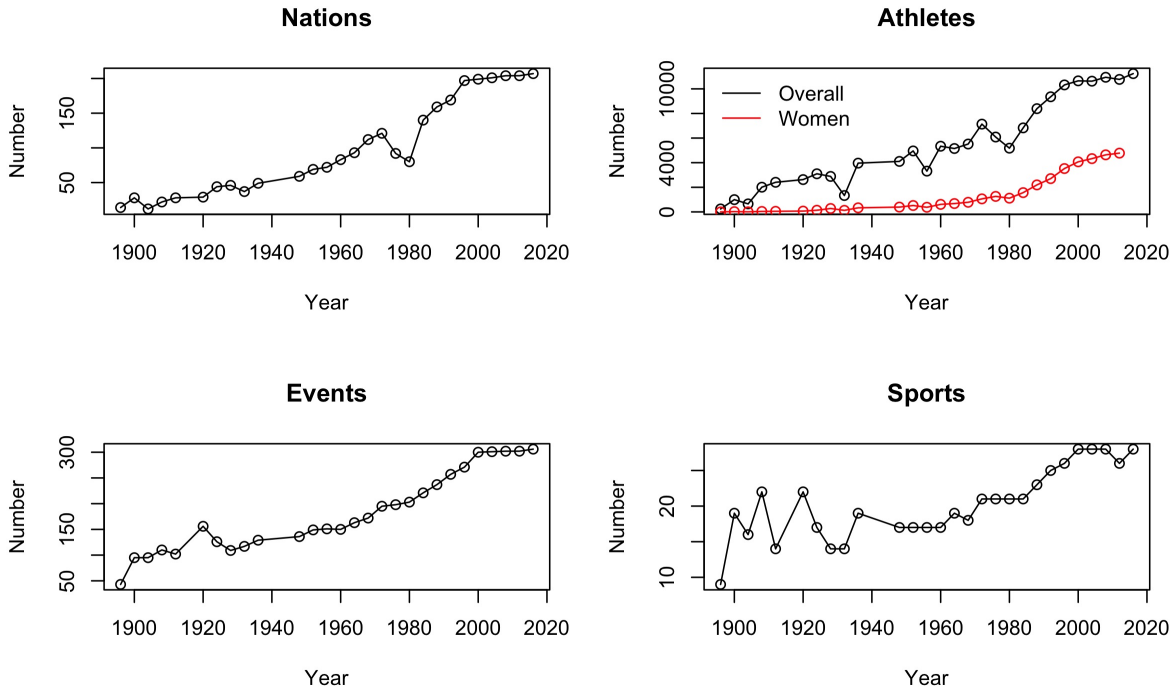

Figure 3: The development of the Olympic Games in terms of the number of nations, athletes, events and sports included over the years since the initial games in 1896. Source: Olympedia.org

than all others, and as a result directly competes with the multi-sport Olympic Games for popularity.[7] FIFA, football's world governing body, claims the World Cup in 2018 reached 3.6bn viewers, while the International Olympic Committe claimed that 3.05bn viewers watched the Tokyo Olympics in 2021.[8]

3 The Development of Big Events

While Müller (2015) has quantified 'mega' and 'giga' events, this is a static exercise reflecting the current size of events. Those large events have not always been of their current magnitude, however. The first modern Olympics was staged in 1896, and the first World Cup was an offshoot of the Olympic football competition that only emerged in 1930. The 1896 Olympics featured just 14 nations, 241 athletes and 43 events in 9 sports, while in Rio there was 207 nations, 11,238 athletes, 306 events in 28 sports. Figure 3 plots this development through time. The first football World Cup in 1930 involved 13 teams by invitation, the 2022 edition involved all 211 national teams that are FIFA members, with 32 teams qualifying for the Finals event — the mega event — in Qatar.

[7] There are various sources of information on viewing figures for major events, which themselves must be somewhat dubious. One is here, in the Huffington Post: www.huffingtonpost.co.uk/2018/02/21/10-most-watched-sport-events-in-the-history-of-television_a_23367211/

[8] See 'More than half the world watched record breaking 2018 World Cup', FIFA.com, www.fifa.com/tournaments/mens/worldcup/2018russia/media-releases/more-than-half-the-world-watched-record-breaking-2018-world-cup for the first claim, and 'Olympic Games Tokyo 2020 watched by more than 3 billion people', IOC, olympics.com/ioc/news/olympic-games-tokyo-2020-watched-by-more-than-3-billion-people

As these events become sufficiently huge, they become costly to host. But equally, the benefits are often argued to be greater still. The costs and benefits of mega events rightly dominated much of the economic focus on large events; these are covered in depth in Chapter XX in this edition. The increased scale of mega events must increase yet further their potential to divert public resources, and in particular the manner in which they become a public health concern and hence become affected by threats to public health.

4 Viability in the Future

The increased size of mega events changes their nature, and raises the various costs, accounted or otherwise, involved in hosting. The logistical exercise described in Section 2 has grown, but despite this future iterations of large events still generate. The 2026 edition of the World Cup will involve 48 teams, and be held in 16 different cities across the US, Canada and Mexico. It seems unlikely any single nation would be willing, or indeed able, to host an event of such scale. None of the prospective hosts for 2030 are single countries.[9] Similarly, collaborations of cities (Montreal-Toronto, Bologna-Florence and Berlin-Tel Aviv) are considering bids to host the 2036 Olympics Games.[10]

The documented social unrest in Rio during the Olympic Games there in 2016, however, suggests that public enthusiasm may not necessarily match that of some governments in considering hosting large events.[11] Wicker and Coates (2018) conduct a survey in and around a referendum held in Germany regarding a potential bid by Hamburg for the 2024 Olympic Games, and they note that of four referenda for the 2022 Winter Olympics, just one in Oslo saw a vote in favour of hosting. Streicher et al. (2020) investigate sentiment regarding the future hosting of mega events using survey data from 11 cities in EUrope and the United States. The Pandemic has brought to light the wider public health and safety issues associated with large sporting events.

A focus of proposed reforms to the organisation of mega events has focussed on sustainability; the absence of a legacy at many past events provides a graphic illustration of the lack of sustainability of activity related to hosting mega events.[12] Sustainability more broadly is becoming a much more salient factor in economic activity, with organisations around the world increasingly orienting themselves towards targets of being carbon neutral. With mega events, this is always likely to be a particularly difficult goal to achieve, since they involve the travel of many thousands of athletes, coaching teams and officials to a particular location, as well as travel within the host city or country. The Qatar FIFA World Cup produced more emissions than any recent tournament, thanks to the construction needs, as well as the shuttling of fans in from neighbouring countries for matches.[13]

As global temperatures continue to increase, sustainability seems certain to become a yet more important aspect of the planning and running of mega events, and seems likely to contribute to a wider

[9] At this point two collections of countries have expressed interest: original 1930 hosts Uruguay with Argentina, Paraguay and Chile, and a separate inter-continental grouping of Saudi Arabia, Greece and Egypt. See www.sportico.com/personalities/athletes/2022/messi-ronaldo-and-saudi-arabias-bid-to-host-2030-1234698865/ for more details.

[10] See en.wikipedia.org/wiki/Bids_for_the_2036_Summer_Olympics for more details.

[11] See www.npr.org/sections/thetorch/2016/08/09/489284024/controversy-grows-in-rio-over-political-protests-during-olympics for more information.

[12] See https://www.sports-management-degrees.com/haunting-images-of-abandoned-olympic-venues/ for some examples of derelict former Olympic venues.

[13] See https://www.economist.com/graphic-detail/2022/12/01/qatars-world-cup-will-emit-more-co2-than-any-recent-sporting-event and https://www.timesaerospace.aero/news/air-transport/football-fans-to-receive-match-day-shuttle-flights-during-fifa-world-cup for more detail.

appreciation of the externalities of such events. A salient example of the impact of climate change, and concerns regarding sustainability, is the 2022 Winter Olympics in Beijing, where events took place solely on artificial snow.[14] It is clear that the social costs and benefits differ significantly from the private costs and benefits accruing to event organisers. While football is arguably a particularly special case when considering the social costs of events, the clear impact of football matches on crime around football stadiums as documented by Marie (2016) and Montolio and Planells-Struse (2016) emphasises the importance of potential social disorder when appraising sporting events. Müller et al. (2021) evaluate the sustainability of Olympic Games between 1992 and 2020, and find that sustainability has never been particularly strong, and has declined in recent editions of the games.

Our focus in the rest of this chapter will be broader, perhaps, than previous evaluations of the economic impact of mega events, and in doing so it will consider the externalities of such events. We won't specifically mention climate-related uncertainty associated with mega events, but this clearly remains a salient issue, and one likely to only become more pressing in the coming years.

5 Large Events and a Public Health Emergency

The Covid-19 Pandemic has had a dramatic impact on all aspects of life. As the first global pandemic since sporting events have become mega events of tens of thousands of participants and hundreds of thousands of spectators, its impact has been marked on such events. Indeed, sporting events have provided one of the more visible ways in which the Pandemic has changed how all kinds of events happen.

The most visible manifestations on everyday sport was the empty stadiums that became a common feature of sport globally. In the immediate months after the outbreak, large events were either postponed (Euro 2020, the 2020 Olympics, the French Open) or cancelled (e.g. Wimbledon). The postponed events were generally held later: both the European Championships and Olympics in the summer of 2021, and in 2021 most events took place at an elite level, albeit with restrictions for fans and participants.

The postpone vs cancel decision appeared to be one of calendar pressure and stature of event. Within many sports such as tennis, smaller events were cancelled in 2020, whereas larger stature events like Grand Slam, generally went ahead. The Wimbledon Championships in tennis provided a distinct event in the Pandemic, as the organisers of that event had taken out pandemic insurance since the SARS outbreak in 2003, and hence were able to cancel their event without suffering significant financial losses.[15] It seems likely that more large events will now take out pandemic insurance policies than would have been the case previously. However, even if organisers are protected from financial repercussions, the cancelling of events that form part of a sporting calendar will still prove disruptive in future pandemics.

In many sports like football, calendar pressure is intense, with national competitions fitting within a continental and global calendar. England's Premier League carried on after a break, as did the Championship (the league below it), but outside of these two competitions, seemingly arbitrary decisions were made regarding outcomes.[16] The conclusion of elite leagues (other than in France) was permissible

[14] See https://www.scientificamerican.com/article/the-olympics-have-100-percent-fake-snow-heres-the-science-of-how-it-gets-made/ for more details.

[15] See https://www.insurancetimes.co.uk/news/wimbledon-set-for-coronavirus-windfall-in-huge-pay-out-from-pandemic-insurance/1433146.article for more details.

[16] In particular, even though seasons had not concluded and hence chammpionship winners, promotions and relegations decided, the teams to fill these positions needed to be determined. In some cases (e.g. the Eredivisie in the Netherlands) the competition was annulled, while in others (e.g. Ligue 1 in France) a winner was declared. In the lower divisions in England, relegation and promotion was determined on points per game which, with 10–12 matches still to be played,

only because of the postponement of the Euro 2020 tournament, the summer mega event, in which many of the players in these leagues would have been participating in. While the subsequent Winter World Cup in Qatar in 2022 in men's football shows that domestic sporting calendars can adapt to conflicting major competitions, this naturally requires lengthy advanced planning.

Each sport has its complexities; for tennis, the season in which a particular surface is played on matters, whereas in football, the type of football, be it domestic or international, matters. Each sport has its pinnacle event or events, be they Grand Slam tournaments, Grand Prix, or World Cups. These complexities will interact in different ways with a public health emergency. We will first consider how a mega event might affect a public health emergency, and then consider the reverse question of how public health emergencies will affect mega events.

5.1 The Impact of Large Events on a Public Health Emergency

Mass gatherings, which are commonly, but not exclusively, associated with sporting events, are resource intensive. The sporting participants involved will devote significant resources into planning for the events, and a range of local organisations will also be required to provide resources for the event. Policing and health are perhaps the two most obvious, with the latter likely covering a range of organisations, from a health and safety agency ensuring that a venue is safe from the perspective of any kind of threat (e.g. fire) through to first responders and local hospitals being ready in case of any emergencies that develop during the event.

While the Covid-19 Pandemic brought the role of mass gatherings to the fore when considering public health, prior to the pandemic a number of studies have been published regarding the role of mass gatherings, and whether they ought to be restricted in the case of a transmissible disease like Covid-19.

Karami et al. (2019) conducts a systematic review of evidence gathered relating to different types of mass event; they consider 45 published studies and categorise mass events into religious, sporting and festival events. At sporting events, they found that injuries were the most common public health threat, but that infectious diseases as well as alcohol- and drug-related disorders were common.

Ishola and Phin (2011) consider 24 published papers and look particularly at the question of whether restricting mass gatherings might reduce influenza transmission. The evidence they cover appears to be indicative, and suggestive that restrictions may have an impact without being able to identify conclusive evidence on the role restricting mass events may play.

There must always be some balance of risks associated with any event, from a single mass gathering to a collection of them, or a mega event. The demand for attendance at such events provides evidence regarding their social and economic importance, and such social benefits must be considered alongside the risks.

Evidence from smaller scale events exists regarding the potential for large sporting events to contribute to a public health emergency. Cardazzi et al. (2020) consider the impact of sports franchises on influenza in US cities, and Stoecker et al. (2016) look at the impact of the Super Bowl on influenza. These are events that can be thought of as 'local mega events', particularly the Super Bowl, but arguably also the location of US sport franchises. In both cases, a host needs to be determined and some kind of process is followed to determine who that is, formal or otherwise. Cardazzi et al. (2020) considered cities that gained sport franchises over the period 1964–2016, and determined that they experienced increased influenza mortality, with the size of the effect varying between 4% and 24% depending on the

afforded no recognition of the high levels of uncertainty that remained regarding final league positions (Gorgi et al., 2021).

sport. Stoecker et al. (2016) find that the city hosting the Super Bowl sees increased flu transmission leading to an 18% increase in influenza deaths amongst the elderly population of US counties that send teams to the Super Bowl, a result of more people meeting during flu season. Gitter (2017) found that the H1N1 virus exerted a negative impact on demand for baseball events in Mexico. As global events must span flu season in some part of the world, and involve significant global travel and mixing, it seems plausible that there might be an impact of mega events on the transmission of infectious conditions. As such, evidence exists to suggest that mass gatherings at sporting events can contribute to the spread of communicable diseases.

The wealth of data on individual sporting events adds further to this body of information. Ahammer et al. (2020) looked at NBA and NHL matches in the early days of the Pandemic, finding that each additional event was consistent with 11% additional Covid-19 deaths. Outside the United States, Alfano (2022a) and Olczak et al. (2020) considered the impact of football matches in Italy and England respectively on the spread of Covid-19 and noted that each football match in February was consistent with more Covid-19 cases in March and April. Alfano (2022a) found that each match was consistent with almost 900 extra cases in a province, and Olczak et al. (2020) found that each match was consistent with 6% more cases, 2% more deaths, and 3% more excess deaths. Both studies found that neither the attendance, or the density of the attendees, impacted the number of subsequent cases, and hence provide indicative evidence that simply hosting mass gatherings created an environment in which communicable diseases could spread. Both of these studies considered very small gatherings of 100s through to the larger gatherings in each country's top divisions, where well above 20,000 people would attend.

These three studies considered the spell before the major lockdown measures were put into place around the world in the wake of the Covid-19 Pandemic. Once sporting events resumed after the first set of lockdowns, crowds were often permitted to attend events, but in restricted numbers. Fischer (2021) investigated this period of potential transmission of the virus on the basis that, in principle, both increased awareness of the risks of Covid-19, allied with the restrictions in place on social mixing, ought to have reduced the likelihood that a communicable disease might spread. Fischer (2021) found that there was still an effect of between 0.34 and 0.71 cases per 100,000 inhabitants of a region three weeks after an event. Fischer (2021) did find, nonetheless, that the ban on supporters of the away team helped in reducing the spread across regions of Covid-19.

Funahashi et al. (2022) used a hugely detailed dataset on flu cases in Japan, and found that baseball matches in the flu season increased the number of infections in an area by 0.1%. These studies all make use of the relatively high frequency of sporting events during sporting seasons, where usually there will be hundreds of matches in a month, sometimes even in a week, geographically dispersed around a region. The frequency of football matches in many countries across all levels rivals that of a mega event like a World Cup or Olympics Games, but without the necessary linkages between events that might occur in a mega event, and hence movements of people (participants, officials, spectators) between. Dehning et al. (2023) investigate the role that one of the first mega events to resume after the start of the Covid-19 Pandemic had on the spread of the virus. In 2021 the European Championships was played, delayed a year. The format was unusual for a mega event, in that matches took place spread across Europe, an idea planned for when the tournament should have been played in 2020, marking 60 years since the first edition of the tournament. Matches took place with a range of restrictions on fan attendance, from very few fans in many countries, and extensive restrictions on travel between countries, to full capacity stadiums in Hungary, and increasing capacity utilisation in England, where many of the matches took place. Dehning et al. (2023) consider the impact of the tournament, and suggest that the tournament

was consistent with 840,000 Covid-19 cases across the 12 countries in which matches took place, with the majority in England, the Czech Republic and Scotland. Given that no matches took place in the Czech Republic, this is indicative that the broadcasting of mega events can also aid transmission of communicable diseases.

The evidence taken together suggests that major international events, which large sporting events will always be, do pose a threat to public health in the face of novel viruses like that of Covid-19. More local sporting events have also been documented to aid the spread of more familiar health threats, namely influenza. Thus far there does not appear to have been any study of the impact of mega events like the Olympics on the spread of influenza, and yet given the global nature of such events, it must be that some participants attend the games while it is flu season in their part of the world.

5.2 The Impact of a Public Health Emergency on Large Events

All health and safety emergencies and threats will elicit a response. While it is instinctive to immediately consider the Covid-19 Pandemic, it is worth noting that the episodes of violence at football events mentioned in Section 1 had consequences; after the Heysel Disaster in 1985, English football clubs were banned from entering elite European competitions, and English football suffered greatly as a result. In 1985 English clubs were ranked as the best in Europe, and despite a ban of only 5 years, it took until 2008 for English clubs to once again be ranked as the best on the Continent. Domestically, the crises of the late 1980s in public health and safety (stadium fires and crushes leading to over a hundred deaths) heralded a period of substantial investment in stadiums and the infrastructure surrounding English football, dramatically improving safety, and coinciding with significant increases in demand (Jewell et al., 2014). Singleton et al. (2021) also document the consequences of extreme violence in Egyptian football, where for more than a decade football matches have been played almost exclusively without fans.

The impact of the public health emergency of Covid-19 was to postpone or cancel events, with some events happening later. In the case of the Tokyo Olympics, they took place without spectators in 2021. They were tightly organised, not least as they took place while a subsequent wave of the pandemic was affecting Toyko, with participants unable to exit quarantine for 14 days, and by and large leaving immediately after their event, rather than staying for the duration, as would usually be the case. Akashi et al. (2022) suggests that this was largely successful in limiting the spread of Covid-19.

However, it left an Olympics shorn of some of its spectacle: fans enjoying the event. This must matter; fans are part of a sporting event, as television coverage makes clear, regularly showing images of fans observing and interacting with the event. The role of spectators in sporting events has long been studied. Seminal studies have considered the role of social pressure in determining outcomes both via influencing officials (Garicano et al., 2005), and via the choking of individual participants despite the support of the crowd (Harb-Wu and Krumer, 2019). Many studies have considered the role of spectators in assisting home teams or participants to win more often than their quality might suggest — the home advantage. Larger crowds are consistent with more home wins, but the mechanism still remains somewhat unclear (Pollard, 2006). Fans certainly believe they have a role to play (Wolfson et al., 2005).

All of this suggests that the absence of fans, or restrictions on their participation, will have a significant impact on outcomes of sporting events. A wide range of studies made use of the variation in crowd attendance during the Covid-19 Pandemic to shed more light on the phenomenon of home advantage. Bryson et al. (2021) considered a range of competitions where fans were completely shut out of attending matches, and found that while there was a reduction in home advantage, it was not statistically signif-

icant. The significant effect they found, replicated in a number of other studies (Endrich and Gesche, 2020; Cueva, 2020; McCarrick et al., 2020), was on the disciplinary action taken by officials towards the visiting team. While a number of studies found significant reductions in the home advantage, by and large the effect did remain, just in a reduced form.

As restrictions were imposed on attendance at sporting events during the Pandemic, this did not enable much understanding about how sport attendees might react to the presence of a public health emergency. With an increase in uncertainty surrounding public safety, it might be anticipated that demand for mega events might be reduced. There are some studies that enable light to be shed on this question, though. Frevel and Schreyer (2020) considered the response of fans in Germany's Bundesliga to the terrorist attack at an international football match between France and Germany in Paris in 2015. The threat of a terrorist attack is a threat to safety and might thus be compared to the threat that a Pandemic can pose. Frevel and Schreyer (2020) found a short-term impact on the number of spectators who, having purchased a ticket for a football match, did not turn up to the match. This effect lasted only two weeks, however.

Another piece of evidence regarding individual actions in response to a public health threat is the reaction of football supporters in Belarus. While almost all sports leagues stopped in early 2020 as the Pandemic spread, three leagues carried on: Belarus, Turkmenistan and Nicaragua. Attendance data is readily available for football matches in Belarus, and Reade et al. (2020) analysed attendances in the 2020 season relative to previous years, finding a significant drop as the Pandemic developed, with median attendances dropping by more than 50%. The effect, though, lessened as the Pandemic developed, in a similar finding to Frevel and Schreyer (2020). Public health messaging in Belarus did not emphasise the concerns surrounding Covid-19, but it is impossible that football fans in Belarus would not have noticed the postponement of essentially all sport globally. As such, this can be interpreted as evidence in favour of some spontaneous social distancing in the absence of any compulsion, or even encouragement, by authorities. In a similar vein, Reade and Singleton (2020) considered demand for football as measured by recorded attendances at matches in the 'big five' European football leagues (England, Italy, Spain, Germany and France) as the Pandemic developed in Spring 2020. They found a small effect of cases on observed demand, again indicative that public health threats may affect demand. Similarly, Jewell et al. (2014) present evidence that arrests had a negative impact on football club revenues for English teams in the 1980s, again indicative that threats to health and safety deter demand for sporting events.

Finally, Fischer et al. (2022) documented the impact on football players of the spread of Covid-19 — up to a year after an infection, elite footballers were 5% less productive. Athletes themselves, the focal point of mega events, can catch viruses, and indeed can also be the subject of terrorist attacks, as occurred at the 1972 Olympics Games in Munich, Germany. Finally, Alfano (2022b) document that the stringency of Covid-19 restrictions implemented by national governments reduced the performance of athletes at the Tokyo 2020 games, especially in team events where training would have been much harder with more stringent restrictions. If elite athletes are less productive because of a public health threat, it is possible that sporting spectacles will be less interesting as a result, since sporting quality is a significant part of its demand.

Another related aspect of the Pandemic's impact on sport is the subsequent return to in-person attendances. In many places, the behaviour of spectators has appeared to be significantly altered since the Pandemic, with a clear increase in anti-social behaviour. According to data published by the UK government, the total number of arrests increased in absolute terms by 59% in the 2021/2022 season

relative to 2018/2019, the last season before the Pandemic, as is visible in Figure 2.[17] There were also high profile incidents, most notably at the Final of the 2020 European Championships (played in 2021) with many episodes of violence around London and at the venue for the final itself, Wembley. The expert opinion submitted by Pearson (2022) to the independent review of the final makes particular note of the sociological aspects of lockdown measures on football fan behaviour that may have contributed to the heightened levels of misbehaviour since the Pandemic, and in particular the problems at Wembley. Another aspect mentioned in the opinion is the loss of collective wisdom regarding the policing and stewarding of major events as a result of the Pandemic. It is possible that Covid-19 contributed to this as older people were more at risk, and also possessed greater levels of experience dealing with mega events.

5.3 Large Sporting Events Post-Pandemic

Taken together, there is significant evidence both that large sporting events can aid the transmission of communicable diseases and hence exacerbate a public health emergecy. Such events have been terrorist threats on occasions in the past. There is also considerable evidence about the impact of public health threats on sport itself both via the athletes themselves and the demand for sporting events.

The restrictions imposed by the Pandemic meant that both the Tokyo Olympics when held in 2021, and the Beijing Winter Olympics in 2022, took place without spectators, and with heavy restrictions on athlete movement. It took place with some athletes more heavily impeded than others by the varying stringency of Covid-19 restrictions across countries, and potentialy with many participants less productive as a result of Covid-19 infections.

It seems plausible that the value of sporting events from a broadcasting perspective will be lessened since participants may be less able to perform to the best of their abilities, and one of the main ingredients of broadcasting sport, the interaction of fans and participants, is restricted. That said, the restriction on fans attending may lessen the role of home advantage in determining outcomes, removing one known bias in outcomes. As Szymanski (2006) argued, however, some degree of home advantage may remain optimal for sporting organisers if demand is positively related to particular large market teams winning.

It also left both hosts without any revenue from tourism via people attending the games, as might have been anticipated. It ensured that many of the venues were never used for their primary purpose, and hence without any legacy, will likely have been sorely under-used. Many such venues are build to a capacity for an Olympics event that subsequently will not be necessary.

The contrast is with the already discussed European Championships of football, which took place in the summer of 2021. These took place with restricted numbers of fans throughout, albeit with increasing numbers as the tournament progressed. However, the violent disorder that characterised the Euro 2020 Final can be argued to be a result again of the Pandemic's behavioural impact.

6 Discussion, Policy Implications and Conclusions

In this chapter we have considered the role of large, or mega events, and their interaction with public health and safety concerns. Such mega events, sporting events that generate huge levels of demand and hence private commercial revenues, are collections of mass gatherings, each of which has the documented

[17] See https://www.gov.uk/government/statistics/football-related-arrests-and-banning-orders-england-and-wales-2021-to-2022-season/football-related-arrests-and-banning-orders-england-and-wales-2021-to-2022-season for more information.

potential to attract public disorder, exert strain on public health infrastructure, and act to spread communicable diseases. As such, the net social benefits of such events may significantly differ from the net private benefits. In such a circumstance, the response need not necessarily be any kind of public policy action. Neale (1964) documented that many externalities at the level of sports clubs are internalised at the level of sports competitions. Moreover, as sporting mega events are usually organised by international sporting institutions, these are the bodies making the important decisions, rather than necessarily any individual government.

Nonetheless, the Covid-19 Pandemic, with varying levels of governmental intervention in terms of restrictions, emphasised the complex interaction between international sporting organisations and national governments. Football's Euro 2020 tournament, when eventually played, had to change some of the venues it organised events at due to governments being unwilling to relax some Pandemic-related restrictions. That tournament, taking place over multiple countries, and even continents (with one venue in Baku in Asia), arguably presents a model of future mega events, as their size continues to increase. At the same time, such international tournaments must create greater emissions due to travel, and hence must be less sustainable, as well as being at a greater risk of being disrupted by public health and safety threats.

The impact of such health and safety threats on the mega events themselves also likely reduces the commercial value of those events. If fans are restricted from attending, then direct revenues from ticket sales, and potential tourism benefits to a region are lost, and the resulting television broadcasting must also lose some of its value as a result. At the same time, costs are very likely to increase; pandemic insurance policies like the one taken out by Wimbledon are likely to become more common, alongside greater awareness of potential risks. The independent inquiry into the Manchester Arena Bombing found repeated failing of security staff in and around the event; increased training and vigilance against threats will impose costs on the organisation of large events.[18]

However, despite all the likely impacts both of mega events on communicable diseases and hence public health threats, and of such emergencies on mega events, and despite all the likely negative economic consequences of hosting such events even before the legacy of Covid-19 is factored in, there remains appetite for hosting events. As economists, there may be scepticism that the benefits of such events are merely the displacing of economic activity from one region or sector to another, and the costs are likely highly under-estimated (especially if the kinds of wider public health and safety considerations in this chapter are factored in). But it remains that the intangible allure of large sporting events, the promise of great joy, and memories to last long into common identities are such that there is no foreseeable threat to the presence on the sporting calendar of large, or mega events.

References

Ahammer, A., Halla, M., and Lackner, M. (2020). Mass Gatherings Contributed to Early COVID-19 Spread: Evidence from US Sports. *Covid Economics*, 30.

Akashi, H., Shimada, S., Tamura, T., Chinda, E., and Kokudo, N. (2022). SARS-CoV-2 infections in close contacts of positive cases in the Olympic and Paralympic village at the 2021 Tokyo Olympic and Paralympic Games. *JAMA*.

[18] See https://manchesterarenainquiry.org.uk/ for more details.

Alfano, V. (2022a). COVID-19 Diffusion Before Awareness: The Role of Football Match Attendance in Italy. *Journal of Sports Economics*, 23(5):503–523.

Alfano, V. (2022b). Training in lockdown. The impact of stringency measures on the Olympic games of Tokyo 2020. Reading online sport economics seminar, University of Reading.

Bryson, A., Dolton, P., Reade, J., Schreyer, D., and Singleton, C. (2021). Causal effects of an absent crowd on performances and refereeing decisions during Covid-19. *Economics Letters*.

Cardazzi, A., Humphreys, B., Ruseski, J., Soebbing, B., and Watanabe, N. (2020). Professional Sporting Events Increase Seasonal Influenza Mortality in US Cities. Technical Report 3628649, SSRN.

Cary, M. and Stephens, H. (2023). Gendered Consequences of COVID-19 Among Professional Tennis Players. *Journal of Sports Economics*, 24(2):241–266.

Cueva, C. (2020). Animal Spirits in the Beautiful Game. Testing social pressure in professional football during the COVID-19 lockdown. Osf preprints.

Dehning, J., Mohr, S., Contreras, S., Dönges, P., Iftekhar, E., Schulz, O., Bechtle, P., and Priesemann, V. (2023). Impact of the Euro 2020 championship on the spread of COVID-19. *Nature Communications*, 14(1):122.

Endrich, M. and Gesche, T. (2020). Home-Bias in Referee Decisions: Evidence from "Ghost Matches" during the COVID19-Pandemic. *Economics Letters*, (197):109621.

Fischer, K. (2021). Thinning out Spectators: Did Football Matches Contribute to the Second COVID-19 Wave in Germany? Ssrn paper 3793379, Heinrich Heine University Dusseldorf - Duesseldorf Institute for Competition Economics (DICE).

Fischer, K., Reade, J., and Schmal, W. (2022). What cannot be cured must be endured: The long-lasting effect of a COVID-19 infection on workplace productivity. *Labour Economics*, 79:102281.

Frevel, N. and Schreyer, D. (2020). Behavioral responses to terrorist attacks: empirical evidence from professional football. *Applied economics letters*, 27(3):244–247.

Funahashi, H., Cardazzi, A., and Watanabe, N. (2022). Mass Gathering Sport Events and the Spread of Viral Respiratory Infection: Japanese Professional Baseball and Influenza. *Journal of Sports Economics*, page 15270025221143978.

Garicano, L., Palacios-Huerta, I., and Prendergast, C. (2005). Favouritism Under Social Pressure. *Review of Economics and Statistics*, 87(2):208–216.

Gitter, S. (2017). The H1N1 Virus and Mexican Baseball Attendance. *Athens Journal of Sports*, 4(4).

Gorgi, P., Koopman, S., and Lit, R. (2021). Estimation of final standings in football competitions with a premature ending: The case of COVID-19. *AStA Advances in Statistical Analysis*, pages 1–18.

Harb-Wu, K. and Krumer, A. (2019). Choking under pressure in front of a supportive audience: Evidence from professional biathlon. *Journal of Economic Behavior & Organization*, 166:246 – 262.

Ishola, D. and Phin, N. (2011). Could influenza transmission be reduced by restricting mass gatherings? Towards an evidence-based policy framework. *Journal of epidemiology and global health*, 1(1):33–60.

Jewell, R., Simmons, R., and Szymanski, S. (2014). Bad for business? The effects of hooliganism on English professional football clubs. *Journal of Sports Economics*, 15(5):429–450.

Karami, M., Doosti-Irani, A., Ardalan, A., Gohari-Ensaf, F., Berangi, Z., Massad, E., Yeganeh, M., Asadi-Lari, M., and Gouya, M. (2019). Public health threats in mass gatherings: A systematic review. *Disaster medicine and public health preparedness*, 13(5-6):1035–1046.

Marie, O. (2016). Police and thieves in the stadium: measuring the (multiple) effects of football matches on crime. *Journal of the Royal Statistical Society: Series A (Statistics in Society)*, 179(1):273–292.

McCarrick, D., Bilalic, M., Neave, N., and Wolfson, S. (2020). Home Advantage during the COVID-19 Pandemic in European football. Psyarxiv.

Montolio, D. and Planells-Struse, S. (2016). How time shapes crime: The temporal impacts of football matches on crime. *Regional Science and Urban Economics*, 61:99–113.

Müller, M. (2015). What makes an event a mega-event? Definitions and sizes. *Leisure studies*, 34(6):627–642.

Müller, M., Wolfe, S., Gaffney, C., Gogishvili, D., Hug, M., and Leick, A. (2021). An evaluation of the sustainability of the Olympic Games. *Nature sustainability*, 4(4):340–348.

Neale, W. (1964). The Peculiar Economics of Professional Sports. *Quarterly Journal of Economics*, 78(1):1–14.

Olczak, M., Reade, J., and Yeo, M. (2020). Mass Outdoor Events and the Spread of an Airborne Virus: English Football and Covid-19. *Covid Economics*.

Pearson, G. (2022). Provided for Baroness Casey of Blackstock's Independent Review of the Euro 2020 Final for the Football Association. Technical report, The University of Manchester Law School.

Pollard, R. (2006). Worldwide Regional Variations in Home Advantage in Association Football. *Journal of Sports Sciences*, 24(3):231 – 240.

Reade, J., Schreyer, D., and Singleton, C. (2020). Stadium attendance demand during the COVID-19 crisis: First empirical evidence from Belarus. *Applied Economics Letters*.

Reade, J. and Singleton, C. (2020). Demand for Public Events in the COVID-19 Pandemic: A Case Study of European Football. *European Sport Management Quarterly*.

Singleton, C., Reade, J., and Schreyer, D. (2021). A decade of violence and empty stadiums in Egypt: When does emotion from the terraces affect behaviour on the pitch? Discussion Paper 2021-21, University of Reading.

Stoecker, C., Sanders, N., and Barreca, A. (2016). Success Is something to sneeze at: Influenza mortality in cities that participate in the Super Bowl. *American Journal of Health Economics*, 2(1):125–143.

Streicher, T., Schmidt, S., Schreyer, D., and Torgler, B. (2020). Anticipated feelings and support for public mega projects: Hosting the Olympic Games. *Technological Forecasting and Social Change*, 158:120158.

Szymanski, S. (2006). Tilting the Playing Field: Why a sports league planner would choose less, not more, competitive balance. Working Papers 0620, International Association of Sports Economists & North American Association of Sports Economists.

Wicker, P. and Coates, D. (2018). Flame goes out: Determinants of individual support at the 2024 Hamburg Games Referendum. *Contemporary Economic Policy*, 36(2):302–317.

Wolfson, S., Wakelin, D., and Lewis, M. (2005). Football supporters' perceptions of their role in the home advantage. *Journal of Sports Sciences*, 23(4):365 – 374.