The Arsenal of Democracy? An Examination of Political Regime Types' Success in the Global Sporting Arms Race Following the Collapse of the Iron Curtain

Rasmus K. Storm[1, 2*] & Tor Georg Jakobsen[2]

[1] *Danish Institute for Sports Studies, 8000 Århus, Denmark*

[2] *NTNU Business School, Norwegian University of Science and Technology, Trondheim, Norway*

[*] *Corresponding Author*

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Abstract

Over the years, international elite sport has developed into an 'arms race' with the success of national elite sport systems becoming a symbol of regime superiority. During the Cold War, the Eastern and Western Blocs battled for success in various sports disciplines. The former nations were dominating in terms of medals, symbolising the force of the socialist autocratic system. However, because of the fall of the Iron Curtain in 1989, Western liberal democracies had the opportunity to gain more strength. In this paper, we aim to test whether this has happened by analysing the association between political regime type and international sporting success at the Winter and Summer Olympic Games in the post-Cold War Period. We do this by deploying data on the political regime types to a set of regression models, finding that democratic nations have taken over the international sporting arms race at the Summer Olympic Games. For the Winter Games, our results indicate that less democratic countries (anocracies) are in the lead. Our results add to existing research by suggesting that political regime type still matters to international sporting success. Implications for stakeholders, sports managers, and politicians are that they must decide to what extent they want to be part of this game in the coming years.

Keywords: Elite Sport; Political Regimes; Nations, Success, Polity Data

Introduction

During World War II (WWII), a gigantic industrial arms build-up program in the US, initiated by President Roosevelt, became known as the 'Arsenal of Democracy' (Baime, 2014; Rhode et al., 2018). It helped and was initiated to outpace the war production of Germany, Italy, and Japan (the Axis Alliance) and assisted the Allies in winning the war.

Following WWII, a new and less catastrophic battle between the post-WWII autocratic-socialist and democratic regimes was fought at international sporting tournaments (D'Agati, 2013; Washbrun, 1957), particularly at the prestigious Summer and Winter Olympic Games (Rhamey & Early, 2013). While also engaging themselves in various surrogate wars worldwide, the new rivalry between the blocs came to be expressed on the sporting stage.

It is well known that the socialist regimes – in the autocratic 'Eastern Bloc'[1] – dominated the medal tables these years (Lowen et al., 2016; Nielsen & Storm, 2014; Noland & Stahler, 2017), but also the western side strived to be competitive (Dennis & Grix, 2012). Not only were large amounts of resources poured into achieving international sporting success, but the prestige attached to it and the importance of sport for national (and Eastern or Western) identity were also in focus on both sides (Freeman, 2012; Jedlicka et al., 2020). In this sense, international elite sport became an arena for political competition between democratic nations and socialistic autocracies that continued until the collapse of the Soviet Union in the late 1980s and early 1990s (Andreff, 2021; Dennis & Grix, 2012).[2] However, have democratic

[1] In this paper, we refer to 'The Eastern Bloc' as, first and foremost, the group of socialist/communist nations in Central and Eastern Europe—for example, East Germany, Hungary, Poland, and the Soviet Union. However, in a broader understanding, nations in East Asia, Southeast Asia, Africa, and Latin America that were under the influence of the Soviet Union during the Cold War period were part of the bloc, too. All these nations opposed the democratic and capitalist-oriented 'Western Bloc'.

[2] We understand 'democracy' (or 'democratic nations') as consisting of "…three essential, interdependent elements. One is the presence of institutions and procedures through which citizens can express effective preferences about alternative policies and leaders. Second is the existence of institutionalized constraints on the exercise of power by the executive. Third is the guarantee of civil liberties to all citizens in their daily lives and in acts of political participation.

regimes gained dominance in international elite sport since then? Or, put differently: Has international elite sport become the arsenal of a parallel arms race expressing the superiority of democracy in the post-Cold War period?

This paper aims to understand the association between political regime types and their respective medal portfolios across the most prestigious sports internationally. The question is of academic as well as broader political interest.

Firstly, the quest for international sporting success has intensified since the end of the Cold War (De Bosscher et al., 2006). However, the academic question of political regime characteristics and international sporting success has only been addressed in a limited number of sports (e.g. Valenti et al., 2020), mainly through some rough measures of political regime types (e.g. Scelles & Andreff, 2019), and primarily for the Summer Olympics (e.g. Scelles et al., 2020).

Secondly, sport and international politics appear to have become closer and closer connected (Hoberman, 1977; Seippel et al., 2018). As indicated above, elite sports competitions, the success of elite athletes, and major sporting events have increasingly been used over the years to brand nations and showcase the global power of various political regimes (Grix, 2013; Haut et al., 2017; Jedlicka et al., 2020) – and not only during the Cold War. For example, the 2008 Summer Olympic Games in Beijing (Cha, 2009), the 2014 FIFA World Cup in Brazil (Grix et al., 2015; Grix & Lee, 2013), and the 2014 Winter Olympic Games in Sochi in Russia (Alekseyeva, 2014; Gorokhov, 2015; Grix et al., 2024). These events aimed to attract the attention of other nations through deliberate strategies of the host nations, signalling that China, Brazil, and Russia are (growing) international economies and

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Other aspects of plural democracy, such as the rule of law, systems of checks and balances, freedom of the press, and so on, are means to, or specific manifestations of, these general principles“ (Marshall & Gurr, 2020, p. 13). The polity5 variable deployed in our analysis measures the degree to which these elements are obtained in a given nation. Autocracies are, on the other hand, defined by the absence of these elements (more on this later).

superpowers (Grix et al., 2019). At the same time, the countries[3] strived to achieve sporting success at the events to underscore their global significance. Hosting major sporting events or striving for international sporting success is – in other words – still used to meet specific political ends of importance for nations (Kramareva & Grix, 2019; Liu, 2020).

There are several reasons to believe that democracies have increased their competitiveness in the international sporting arms race in the post-Cold War period. First, following the fall of the Iron Curtain, many Eastern Bloc nations fell into economic turmoil (Berend, 2001) that not only affected living standards among the general population but is likely to have affected the medal-gaining capabilities for many years as well.

Second, some strong former Eastern Bloc nations developed into democracies following the fall of the Iron Curtain while withholding their competitiveness in international elite sport. This was the case with East Germany, which was reunited with West Germany, and Hungary and Poland, still high in today's Olympic medal standings. It is likely that the 'democratic sporting arsenal' benefitted from autocratic nations ‘shifting sides‘ politically.

Third, democratic nations have over the years copied, funded, and optimized Western variations of the successful Eastern European model of supporting and nurturing elite sport (Green & Oakley, 2001) – for example, in Australia, New Zealand, the United Kingdom, Canada, and Denmark – to strengthen their international competitiveness (Dennis & Grix, 2012).

To test whether democratic nations – in the light of these developments – have been able to take the lead in international elite sport in the post-Cold War period, this paper is structured as follows: First, we review existing literature to identify research gaps. Second, we establish an analytical model that outlines the factors behind nations' international sporting

[3] In this paper, we use the terms ‘nation’ and ‘country’ interchangeably. A nation or a country is a geographical unit containing a specific political regime type.

success. Third, we present our data and describe our methods, and fourth, we present and discuss our results. Finally, we conclude and outline implications and potential future research avenues.[4]

Literature Review: Determinants of Olympic Sporting Success to Nations

Over the years, papers that deal with determinants of – and which model the – country-level medal portfolios at the Olympics have significantly increased (Scelles et al., 2020). In this section, we group the most relevant studies by topic to provide a brief overview of the generated knowledge and the gaps to be filled.

Population, Wealth, Hosting and Political Regime Type

Some of the earliest papers date back to the 1970s (e.g., Grimes et al., 1974; Levine, 1972). However, more recent and important studies are published by Bernard and Busse (2004) and M. Andreff, W. Andreff, and Poupaux (2008). These authors established the main variables that – with some variation – have been used since then. Focussing on the Summer Olympics, they find that population, wealth (measured by GDP), hosting the event(s), and being a planned economy (Soviet or another socialist system) is essential for international sporting success.

However, to Forrest et al. (2010), it is essential to be more specific when it comes to economic resources than just testing the influence of the general wealth of a nation (using

[4] It is important to stress that we focus on the post-Cold War period in our analysis because this is where we have the best data. The Cold War period was marked by significant political upheavals, including several boycotts of the Olympic Games. These boycotts could introduce significant biases if we conducted a direct comparison using the same analytical methods of both periods. Instead, we use the Cold War period as a stepping stone to conduct the post-Cold War period analysis, testing if democratic nations today are in the lead, thus indicating whether the power balance has shifted.

GDP as a variable). Instead, the authors expand on previous studies by adding a variable on national public expenditure on recreation (sport) to account for different sports policies across nations. They find this increases the accuracy of their models predicting the Beijing 2008 results.

In one of the most recent studies performed by Rewilak (2021), the author applies new modifications to these usual modelling approaches to determine Summer Olympic success. When time-invariant country-specific unobservables are included in the estimations, the results suggest that population size and hosting are the most critical factors behind Olympic performance.

Forrest et al. (2017) deployed a slightly modified version of the Bernard and Busse (2004) model to 15 sports at six Summer Olympic events in the 1992 to 2012 period. Most interestingly, concerning the research presented in this article, they find that the strength in terms of the performance of former communist nations is declining. There still seems to be a legacy effect from when the Eastern Bloc existed, mainly in countries that were "part of the old Soviet Union rather than in its sphere of influence" (p. 129).

A similar conclusion related to the former communist nations is found in a study by Noland and Stahler (2017). They model determinants of medal shares for the Summer Games (1960–2012) and the Winter Games (1960–2010), finding that the effect of being part of the Eastern Bloc is higher for women in the Summer Olympics than for men. For the Winter Games, this is different because, for women, the effect is 'largely insignificant' (p. 519) (more on how gender issues are dealt with in other studies below).

Past Performance and Team Size

Other prime determinants have been added to the usual approaches. For example, Celik and Guis (2014) add past performance to their regression models. However, they include not only one lagged variable (i.e., the latest Olympic results) but also the past two Summer

Olympics results. This would theoretically improve their models, according to the authors. Contrary to this assumption, their test reveals insignificant results. Only a one-Olympiad lag of results is significant.

The results by Trivedi and Zimmer (2014) correspond with these results, showing that past performance – i.e., the success at the former Summer Olympic Games – impacts current results. According to the authors, this indicates a persistent effect on performance in their regression analysis from 1988 to 2012. Further, they find that the size of the Olympic team is a significant predictor of the number of medals won.

Olympic Team size is also tested by Vagenas and Vlachokyrikou (2012), in addition to variables such as urban population, inflation, unemployment, and health expenditures. However, only data from the 2004 Summer Olympics are used. Still, the authors find that team size is the best single predictor of Olympic medals because it appears to be a proxy for medals won: It expresses the influence of other macro-level variables on the sporting success of nations.

Pettigrew and Reiche (2016), looking at both the Winter and Summer Games, find that team sizes for host nations are significantly larger than in previous Olympic Games because "the qualification standards for the host country are substantially easier" (p. 4). Correcting this selection bias, the authors argue that the hosting effect found in other studies is due to the enlarged team (size) hosts enjoy – and therefore have a higher probability of winning medals than other nations – rather than a (home) advantage from being the host.

Gender Issues

Recently, gender issues have also been dealt with in studies on determinants of Olympic success. For example, Leeds and Leeds (2012) estimated separate regression models for medals won by men and women, respectively, in four Summer Olympic events (1996–2008). Their findings are that determinants of medal portfolios are similar across gender.

However, different results are found for former Soviet republics and former communist nations. According to the authors, coming from a former Soviet or communist country still seems to be linked to success for male, but not female, athletes. In communist nations, (elite)sport was used to promote equal rights for men and women (Riordan, 2007). Following the collapse of the Iron Curtain, this might have changed with women not being supported or promoted to the same degree as before, resulting in the difference found by Leeds and Leeds (2012).

Lowen et al. (2016) investigate the relationship between women's empowerment and medals won in the Summer Olympics in the 1996-2012 period using a gender inequality index. Their results suggest that greater gender equality positively correlates with the Olympic performance of nations. Further, their appliance of the continuous Polity2 variable to consider political regime types is relevant to the research in this paper, finding it negative and insignificant.

Factors Related Specifically to Winter Olympic Sports

While most existing research investigates the Summer Olympics, some studies focus specifically on the determinants of medal success at the Winter Olympics. This is the case in the study performed by W. Andreff (2013), which aims to predict the medal distribution at the 2014 Sochi Winter Olympic Games using a model including the usual variables such as GDP, population, and hosting of the event but also the presence of ski and winter resorts on data ranging from 1964 to 2010. A variable representing snow coverage is further included. The author finds that all variables except snow coverage are significant.

Otamendi and Doncel (2014) also focus on the Winter Olympics – in the 1992 to 2010 period – and, compared to many other studies in the area, expand their analysis by performing a sport-specific simulation of participating nations' medal shares in a total of 15 sports. They find that being a 'snowy' country and hosting the Winter Games are critical success factors.

Further, they argue that being near an event and having a similar climate could give a neighbouring nation a competitive advantage.

Summing up: A Brief Overview of Generated Knowledge

What is clear from the above review is that the body of literature regarding determinants of success at the Olympics is large and growing. When modelling Summer or Winter Olympic success and predicting future medal portfolios, variables commonly used are GDP (including per capita), population, host dummies, communist/Eastern European nation dummies and lagged performance. These variables are all related to nations' international sporting success (M. Andreff et al., 2008; Bernard & Busse, 2004; Forrest et al., 2010). Some studies disaggregate their analysis between genders (e.g. Leeds & Leeds, 2012) and disciplines (e.g. Otamendi & Doncel, 2014) and look at team sizes (e.g. Vagenas & Vlachokyriakou, 2012) also with findings suggesting a relationship.

However, to our knowledge, no study has explicitly focused on the question of to what extent democratic nations have gained momentum in the post-Cold War period. Political regime-type variables have – as mentioned – been applied in existing research, but mainly in the form of a Soviet/socialist/communist/planned economy system dummy used to establish to what extent Eastern European nations were (still) competitive (e.g. Forrest et al., 2017; Hoffmann et al., 2006). One notable exemption is Lowen et al. (2016). But as is the case with most studies in the existing body of research, that study only focused on the Summer Olympics. Very few authors are examining both the Winter and Summer Olympics. Further, Winter Olympic studies are fewer. Finally, and so far, no published papers have included all Olympic games from the collapse of the Iron Curtain to the present day.

This paper aims to bridge this gap whilst also building a richer and more up-to-date design than previously seen. We do this by including all Olympic Games from the fall of the Eastern Bloc up until the most recent Summer (Tokyo 2020(21)) and Winter Games (Beijing

2022). Further, we apply a detailed measure of democracy/autocracy – using the *polity5* variable (more on this below) – to a set of relevant regression specifications to answer whether international elite sport performances in the post-Cold War area have become the 'arsenal of democracy'. In the coming section, we briefly establish an analytical model to establish a foundation for our empirical examination. This is followed by a presentation of the materials and methods used in the study.

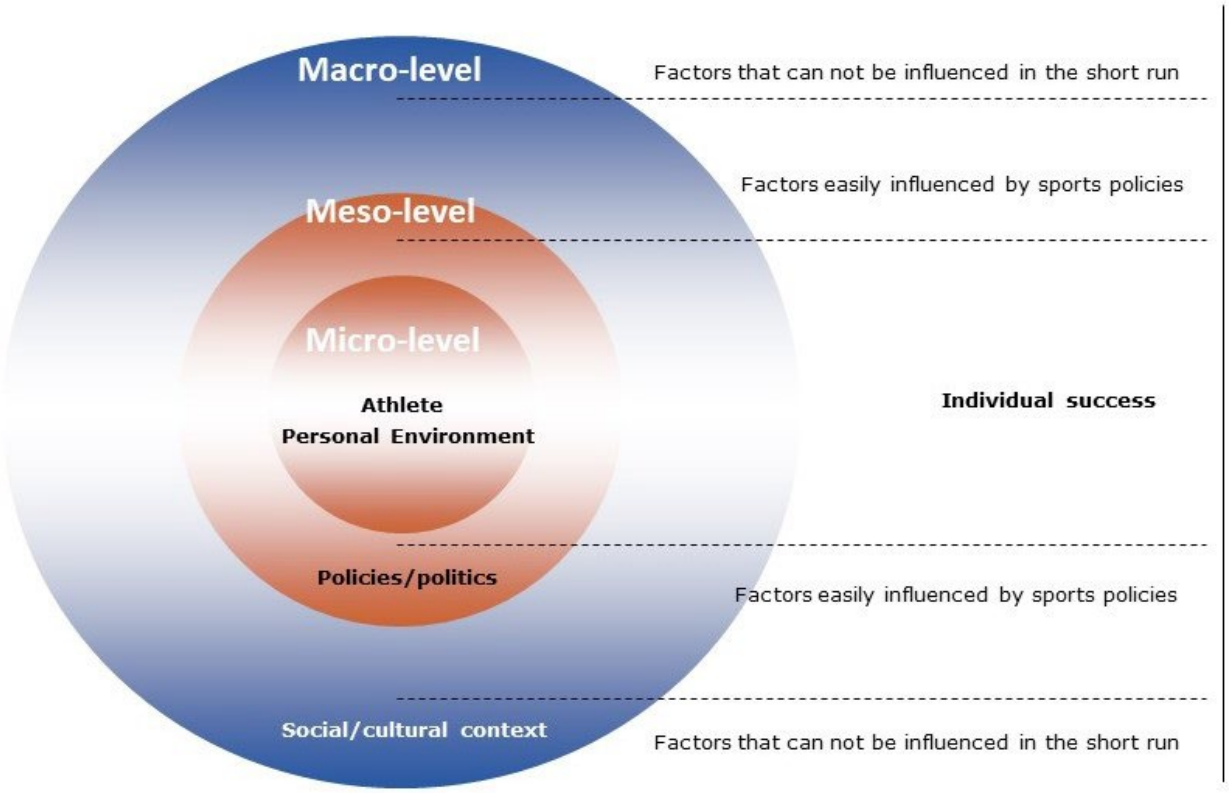
Analytical Model

As described in the literature review, many determinants of international sporting success exist. According to De Bosscher et al. (2006, 2010, 2015), these factors can be broken down into elements at the micro-, meso- and macro-levels. This is illustrated in Figure 1.

Figure 1

Factors Determining International Sporting Success[5]

[5] The figure is reproduced from De Bosscher (2006, p. 187).



De Bosscher et al. (2006) argue that micro-level factors are closely related to the individual. The athlete's personal environment can influence whether they rise to the highest international level and win medals for their nation. Meso-level factors are also important because national elite sport policies support the athletes' progression from being identified as talented to competing at the elite level (De Bosscher et al., 2006). This support can extend beyond the capabilities of the athlete's personal environment and support network (Wicker et al., 2012).

In the Figure 1 model, the meso-level consists of a set of 'pillars' that all exercise an influence over international sporting success: Direct financial funding, organisational structures and scientific research, talent identification and development, training facilities, provision and development of coaches, access to international competition, (a high level of) sport participation, and athletic and post-career support initiatives. All these pillars – and the national aggregate 'score' on each – constitute the competitive strength of the national elite

sport system, with the direct financial funding pillar being the most important at the meso-level (De Bosscher et al., 2015).

This being said it could be argued that macro-level factors have the most significant impact on international sporting success because they determine the structural conditions and policies of the sports system and how each athlete fits into and progresses through that system. There may be cases where athletes reach the highest level without significant support from their families (micro) or the national elite sport system (meso). Still, macro-level factors are always structurally present, as indicated in the analytical model. For example, larger nations have greater talent pools, and wealthier countries have higher levels of public health, can provide better facilities, do better scientific research, and generally pour more money into the meso-level pillars to maximise their chances of success. As pointed out by De Bosscher et al. (2006), this is reflected by the usual medal tally leaders at the Olympic Games: the US (with the largest national GDP of all world nations), China (the most populous country) and Russia (with significant oil and natural resources leading to greater wealth).

Further, because the political regime type of a given country is essentially a macro-level condition – it does not change much over time, usually slowly – it is relevant to understand how various macro-level factors affect the international sporting success of nations. Based on this observation, and in accordance with the literature review, where existing research deploys macro-level variables, we focus on examining macro-level determinants in the following analysis.

Presentation of Materials and Methods

Data and Econometric Approach

To understand how various macro determinants are associated with international sporting success – and what specific role different political regime types play – it is necessary

to consider the complex developmental processes that have occurred across the included set of nations over the period examined. Therefore, we deploy a regression estimation strategy because it can handle complex (and large) data sets by analysing the association between a dependent variable (international sporting success) and a range of independent variables that vary over time (Mehmetoglu & Jakobsen, 2017). Using this approach, it is possible to single out the potential effect of a given variable of interest – here, a variable on democracy/autocracy (more on this later) – while also considering other factors that might have an influence.

Our data set[6] covers the Summer Olympics from 1996 (Atlanta) to 2020(21) (Tokyo) and the Winter Olympics from 1994 (Lillehammer) to 2022 (Beijing), representing 149 nations in the Summer Olympics and 90 countries in the Winter Olympics over the examined period.[7] The data analysed can be considered the post-Cold War period of international sport, during which the socialist system and its significant resource allocation to sport collapsed and where Western nations started to copy the Eastern Bloc elite sport model (Dennis & Grix, 2012) – all factors that potentially has given rise to a higher level of competitiveness in Western (democratic) nations (Nielsen & Storm, 2014).

The Olympics features some of the most prestigious international competitions and a broad set of disciplines, which is why we focus on these events in accordance with existing research. By looking into these Olympic Games from the collapse of the Eastern Bloc until the present day, we expand on already published studies by analysing the most up-to-date data. Models of the Summer and Winter Olympic Games are run separately because they are qualitatively different events with (potentially) different determinants of success (more on this later).

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[6] We thank student assistant Andreas Nygaard for checking and correcting the database for errors.

[7] We exclude the 1992 Summer and Winter Olympic Games from our study because many former Eastern Bloc athletes were part of a unified (former) USSR Team in these games. This situation is not comparable to later Olympic Games and will potentially distort our model estimations.

Dependent variable

Because international elite sport is a winner-takes-all market (Frick & Wicker, 2016), and all public prestige and interest are focused on the medal tally, we deploy the total *medal score* at the Olympic Winter and Summer Games to measure sporting success (i.e. the dependent variable in our regressions).[8] This score is the sum of all medals, where the value of each medal is weighted as follows: Gold = 5, silver = 3, and bronze = 2, as also applied by Rewilak (2021) and Condon et al. (1999). We apply the weighting to show that to nations, winning gold matters most while still considering that governments and national federations can have broader goals than just achieving the highest position possible (Singleton et al., 2023). The dependent variable is a classic 'count variable', where the variance is greater than the mean, and there is an excess of zeros because data from all participating nations at each Olympic Games in the period examined are included in the estimated models. We thus – in accordance with Santos Silva and Tenreyro (2011) – run Poisson Pseudo-Maximum Likelihood estimator models (Poisson PML). If linear regression models are deployed to count outcome variables, there is a risk that the procedure could produce inefficient, inconsistent, and biased estimates (Long, 1997). We have also run zero-inflated negative binomial regressions (NBR) as sensitivity models (as suggested by Leeds and Leeds (2012)), as well as zero/one inflated beta models (as suggested by Ferrari & Cribari-Neto (2004)), achieving similar results. As can be seen from Table 1, the number of available medals is growing over time. Therefore, we include dummy variables for each Olympic Games to account for the increased available medals.

Table 1

Available medals over time

[8] All variables and data sources of the variables are described in the supplementary materials to this article.

Summer Olympics			*Winter Olympics*		
Year	Host	Medals	**Year**	Host	Medals
1996	Atlanta	842	**1994**	Lillehammer	183
2000	Sidney	927	**1998**	Nagano	205
2004	Athens	927	**2002**	Salt Lake	234
2008	Beijing	958	**2006**	Torino	252
2012	London	960	**2010**	Vancouver	258
2016	Rio	973	**2014**	Sochi	294
2020(21)	Tokyo***	1080	**2018**	PyeongChang	307
			2022	Beijing	327

***The Tokyo 2020 Games were held in 2021 due to Covid19 issues

Independent Variables

Our primary independent variable of interest is a measure of democracy/autocracy developed by the Polity Project. *Polity5* (Marshall & Gurr, 2020) is a time-varying composite score produced for all world nations above 500.000 inhabitants, going from -10 to +10; i.e., from autocratic to fully democratic and obtained from the Center for Systemic Peace's website.[9] It consists of different underlying scores used to measure the overall degree of democracy (and autocracy). For example, the competitiveness of executive recruitment (to political institutions), the openness of executive recruitment (to political institutions), constraint on the chief executive, and competitiveness of political participation.

According to the Polity Project, national scores from -10 to -6 can be characterised as autocratic regimes (e.g. China), -5 to 0 are closed anocracies (e.g. Turkey), +1 to +5 are open anocracies (e.g. Russia), and above +5 are democracies (e.g. USA or Germany). In short, higher (lower) and more positive (negative) values equal higher levels of democracy (autocracy).

[9] http://www.systemicpeace.org/inscrdata.html

Other indexes of political regime type exist. For example, *The Economist* has produced a democracy index.[10] However, *polity5* is a commonly used indicator of democracy/autocracy in the social sciences. It is not a measure without problems, though. All data on social issues are abstractions, and measuring complex issues as political regime types is inherently tricky. The question is to what extent *polity5* can grasp differences in degrees of democracy/autocracy appropriately. As noted by Wei (2021), there are issues with the polity index - and other similar indexes - that question its ability to consider all relevant aspects of political regime types. For example, the *polity5* score is a (composite) macro-level measure that does not take the lived political culture or the implementation of state-level decisions into appropriate consideration. Also, comparing two of the leading measures of democracy, Freedom House and polity4 (the predecessor of polity5), showed differences in how these two rated countries (Högström, 2013).

This being said, polity5 is one of the most rigorous measures on the subject available and has been used in many studies, receiving more than 5,000 citations (Vaccaro, 2021). The score's robustness lies in its extensive coverage across time and nations and the provision of precise coding guidelines and publicly accessible data. It was introduced in 1975, marking one of the initial significant efforts to systematically assess global political regime structures over time. Despite the abovementioned issues, we consider it one of the best indexes and highly relevant to our analysis. Further, issues with polity4 have been corrected in *polity5*, making it highly reliable.

As mentioned earlier, other studies have deployed variables on political regime types (e.g. W. Andreff, 2021; Storm et al., 2016). However, these variables are usually dummies indicating whether nations are, for example, former Eastern Bloc (autocratic) countries or not.

[10] Se for example: https://www.eiu.com/n/campaigns/democracy-index-2021/

The study by Lowen et al. (2016) is an exception, where the polity variable is applied to better understand how political regime types matter to international sporting success.

In this study, we follow the idea of Lowen et al. (2016) by adding the *polity5* variable to our regressions, expanding on their research in several ways. First, we add more Olympic events to our analysis than previously seen. Extending the data periods used in previous studies is important because the development in the power balances of international sport – and regime types – is slow. Adding more time periods to our models can reveal a tip of the power balance between democratic and autocratic regimes, which is not possible in data on smaller periods. Further, our study can capture more variability and underlying trends that might not be evident in a shorter period. This allows for a more comprehensive understanding and can provide insights that might not be apparent in existing research.

Second, we deploy models for the Winter Olympics because previous studies on winter sports have not included the *polity5* variable. Running separate models for the Winter and Summer Olympics is essential because each Olympic type's global attention and prestige can vary, influencing how political regimes prioritise their investments and policies for these tournaments. In addition, preparing for the Winter Olympics often requires different training facilities, infrastructure, and investments than the Summer Olympics and different (autocratic and/or democratic) regimes might prioritise or neglect these based on their geographical, political, and socio-economic attributes. Further, one regime type might find investing in and prioritising a smaller set of sports easier, leading to disproportionate success in the Winter Olympics. However, whether that is the case and generally goes for more or less democratic nations has not been tested so far.

Third, we aim to include more relevant controls to build more robust models than previously seen. We do this based on existing literature and adding new, not previously deployed, variables (more on this below).

Finally – and fourth – we update the analysis by Lowen et al. (2016) using the best and updated *polity5* instead of the polity2 variable used in their study. This ensures the most robust analysis.

Should there be a positive (negative) association between international success in elite sport and (more/less) democratic political systems considering our controls, our *polity5* variable will appear significant and positive (negative) in our estimations, and this will enable us to understand whether autocratic or democratic nations dominate the overall picture – i.e. the Winter and/or Summer Olympics – in the period we are investigating.

It is important to note here that *polity5* values – as described earlier – must be above a certain threshold for the respective nations to be democratic (+5). This means that even though we should get a positive and significant regression output on our *polity5* variable, it could be driven by nations that are not above the democracy threshold, even though they have a positive score and, therefore, feature democratic elements of political steering to some extent. To understand the dynamic of this issue better, we test for a potential curvilinear relationship between our democracy score and our dependent medal score variable and include *polity squared* in another set of models (Model 2 and Model 4 in Table 3).

As clarified in the literature review section and through our analytical model, several macro-level factors have previously been found to be related to the medal capabilities of nations, and we, therefore, enter a broad range of variables as controls, one of them being wealth (Bernard & Busse, 2004). Rich nations are better equipped to handle elite sport and develop a systematic elite sport system that can assist talents to develop their skills into the international elite (De Bosscher, De Knop, Bottenburg, et al., 2009). Therefore, *gdp/capita* (expressed in Purchasing Power Parity-values (PPP)) aims to test whether this is true in our data set. The variable has been built from two sources: The World Bank and Groningen Growth and Development Centre website because only some data for all nations were

available from the World Bank database. We log-transform this variable because we expect a diminishing return of (higher) wealth on our dependent variable (De Bosscher et al., 2015).

Another important factor related to international sporting success is the nation's population size (Rewilak, 2021). Several studies have shown that having a large pool of potential talents is important for sporting success (e.g. Storm et al., 2016). As with the wealth variable, and typical in existing research, we log-transform this variable too (*population*).

Further, and as shown in the literature review section, several studies use a host dummy, finding it significant (e.g. Bernard & Busse, 2004; Lowen et al., 2016; Scelles et al., 2020). This is due to the number of resources pledged towards hosting the Olympic Games and funding a larger team of athletes, as is entitled by the host nation (Rewilak, 2021). Therefore, we enter a similar dummy (*host*) to account for this potential association in our estimations, expecting it to be significant and positive.

Because Olympic Games are often awarded several years ahead, training talents and accumulating resources could theoretically start many years before hosting the event (Forrest et al., 2010; Scelles et al., 2020). Therefore, we add a dummy (*next*) to test whether there is a relationship to international performance one tournament ahead of the Olympic Games. We have not seen studies other than Scelles et al. (2020) and Forrest et al. (2010) deploying this variable, and adding this type of a dummy, especially our *previous2games* dummy, is potentially new to studies like ours and adds to existing research by testing a new dimension to previous regression model designs. The *previous2games* variable takes the value of 1 if the nation has been the host of one of the past two Olympics to test whether the previous build-up of resources has a long-term association with the medal portfolio.

The *neighbour* dummy tests whether sharing borders with a host nation is related to a country's medal performance. Theoretically, being near the event and having a similar climate could give a neighbouring nation a competitive advantage – at least at the Winter Olympics,

as indicated by Otamendi and Doncel (2014) – and we expect the association to be significant and positive.

It is well known (W. Andreff, 2021; Dennis & Grix, 2012) that some nations – especially many of the former Eastern Bloc nations, but also Western nations like Finland (Storm & Nielsen, 2022) – have employed athletes in the military forces. This was done to fund athletes' salaries and give them sufficient training time. So, by including the variable *military spending* (measured as a percentage of GDP), we aim to test whether military expenditure is associated with medal performance.

De Bosscher et al. (2006) argue that nations with a high population density could have an advantage in the international sporting arms race. Further, such a variable is deployed by Noland and Stahler (2017). According to these three authors, athletes from nations with higher population densities usually have shorter distances to travel to training facilities than those with lower densities. Therefore, we can expect our *urban* variable to be significant in the Olympic Summer Games models. However, this will likely not apply to Winter Olympic Games athletes, as their training (and competition) facilities are often outside urban areas.

Inspired by Lowen et al. (2016), we also deploy a measure of *gender inequality* with the Gender Inequality Index (GII) developed by the United Nations Development Program (UNDP). This composite measure includes three dimensions: Reproductive health, empowerment, and the labour market. High values indicate a high degree of *in*equality between women and men, and we expect that higher levels of equality (low scores) are positively related to our dependent variable because it would cater for both men and women having good opportunities to become elite athletes. Because we cannot disaggregate our data on gender, as done by Leeds and Leeds (2012), we cannot build models for men and women separately, which is a limitation of this study. Still, by entering the GII, gender issues are dealt with in our analysis.

Finally, *freeze* and *resort many* are entered into our Winter models. *Freeze* is a variable measuring the number of days per year with temperatures below zero degrees Celsius in the included nations.[11] Following W. Andreff (2021) and Otamendi and Doncel (2014), who include similar variables to account for climatic differences across countries, we expect that nations with higher levels of *freeze* are more likely to perform better at the Winter Olympic Games. Freeze shall be seen in connection to *resort many,* inspired by W. Andreff (2013) to capture high endowment in ski resorts and winter sports facilities. The variable includes nations with 60+ ski resorts with downhill winter sports facilities. We expect countries with many resorts to perform well at the Winter Olympics in such disciplines and consider the variable a supplement to *freeze,* which should capture a broader set of Winter Olympic disciplines.

Specifications

In total, we add nine controls to our main independent variable of interest in one set of models and 10 in another. We present four models: Two for the Summer and two for the Winter Olympics, which includes one model each with (Model 2 and Model 4) and without (Model 1 and Model 3) the squared *polity5* variable building a new and not previously seen configuration of models. The general equation for the Poisson PML model is as follows:

$$[1]\quad P(Y_i = y_i \mid X_i, \beta) = \frac{e^{-\exp\{X,\beta\}} \exp\{X_i\beta\}^{y_i}}{y_i!}$$

[11] The data have been obtained from this source: http://catalogue.ceda.ac.uk/uuid/d4e823f0172947c5ae6e6b265656c273?search_url=%2F%253Fq%253Dfrost%2Bcountry%26sort_by%253D

Table 2 presents the descriptive statistics for the Summer and Winter Olympic models, respectively.

Table 2

Descriptive Statistics

	Summer Olympics N = 963				***Winter Olympics N = 536***			
Variables	Min	Max	Mean	Std.d.	Min	Max	Mean	Std.d.
medal score	0	417	21.48	52.25	0	134	12.80	25.68
polity5	-10	10	4.323	6.070	-9	10	6.96	4.91
gdp/capita	5.644	11.74	8.887	1.300	6.567	11.81	9.669	1.602
population	12.89	21.08	16.32	1.512	12.91	21.07	16.53	1.602
host	0	1	0.006	0.079	0	1	0.015	0.121
next	0	1	0.007	0.085	0	1	0.013	0.113
previous2games	0	1	0.015	0.120	0	1	0.026	0.160
neighbour	0	1	0.037	0.190	0	1	0.052	0.223
military spending	0	16.08	2.069	1.690	0	11.62	1.926	1.268
urban	1.091	100	56.56	22.59	14.24	100	67.11	17.15
gender inequality	0.013	0.820	0.334	0.200	0.013	0.680	0.197	0.151
freeze	---	---	---	---	0	258.1	90.33	67.18
resort many	---	---	---	---	0	1	0.239	0.427

Note. The variables *gdp/capita* and *population* are log-transformed.

Results and Discussion

Regression output for both models on the Summer Olympics (Models 1 and 2) and the Winter Olympics (Models 3 and 4) are presented in Table 3.

Table 3

Poisson PML Regression Models on Olympic Success, 1994–2022

	Medal score **Summer Olympics (1996–2021)**		***Medal score*** **Winter Olympics (1994–2022)**	
	Model #1	**Model #2**	**Model #3**	**Model #4**
constant	-8.945***	-9.295***	-16.578***	-17.862***
	(1.603)	(1.531)	(3.418)	(0.050)
polity5	0.036**	0.052**	0.041	0.087*
	(0.033)	(0.021)	(0.041)	(0.050)
polity squared	---	-0.007	---	-0.015**
		(0.005)		(0.006)

gdp/capita	-0.007	0.086	0.914***	1.124***
	(0.175)	(0.127)	(0.344)	(0.264)
population	0.721***	0.730***	0.706***	0.766***
	(0.063)	(0.063)	(0.138)	(0.142)
host	0.687***	0.732***	0.250**	0.164
	(0.192)	(0.186)	(0.123)	(0.155)
next	0.130	0.190	-0.073	-0.181
	(0.176)	(0.155)	(0.131)	(0.176)
previous2games	0.330*	0.342*	-0.076	-0.138
	(0.200)	(0.184)	(0.199)	(0.259)
neighbour	-0.076	-0.101	0.139	0.131
	(0.107)	(0.113)	(0.107)	(0.113)
military spending	0.114	0.090	0.242***	0.129
	(0.074)	(0.063)	(0.086)	(0.104)
urban	0.008	0.005	-0.036**	-0.042***
	(0.007)	(0.006)	(0.014)	(0.013)
gender inequality	-5.822***	-6.090***	-14.919***	-16.255***
	(0.750)	(0.826)	(2.42)	(2.253)
freeze	---	---	0.010***	0.010***
			(0.002)	(0.002)
resort many	---	---	0.022	-0.116
			(0.412)	(0.401)
N	963	963	536	536
Log-likelihood	-7849.600	-7718.706	-2589.818	-2494.177

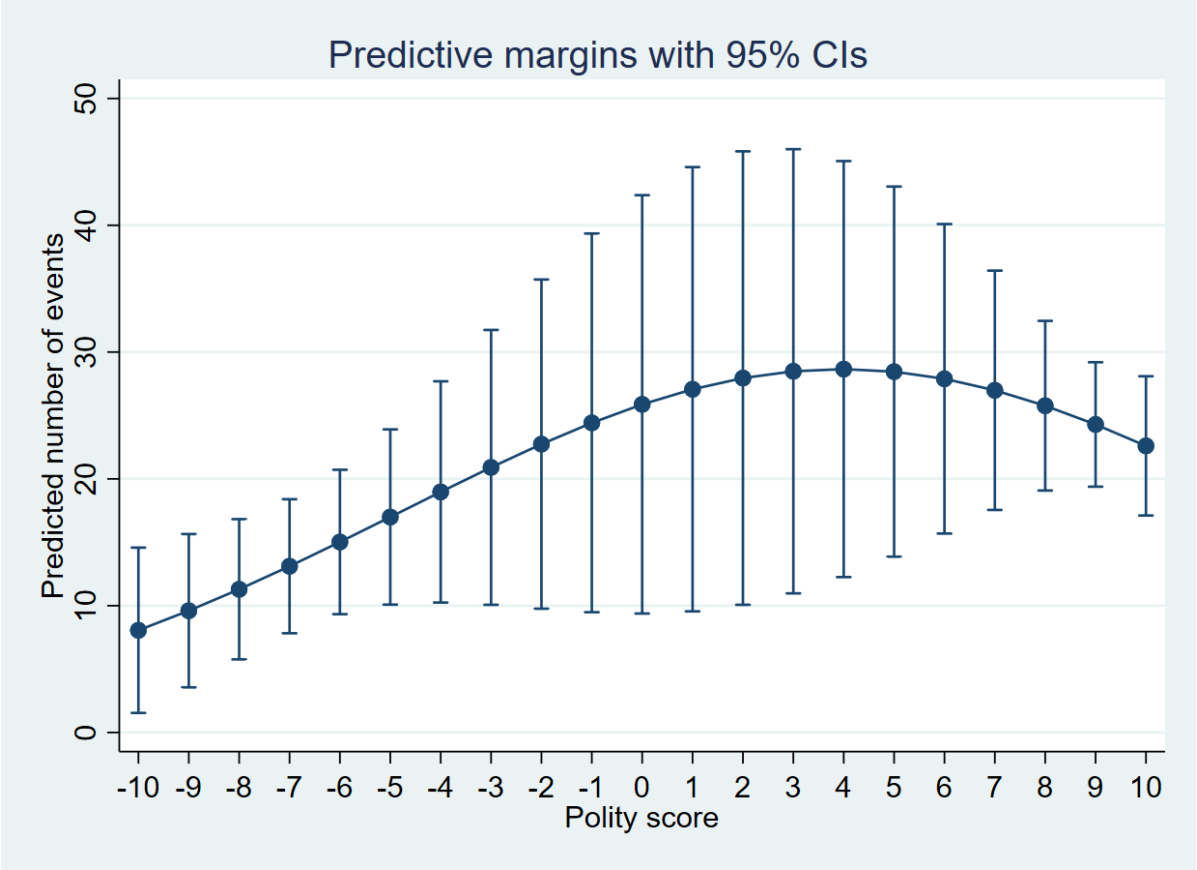
Note. ***$p<0.01$, **$p<0.05$, *$p<0.10$. *Note. gdp/capita* and *population* are log-transformed. The output for the year dummies is suppressed (space limitations). Standard errors are clustered by country using the Huber-White robust standard errors (Huber, 1967; White, 1980).

The Summer Olympics

The model output on the *polity5* variable in Model 1 is positive and significant at the 5%-level. This indicates that (more) democratic nations in the post-Cold War period have established a competitive advantage in the international sporting arms race seen in relation to less democratic countries. As mentioned earlier, we have also run models that included a squared polity variable (Model 2) to understand the dynamics of the *polity5* variable. The effect of the squared polity variable can be seen in Figure 2, which indicates that Russia (which has alternated between the *polity5* values 3, 4, and 6 in the period investigated) influences the results, giving the relationship a more curvilinear form.

Figure 2

Curvilinear effect of polity5 on Summer Olympics



The pool of countries in the Summer Olympics includes several often poorly performing autocracies. Russia is not a pure autocracy (they fall into the category of open anocracy) as they score on the plus side of the *polity5* variable. Russia performs not as well as during the Soviet era but is still highly competitive. Still, it is important to stress that the squared term is not significant and that the highest medal-scoring nations clearly lie in the democracy part (above +5) of the *polity5* variable, indicating that it is Model 1 – i.e., the linear relation – that best captures the relationship between *polity5* and *medal score*.

These results correspond with Forrest et al. (2017) and Noland and Stahler (2017), who saw a decline in the performance of socialist nations after the fall of the Eastern Bloc. However, the findings contradict Lowen et al.'s (2016) null result on the policy variable. It is difficult to say why this is the case, but it is reasonable to assume that adding more Summer

Olympic Games (three new events) to the analysis makes up the difference (1996-2012 versus 1996-2020(21)). As mentioned earlier, because the development in power balances in international sport and regime types is slow, adding more periods to our models can reveal a tip of the balance between democratic and autocratic regimes not possible to detect in studies running a shorter time set of data. Thus, it is a plausible explanation – which is in accordance with our analytical model, where macro-level determinants of sporting success are difficult to change in the short run – that it has taken several years for (more) democratic nations to build their strength fully. Further, elite sport culture in Eastern Bloc nations could have remained and affected results positively for some time before it slowly vaned up until today. Further, adding more controls than in the Lowen et al. (2016) study could be argued to build a more robust model because it is better equipped to single out the relationship between regime type and international sporting success. Finally, using the updated *polity5* variable instead of polity2 (as done in the Lowen et al. (2016) study) could make a difference, as the newest version is better than its predecessor versions.

The strongest indicator in the Summer Olympic Models is *population*, which naturally is positive and significant (Model 1 & Model 2). Further, the Summer Models show that *host* is positive and significant at the 1%-level (Model 1 & Model 2) while having hosted one of the previous two games (*previous2games*) is positive and significant at the 10%-level (Model 1 & Model 2). The variable *gdp/capita* is not significant in either Model 1 or Model 2. Hosting the *next* Olympic Games is not significant either. Being a neighbouring country and the variable *urban* are not significant, and *military spending* is positive but barely significant at the 10%-level. The variable *gender inequality* is negative and significant (the second strongest indicator in this model) in Model 1 & Model 2.

These results correspond with existing research presented earlier (e.g. Bernard & Busse, 2004; Leeds & Leeds, 2012; Lowen et al., 2016) and our analytical model. One minor exemption is the insignificant results on *gdp/capita* that are significant in most existing

studies (e.g. W. Andreff, 2013; Scelles et al., 2020), with Rewilak (2021) being the exception that fits our estimations. Also, the insignificant result on *military spending* is inconsistent with our expectations (e.g. W. Andreff, 2021; Storm & Nielsen, 2022).

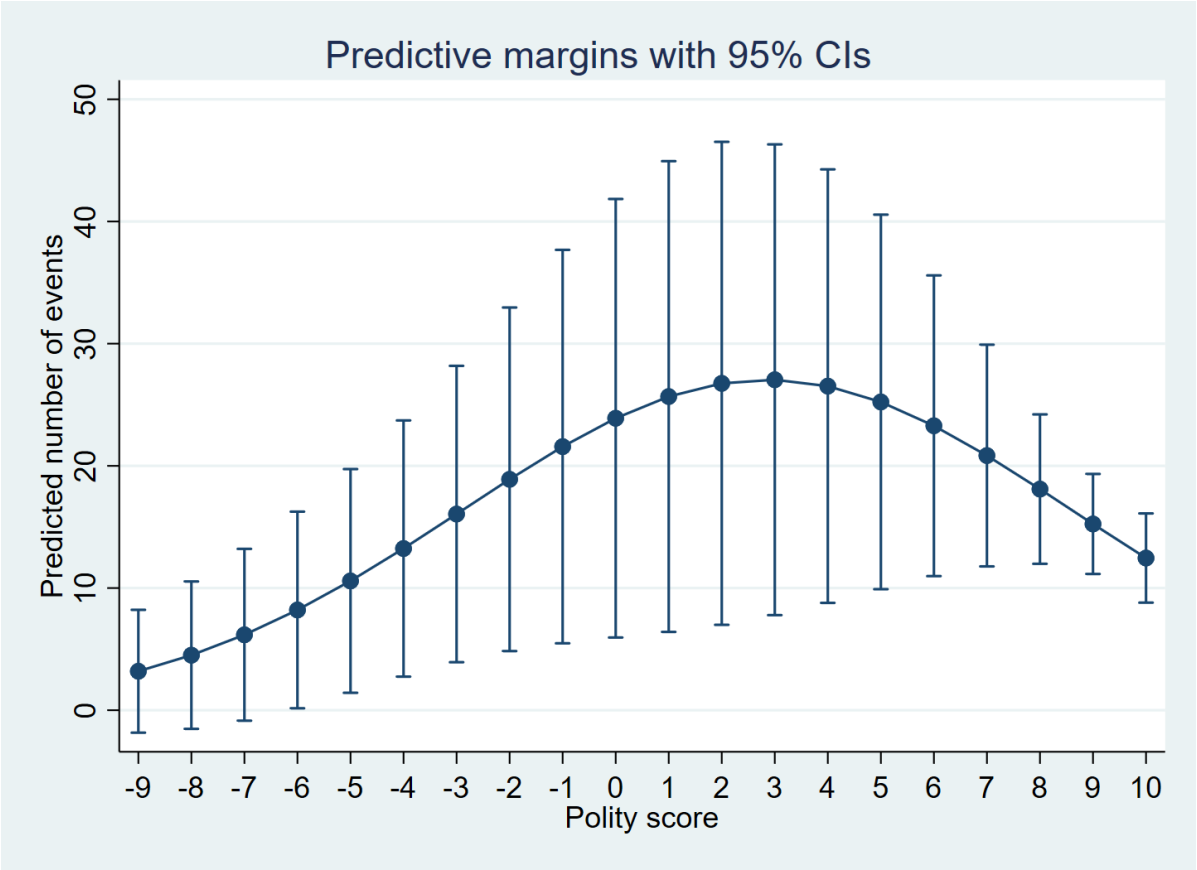
However, looking deeper into our model configurations, it appears that the effect of *gdp/capita* is captured by a couple of other variables, *urban* (urbanized nations are usually wealthier) and *gender inequality* (more gender-equal nations are usually wealthier), as *gdp/capita* becomes significant when these variables are removed from the regression. Regarding *military spending,* the results indicate that the military sector plays a more marginal role in supporting national elite sport systems than expected. The results found concerning gender are interesting because they can add some explanation to why more democratic nations are more competitive today. As mentioned earlier, Eastern Bloc autocracies promoted women's equality with men (Riordan, 2007). However, today such regime types appear less balanced in this regard. This can likely affect the possibility of women succeeding in elite sports negatively in these regime types and – as an effect of this – overall performance (total *medal score*) at the Olympic Games.

The Winter Olympics

In the models for the Winter Olympics, we see that the linear effect of *polity5* on *medal count* is positive but not significant. However, the curvilinear effect (Model 4 and Figure 2) is significant. This means that the mean medal score is expected to be highest when the *polity5* value equals 2.86 before it decreases. This can be seen in Figure 3.

Figure 3

Curvilinear effect of polity5 on the Winter Olympics



There are two immediate explanations for this inverted U-shaped relationship. First, as was the case in the Summer Games, Russia is very successful in the Winter Olympics. Also, China (-7) and Belarus (-7) have been high medal scorers. Further, we must consider that the pool of countries participating differs from that of the Summer Olympics. The share of democratic countries (including several who perform poorly in the Winter Olympics, e.g. New Zealand, Denmark, and Portugal) is larger. As such, Russia exerts more significant influence here (there are also few other countries in the open anocracy category), making the relationship curvilinear. There are, of course, democracies performing well, such as Norway, Germany, and the United States. The curvilinear form of the relationship indicates that it is open anocracies – with the notable exception of highly successful Norway (also highly democratic (+10)) – that dominate the Winter Olympics.

Unlike the Summer Models, the variable *gdp/capita* is positive and significant at the 1%-level (Model 3 & Model 4). These results correspond with existing research (e.g. De Bosscher et al., 2015) and our analytical model, indicating that wealthier nations are better equipped to do winter sports because winter disciplines demand expensive facilities and equipment. This factor could also be an additional explanation for the difference in results on this variable between Winter and Summer Models because the Summer Olympics include more 'low-cost' sports.

The strongest variable in the Winter Models is *gender inequality*, which is negative and statistically significant at the 1%-level – a finding also consistent with our expectations and existing literature (e.g. Lowen et al., 2016). Both *population* and *freeze* are positive and significant in Model 3 and Model 4, while *urban* is negative and significant in both models – all results are in accordance with our analytical model and existing literature (e.g. W. Andreff, 2013; De Bosscher et al., 2006).

However, being neighbouring is not significant, contrary to our expectations (e.g. Otamendi & Doncel, 2014). Military spending is only significant in Model 3, which is inconsistent with our expectations as in the Summer Olympic models.

Summing up, the overall impression from our estimations is that the effect of democracy is linear for the Summer Olympics, with democratic nations dominating. At the same time, for the Winter Olympics, it is curvilinear (with an inverted U-shape), with nations operating an open anocracy political regime being the dominant ones here.

Potential Mechanisms Driving the Relationship Between Regime Type and International Sporting Success

The model outputs presented beg the question of why democratic nations are in the lead in the Summer Olympic Games. At the same time, other regime types are more dominant in the Winter Olympic Games. What mechanisms drive these results?

According to Meier and Mutz (2018), less democratic nations have historically been keener on international sporting success – or 'output legitimacy' – because it is believed to improve national pride and be a political regime-type stabilising factor (see also: Houlihan & Green, 2008). Therefore, we would expect another result for the Summer Games while the results for the Winter Games are more consistent.

However, according to De Bosscher et al. (2015), the strive for international sporting success among democratic nations has significantly increased in recent years (see also: De Bosscher & Shibli, 2021). Related to our analytical model, the agency for obtaining international sporting success is founded at the meso-level, where nations can develop elite sports policies – in the form of increased financial funding, development of organisational structures and scientific research related to elite sport, building talent identification and development programs, provision of training facilities, and provision and development of coaches – to improve their chances of getting podium positions at prestigious international tournaments.

As mentioned in the introduction, Western nations have, over recent years, been more systematic in building national support systems for their athletes and poured larger amounts of funding and resources in to achieve success (De Bosscher, De Knop, & Bottenburg, 2009; Green & Oakley, 2001). They have also copied and adapted former Eastern Bloc methods and models (Dennis & Grix, 2012). Further, Democracies often emphasise widespread participation in sports at all levels, from grassroots to elite. For example, this is the case in all Nordic countries (Andersen & Ronglan, 2012) resulting in larger talent pools. Combined with systematic elite sports support and policies, overall increases in performance appear to be the result, as witnessed by our estimations.

Conclusion, Implications and Future Research

Summary

This paper has aimed to understand whether democratic nations have increased their competitiveness in the international sporting arms race following the post-Cold War period, where the dominance of Eastern European countries waned due to the collapse of the socialist Eastern Bloc. By including a detailed measure of autocracy/democracy, controlling for other known determinants of international sporting success, and adding new variables, we expand on existing research finding that international sporting success is related positively to democratic characteristics, with the national *medal score* becoming stronger in parallel with higher levels of *polity5* and that high medal scoring nations are gaining the highest scores. In this sense, international elite sport seems to have become the arsenal of democracy. The findings are strongest concerning the Summer Olympic Games, while they are more complex and have an (inverted) U-shaped form for the Winter Olympics. Still, democratic characteristics are part of the political regime types among some of the dominating Winter Olympic nations (e.g. Norway).

Implications

Our results add to existing research by underscoring that political regime type matters in relation to international sporting success. International elite sport is a peaceful but important medium for global interaction among nations, expressing the nation's broader capabilities in the international power hierarchy (Dennis & Grix, 2012). This study takes this as its starting point while also confirming that politics and sport are closely connected and that sport is used as a political means to gain a position that can potentially be exploited for other purposes (Rhamey & Early, 2013).

While the power balance appears to have been shifted towards democratic nations in the Summer Olympics, sports managers, stakeholders and politicians need to take into consideration that with increasing international tensions between less democratic countries and democratic ones – following growing tensions between China and the US, and the military conflict in Ukraine – it is likely that a pre-Cold War-like rivalling between democracies and autocracies could be re-activated with an intensifying sporting arms race as a result. Going deeper into our results reveals a tendency where less democratic nations now improve their medals shares, indicating that the post-Cold War dominance of democratic nations is challenged in the Summer Olympics. China, especially, has gained competitiveness in recent years, challenging democratic regime-type dominance. In the Winter Olympics, no clear trend is present.

Whether (more) democratic nations can counter this and maintain their post-Cold War sporting arsenal of success in the Summer Olympics remains to be seen. However, the power balance can be affected by politicians, sport managers and stakeholders responsible for supporting or providing funding for developing elite sport talent.

In addition, how the relationship will develop in relation to the Winter Olympic Games all depends – as is the case with the Summer Games – on the resources poured into national elite sport systems. As pointed out by De Bosscher et al. (2019), because "… the rules of the game are dictated by what rival nations are doing, (and/ed.) not on the basis of what an individual nation is doing now compared with what it did in the past" (p. 238), nations must decide to what extent they want to be part of the international sporting arms race – i.e. how many resources they will allocate to keep up their sporting competitiveness. This leads us to the paper's final section.

Limitations and Future Research

This paper has some limitations that point toward future research. The most important caveat of our paper is the missing data on direct national-level – i.e., the meso-level spending in our analytical model in Figure 1 – elite sports investments. This is a general problem common to all studies in the field. What seems clear from contemporary research is that it is not only the general wealth of a nation, as expressed through our macro-level gdp/cap variable, that is important for international sporting success. It might rather be the direct input to the elite sport system – i.e. how big a share of GDP a nation uses – that determines how successful a country will be in the international sporting arms race (De Bosscher et al., 2015).

However, no systematic information for such meso-level direct investments is available from any source. So far, only a few studies have aimed to understand the relationship between overall public investments in recreation and (grassroots) sport and international sporting success (e.g. W. Andreff, 2010; Blais-Morisset et al., 2017; Forrest et al., 2010). While this is highly valuable, the existing studies are limited in terms of included nations and precision in relation to the elite sport-specific investments in the respective nations. It would be interesting for future studies to compile better data for a larger set of nations on elite sport-specific investments to improve the model estimations deployed in this paper.

Looking into issues related to disciplines specifically would also be relevant. I.e., are there differences across political regime types in how they value different sports disciplines? Disaggregating the data on disciplines could give new insights into this. Further, testing our models with medal scores *and* secondary positions outside the medal table as a dependent variable (for example, by deploying top-8 points as done by Storm & Nielsen (2022)) would not only be interesting. It would – also – be beneficial to see if our model output is robust to other performance measures.

Finally, it is essential to keep modelling determinants of the Olympic Games with relevant regression designs. This study has only used the available data for a limited time

after the collapse of the Eastern Bloc socialist system. However, future studies should test the relationship between democracy and sporting success to see if democratic nations can keep pace in the coming years in the Summer Olympic Games. The same tests should be done in relation to the Winter Olympic Games to see how the relationship between measures of democracy and international sporting success develops for the Winter Olympics in the future. Additionally, using other indicators of democracy/autocracy would help test the robustness of our findings.

Future studies should also investigate more closely the mechanisms driving the success of different political regime types. This study has only scratched the surface in this regard. However, closer examinations could help understand the motivations and political will behind the strive for international competitiveness in autocratic as well as democratic nations.

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References

Alekseyeva, A. (2014). Sochi 2014 and the rhetoric of a new Russia: Image construction through mega-events. *East European Politics*, *30*(2), 158–174. https://doi.org/10.1080/21599165.2013.877710

Andersen, S. S., & Ronglan, L. T. (2012). Same ambitions–different tracks: a comparative perspective on Nordic elite sport. *Managing Leisure*, *17*, 155–169. https://doi.org/http://dx.doi.org/10.1080/13606719.2012.674392

Andreff, M., Andreff, W., & Poupaux, S. (2008). Les déterminants économiques de la performance olympiques : prévision des médailles qui seront gagnées aux Jeux de Pékin. *Revue d'économie Politique*, *Vol. 118*(2), 135–169. https://doi.org/10.3917/redp.182.0135

Andreff, W. (2010). *Public and Private Sport Financing in Europe: The impact of Financial Crisis*. https://www.researchgate.net/publication/289127093_Public_and_private_sport_financing_in_Europe_the_impact_of_financial_crisis

Andreff, W. (2013). Economic development as major determinant of Olympic medal wins: Predicting performances of Russian and Chinese teams at Sochi Games. *International Journal of Economic Policy in Emerging Economies*, *6*(4), 314–340. https://doi.org/10.1504/IJEPEE.2013.057908

Andreff, W. (2021). The Economic Determinants of the Olympic Performance in Communist and Post-Communist Countries. In W. Andreff (Ed.), *Comparative Economic Studies in Europe: A Thirty Year Review* (pp. 377–412). Palgrave Macmillan. https://doi.org/10.1007/978-3-030-48295-4_18

Baime, A. J. (2014). *The Arsenal of Democracy. FDR, Detroit, and an Epic Quest to Arm*. First Mariner Books.

Berend, I. T. (2001). The "Crisis Zone" Revisited: Central and Eastern Europe in the 1990s. *East European Politics and Societies: And Cultures*, *15*(2), 250–268. https://doi.org/10.1177/0888325401015002003

Bernard, A. B., & Busse, M. R. (2004). Who wins the Olympic games: Economic resources and medal totals. *Review of Economics and Statistics*, *86*(1), 413–417. https://doi.org/10.1162/003465304774201824

Blais-Morisset, P., Boucher, V., & Fortin, B. (2017). L'impact des dépenses publiques consacrées au sport sur les médailles olympiques [The Impact of Public Spending

Dedicated to Sport on Olympic Medals]. *Revue Économique*, *Vol. 68*(4), 623–642. https://doi.org/10.3917/reco.684.0623

Celik, O. B., & Gius, M. (2014). Estimating the Determinants of Employee Performance. *International Journal of Applied Economics*, *11*(1), 39–47. https://doi.org/10.2307/145468

Cha, V. D. (2009). A Theory of Sport and Politics. *The International Journal of the History of Sport*, *26*(11), 1581–1610. https://doi.org/10.1080/09523360903132972

Condon, E. M., Golden, B. L., & Wasil, E. A. (1999). Predicting the success of nations at the Summer Olympics using neural networks. *Computers & Operations Research*, *26*(13), 1243–1265. https://doi.org/10.1016/S0305-0548(99)00003-9

D'Agati, D. (2013). *The Cold War and the 1984 Olympic Games: A Soviet-American Surrogate War*. Palgrave Macmillan.

De Bosscher, V., De Knop, P., & Bottenburg, M. V. (2009). An analysis of homogeneity and heterogeneity of elite sports systems in six nations. *International Journal of Sports Marketing and Sponsorship*, *January*, 111–132.

De Bosscher, V., De Knop, P., Bottenburg, M. V., Shibli, S., & Bingham, J. (2009). Explaining International Sporting Success: An International Comparison of Elite Sport Systems and Policies in Six Countries. *Sport Management Review*, *12*, 113–136. https://doi.org/10.1016/j.smr.2009.01.001

De Bosscher, V., De Knop, P., Van Bottenburg, M., & Shibli, S. (2006). A Conceptual Framework for Analysing Sports Policy Factors Leading to International Sporting Success. *European Sport Management Quarterly*, *6*(2), 185–215. https://doi.org/10.1080/16184740600955087

De Bosscher, V., & Shibli, S. (2021). *Tokyo 2020: Evaluation of the Elite Sport Expenditures and Success in 14 Nations*. https://spliss.research.vub.be/sites/default/files/atoms/files/Tokyo 2020 Evaluation.pdf

De Bosscher, V., Shibli, S., van Bottenburg, M., De Knop, P., & Truyens, J. (2010). Developing a method for comparing the elite sport systems and policies of nations: a mixed research methods approach. *Journal of Sport Management*, *24*(5), 567–600. https://doi.org/10.1123/jsm.24.5.567

De Bosscher, V., Shibli, S., & Weber, A. Ch. (2019). Is prioritisation of funding in elite sport effective? An analysis of the investment strategies in 16 countries. *European Sport Management Quarterly*, *19*(2), 221–243. https://doi.org/10.1080/16184742.2018.1505926

De Bosscher, V., Shibli, S., Westerbeek, H., & Van Bottenburg, M. (2015). *Successful Elite Sport Policies: An International Comparison of the Sports Policy Factors Leading to International Sporting Success (SPLISS 2.0) in 15 Nations*. Meyer and Meyer Sports.

Dennis, M., & Grix, J. (2012). *Sport Under Communism: Behind the East German "Miracle."* Palgrave Macmillan.

Ferrari, S. L. P., & Cribari-Neto, F. (2004). Beta regression for modelling rates and proportions. *Journal of Applied Statistics*, *31*(7), 799–815. https://doi.org/10.1080/0266476042000214501

Forrest, D., McHale, I. G., Sanz, I., & Tena, J. D. (2017). An analysis of country medal shares in individual sports at the Olympics. *European Sport Management Quarterly*, *17*(2), 117–131. https://doi.org/10.1080/16184742.2016.1248463

Forrest, D., Sanz, I., & Tena, J. D. (2010). Forecasting national team medal totals at the Summer Olympic Games. *International Journal of Forecasting*, *26*(3), 576–588. https://doi.org/10.1016/j.ijforecast.2009.12.007

Freeman, K. (2012). Sport as swaggering: Utilizing sport as soft power. *Sport in Society*, *15*(9), 1260–1274. https://doi.org/10.1080/17430437.2012.690403

Frick, B., & Wicker, P. (2016). The trickle-down effect: How elite sporting success affects amateur participation in German football. *Applied Economics Letters*, *23*(4), 259–263. https://doi.org/10.1080/13504851.2015.1068916

Gorokhov, V. A. (2015). Forward Russia! Sports mega-events as a venue for building national identity. *Nationalities Papers*, *43*(2), 267–282. https://doi.org/10.1080/00905992.2014.998043

Green, M., & Oakley, B. (2001). Elite Sport Development Systems and Playing to Win: Uniformity and Diversity in International Approaches. *Leisure Studies*, *20*, 247–267. https://doi.org/10.1080/02614360110103598

Grimes, A. R., Kelly, W. J., & Rubin, P. H. (1974). A Socioeconomic Model of National Olympic Performance. *Social Science Quaterly*, *55*(3).

Grix, J. (2013). Sport Politics and the Olympics. *Political Studies Review*, *11*(1), 15–25. https://doi.org/10.1111/1478-9302.12001

Grix, J., Bason, T., Grix, L., & Jeong, J. B. (2024). An overview and analysis of sports mega-events as part of state soft power strategies. In H. A. Solberg, R. K. Storm, & K. Swart (Eds.), *Research Handbook on Major Sporting Events* (pp. 449–460). Edward Elgar Publishing. https://doi.org/10.4337/9781800885653.00009

Grix, J., Brannagan, P. M., & Houlihan, B. (2015). Interrogating States' Soft Power Strategies: A Case Study of Sports Mega-Events in Brazil and the UK. *Global Society*, *29*(3), 463–479. https://doi.org/10.1080/13600826.2015.1047743

Grix, J., Brannagan, P. M., & Lee, D. (2019). *Entering the Global Arena*. Springer Singapore. https://doi.org/10.1007/978-981-13-7952-9

Grix, J., & Lee, D. (2013). Soft power, sports mega-events and emerging states: The Lure of the politics of attraction. *Global Society*, *27*(4), 521–536. https://doi.org/10.1080/13600826.2013.827632

Haut, J., Grix, J., Brannagan, P. M., & Hilvoorde, I. van. (2017). International prestige through 'sporting success': an evaluation of the evidence. *European Journal for Sport and Society*, *14*(4), 311–326. https://doi.org/10.1080/16138171.2017.1421502

Hoberman, J. M. (1977). Sport and Political Ideology. *Journal of Sport and Social Issues*, *1*(2), 80–114. https://doi.org/10.1177/019372357700100204

Hoffmann, R., Chew Ging, L., Matheson, V., & Ramasamy, B. (2006). International women's football and gender inequality. *Applied Economics Letters*, *13*(15), 999–1001. https://doi.org/10.1080/13504850500425774

Högström, J. (2013). Does the Choice of Democracy Measure Matter? Comparisons between the Two Leading Democracy Indices, Freedom House and Polity IV on JSTOR. *Government and Opposition*, *48*, 201–221. https://www.jstor.org/stable/26347393

Houlihan, B., & Green, M. (2008). *Comparative Elite Sport Development. Systems, Structures and Public Policy*. Butterworth-Heinemann.

Jedlicka, S. R., Harris, S., & Reiche, D. (2020). State intervention in sport: a comparative analysis of regime types. *International Journal of Sport Policy and Politics*, *12*(4), 563–581. https://doi.org/10.1080/19406940.2020.1832134

Kramareva, N., & Grix, J. (2019). 'War and Peace' at the 1980 Moscow and 2014 Sochi Olympics: The Role of Hard and Soft Power in Russian Identity. *Https://Doi.Org/10.1080/09523367.2019.1610400*, *35*(14), 1407–1427. https://doi.org/10.1080/09523367.2019.1610400

Leeds, E. M., & Leeds, M. A. (2012). Gold, silver, and bronze: Determining national success in men's and women's summer olympic events. *Jahrbucher Fur Nationalokonomie Und Statistik*, *232*(3), 279–292. https://doi.org/10.1515/jbnst-2012-0307

Levine, N. (1972). Why do Countris win Olympic Medals? Some Correlates of Olympic Games Success. *Sociology and Social Research*, *58*(2), 353–360.

Liu, D. (2020). Signaling soft power through medal success: China as an example. *Sport in Society*, *23*(11), 1827–1840. https://doi.org/10.1080/17430437.2020.1804109

Long, J. S. (1997). *Regression Models for Categorical and Limited Dependent Variables*. Sage.

Lowen, A., Deaner, R. O., & Schmitt, E. (2016). Guys and Gals Going for Gold: The Role of Women's Empowerment in Olympic Success. *Journal of Sports Economics*, *17*(3), 260–285. https://doi.org/10.1177/1527002514531791

Marshall, M. G., & Gurr, T. R. (2020). POLITY5: Political Regime Characteristics and Transitions, 1800-2018. Dataset Users' Manual. In *Center for Systemic Peace*. Center for Systematic Peace. http://www.systemicpeace.org/inscr/p5manualv2018.pdf

Mehmetoglu, M., & Jakobsen, T. G. (2017). *Applied Statistics Using Stata: A Guide for the Social Sciences*. Sage Publications.

Meier, H. E., & Mutz, M. (2018). Political regimes and sport-related national pride: a cross-national analysis. *International Journal of Sport Policy and Politics*, *10*(3), 525–548. https://doi.org/10.1080/19406940.2018.1447498

Nielsen, K., & Storm, R. K. (2014). En ny dansk guldalder? Danmarks resultater i den skærpede konkurrence om medaljer [The Success of Danish Elite Sport]. In S. Willeberg & K. Schäfer (Eds.), *1984 - Team Danmark - 2014: Jubilæumsskrift i anledning af Team Danmarks 30 år* (pp. 64–83). Team Danmark.

Noland, M., & Stahler, K. (2017). An Old Boys Club No More: Pluralism in Participation and Performance at the Olympic Games. *Journal of Sports Economics*, *18*(5), 506–536. https://doi.org/10.1177/1527002515588138

Otamendi, J., & Doncel, L. M. (2014). Medal Shares in Winter Olympic Games by Sport: Socioeconomic Analysis After Vancouver 2010. *Social Science Quarterly*, *95*(2), 598–614. https://doi.org/10.1111/ssqu.12055

Pettigrew, S., & Reiche, D. (2016). Hosting the Olympic Games: an Overstated Advantage in Sports History. *International Journal of the History of Sport*, *33*(6–7), 635–647. https://doi.org/10.1080/09523367.2015.1132201

Rewilak, J. (2021). The (non) determinants of Olympic success. *Journal of Sports Economics*, *22*(5), 546–570. https://doi.org/10.1177/1527002521992833

Rhamey, J. P., & Early, B. R. (2013). Going for the gold: Status-seeking behavior and Olympic performance. *International Area Studies Review*, *16*(3), 244–261. https://doi.org/10.1177/2233865913499563

Rhode, P. W., Snyder, J. M., & Strumpf, K. (2018). The arsenal of democracy: Production and politics during WWII. *Journal of Public Economics*, *166*, 145–161. https://doi.org/10.1016/j.jpubeco.2018.08.010

Riordan, J. (2007). The Impact of Communism on Sport. *Historical Social Research*, *32*(1), 110–115. https://doi.org/10.12759/HSR.32.2007.1.110-115

Santos Silva, J. M. C., & Tenreyro, S. (2011). Further simulation evidence on the performance of the Poisson pseudo-maximum likelihood estimator. *Economics Letters*, *112*(2), 220–222. https://doi.org/10.1016/J.ECONLET.2011.05.008

Scelles, N., & Andreff, W. (2019). Determinants of national men's football team performance: A focus on goal difference between teams. *International Journal of Sport Management and Marketing*, *19*(5–6), 407–424. https://doi.org/10.1504/IJSMM.2019.104168

Scelles, N., Andreff, W., Bonnal, L., Andreff, M., & Favard, P. (2020). Forecasting National Medal Totals at the Summer Olympic Games Reconsidered. *Social Science Quarterly*, *101*(2), 697–711. https://doi.org/10.1111/ssqu.12782

Seippel, Ø., Dalen, H. B., Sandvik, M. R., & Solstad, G. M. (2018). From political sports to sports politics: on political mobilization of sports issues. *International Journal of Sport Policy and Politics*, *10*(4), 669–686. https://doi.org/10.1080/19406940.2018.1501404

Singleton, C., Reade, J., Rewilak, J., & Schreyer, D. (2023). How big is home advantage at the Olympic Games? In H. A. Solberg, R. K. Storm, & K. Swart (Eds.), *Research Handbook on Major Sporting Events*. Edward Elgar Publishing. https://doi.org/10.2139/SSRN.3888639

Storm, R. K., & Nielsen, K. (2022). *ELITE SPORTS IN FINLAND: External international evaluation*. https://www.idan.dk/media/cpnbe0n0/report-on-finnish-elite-sport-2022.pdf

Storm, R. K., Nielsen, K., & Thomsen, F. (2016). Can a small nation be competitive in the global sporting arms race? The case of Denmark. *Managing Sport and Leisure*, *21*(4), 181–202. https://doi.org/10.1080/23750472.2016.1243993

Trivedi, P. K., & Zimmer, D. M. (2014). Success at the summer olympics: How much do economic factors explain? *Econometrics*, *2*(4), 169–202. https://doi.org/10.3390/econometrics2040169

Vaccaro, A. (2021). Comparing measures of democracy: statistical properties, convergence, and interchangeability. *European Political Science*, *20*(4), 666–684. https://doi.org/10.1057/S41304-021-00328-8/FIGURES/3

Vagenas, G., & Vlachokyriakou, E. (2012). Olympic medals and demo-economic factors: Novel predictors, the ex-host effect, the exact role of team size, and the "population-GDP" model revisited. *Sport Management Review*, *15*(2), 211–217. https://doi.org/10.1016/j.smr.2011.07.001

Valenti, M., Scelles, N., & Morrow, S. (2020). Elite sport policies and international sporting success: a panel data analysis of European women's national football team performance. *European Sport Management Quarterly*, *20*(3), 300–320. https://doi.org/10.1080/16184742.2019.1606264

Washbrun, J. N. (1957). Sport as a Soviet Tool. *Foreign Affairs*, *34*(3), 490–499.

Wei, L. (2021). Evaluating the performance of political systems - A critique of extant assessment and a search for alternatives. *Journal of US-China Public Administration*,

2(152). https://www.researchgate.net/publication/350192338_Evaluating_the_performance_of_political_systems-A_critique_of_extant_assessment_and_a_search_for_alternatives

Wicker, P., Breuer, C., & von Hanau, T. (2012). Is it profitable to represent the country? Evidence on the sport-related income of funded top-level athletes in Germany. *Managing Leisure*, *17*(2–3), 221–238. https://doi.org/10.1080/13606719.2012.674396

Supplemental Materials

Table S1

Variable description and data sources

Variables	***Description***
medal score	Official Olympic Medal Counts (weighted)
polity5	composite score (going from -10 to +10; i.e. from authoritarian to highly democratic)
polity squared	Calculated from Polity5
gdp/capita	Log (National GDP) (PPP)
population	Log (National Population)
host	Dummy for being the host nation at the current Olympics
next	Dummy for being the host nation at the next Olympic Games
previous2games	Dummy for being host nation at one of the previous two Olympic Games
neighbour	Dummy for being neighbour to the host nation
military spending	Military spending as a percentage of GDP
urban	Urban population in per cent of the national population
gender inequality	Gender Inequality Index

freeze	Number of days per year with negative degrees (Measured in Celsius)
resort many	Countries with 60+ ski-resorts (downhill/freestyle etc.)