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WHO WINS OLYMPIC BIDS?



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Who wins Olympic bids?

Abstract: The prospect of hosting the Olympic Games is attractive to many cities around the world. This article examines 147 variables' potential to discriminate successful from unsuccessful Olympic bids. Our stepwise, rank-ordered logistic regression model includes nine determinants supporting the contention that economic, political and sports/Olympic factors are important. Hosts are characterized by larger markets and higher medium-term growth economies. Olympic bids that follow a political liberalization are rewarded with additional votes. Moreover, cities offering winning bids are more experienced at hosting and have no dispute with the International Olympic Committee (IOC). IOC members disfavor bids lacking a sufficient number of existing stadiums and bidding cities of fewer than 2.5 million inhabitants. Finally, we observe "it is the country's turn" election behavior – countries that have not hosted the Olympics for a long period are favored.

Keywords: Olympic Summer Games, mega events, indicators, host election, bidding process, IOC

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1 Introduction

With 'in-person attendance in the millions and a television audience in the billions', hosting the Olympic Games provides an attractive opportunity for cities worldwide (Barclay 2009; Barget, Gouquet 2007). The International Olympic Committee (IOC), in the role of the event owner, selects the host in a secret, exhaustive ballot seven years prior to the Olympics. Assuming rationality, the IOC intends to select the best host to strengthen the Olympic brand, increase revenues, and secure its monopoly position (Humphreys, van Egteren 2012).

Based on a poll concerning the decisive characteristics of bids for hallmark sporting events among 135 sport decision makers, Westerbeek et al. (2002) isolate eight clusters, which they call "ability to organize the event", "political support", "infrastructure", "existing facilities", "communication and exposure", "accountability", "bid team composition", and "relationship marketing". In another survey study concentrated on the host selection for the 2002 Olympic Winter Games, Persson (2002) highlights the importance of compatibility between the views of the IOC and those of the bid cities. Her analysis yields 17 determinants, including the Olympic village, transportation, sports/arenas, and finances.

Applying multivariate regression techniques on data from official statistical sources and bid books, Feddersen et al. (2008) and Poast (2007) empirically analyze the

determinants of host elections. The authors of the first article studied the impact of 20 variables on the selection of the Summer Olympic hosts from 1992 to 2012.¹ Their panel logit model with fixed effects contained three significant variables: *average distance between Olympic village and sports venues*, *temperature in °C* and *accommodation capacity in the bidding city*, measured by the number of *beds*. Poast (2007) analyzed 11 variables in a rank-ordered logit model for the Summer Olympic Games from 1964 until 2012. He suggested that the IOC prefers countries with growing economies, as demonstrated by the three significant variables *1-year*, *5-year*, and *10-year real GDP per capita growth*.

Tab. 1 Comparison of analysis models from Feddersen et al. (2008) and Poast (2007)

	Feddersen et al. (2008): Panel logit model with fixed effects ²		Poast (2007): Rank-ordered conditional logit model ³		Combined: fixed effects	Combined: rank- ordered
	1992-2012	1992-2020	1964-2012	1992-2020	1992-2020	1992-2020
Main Effects						
Distance Olympic village – venues [km]	-0.497**	-0.103			-0.100	-0.071
Temp [°C]	0.534*	0.105			0.113	-0.001
Beds [1,000]	0.032*	0.011*			0.013*	0.011***
1-Year real GDP per capita growth [%]			-0.231*	-0.003	0.036	-0.001
5-Year real GDP per capita growth [%]			0.691**	0.030	-0.011	0.035
10-Year real GDP per capita growth [%]			-0.204**	-0.084	0.052	-0.028
Number of Olympic Games	6	8	14	8	8	8
Bids included	47	59	52	59	59	59
McFadden R ²	0.364	0.144	-	-	-	-
Area under the ROC curve	0.886	0.762	-	0.583	0.789	0.730
Correctly classified (Hosts)	4 of 6 (66.7%)	5 of 8 (62.5%)	-	1 of 8 (12.5%)	3 of 8 (37.5%)	3 of 8 (37.5%)

Notes: *** p < 0.01; ** p < 0.05; * p < 0.10.

¹ In another empirical study, which focused on the Olympic Winter Games from 1992-2018, Feddersen, Maennig (2012) found that the following factors significantly influence for the IOC's decisions: altitude, precipitation, snow, existing venues, city population, inflation, corruption, accommodation capacity, and distances between the sporting venues and the Olympic villages and to the nearest international airport.

² Feddersen et al. (2008) presented a discrimination of 50% (3 of 6) for their model (1992-2012) based on a cutpoint of 0.5. In contrast, this article classifies bids as hosts if the corresponding probability is the highest among bids for the same Olympics.

³ In discussing the model of Poast (2007), we refer to his model for Summer Olympic bids from 1959 to 2005 for the Olympics from 1964 to 2012 without political proximity. While this model is the most comparable to our analysis, it includes all tested variables, although only the real GDP growth rates are significant.

Refitting the original models of Feddersen et al. (2008) and Poast (2007) to the period from 1992 until 2020 results in the models having a lack of discrimination power between host cities and non-elected cities. It is of particular concern that nearly all of the variables lose their significance when applied to this period. Only the *beds* variable remains significant in the fixed effects model and the combined models.

This contribution builds on Feddersen et al. (2008) and Poast (2007) but analyzes a longer and more recent period. Most important, it considers a larger number of potential determinants (147) to better identify indicators that discriminate Olympic hosts from unsuccessful bids.

The remainder of this article is structured as follows: Section two presents the data that potentially influence the IOC's decisions. Section three describes the methodological approach. Section four reviews the results, and section five concludes.

2 Data

This study focuses on the eight host city elections for the Summer Olympics from 1992 to 2020. In this period, 39 cities from 27 countries submitted bids.⁴ Including double and triple attempts, the IOC received 59 applications, i.e., cases in our analysis, on average 7.4 per Olympic Games.

Our selection of potential determinants rests on three pillars: First, we use all determinants discussed in academic studies to the extent that they are available from official statistical sources, cited studies and publications that, occasionally as a side-effect, elaborate on potential determinants of the selection process. Second, we employ determinants cited in studies and official IOC reports edited by the IOC Candidature Acceptance Working Group and the IOC Evaluation Commission. Third, we do not restrict ourselves to static figures; rather, we analyze the dynamic evolution of each of the variables on a short-term (1-year), medium-term (5-year), and long-term

⁴ The IOC restructured the host selection procedure for the 2008 Olympics by introducing two phases. This article considers all applications to be Olympic bids, even if they fail to progress from the application phase to the candidature phase.

(10-year) basis.⁵ Table 2 summarizes the mean, median, and coefficient of variation of the 147 explanatory variables for failed and successful Olympic bids (= hosts). Data sources are tabulated in the appendix.

In the following discussion, we structure these variables into six complementary groups, namely economic, socio-political, tourism, infrastructure, Olympics and sports, and bid concept.⁶

Economic determinants

Hosting the Olympic Games places a significant burden on most public budgets, even without additional infrastructure investments (Swart, Bob 2004). One would therefore expect countries with larger *gross domestic products* (GDP) and *GDP per capita* to receive hosting rights (Poast 2007). In addition, the IOC might prefer growing and stable economies, as reflected in superior *growth rates of GDP* and *GDP per capita* and *low rates of inflation* and *unemployment*.

Rose, Spiegel (2011) argue that an Olympic bid might act as a signal that a national government has pursued a deregulation and liberalization policy. They find increased exports and overall trade, not only for event hosts but also for failed bidding nations. Consequently, we analyze whether the IOC members prefer countries with higher or lower *exports*, *exports relative to GDP* and *trade to GDP ratio*, i.e., trade openness (e.g., Dollar, Kraay 2004; Frankel, Romer 1999). As a measure of financial liberalization, the *inflow of foreign direct investment (FDI)* is included (Borensztein et al. 1998; Chakrabarti 2001; Neary 2009). We also include dichotomous variables for the *membership in the GATT/WTO*, the *IMF*, and the *OECD*.

The IOC may be concerned with its ability to generate current and, particularly, future revenues (Baade, Sanderson 2012). If this is the case, the bid's market size, defined as *country population* or *urban population*, might determine the next host. In addition, the IOC appears to value prestigious bid cities with global attractiveness and

⁵ IOC members might also consider the country's future development. While their expectations are obviously not available, we assume that past development serves as a reliable indicator for the future.

⁶ We therefore loosely follow the approach of Poast (2007), who used economic, American corporate dependence, European identity, corruption, presidential preference, and distributive explanations.

encourages competition among them (Shoval 2002). We include the *population of the bid city* and two dichotomous variables that indicate whether the bid city is the *country's largest city* and its *capital*.

Social, political and ecological determinants

If the bid country's population suffers from social issues, the bid and subsequent hosting might be regarded as a matter of 'misplaced priorities' as was the case for the Toronto 2000 bid (Hiller 2000) and Brazil's hosting of the FIFA World Cup in 2014 (Aragão, Maennig 2013). By contrast, Jakobsen et al. (2013) contend that smaller or less developed countries generate more noticeable effects by hosting a major sporting event. To assess both arguments, the *human development index (HDI)* of the United Nations Development Programme, *life expectancy*, the *infant mortality rate* and the *mortality rate under 5 years* are considered.⁷

Regarding the political landscape of bid countries, the IOC might prefer countries that promote the ideas of freedom, democracy, civil and political rights, and political and social globalization. Consequently, multiple variables that reflect the political conditions and their development are included in the analysis: freedom status, political rights, civil liberties and democracy score as measured by Freedom House (2014); democracy status developed by Cheibub et al. (2010); a democracy index including political competition and participation developed by Vanhanen (2014); a corruption perceptions index developed by Transparency International (2013), the political terror scale of the US State Department as in Gibney et al. (2013); and an index of globalization including economic, political, and social globalization (Dreher 2006; Dreher et al. 2008).

Finally, the ecological development of the country must be considered, as the IOC reviews the environmental conditions and impact of the Olympic Games. Therefore, *CO₂ emissions per capita and relative to GDP* and the dichotomous variable *ratification of the Kyoto protocol* are included.

⁷ Educational factors such as average years of schooling are not included due to a lack of adequate data.

Tourism, destination image and marketability determinants

Olympic bids are occasionally made to promote tourism and enhance the destination image of the bidding city and country (Barclay 2009; Barget, Gouguet 2007; Getz 2008). The IOC is concerned with a country's tourism infrastructure, explicitly citing the accommodation capacity for the IOC family, media, sponsors, broadcasters, and visitors (International Olympic Committee 2008, 2009). Therefore, we include the *accommodation rooms in the country and in the bid city* as potential determinants of host selection.

In addition, Hiller (2000) states that marketability was key for Cape Town winning the national competition as South Africa's bid city for the 2004 Olympics. Therefore, countries may require a certain degree of marketability, i.e., higher levels of *international tourism arrivals, international tourism receipts total, and receipts relative to exports* to have a realistic chance of winning the IOC election.

Infrastructural determinants

The IOC expects bids to conform to multiple requirements, particularly regarding infrastructure (Humphreys, van Egteren 2012). First, the transportation infrastructure may be strained during the Olympic Games; there are estimates of 1.5 to 2 million additional journeys per day (International Olympic Committee 2008). To control for transport infrastructure, we measure road capacity by *distance of roads*, and aviation infrastructure is included using the number of *airports, plane departures and passengers carried*. Second, a resilient telecommunications infrastructure is required for the Olympics, which receives among the highest media coverage for events worldwide (International Olympic Committee 2008). A *communications infrastructure* index is composed of the telephone lines, mobile cellular subscriptions, fixed broadband internet subscribers, and internet users (all per 100 persons). Third, the construction of sports venues and, particularly, the Olympic stadium is responsible for a significant portion of the costs, which is why we include the number of existing *sport stadia with a capacity exceeding 40,000 persons on national and city level*.

Olympic and sports determinants

The voting decision might also be motivated by geographical diversity resulting in a sort of continental rotation, as two consecutive Summer Olympics have never been held on the same continent (Andranovich et al. 2001; Shoval 2002). Additionally, to determine whether the *last Summer Olympics were hosted in the bid's region*, we consider the *years since the country or region last hosted the Summer Olympics or any Olympics*.⁸ In addition, we determine the *number of years since last hosting the FIFA World Cup*, as this might be implicitly included in considerations of continental rotation.

Second, the IOC may reward persistence; cities have been selected after multiple failed bid attempts. Therefore, the number of *failed bids in the last four host selections* and the *votes a bid received in the previous election* are included in the analysis.⁹ Third, the IOC emphasizes experience in hosting world-class sporting events as a crucial factor for the country's capability to host the Olympics (Westerbeek et al. 2002). Our analysis therefore includes the number of *world championships in Olympic sports organized in the election year and the 10 years prior* at the *city and national level*. In addition, two dichotomous variables are set to one if the city has *ever bid for or hosted the Olympics*.

Fourth, the country's influence within the IOC is characterized by its financial and personal commitment. Of the IOC's revenues, the sale of sponsorships and broadcasting rights accounts for approximately 85% (Baade, Sanderson 2012). Therefore, we add the *sponsorship fees from the country and the region* and the *regional broadcasting fees*. Another variable tests the hypothesis that the *dispute between the IOC and the United States Olympic Committee (USOC)* regarding broadcasting revenues impeded the 2012 New York City and 2016 Chicago bids (Baade, Sanderson 2012). In addition to financial commitment, the failed 2000 Cape Town bid apparently lacked established relationships with the IOC (Swart, Bob 2004). The bid's chances might increase if the country is represented by the *IOC president*, more *IOC executive board*

⁸ Regions are formed based on the continental associations of NOCs, resulting in one joint Pan-American region.

⁹ Non-candidate applicant cities are assigned a fictional voting count of 1 to include these bids.

members or more regular *IOC members* (Baade, Sanderson 2012; Poast 2007).¹⁰ Finally, we define tradition, i.e., how established a country is in the Olympic movement, by the *years since the NOC was recognized* and the country's Olympic success, in *medals at the last Summer Olympics*.

Bid concept determinants

The following variables test whether the IOC considers the specifics of the bid concept to be vital or merely necessary condition for a successful bid. The *support* of the local population is apparently a central factor in Olympic bids (Baade, Sanderson 2012). The IOC likely prefers compact Olympics with short *distances between the Olympic village and the sporting venues* and as few *Olympic villages* as possible. In addition, the IOC might value a large proportion of existing venues as a share of the total venues necessary (Feddersen et al. 2008). Finally, the climatic conditions, namely the *average temperature* and *humidity in August*, are considered as a potential factor.

Tab. 2 Descriptive statistics of the explanatory variables for Summer Olympic bids, 1992-2020

Explanatory Variables	Mean			Median		Coefficient of Variation		
	No. Obs.	Failed Bids	Hosts	Failed Bids	Hosts	All	Failed Bids	Hosts
Economic explanations								
Gross domestic product (GDP) [2010 US\$-bn]	59	1338.83	2360.72	554.22	1251.64	1.84	2.03	1.19
1-Year real GDP growth [%]	59	3.20	3.64	2.71	3.51	1.99	2.17	0.55
5-Year real GDP growth [%]	59	3.65	3.30	2.94	3.28	1.15	1.18	0.95
10-Year real GDP growth [%]	57	3.80	3.35	2.89	2.92	0.93	0.95	0.81
GDP per capita [2010 US\$]	59	19283.82	21184.07	18014.30	21578.95	0.83	0.86	0.71
1-Year real GDP per capita growth [%]	57	1.94	2.84	1.87	2.31	2.74	3.12	0.71
5-Year real GDP per capita growth [%]	57	2.23	2.40	1.81	2.24	1.55	1.61	1.22
10-Year real GDP per capita growth [%]	55	2.33	2.47	1.84	1.69	1.16	1.20	1.01
Inflation Rate [%]	50	68.41	4.79	4.99	3.02	5.06	4.70	1.17
Unemployment in bid country [%]	59	9.21	9.10	8.20	7.00	0.64	0.63	0.71
Exports [2010 US\$-bn]	58	245.39	315.45	128.79	219.61	1.22	1.29	0.93
1-Year real Export growth [%]	55	7.85	7.95	6.89	6.30	1.01	1.04	0.87
5-Year real Export growth [%]	52	6.73	7.22	5.88	4.76	0.73	0.67	1.03
10-Year real Export growth [%]	51	6.65	7.35	5.57	5.28	0.66	0.64	0.77
Exports as share of GDP [%]	58	28.88	16.71	23.51	16.29	0.72	0.71	0.32
1-Year development of Exports as a share of GDP [pp]	56	0.71	0.06	0.26	0.01	6.63	6.19	19.73
5-Year development of Exports as a share of GDP [pp]	56	2.96	0.08	1.04	0.29	3.03	2.78	30.17
10-Year development of Exports as a share of GDP [pp]	55	5.14	2.33	3.23	3.12	2.36	2.33	1.61
Trade as share of GDP [%]	57	56.96	34.59	50.14	34.30	0.62	0.62	0.33
1-Year development of Trade as a share of GDP [pp]	57	0.56	-0.04	0.24	-0.30	11.35	10.32	-54.58
5-Year development of Trade as a share of GDP [pp]	57	3.40	-0.76	3.60	-0.92	4.29	3.78	-5.54
10-Year development of Trade as a share of GDP [pp]	56	6.45	4.51	5.96	6.03	2.91	2.99	1.27
Inflow of foreign direct investments (FDI) [2010 US\$-bn]	56	21.15	23.87	4.96	16.73	2.13	2.30	1.04
1-Year real FDI growth [%]	56	107.67	-4.86	2.84	-0.34	5.10	4.68	-10.28
5-Year real FDI growth [%]	55	7.64	3.45	9.06	4.21	6.67	6.59	4.79
10-Year real FDI growth [%]	51	14.41	9.22	11.64	9.47	0.99	0.92	1.54
WTO / GATT membership status [0/1] (%)	59	88.24	87.50					
OECD membership status [0/1] (%)	59	62.75	75.00					
IMF membership status [0/1] (%)	59	90.20	87.50					
Population in country [m]	59	82.31	240.32	53.99	93.39	2.08	1.98	1.72
Urban population in country [m]	59	50.22	120.95	31.97	81.07	1.32	1.24	1.14

¹⁰ Note that IOC members from bidding countries are not allowed to vote in the host city election. Nonetheless, they might lobby for their country's bid.

Population in metropolitan area of the city [m]	59	4.94	6.93	3.38	5.60	0.79	0.81	0.66
Bid city = largest city in country? [0/1] (%)	59	68.63	50.00					
Bid city = capital city? [0/1] (%)	59	54.90	50.00					
Socio-political explanations								
Human development index (HDI) [%] ¹¹	55	72.67	77.61	77.8	80.79	0.24	0.26	0.15
1-Year development of HDI [pp]	49	4.27	2.11	2.91	1.62	2.45	2.44	0.62
10-Year development of HDI [pp]	40	5.83	5.04	6.34	4.79	0.41	0.40	0.50
Life Expectancy at Birth [Years]	55	74.28	76.15	75.94	76.56	0.07	0.07	0.05
1-Year development of Life Expectancy [years]	55	0.24	0.22	0.23	0.20	1.05	1.09	0.83
5-Year development of Life Expectancy [years]	54	1.26	1.14	1.15	0.98	0.71	0.75	0.38
10-Year development of Life Expectancy [years]	54	2.72	2.30	2.31	2.01	0.58	0.60	0.27
Mortality Rate, Under-5 [per 1,000]	55	19.24	14.96	10.40	11.45	0.94	0.96	0.77
1-Year development of Mortality Rate [points]	55	-0.88	-0.86	-0.40	-0.50	-1.22	-1.26	-0.99
5-Year development of Mortality Rate [points]	54	-5.00	-4.15	-2.40	-2.55	-1.16	-1.18	-0.91
10-Year development of Mortality Rate [points]	54	-11.78	-8.01	-5.45	-6.75	-1.13	-1.14	-0.85
Infant Mortality Rate [per 1,000 live births]	55	15.89	12.65	8.40	9.95	0.93	0.95	0.75
1-Year development of Infant Mortality Rate [points]	55	-0.72	-0.66	-0.30	-0.40	-1.20	-1.24	-1.01
5-Year development of Infant Mortality Rate [points]	54	-4.02	-3.40	-1.95	-2.25	-1.12	-1.15	-0.89
10-Year development of Infant Mortality Rate [points]	54	-9.20	-6.61	-4.65	-6.00	-1.07	-1.08	-0.85
Freedom House (FH) status	57	1.57	1.25	1	1	0.51	0.50	0.57
Free (%)	37	61.22	87.50					
Partly Free (%)	10	20.41	0.00					
Not Free (%)	10	18.37	12.50					
FH Civil Liberties [1 = high, 7 = low]	57	2.94	2.38	2	2	0.66	0.65	0.71
1-Year development of FH Civil Liberties [points]	57	-0.06	-0.38	0	0	-4.28	-7.00	-1.38
5-Year development of FH Civil Liberties [points]	56	-0.04	-0.38	0	-0.50	-9.13	-19.78	-1.98
10-Year development of FH Civil Liberties [points]	56	-0.08	-0.75	0	0	-5.66	-10.45	-2.11
FH Political Rights [1 = high, 7 = low]	57	2.65	2.00	1	1	0.84	0.82	1.04
1-Year development of FH Political Rights [points]	57	-0.12	-0.13	0	0	-4.37	-4.61	-2.83
5-Year development of FH Political Rights [points]	56	-0.02	-0.25	0	0	-14.86	-40.21	-1.85
10-Year development of FH Political Rights [points]	56	0.00	-0.38	0	0	-18.64	.	-4.02
FH Democracy - Polity imputed [0 = low, 10 = high]	57	7.40	8.39	9.17	9.38	0.43	0.44	0.36
1-Year development of FH Democracy [points]	57	0.08	0.24	0	0	3.65	4.61	1.63
5-Year development of FH Democracy [points]	56	0.07	0.42	0	0.21	6.27	10.44	1.85
10-Year development of FH Democracy [points]	56	0.23	1.06	0	0.04	4.14	4.94	2.50
Democracy [0/1]	52	73.33	85.71					
Index of Democratization [0 = low, 100 = high]	57	24.07	26.21	27.30	28.10	0.51	0.53	0.43
1-Year development of Demo. Index [points]	57	-0.41	0.16	0	0	-10.80	-9.15	13.11
5-Year development of Demo. Index [points]	56	0.41	-1.46	0.05	-0.25	31.93	11.52	-1.87
10-Year development of Demo. Index [points]	56	2.98	4.98	0.90	3.20	2.29	2.35	2.09
Political Competition [0 = low, 100 = high]	57	47.78	47.21	56.1	53.85	0.46	0.47	0.42
1-Year development of Political Competition [points]	57	-0.84	-1.01	0	0	-4.74	-4.51	-5.89
5-Year development of Political Competition [points]	56	-0.04	-4.12	0	-2.45	-11.20	-185.04	-1.55
10-Year development of Political Competition [points]	56	3.95	6.10	0.40	1.15	3.30	3.36	3.13
Political Participation [0 = low, 100 = high]	57	45.41	48.78	49.10	55.75	0.42	0.42	0.42
1-Year development of Political Participation [points]	57	0.22	1.10	0	0	20.22	33.95	2.07
5-Year development of Political Participation [points]	56	1.23	1.15	0.25	1	6.05	6.25	4.80
10-Year development of Political Participation [points]	56	5.44	9.89	2.10	8.20	3.11	3.48	1.99
Political Terror Scale (Scale 1-5)	54	2.19	2.29	2	2	0.57	0.58	0.55
Secure rule of law, no political imprisonment (%)	22	42.55	28.57					
Limited imprisonment for political activity (%)	12	19.15	42.86					
Extensive political imprisonment (%)	9	19.15	0.00					
Civil and political rights violations common (%)	9	14.89	28.57					
Terror expanded to the whole population (%)	2	4.26	0.00					
Index of Globalization [0 = low, 100 = high]	55	67.40	66.29	69.02	65.61	0.20	0.21	0.17
1-Year development of Globalization Index [points]	55	0.72	1.02	0.38	0.24	2.75	2.92	2.16
5-Year development of Globalization Index [points]	54	4.49	6.81	4.08	5.03	0.84	0.83	0.81
10-Year development of Globalization Index [points]	54	9.37	9.76	9.22	7.10	0.55	0.53	0.68
Economic Globalization [0 = low, 100 = high]	53	62.98	57.13	62.41	56.57	0.22	0.22	0.21
1-Year development of Economic Global. [points]	53	0.38	0.24	0.26	0.63	5.77	5.86	3.44
5-Year development of Economic Global. [points]	52	4.28	3.04	5.03	2.19	1.24	1.23	1.39
10-Year development of Economic Global. [points]	52	9.11	7.35	9.10	7.48	0.68	0.68	0.67
Political Globalization [0 = low, 100 = high]	55	83.42	85.25	89.33	87.33	0.17	0.18	0.10
1-Year development of Political Global. [points]	55	0.77	-0.04	0.23	-0.15	6.28	5.75	-17.50
5-Year development of Political Global. [points]	54	4.13	5.65	2.91	1.84	1.78	1.74	1.94
10-Year development of Political Global. [points]	54	9.38	7.25	5.20	2.41	1.07	1.01	1.62
Social Globalization [0 = low, 100 = high]	55	61.21	61.90	64.62	64.64	0.30	0.31	0.27
1-Year development of Social Global. [points]	55	1.17	2.51	0.37	0.31	2.64	2.70	2.28
5-Year development of Social Global. [points]	54	5.10	11.29	3.63	12.87	1.02	0.98	0.83
10-Year development of Social Global. [points]	54	9.69	13.89	8.95	14.49	0.68	0.64	0.74
Corruption Perceptions Index (0 = corrupt, 10 = clean) ¹²	53	5.85	6.03	6.10	6.07	0.38	0.38	0.40
CO2 emissions per capita [metric tons]	58	9.27	8.91	6.69	8.20	0.99	1.04	0.69
1-Year growth of CO2 emissions per capita [%]	55	-0.66	0.15	-0.54	-0.05	-10.42	-9.01	25.25
5-Year growth of CO2 emissions per capita [%]	54	0.42	0.11	0.36	-0.21	7.05	6.71	11.06

¹¹ As the HDI was compiled only every 5 years from 1980 to 2005, we interpolated the missing years in between. Consequently, the 1-Year development of HDI was excluded.

¹² The Corruption Perceptions Index was only measured from 1995 onwards. We assume continuity in corruption perception by using the 1995 values as a proxy for the prior Olympic bids.

10-Year growth of CO2 emissions per capita [%]	54	0.80	0.82	0.56	0.90	3.10	3.28	1.99
CO2 emissions [kg per PPP\$ of GDP]	53	0.65	0.66	0.51	0.61	0.74	0.77	0.62
Ratification of the Kyoto protocol [0/1] (%)	59	27.45	37.50					
Tourism explanations								
Accommodation rooms in country [1,000]	57	533.42	887.82	279.07	625.86	1.50	1.66	0.89
Accommodation rooms in city [1,000]	59	36.70	56.85	28.99	49.18	0.70	0.73	0.51
International Tourism Arrivals (ITA) [1,000]	59	17791.06	15666.25	8464.00	16474.50	1.11	1.16	0.64
1-Year development of ITA (%)	52	10.60	7.37	3.89	6.31	3.23	3.31	1.43
5-Year development of ITA (%)	50	7.54	4.82	5.84	5.06	1.01	0.99	0.99
10-Year development of ITA (%)	39	7.10	5.72	5.82	6.53	0.77	0.79	0.38
International Tourism Receipts (ITR) [2010 US\$-m]	57	17259.48	15274.19	6336.42	13891.7	1.35	1.42	0.72
1-Year development of ITR (%)	50	3.67	15.79	3.88	12.24	3.42	5.15	0.65
5-Year development of ITR (%)	50	6.16	7.70	4.85	7.54	1.52	1.60	1.18
10-Year development of ITR (%)	43	7.04	8.56	5.28	8.26	0.79	0.81	0.74
International Tourism Receipts as share of Exports [%]	55	7.77	8.76	6.04	4.92	0.91	0.93	0.83
Infrastructure explanations								
Distance of Road Network [1,000 km]	59	725.40	1360.88	361.49	604.74	1.70	1.72	1.54
Airports / Airfields in country	59	1077.84	2658.13	171	338	2.57	2.70	2.01
Plane Departures [1,000]	56	662.93	1196.07	275.60	535.67	2.42	2.65	1.68
Airline Passengers Carried [m]	56	51.15	91.08	20.64	47.09	2.31	2.57	1.48
Communications index [per 100 persons]	58	19.53	22.95	10.89	12.22	0.94	0.94	0.97
Stadia in country with capacity > 40,000	59	10.47	24.13	4	13	2.22	2.44	1.51
Stadia in city with capacity >40,000	59	1.10	2.00	1	2	0.71	0.78	0.27
Olympics and sports explanations								
Did the region host the last Summer Olympics? [0/1] (%)	59	17.65	0.00					
Years since country last hosted the Summer Olympics	59	20.00	35.50	12	28	1.24	1.24	1.11
Years since country last hosted the Olympics	59	17.76	30.00	12	17	1.27	1.27	1.20
Years since region last hosted the Summer Olympics	59	10.75	17.50	8	12	0.71	0.68	0.66
Years since region last hosted the Olympics	59	6.78	11.75	6	8	1.10	1.04	1.13
Years since country last hosted the FIFA World Cup	59	12.12	9.75	0	2	1.43	1.41	1.64
Failed bids in last 4 host city selections	59	0.75	1.25	0	1.50	1.22	1.34	0.71
Votes in last host city election for the Summer Olympics	59	2.90	4.63	0	0	2.41	2.57	1.87
World Championships hosted in country in last 10 years	59	8.06	9.75	7	10	0.73	0.78	0.44
World Championships hosted in city in last 10 years	59	2.25	2.88	2	3	0.84	0.86	0.73
Did the city host the Olympic Games before? [0/1] (%)	59	21.57	37.50					
Did the city bid for the Olympic Games before? [0/1] (%)	59	58.82	87.50					
IOC Sponsorship fees from country [2010 US\$-m]	59	22.14	24.82	0	0	3.71	3.99	1.87
IOC Sponsorship fees from region [2010 US\$-m]	59	144.15	152.34	136.11	124.28	1.16	1.17	1.17
IOC Broadcasting fees from region [2010 US\$-m]	59	390.23	381.53	268.92	324.89	1.06	1.08	0.94
Involved in dispute with IOC? [0/1] (%)	59	3.92	0.00					
IOC president	59	3.92	12.50					
IOC Executive Board members	59	0.24	0.25	0	0	1.81	1.82	1.85
IOC members	59	1.71	2.13	2	2	0.57	0.61	0.30
Years since the NOC was recognized by the IOC	59	80.29	90.13	91	103.50	0.38	0.39	0.30
Medals won in last Summer Olympics	59	22.08	38.63	14	19.50	1.38	1.30	1.47
Bid concept explanations								
Support of the population	59	77.44	80.25	80.00	84.50	0.19	0.19	0.20
Average distance from Olympic village to sports venues	59	15.58	13.34	14.50	12.47	0.35	0.35	0.34
Number of Olympic villages	59	1.49	1.25	1	1	0.41	0.41	0.37
Capacity of Olympic villages	59	16.02	15.91	16.00	15.25	0.10	0.10	0.07
Existing venues that do not require work [%]	59	44.70	46.35	46.00	45.73	0.48	0.51	0.30
Existing Venues that require renovation [%]	59	21.37	20.05	16.22	17.44	0.77	0.80	0.56
Planned, non-existing venues [%]	59	33.77	33.59	32.00	34.83	0.51	0.52	0.46
Average temperature in August in bid city [°F]	59	71.39	70.90	73.80	74.70	0.14	0.14	0.17
Humidity in bid city [%]	59	64.67	65.89	67.50	70.00	0.14	0.14	0.15

N = Observations without missing data; Label in brackets “[]” represents the scale of the variable.

Dichotomous variables: ‘Mean’ columns report the average of the characteristic for cities in the category of the characteristic.

3 Empirical strategy

The dataset contains 8,850 values (dependent variable, country identifier, time variable and 147 explanatory variables multiplied by 59 cases), of which 430 are missing (4.9%).¹³ Missing data are primarily a problem for developing countries, particularly in early stages of development. As multiple variables regarding economic, social, and

¹³ Missing data occurs in 97 variables, the data for which are primarily obtained from the World Bank and the Quality of Governance Institute at the University of Gothenburg.

political development are present, it appears reasonable to assume that the data are missing at random (MAR) (Little, Rubin (2002)).

Based on the MAR assumption, we use multiple imputation (MI) for the missing data (Rubin 1976, 1987)¹⁴ and draw on a dataset that includes all countries with National Olympic Committees (NOC), thus bidding and non-bidding.¹⁵ We implement multiple imputation by chained equations (MICE) using predictive mean matching (PMM), drawing from the three closest cases (Royston 2004; White et al. 2011).¹⁶ Following White et al. (2011), we create 88 imputations equaling the percentage of incomplete cases in the larger dataset. Clustering on countries is incorporated by adding a country identifier variable into the imputation model (Eddings, Marchenko 2011).¹⁷

Modeling the IOC's host election decision requires two features. First, chances of an individual bid need to be determined based on the characteristics of all bids for a given Olympics (Poast 2007). Second, the IOC uses an exhaustive ballot voting system, which, in each round, eliminates the bid with the least votes until one candidate city attains the absolute majority of the votes. Both requirements are satisfied by a rank-ordered logistic regression model, which is characterized by a sequential choice interpretation conditional on one event (Allison, Christakis 1994; Long, Freese 2006). While the fixed

¹⁴ The MI approach creates multiply imputed data sets based on the distribution of the observed data and random components (White et al. 2011). After each imputation is analyzed independently, the results are combined to obtain overall estimates and standard errors (Schafer, Graham 2002). Compared to the complete cases model, the MI approach yields superior inferences based on unbiased and efficient estimates (Schafer 1999).

¹⁵ The number of NOCs eligible for bidding increased from 151 for the 1992 Olympics to 204 NOCs for the 2020 Olympics, resulting in 1,477 cases for the eight Olympic Games under consideration in the larger dataset. A total of 16 variables that relate to the bid city or concept are not available in the larger dataset, which consists of 162,470 values in total (dependent variable, country identifier variable, time variable and 131 explanatory variables multiplied by 1,477 cases). Of these, 25,608 (13.2%) are missing, resulting in 88% of cases being incomplete.

¹⁶ A monotone missing pattern is not present. Graphical and statistical inspection suggests that none of the continuous variables with missing values follow a normal distribution. The majority can be assessed as semi-continuous with multiple values close to zero, which is why transformations would not lead to normally distributed variables (White et al. 2011). With the population consisting of broad ranges of countries and observed values, extrapolation does not appear necessary.

¹⁷ The imputation process should account for the clustered data by imputing using a cluster (wide) format (Lloyd et al. 2013; White et al. 2011). Unfortunately, this approach appears to be impractical in unbalanced, 'haphazard' data sets, which is a result of the constantly changing number of NOCs in our dataset (Royston, White 2013).

effects logit model employed by Feddersen et al. (2008) concentrates on the most preferred bid, our model incorporates how each bid is ranked by the IOC members.

As a full model would entail overfitting concerns, variables are selected by stepwise minimizing the Akaike information criterion (AIC), which is averaged over all imputations (Chaurasia, Harel 2012; Rabe-Hesketh, Skrondal 2012). Our method should not be confused with the typical “stepwise” method, which automatically selects variables on the basis of p-values, as this approach is not applicable to multiple imputation or rank-ordered logistic regression models. In addition, “stepwise” is subject to critical assessments, including its capacity to produce the best model, especially when used for forecasting (e.g., Judd et al. (2009)).

The assumption of linearity is assessed through fractional polynomial (FP) analysis, which suggests transformation of *population in the city* and *stadia in the country with a capacity exceeding 40,000 persons* using one-term FP with power (-2), while the variable *years since the country last hosted the Olympics* is transformed using a one-term FP with power (2) (Royston, Sauerbrei 2008). No significant and meaningful interactions were observed.

4 Results

Based on the Summer Olympic Games between 1992 and 2020 and stepwise minimizing the AIC, the outcome of the IOC host city election is best explained by the model displayed in the first column of table 3. It contains nine indicators in total; all are statistically significant at least at the 0.1 level.^{18,19}

¹⁸ It must be noted that the resulting AIC of 53.078 could have been decreased further by including, for example, the variable *number of Olympic villages* in the model. However, the discrimination between hosts and unsuccessful bids remains unchanged or worsens and two issues emerge: the model F-statistic becomes insignificant and the model does not converge in the out-of-sample predictions. Consequently, the model is maintained as displayed in table 3.

¹⁹ Multicollinearity is not an issue in the final model. The highest pairwise correlation coefficient exists between *stadia in country with capacity > 40,000 (transformed)* and *5-Year real GDP growth* at 0.5.

Tab. 3 Determinants of IOC host city voting: in-sample analysis and out-of-sample predictions

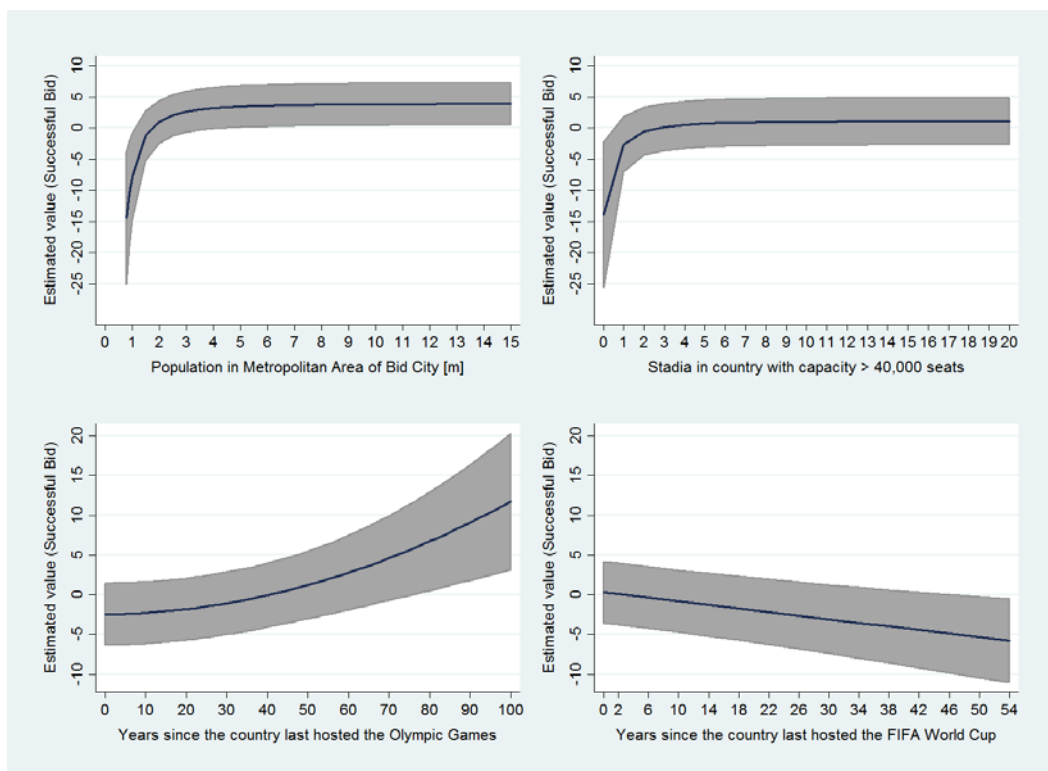
Determinants	Analysis model	Out-of-sample predictions		
	1992-2020	1992-2016 → 2020	1992-2012 → 2016, 2020	1992-2008 → 2012-2020
Urban Population in country [m]	0.011*	0.010	0.009	0.009
(Population in metropolitan area of the city [m]) ²	-0.117***	-0.115***	-0.113***	-0.107***
5-Year real GDP growth [%]	0.674**	0.717**	0.608**	0.454**
5-Year development of FH Political Rights [points] ³	-1.262**	-1.271**	-1.078*	-0.816
World Championships hosted in country in last 10 years	0.362***	0.352***	0.348***	0.309***
(Years since the country last hosted the Olympics) ²	0.137***	0.136***	0.127***	0.108***
Years since the country last hosted the FIFA World Cup	-0.113***	-0.112***	-0.111***	-0.110***
(Stadia in country with capacity > 40,000) ²	-0.001**	-0.001**	-0.001**	-0.001**
Involved in dispute with IOC? [0/1]	-5.692**	-5.319**	-4.923**	(omitted)
Number of Olympic Games	8	7	6	5
Applications included	59	54	47	38
Model F-Test	1.74*	1.69*	1.65*	1.69*
AIC (without fractional polynomials)	53.078 (94.339)	51.627 (90.649)	48.714 (81.810)	41.870 (69.890)
Area under the ROC curve	1.000	0.985	0.993	0.941
Correctly classified (Hosts)	8 of 8 (100.0%)	-	2016, 2020	2020
Incorrectly classified (Hosts)	-	2020	-	2012, 2016

Notes: *** p < 0.01; ** p < 0.05; * p < 0.10; *Population in city [m]* is transformed $(x/10)^2$; *Years since the country last hosted the Olympics* is transformed $((x+2)/10)^2$; *Stadia in country with capacity > 40,000* is transformed $((x+1)/100)^2$; a Freedom House indicator ranges from 1 (most free) to 7 (least free).

The first indicator *urban population* may confirm the hypothesis of Baade, Sanderson (2012) that the IOC is concerned with current and, particularly, future Olympic audiences. The *urban population* may be more relevant than the *total population*, as a country’s rural population is often less able to afford media and personal access to the Olympic Games and its sponsors’ products.

The highly significant (negative) coefficient of the squared inverse of the metropolitan area population, in conjunction with the top left graph of figure 1, implies that IOC significantly downgrades bids from cities with a *population in the metropolitan area* of fewer than 2.5 million. With exception of Barcelona 1992, no Olympic city had a metropolitan population of fewer than 2.5 million persons. In addition, there were three unsuccessful bids, by Birmingham (1992) and Manchester (1996, 2000), before London was selected (Shoval 2002).

Fig. 1 Marginal effects of four indicators, of which three are transformed (Predictive Margins with 95% confidence intervals)



The likelihood of winning the host city election increases when the country records a higher medium-term economic growth (*5-Year real GDP growth [%]*). This supports the rationale of Poast (2007), who highlighted the importance of a prospering host country to the IOC.

The indicator *5-year development of political rights* indicates that IOC members reward Olympic bids from countries implementing policy changes and political liberalization.²⁰ This appears to be reflected in four of the past eight host decisions. While Spain and Brazil improved political rights prior to their successful 1992 and 2016 Olympic bids, the weakening of political rights might have cost the Greece and China bids for 1996 and 2000 important votes.²¹ Additionally, the 2004 South African bid, which emphasized the beginning of the post-Apartheid era, finished third of a record eleven

²⁰ Note that we retained the original Freedom House coding for this indicator: countries are graded between 1 (most free) and 7 (least free).

²¹ Greece was not graded most free in terms of political rights by Freedom House during a four-year period from 1985 to 1989, while China received a grade of 6 from 1977 to 1988 but was downgraded thereafter to least free.

bid cities, although the bid was not considered particularly strong given the country's unstable environment (Swart, Bob 2004).

The number of *world championships hosted in the country in the last 10 years* is significant at the 0.01 level. In addition to being able to host the Olympic Games, this variable might also indicate the countries' ability to establish good relationships with international sporting federations and IOC members.

As the Summer Olympics have never been hosted on the same continent in two consecutive occasions, researchers have suspected an implicit rotation among regions (Andranovich et al. 2001; Feddersen et al. 2008; Swart, Bob 2004). However, no previous analysis or the present model was able to confirm this presumption, although this study included – in addition to a dummy variable for the region having hosted the preceding games – the continuous variable *years since region last hosted Summer Games*. The difficulty in isolating continental rotation may be caused by anticipative bidding behavior, which induces fewer bids from the previous hosting region, and when made, generally exhibit “weaker” characteristics. However, the indicator *years since the country last hosted the Olympics*, illustrated in the bottom-left graph of figure 1, is significant. *Ceteris paribus*, there is an “it is the country's turn” election behavior.

The negative coefficient of the variable *years since the country last hosted the FIFA World Cup* (see the bottom-right graph of figure 1) indicates that the IOC prefers bids from countries that have recently hosted the FIFA World Cup. For the period under observation, the cases of Spain (Olympics 10 years after hosting the FIFA World Cup in 1982), the United States (2 years), Brazil (2 years), and Japan (18 years) are illustrative.²² Two explanations may apply: First, the IOC (as well as the bid cities) intends to exploit synergies between the two largest sporting events in the world that may result from new stadia and upgraded infrastructure. Second, these countries exhibit advantageous characteristics that favor them in both the IOC and FIFA elections.

The significantly positive number of *stadia in the country with a capacity exceeding 40,000 persons* must be interpreted in conjunction with figure 1 (top right). If a country

²² FIFA appears more innovative in selecting hosts, as the IOC has often followed the former's lead and not vice versa.

has fewer than three such stadia, it will be “punished” by a significant loss of votes. In contrast, having more than three large stadia yields only a marginal positive impact. IOC members may interpret a small number of large stadia as a proxy for the (absence of) demand in the country for (Olympic) sports and sports entertainment and the population’s acceptance and political will to invest in such stadia.

Olympic broadcasting rights account for up to 85% of IOC revenues, which explains the length and intensity of the *dispute between the IOC and the USOC* concerning the distribution of television fees (Levinson 2012). As suspected by Baade, Sanderson (2012), our model suggests that this dispute dramatically decreased New York and Chicago’ chances for hosting the 2012 and 2016 Olympic Games.

It is striking that none of the bid-specific features such as the distance from the Olympic village to the sports venues or the percentage of existing venues that do not require substantial investment do have any statistical power in explaining the success or failure of an Olympic bid. This irrelevance is true even for the support of the population. The statistical explanation is relatively simple: The coefficients of variation of the bid-specific variables (tab. 2, last three columns) are especially low.²³ These bid-specific factors are too similar to be able to help to discriminate between successful and failing bids.

Three explanations are possible: First, the IOC and the international federations openly communicate their requirements and demands to interested cities and countries, on many occasions leaving little room for diversity. Second, the bids are often influenced by the expertise of a limited number of international consultants, some of whom possess knowledge from previous (successful) bids. Both factors have, in the past, led to increasingly “streamlined” bids.

Third, our data might be “skewed”, and the perceptions of the IOC members, which are ultimately decisive for their votes, may differ from the data included in our analysis. *Support of the population* may be a good example for the potential gap: Prior to the elections for the Games in 2004, the data were exclusively obtained by the bidding

²³ The average absolute coefficient of variation (cv) for the bid-specific variables is 0.34, while the average absolute coefficient of variation over all variables is 2.25 and 2.97 for the variables in the model.

cities themselves. The public opinion reported by the bidding cities may have been, at least on certain occasions, more positive than perceived by IOC members. For the Games in 2008, the IOC commissioned surveys itself but only for the Candidature Phase. Since 2012, the IOC has commissioned surveys in both periods and compared the results with the data provided by the bidding cities. In this analysis, we preferred the IOC data from the application phase; if these were not available, the cities' opinion polls were considered.

Model fit and predictive performance

The fit of the model can be assessed from two perspectives. First, the model classifies 100% of the eight hosts correctly (tab. 4). Consequently, the area under the receiver operating curve (ROC) equals 1.000, which can be regarded as outstanding.²⁴ Both figures are superior to the previous models advanced by Feddersen et al. (2008) and Poast (2007). We conclude that the model improves the discrimination of Olympic hosts from failing bids.

Second, model performance is assessed through out-of-sample predictions. The three columns on the right of table 3 are based on reduced data sets, increasing the out-of-sample prediction period. If the model is adjusted to shorter data sets, all estimates except *urban population*, which was previously significant at the 10% level, and the 5-year development of the Freedom House political rights index for the period 1992-2008 remain significant at traditional levels.

The 1992-2016 reduced model fails to correctly predict the 2020 Olympic host of Tokyo.²⁵ However, removing the 2016 and 2020 bids results in 100% correct prediction of the 2016 and 2020 hosts. Variations in the estimated coefficients in both reduced models remain below 16.5%, indicating a stable model. Focusing on the 1992 to 2008 Summer Olympics causes greater difficulty. As the indicator *dispute between IOC and USOC* is only relevant for the 2012 and 2016 bids, it acts as an outlier, the effect of which was difficult to anticipate. Therefore, the model, omitting *dispute*, predicts

²⁴ A ROC value of 1.000 indicates that every Olympic host yields a higher probability of winning than every failed Olympic bid.

²⁵ The model results in a 48.0% probability for Tokyo and a 49.5% probability for Istanbul. See appendix 2 for details.

different hosts for 2012 (New York) and 2016 (Chicago) but the correct host for 2020. In summary, the full model has high predictive power for the success of Olympic bids.

Predictions of past and future Olympic host city elections

Table 4 contains the Summer Olympic bids from 1992 until 2020 and potential bids for the 2024 Olympics. The estimated probabilities for winning the host city election are tabulated in column three, while the estimated value of the rank-ordered logistic regression model is displayed in column two. The IOC voting results form the last columns of the table. As mentioned above, the model predicts all hosts correctly.

Tab. 4 Predictions of past and future Olympic bids

Olympics	Estimated Value	Estimated probability ^A	Bid city	Bid country	Voting rounds				
					1st	2nd	3rd	4th	5th
1992	0.05	46.9%	Barcelona	Spain	29	37	47		
1992	-0.13	39.2%	Paris	France	19	20	23		
1992	-2.19	5.0%	Brisbane	Australia	11	9	10		
1992	-1.77	7.6%	Belgrade	Yugoslavia	13	11	5		
1992	-3.55	1.3%	Birmingham	Great Britain	8	8	-		
1992	-17.87	0.0%	Amsterdam	Netherlands	5	-	-		
1996	8.55	51.9%	Atlanta	United States	19	20	26	34	51
1996	8.41	44.9%	Athens	Greece	23	23	26	30	35
1996	3.40	0.3%	Toronto	Canada	14	17	18	22	-
1996	5.52	2.5%	Melbourne	Australia	12	21	16	-	-
1996	3.71	0.4%	Manchester	Great Britain	11	5	-	-	-
1996	-4.10	0.0%	Belgrade	Yugoslavia	7	-	-	-	-
2000	9.41	76.5%	Sydney	Australia	30	30	37	45	
2000	8.07	20.2%	Beijing	China	32	37	40	43	
2000	3.98	0.3%	Manchester	Great Britain	11	13	11	-	
2000	6.14	2.9%	Berlin	Germany	9	9	-	-	
2000	1.82	0.0%	Istanbul	Turkey	7	-	-	-	
2004	13.48	99.9%	Athens	Greece	32	-	38	52	66
2004	6.13	0.1%	Rome	Italy	23	-	28	35	41
2004	4.42	0.0%	Cape Town	South Africa	16	62	22	20	-
2004	2.16	0.0%	Stockholm	Sweden	20	-	19	-	-
2004	0.80	0.0%	Buenos Aires	Argentina	16	44	-	-	-
2004	-2.63	0.0%	Istanbul	Turkey	-	-	-	-	-
2004	-3.51	0.0%	Lille	France	-	-	-	-	-
2004	-2.84	0.0%	Rio de Janeiro	Brazil	-	-	-	-	-
2004	-74.89	0.0%	San Juan	Puerto Rico	-	-	-	-	-
2004	-19.82	0.0%	Seville	Spain	-	-	-	-	-
2004	-4.51	0.0%	St. Petersburg	Russia	-	-	-	-	-
2008	13.08	99.0%	Beijing	China	44	56			
2008	8.02	0.6%	Toronto	Canada	20	22			
2008	7.29	0.3%	Paris	France	15	18			
2008	1.04	0.0%	Istanbul	Turkey	17	9			
2008	4.99	0.0%	Osaka	Japan	6	-			
2008	-0.68	0.0%	Bangkok	Thailand	-	-			
2008	0.34	0.0%	Cairo	Egypt	-	-			
2008	-4.32	0.0%	Havana	Cuba	-	-			
2008	0.17	0.0%	Kuala Lumpur	Malaysia	-	-			
2008	-17.73	0.0%	Seville	Spain	-	-			

2012	7.90	59.1%	London	Great Britain	22	27	39	54
2012	7.02	24.7%	Paris	France	21	25	33	50
2012	6.38	13.0%	Madrid	Spain	20	32	31	-
2012	4.62	2.2%	New York	United States	19	16	-	-
2012	3.70	0.9%	Moscow	Russia	15	-	-	-
2012	-3.56	0.0%	Havana	Cuba	-	-	-	-
2012	1.79	0.1%	Istanbul	Turkey	-	-	-	-
2012	-34.33	0.0%	Leipzig	Germany	-	-	-	-
2012	-1.89	0.0%	Rio de Janeiro	Brazil	-	-	-	-
2016	7.04	55.2%	Rio de Janeiro	Brazil	26	46	66	
2016	6.09	21.5%	Madrid	Spain	28	29	32	
2016	6.11	21.9%	Tokyo	Japan	22	20	-	
2016	3.34	1.4%	Chicago	United States	18	-	-	
2016	-4.89	0.0%	Baku	Azerbaijan	-	-	-	
2016	-7.11	0.0%	Doha	Qatar	-	-	-	
2016	-19.04	0.0%	Prague	Czech Republic	-	-	-	
2020	4.47	54.3%	Tokyo	Japan	42	-	60	
2020	4.24	43.3%	Istanbul	Turkey	26	49	36	
2020	1.35	2.4%	Madrid	Spain	26	45	-	
2020	-4.98	0.0%	Baku	Azerbaijan	-	-	-	
2020	-9.81	0.0%	Doha	Qatar	-	-	-	

Notes: * Potential 2024 Olympic bids based information retrieved from www.GamesBids.com; ^A The estimated probability that a bid is valued higher than all other bids for a given Olympics can be written as: $Pr \{ \text{estimated value}_1 > \max(\text{value}_2, \dots, \text{value}_m) \} = \frac{\exp(\text{value}_1)}{\sum_{i=1}^m \exp(\text{value}_i)}$

Modeling the outcome of the host city elections required a conditional evaluation of each bid under consideration on all other bids for the same Olympic Games. This results in remarkable cases. For example, the model yields a relatively high linear prediction for Toronto 2008 (8.02). The competing bid of Beijing, however, reaches a value of 13.08, equal to an estimated probability of 99%. In contrast, the 1992 Barcelona bid only exhibits a linear estimation of 0.05, resulting in a probability of 46.9%. Barcelona nevertheless won because of a relatively weak competition.

As argued above, the model may be used to predict future Olympic hosts, as shown in table 5. Likely bids for the 2024 Olympics include the United States, France, Germany, Italy, Qatar, Turkey and Azerbaijan (www.GamesBids.com). The model, using currently available data, predicts the success of a German bid, potentially Hamburg or Berlin. This is primarily attributable to the long period since last hosting the Olympics (in 2024, 52 years will have elapsed), having recently hosted the FIFA World Cup in 2006, considerable experience from hosting world championships, and a stable (in the last 5 years, on average), more rapidly growing economy than France and the United States.

Tab. 5 Model-based prognosis for the host of the 2024 Olympic Games

Potential Bids for the 2024 Olympics		Germany	Turkey	France	United States	Italy	Azerbaijan	Qatar
Determinants	Co-efficient	Hamburg	Istanbul	Paris	Los Angeles	Rome	Baku	Doha
Urban Population in country [m]	0.011	60.4	50.8	55.4	254.1	41.3	6.6	1.7
<i>Population in metropolitan area of the city [m]</i>	-	<i>3.5</i>	<i>14.2</i>	<i>11.5</i>	<i>12.8</i>	<i>4.2</i>	<i>2.3</i>	<i>0.8</i>
(Population in metropolitan area of the city [m]) ²	-0.117	8.2	0.5	0.8	0.6	5.6	18.9	156.3
5-Year real GDP growth [%]	0.674	1.4	3.2	0.6	0.7	0.0	16.4	16.6
5-Year development of FH Political Rights [points]	-1.262	0	0	0	0	0	0	0
World Championships hosted in country in last 10 years	0.362	14	9	15	8	14	2	5
<i>Years since the country last hosted the Olympics</i>	-	<i>52</i>	<i>0</i>	<i>32</i>	<i>22</i>	<i>18</i>	<i>0</i>	<i>0</i>
(Years since the country last hosted the Olympics) ²	0.137	29.2	0.04	11.6	5.8	4	0.04	0.04
Years since the country last hosted the FIFA World Cup	-0.113	18	0	26	30	34	0	0
<i>Stadia in country with capacity > 40,000</i>	-	<i>18</i>	<i>3</i>	<i>5</i>	<i>139</i>	<i>7</i>	<i>0</i>	<i>1</i>
(Stadia in country with capacity > 40,000) ²	-0.001	27.7	625	277.8	0.5	156.3	10000	2500
Involved in dispute with IOC? [0/1]	-5.692	0	0	0	0	0	0	0
Determinants	Estimated values per indicator (Coefficient * value of bid city)							
Urban Population in country [m]		0.67	0.56	0.61	2.82	0.46	0.07	0.02
(Population in city [m]) ²		-0.98	-0.06	-0.09	-0.07	-0.67	-2.28	-18.84
5-Year real GDP growth [%]		0.97	2.28	0.45	0.48	-0.02	11.75	11.85
5-Year development of FH Political Rights [points]		0	0	0	0	0	0	0
World Championships hosted in country in last 10 years		5.34	3.43	5.72	3.05	5.34	0.76	1.91
(Years since the country last hosted the Olympics) ²		4.14	0.01	1.64	0.82	0.57	0.01	0.01
Years since the country last hosted the FIFA World Cup		-2.10	0	-3.03	-3.50	-3.96	0	-0.23
(Stadia in country with capacity > 40,000) ²		-0.04	-0.97	-0.43	0.00	-0.24	-15.59	-3.90
Involved in dispute with IOC? [0/1]		0	0	0	0	0	0	0
Total Estimated value (sum of values per indicator)		8.00	5.25	4.87	3.60	1.47	-5.28	-9.19
EXP (estimated value)		2976.8	190.7	130.8	36.44	4.35	0.01	0.00
Estimated probability		89.2%	5.7%	3.9%	1.1%	0.1%	0.0%	0.0%

Notes: Italicized variables in grey rows are not included in the analysis with their original values. They only enter the analysis in transformed form, which is presented in the respective rows below the grey rows. *Population in city [m]* is transformed $(x/10)^2$; *Years since the country last hosted the Olympics* is transformed $((x+2)/10)^2$; *Stadia in country with capacity > 40,000* is transformed $((x+1)/100)^2$. Assuming Berlin (with its population of 7 million in the metropolitan area) instead of Hamburg becomes the German bid city, the estimated value increases to 8.74 with a corresponding estimated probability of 93.6%.

Certain caveats are in order for this forecast: Bids have yet to be submitted to the IOC, and the non-submission of certain cities included in our analysis and the submission of bids neglected in our calculations may change the prediction. The collection method for the data on public support differs from that for most of the period of our analysis. Support of the population did not exhibit any significant impact in our analysis because the bidding cities' reports were too similar to allow us to discriminate between successful and failing bids. With a more "objective" data collection process and, potentially, more diverse support data, the variable may become relevant. More important, the IOC has initiated a reform process, known as "Agenda 2020", which may reshape the future bidding process and the Games themselves. The above-mentioned incentives for "streamlined" bids may be reduced, leading to more diverse bid concepts – and the statistical significance of bid-specific factors. In statistical terms, a structural break may occur, which does not allow us to use the experience accumulated in former bid processes in future ones.

5 Summary and conclusions

The aim of this article is to identify indicators that discriminate successful from unsuccessful Summer Olympic bids. Previous studies by Feddersen et al. (2008) and Poast (2007) presented divergent regression results and limited discrimination between hosts and failed bids. Our analysis differs by examining additional variables (147 in total) and an extended period (1992-2020) and significantly improved discrimination (all eight Olympic hosts were predicted correctly).

Our findings support economic, political and sports/Olympic explanations for the bids' success. Successful bids feature larger Olympic audiences with larger *urban populations* in the country. The bid's *metropolitan population* should not be fewer than 2.5 million inhabitants. IOC members prefer economies that record *higher medium-term GDP growth rates*, and they reward bid countries that have strengthened political rights prior to an Olympic bid. In addition, winning bids are more experienced in *hosting world championships*. Moreover, there is an "it is the country's turn" election behavior. A bid's chances may be seriously reduced by a *dispute with the IOC*, as evinced by the New York and Chicago bids for 2012 and 2016. Finally, the IOC members dislike an underdeveloped *existing stadium infrastructure*, which demonstrates a lack of demand for sports entertainment, at least in the past.

The successful cities form a relatively homogenous group, as indicated by the average coefficient of variation, whereas failing cities were rather heterogeneous.²⁶

The model identifies 100% of the successful bids. Moreover, its out-of-sample predictive power is high. We conclude that the IOC members appear to behave fairly rationally in selecting host cities for the Olympic Games, despite various allegations by the media, the public, and unsuccessful bids.

Using the model for future forecasts may be limited due to potential structural breaks: The IOC reform "Agenda 2020" may change the rules for the bidding process and for

²⁶ Considering only the significant variables, the average coefficient of variation is 1.17 for the successful bids and 6.17 for the failed bids.

the Games themselves. For example, public support may become more important in the future than identified in the past.

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Appendix 1 Sources of explanatory variables

Variables	Source
Economic explanations	
Gross domestic product (GDP) [2010 US\$-bn]	http://data.worldbank.org/indicator/NY.GDP.MKTP.PP.CD
GDP per capita [2010 US\$]	http://data.worldbank.org/indicator/NY.GDP.PCAP.PP.CD
Inflation Rate [%]	http://data.worldbank.org/indicator/FP.CPI.TOTL.ZG
Unemployment in bid country [%]	http://data.worldbank.org/indicator/SL.UEM.TOTL.ZS
Exports [2010 US\$-bn]	http://data.worldbank.org/indicator/NE.EXP.GNFS.CD
Exports as share of GDP [%]	http://data.worldbank.org/indicator/NE.EXP.GNFS.ZS
Trade as share of GDP [%]	http://data.worldbank.org/indicator/NE.TRD.GNFS.ZS
Inflow of foreign direct investments (FDI) [2010 US\$-bn]	http://data.worldbank.org/indicator/BX.KLT.DINV.CD.WD
WTO / GATT membership status [0/1] (%)	http://www.wto.org/english/thewto_e/whatis_e/tif_e/org6_e.htm
OECD membership status [0/1] (%)	http://www.oecd.org/about/membersandpartners/
IMF membership status [0/1] (%)	https://www.imf.org/external/np/sec/memdir/memdate.htm
Population in country [m]	http://data.worldbank.org/indicator/SP.POP.TOTL
Urban population in country [m]	http://data.worldbank.org/indicator/SP.URB.TOTL
Population in city [m]	Bid Books 1992-2020
Bid city = largest city in country? [0/1] (%)	Bid Books 1992-2020
Bid city = capital city? [0/1] (%)	Bid Books 1992-2020
CO2 emissions per capita [metric tons]	http://data.worldbank.org/indicator/EN.ATM.CO2E.PC
CO2 emissions [kg per PPP\$ of GDP]	http://data.worldbank.org/indicator/EN.ATM.CO2E.PP.GD
Ratification of the Kyoto protocol [0/1] (%)	https://unfccc.int/kyoto_protocol/status_of_ratification/items/2613.php
Socio-political explanations	
[...]	All socio-political data from: The Quality of Government Institute http://www.qog.pol.gu.se/data/datadownloads/qogstandarddata/
Tourism explanations	
International Tourism Arrivals [1,000]	World Tourism Organization:
International Tourism Receipts [2010 US\$-m]	Annuaire des statistiques du tourisme /
International Tourism Receipts as share of Exports [%]	Yearbook of tourism statistics
Accommodation rooms in country [1,000]	(1982-2010)
Accommodation rooms in city [1,000]	Bid Books 1992-2020
Infrastructure explanations	
Distance of Road Network [1,000 km]	http://data.worldbank.org/indicator/IS.ROD.TOTL.KM
Airports / Airfields in country	https://www.cia.gov/library/publications/the-world-factbook/
Plane Departures [1,000]	http://data.worldbank.org/indicator/IS.AIR.DPRT
Airline Passengers Carried [m]	http://data.worldbank.org/indicator/IS.AIR.PSGR
Communications index [per 100 persons]	http://data.worldbank.org/indicator/IT.MLT.MAIN.P2; .../IT.CEL.SETS.P2; .../IT.NET.USER.P2; .../IT.NET.BBND.P2
Stadia in country with capacity > 40,000	http://www.worldstadiums.com/stadium_menu/stadium_list.shtml
Stadia in city with capacity >40,000	http://www.worldstadiums.com/stadium_menu/stadium_list.shtml
Olympics and sports explanations	
Did the region host the last Summer Olympics? [0/1]	http://www.olympic.org/olympic-games
Years since the country last hosted the Summer Olympics	http://www.olympic.org/olympic-games
Years since the country last hosted the Olympics	http://www.olympic.org/olympic-games
Years since the region last hosted the Summer Olympics	http://www.olympic.org/olympic-games
Years since the region last hosted the Olympics	http://www.olympic.org/olympic-games
Years since the country last hosted the FIFA World Cup	http://www.fifa.com/tournaments/archive/worldcup/index.html
Votes in last host city election for the Summer Olympics	http://www.gamesbids.com/eng/past.html
World Championships hosted in country in last 10 years	Respective websites of International Federations
World Championships hosted in city in last 10 years	of Summer Olympic sports
Did the city host the Olympic Games before? [0/1] (%)	http://www.olympic.org/olympic-games
Did the city bid for the Olympic Games before? [0/1] (%)	http://www.olympic.org/olympic-games
IOC Sponsorship fees from country [2010 US\$-m]	http://www.olympic.org/marketing/documents-reports-studies-publications
IOC Sponsorship fees from region [2010 US\$-m]	
IOC Broadcasting fees from region [2010 US\$-m]	
Involved in dispute with IOC? [0/1] (%)	Baade, Sanderson (2012)
IOC president	http://www.olympic.org/about-ioc-institution?tab=Presidents
IOC Executive Board members	http://www.olympic.org/executive-board?tab=Composition
IOC members	http://www.reinhardt-consult.de/Olympiade/IOC-Besetzung/IOC-Mitglieder/ioc-mitglieder1.html
Years since the NOC was recognized by the IOC	http://www.olympic.org/national-olympic-committees
Medals won in last Summer Olympics	http://www.databaseolympics.com/
Bid concept explanations	
[...]	All bid concept data from: Bid Books 1992-2020.

Appendix 2 In-sample and out-of sample prognosis for the 2020 Olympic Games

Bids for the 2020 Olympic Games	In-sample coefficient	Out-of-sample coefficient	Japan	Turkey	Spain	Azerbaijan	Qatar
	1992-2020	1992-2016	Tokyo	Istanbul	Madrid	Baku	Doha
Determinants							
Urban Population in country [m]	0.011	0.010	115.4	50.8	35.6	4.8	1.7
<i>Population in city [m]</i>	-	-	<i>13.2</i>	<i>13.3</i>	<i>3.3</i>	<i>2.3</i>	<i>0.8</i>
(Population in city [m]) ²	-0.117	-0.115	0.6	0.6	9.3	18.9	156.3
5-Year real GDP growth [%]	0.674	0.717	0.3	3.2	0.8	16.4	16.6
5-Year development of FH Political Rights [points]	-1.262	-1.271	0	0	0	0	0
World Championships hosted in country in last 10 years	0.362	0.352	12	7	13	3	3
<i>Years since the country last hosted the Olympics</i>	-	-	<i>22</i>	<i>0</i>	<i>28</i>	<i>0</i>	<i>0</i>
(Years since the country last hosted the Olympics) ²	0.137	0.136	5.8	0	9.0	0	0
Years since the country last hosted the FIFA World Cup	-0.113	-0.112	18	0	38	0	0
<i>Stadia in country with capacity > 40,000</i>	-	-	<i>17</i>	<i>3</i>	<i>9</i>	<i>0</i>	<i>1</i>
(Stadia in country with capacity > 40,000) ²	-0.001	-0.001	30.9	625	100	10000	2500
Involved in dispute with IOC? [0/1]	-5.692	-5.319	0	0	0	0	0
Estimated value based on in-sample coefficient			4.47	4.24	1.35	-4.98	-9.81
EXP (estimated value) based on in-sample coefficient			87.16	69.53	3.86	0.01	0.00
Estimated probability based on in-sample coefficient			54.3%	43.3%	2.4%	0.0%	0.0%
Estimated value based on out-of-sample coefficient			4.22	4.25	1.27	-4.13	-8.70
EXP (estimated value) based on out-of-sample coef.			67.88	70.03	3.55	0.02	0.00
Estimated probability based on out-of-sample coef.			48.0%	49.5%	2.5%	0.0%	0.0%

Notes: Italicized variables in grey rows are not included in the analysis with their original values. They only enter the analysis in transformed form, which is presented in the respective rows below the grey rows. *Population in city [m]* is transformed $(x/10)^2$; *Years since the country last hosted the Olympics* is transformed $((x+2)/10)^2$; *Stadia in country with capacity > 40,000* is transformed $((x+1)/100)^2$.

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