HOSTING MEGA EVENTS IMPACT ON GDP GROWTH: A Panel Data Analysis

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Abstract:

This paper investigates the impact of hosting "mega events" such as the Olympics on a country's GDP growth. The study incorporates information on the country's factors of economic development. Spillovers will be modeled through the state of the global economy by using controls such as countries that did not host mega events. The results show that countries that host the Olympics do not see any extra GDP growth than those that did not host an event.

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1.0 INTRODUCTION

Having the opportunity to host mega-events such as, the Olympics, FIFA World Cup, and Formula 1 races, is a prestigious experience for host countries. Host countries spend, "$8.9 billion on average," (Budzier, et al., 2016) which is no small expenditure. Countries are willing to spend this amount to host in hopes that the benefits that mega-events are believed to bring, such as notoriety, respect, and most importantly increased economic benefits. Do these benefits make up for the costs of these massive events?

This study aims to enhance how much is gained for a country's economic growth through the hosting of mega-events. From a policy perspective, this analysis is important to provide spending recommendations for countries that are bidding to host these events, to make sure it is a good investment or if the money should be spent on more pressing issues. The relevance of this study comes with the US bidding to host the 2024 Olympics, hosting some games of the 2026 FIFA World Cup, and hosting the 2028 Summer Olympics.
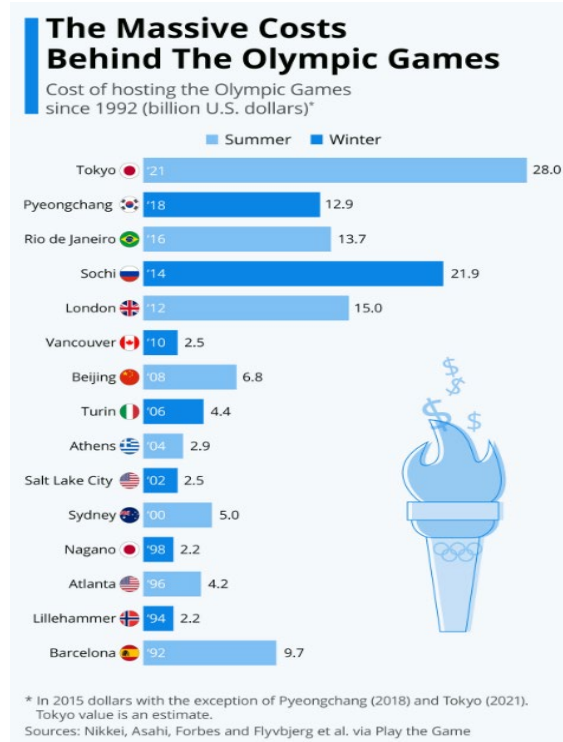
This paper was guided by three research objectives that differ from other studies: First being the investigation will investigate multiple different Olympics and multiple different FIFA World Cups; Second; the time frame of events will be larger than previous studies have analyzed. Last, it analyzes how the economic growth in the rest of the world is compared to the host country. This will help account for any current world events that may be throwing off the results of the model and over/under estimate growth.

The rest of the paper is organized as follows: Section 2 highlights trends of mega-events and economic growth. Section 3 gives a brief literature review. Section 3 outlines the empirical model. Data and estimation methodology are discussed in section 4. Finally, section 5 presents and discusses the empirical results. This is followed by a conclusion in section 6.
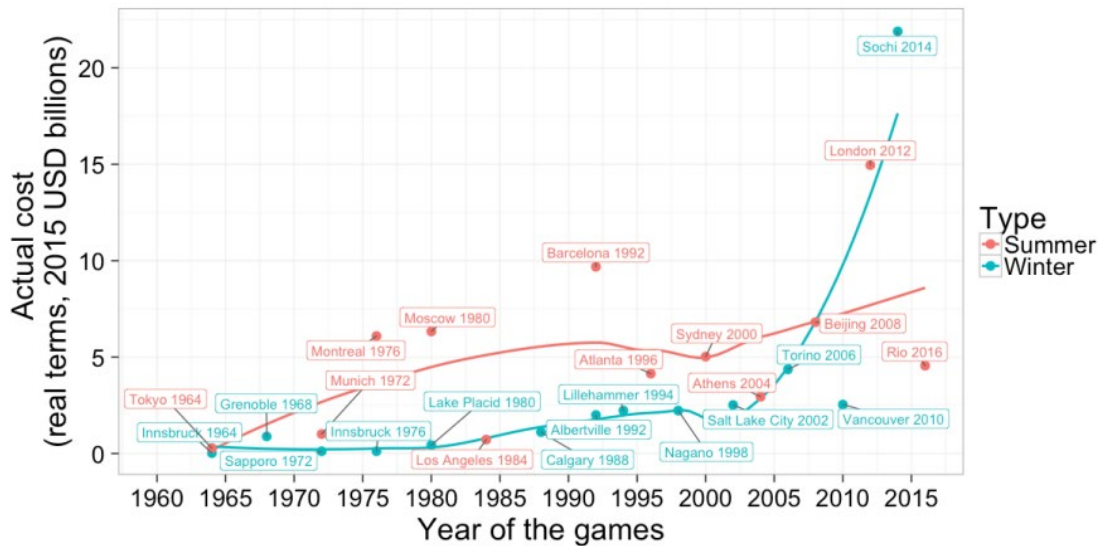
2.0 MEGA-EVENTS AND ECONOMIC GROWTH

Figure 1 shows how much investment goes into hosting the Olympics each year for a country. It is a costly venture that takes years of investment and construction for events that last two weeks. The more recent Olympic games of the past decade have been the most expensive, with the 21' Tokyo games being the most expensive by almost 33% more than the previous highest, Sochi '14. Some of the extra costs for the Tokyo games were caused by COVID-19 regulations, which makes it an outlier. With such an increase in costs, this only makes it more difficult for there to be an economic gain from the events.

Figure 1: Costs of Olympic Games

The Massive Costs Behind The Olympic Games

Cost of hosting the Olympic Games since 1992 (billion U.S. dollars)*

■ Summer ■ Winter

Host	Year	Cost
Tokyo	'21	28.0
Pyeongchang	'18	12.9
Rio de Janeiro	'16	13.7
Sochi	'14	21.9
London	'12	15.0
Vancouver	'10	2.5
Beijing	'08	6.8
Turin	'06	4.4
Athens	'04	2.9
Salt Lake City	'02	2.5
Sydney	'00	5.0
Nagano	'98	2.2
Atlanta	'96	4.2
Lillehammer	'94	2.2
Barcelona	'92	9.7

* In 2015 dollars with the exception of Pyeongchang (2018) and Tokyo (2021). Tokyo value is an estimate.
Sources: Nikkei, Asahi, Forbes and Flyvbjerg et al. via Play the Game

Source: Statista

Figure 2: Time Series Cost of Olympics

Source: (Budzier, et al., 2016)

3.0 LITERATURE REVIEW

Many countries have put forward bids to the International Olympic Committee to host the Olympics, but since 2008 the number of bids has only decreased every four years (Huang, et al., 2022). One factor leading to this decline in bids is the increasing costs to host mega-events, as seen in Figure 1. The other factor is the confusion on if these mega-events bring in enough of an economic benefit to pay for those high costs. Previous reports and studies show that there is no clear cut answer or consensus to the question. Some of the studies found that there is no significant effect of hosting the Olympics on GDP growth, (Whitson & Horne, 2006; Kobierecki & Pierzgalski, 2022; Ferris, et al., 2022). In a review of the costs/benefits of these events, (Whitson & Horne, 2006) looked at Japan and talked about how construction of new infrastructure that takes place for the games is generally looked at as beneficial for the country. It's believed to add jobs make space for future events, but what they found was that in cases the arenas or stadiums don't see enough use to stay profitable once the mega-events have come and gone.

Many found short term benefits immediately after hosting the event, (Anton, et al., 2011; Elahi, et al., 2021). These short-term benefits come in the form of job growth and tourism in the 1-2 years preceding, the year of, and the 1-2 years following the event (Elahi, et al., 2021). No studies showing any form of long-term benefits from hosting mega-events was found. One of the main problems with the literature is highlighted by Ferris et al. (2022) is that most of the studies have relatively small sample size and the studies could benefit

from using a larger data set. One of the factors that limits the studies are that the World Cup and Olympic Games are only hosted every 4 years which makes it difficult to collect a large data set that is comparable to some of the control countries or non-host countries (Firgo, 2021).

A couple of the studies that used empirical models to answer their questions about the costs and benefits of these events will be the focus of the literature. (Wan & Song, 2019) found that the 2012 UK Olympics were profitable, but the 2014 Brazil World Cup was not and (Firgo, 2021) found it varied between Summer and Winter Olympics, showing that it can vary on a case-by-case basis. The literature shows that there is no direct yes or no answer to the question of whether mega-events have a positive or negative impact on a country's economy. (Kobiercki & Pierzgalski, 2022) came to a similar conclusion after finding insignificant results for the London Olympics, Canadian Olympics, South African World Cup, and the Brazilian Olympics/World Cup. They believed that although their results did not show a direct positive economic impact from these events, that does not mean that countries do not see some sort of benefit. Each host country handles their preparation for these events differently and contributes different sized investments to it, which means they will receive a different impact from it. One study took it a step further, saying that the state of a countries current development is one of the main factors that determines how hosting will imapct the countries GDP growth, "the World Cup of 2002 did not have the same effect in the dynamism of the economic activity in South Korea and Japan," (Anton, et al., 2011).

4.0 DATA AND EMPIRICAL METHODOLOGY

4.1 Data

The study uses annual panel data from 1999 to 2019. Data were obtained from the World Development Indicators (WDI). The data is from countries that have hosted the Olympics and non-host countries in a similar economic state that were also potential candidates for hosting the Olympics at some point. The countries were chosen based off Kobiercki & Pierzgalski's 2022 work. Summary statistics for the data are provided in Table 1.

Table 1 Summary Statistics

	GDP	LIFE	INF	EXP	IND	TOUR
Mean	36218.69731	77.86154	3.269543	4.52567E+11	4.99E+11	2.39E+10
Standard Error	739.0460861	0.187422	0.253688	23277493244	3.83E+10	1.27E+09
Median	39691.48231	79.03293	2.292253	2.82834E+11	1.88E+11	1.72E+10
Standard Deviation	16591.54348	4.207619	5.695275	5.22578E+11	8.61E+11	2.85E+10
Sample Variance	275279315.1	17.70406	32.43616	2.73088E+23	7.41E+23	8.1E+20
Kurtosis	-0.6443628	-0.19843	100.781	4.939452001	11.19027	7.971425
Skewness	-0.13517057	-0.77838	8.399216	2.184614911	3.221713	2.61049
Range	83778.2573	19.32878	90.2246	2.65081E+12	5.51E+12	1.86E+11
Minimum	3206.730026	65.02756	-4.4781	4797546243	3E+09	4.28E+08
Maximum	86984.98733	84.35634	85.74649	2.65561E+12	5.51E+12	1.86E+11
Sum	18254223.44	39242.21	1647.85	2.28094E+14	2.51E+14	1.2E+13
Count	504	504	504	504	504	504

4.2 Empirical Model

Using the aspects from the studies by Wan & Song (2019) and Kobierecki & Pierzgalski (2022) the model was assembled to account for GDP growth. We added a dummy variable to compare which countries hosted the Olympics and which countries did not.

The model could be written as follow:

$$GDP = \beta_0 + \beta_1 LIFE + \beta_2 INF + \beta_3 EXP + \beta_4 IND + \beta_5 TOUR + \beta_6 CONS +$$

$$\beta_7 HOST + \varepsilon$$

GDP is the annual growth domestic product per capita in 2017 international dollars. *GDP* is used as an endogenous variable. It demonstrates the benefits that countries stand to gain from hosting the Olympics. Measuring GDP per capita is important to help gauge a better economic comparison between the countries without population size impact the results.

Independent variables consist of six variables obtained from the WDI. Appendix A and B provide data source, acronyms, descriptions, expected signs, and justifications for using the variables. First, *LIFE* represents the country's life expectancy at birth in total years. This helps account for the contribution that human capital makes towards a country's GDP. Second, *INF* accounts for inflation in consumer prices by annual percentage. Third, *EXP* represents the amount of exports a country exchanges in current US dollars. Exports are a big contributing factor to a country's GDP. Fourth, *IND* measures the value of industry added in US dollars which includes construction. This is included to account for any value added through the arenas, hospitality services, restaurants, or anything else that is built to accommodate the events. Fifth, *TOUR* is a measure of international tourism expenditures in current US dollars to account for the increase in visitors that occurs during and after the events. Sixth, CONS is a measure of consumption expenditure in current US dollars to account for one of the major GDP contributors. Lastly, *HOST* is a dummy variable is labeled 1 if the country has hosted the Olympics within the 20 year time period and 0 if the country has not. This allows for the comparison between the host and nonhost countries to measure the impact of the Olympics.

5.0 EMPIRICAL RESULTS

The empirical estimation results are presented in Table 2.

Table 2: Regression Results

GDP per capita	
CONSTANT	-185220.15 (9515.77)***
LIFE	2825.05 (121.82)***
INF	177.59** (84.61)
EXP	7.417E-09 (2.708E-09)***
IND	-1.218E-08 (1.773E-09)***
TOUR	4.959E-08 (4.0397E-08)
CONS	2.804E-09 (5.117E-10)***
HOST	-4021.47268 (888.785)***
R^2	0.698822121
F-statistics	164.41
Observations	503

Note: *** , **, and * denotes significance at the 1%, 5%, and 10% respectively. Standard errors in parentheses

The LIFE variable estimate was significant at the 1% level. The estimate indicated that LIFE was positively associated with GDP, meaning that as a countries life expectancy increases, GDP per capita increases. The model estimates that a one year increase in life expectancy will increase the country's GDP per capita by approximately $2825.05. The INF variable was significant at the 5% level. The estimate indicated that a 1% increase in inflation will increase a country's GDP per capita by approximately $177.59. In theory, inflation should have a negative effect on GDP per capita, so the positive correlation in the model may be due to the increase on wages that comes to combat inflation. The EXP variable was significant at the 1% level. The estimate indicated that a $1 billion increase

in exports increases GDP per capita by approximately $7.42. The IND variable was significant at the 1% level. The estimate indicated that a $1 billion increase in IND decreases GDP per capita by $12.18. This is as expected since construction of new stadiums and arenas can be costly. The TOUR variable was the only variable that was not significant at any level. The model estimate indicated that a $1 billion increase in tourism increases GDP per capita by $49.59. The CONS variable was significant at the 1% level. The estimate indicated that a $1 billion increase in CONS will increase a country's GDP per capita by approximately $2.80. The HOST variable was significant at the 1% level. The estimate indicated that hosting the Olympics would result in approximately a $4021.47 decrease in GDP per capita. This result implies that hosting the Olympics has negative impacts on GDP growth.

5.0 CONCLUSION

In conclusion, hosting the Olympics have negative effects to GDP per capita. The results in this paper imply that countries looking to host the Olympics should investigate the opportunity costs to see if the funding should be dedicated to other areas. If the country has a low GDP per capita, it should not consider hosting the Olympics due to the negative affects it would have on it's peoples welfare. If a country is to host the Olympics, it should not devote a large amount of funding to building new arenas, stadiums, or infrastructure. This conclusion can be made from the negatively correlated IND variable, since construction is included. Instead, countries should take the approach that the U.S. is taking for hosting FIFA World Cup games in 2026. The U.S. is using already existing stadiums to host the games, instead of building any new arenas. As seen in Figure 1, the two most expensive Olympics were the Sochi and Tokyo Olympics, which both had new arenas constructed for the events.

Instead of building these fancy, new stadiums, host countries should be devoting their Olympic budget to attract tourists and market domestically produced products. Seeing that the results showed increased tourism and exports have a positive effect on GDP per capita, it would be beneficial to focus on these two areas. Possible areas host countries could look to fund would be improving infrastructure to be able to account for added tourism, such as improving public transportation or hotel services to attract visitors. Improving these areas would have lasting benefits for the country after the events, not just during.

Appendix A: Variable Description and Data Source

Acronym	Description	Data source
GDP	GDP per capita based on purchasing power parity (PPP). PPP GDP is gross domestic product converted to international dollars using purchasing power parity rates. An international dollar has the same purchasing power over GDP as the U.S. dollar has in the United States. GDP at purchaser's prices is the sum of gross value added by all resident producers in the country plus any product taxes and minus any subsidies not included in the value of the products. It is calculated without making deductions for depreciation of fabricated assets or for depletion and degradation of natural resources. Data are in constant 2017 international dollars.	World Bank Group – World Development Indicators
LIFE	Life expectancy at birth indicates the number of years a newborn infant would live if prevailing patterns of mortality at the time of its birth were to stay the same throughout its life.	World Bank Group – World Development Indicators
INF	Inflation as measured by the consumer price index reflects the annual percentage change in the cost to the average consumer of acquiring a basket of goods and services that may be fixed or changed at specified intervals, such as yearly. The Laspeyres formula is generally used.	World Bank Group – World Development Indicators
EXP	Exports of goods and services represent the value of all goods and other market services provided to the rest of the world. They include the value of merchandise, freight, insurance, transport, travel, royalties, license fees, and other services, such as communication, construction, financial, information, business, personal, and government services. They exclude compensation of employees and investment income (formerly called factor services) and transfer payments. Data are in current U.S. dollars.	World Bank Group – World Development Indicators
IND	Industry (including construction) corresponds to ISIC divisions 05-43 and includes manufacturing (ISIC divisions 10-33). It comprises value added in mining, manufacturing (also reported as a separate	World Bank Group – World Development Indicators

	subgroup), construction, electricity, water, and gas. Value added is the net output of a sector after adding up all outputs and subtracting intermediate inputs. It is calculated without making deductions for depreciation of fabricated assets or depletion and degradation of natural resources. The origin of value added is determined by the International Standard Industrial Classification (ISIC), revision 4. Data are in current U.S. dollars.	
TOUR	International tourism expenditures are expenditures of international outbound visitors in other countries, including payments to foreign carriers for international transport. These expenditures may include those by residents traveling abroad as same-day visitors, except in cases where these are important enough to justify separate classification. For some countries they do not include expenditures for passenger transport items. Data are in current U.S. dollars.	World Bank Group – World Development Indicators
CONS	Final consumption expenditure (formerly total consumption) is the sum of household final consumption expenditure (private consumption) and general government final consumption expenditure (general government consumption). Data are in current U.S. dollars.	World Bank Group – World Development Indicators

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