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Economic impacts of hosting the winter olympics on GDP per capita

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Abstract. The Winter Olympics have been held since 1924, and each time host countries spend billions on organization, so it is important for them to know if this pays off in the future. This paper examines whether hosting the Winter Olympic Games yields long-term economic benefits. To achieve this, the difference-in-difference model for relative changes in Gross Domestic Product per capita was estimated. A difference-in-difference estimator examines post-Olympic impacts for host countries between 1972 and 2014. Regression results provide no additional long term impacts of hosting the Winter Olympics on GDP per capita.

Keywords: Winter Olympics; difference-in-difference; Gross Domestic Product; economic growth; long-term

1 Introduction

The Winter Olympics are one of the largest sporting events in the world with hundreds of thousands of people coming to see it (Forbes announces that more than 1 million tickets were sold to the 2018 Pyongyang Winter Olympics), and even more of them are watching the Games on TV screens. Such an influx of visitors brings significant revenue to the country's tourism sector. Additionally, international exposure of a host country may benefit international trade and capital flows. But there is another side of the coin – a host country spends billions to host an event of such magnitude. In order to host the Winter Olympics, countries must make sizable investments in their infrastructure, such as arenas, airports, highways. Proponents of the Olympics argue that this investment will pay off through increased economic growth, but research confirming these claims is lacking. The present paper will test the hypothesis that hosting

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the Winter Olympics brings long-term economic benefits that would not be realized otherwise. To achieve this goal, we will apply the difference-in-difference (DD) model to the transformed GDP per capita data of the Olympics host and finalist countries.

2 Winter Olympic Games

2.1 Olympics and economic impacts

Every four years, people from all over the world prepare for one of the biggest international sports events – the Winter Olympics. The organization of this event is considered such a great honor that states are ready to spend extraordinary sums of money just in order to submit their candidacy. A digital personal finance publication MoneyWise publishes that the total cost of planning, hiring consultants, holding PR events and travel just to make the bid can fall anywhere between 50 and 100 million dollars. Winners of the selection spend even higher sums to build new arenas, hotels, upgrade infrastructure, and more. For example, the most expensive Winter Olympics ever held were the 2014 Winter Games in Sochi, Russia. They were originally budgeted at $12 billion, but with cost overruns and increased security the final price tag came in at $50 billion [5].

Whether such spending on the Olympics and other global events is reflected in the country's subsequent economic growth is still a hotly debated topic. Some argue that organizing events of this magnitude creates new jobs, attracts foreign investment, and ultimately leads to long-term economic growth in the host city, and thus in the state. In addition, the city is becoming better known and more attractive to tourists, which means that the country will receive a rise in GDP. Opponents, meanwhile, argue that any benefits are short-lived and do not outweigh the costs involved.

Literature examining the economic impact of other global sporting events, such as the Summer Olympics or the World Cup, is abundant, but there is a lack of research that delves deeper into the Winter Olympics and their impact on economic performance. The Winter Olympics differ from the Summer Olympics or the World Cup in many ways. First of all, the World Cup is a broader, territorially, event, as the competition takes place in more than one city. In addition, most of them are industrialized, so they already have the right infrastructure, which allows to reduce costs. The Winter Olympics usually take place in lesser-known cities, which is why a lot of attention and funding needs to be paid to improving infrastructure before organizing the Games. The Summer Olympics are also held in large and well-known cities, such as London, Beijing or Sydney. While such cities can reduce costs due to better initial preparation, they are already globally known and raising the profile of the name will not attract significant revenue.

Based on this information, the main objective of the research is to investigate whether hosting the Winter Olympics has an impact on the economy of the host country in long-term and, if so, what the impact it is. If the impact were positive, it would suggest that the state should step up its efforts to win the right to host the Olympics. Otherwise, it would mean that smaller cities and countries would have to refrain from running for organizers.

2.2 Olympic bid and selection process

The process of selecting an Olympic host city typically begins almost a decade before the actual hosting the Games. According to the information published on the official

Table 1. Voting outcomes of the bids of Games held in the period 1972–2014.

Winter Olympic host (year)	No. of candidates	Rounds	% of votes received by winner in the first round	Ranking of winner in the first round	% of votes received by winner in the final round
Japan (1972)	4	1	52	1	52
Australia (1976)	4	3	–	–	–
USA (1980)	1	–	–	–	–
Canada (1988)	3	2	49	1	61
France (1992)	7	6	23	2	67
Norway (1994)	4	3	30	1	54
Japan (1998)	5	5	24	1	52
USA (2002)	9	1	61	1	61
Italy (2006)	6	1	60	1	60
Canada (2010)	8	2	37	2	51
Russia (2014)	7	2	36	2	52

Source: https://gamesbids.com/eng/past-bid-results/.

website of the Olympic Games www.olympics.org, informally, the process begins with the International Olympic Committee (IOC) sending out inquiries to determine which cities might be interested in hosting an upcoming Olympics. Cities then communicate with their respective National Olympic Committees (NOC) to indicate their interest in representing their country as an applicant to the IOC. Each NOC then promotes a single competitive city as an applicant to the IOC.

The formal process for becoming a Winter Olympic host city has two distinct phases: the application stage and the candidate stage. The application stage consists of interested cities filling out a detailed questionnaire that addresses such questions as "What are your principal motivation and objectives for hosting the Winter Olympic Games?", as well as detailed questions regarding proposed or existing infrastructure related to Olympic sporting venues and information on athlete lodging facilities and security. The cities that demonstrate sufficient potential are advanced to the candidate phase. A detailed plan for the preparation of the Olympic Games needs to be provided at this stage. It must address a number of event-related issues including overall vision, legal and political structure of the Olympic host committee, environmental conditions, marketing, security, financing, accommodations, sport venues, transportation, and media. Each candidate must guarantee funding for all aspects of the Olympic Games. Upon reviewing candidate files, the IOC Evaluation Commission conducts a series of site visits to evaluate both planned and existing infrastructure and organizations that were mentioned as part of a candidate's bid. After evaluating all the candidate cities, the IOC Evaluation Commission conducts a formal vote to determine the host city.

The host city and country are selected through a multi-round voting process depending on the number of candidates. At each round the candidate with the lowest number of votes is eliminated. Rounds are held until any candidate receives at least 50% of the total votes. In order to have enough time to implement the infrastructure, funding and other plans, the organizer of the Winter Olympic Games is announced approximately 6–7 years before the date of the Games. The IOC monitors preparations for the Olympics to ensure quality and may threaten to relocate the event if plans are delayed. Table 1 shows voting outcomes of Winter Olympics bids for the study period. It can be seen that 5 selections were won in the final stage with less

than 60% of the total votes. In several cases, the winner of the selection did not take the lead after the first stage. The 1976 Games were organized by Austria, although it did not participate in the selection. This happened because in 1972, the city of Denver waived the right to host the Games. Meanwhile, only one candidate was present in the selection for the organization of the 1980 Olympics, so the voting did not take place.

2.3 Literature review

Billings and Holladay (2012) [3] examined data on Olympic host cities from 1956 through 2004 to determine what, if any, the long term economic effects hosting the Summer Olympic Games has on its host city. They compared the host city of each Summer Olympics to the other finalists for the same Olympics. For example, they compared Atlanta to its two competitors for the 1996 Games: Manchester and Belgrade. The reason for doing this was to eliminate what they perceived as self-selection bias in other studies. Self-selection bias can occur when someone or something selects itself into a group. The idea being that cities that select themselves to host an Olympics may have special characteristics that make them difficult to compare to other cities, even if they are in the same region. In order to test if hosting Olympics has long term impacts, they adopted difference-in-difference methodology with the assignment of treatment and control groups based on the Olympic selection process. The results showed a number of interesting findings. First, population in host cities grew at a faster rate, and continues to grow at a faster rate, than the other finalists. They note however, that these findings may be misleading insofar as the population growth in more recent Olympic hosts is equal to or lower than their finalist counterparts. Next, they concluded that GDP growth for host cities was on par with the finalist cities implying that there is no benefit to GDP by hosting. In summary, regression results provided no long term impacts of hosting the Olympics on two measures of population, real Gross Domestic Product per capita and trade openness.

Miyoshi and Sasaki (2016) [8] used the synthetic control method to access the hosting impact on labour market outcomes for the 1998 Winter Olympic Games in Nagano. They build counterfactual dynamics of various outcomes for Nagano city and its neighboring areas and compare it with the actual data of these variables. In this way they had determined how the local economic and labour market outcomes would have been different had the Olympic Games not been held there. Authors do not find evidence of a long-term positive impact of the Nagano Olympics on the local economy, in terms both total GDP and GDP per capita. Furthermore, they do not observe either a short-run or long-run impact on the local labour markets where Olympic events were held.

In 2016, Nicholson and Jaramillo investigated the generalized economic effect of the Winter Olympics [6]. Their goal was to determine if hosting Winter Olympics makes economic sense on the aggregate, not just for specific cities. As in the previous work, the study involves not only the hosting countries, but also the finalists. The average GDP per capita for the four years before and after the Olympic Games, government expenditure, economic openness and foreign investment were analyzed. Models consistently showed that the most significant factor in predicting a country's post-Olympics GDP were pre-Olympics GDP and foreign direct invest as a percentage

of GDP. Chow test showed that the null hypothesis cannot be rejected, implying that there is no difference between hosting and not hosting Winter Olympics on a country's GDP, but low R^2 values on models as well as the number of significant variables cast a shadow of doubt on this result.

Also, there are some other econometric studies providing estimates of the impact of hosting an Olympics on employment and/or migration. For the 1984 Los Angeles games and the 1996 Atlanta games, Baade and Matheson (2002) [2] find insignificant impacts on post-Olympic metropolitan area employment while controlling for population, income, taxes as well as other macroeconomic trends. Lybbert and Thilmany (2000) [7] estimate the impact of four U.S. hosted Olympics on county level employment and net migration, and found positive impacts. These positive impacts were greater for Summer Olympic hosts relative to Winter Olympic hosts. Hotchkiss, Moore and Zobay (2003) [4] find a 17% increase in employment in counties that contained an Olympic venue relative to similar counties that did not host an event in the 4 years following the 1996 Olympics.

Based on the analyzed literature, our research will be conducted at the country level. It will include not only the countries that hosted the Winter Olympics, but also those countries that have reached the final candidate stage. In order to investigate whether the organization of the Winter Olympics has an impact on the country's economics, we will apply a difference-in-difference model with treatment and control groups. The Winter Olympic host cities will represent the treatment group, and the finalists will represent the control group. We will assess the country's economic status in terms of GDP per capita.

3 Data analysis

3.1 Description of the data

The research uses data on the GDP per capita of the candidate countries in US dollars at the current exchange rate. Data source is the World Bank. For all countries, data were collected at country level for several reasons:

1. The Winter Olympics are usually held in a larger area, often involving more than one region, so the Games can have a potential impact on the economy of the whole country.
2. Host or finalist cities are smaller and less well known, making it difficult to obtain data. Some of the largest cities that have hosted the Winter Olympics are Sapporo, Japan (area 112 126 km^2, population of 1 957 914), Calgary, Canada (area 82 556 km^2, population of 1 239 220), while Tokyo, the organizer of the Summer Olympics, has a population of 13 929 286 and 219 396 km^2 of total area.
3. Lack of data for small cities and regions.

3.1.1 Hosts and finalists

As mentioned before, we will use data not only of the countries that hosted the Winter Olympics, but also of the countries that participated in the selection process,

Table 2. Olympic host and finalist countries 1972–2014.

Olympiad	XI	XII	XIII	XIV	XV	XVI
Year	1972	1976	1980	1988	1992	1994
Host	Japan	Austria	USA	Canada	France	Norway
Finalist	Finland	Switzerland	–	Sweden	Bulgaria Germany	–

Olympiad	XVII	XVIII	XIX	XX	XXI
Year	1998	2002	2006	2010	2014
Host	Japan	USA	Italy	Canada	Russia
Finalist	Spain	Switzerland Slovakia	Finland Poland	Andorra China Bosnia and Herzegovina	Kazakhstan Georgia Bulgaria

Source: https://gamesbids.com/eng/past-bid-results/.

but did not win. The latter were included in the study due to self-selection, which was emphasized in their work by Billings and Holladay [3]. Our process of coding host and finalist countries for estimation was complicated due to the fact that some countries bid to host the Winter Olympics in more than one year, so several rules were introduced. If the finalist for a given Olympiad ever hosted an Olympiad from 1972 to 2014 then it was excluded as a finalist country. For example, Italy bid for the 1998 Olympics, but is not included as a finalist because it hosted the 2006 Olympics. Any country that bid in multiple Olympics and never became a host country was assigned to the first Olympics upon which the country became a finalist. Exclusively, for the second time, countries are included as finalist or host country when there is a gap of at least twenty years between bids. In Table 2 you will see the hosts and finalists assigned to the Olympics under this system. Furthermore, North Korea finalist for the 2010 and 2014 Olympics was excluded from the set of studied countries due to the lack of data.

3.1.2 Investigation period

In the investigation period, we include the Winter Olympics from 1972 to 2014. Olympics prior to 1972 were excluded due to a lack of data and to avoid economic impacts from wars, depressions, etc. The 1984 Olympics in Yugoslavia were also excluded from the investigation period. Since the former Socialist Federal Republic of Yugoslavia collapsed in 1992 and the Federal Republic of Yugoslavia was formed, we cannot assess the economic impact of these Games.

The selection process for the Winter Games and the timing of the games themselves divides the analysis into three respective time periods: before the announcement of the host city for a given Olympiad, the time between the announcement of the host city and the actual playing of the Olympics and after the playing of the Olympics. As our focus of interest is on the longerterm impacts of the Olympics, we focus on comparisons from before to after the actual playing of the Olympics. There may be some impacts between announcement and hosting the games, which are related to the construction activity in preparation for the Olympics. For example, construction activity may provide a temporary influx of workers and income to a city, but this impact should be limited to before and during the Olympics.

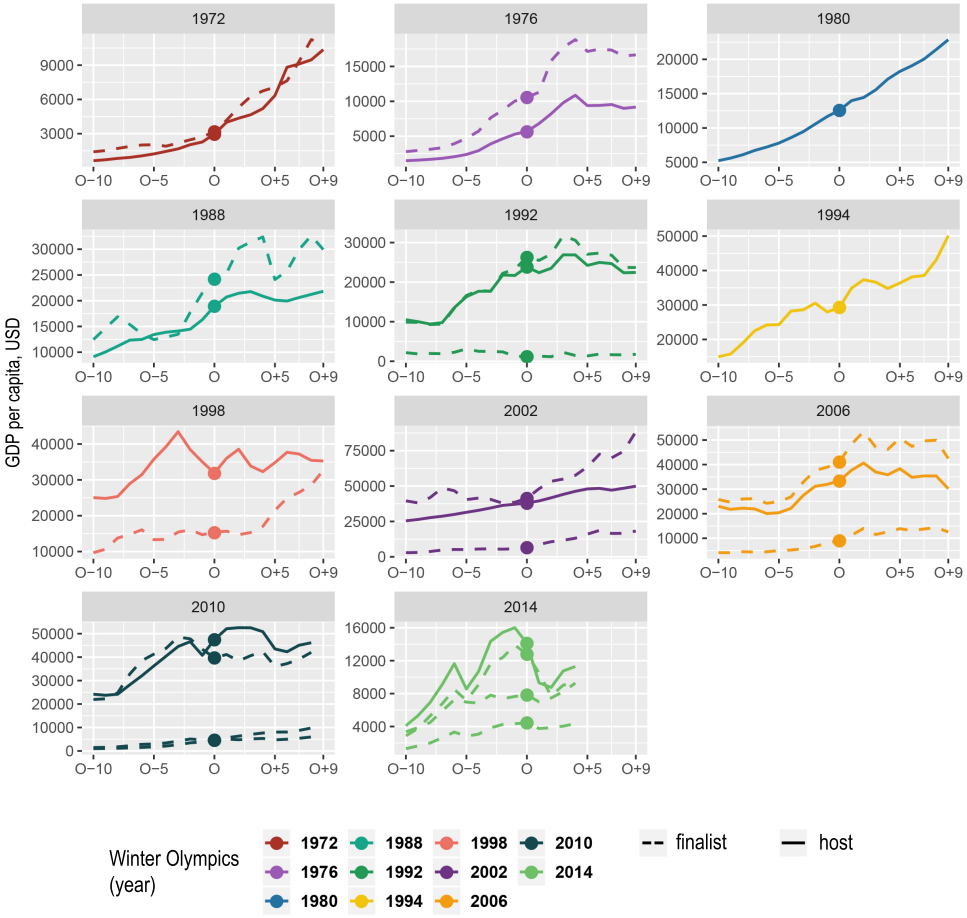

Fig. 1. GDP per capita of Olympics host and finalist countries.

We reduced the research period of each Olympiad to twenty years and divided it into two parts. The first part is ten years before the Olympics and the second is ten years after the Olympics, including the year in which the Olympics took place. This time period was selected based on Billings and Holladay research [3]. To make the data easier to interpret, we distance ourselves from the specific dates of the Olympic Games and unify the time scale, where we will mark the Olympic year at a point O, years before the Olympics $O-k$, $k=1,\ldots,10$ and years after the Olympics $O+l$, $l=1,\ldots,9$. In this study case

$$O=\{1972,1976,1980,1988,1992,1994,1998,2002,2006,2010,2014\}.$$

The GDP per capita of the hosts and finalists of the Olympics tends to increase overall over the above twenty-year periods (Fig. 1). It can be seen that the GDP per capita of the 1988 Olympics finalist grew faster than the host country after the Olympics. Meanwhile, during the 1976, 1992, and 2006 Olympics, this indicator for

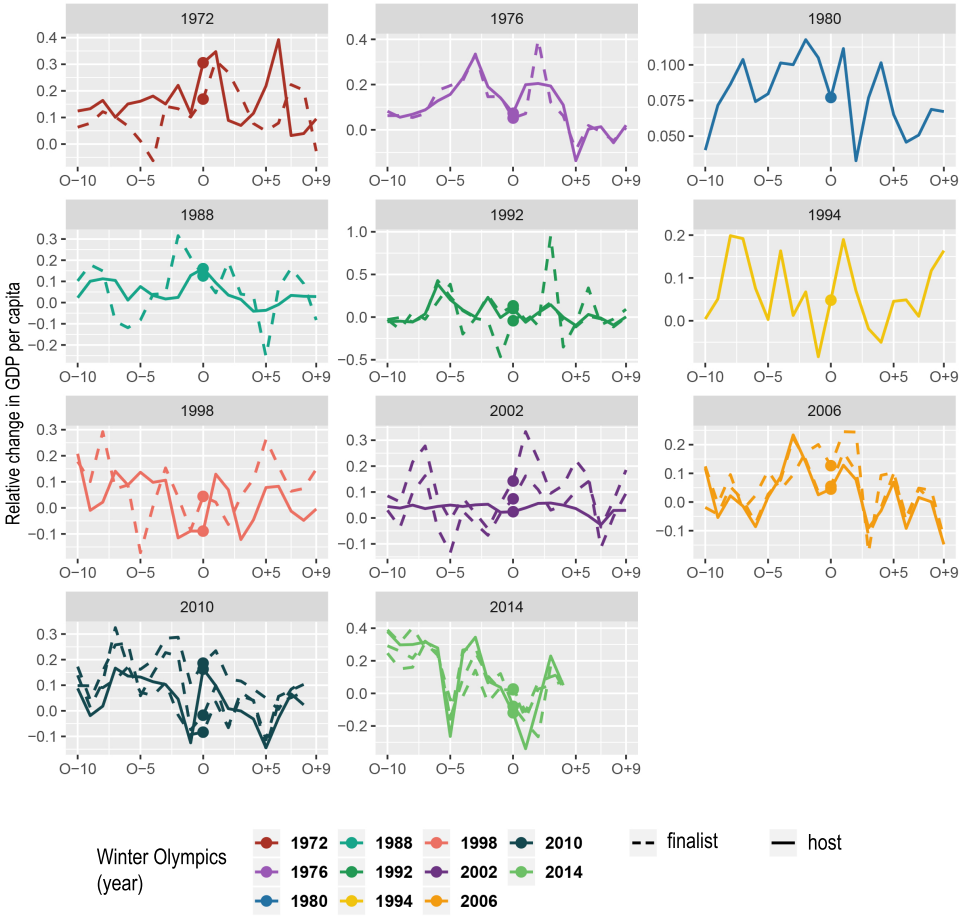

Fig. 2. Relative changes in GDP per capita of Olympics host and finalist countries.

hosts and finalists changed quite parallel after the Games. The graphs show that only the 2014 Olympics countries suffered more pronounced losses immediately after the event.

3.1.3 Data transformation

To eliminate the obvious differences in GDP per capita between countries, we calculate the relative change $Y_{t,i}$ for country i in year t by equation

$$Y_{t,i} = \frac{X_{t,i} - X_{t-1,i}}{X_{t-1,i}},$$

where $t = -10, \ldots, 9$, $i = 1, \ldots, 27$, $X_{t,i}$ and $X_{t-1,i}$ are the corresponding values of GDP per capita. Representing the obtained data graphically (Fig. 2), we can see that the differences between the GDP per capita values and trends have disappeared.

3.1.4 Final variables

So, we have a panel data set consisting of data of 21 countries over 20-year periods, except for the 2010 and 2014 Olympics countries. For these countries, we have the periods of 19 and 15 years, respectively. Since six countries are included twice in the set of finalist and host countries, the final result is a data set of 3 variables and 516 country-year observations. Briefly about them:

- **Relative changes in GDP per capita (*GDPchange*).** Quantitative variable showing how much the country's GDP per capita has changed from year $t-1$ to year t compared to year $t-1$.
- **Olympics host country indicator (*host*).** A dummy variable assigned a 1 for host countries and 0 for finalist countries.
- **Post-Olympics period indicator (*postOlymp*).** Second dummy variable which is equal to 1 for observations after Olympics and 0 for observations before Games.

3.2 Empirical data analysis

Table 3 provides descriptive statistics of *GDPchange* for all countries and for the hosts and finalists separately. It shows that the GDP per capita of all countries changes by an average of 7.4% per year. The scatter plot (Fig. 3) also shows that there have been more positive changes. The mean and median do not differ significantly, which would mean that there are no outliers in the data, but the scatter plot shows several of them. One of outliers shows that a country's GDP per capita has increased by almost 100% from the second to the third post-Olympic years. Based on the data in the table, we can determine that this is the finalist country. We also see some negative outlying values in the plot. These values are likely to neutralize the aforementioned outliers, so the mean and median do not show any of them.

Analyzing the data of hosts and finalists separately, it can be noticed that the average annual change of the host countries (6.7%) is lower than that of the countries that did not host (7.9%). In addition, the standard deviation of the latter is also smaller. A histogram of relative changes in GDP per capita (Fig. 4) shows that the data have approximately normal distribution.

Table 3. Descriptive statistics.

Variable	Obs	Mean	Max	Min	Std. dev.	Median
			All countries			
GDPchange	516	0.074	0.954	−0.464	0.127	0.067
			Host countries			
GDPchange	214	0.067	0.392	−0.339	0.107	0.056
			Finalist countries			
GDPchange	302	0.079	0.954	−0.464	0.139	0.073

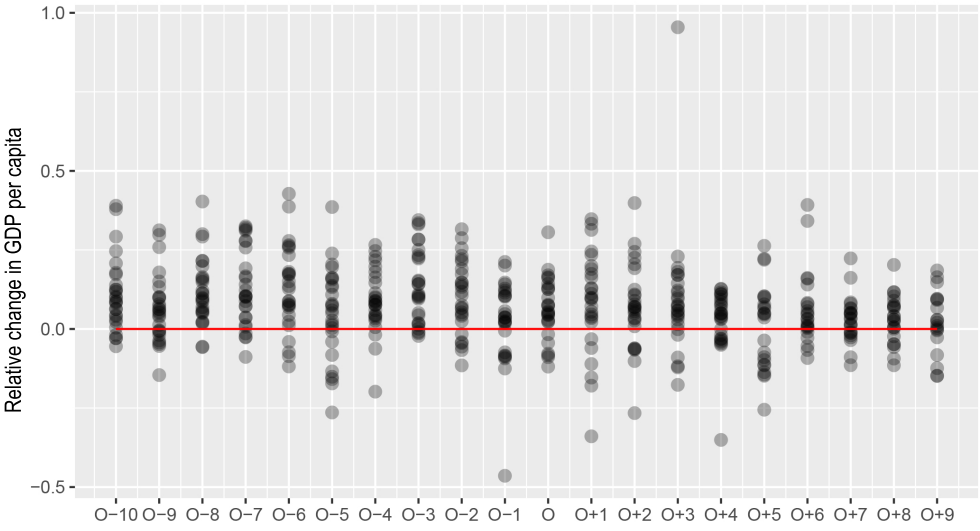

Fig. 3. Scatter of relative changes in GDP per capita.

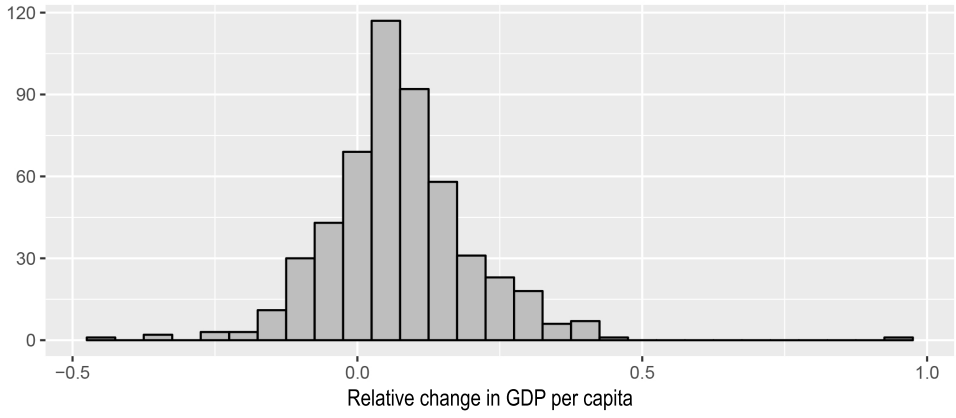

Fig. 4. Distribution of relative changes in GDP per capita.

4 Testing hypothesis

4.1 Hypothesis of normality

The Shapiro–Wilk test tests the null hypothesis that a sample $x_1, \ldots, x_n$ came from a normally distributed population [9]. We get that the statistic $W = 0.95554$ is statistically significant, so we reject the null hypothesis. Consequently, according to the Shapiro-Wilk test results, the data are not normally distributed, but it should be noted that for larger samples, this test may be too conservative and to reject the null hypothesis too easy.

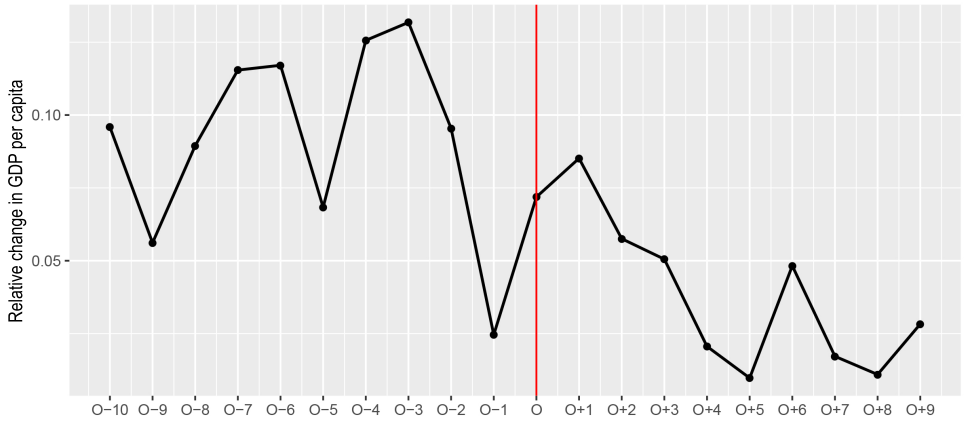

Fig. 5. Average relative change in GDP per capita of host countries.

4.2 Comparison of two distributions

To determine whether the average change before the Olympics for all host countries differs from the average change after the Olympics, we will take the Mann-Whitney U test. This non-parametric test was chosen due to the small sample size and not normally distributed data. Averages for each t year were calculated by the following equation

$$\bar{Y}_t = \frac{1}{n}\sum_{i=1}^{n} Y_{t,i} = \frac{Y_{t,1} + Y_{t,2} + \cdots + Y_{t,n}}{n},$$

$Y_{t,i}$ – relative change in GDP per capita of host country i in year t, n – number of Olympiads.

The resulting sample is shown in Fig. 5. We divide the sample into two parts: from $O-10$ to $O-1$ and from O to $O+9$. For these samples we will test the following hypothesis:

$$\begin{cases} H_0 : \text{distributions are not different,} \\ H_1 : \text{distributions are different.} \end{cases}$$

Test statistic U is given by

$$U_1 = n_1 n_2 + \frac{n_1(n_1+1)}{2} - R_1 \quad \text{and} \quad U_2 = n_1 n_2 - \frac{n_2(n_2+1)}{2} - R_2,$$

where n_1, n_2 – sample sizes, R_1, R_2 – sums of the ranks in sample.

Results of the test ($W = 89$, p-value $= 0.002089$) have showed that there is a statistically significant difference between the relative changes in the GDP per capita of the Winter Olympic host countries before and after the Games.

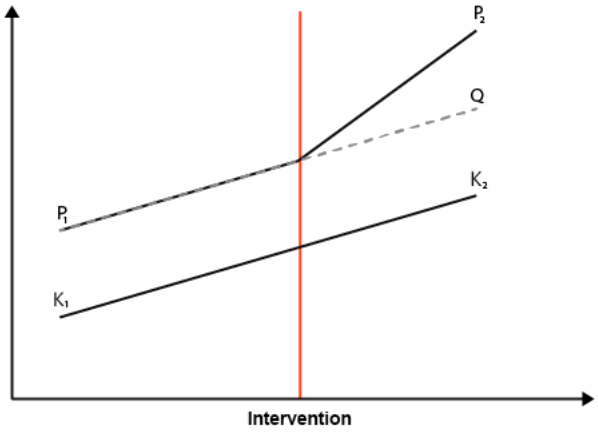

Fig. 6. Geometric interpretation of difference-in-difference method.

5 Methodology

5.1 Model selection

In order to determine whether the hosting Winter Olympics has an impact on the relative changes in the country's GDP per capita, we will apply the difference-in-differences (DD) model. This method is easily applied to panel data and used in cases where two groups are in place and members of one of them are undergoing intervention at some point and members of the other group are not. It is appropriate to assess the impact of sudden changes in the economic environment or changes in government policy [1]. In our case, the group that is undergoing the intervention, i.e. the treatment group, consists of the Winter Olympic host countries and the control group – the finalist countries that bid to organize the Games, but did not win the selection.

5.2 Difference-in-difference model

Difference-in-difference is a statistical technique used in econometrics and quantitative research in the social sciences when it is desired to determine whether a particular intervention has had any effect. It calculates the effect of a treatment (i.e., independent variable) on an outcome (i.e., dependent variable) by comparing the average change over time in the outcome variable for the treatment group, compared to the average change over time for the control group. The DD method requires measurements of both treatment and control groups of the studied parameters at two or more time points. One of the measurements should be taken before the intervention and the other after it.

5.2.1 Geometric interpretation

In the example pictured (Fig. 6), the outcome in the treatment group is represented by the line P, and the outcome in the control group is represented by the line K.

Table 4. Difference-in-difference method calculations.

	Pre	Post	Post-Pre difference
Treatment group	$\bar{Y}_{P,pre}$	$\bar{Y}_{P,post}$	$\bar{Y}_{P,post} - \bar{Y}_{P,pre}$
Control group	$\bar{Y}_{K,pre}$	$\bar{Y}_{K,post}$	$\bar{Y}_{K,post} - \bar{Y}_{K,pre}$
$P - K$ difference	$\bar{Y}_{P,pre} - \bar{Y}_{K,pre}$	$\bar{Y}_{P,post} - \bar{Y}_{K,post}$	$(\bar{Y}_{P,post} - \bar{Y}_{P,pre}) - (\bar{Y}_{K,post} - \bar{Y}_{K,pre})$

The dependent variable in both groups is measured before the intervention (points P_1 and K_1). The treatment group then receives or experiences an intervention, and both groups are measured again (points P_2 and K_2). Not all of the difference between the treatment and control groups at time 2 (that is, the difference between P_2 and K_2) can be explained as being an effect of the treatment, because the treatment group and control group did not start out at the same point at time 1. DD therefore calculates the "normal" difference in the outcome variable between the two groups (difference that would still exist if neither group experienced the treatment), represented by the dotted line Q. The treatment effect is the difference between the observed outcome and the "normal" outcome (difference between P_2 and Q).

5.2.2 Difference-in-difference estimator

Difference-in-difference estimator is defined as the difference between the means of the treatment group dependent variable after and before the intervention differences and the means of the control group dependent variable after and before the intervention differences. The DD method can be implemented according to Table 4, where the lower right cell is the DD estimator. Also, DD is usually implemented as an interaction term between time and treatment group dummy variables in a regression model [3]. The assumptions required to construct DD regression model coincide with the assumptions of the Ordinary Least Squares method. In addition, it requires the assumption of a parallel trend which means that in the absence of treatment, difference between the treatment and control group is constant over time.

6 Model parameters estimation and interpretation

We can see in Fig. 7 that difference between the groups of countries is not constant, but the general trend is similar, so we will assume that the assumption of a parallel trend is fulfilled. In order to find difference-in-difference estimator, we will construct a linear regression model with year fixed effects

$$GDPchange_{i,t} = \alpha + \beta host_i + \gamma postOlymp_t + \delta(host_i \cdot postOlymp_t) + year_t + \varepsilon_{i,t}. \quad (1)$$

First model results (Table 5) provide that in the post-Olympic years, the relative change in GDP per capita decreases by 0.0244. This variable is statistically significant at the 0.1 level. Relative changes in this indicator are also declining for the Winter Olympic host countries, but this dummy variable is insignificant. However, in the results of the model, we see that interaction variable is insignificant, and this shows that null hypothesis that hosting Winter Olympics does not cause an additional effect could not be rejected.

Table 5. Regression results.

	GDP change All countries (1)	*GDP change* Without Bulgaria (2)
Intercept	0.0991	0.1042
	(0.0675)	(0.0561)
Olympic host city indicator	−0.0104	−0.0205*
	(0.0123)	(0.0104)
Post-Olympic time period indicator	−0.0244*	−0.0374***
	(0.0124)	(0.0104)
Olympic host city*	−0.0136	0.0011
Post-Olympic time period	(0.0175)	(0.0149)
R^2	0.12	0.34
N	516	496
Fixed effects	Year	Year

Note: $^*p < 0.1$; $^{**}p < 0.05$; $^{***}p < 0.01$.

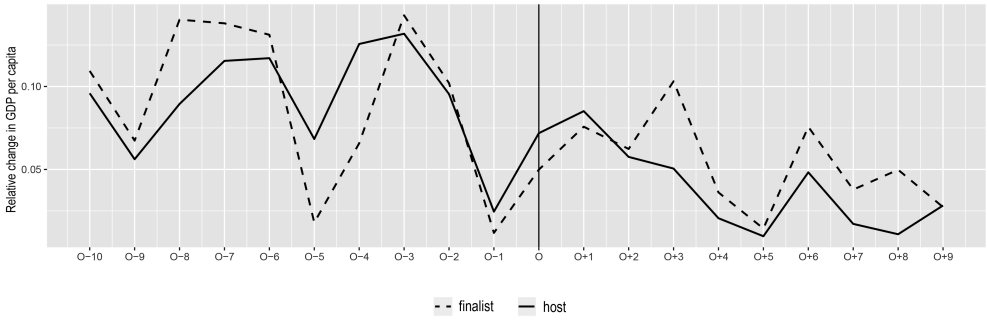

Fig. 7. Parallel trend assumption verification.

As the analysis of the data found an outlier in the data, which is likely to be mistaken, we will make another model after removing the finalist of the 1992 Olympics, Bulgaria. The second model (Table 5) explains a slightly larger part, i.e. 34% variation in relative changes in GDP per capita than the first one (12%). In this model, intercept α is slightly increased. In the post-Olympic years, relative changes in GDP per capita decline even further, and this variable is statistically significant at the 0.01 level. The "natural" difference between host and finalist countries in the model remains insignificant. As in the first model, the DD estimator is not statistically significantly different from zero. Hypothesis that the Winter Olympics do not affect the relative changes in the country's GDP per capita is still not rejected.

7 Conclusion

The estimated models have provided that the actual effect of hosting the Winter Olympics is not statistically significant. In addition, the declining relative change in GDP per capita in the post-Olympic years may be consistent with the theory that host

countries bid away potential benefits in an effort to win the right to host the games. High costs and a competitive selection process may reduce or completely neutralize potential long-term economic benefits, but a separate study should be performed to justify this. As the results have shown that hosting the Winter Olympics does not affect the country's economy, in terms of GDP per capita, in the long run, countries should weigh the public costs and specific potential benefits (improved infrastructure, arenas, etc.) before submitting their candidacy. It may be the case that overall impacts are limited, but specific elements of Olympic investment are beneficial for the long-term growth of a country.

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REZIUMĖ

Žiemos olimpinių žaidynių poveikis ekonomikai BVP vienam gyventojui kontekste

A. Žečkytė

Žiemos olimpinės žaidynės vyksta nuo 1924-ųjų metų ir kaskart jas rengiančios valstybės organizavimui išleidžia milijardines sumas, todėl natūralu, jog organizatoriams svarbu žinoti, ar žaidynių rengimas atsipirks ateityje. Šio darbo tikslas – ištirti, ar žiemos olimpinių žaidynių organizavimas turi įtakos šalies ekonomikai ilguoju laikotarpiu. Siekiant atsakyti į šį klausimą panaudotas dvigubo skirtumo analizės metodas, kuris pritaikytas bendrojo vidaus produkto vienam gyventojui santykiniams pokyčiams. Taikant šį metodą siekta nustatyti, ar žiemos olimpinių žaidynių organizavimo efektas yra statistiškai reikšmingas. Šio metodo taikymo rezultatai parodė, jog žiemos olimpinių žaidynių organizavimas neturi poveikio ekonomikai ilguoju laikotarpiu.

Raktiniai žodžiai: žiemos olimpinės žaidynės; dvigubo skirtumo analizės metodas; poveikis ekonomikai; ilgasis laikotarpis