Should Countries Host the Olympics?

The Impact on Host Countries' Economy, Poverty, and Inequality

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Abstract

This paper researches the effect of hosting the Olympics on the host country's economy, poverty levels, and inequality levels in the ten years after hosting the event. The research is conducted using difference-in-differences and matching methods comparing host countries to countries who bid to host the games but were not selected. The results show that there is no statistically significant impact on economic measures such as Gross Domestic Product (GDP) per capita, Foreign Direct Investment or trade in the ten years after the games. In addition, the research also finds that there is a statistically significant negative impact in the GDP growth rate ten years after hosting. In regard to social implications, the matching results show a statistically significant impact in rising inequality levels of the host countries compared to bid countries, as well as an increase in the poverty gap. The paper concludes by addressing some policy recommendations in order to ensure hosting the Olympics does not lead to an increased inequality.

Keywords: Olympics, economy, inequality, poverty

1. Introduction

Once every two years, the sporting world turns its eyes to the major sporting event that is the Olympics. Alternating between winter and summer events, the Olympics aspire to promote social development, among other principles, through sport.[1] The financial implications of hosting the Olympics are enormous and can be seen as an investment risk. This has been demonstrated through the

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[1] International Olympic Committee, "Olympic Values & Ideals - Olympism In Action", International Olympic Committee, 2020, https://www.olympic.org/the-ioc/promote-olympism.

most recent events of the Covid-19 pandemic delaying the estimated \$12.6 billion (USD) Tokyo Olympics to 2021 and adding \$2.7 billion (USD) to the cost[2] [3] Notwithstanding this considerable financial risk, countries continue to submit bids to host the games citing both the direct and indirect economic benefits the Olympics will bring. Pairing this economic question with the aspired ideal of the games, the research question for this paper is, "Does hosting the Olympics affect the economy, inequality, and poverty of the host country?"

In 2015 the United Nations introduced their Agenda 2030, and with this agenda, the 17 Sustainable Development Goals (SDGs).[4] These 17 SDGs are a way for countries to focus on various aspects of sustainable development by incorporating clear targets set for each goal.[5] This particular research question directly examines the impacts of the Olympics on SDG 1: No Poverty, SDG 8: Decent Work and Economic Growth, as well as SDG 10: Reduce Inequalities.[6] As the Olympics state that their values include social development, and countries seek to host the games primarily for the perceived economic growth, it is important to verify if growth does occur and if it does, who in the country is benefitting. SDG 17 is Partnerships for the Goals, which targets utilizing the synergies between the goals while minimizing the negative impact, or "trade-offs."[7] It is, therefore, important to investigate the impacts of the games on poverty and inequalities for social and sustainable development. These questions are important to investigate for countries that seek to further their development through hosting the games and may not understand the social and economic implications.

2. Research Argument

The Olympics have long been subject to debate about whether or not the financial risk and investments do, in fact, pay-off in the future. Previous research has been divided on this argument, with various studies taking different stances.

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[2] International Olympic Committee, "Joint Statement From The International Olympic Committee And The Tokyo 2020 Organising Committee - Olympic News", International Olympic Committee, 2020, https://www.olympic.org/news/joint-statement-from-the-international-olympic-committee-and-the-tokyo-2020-organising-committee.

[3] Mike Ozanian, "Postponement Of Tokyo Olympics Expected To Increase Games' Cost By \$2.7 Billion", Forbes, 2020, https://www.forbes.com/sites/mikeozanian/2020/03/25/postponement-of-tokyo-olympics-expected-to-increase-its-cost-by-27-billion/#1af904091b7c.

[4] United Nations, "Transforming Our World: The 2030 Agenda For Sustainable Development .:. Sustainable Development Knowledge Platform", Sustainable Development Knowledge Platform, 2015, https://sustainabledevelopment.un.org/post2015/transformingourworld.

[5] United Nations, https://sustainabledevelopment.un.org/post2015/transformingourworld.

[6] United Nations, https://sustainabledevelopment.un.org/post2015/transformingourworld.

[7] United Nations, https://sustainabledevelopment.un.org/post2015/transformingourworld.

A paper by Overmyer (2017) concludes that there are overall positive economic impacts on hosting the Olympics through increased foreign investment.[8] This paper was limited in scope; however, only focusing on the summer Olympic games from 1996 in Atlanta to 2012 in London.[9] The paper "The Olympic Effect" by Rose and Spiegel (2009) also notes the positive effect of the games, particularly in the area of trade and trade openness.[10] Rose and Spiegel (2009) argue, however, that this increase of trade openness is also shown in countries that bid to host the games but do not win the bid.[11] The authors feel that this may be due to the signal this bid sends to the rest of the world about their openness for trade opportunities.[12] Research conducted by Brückner and Pappa (2013) also notes that most of the positive economic impacts occur between two to five years before hosting the games.[13]

The findings mentioned above contrast those in a paper conducted by Billings and Holladay (2012), which notes that "regression results provide no long-term impacts of hosting an Olympics on two measures of population, real Gross Domestic Product per capita."[14]

Based on the conflicting results from the literature cited above, this research paper hypothesizes that hosting the Olympics will positively impact the economic measures of the host country. This argument is due to the level of competition that surrounds hosting the Olympics, and the literature that has shown positive results, especially in terms of trade openness and foreign direct investment. The hypothesis that hosting the Olympics will positively impact the economic measures of the host country opposes the study by Billings and Holladay (2012) that showed no long-term effects on GDP or population at a city level.[15] This research paper will also aim to fill some of the gaps of previous work by widening the scope to investigate both the Summer and Winter Olympic games from 1950-2008. Additionally, this paper hypothesizes that the inequality and poverty levels of the host country will be negatively affected as any benefits that are observed would be observed by businesses and investors in the country and would, therefore, raise inequality and effect the poverty levels of the country.

3. Research Design

8 Michael P. Overmyer, "Economic Impact Analysis On Olympic Host-Cities", Honors Projects 647 (2017), http://scholarworks.gvsu.edu/honorsprojects/647.

9 Overmyer, http://scholarworks.gvsu.edu/honorsprojects/647
10 Andrew K. Rose and Mark M. Spiegel, "The Olympic Effect", The Economic Journal 121, no. 553 (2009): 652-677, doi:10.1111/j.1468-0297.2010.02407.x.

11 Rose and Spiegel, 652-677

12 Rose and Spiegel, 652-677

13 Markus Brückner and Evi Pappa, "News Shocks In The Data: Olympic Games And Their Macroeconomic Effects", Journal Of Money, Credit And Banking 47, no. 7 (2013): 1339-1367, doi:10.1111/jmcb.12247.

14 STEPHEN B. BILLINGS and J. SCOTT HOLLADAY, "SHOULD CITIES GO FOR THE GOLD? THE LONG-TERM IMPACTS OF HOSTING THE OLYMPICS", Economic Inquiry 50, no. 3 (2012): 754-772, doi:10.1111/j.1465-7295.2011.00373.x.

15 Billings and Holladay, 754-772

In order to determine if hosting the Olympics affects the economy, inequality, and poverty of the host countries, a series of tests will be conducted utilizing difference-in-differences methodology as well as matching. Data for the research will be analyzed for years 1950-2018, encompassing sixteen different Olympic games (Figure 1).

Utilizing the difference-in-differences method, the effect of hosting the Olympic games will be compared between a control group and a test group. The control group for the research will be comprised of countries that submitted a bid to host the Olympics but were not successful. The test group for this research will be comprised of the host countries for the Olympics. Data on the host countries and bid countries was compiled from both the Olympic Games website and a Game Bids website.[16][17]

The bidding process generally begins around ten years before the games, subsequently, data will be analyzed from ten years before each Olympic event, to ten years post the event.[18] Data from 1950-2018 will be included in the analysis, standardizing the time for each event so that they can be compared.

For example, for the games held in 1968, the year 1958 will be given the value of -10, 1968 will be given the value of 0, and 1978 will be given the value of +10. The decision to begin the analysis for the 1968 games was due to the uncertainty of the data surrounding World War II and the years that followed.

The following equation (1) was utilized for the difference-in-differences method regression, derived in the Annual Review of Public Health by Wing et al. (2018), and modified for this study.[19] The variable Y_{gt} is the interested outcome for the country (g) and time period (t).

$$Y_{gt} = \beta_0 + \beta_1 H_g + \beta_2 T_t + \beta_3 (H_g \times T_t) + \beta_4 P_{gt} + \epsilon_{gt} \text{ (1)}$$

The outcome variables tested will include the GDP per capita, the growth rate of GDP as a percentage, the amount of trade as a percent of the GDP, foreign direct investment, the Gini coefficient for inequality, and the poverty gap. The data for each of these variables will be obtained from the Quality of Government Institute.[20]

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16 International Olympic Committee, "Olympic Games | Winter Summer Past And Future Olympics", International Olympic Committee, 2020, https://www.olympic.org/olympic-games.

17 "Past Bid Results | Gamesbids.Com", Gamesbids.Com, 2020, https://gamesbids.com/eng/past-bid-results/.

18 Billings and Holladay, 754-772

19 Coady Wing, Kosali Simon and Ricardo A. Bello-Gomez, "Designing Difference In Difference Studies: Best Practices For Public Health Policy Research", Annual Review Of Public Health 39, no. 1 (2018): 453-469, doi:10.1146/annurev-publhealth-040617-013507.

20 "Qog Standard Data - QOG, University Of Gothenburg, Sweden", Göteborgs Universitet, 2020, https://qog.pol.gu.se/data/datadownloads/qogstandarddata.

The variable H in equation (1) represents a dummy variable for whether or not the country is a host country, and the variable T indicates the treatment period or years from +1 to +10. The coefficient β_3 is the value in question, as this will determine the difference-in-differences effect of the host country and treatment time on the outcomes tested.

In equation (1) a control variable was added, P_{gt} which represents the population of the host country. Population was added as a control as the population of a country can impact the GDP growth

Table 1: Olympic Bid Countries and Host Countries Analyzed [21],[22]

Year of the Olympics	Bid Countries	Host Country
1960 Summer	Belgium Hungary Switzerland	Italy
1960 Winter	Germany Pakistan	USA
1964 Summer	Belgium	Japan
1964 Winter	Canada Finland	Austria
1968 Summer	Argentina	Mexico
1968 Winter	Canada Finland Norway	France
1972 Summer	Canada Spain	Germany
1972 Winter	Finland	Japan
1976 Summer		Canada
1976 Winter	Finland Switzerland	USA
1984 Winter	Japan Sweden	
1988 Summer	Japan	Canada
1988 Winter	Italy Sweden	South Korea
1992 Summer	Netherlands United Kingdom	Spain
1992 Winter	Bulgaria	France

21 International Olympic Committee, https://www.olympic.org/olympic-games

22 "Past Bid Results | Gamesbids.Com", Gamesbids.Com, 2020, https://gamesbids.com/eng/past-bid-results/.

	Italy	
	Sweden	
	West Germany	
1994 Winter	Bulgaria	Norway
	Sweden	
1996 Summer	United Kingdom	USA
1998 Winter	Sweden	Japan
2000 Summer	Brazil	Australia
	Germany	
	Turkey	
	United Kingdom	
	Uzbekistan	
2002 Winter	Austria	USA
	Russia	
	Slovakia	
	Spain	
	Sweden	
	Switzerland	
2004 Summer	Argentina	Greece
	Brazil	
	France	
	Russia	
	South Africa	
	Spain	
	Sweden	
	Turkey	
2006 Winter	Austria	Italy
	Poland	
	Slovakia	
	Switzerland	
2008 Summer	Cuba	China
	France	
	Japan	
	Malaysia	
	Spain	
	Thailand	
	Turkey	
2010 Winter	Austria	Canada
	Bosnia- Herzegovina	
	South Korea	
	Spain	
	Switzerland	

The term S_g is an additional dummy variable where 1 indicates Summer Olympic events and 0 Winter Olympic events.

rate, poverty, and inequality of a country, but hosting the Olympics has not proven to have an impact on population or population growth.[23] Lastly, the term ϵ_{gt} represents omitted variable error in the equation.

These tests will be run to determine if there is a significant difference in the outcome when data is segregated between winter and summer events.

$$Y_{gt} = \beta_0 + \beta_1 H_g + \beta_2 T_t + \beta_3(H_g \times T_t) + \beta_4 P_{gt} + \beta_5 S_g + \epsilon_{gt} \ (2)$$

Utilizing this difference-in-differences method, regressions will be run for each of the outcomes in question. Additional regressions will then be run with an added dummy variable, as shown in equation (2).

A second methodology, matching, will also be utilized for this research. Data from the control group will be matched with data from the test group, based upon the

Name	Definition	Source
Dependent Variables		
wdi_gdpcapcon2010	GDP per capita in 2010 USD	QoG Standard Data, 2020[24]
wdi_gdpgr	GDP growth rate, annual %	QoG Standard Data, 2020
wdi_trade	Trade as a % of GDP	QoG Standard Data, 2020
wdi_fdiin	Foreign direct investment, net inflow as % of GDP	QoG Standard Data, 2020
wdi_gini	Gini Coefficient	QoG Standard Data, 2020
wdi_povgap190	Poverty gap at $1.90 USD a day (PPP) %	QoG Standard Data, 2020
Independent Variables		
wdi_pop	Total population	QoG Standard Data, 2020
Host	Dummy variable 1 if host, 0 if bid city	Past Bid Results, 2020[25]
time	Standardized time in years from the Olympic event	Past Bid Results, 2020
Summer.Olympics	Dummy variable 1 if summer, 0 if winter event	Past Bid Results, 2020

23 Billings and Holladay, 754-772

24 "Qog Standard Data - QOG, University Of Gothenburg, Sweden", Göteborgs Universitet, 2020, https://qog.pol.gu.se/data/datadownloads/qogstandarddata.

25 "Past Bid Results | Gamesbids.Com", https://gamesbids.com/eng/past-bid-results/.

matching criteria of country population, and country GDP ten years before the Olympics.

Matching will result in sixteen pairs, as the test group contains sixteen host countries, whereas the control group contains fifty-three bid countries. Matching will be completed using the "nearest" method in order to match pairs with the closest propensity scores.[26] Based on these propensity scores, denoted as distance, the top pairs will then be captured in a separate data set based on their pair number. Regression tests will then be completed on the countries that matched in these top pairs, applying the data from the entire treatment time period, once again utilizing the difference-in-differences method to determine if there is an effect of hosting the Olympics on the outcomes in question. The equation for this regression is the same as equation (1) shown previously.

Due to the several factors that may impact economic growth, inequality, and poverty as well as if a country is to host the Olympics, there is some concern regarding omitted variable bias. One example of this could be the corruption levels in the country. Corruption could impact both economic growth and corruption could

impact if a city was to host the Olympics or not, although omitted variable bias cannot be eliminated by utilizing propensity score matching (PSM) methodology assists in balancing any bias between the control and treatment groups.[27][28] The PSM addresses endogeneity by matching control and test groups with similar variables such as the original GDP and country population. This can help balance some of the bias in the system, although there is still a risk of unobserved omitted variable bias.[29][30] In addition to matching, this research will also conduct regression tests with the top matched pairs based upon their differences in propensity score, which again should aid in endogeneity and offer an indication of robustness.[31][32]

4. Results

As outlined in the Research Design section, the first set of tests were conducted using all of the data for host and bid countries and employing the difference-in-differences method. OLS regressions were then run for each of the dependent variables listed in Table 2. While this section will

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26 Simon Ejdemyr, "R Tutorial 8: Propensity Score Matching", Sejdemyr.Github.Io, accessed 7 April 2020, https://sejdemyr.github.io/r-tutorials/statistics/tutorial8.html#executing-a-matching-algorithm.

27 Laurence Ball, "The Performance Of Alternative Monetary Regimes", Handbook Of Monetary Economics, 2010, 1303-1343, doi:10.1016/b978-0-444-53454-5.00011-6.

28 Michael R. Roberts and Toni M. Whited, "Endogeneity In Empirical Corporate Finance1", Handbook Of The Economics Of Finance, 2013, 493-572, doi:10.1016/b978-0-44-453594-8.00007-0.

29 Ball, 1303-1343

30 Roberts and Whited, 493-572

31 Ball, 1303-1343

32 Roberts and Whited, 493-572

highlight the main results from the study, results for the OLS regressions run can be found in Appendix A.

The OLS regression demonstrated that hosting the Olympics had a statistically significant negative impact on the annual growth rate of GDP, with a p-value of 0.005. In contrast, the regression results for all other dependent variables did not show a statistically significant difference for countries that hosted the Olympics versus those who only placed bids.

Figure 1 illustrates the increase in GDP over time for both host and bid countries. As mentioned above, the regression results did not indicate a statistically significant difference in the trend of the host countries versus the bid countries. Looking at the figure, it can also be noted that host countries tend to have a higher GDP than bid countries. In all figures, "TRUE" denotes the trend for host countries, and "FALSE" denotes the trend for bid countries.
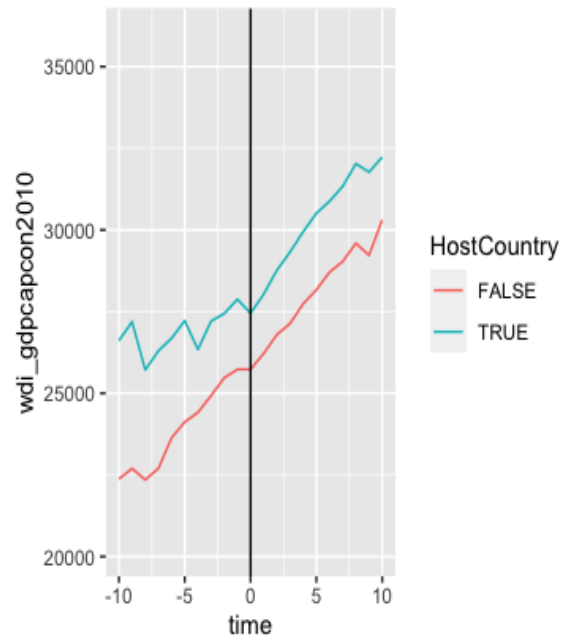

Figure 1: GDP per capita

The regression results show there is a statistically significant relationship between hosting the Olympics and the GDP growth rate. This relationship is negative. It is interesting to note that while bid countries' growth rate fluctuated between 2.5 and 4 percent, after year 0 the Olympic event, host countries fluctuated from 5 to below 2.5, with an overall negative slope.

The next step in the research was to investigate the difference in effect, if any, when segregating the data into Summer and Winter Olympics. The results for these regressions did not change any of the conclusions, and there was little variation between the results for Summer and Winter Olympic games, in regard to the growth rate of GDP.

A second method applied during this research was matching. Host countries and bid countries were matched using their population and GDP at year -10, or when the

bid was placed. Figure 2 shows the resulting propensity scores from the matching analysis for the eleven pairs that matched the closest. A table of matched results for all sixteen pairs can be found in Appendix B. The pairs shown in Figure 2 alternate by color, with the host country on the left, and it has paired bid country on the right. For example, the first pair is host country South Korea '88 and bid country Finland '76.
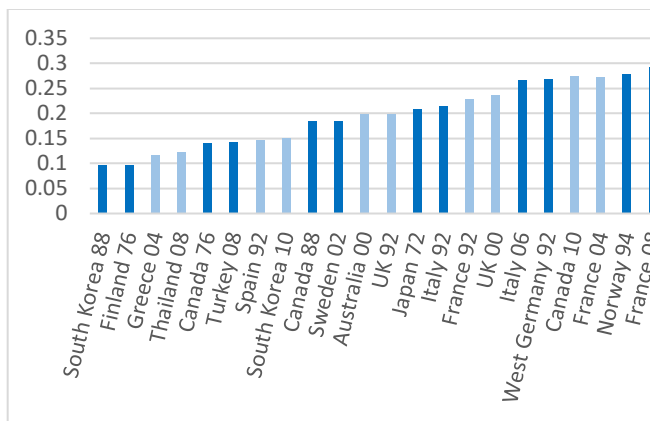

Figure 2: PSM Paired Host Countries and Bid Countries

These matched pairs were then entered into an OLS regression, applying the difference-in-differences method. The matched results for the economic variables remained consistent with the original conclusions from utilizing the entire dataset. The GDP annual growth rate returned statistically significant results, while for the other economic variables, GDP per capita, trade, and foreign direct investment, no statistically significant relationships were found.

Figures 3 and 4 illustrate the trends in host countries and bid countries for GDP per capita and GDP growth rate using the matched data.
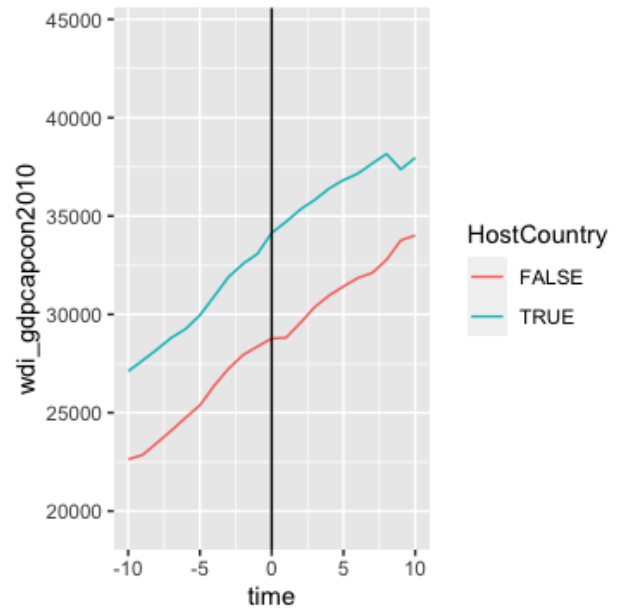

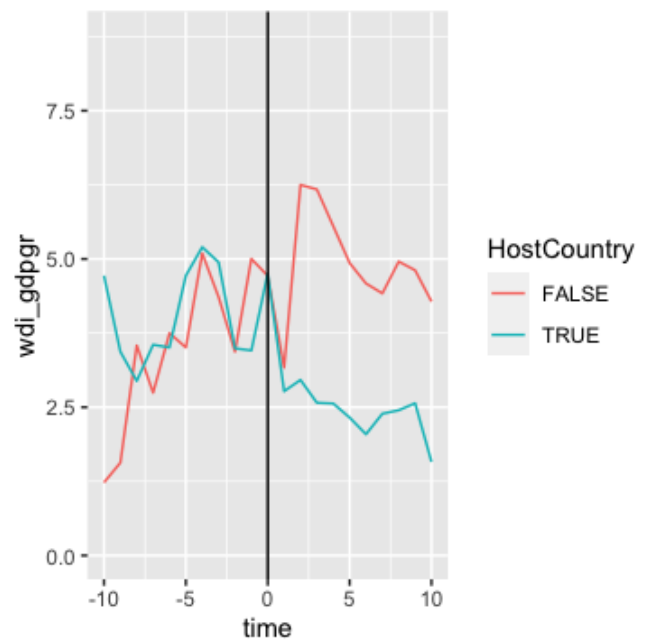*Figure 3: Matching - GDP per capita*

Figure 4: Matching- GDP growth rate %

As shown in Figure 4, the growth rate for bid countries had a positive trend in the years following the Olympic event, whereas for host countries, the percent growth of GDP decreased. The regression results indicate that this trend is statistically significant. The regression results for

GDP per capita, however, did not show statistically significant results.

The results for the economic variables demonstrate findings that go against the research hypothesis. The economy of a host country does not appear to be statistically significantly impacted in the ten years after hosting the Olympics, compared to countries that placed bids to host the Olympics but were unsuccessful in their bids and negative impacts were observed in the GDP growth rate. This aligns with the work completed by Billings and Holladay, however, their study was completed at the city level and not the country level, and the growth rate of GDP was not discussed.[33]

Utilizing only the difference-in-differences method without matching, there were no statistically significant results found for the measures of inequality and poverty; however, when matching is applied, this is no longer the case. The regression results show the significant findings for the Gini Coefficient of host countries versus bid countries.

These results indicate a positive relationship between hosting the Olympics and the Gini Coefficient, with a p-value of 0.01. The higher the Gini Coefficient, however, the greater the inequality. It can, therefore, be inferred from these results that in the ten years after hosting the Olympics, the inequality in the host country increases a statistically significant amount more than the inequality in bid countries. Figure 5 below shows that the fluctuation in inequality for host countries varies from 32 to 36 in the ten

years following the Olympics, while the bid countries fluctuate from approximately 30-35.
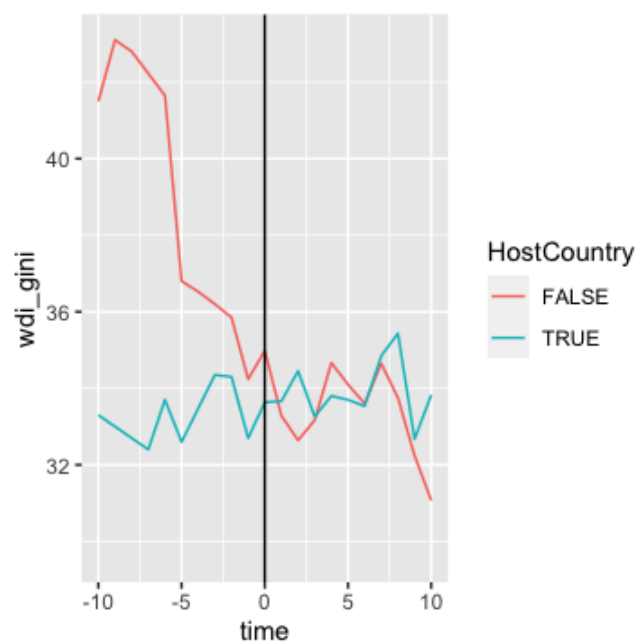

Figure 5: Matching- Gini Coefficient

Additionally, when applying the matching methodology, the difference-in-differences OLS regression results for the poverty gap return statistically significant results.

The p-value of the regression above is 0.005, indicating statistical significance, which in Figure 6 translates to less than one percent difference. The coefficient also denotes a positive relationship, which in this case indicates an increase in the poverty gap in host countries.

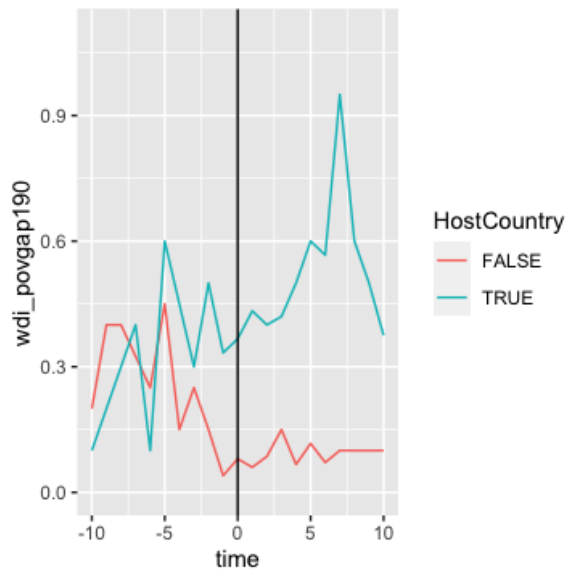---

33 Billings and Holladay, 754-772

Figure 6: Matching- Poverty Gap

The results for the inequality and poverty variables agree with the hypothesis that the Olympics negatively affect inequality and poverty in the host country. However, the hypothesis predicted that this was due to the economic impact of the games only affecting the wealthy in the country. Based on the conclusion that hosting the Olympics does not appear to have positive long-term impacts, and the growth rate of GDP is lower than those that did not host, other reasons need to be considered for why poverty and inequality would be negatively affected. Reasons for this could be; the GDP growth is lower than what it was before the Olympics, or it could be due to the allocation of funds by the government of these countries. Often when hosting the Olympics, significant investments need to be made into infrastructure, which may take away from funding for social programs.[34]

5. Policy Recommendations and Conclusion

Research has shown mixed reviews as to whether hosting the Olympics garners economic growth for the host country. The results of this research conclude that long-term economic impacts are not statistically significant in terms of GDP per capita, trade, and foreign direct investment. It was demonstrated, however, through matching and difference-in-differences methods that the GDP annual growth rate is negatively impacted by hosting the Olympics in the ten years after the games. This is a compelling finding as the economic benefits are often cited for the reason that countries leap to invest in such a mega-event.

The Olympic committee also states that their values include promoting social development through the avenue of sport.[35] This research study focused on social development through indicators of inequality and poverty. Through the matching and difference-in-differences techniques employed to study this data, the results showed statistical significance in the impact of hosting the Olympics on the Gini coefficient and poverty gap. In the ten years succeeding the games, the Gini coefficient was shown to rise significantly compared with the bid countries, which indicates greater inequality in the country. Similarly, the poverty gap was observed to increase on a statistically significant level for host countries as opposed to bid

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34 Rose and Spiegel, 652-677
35 International Olympic Committee, https://www.olympic.org/the-ioc/promote-olympism.

countries. These again are interesting findings as they contradict the ideal set forth by the Olympic organization.

The hypothesis for this research predicted that equality in the host countries would be negatively impacted due to economic gains, but the previous conclusion regarding economic factors displays that this is not the case. The reason behind this increased level of inequality and poverty may be due to the number of resources allocated to hosting the games, and how governments decide where this money comes from, and if social programs are the victim. An article in the Economist implies that this may have been the case for the London 2012 Olympics, stating that there were "cuts to public services."[36] The government of Brazil also received much criticism for spending so much money on the Olympics while their schools and hospitals were in disrepair contrasting the ideal of social development through sport.[37] [38] Moving forward, these are important things to consider from a policy perspective. If a country wishes to host the Olympics as a way to further development they will need to adopt policies that promote the games without sacrificing the budget for social programs. It is the recommendation of this paper that host country governments and the International Olympic Committee seek to reform the bidding process of the games in a way that is more sustainable. In being more sustainable through means such as the encouragement of reusing existing facilities, the cost of the games could be reduced, lessening the economic burden of host countries which in the past have taken money from social services funding. It is also the recommended that both the Olympic Committee and host country governments seek to form partnerships with various corporations, charities, and social impact organizations. These partnerships can bring publicity to the social development agenda through the games, while also assiting corporations with their marketing and alleviating funding concerns for both the social impact organizations and host countries.

The limitations of this study are surrounding the complicated relationship that hosting the Olympics has to many aspects of the economy and the government. Additionally, data regarding inequality and poverty has also been relatively recently collected, and so there is limited data in these areas as opposed to economic data. In order to improve this study, moving forward matching could also be applied to cities within the same country as the Olympic host to determine if there are varied effects within the country. This research could also be expanded upon by investigating government corruption levels, transparency, and media freedom in relation to Olympic host countries. This study could provide some enlightenment if countries have alternative motives for hosting the games, and the impact of the games on the freedom of the press. In the

36 T, W., "Why Would Anyone Want To Host The Olympics?", The Economist, 2013, https://www.economist.com/the-economist-explains/2013/09/08/why-would-anyone-want-to-host-the-olympics.

37 International Olympic Committee, https://www.olympic.org/the-ioc/promote-olympism.

38 Michael Powell, "Officials Spent Big On Olympics, But Rio Natives Are Paying The Price", Nytimes.Com, 2016, https://www.nytimes.com/2016/08/15/sports/olympics/rio-favelas-brazil-poor-price-too-high.html.

future, it could also be beneficial to expand this study to more social development factors such as impacts on gender equality in a country to see if the games positively influenced women and young girls in the country to engage in sport.

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Appendix A: Regression Results

OLS Regression Results: Difference-in-differences Effect of Hosting on GDP Growth

```
Call:
lm(formula = wdi_gdpgr ~ Host + treatment_time + did + wdi_pop,
    data = mydata_a)

Residuals:
     Min      1Q   Median      3Q      Max
-17.9768  -1.6483  -0.0985   1.5214  30.3754

Coefficients:
                Estimate Std. Error t value Pr(>|t|)
(Intercept)    2.889e+00  1.520e-01  19.007  < 2e-16 ***
Host           1.016e+00  3.172e-01   3.204  0.00138 **
treatment_time 1.822e-01  2.132e-01   0.854  0.39299
did           -1.197e+00  4.290e-01  -2.791  0.00531 **
wdi_pop        3.747e-09  6.394e-10   5.860 5.53e-09 ***
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 3.842 on 1722 degrees of freedom
Multiple R-squared:  0.03128, Adjusted R-squared:  0.02903
F-statistic:  13.9 on 4 and 1722 DF,  p-value: 3.654e-11
```

OLS Regression Results: Difference-in-differences Effect of Hosting on GDP per Capita

```
Call:
lm(formula = wdi_gdpcapcon2010 ~ Host + treatment_time + did +
    wdi_pop, data = mydata_b)

Residuals:
   Min     1Q Median     3Q    Max
-27888 -14578    569  11623  53120

Coefficients:
                Estimate Std. Error t value Pr(>|t|)
(Intercept)    2.505e+04  6.601e+02  37.948  < 2e-16 ***
Host           5.198e+03  1.362e+03   3.816  0.00014 ***
treatment_time 4.218e+03  9.258e+02   4.556 5.58e-06 ***
did           -6.582e+02  1.858e+03  -0.354  0.72313
wdi_pop       -2.312e-05  2.795e-06  -8.270 2.61e-16 ***


---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 16820 on 1752 degrees of freedom
Multiple R-squared:  0.05487, Adjusted R-squared:  0.05271
F-statistic: 25.43 on 4 and 1752 DF,  p-value: < 2.2e-16
```

OLS Regression Results: Difference-in-differences Effect of Hosting on Trade

```
Call:
lm(formula = wdi_trade ~ Host + treatment_time + did + wdi_pop,
    data = mydata_e)

Residuals:
    Min      1Q  Median      3Q      Max
```

```
-57.754 -19.092  -6.077  14.230 159.133
```

Coefficients:

```
                 Estimate Std. Error t value Pr(>|t|)
(Intercept)      6.194e+01  1.154e+00  53.661  < 2e-16 ***
Host            -1.981e+01  2.371e+00  -8.356  < 2e-16 ***
treatment_time   6.837e+00  1.615e+00   4.233 2.43e-05 ***
did             -5.193e+00  3.232e+00  -1.607    0.108
wdi_pop         -2.881e-08  4.859e-09  -5.929 3.67e-09 ***
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
Residual standard error: 29.23 on 1742 degrees of freedom
Multiple R-squared:  0.146,   Adjusted R-squared:  0.144
F-statistic: 74.46 on 4 and 1742 DF,  p-value: < 2.2e-16
```

OLS Regression Results: Difference-in-differences Effect of Hosting on Foreign Investment

Call:
```
lm(formula = wdi_fdiin ~ Host + treatment_time + did + wdi_pop,
    data = mydata_f)
```

Residuals:

```
     Min       1Q   Median       3Q      Max
-12.2327  -1.6899  -0.6612   0.7123  23.4068
```

Coefficients:

```
                 Estimate Std. Error t value Pr(>|t|)
(Intercept)      2.316e+00  1.268e-01  18.256  < 2e-16 ***
Host            -1.069e+00  2.715e-01  -3.937 8.62e-05 ***
treatment_time   3.205e-01  1.738e-01   1.845   0.0653 .
did             -2.463e-01  3.614e-01  -0.681   0.4957
wdi_pop          4.334e-10  4.950e-10   0.876   0.3814
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
Residual standard error: 2.94 on 1488 degrees of freedom
  (1 observation deleted due to missingness)
Multiple R-squared:  0.02909, Adjusted R-squared:  0.02648
F-statistic: 11.14 on 4 and 1488 DF,  p-value: 6.568e-09
```

OLS Regression Results: Difference-in-differences Effect of Hosting on Gini Coefficient

Call:
```
lm(formula = wdi_gini ~ Host + treatment_time + did + wdi_pop,
    data = mydata_c)
```

Residuals:

```
    Min      1Q  Median      3Q     Max
-13.107  -5.707  -1.296   3.414  29.548
```

Coefficients:

```
                 Estimate Std. Error t value Pr(>|t|)
(Intercept)      3.801e+01  6.640e-01  57.243  < 2e-16 ***
Host            -6.115e+00  1.830e+00  -3.341 0.000899 ***
treatment_time  -3.439e+00  8.005e-01  -4.296  2.1e-05 ***
did              3.728e+00  2.155e+00   1.730 0.084339 .
wdi_pop          1.424e-08  2.030e-09   7.013  7.7e-12 ***
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
Residual standard error: 7.852 on 494 degrees of freedom
Multiple R-squared:  0.1244,  Adjusted R-squared:  0.1173
F-statistic: 17.55 on 4 and 494 DF,  p-value: 1.765e-13
```

OLS Regression Results: Difference-in-differences Effect of Hosting on Poverty Gap

```
Call:
lm(formula = wdi_povgap190 ~ Host + treatment_time + did + wdi_pop,
    data = mydata_d)

Residuals:
    Min      1Q  Median      3Q     Max
-3.7583 -0.8609 -0.4533  0.0247 21.6638

Coefficients:
                Estimate Std. Error t value Pr(>|t|)
(Intercept)    1.363e+00  2.008e-01   6.788 3.27e-11 ***
Host          -5.928e-01  5.536e-01  -1.071 0.284782
treatment_time -9.259e-01 2.421e-01  -3.825 0.000148 ***
did            5.406e-02  6.519e-01   0.083 0.933942
wdi_pop        2.961e-09  6.140e-10   4.822 1.90e-06 ***
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 2.375 on 494 degrees of freedom
Multiple R-squared:  0.07883, Adjusted R-squared:  0.07137
F-statistic: 10.57 on 4 and 494 DF,  p-value: 3.187e-08
```

OLS Regression Results: Effect of Hosting Summer Olympics on GDP Growth

```
Call:
lm(formula = wdi_gdpgr ~ Host + treatment_time + Summer.Olympics +
    did + wdi_pop, data = mydata_a)

Residuals:
     Min      1Q  Median      3Q     Max
-17.8392 -1.5849 -0.0937  1.5334 30.5016

Coefficients:
                 Estimate Std. Error t value Pr(>|t|)
(Intercept)     2.776e+00  1.728e-01  16.064  < 2e-16 ***
Host            1.036e+00  3.175e-01   3.264  0.00112 **
treatment_time  1.812e-01  2.132e-01   0.850  0.39536
Summer.Olympics 2.585e-01  1.886e-01   1.370  0.17086
did            -1.204e+00  4.289e-01  -2.807  0.00506 **
wdi_pop         3.580e-09  6.508e-10   5.501 4.35e-08 ***
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 3.841 on 1721 degrees of freedom
Multiple R-squared:  0.03234, Adjusted R-squared:  0.02952
F-statistic:  11.5 on 5 and 1721 DF,  p-value: 6.062e-11
```

OLS Regression Results: Effect of Hosting Winter Olympics on GDP Growth

```
Call:
lm(formula = wdi_gdpgr ~ Host + treatment_time + Winter.Olympics +
    did + wdi_pop, data = mydata_a)

Residuals:
     Min      1Q  Median      3Q     Max
-17.8730 -1.6081 -0.0932  1.5145 30.4701

Coefficients:
                Estimate Std. Error t value Pr(>|t|)
(Intercept)    3.005e+00  1.876e-01  16.023  < 2e-16 ***
```

```
Host              1.029e+00  3.174e-01   3.241  0.00122 **
treatment_time    1.813e-01  2.132e-01   0.850  0.39543
Winter.Olympics  -2.007e-01  1.892e-01  -1.060  0.28912
did              -1.202e+00  4.290e-01  -2.802  0.00513 **
wdi_pop           3.615e-09  6.515e-10   5.549 3.32e-08 ***
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 3.842 on 1721 degrees of freedom
Multiple R-squared:  0.03191, Adjusted R-squared:  0.0291
F-statistic: 11.35 on 5 and 1721 DF,  p-value: 8.662e-11
```

OLS Regression Results: Matching- Effect on GDP Growth

```
Call:
lm(formula = wdi_gdpgr ~ Host + treatment_time + did + wdi_pop,
    data = match_a)

Residuals:
    Min       1Q   Median       3Q      Max
-11.6353  -2.6197  -0.5309   1.4801  28.7286

Coefficients:
                Estimate Std. Error t value Pr(>|t|)
(Intercept)    1.216e+00  6.532e-01   1.861  0.06334 .
Host           1.179e+00  6.543e-01   1.802  0.07221 .
treatment_time 1.240e+00  6.604e-01   1.877  0.06118 .
did           -3.036e+00  9.331e-01  -3.253  0.00123 **
wdi_pop        4.523e-08  9.155e-09   4.941  1.1e-06 ***
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 4.984 on 453 degrees of freedom
Multiple R-squared:  0.07862, Adjusted R-squared:  0.07048
F-statistic: 9.663 on 4 and 453 DF,  p-value: 1.659e-07
```

OLS Regression Results: Matching- Effect of Hosting on GDP Growth Rate

```
Call:
lm(formula = wdi_gdpgr ~ Host + treatment_time + did + wdi_pop,
    data = match_a)

Residuals:
    Min       1Q   Median       3Q      Max
-11.6353  -2.6197  -0.5309   1.4801  28.7286

Coefficients:
                Estimate Std. Error t value Pr(>|t|)
(Intercept)    1.216e+00  6.532e-01   1.861  0.06334 .
Host           1.179e+00  6.543e-01   1.802  0.07221 .
treatment_time 1.240e+00  6.604e-01   1.877  0.06118 .
did           -3.036e+00  9.331e-01  -3.253  0.00123 **
wdi_pop        4.523e-08  9.155e-09   4.941  1.1e-06 ***
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 4.984 on 453 degrees of freedom
Multiple R-squared:  0.07862, Adjusted R-squared:  0.07048
F-statistic: 9.663 on 4 and 453 DF,  p-value: 1.659e-07
```

OLS Regression Results: Matching- Effect of Hosting on GDP per capita

```
Call:
```

```
lm(formula = wdi_gdpcapcon2010 ~ Host + treatment_time + did +
    wdi_pop, data = match_b)

Residuals:
    Min     1Q Median     3Q    Max
-28534 -10836   1897   9938  42821

Coefficients:
                 Estimate Std. Error t value Pr(>|t|)
(Intercept)     3.605e+04  1.755e+03  20.536  < 2e-16 ***
Host            1.776e+03  1.758e+03   1.010 0.313033
treatment_time  6.528e+03  1.775e+03   3.678 0.000263 ***
did             5.780e+02  2.508e+03   0.230 0.817815
wdi_pop        -2.029e-04  2.460e-05  -8.245  1.8e-15 ***
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 13400 on 453 degrees of freedom
Multiple R-squared:  0.192,   Adjusted R-squared:  0.1848
F-statistic: 26.91 on 4 and 453 DF,  p-value: < 2.2e-16
```

OLS Regression Results: Matching- Effect of Hosting on Trade

```
Call:
lm(formula = wdi_trade ~ Host + treatment_time + did + wdi_pop,
    data = match_e)

Residuals:
    Min     1Q  Median     3Q    Max
-30.159 -12.350  -4.488   7.181  85.066

Coefficients:
                 Estimate Std. Error t value Pr(>|t|)
(Intercept)     6.945e+01  2.515e+00  27.618  < 2e-16 ***
Host           -1.407e+01  2.519e+00  -5.585 4.04e-08 ***
treatment_time  7.912e+00  2.542e+00   3.112  0.00198 **
did            -2.544e+00  3.592e+00  -0.708  0.47915
wdi_pop        -2.116e-07  3.524e-08  -6.003 3.97e-09 ***
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 19.19 on 453 degrees of freedom
Multiple R-squared:  0.1721,  Adjusted R-squared:  0.1648
F-statistic: 23.55 on 4 and 453 DF,  p-value: < 2.2e-16
```

OLS Regression Results: Matching- Effect of Hosting on Foreign Direct Investment

```
Call:
lm(formula = wdi_fdiin ~ Host + treatment_time + did + wdi_pop,
    data = match_f)

Residuals:
    Min     1Q  Median     3Q    Max
-5.5375 -1.2425 -0.4877  0.6486 19.6698

Coefficients:
                 Estimate Std. Error t value Pr(>|t|)
(Intercept)     2.787e+00  3.121e-01   8.930  < 2e-16 ***
Host           -1.115e+00  3.030e-01  -3.679 0.000264 ***
treatment_time -6.348e-03  2.839e-01  -0.022 0.982172
did             4.830e-01  4.095e-01   1.179 0.238866
wdi_pop        -1.131e-08  4.575e-09  -2.472 0.013838 *
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
Residual standard error: 2.127 on 429 degrees of freedom
Multiple R-squared:  0.04089, Adjusted R-squared:  0.03194
F-statistic: 4.572 on 4 and 429 DF,  p-value: 0.001262
```

OLS Regression Results: Matching- Effect of Hosting on Gini Coefficient

```
Call:
lm(formula = wdi_gini ~ Host + treatment_time + did + wdi_pop,
    data = match_c)

Residuals:
   Min     1Q Median    3Q    Max
-9.006 -1.879 -0.306  2.450  7.694

Coefficients:
                 Estimate Std. Error t value Pr(>|t|)
(Intercept)     3.105e+01  1.235e+00  25.134  < 2e-16 ***
Host           -7.736e-01  1.297e+00  -0.596 0.552021
treatment_time -2.867e+00  8.399e-01  -3.413 0.000865 ***
did             3.767e+00  1.445e+00   2.606 0.010271 *
wdi_pop         8.943e-08  1.607e-08   5.565 1.52e-07 ***
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 3.586 on 125 degrees of freedom
Multiple R-squared:  0.2798,  Adjusted R-squared:  0.2568
F-statistic: 12.14 on 4 and 125 DF,  p-value: 2.272e-08
```

OLS Regression Results: Matching- Effect of Hosting on Poverty Gap

```
Call:
lm(formula = wdi_povgap190 ~ Host + treatment_time + did + wdi_pop,
    data = match_d)

Residuals:
     Min       1Q   Median       3Q      Max
-0.43207 -0.09096 -0.07578  0.11036  0.91248

Coefficients:
                 Estimate Std. Error t value Pr(>|t|)
(Intercept)     2.247e-01  7.644e-02   2.939  0.00392 **
Host            1.414e-01  8.027e-02   1.761  0.08062 .
treatment_time -8.349e-02  5.197e-02  -1.606  0.11069
did             2.531e-01  8.944e-02   2.830  0.00542 **
wdi_pop        -7.933e-10  9.944e-10  -0.798  0.42653
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 0.2219 on 125 degrees of freedom
Multiple R-squared:  0.3862,  Adjusted R-squared:  0.3666
F-statistic: 19.66 on 4 and 125 DF,  p-value: 1.415e-12
```

Appendix B: Matching Results

Pair Number	Countries	Year of Olympics	Distance
1	South Korea (H) Finland (B)	1988 1976	0.096492 0.097492
2	Greece (H) Thailand (B)	2004 2008	0.117834 0.123553
3	Canada (H) Turkey (B)	1976 2008	0.141464 0.142438
4	Spain (H) South Korea (B)	1992 2010	0.146335 0.150016
5	Canada (H) Sweden (B)	1988 2002	0.184927 0.185503
6	Australia (H) United Kingdom (B)	2000 1992	0.1991 0.198666
7	Japan (H) Italy (B)	1972 1992	0.209628 0.213787
8	France (H) United Kingdom (B)	1992 2000	0.228524 0.237608
9	Italy (H) West Germany (B)	2006 1992	0.266199 0.268793
10	Canada (H) France (B)	2010 2004	0.274561 0.272523
11	Norway (H) France (B)	1994 2008	0.279384 0.293061
12 Excluded	Japan (H) Brazil (B)	1998 2004	0.45316 0.344845
13 Excluded	USA (H) Japan (B)	1976 1988	0.561574 0.346711
14 Excluded	USA (H) Switzerland (B)	1996 2002	0.755101 0.346745
15 Excluded	USA (H) Switzerland (B)	2002 2010	0.806955 0.390732
16 Excluded	China (H) Japan (B)	2008 2008	0.999993 0.517477