Gravity Model Extensions for the Impact of Mega Sports Events on Tourist Flow

Ghaith Rabadi, A. Sami Stanekzai, T. Steven Cotter, and Mohammed H. Al-Salem

**Abstract**—Mega sports events such as the Olympics and the FIFA World Cup are highly attended and countries compete ferociously to host such events due to their perceived long term positive effects. Inbound tourist forecasting is an important aspect of the hosting decision; however, due to the infrequent occurrence of such events, it is not straightforward to predict the number of tourists who may travel to the host country. We focus in this paper on a regression model known as the Gravity Model to predict the number of inbound tourists between pairs of countries and we extend it to include new predictors and study their impact.

**Index Terms**—Gravity model, mega sport events, tourists forecasting, ordinary least square regression.

**I. INTRODUCTION**

Mega sports events such as the summer and winter Olympics, the FIFA Soccer World Cup, Cricket competitions, among others have recently been highly attended and countries have been competing to host such events for economic and legacy benefits despite the divide among economists and analysts regarding the benefits and costs of hosting such events. Forecasting the number of local and inbound tourists is a very important factor in the events’ cost-benefit analysis and therefore researchers have taken different approaches to study the impact of mega sport events on the expected number of tourists. In this paper, we study a regression model for the number of inbound tourists between pairs of countries known as the Gravity Model.

Fourie and Santana-Gallego in 2011, based on previous literature, introduced a Gravity Model that includes several predictors to study the impact of various mega sports events on the number of tourists over time [1]. They collected data between 1995 – 2006 from various sources to analyze the significance of a set of predictors such as trade, GDP, population, among others including 6 types of mega events on the number of inbound tourists. The authors identified the most significant predictors (details are described later). In this paper, we build on their work by updating the data to 1995 – 2013 and extending the model to include new factors and study their significance in the model.

**II. LITERATURE REVIEW**

Several tourism demand forecasting models have been introduced over the years which can be grouped into different categories of qualitative versus quantitative, linear versus non linear, and the more distinguished category of Time Series versus Econometric models. The general area of tourist demand forecasting is extensive. For example, authors in [2]-[7], and [8] have all listed reviews of the literature that includes hundreds of papers on the topic.

An important aspect of international tourism is the variety in identifying relevant input variables or predictors. Often tourism is referred to as a form of global trade in services [1]. [9]. This understanding of tourism initiates strong ties between international tourism and trade leading to a number of scholars studying the possible relationship and impact of one over another [10]-[13]. The research results of the analysis from different scholars confirm that International tourism leads to economic growth. However, the number of data points included in the studies which largely influence the accuracy of the results are relatively small. Price levels and relative prices is for example another significant factor that could often be seen in the tourism literature [14]. Gross Domestic Products per capita (GDP PC) and Population despite the controversies on the significance of the latter are the most common indicators in the econometric studies [15]-[17]. Common currency, common language, common borders and geographical distance have also been considered as significant cultural and geographical decisive factors in determining international tourism [18]-[20].

Although these factors and their impact on tourism have been studied by different scholars, it is very rare to find models that incorporate all of the significant variables. Therefore, and as suggested by several researchers, a combination of more predictors should yield higher accuracy in forecasting than using single predictors [21], [22]. Thus, we apply this approach in our paper to reach more accurate results.

We focus in this paper on studying of relationship between mega sports events and international tourism. Researchers have looked at this topic from different perspectives; some focused on the socio political, environmental and developmental consequences of these events [23], [24], while others studied the publicity, image building of the host cities and the lasting legacies effects [25]- [28]. Little attention has been paid to its impact on international tourism. Rose and Spiegel in 2011 studied the impact of Mega events on international trade, later in the same year Fourie and Santana-Gallego applied the same method to study the impact of mega events on tourism [1], [29]. Our approach to...
the analysis is inspired by authors in [1] who presented a Gravity Model that included several explanatory factors or predictors for the number of international (inbound) tourists between country pairs. In our paper, we validate their results for additional periods of time and extend their model for additional factors.

III. THE GRAVITY MODEL

Some researchers used what is known as the Spatial (Gravity) models to predict the number of tourists traveling between pairs of countries and to identify which predictors are more significant than others. The basic concept is based on Newton's Universal Gravitation, in which the gravitational force between two objects is directly proportional to their masses and inversely proportional to the squared distance between them. The idea was adapted for trade and tourism and was developed in the 60's and 70's using the same formula of \( F = \frac{G m_1 m_2}{d^2} \) where \( F \) represents in this case the trade flow between two countries \( i \) and \( j \); \( m_1 \) and \( m_2 \) are their economic sizes; \( d \) is the distance between them; and \( g \) is a constant. This relation means that trade flows between two countries are proportional to the scale of their economies and inversely affected by the distance between them [13]. Since then, the model has gone through several iterations of development by several researchers to predict the amount of trade, and then the number of international tourists as a form of trade commodity, and to also identify the significant predictors. Fourie and Santana-Gallego in [1] presented the following Gravity Model:

\[
\ln \text{Tour}_{ijt} = \beta_0 + \beta_1 \ln \text{Trade}_{ijt} + \beta_2 \text{GDPpc}_i + \beta_3 \text{GDPpc}_j + \\
+ \beta_4 \ln \text{POP}_i + \beta_5 \ln \text{POP}_j + \beta_6 \ln \text{PPP}_i + \beta_7 \ln \text{Dist}_{ij} + \\
\beta_8 \text{Lang}_{ij} + \beta_9 \text{Border}_{ij} + \beta_{10} \text{Colony}_{ij} + \beta_{11} \text{CU}_{ij} + \eta E_{it} + \\
\gamma_i + \delta_j + \lambda_t + u_{it}
\]

(1)

where

- \( \ln \): Natural log
- \( i \): Destination country
- \( j \): Origin country
- \( \text{Tour}_{ijt} \): Number of tourists between \( i \) and \( j \) at year \( t \)
- \( \text{Trade}_{ijt} \): Real bilateral trade-in-goods, as the sum of exports and imports, between \( i \) and \( j \)
- \( \text{GDPpc}_i \): GDP per capita of \( i \) in year \( t \)
- \( \text{GDPpc}_j \): GDP per capita of \( j \) in year \( t \)
- \( \text{POP}_i \): Population of \( i \) in year \( t \)
- \( \text{POP}_j \): Population of \( j \) in year \( t \)
- \( \text{PPP} \): Purchasing power parity that reflects relative cost of living in the \( i \) with respect to \( j \)
- \( \text{Dist}_{ij} \): Great circle distance between the capital cities of \( i \) and \( j \)
- \( \text{Lang}_{ij} \): 1 if there is a common language between \( i \) and \( j \); 0 otherwise
- \( \text{Border}_{ij} \): 1 if there is common land border between \( i \) and \( j \); 0 otherwise
- \( \text{Colony}_{ij} \): 1 if there has ever existed colonial relationship between \( i \) and \( j \); 0 otherwise
- \( \text{CU}_{ij} \): 1 if \( i \) and \( j \) share common currency; 0 otherwise
- \( E_{it} \): 1 if a mega-event is held at \( i \) in year \( t \); 0 otherwise
- \( \eta \): Destination fixed effect
- \( \delta_j \): Origin fixed effect
- \( \lambda_t \): Year fixed effect
- \( u_{it} \): Error

The authors in [1] used a dataset that includes 169 countries as tourist destination and 200 countries as origin of tourists over the period 1995 – 2006 (33,800 pairs of countries). They obtained the number of annual international tourist arrivals by country of origin from the United Nations World Tourism Organization (UNWTO). The sources of their input data are listed in [1]. Ordinary Least Square (OLS) regression was used to first study the significance of selected predictors. Their analysis showed that trade, GDP per capita, common borders, colonial relationship, common language and common currency are all positively significant. On the other hand, distance between countries, destination population, and PPP are significantly negative which means that far countries, crowded destinations and an increase in the relative price level of the destination country decreases the number of tourist arrival. The mega event variable turned out to be significant as well and according to the results, holding a mega event at a destination should increase inbound tourists by about 8%. Country fixed effects of origin and destination and year fixed effects are included in the OLS model. Heteroscedasticity in the data is also taken into account, such that the robust standard error is clustered by country pairs.

IV. DATA EXTENSION

The dataset obtained from the second author in [1] has been extended to include the years from 2007 to 2013 (the complete dataset is now from 1995 to 2013). The extended time frame dataset is generated using exactly the same countries as the tourism origin, tourism destination and their pairs as in [1]. The historical data included in the study is the most up-to-date annual records of overnight stays of visitors from the counterpart country based on administrative and immigration reports, traffic counts, and border surveys collected by the UNWTO. The bilateral trade data is obtained from the International Monetary Fund’s (IMF) Direction of trade statistics (DOTS, 2015). Trade data (in thousands) is the sum of exports reported on free on board (FOB) basis and imports reported on cost, insurance, and freight (CIF) basis (IMF, 2016). Trade Dollar values are turned into real terms by dividing them by the U.S GDP deflator with base year 2010 in contrast to the original data set which used year 2000 as the base year. Some minimal inconsistencies as a result of delays in reporting the actual trade values, misinterpretation of trans-shipment country as country importing, time differences in reporting exports by origin, shipment and transit, and the actual entries by country importing the merchandise were spotted for some pairs. These differences are rare and relatively small, therefore deemed to have insignificant effect on the overall results. GDP, GDP per capita, PPP, and total population values were obtained from the World Development Indicators (WDI) dataset of the World Bank 2015 publication, which is available at the World Bank’s website. GDP and GDP per capita values were turned into real terms using the U.S GDP
deflator with base year 2010. Country specific PPP values were obtained by taking the ratio of GDP reported in the Current Local Currency Units (LCU) and GDP-PPP reported in current international dollars in the WDI dataset. As a result, the PPP would represent the relative difference of country and the United States (used as a benchmark for all countries at the first place), since we are interested in the relative prices of country pairs with each other; therefore the ratio of the PPs of country pairs is included in the extended data set.

Six types of major sport events complying with Roche’s definition of mega events in [30] [p.1], are included in the dataset over the years 1995 to 2013. Namely, Summer Olympic Games (SOG), Winter Olympic Games (WOG), FIFA World Cup (FIFA WC), Rugby World Cup (RWC) and Rugby Lions Tours. Necessary information about the time and place of the events, bid candidate and host countries, and participating countries in the mega events have been collected from their respective official website. For example, information about SOG and WOG were obtained from www.olympic.org, FIFA WC from www.fifa.com/worldcup, RWC from www.rugbyworldcup.com, CWC from www.icc-cricket.com/cricket-world-cup, and finally data for Rugby Lions tours were obtained from www.lionsrugby.com. The extended dataset generated for the purpose of this study covers almost double the number of events found in [1]. The information for the dummy (binary) variables of common language, common border, colonial relationships, distance, and currency unions are obtained from the Centre d’Etudes Prospectives et d’Informations Internationales (CEPII) database found at www.cepii.fr/distance/geo_cepii.xls and completed by the CIA fact book. These variables that largely remain constant over the referenced time frame have specific definitive criteria. For example, a language is considered common only if both countries of the referenced pair recognize it as official language of the country and at least 9-20% citizens of each country speak it in daily conversations. If the pair of countries ever had colonial ties, the colony variable will take the value of one. Distance between the main cities (in some cases cities other than the capital are considered as economic centers) is calculated based on the latitude and longitude coordinates using the “great circle” method similar to the one used by authors in [31].

V. GRAVITY MODEL EXTENSION

The aforementioned variables have significant deterministic characteristics; however, one of the important factors that shapes the visitor’s state of mind in the decision making process from security, fear, and perceived satisfaction perspectives is not included in the models in [1] and [29]. We refer to these factors as the Risk factor, which could be unveiled from the diversity in the methodological and perspectival scholarly approaches towards the subject in the literature. For example, Sequeira and Nunes uses the dynamic panel data analysis to study the impact of political risk on the international tourism [32], Authors in [25], [33], [34], and [35] addressed Risk in the context of crime in international tourism. Some others have studied the impact of local or regional terrorism, government instability, and relationship between governance and tourism [36] - [38]. Research results of these studies, which are vastly diverse reveal important facts about the nature of tourists’ sensitivity towards perceived risk; hence appealing for inclusion of a risk factor in the Gravity Model for the impact analysis of mega events in international tourism context. Therefore, we introduce a unique approach of accounting for risk in a comprehensive way through unification of several risk indicators studied separately by other scholars and incorporate them into the Gravity Model for more accurate results potentially. Data for the risk variable is obtained from World Banks’ World Governance Indicators (WGI) dataset of 2015 publication. The WGI ranks countries based on surveys, collected data and evidence in six categories of Political Stability and Terrorism, Control of Corruption, Rule of Law, Regulatory Quality, Government Effectiveness, and Voice accountability. The indicators values range from -2.5 to +2.5 with higher values indicating higher stability and betterment. The first five factors being most relevant to our study in the context of creating or taking away tourism opportunities can constitute an overall risk indicator we refer to as ORK in the extended Gravity Model. In order to use the natural logarithm in our model, we eliminated the negative sign by scaling the range by adding 2.5 to the original values changing the scale to 0.0001 (lowest) to 5.0000 (highest) ranking. ORK is the unweighted average of the five disaggregated risk indicators. The new variables included in the model are:

\[ ORK_1; \text{Overall Risk values of } i \text{ in } t. \]
\[ ORK_2; \text{Overall Risk values of } i \text{ in } t. \]

VI. RESULTS AND DISCUSSION

In a first attempt, the work in [1] is revisited by testing all four hypotheses using OLS method and the gravity model discussed in III over the extended dataset. In the tables of analysis results, significant coefficient estimates at Alpha (\(\alpha\)) level of 0.99 are marked with double asterisks (**), those significant at \(\alpha\) level of 0.90 are marked with single asterisk (*), and estimates statistically insignificant are left unmarked. Table I presents results of the analysis for the hypothesis of whether hosting mega events in general increases tourism. Before we discuss the impact of mega events on tourist arrival, as discussed in the literature review, it is important to analyze the overall model and the control variables first.

The R-squared value of the model (an indication of the accountability of variables towards the total variation) has slightly been increased from 0.83 in [1] to 0.84 with the inclusion of approximately 40,000 additional observations. The analysis shows a strong relationship between the significantly positive Trade variable and inbound tourist arrival. GDP PC of the tourism origin and destination countries confirm the argument that the richer the countries the higher the people’s intentions for travel. PPP and Distance control variables are statistically significant with negative signs, meaning people intend to visit countries closer to them with lower differences in relative prices. Common languages and borders and existence of colonial ties also enhance tourism significantly. At a lower level of
significance, common currency has less impact on tourism increase compared to other variables.

One of the important results of the model with the extended data is the change in sign and significance of population destination from negative (-0.0746) to positive (0.1916) when compared to Foruie and Santano-Gallego’s work in [1], who argue that the inclusion of GDP PC in the model accounts for the demand size and therefore the population of the destination country is not important. However, studies suggest that GDP PC cannot be deterministic of population size neither does its economic importance [39], [40]. Therefore, the results of our analysis could be explained by presumptive direct relationship between population and publicity, economic growth, and technological advancements which in turns can indirectly promote tourism.

Table II shows that three out of the total four RWCs have coincided with FIFA World cups. This means that although the events themselves might be significant in attracting tourists, their coincidence with other events may be a root cause for tourism displacement and a statistically demoting effect as a result.

Table III: Results of Analysis for Mega Sports Events and their Lasting Legacy Effects

Table IV: Impact of Mega Events on Tourism

Table V: Host Country by Mega Event Type

Next we analyze the events’ lasting legacy hypothesis and its contribution to tourism gains. Only the three mega events of SOG, FIFA WC, and CWC with highly positive economic significance have been studied over the immediate three years before and after the events.
of tourists’ satisfaction during the visits, and utilization of the infrastructure.

The Hypothesis whether seasonality and participation in mega events have any impact on the overall gains from such events are analyzed next. Results of the analysis presented in Table IV validates the findings in [1] that suggested high tourism gains from the countries participating in the sport event while the none participating countries remain insignificant.

### Table IV: Seasonality and Participation Effects of Mega Events on Tourists Arrival

<table>
<thead>
<tr>
<th>Observations</th>
<th>F-Statistics</th>
<th>R-Squared</th>
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<tbody>
<tr>
<td></td>
<td>12274</td>
<td>0.8411</td>
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</table>

The authors in [1] and [29] suggest almost equal consequential effects for countries that participate in the bidding process with those who actually host the mega events. In contradiction to their findings, the results of analysis over the extended time frame presented in Table V suggest that participation in the bidding process will not have significant impact on increasing or decreasing tourism. Moreover, there is not enough evidence in the literature to support the argument of participation in the bidding process leading to economic benefits from this industry.

In this part of the paper we analyze the significance of the Risk factor introduced in V. The same three dimensional methodology is undertaken using OLS and the extended dataset. Results of the analysis presented in Table VI shows that the R-Squared value of the overall model is increased to 0.842 with almost the same number of observations. The coefficient estimates and statistical significance of almost all control variables remained the same, except for the coefficient estimate of the population of country destination variable which has significantly increased, implying close ties between population and the risk factor. The coefficient estimate of the mega event variable also increased. Although little, the incremental increase suggests higher positive impact of hosting the mega events when the risk factor is accounted for.

### Table V: Participation in Bidding vs Hosting Mega Events

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<tr>
<th>Observations</th>
<th>F-Statistics</th>
<th>R-Squared</th>
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<tr>
<td></td>
<td>121888</td>
<td>0.8421</td>
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However, the analysis for seasonal effects (column b) with the negative sign for hosting the mega event in peak tourism season (defined as summer) strongly suggest to avoid such times. Although the authors in [1] have similar suggestion based on the statistical significance of the Tourism off-peak season (Fall, Winter, and Spring), the statistical significance of the tourism peak season with a negative sign in this paper using the extended data further strengthens the argument.

Finally the hypothesis of whether participation in bidding for hosting such events increases tourism gains has been re-tested with the extended dataset.

### Table VI: Analysis of the Extended Model with Risk Factor Included

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<th>Observations</th>
<th>F-Statistics</th>
<th>R-Squared</th>
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<tr>
<td></td>
<td>1236.52</td>
<td>0.00</td>
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</table>

The variable of our main interest in this table is the Overall risk factor (ORK). Results in Table VI shows that the overall risk factor is significantly positive for the tourism destination country, or more specifically the host country to the mega event. This means the higher the Country’s ORK ranking, the safer tourists will be feeling to travel to. The relatively large coefficient estimate of the variable calls for intrinsic attention to be paid to the inclusions of ORK when analyzing the impact of mega events on tourist arrivals or forecasting.
international tourism in general. On the other hand, the ORK of the tourism origin country is statistically insignificant. This result further confirms the validity of the extended model and the ORK estimates based on the practical logic that, regardless of the current situation of the origin country, tourists are concerned for their safety, security of their property, and facing unexpected situations at the destination country.

Inclusion of ORK in the Gravity Model is the most comprehensive way of incorporating a wide range of tourism risk aspects into a single dimension. Although a further disaggregation and the study of individual risk factors will provide deeper analytical insight to the concept, we leave that for future research. Overall, results of the three dimensional empirical analysis with the high statistical significance of the ORK imply an inevitable relationship between the tourism destination’s risk perception and the tourist’s final decision making.

VII. CONCLUSION

Our cost and benefit based empirical study of mega sport events in the international tourism context grasps on the root causes for enhancement of expected economic gains and extends towards suggestion of a comprehensive model for analysis purposes. In the process of validation, the work in [1] is revisited. Changes are captured and important observations are made. The empirical results in this paper suggest that Bilateral trade increases inbound tourist arrival. It also suggests that people from richer countries travel more often compared to nations that have lower income (GDP PC). Moreover, difference in the prices (PPP) significantly influences the travel intentions of the people. The dummy variables included in the model account for the cultural and geographical aspects of the international inbound tourism where the results suggest that, people are more likely to visit counterpart countries sharing with them a common language, common border, common currency, colonial ties or a combination of two or more of these variables. This means the cultural factor is highly important and therefore extreme measures should be taken to decide on the mega event’s host country in a way that can incorporate as many of these aspects as possible, hence leading to an optimal outcome. The results also emphasize on independent studies of the interested countries, in case they find themselves meeting most of the criterion suggested in this paper, they are encouraged to present stronger bids so that they can host the mega events and benefit from the economic gains. Our findings show that population of the destination country is statistically insignificant. Regardless of the current situation of the destination country, tourists are concerned for their safety, security of their property, and facing unexpected situations at the destination country.

Inclusion of ORK in the Gravity Model is the most comprehensive way of incorporating a wide range of tourism risk aspects into a single dimension. Although a further disaggregation and the study of individual risk factors will provide deeper analytical insight to the concept, we leave that for future research. Overall, results of the three dimensional empirical analysis with the high statistical significance of the ORK imply an inevitable relationship between the tourism destination’s risk perception and the tourist’s final decision making.

APPENDIX

List of Countries included in the study

<table>
<thead>
<tr>
<th>Afghanistan</th>
<th>Dominica</th>
<th>Latvia</th>
<th>Saint Helena</th>
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</table>
Cameroon | Hungary | Caledonia | Trinidad and Tobago | 2010 | Turkey (lost) | Austria (lost) | Egypt (lost) | South Korea (lost) | South Africa (won) |
---|---|---|---|---|---|---|---|---|---|
Canada | Iceland | Nicaragua | Tunisia | 2010 | Canada (won) | Morocco (lost) | South Korea (lost) | South Africa (won) |
Cape Verde | India | Niger | Turkey | 2010 | Canada (won) | Morocco (lost) | South Korea (lost) | South Africa (won) |
Central African Republic | Indonesia | Nigeria | Turkmenistan | 2010 | Canada (won) | Morocco (lost) | South Korea (lost) | South Africa (won) |
Chad | Iran, I.S.R | Norway | Turks and Caicos | 2010 | France (lost) | Russian Federation (lost) | Spain (lost) | United Kingdom (won) | USA (lost) |
Chile | Iraq | Oman | Uganda | 2010 | France (lost) | Russian Federation (lost) | Spain (lost) | United Kingdom (won) | USA (lost) |
China | Ireland | Pakistan | Ukraine | 2010 | France (lost) | Russian Federation (lost) | Spain (lost) | United Kingdom (won) | USA (lost) |
Colombia | Israel | Palau | United Arab Emirates | 2010 | France (lost) | Russian Federation (lost) | Spain (lost) | United Kingdom (won) | USA (lost) |
Comoros | Italy | Panama | Kingdom | 2010 | France (lost) | Russian Federation (lost) | Spain (lost) | United Kingdom (won) | USA (lost) |
Congo | Jamaica | Papua New Guinea | United States | 2010 | France (lost) | Russian Federation (lost) | Spain (lost) | United Kingdom (won) | USA (lost) |
Congo (Dem.Rep) | Japan | Paraguay | Uruguay | 2010 | France (lost) | Russian Federation (lost) | Spain (lost) | United Kingdom (won) | USA (lost) |
Cook Islands | Jordan | Peru | Uzbekistan | 2010 | France (lost) | Russian Federation (lost) | Spain (lost) | United Kingdom (won) | USA (lost) |
Costa Rica | Kazakhstan | Philippines | Vanuatu | 2010 | France (lost) | Russian Federation (lost) | Spain (lost) | United Kingdom (won) | USA (lost) |
Cote d'Ivoire | Kenya | Poland | Venezuela | 2010 | France (lost) | Russian Federation (lost) | Spain (lost) | United Kingdom (won) | USA (lost) |
Croatia | Kiribati | Portugal | Vietnam | 2010 | France (lost) | Russian Federation (lost) | Spain (lost) | United Kingdom (won) | USA (lost) |
Cuba | Korea, Dem Republic of | Korea, Republic of | Qatar | 2010 | France (lost) | Russian Federation (lost) | Spain (lost) | United Kingdom (won) | USA (lost) |
Cyprus | Kuwait | Romania | Zimbabwe | 2010 | France (lost) | Russian Federation (lost) | Spain (lost) | United Kingdom (won) | USA (lost) |
Czech Republic | Kyrgyz Republic | Lao People’s Dem.Rep | Rwanda | 2010 | France (lost) | Russian Federation (lost) | Spain (lost) | United Kingdom (won) | USA (lost) |
Denmark | Djibouti | | | 2010 | France (lost) | Russian Federation (lost) | Spain (lost) | United Kingdom (won) | USA (lost) |

**Bid Candidate Countries**

<table>
<thead>
<tr>
<th>Year</th>
<th>Summer Olympic Games (SOG)</th>
<th>Winter Olympic Games (WOG)</th>
<th>FIFA World Cup (FIFA)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1996</td>
<td>USA(won)</td>
<td>United Kingdom (lost)</td>
<td>Australia (lost)</td>
</tr>
<tr>
<td>1998</td>
<td>Japan(won)</td>
<td>France(won)</td>
<td>Italy (lost)</td>
</tr>
<tr>
<td>2000</td>
<td>Australia(won)</td>
<td>China (lost)</td>
<td>Germany (lost)</td>
</tr>
<tr>
<td>2002</td>
<td>USA(won)</td>
<td>Korea/Japan (won)</td>
<td>Canada (lost)</td>
</tr>
<tr>
<td>2004</td>
<td>Greece(won)</td>
<td>Argentina (lost)</td>
<td>South Africa (lost)</td>
</tr>
<tr>
<td>2006</td>
<td>Italy(won)</td>
<td>Germany(won)</td>
<td>South Africa (lost)</td>
</tr>
<tr>
<td>2008</td>
<td>Canada (lost)</td>
<td>China (won)</td>
<td>France (lost)</td>
</tr>
</tbody>
</table>

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**REFERENCES**


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