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

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***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.

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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 liner, 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 Santano-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 $F_{ij}=g\ m_1\ m_2/d_{ij}^2$ where F_{ij} represents in this case the trade flow between two countries i and j; m_i and m_j are their economic sizes; d_{ij} 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:

$$\begin{aligned} LnTou_{ijt} &= \beta_0 + \beta_1 LnTrade_{ijt} + \beta_2 GDPpc_{it} + \beta_3 GDPpc_{jt} \\ &+ \beta_4 LnPOP_{it} + \beta_5 LnPOP_{jt} + \beta_6 LnPPP_{ijt} + \beta_7 LnDist_{ij} + \\ &\beta_8 Lang_{ij} + \beta_9 Border_{ij} + \beta_{10} Colony_{ij} + \beta_{11} CU_{ij} + \eta E_{it} + \\ &\gamma_i + \delta_j + \lambda_t + u_{ijt} \end{aligned} \tag{1}$$

where

Ln: Natural log

i: Destination country

j: Origin country

Tou_{ijt}: Number of tourists between i and j at year t

$Trade_{ijt}$: Real bilateral trade-in-goods, as the sum of exports and imports, between i and j

$GDPpc_{it}$: GDP per capita of i in year t

$GDPpc_{jt}$: GDP per capita of j in year t

POP_{it}: Population of i in year t

POP_{jt}: Population of j in year t

PPP_{ijt}: Purchasing power parity that reflects relative cost of living in the i with respect to j

$Dist_{ij}$: Great circle distance between the capital cities of i and j

$Lang_{ij}$: 1 if there is a common language between i and j; 0 otherwise

$Border_{ij}$: 1 if there is common land border between i and j; 0 otherwise

$Colony_{ij}$: 1 if there has ever existed colonial relationship between i and j; 0 otherwise

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

γ_i: Destination fixed effect

δ_j: Origin fixed effect

λ_t: Year fixed effect

u_{ijt}: 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 PPPs 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), Cricket World Cup (CWC), 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_{it}: Overall Risk values of i in t.

ORK_{jt}: Overall Risk values of i 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 (α) level of 0.99 are marked with double asterisks (**), those significant at α 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 I: IMPACT OF MEGA EVENTS ON TOURISM

	Estimate (a)	**t value**	**Estimate (b)**	**t value**	**Pr (>|t|)**
(Intercept)	2.7452	1.47	2.6899	1.44	0.14
Ln $Trade_{ij}$	0.2855 **	32.95	0.2855	32.95	0.00
Ln GDP_{PCj}	0.1849 **	6.91	0.1848	6.91	0.00
Ln GDP_{PCi}	0.3028 **	12.89	0.3018	12.84	0.00
Ln POP_j	-0.0054	-0.06	-0.0041	-0.05	0.95
Ln POP_i	0.1916 *	2.23	0.1945	2.26	0.03
Ln PPP_{ij}	-0.1072 **	-7.72	-0.1079	-7.77	0.00
Ln $Dist_{ij}$	-1.0839 **	-43.99	-1.0839	-43.99	0.00
$Lang_{ij}$	0.8323 **	18.52	0.8322	18.52	0.00
$Border_{ij}$	1.1160 **	11.45	1.1160	11.45	0.00
$Colony_{ij}$	0.5963 **	5.40	0.5964	5.40	0.00
CU_{ij}	0.2120 *	2.00	0.2119	2.00	0.05
Event	0.0340 **	3.18			0.00
SOG			0.1996 **	7.42	0.00
WOG			-0.1058 **	-5.69	0.00
FIFA			0.0802 *	2.31	0.02
CWC			0.1681 **	6.53	0.00
RWC			-0.1193 **	-3.90	0.00
Lion			-0.0308	-1.46	0.14
Observation	122747		122747		
F-statistics	237.54	0.00	234.77	0.00	
R-Squared	0.8411		0.8411		

Hosting mega events is positively significant and confirms that mega events do increase tourist arrivals in the year the event is held. However, the disaggregated analysis of the six mega events shows that the rugby Lions tour is not significant at all in the tourism context. Low density of the event's popularity on international scale can be one of the influential factors among others leading to this result. SOG, FIFA WC, and CWC are positively significant with varying level of increase in tourist arrivals such that SOG holds the highest, and FIFA WC the lowest positions. WOG and RWC are statistically significant with negative signs indicating demotion in tourism gains. Although this result complies with the findings in [1] and [29], the extended data set provides better foundations for explanation of these results.

Table II shows that three out of the total four RWCs have been hosted in the same year with a CWC, and all the four WOG 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 II: HOST COUNTRY BY MEGA EVENT TYPE

Year	SOG	WOG	FIFA WC	CWC	RWC	Lions
1996	USA			India		
1998		Japan	France			
1999				UK	UK	
2000	Australia					
2001						Australia
2002		USA	Japan			
2003				South Africa	Australia	
2004	Greece					
2005						New Zealand
2006		Italy	Germany			
2007					France	
2008	China					
2009						South Africa
2010		Canada	South Africa			
2011				India	New Zealand	
2012	UK					
2013						Australia

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.

TABLE III: RESULTS OF ANALYSIS FOR MEGA SPORTS EVENTS AND THEIR LASTING LEGACY EFFECTS

	Estimate	**t value**	**Pr(>|t|)**
(Intercept)	2.6932	1.44	0.149
Ln $Trade_{ij}$	0.2855 **	32.95	0.000
Ln GDP_{PCj}	0.1844 **	6.89	0.000
Ln GDP_{PCi}	0.3069 **	13.01	0.000
Ln POP_j	-0.0037	-0.04	0.965
Ln POP_i	0.1911 *	2.22	0.026
Ln PPP_{ij}	-0.1083 **	-7.79	0.000
Ln $Dist_{ij}$	-1.0838 **	-43.98	0.000
$Lang_{ij}$	0.8323 **	18.52	0.000
$Border_{ij}$	1.1161 **	11.45	0.000
$Colony_{ij}$	0.5963 **	5.40	0.000
CU_{ij}	0.2123 *	2.00	0.045
Event	0.0273 *	2.05	0.040
Event (t+1)	-0.0608 **	-4.31	0.000
Event (t+2)	-0.0790 **	-5.19	0.000
Event (t+3)	-0.0636 **	-3.79	0.000
Event (t-1)	0.0411 **	2.74	0.006
Event (t-2)	0.0249	1.86	0.064
Event (t-3)	0.0288	1.90	0.058
Observations	122747		
F-Statistics	234.16		0.00
R-Squared	0.8411		

Although it is widely claimed that hosting mega sport events result in long term tourism gains, the empirical results of our analysis in Table III suggest that positive gains from such events should be expected one year immediately before the event and in the same year of the event. This opens a dialogue for further research in identification of areas to be improved in order to secure the expected lasting gains. Some of the suggested areas are continued publicity, achievement 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

	Estimate (a)	**t value**	**Estimate (b)**	**t value**	**Pr(>|t|)**
(Intercept)	2.6918	1.44	2.7235	1.46	0.15
Ln Trade$_{ij}$	0.2855 **	32.96	0.2855	32.95	0.00
Ln GDP$_{PCj}$	0.1851 **	6.92	0.1855	6.94	0.00
Ln GDP$_{PCi}$	0.3020 **	12.86	0.3030	12.91	0.00
Ln POP$_{i}$	-0.0034	-0.04	-0.0029	-0.03	0.97
Ln POP$_{i}$	0.1933 *	2.25	0.1899	2.21	0.02
Ln PPP$_{ij}$	-0.1076 **	-7.75	-0.1072	-7.72	0.00
Ln Dist$_{ij}$	-1.0838 **	-43.99	-1.0839	-43.99	0.00
Lang$_{ij}$	0.8320 **	18.51	0.8322	18.52	0.00
Border$_{ij}$	1.1158 **	11.45	1.1161	11.45	0.00
Colony$_{ij}$	0.5957 **	5.39	0.5963	5.40	0.00
CU$_{ij}$	0.2120 *	2.00	0.2121	2.00	0.05
Participant	0.1637 **	7.00			0.00
None Participant	-0.0381	-1.69			0.09
Peak Season			-0.0949 **	-5.77	0.00
Off Season			0.1099 **	5.97	0.00
Observations	122747				
F-Statistics	237.26	0.00	236.99	0.00	
R-Squared	0.8411				

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 V: PARTICIPATION IN BIDDING VS HOSTING MEGA EVENTS

	Estimate	**t value**	**Pr(>|t|)**
(Intercept)	2.7287	1.46	0.14
Ln Trade$_{ij}$	0.2855 **	32.95	0.00
Ln GDP$_{PCj}$	0.1848 **	6.91	0.00
Ln GDP$_{PCi}$	0.3032 **	12.90	0.00
Ln POP$_{j}$	-0.0057	-0.07	0.95
Ln POP$_{i}$	0.1930 *	2.24	0.02
Ln PPP$_{ij}$	-0.1073 **	-7.72	0.00
Ln Dist$_{ij}$	-1.0839 **	-43.99	0.00
Lang$_{ij}$	0.8322 **	18.52	0.00
Border$_{ij}$	1.1160 **	11.45	0.00
Colony$_{ij}$	0.5963 **	5.40	0.00
CU$_{ij}$	0.2120 *	2.00	0.05
Bid Host	0.0190	1.45	0.15
Bid Candidate	0.0165	1.53	0.13
Observations	122747		
F-Statistics	237.05	0.00	
R-Squared	0.8411		

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 VI: ANALYSIS OF THE EXTENDED MODEL WITH RISK FACTOR INCLUDED

	Estimate	t value	Pr(>|t|)
(Intercept)	-1.4356	-0.75	0.45
Ln Trade$_{ij}$	0.2855 **	32.85	0.00
Ln GDP$_{PCj}$	0.1877 **	6.99	0.00
Ln GDP$_{PCi}$	0.2316 **	9.86	0.00
Ln POP$_{j}$	0.0248	0.29	0.77
Ln POP$_{i}$	0.4154 **	4.70	0.00
Ln PPP$_{ij}$	-0.1020 **	-7.80	0.00
Ln Dist$_{ij}$	-1.0837 **	-44.27	0.00
Lang$_{ij}$	0.8324 **	18.44	0.00
Border$_{ij}$	1.1187 **	11.42	0.00
Colony$_{ij}$	0.5944 **	5.36	0.00
CU$_{ij}$	0.2101 *	1.99	0.05
ORK$_{j}$	0.0158	0.20	0.84
ORK$_{i}$	1.0839 **	13.73	0.00
Event	0.0378 **	3.45	0.00
Observations	121888		
F-Statistics	236.52	0.00	
R-Squared	0.8421		

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 could be a plus point in the attraction of international tourism, especially with the current era of global connectivity and social media generation. Our focus on the mega events shows that the tourism gains will significantly depend on the popularity-density of the event, less popular events such as the Rugby Lions tours do not have any impact on international tourism enhancement. The historical data shows that tourism gains could be achieved one year prior to the event and in the year of event. However, continued publicity and achievement of visitor's satisfaction during the visit may change this trend. We find the time of the mega event very important and suggest the organizing committees to plan the events for an off peak tourism season. In this way not only will the regular general-purpose tourists continue to visit, but the hosting country will also receive an increased number of new tourist specifically for the mega event. We also suggest the organizing committees to coordinate two or more mega events happening in the same year. In the ideal case, it is recommended to host the mega events in different years, however if this is not possible, then concertation on the geographical distance and overlapping nations can be a good way of accounting for this factor. Our findings show that participation in the bidding process for hosting such mega events should not be interpreted as resulting in significant tourism gains. Moreover, the host countries should give special consideration in their preparation to inbound tourists from countries participating in the events. Finally, we introduce the risk control variable and extend the Gravity Model for increased accuracy and further comprehensiveness of the analytics. Results of the analysis with the extended model shows significant importance of the variable, and validates the argument of risk being a substantial factor in shaping the tourist's final decision.

Appendix

List of Countries included in the study

Afghanistan	Dominica	Latvia	Saint Helena
Albania	Dominican Republic	Lebanon	Saint Kitts and Nevis
Algeria	Ecuador	Lesotho	Saint Lucia
Angola	Egypt	Liberia	Saint Pierre and Miquelon
Antigua and Barbuda	El Salvador	Libya	Saint Vincent and the Grenadines
Argentina	Equatorial Guinea	Liechtenstein	Samoa
Armenia	Eritrea	Lithuania	Sao Tome and Principe
Aruba	Estonia	Luxembourg	Saudi Arabia
Australia	Ethiopia	Macao	Senegal
Austria	Falkland Islands	Macedonia, FYR	Serbia
Azerbaijan	Faroe Islands	Madagascar	Seychelles
Bahamas	Fiji	Malawi	Sierra Leone
Bahrain	Finland	Malaysia	Singapore
Bangladesh	France	Maldives	Slovak Republic
Barbados	French Polynesia	Mali	Slovenia
Belarus	Gabon	Malta	Solomon Islands
Belgium	Gambia	Mauritania	Somalia
Belize	Georgia	Mauritius	South Africa
Benin	Germany	Mexico	Spain
Bermuda	Ghana	Moldova	Sri Lanka
Bhutan	Gibraltar	Monaco	Sudan
Bolivia	Greece	Mongolia	Suriname
Bosnia and Herzegovina	Greenland	Montserrat	Swaziland
Botswana	Grenada	Morocco	Sweden
Brazil	Guatemala	Mozambique	Switzerland
British Virgin Islands	Guinea	Namibia	Syrian Arab Republic
Brunei Darussalam	Guinea-Bissau	Nauru	Tajikistan
Bulgaria	Guyana	Nepal	Tanzania
Burkina Faso	Haiti	Netherlands	Thailand
Burundi	Honduras	Netherlands Antilles	Togo
Cambodia	Hong Kong	New	Tonga

		Caledonia	
Cameroon	Hungary	New Zealand	Trinidad and Tobago
Canada	Iceland	Nicaragua	Tunisia
Cape Verde	India	Niger	Turkey
Central African Republic	Indonesia	Nigeria	Turkmenistan
Chad	Iran, I.S.R	Norway	Turks and Caicos
Chile	Iraq	Oman	Uganda
China	Ireland	Pakistan	Ukraine
Colombia	Israel	Palau	United Arab Emirates
Comoros	Italy	Panama	United Kingdom
Congo	Jamaica	Papua New Guinea	United States
Congo (Dem.Rep)	Japan	Paraguay	Uruguay
Cook Islands	Jordan	Peru	Uzbekistan
Costa Rica	Kazakhstan	Philippines	Vanuatu
Cote d'Ivoire	Kenya	Poland	Venezuela
Croatia	Kiribati	Portugal	Vietnam
Cuba	Korea, Dem	Puerto Rico	Yemen
Cyprus	Korea, Republic of	Qatar	Zambia
Czech Republic	Kuwait	Romania	Zimbabwe
Denmark	Kyrgyz Republic	Russian Federation	
Djibouti	Lao People's Dem.Rep	Rwanda	

Bid Candidate Countries

Year	Summer Olypic Games (SOG)	Winter Olympic Games (WOG)	FIFA World Cup (FIFA)
1996	USA(won)		
	United Kingdom (lost)		
	Australia (lost)		
	Canada (lost)		
1998		Japan(won)	France(won)
		Italy (lost)	Morocco (lost)
		Spain (lost)	Switzerland (lost)
		Sweden (lost)	
		USA (lost)	
2000	Australia(won)		
	China (lost)		
	Germany (lost)		
	Turkey (lost)		
	United Kingdom (lost)		
2002		USA(won)	South Korea/Japan (won)
		Sweden (lost)	Mexico (lost)
		Canada (lost)	
		Switzerland (lost)	
2004	Greece(won)		
	Argentina (lost)		
	South Africa (lost)		
	Italy (lost)		
	Sweden (lost)		
2006		Italy(won)	Germany(won)
		Switzerland (lost)	South Africa (lost)
		Finland (lost)	Morocco (lost)
		Austria (lost)	Germany (lost)
		Slovak Rep. (lost)	Brazil (lost)
2008	Canada (lost)	Poland(lost)	
	China (won)		
	France (lost)		
	Japan (lost)		
	Turkey (lost)		
2010		Austria (lost)	Egypt (lost)
		Canada (won)	Morocco (lost)
		South Korea (lost)	South Africa (won)
2012	France (lost)		
	Russian Federation (lost)		
	Spain (lost)		
	United Kingdom (won)		
	USA (lost)		

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