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IMPACTS OF OLYMPICS ON EXPORTS AND TOURISM

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There have been debates on the effects of Olympics on economy. Previous studies estimated the direct benefits and costs of Olympic Games, and concluded that the net effects were positive or negative depending on specific assumptions used for evaluations. Recent studies turn attentions to indirect benefits. For example, signaling model by Rose and Spiegel (2010) argues that mega events are the signals of liberalization the country sends, and that the hosting of mega events spurs exports. This paper more thoroughly estimates the effects of Summer Olympics on exports and tourism using the Rose and Spiegel's data set extended up to 2008. Our empirical results show that the Summer Olympics have positively and significantly affected exports and tourists. The patterns are, however, different for exports and tourists. The effects on exports are slow and persist for long periods of time, whereas those on tourists are quick and short-lived. This finding is robust to different specifications. This result implies that, without carefully considering the time horizons of the effects of mega events, impact studies may be prone to over- or under-estimating the benefits of the mega events.

Keywords: Mega Events, Olympics, Tourists, Gravity Model
JEL classification: C21, C23

1. INTRODUCTION

There have been many arguments against and for the effects of hosting mega events on economic growth. Previous studies computed the costs and benefits of hosting mega events and concluded that the events were beneficial or harmful to the national economy, based on their assumptions and estimates. For example, previous literature on the Olympics emphasizes long-term benefit such as newly constructed event facilities and infrastructure, urban revival, enhanced international reputation, increased tourism, as well as improved public welfare, additional employment, local business opportunities and corporate relocation (Ritchie and Aitken, 1985; Hall, 1987; Kang, 1988; Robin,

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1988; Walle, 1996; French and Disher, 1997). In contrast, potential negative impacts include high construction costs of public sports infrastructure and related necessary investments (usually placing a heavy burden on the government budget), temporary crowding out problems, loss of visitors, and property rental increases (Hiller, 1990; Darcy and Veal, 1994; Mount and Leroux, 1994; Leiper, 1997; Spilling, 1998).[1]

The debates have been far from being settled yet, and new trends of research have begun to show up. One of the efforts is the signaling model by Rose and Spiegel (2010). They investigated the impact of hosting the Olympic Games on international trade flows and showed that hosting mega events benefits the hosting country in stimulating exports and imports. These authors find strong support that hosting a Summer Olympic Game increases trade flows significantly. Furthermore, they posit a theory of signaling, whereby countries that bid for a mega-event send a "policy signal that is followed by future liberalization". The benefits of the mega-events are therefore not through the increase in event-related activities but through the signal a country sends by hosting the event.

In this paper, we focus on indirect parts of the benefits such as enhanced international reputation or increased tourism and extend Rose and Spiegel (2010)'s study. More specifically, we improve their work in two ways. First, we try to quantify the effects of Olympics on trade and tourist visits. These impacts are generally not incorporated into the economic impact estimates, but rather regarded as additional, unquantifiable benefits. Rose and Spiegel examined the impacts of mega events on exports and imports. We now extend their study to further analyze the effects of Olympics on tourist visits. Second, the long-run impact on tourism (including country brand and other tourism related marketing) is often cited as a key consideration when countries bid to host mega-events (see, e.g., Fourie and Santana-Gallego, 2010). Then, we might expect large tourist visits even after the hosting years. We now try to tackle this issue empirically and investigate the time horizons of the Olympic effects on tourism.

The rest of the paper is organized as follows. Section 2 reviews previous literature on the impact studies of mega events. Section 3 briefly introduces our methodology and data used for our analysis. Section 4 presents empirical results. Concluding remarks are found in Section 5.

2. LITERATURE REVIEW

There are many studies that try to estimate the economic effects of mega events. For example, Humphreys and Plummer (1995) estimate the short-term economic impact to Atlanta from hosting the 1996 games to be $5.1 billion. Similarly, Fuller and Clinch

[1] See Kasimati (2003) for a review of related studies.

(2000) estimate that the total economic impact of hosting the 2012 games on the Washington-Baltimore metropolitan area would have been $5.3 billion. Economic impact studies confirm economic benefits of mega events in the billions of dollars. Unfortunately, these ex-ante studies are criticized for being filled with misapplications of economic theory that virtually guarantee their projections will be large. Critics have focused primarily on the following areas of misapplication: treating costs as benefits, ignoring opportunity costs, and using gross spending instead of net changes. For instance, much of the spending on the event by local citizens is a substitute from a different leisure activity or consumption good, rather than true additional spending (see, e.g., Siegfried and Zimbalist, 2000; and Coates and Humphreys, 2003).

In contrast, ex-post studies have consistently found no evidence of positive economic impacts from mega-sporting events. Empirical results vary considerably across papers. More rigorous studies are skeptical of the net economic benefits of hosting mega-events. Preuss (2004, 2007) and Baade and Matheson (2002) measured the economic returns to host the Summer Olympic Games, and show that the gains are ambiguous. The benefits from hosting the FIFA World Cup are similarly doubtful (Szymanski, 2002; Baade and Matheson, 2004; Lee and Taylor, 2005; Allmers and Maennig, 2009). Although a modest number of jobs may be created as a result of hosting the games, there appears to be no detectable effect on income, suggesting that existing workers do not benefit (Hagn and Maennig, 2008, 2009). Moreover, the impact of hosting the games depends on the overall labor market response to the new jobs created by the games and might not be positive (Humphreys and Zimbalist, 2008).

While the (direct and indirect) costs and benefits remain a source of debate, the focus has shifted recently towards indirect benefits of mega-events that are quantifiable. Recently, Rose and Spiegel (2010) tried to analyze this issue in a different way. They noted Preuss (2004) which discussed how the Seoul Games in 1988 were intended to improve international relations between South Korea and the Soviet Bloc countries "as well as raise international awareness of Korean manufactured products" so as to promote Korean exports. They examined this issue empirically, and found strong evidence of a large persistent effect of the Olympics on both exports and overall trade. They also develop a theoretical political-economy model consistent with this conjecture.[2] In the model, they obtain a separating equilibrium where countries that choose to liberalize also choose to bid for the Olympics; those that prefer to remain closed neither send the signal nor do they liberalize. Thus, bidding to host a mega-event provides a positive signal about future policy intentions, and, hence, hosting the games in and of itself has

[2] The signal model introduced in Rose and Spiegel (2010) is of the "burning money" type. They assume that countries that intend to pursue liberal trade policies in the future can signal this intent by engaging in the costly activity of bidding to host the Olympic Games. The payoff for sending this signal is that countries which expect to liberalize receive increased investment in the export sector (the sector whose prices are raised by liberalization).

no impact on a nation's fundamentals or trade.

Another important benefit of mega events is the impact on tourism. The International Olympic Committee (IOC) believes that potential visitors will be drawn to Olympic venues after being exposed to them through the games. Recent studies on tourism include Solberg and Preuss (2006), and Preuss (2007). However, there have been relatively few rigorous studies on tourism development resulting from mega events. Recently, Fourie and Santana-Gallego (2010) applied the gravity model to the data set used in Rose and Spiegel (2010), and analyzed the effects of various mega events on tourism. Their results suggest that mega-events promote tourism but the gain is dependent on the type of mega-event, the participating countries, the host country's level of development, and whether the event is held during the peak- or off-season. Also, Song and Kim (2010) studied the economic impacts of mega events such as Olympics, World Cups, and Expos *a la* Rose and Spiegel (2010), and showed that mega events exerted significant impacts on exports, foreign investments, tourists, and travel balance.

3. MODEL AND DATA

We start our investigation by using the well-known and widely employed gravity model of international trade. This model assumes bilateral trade flows between a pair of countries as a function of the distance between the two countries and their economic "masses". The theory, first developed by Anderson (1979), tells us that after controlling for size, trade between two regions is decreasing in their bilateral trade barrier relative to the average barrier of the two regions to trade with all their partners.

The model has been successfully applied to flows of various economic variables such as migration, foreign direct investment and more specifically to international trade flows. According to this model, exports from country *i* to country *j* are explained by their economic sizes, their populations, direct geographical distances and a set of dummies incorporating some kind of institutional characteristics common to specific flows. In this sense, the model has been widely used to infer trade flow effects of institutions such as customs unions, exchange-rate mechanisms, ethnic ties, linguistic identity, and international borders. Moreover, note that exports and tourists visits have similarity in that the distance acts as a restricting factor and economic masses as an attracting one. Thus, they both could be well analyzed by the gravity model. The specification we used in the paper is as follows:

$$\ln(Y_{ijt}) = \gamma D_{it} + \beta \ln(X_{ijt}) + \in_{ijt}, \tag{1}$$

where *i* denotes the exporting or tourist destination country, *j* denotes the importer or tourist originating country, *t* denotes time, ln(.) denotes the natural logarithm operator, Y_{ijt} denotes real FOB exports from *i* to *j* or tourist visits from *j* to *i*, measured in

millions of dollars or number of tourists, D_{it} is a binary variable which is unity if *i* hosted a post-war Olympic games and zero otherwise, X_{ijt} are control variables to be defined below, and $\in_{ijt}$ represents the omitted other influences on bilateral exports and tourist visits, assumed to be well behaved. γ and β are coefficients. The control variables are as follows.

Table 1. Control Variables

Variable	Description
Distance	Distance between countries *i* and *j*
Real p/c GDP	Annual real per capita GDP
Currency Union	Binary variable which is unity if *i* and *j* use the same currency at time *t* and zero otherwise
Common Language	Binary variable which is unity if *i* and *j* have a common language
RTA	Binary variable which is unity if *i* and *j* have a regional trade agreement at time *t*
Common Border	Binary variable which is unity if *i* and *j* share a land border
# of Island	Number of island countries in the pair
Product Area	The product of the areas of the countries
Common Colonizer	Binary variable which is unity if *i* and *j* were both colonized by the same country
Currently Colonized	Binary variable which is unity if *i* colonizes *j* at time *t* (or vice versa),
Ever Colonized	Binary variable which is unity if *i* ever colonized *j* (or vice versa),
Common Country	Binary variable which is unity if *i* is part of the same country at time *t* (or vice versa),

We estimated three versions of models. The first model (Model 1) includes year-specific fixed effects to account for time-specific effects. The second model (Model 2) includes sets of year effects dummies as well as dyadic-specific fixed effects to absorb time-invariant characteristics that are common to the pair of countries. The third model (Model 3) includes year effects dummies as well as exporter and importer fixed effects to handle exporter/importer country-specific effects. Country-pair heterogeneity is handled using the robust covariance when using the gravity model (Cheng and Wall, 1999). The models are estimated using 'areg' command in the STATA11 with robust covariance estimator to treat heteroskedasticity.

We use the data set in Rose and Spiegel (2010). The data set covers annual observations between 1950-2006 for 196 countries, and we extended it up to the year 2008

to include the Beijing Olympic in 2008. The tourist data set covers the tourist data between 1982-2008 for 88 countries.[3] The list of countries covered in the data set is shown in the appendix. The source of the tourists data is "Arrivals of non-resident visitors at national borders, by country" in the compendium of *Tourism Factbook* by UN WTO. We take natural logarithms of all the variables except dummies.

4. ESTIMATION RESULTS

4.1. Benchmark Results

In this section, we apply the Equation (1) to our exports and tourists data sets. As benchmark results, we provide the results when permanent effects of Summer Olympics are considered.[4] The regression results are the reproduction of those in Rose and Spiegel (2010), with slight differences due to extended data up to the year 2008. We focus on the analysis of Summer Olympics because Winter Olympics are known to have less clear effects on economy, as shown in Rose and Spiegel (2010). The results of the estimation of our base specification are provided in Table 2.

We first check the model specifications. In Table 2, the F-statistics are quite significant at the 1% level, and the adjusted R^2's are over 60%. This implies that the models are rightly specified. The gravity model seems to work well for our data set. The coefficient of distance is estimated to be negative which is economically and statistically significant. This implies that the exports between the pair of countries fall as the two countries are located far away. Also, the coefficients of log real per capita GDP indicates that larger and richer countries tend to export or import more. Exports are larger when countries share a currency, language, trade agreement, land border, or colonial history.

Our main interest is the coefficient of the summer Olympic host dummy. As shown in Table 2, the coefficient of Model 1 is 0.3220, which is strongly positive and significant. This result indicates that exports are permanently increased by 38% (=exp(0.3220)-1) by the hosting of Olympics. Including other fixed effects do not change the results. With dyadic fixed effects, the magnitude of the effects is slightly reduced, but with exporter/importer fixed effects, it is again comparable to that of Model 1.

[3] In this paper, the tourists visiting the hosting country at the event year are defined to be from the *direct* effects of the Olympics, and the tourists visiting the country at other times due to increased country brand or other tourism related marketing are defined to be from the *indirect* impacts of the Olympics. Our main focus is on the latter ones.

[4] One might ask whether the choice of venue for the Olympic Games could be treated as plausibly exogenous, i.e., whether only countries that are open to trade or tourists are chosen to host the games. In this paper, we do not attempt to directly address this issue because this issue is discussed in Rose and Spiegel (2010). An interested reader is referred to Rose and Spiegel (2010).

Table 2. Permanent Effects of Summer Olympics on Log Exports

	Model 1		Model 2		Model 3	
	Coeff.	Stan. Err.	Coeff.	Stan. Err.	Coeff.	Stan. Err.
Summer Host	0.3220**	0.0350	0.2354**	0.0347	0.3054**	0.0381
Log Distance	-1.1157**	0.0171			-1.3232**	0.0180
Log Exp Population	1.0823**	0.0095	0.3718**	0.0509	-0.0829	0.0528
Log Imp Population	0.8959**	0.0094	0.7278**	0.0503	0.4177**	0.0527
Log Exp Real p/c GDP	1.5695**	0.0128	1.2718**	0.0298	1.2780**	0.0307
Log Imp Real p/c GDP	1.1914**	0.0114	0.8003**	0.0281	0.7973**	0.0283
Currency Union	0.9134**	0.1121	0.1168	0.3139	0.6651**	0.0973
Common Language	0.4583**	0.0349			0.3555**	0.0339
RTA	0.2805**	0.0265	0.3313**	0.0217	0.4511**	0.0249
Common Border	0.7122**	0.0808			0.4784**	0.0815
# of Islands	0.1635**	0.0307			-3.3152**	0.3090
Log Product Area	-0.0695**	0.0065			0.5165**	0.0282
Common Colonizer	0.5448**	0.0562			0.7053**	0.0510
Currently Colonized	1.0188**	0.1743	1.0812**	0.4916	0.9396**	0.1640
Ever Colonized	0.9447**	0.1148			1.02698**	0.1007
Common Country	-0.5165	1.1005			-1.3539**	0.3630
Year Effects	Yes		Yes		Yes	
Dyadic Fixed Effects			Yes			
Exporter Fixed Effects					Yes	
Importer Fixed Effects					Yes	
Adjusted R^2	0.6166		0.8422		0.6994	
RMSE	2.1903		1.4051		1.9395	
F-statistics	3763.60		202.02		360.74	
Observations	459,821		459,821		459,821	

Note: * indicates the significance at the 10% level, ** at the 5% level.

Table 3 shows the results for tourists. The results for other variables except the Olympic dummies are almost similar to those for exports. Distance has negative impacts, and population and GDP have positive influence on tourist visits. Common language, common colonial history, and common relationships such as RTA and common currency all have significant effects on tourist visits.

Table 3. Permanent Effects of Summer Olympics on Log Tourists

	Model 1		Model 2		Model 3	
	Coeff.	Stan. Err.	Coeff.	Stan. Err.	Coeff.	Stan. Err.
Summer Host	-0.3346**	0.0820	-0.2522**	0.0663	-0.2241**	0.0712
Log Distance	-1.4122**	0.0439			-1.5334**	0.0377
Log Dest Population	0.7318**	0.0243	1.087**	0.2079	1.3424**	0.2645
Log Orgn Population	0.8391**	0.0212	-0.4946**	0.1740	-0.0165	0.2068
Log Dest Real p/c GDP	1.0853**	0.0507	0.4238**	0.0840	0.4155**	0.0934
Log Orgn Real p/c GDP	1.3786**	0.0295	0.1736**	0.0681	0.2925**	0.0713
Currency Union	0.565**	0.2848			0.1227	0.2596
Common Language	1.1024**	0.0707			0.7192**	0.0761
RTA	0.1884**	0.0660	0.0855**	0.0331	0.0947*	0.0530
Common Border	0.8759**	0.1804			0.794**	0.1554
# of Islands	0.4709**	0.0682			-2.874*	1.3204
Log Product Area	0.022	0.0151			-0.7179*	0.2900
Common Colonizer	0.773**	0.1872			1.2014**	0.1723
Currently Colonized	0.9017**	0.3280			1.0628**	0.2975
Ever Colonized	0.9691**	0.2391			0.6649**	0.2229
Common Country	-1.8331**	0.2525			-0.8381**	0.3665
Year Effects	Yes		Yes		Yes	
Dyadic Fixed Effects			Yes			
Exporter Fixed Effects					Yes	
Importer Fixed Effects					Yes	
Adjusted R^2	0.7279		0.9662		0.8575	
RMSE	1.6607		0.5857		1.2018	
F-statistics	547.99		62.56		146.40	
Observations	31,803		31,803		31,803	

Note: * indicates the significance at the 10% level, ** at the 5% level.

According to previous literature, mega events such as Olympics generate long-term benefits such as newly enhanced international reputation and increased tourism, thus we expect that the coefficients of Olympic dummies are significantly positive. The coefficients are, however, significantly negative, contrary to our expectations. This is a puzzling result because mega events such as Olympics are supposed to increase tourist visits. The results do not change with other types of fixed effects in Models 2 and 3. In the following, we investigate this phenomenon more thoroughly.

4.2. Further Examination of Olympic Effects

We suspect that the effects of Olympics on tourists may not be permanent. In the previous section, the dummy used is permanent effects dummy. In this section, we divide Olympic dummies into various durations. Also, one might ask whether the effects begin only after the hosting or before the actual hosting. To examine this, we use the following nested structure of dummies.

Table 4. Types of Summer Olympic Dummies

[0, 4]	[0, 8]	[0, 12]	[0, ∞]
[-4, 4]	[-4, 8]	[-4, 12]	[-4, ∞]
[-7, 4]	[-7, 8]	[-7, 12]	[-7, ∞]

We consider total 12 dummies. In Table 4, the first number in the square bracket is the starting year of dummy and the second one is the terminal year around the actual hosting year. Number 0 is the actual hosting year. The permanent effects dummy in previous section corresponds to [0, ∞] in Table 4. We consider 4 different terminal periods; 4, 8, 12 years, and infinity. These dummies measure the effects of the Olympic hosting up to 4, 8, 12 years, and infinity, respectively. We also consider the periods preceding the actual hosting year because the effects of Olympic hosting may begin before the actual hosting of the events. We chose -4 and -7. -7 was chosen because the Olympic venue is determined 7 years before the actual hosting. The baseline model is Equation (1). The 12 dummies are replaced for D_{it} at each regression and the results are summarized in Tables 5 and 6. Detailed regression results are omitted to save space. They are available upon request.

Table 5 shows the results of different Olympic dummies on exports.[5] An interesting finding is that the effects of Olympics become larger and more significant as the duration of dummies increase, i.e., as the terminal period increase from 4 to infinity, the sizes of effects increase. This is observed in all models. In Model 3, for example, the effect for the period [0,4] is 0.0677 while that for permanent dummy [0, ∞] is 0.3054, which is about 4.5 times larger effect. This indicates that the effects of Olympics occur slowly in the later periods of samples. Previous studies failed to seriously consider the effects of the events on exports stimulation. Now, we see that the effects on exports appear only after long periods of time have passed. Thus, we may suspect that previous

[5] One may be interested in determining which one among the 12 different dummies provides the best model from the statistical perspective. Our interest, however, is not in selecting the best dummy, but in estimating the impacts of the Olympics for different time horizons. Thus, we omitted detailed arguments for model specifications in the paper. Interested readers may ask the author for the results.

impact studies have under-estimated the benefit side of hosting the events in terms of boosting exports.

Table 5. Results of Dummies for Exports

Model 1	4	8	12	∞
0	0.0015	0.0718**	0.1179**	0.3220**
-4	-0.0154	0.0428	0.0901**	0.2982**
-7	-0.0379	0.0211	0.0672*	0.2831**
Model 2	4	8	12	∞
0	0.0344*	0.0542**	0.0741**	0.2354**
-4	0.0775**	0.0895**	0.1040**	0.3072**
-7	0.0909**	0.1031**	0.1189**	0.3852**
Model 3	4	8	12	∞
0	0.0677**	0.1084**	0.1429**	0.3054**
-4	0.0944**	0.1291**	0.1622**	0.3969**
-7	0.0990**	0.1357**	0.1708**	0.4841**

Notes: 1) * indicates the significance at the 10% level, ** at the 5% level. 2) Terminal years vary horizontally while starting years vary vertically.

The different starting years also have influences on the Olympic effects. Model 1 have different picture from the other models. In Model 1, the effects covering earlier starting year are smaller than the effects starting at the event year. In Models 2 and 3, however, the direction is converse. The effects covering early starting years are about 1.5 times consistently larger than the effects starting at the event year. Tests of the hypothesis that the long-run dummies [0, ∞], [-4, ∞], and [-7, ∞] are equal show that the coefficient of the dummy [-4, ∞] is larger than that of [0, ∞], and that coefficient of the dummy [-7, ∞] is larger than that of [-4, ∞] at the 1% significance level.[6] This fact suggests that the effects of hosting Olympics begin even before the actual hosting of the event. In other words, this implies that around the time of determination of hosting the event, the countries began to actively open the door to foreign trade and rapidly increase the transactions with other countries. This finding implicitly support Rose and

[6] The F-test statistic for the test of equality of the coefficients of [-4, ∞] and [0, ∞] is 26.42 and the p-value is less than 1%. The F-test statistics for the test of equality of the coefficients of [-7, ∞] and [-4, ∞] is 33.90 and the p-value is also less than 1%.

Spiegel's hypothesis that hosting mega events is sending the signal of liberalization to foreign countries, and that hosting the event itself is not much important.

Table 6. Results of Dummies for Tourists

Model 1	4	8	12	∞
0	0.4885**	0.2357**	0.1306*	-0.3346**
-4	0.6564**	0.4160**	0.2396**	-0.2486**
-7	0.6574**	0.4500**	0.2831**	-0.1984**
Model 2	4	8	12	∞
0	0.0639**	-0.0167	-0.0793**	-0.2522**
-4	0.1305**	0.0397	-0.0333	-0.1154
-7	0.1398**	0.0230	-0.0581	-0.2243**
Model 3	4	8	12	∞
0	-0.0106	-0.1274**	-0.1649**	-0.2241**
-4	0.1444**	-0.0148	-0.0681*	0.0243
-7	0.1718**	-0.0058	-0.0610	-0.0078

Notes: 1) * indicates the significance at the 10% level, ** at the 5% level. 2) Terminal years vary horizontally while starting years vary vertically.

Table 6 shows the results of different dummies for tourist visits. As indicated before, the effects of permanent dummies on tourist visits are significantly negative or insignificant. However, the short-run effects on tourists are surprisingly positive. For Model 1, the effects covering up to 12 years are positive and the effects covering all years are negative. For Models 2 and 3, the effects that cover only up to 4 years are positive and all the other dummies are negative. This finding shows that the effects of Olympics on tourist visits are very short-lived and lasts up to 4-12 years. The magnitudes of the coefficients are also different across models. For Model 1, the coefficients for [-7, 4] is 0.6574, for example, whereas that of Model 3 is 0.1718. The magnitudes of Model 2 are similar to those of Model 3.

Previous studies[7] argued that tourist visits are one of the main long-run benefits of hosting mega events. Our results suggest that the revenue from tourist visits is limited up to a few years after the hosting of mega events because the effects on tourists fade out quickly after the events. Thus, we may cautiously suspect that the benefit side of previous impact studies in terms of tourist visits may be overstated if these transitory

[7] See, for example, Fourie and Santana-Gallego (2010), Owen (2005), or Kasimati (2003).

effects on tourism are not considered.

Earlier starting years also have influences on the effects of Olympics. Dummies with earlier starting years have about 1.5~2 times larger effects than the dummies with starting year at the hosting years.[8] Tests of the hypothesis that the short-run dummies are equal show that the coefficient of the dummy [-4, 4] is larger than that of [0, 4] at the 1% significance level, and that the coefficients of the dummies [-7, 4] and [-4, 4] are similar at the 10% significance level.[9] This finding shows that the tourist visits are concentrated for the 4 years before and after the actual hosting of the events.

The results from Tables 5 and 6 indicate that the effects of Summer Olympics on exports and tourist visits are quite different. The effects on exports gradually increase as time goes on whereas those on tourist visits gradually diminish. This conjecture can be confirmed by using long-run time trend dummies for hosting countries instead of fixed 0/1 dummies. Thus, we define time trend dummy as taking value time t if the country hosted Summer Olympics before time t and value 0 otherwise. Thus the estimated equation is as follows:

$$\ln(Y_{ijt}) = \gamma_1 D_{it} + \gamma_2 TD_{it} + \beta \ln(X_{ijt}) + \in_{ijt}, \tag{2}$$

where TD_{it} is the time trend dummy. The estimation results are shown in Table 7.

Table 7. Results for Summer Olympics with Fixed and Time Trend Dummies

Exports	[-7, ∞]		[-4, ∞]		[0, ∞]	
	Fixed	Trend	Fixed	Trend	Fixed	Trend
Model 1	-0.1680**	0.0116**	-0.1692**	0.0119**	-.1884**	0.0128**
Model 2	0.1565**	0.0058**	0.0935	0.0053**	0.0362	0.0048**
Model 3	0.2627**	0.0055**	0.1928**	0.0049**	0.1228*	0.0043**
Tourists	[-7, ∞]		[-4, ∞]		[0, ∞]	
	Fixed	Trend	Fixed	Trend	Fixed	Trend
Model 1	-0.2643	0.0014	-0.2147	-0.0007	-0.3675	0.0007
Model 2	0.5134**	-0.0152**	0.7187**	-0.0167**	0.3545**	-0.0124**
Model 3	0.6286**	-0.0132**	0.7328**	-0.0143**	0.2490	-0.0096**

Note: * indicates the significance at the 10% level, ** at the 5% level.

[8] This finding is also noted in Fourie and Santana-Gallego (2010).

[9] The F-test statistic for the test of equality of the coefficients of [-4, 4] and [0, 4] is 43.03 and the p-value is less than 1%. The F-test statistic for the test of equality of the coefficients of [-7, 4] and [-4, 4] is 2.68 and the p-value is also less than 10.2%.

Table 7 shows that the coefficients of time trend dummies for exports are positive. This indicates that the effects of the hosting Summer Olympics on exports become large as time goes on. For example, the coefficient of exports for [0, ∞] time trend dummy in Model 3 is 0.0043, and this implies that the exports increase at the rate 0.43% every year due to the hosting of Summer Olympics. Also, the coefficients for time trend dummies become larger for earlier starting years, thus we infer that the significant effects on exports begin only after the actual hosting of the event.

Unlike the case of exports, the coefficients for tourist visits are negative. The results for Model 1 are insignificant. Models 2 and 3 show consistently significant results. The results from Models 2 and 3 indicate that the effects of the hosting Summer Olympics on tourist visits become small as time goes on. For example, the coefficient of tourists for [-4, ∞] time trend dummy in Model 3 is -0.0143, and this implies that the number of tourists decreases at the rate 1.44% every year due to the hosting of Summer Olympics. The coefficients are largest for [-4, ∞] time trend dummy in Model 3, which implies that the effects of the hosting Summer Olympics on tourists begin sometime around 4 years before the actual hosting of the event. Overall, the effects of Summer Olympics for tourist attraction seem to vanish gradually after the event.[10]

Table 8. Results for Olympics with Fixed and Time Trend Dummies

Exports	[-7, ∞]		[-4, ∞]		[0, ∞]	
	Fixed	Trend	Fixed	Trend	Fixed	Trend
Model 1	-0.2273**	0.0138**	-0.2296**	0.0140**	-0.2295**	8.0144**
Model 2	0.3747**	0.0030**	0.3026**	0.0023**	0.2603**	0.0013
Model 3	0.4455**	0.0046**	0.3662**	0.0039**	0.2945**	0.0028**
Tourists	[-7, ∞]		[-4, ∞]		[0, ∞]	
	Fixed	Trend	Fixed	Trend	Fixed	Trend
Model 1	-0.3924	0.0073	-0.3375	0.0053	-0.3392	0.0040
Model 2	0.4468**	-0.0141**	0.6351**	-0.0153**	0.6628**	-0.0150**
Model 3	0.4850**	-0.0104**	0.5708**	-0.0112**	0.5616**	-0.0112**

Note: * indicates the significance at the 10% level, ** at the 5% level.

[10] Ritchie and Smith (1991) examined public awareness of past Winter Olympic host sites in both Europe and North America. Based on several thousand telephone interviews carried out over 1986-89, fewer than 10 percent of the North American residents surveyed and fewer than 30 percent of the Europeans could recall that Innsbruck, Austria, was the site of the 1976 Winter Olympic Games. Only 28 percent of the North Americans and 24 percent of the Europeans surveyed remembered that the 1980 Winter Games took place in Lake Placid, New York.

As a sensitivity analysis, we consider the Winter Olympics together and estimate the effects of Olympics on exports and tourists. Table 8 shows the estimation results. The results of the Winter Olympics alone also show similar results as the Summer ones.[11] However, the Winter Olympics are small both in their sizes and significances, and thus, the results of the Winter Olympics alone do not have strong tendencies as the Summer Olympics have. Hence, the overall effects of Olympics that include both Summer and Winter Olympic Games are slightly smaller than those of Summer Olympics alone. However, the qualitative results of Table 7 are preserved for the Olympic Games.

5. CONCLUDING REMARKS

It is widely known that mega events such as Olympics boost economic growth and tourist visits. Most impact studies focused on local sporting games or specific events. There have been, however, few empirical studies that analyze the effects of mega events using multi-country panel data. This paper examined the effects of Olympics on export and tourists using the cross-country data set.

Our results show that the Summer Olympics have positively and significantly affected export and tourists. However, the patterns of effects are different for exports and tourists. The long-run effects on exports are positive, as already shown in Rose and Spiegel (2010), while those on tourists are negative, which is contrary to prior expectation. We further investigate these puzzling results and found that the effects on exports are slow and persist for long periods of time, whereas those on tourists are quick and short-lived, concentrated around 4 years before and after the actual hosting of Olympics. We confirmed this observation by estimating the coefficients of time trend dummies for hosting countries, and showed that the trend coefficients for exports are positive and those for tourists are negative.

Our results point to some cautions on the interpretations of the results from previous impact studies. Most studies focused on the short-term costs and benefits of Olympics such as those on infrastructure or employment, and may suffer from the possibility of under-estimating the long-run benefits of the mega events such as on exports boosting. On the other hand, other studies that emphasize the effects of Olympics in building up the brand images of the hosting countries may suffer from the possibility of over-estimating the benefits on tourist visits because they are short-lived. Since there are many aspects in the effects of Olympics, our observation indicates that we need to carefully distinguish the long-run and short-run effects of them. Also, our results on tourist visits imply that, to enhance tourist visits, mega events should be hosted repeatedly. This may partly explain why developed countries, that have hosted a mega event once, try to host other mega events. This issue is left for further study.

[11] The results of the Winter Olympics are not reported here to save space. They are available from the author upon request.

Appendix

For the list of countries used for the estimation of export equations and the sources of control variables used for estimation, see the Appendix of Rose and Spiegel (2010). The list of countries analyzed for tourist impacts is as follows.

Table A. List of Countries for Tourist Data (in Alphabetical Order)

Antigua and Barbuda	Greece	Qatar
Argentina	Grenada	Romania
Australia	Hong Kong	Russia
Austria	Hungary	Saudi Arabia
Azerbaijan	Iceland	Serbia
Bahamas	Iran	Seychelles
Bahrain	Ireland	Singapore
Barbados	Israel	Slovak Republic
Belarus	Italy	Slovenia
Belgium	Japan	South Africa
Bermuda	Kazakhstan	Spain
Botswana	Korea, Republic of	St. Kitts & Nevis
Brazil	Kuwait	St. Lucia
Brunei	Latvia	Suriname
Bulgaria	Libya	Sweden
Canada	Lithuania	Switzerland
Chile	Luxembourg	Taiwan
China	Macao	Thailand
Costa Rica	Malaysia	Trinidad &Tobago
Croatia	Malta	Tunisia
Cuba	Mauritius	Turkey
Cyprus	Mexico	Turkmenistan
Czech Republic	Netherlands	Ukraine
Denmark	New Zealand	United Arab Emirates
Dominican Republic	Norway	United Kingdom
Equatorial Guinea	Oman	United States
Estonia	Palau	Uruguay
Finland	Poland	Venezuela
France	Portugal	
Germany	Puerto Rico	

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