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GAMES AND ANTICIPATION EFFECTS
IN MACROECONOMICS**

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ABSTRACT

For an Olive Wreath? Olympic Games and Anticipation Effects in Macroeconomics*

The hosting and bidding for the Olympic Games is a natural experiment to test for anticipation effects in macroeconomics. We examine these effects using panel data for 184 countries during the period 1950-2006. We find that hosting the Games generates positive investment, consumption, and output responses already before the hosting of the Games. We also detect significant anticipation effects in countries that bid for the Games. While bidding for the Games has a transitory level effect, hosting the Games has a permanent level effect.

JEL Classification: E62 and E65

Keywords: anticipation, mega event and natural experiment

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1. Introduction

According to Herodotus, in the ancient Greek times when the Olympics were on, Xerxes and Mardonius asked to a group of Greek deserters what prize the Olympic winners should get. The answer was “An olive-wreath.”¹ Tigranes, one of Xerxes’s generals, uttered: “Good heavens! Mardonius, what manner of men are these against whom you have brought us to fight – men who contend with one another, not for money, but for honor!”

Contemporary economists have no clear answer on whether the organization of the modern Olympic Games is a matter of honor or a matter of money. Although the acquirement of international prestige is obvious, the economic advantages for hosting the Games are not that clear. The economic benefits of hosting the Games are dubious for most academics who have conducted independent research on the issue (see, for example Owen (2005)). Only recently, Rose and Spiegel (2011), using a variety of trade models, show that hosting the Olympics has a positive impact on national exports which is statistically robust, permanent, and large. The authors find that unsuccessful bids to host the Olympics have a similar positive impact on exports and explain their finding by arguing that what matters is the signal countries send to international markets when these countries bid for the Olympics. However, as the authors also recognize, their explanation cannot fit all aspects of the data. For instance, they cannot explain why open economies should bid to host the Olympics, and why countries bid repeatedly for the organization of such events.

The starting point of our analysis is that bidding to host mega events such as the Olympic Games creates important demand anticipation effects that stimulate current output, consumption and investment. In other words, bidding for a mega event such as the Olympic Games is “news” about future investment opportunities and future increases in public spending. Thus, private agents may find it optimal to react to the news signal before the event happens. In fact, we view the competition for the Olympic Games hosting as a natural experiment to test for anticipation effects in macroeconomics. This is because the Olympic bidding process begins with the submission of a city's application to the International Olympic Committee (IOC) by its National Olympic Committee (NOC) – approximately nine years before the actual hosting of the event. The candidate countries compete for a favorable appraisal from the IOC Evaluation Commission and after a technical evaluation of the original bids by the IOC, the top five bids are shortlisted the year after. Finally, a host city is selected seven years before the actual organization of the events and the successful bid delegation signs the "Host City Contract" with the IOC (which delegates the responsibilities of the Games organization to the city and respective NOC). The election of the host city is made by the assembled active IOC members, each possessing

¹ Herodotus (Book 8, Urania, 26, 1).

one vote. Members from countries that have a city taking part in the bidding for the Olympic Games are unable to vote.

Hence, agents in candidate cities/countries receive signals for possible changes in aggregate demand: nine to eight years before hosting they receive the bidding signal and seven years prior to the actual organization of the Games they receive the winning or failing signal. The bidding signal is likely to be less informative than the winning one. It gives typically a 1/5 probability to the bidding country for holding the event in eight years, while the winning signal is very informative and produces important news for what is going to happen in the following years. This particular information structure allows us to test whether such news affect economic behavior and explicitly examine the role of expectations and uncertainty realization in shaping macroeconomic outcomes. To the best of our knowledge our study is the first in the literature to investigate if agents react in anticipation of future events with macroeconomic data.

Anticipation is a general concept used and applied in various domains of economics. Economists have tried to study the effects of several types of economic news. For example, Frenkel (1981), Engel and Frankel (1984) and Hardouvelis (1987) have looked at the response of interest rates to the news embodied in the weekly money supply announcements. Hardouvelis (1988) and Gürkaynak et al. (2005a and 2005b) examine how exchange rates, interest rates, and long-term forward rates respond to monetary news and to monthly macroeconomic news which provide information about the state of the business cycle and are closely watched by economic forecasters (such as the unemployment rate, the industrial production index, personal income, and orders of durable goods). Bartolini et al. (2008) explore how the release of new economic data affects asset prices in the stock, bond, and foreign exchange markets.

In macroeconomics it is often argued that changes in expectations (“animal spirits”) are an important driving force of the business cycle. Beaudry and Portier (2006) present compelling evidence supporting the idea that business cycles are driven by a shock that represents news about future technological opportunities which is captured in stock prices. Schmitt-Grohé and Uribe (2011) confirm and quantify the findings of Beaudry and Portier (2006). Beaudry and Portier (2007) and Jaimovich and Rebelo (2009) propose models that can explain how macroeconomic variables react to future total factor productivity news. Ramey (2011) emphasizes the importance of measuring anticipations when fiscal shocks are considered and constructs series of expected discounted value of government spending changes due to foreign political events to approximate changes in expectations for US public defense spending. All these studies employ time series information and do not exploit the information contained in the evolution of macroeconomic aggregates that are known in advance – such as the

organization of the Olympic Games – to measure anticipation, thus rendering our analysis unique within the existing literature.

To analyze the anticipation effects of Olympic “news” we use a panel of 184 countries spanning the period 1950-2006 and examine how within-country variations in per capita GDP, consumption, investment, government expenditures, the price level and the exchange rate are related to an Olympic Games indicator variable; both for countries that bid and win the Games and for countries that bid and lose the Games. We employ panel fixed effects estimation techniques that allow for contemporaneous, future, and lagged effects of the Games indicator. We consider the bidding and hosting of the Olympic Games as natural experiments in the sense that candidacies and actual hosting is exogenous to current macroeconomic developments.

The Olympic Games are economically beneficial, but neither for their legacy effects, nor for the “honor” they yield. They are beneficial because of the positive effects they induce on the expectations of private agents about changes in future demand. Hosting the Games generates positive investment, consumption, and output responses before, during, and after celebration. Anticipation effects are present in all the variables we consider: GDP growth increases significantly during the previous five years before hosting and the peak response occurs four years before the actual hosting of the event. This increase in GDP per capita growth is due to a significant positive and quantitatively large increase in private investment and consumption. Government spending also increases four years in advance of the actual event. The variable that mostly reflects the anticipatory demand effects of the Games is the price level and the exchange rate: they react significantly when a country bids for the Olympics reaching their maximum reaction around the time when the announcement of the winner is made.

Anticipation effects also account for the increases in output growth of unsuccessful bidders: forward looking investors should boost investment demand in countries that bid for the Olympics since in those countries expected profits increase. We show that this is the case in the data: we observe significant positive output growth, private investment, and private consumption responses in the bidding countries about seven to ten years before actual hosting. Private investment significantly decreases two and three years after the unsuccessful bidding indicating that the investment projects undertaken while bidding are mostly reversible and for that reason the after-effects of bidding for the Olympic Games are significantly negative.

Our results survive a series of sensitivity analyses concerning data treatment, sample periods and omitted variables. First, we compare the organization of the Olympics with other international events such as the International Expo and the World Cup. Both events confirm the presence of anticipation effects, but their effects are not comparable in terms of size with the ones of the Olympics.

Countries that have hosted International Expos experienced a significant increase in their real per capita GDP growth before the hosting of the event, but this effect is small and transitory when compared to the one generated by the Olympics. The hosting of the World Cup, on the other hand, generates negative effects on output growth and only positive effects on government spending growth. Thus, agents perceive the organization of such an event as a minor investment opportunity which simply leads to increases in government spending crowding out private demand. We have also investigated whether local effects are stronger than country effects by repeating our analysis using regional data. The regional analysis confirms the general findings: hosting the Olympics generates positive output growth effects before, on impact, and after the event. Finally, stock price data confirm the presence of anticipatory effects. The stock price index increases significantly eight and nine years before the hosting of the Games and the magnitude of the anticipatory increase in stock prices is comparable in bidding and hosting countries.

The paper is organized as follows. The next section describes the data and the estimation methodology. In section 3 we present the main results. Section 4 examines the sensitivity of the results to changes in the econometric model and the natural experiment performed. The last section concludes.

2. Data and Estimation Approach

We obtain data on countries bidding and hosting the Olympic Games from www.olympic.org. We consider both winter and summer Games to maximize the variance of the Olympic Games indicator variable in the sample. Our data on real per capita GDP, private consumption, private investment, government expenditures, the consumer price level, and the nominal exchange rate, defined as the ratio of home to US currency, are from the Penn World Tables (Heston et al., 2009). Data Appendix Table 1 lists the bidding and hosting countries.

We consider bidding and hosting of the Olympic Games as natural experiments in the sense that the outcome is exogenous to the current macroeconomic developments (See, Rosenzweig and Wolpin, 2000). Of course, the Olympic Games are different in nature than natural disasters such as earthquakes, or floods. However, due to the features of the bidding process (that takes place many years prior to the celebration of the Games) the incidence of the Olympic Games represents an event that can be treated as predetermined to the current state of the economy.

We use the following econometric specification to estimate the effects of the Games:

$$Y_{i,t} = a_0 Host_{i,t} + A(L)Host_{i,t} + B(F)Host_{i,t} + c_0 Bid_{i,t} + C(L)Bid_{i,t} + D(F)Bid_{i,t} + \alpha_i + \beta_t + e_{i,t} \quad (1)$$

where, $Host_{i,t}$ is an indicator variable that is unity in country i and year t if the country hosted in year t

the Olympic Games. $Bid_{i,t}$ is an indicator variable that is unity in country i and year t if the country was bidding to host the Olympic Games that were held in year t . Because bidding to host the Olympic Games takes place about seven to ten years before the actual hosting of the Games, we include up to ten leads of the bidding and hosting country indicator variable on the right-hand side of the estimating equation, so that $B(F) = b_1F + b_2F2 + \dots + b_{10}F10$ and $D(F) = d_1F + d_2F2 + \dots + d_{10}F10$. The coefficients in the polynomial $B(F)$ and $D(F)$ capture the anticipatory effects of hosting and bidding for the Olympic Games. Similarly, we examine the delayed-effects of the Olympic Games by including up to ten lags on the right-hand side of the estimating equation, such that $A(L) = a_1L + a_2L2 + \dots + a_{10}L10$ and $C(L) = c_1L + c_2L2 + \dots + c_{10}L10$. The contemporaneous effects of the Olympic Games for the bidding and hosting countries are in turn captured by the coefficients a_0 and c_0 . We examine whether bidding and hosting the Olympics has long-run (i.e. permanent) effects on the outcome variables $Y_{i,t}$ by testing whether the sum of the estimated coefficients on the contemporaneous, after and before dummy variables is significantly different from zero.

Note that as control variables in equation (1) we have included country fixed effects α_i and year fixed effects β_t . The country fixed effects are an important control variable because they account for time-invariant country specific unobservables that may affect the likelihood of hosting and bidding for the Olympic Games and the outcome variable $Y_{i,t}$. Hence, any fixed factors such as climate, continent, language, or differences in average incomes per capita are controlled for with the inclusion of the country fixed effects. The year fixed effects account for year-specific common factors, such as for example the world business cycle. Because we control for both country and year fixed effects our estimated slope coefficients can be interpreted as a result of a difference-in-difference estimation.

Our outcome variables – real per capita GDP, consumption, investment, government expenditures, the price level, and the exchange rate – are highly persistent. Therefore we include these variables in growth rates in the estimating equation. We account for serial correlation in the error term $e_{i,t}$ using Huber-robust standard errors that are clustered at the country level.

3. Main Results

3.1. Hosting Countries

Table 1 reports our estimates of the contemporaneous and anticipatory effects of hosting the Olympic Games. Column (1) shows that countries which hosted the Olympic Games experienced a significant increase in their real per capita GDP growth up to five years before the organization of the actual event. The peak effect occurs about four years prior to hosting. The estimated coefficient implies that at peak

real per capita GDP growth increases by up to three percentage points. In the year when the Olympic Games are hosted GDP per capita growth is also significantly higher (relative to periods when the Olympics are not hosted) by around 1.8 percentage points.

Column (2) of Table 1 shows that the reason for this significant increase in GDP per capita growth is a significant positive and quantitatively large increase in private investment. The peak investment effect coincides with the peak output effect and the time of the announcement of the Olympic bids winner. Investment responses are still significantly different from zero at the time of the actual hosting of the Games. Columns (3) and (4) show that also private consumption and government expenditures significantly increase prior to the Games and they react more strongly to the news four years before the celebration of the Games.

We also find a significant positive effect of the hosting of the Olympic Games on the consumer price index and the nominal exchange rate. The estimates in columns (5) and (6) of Table 1 show that there is already a significant positive response in consumer prices and the exchange rate about 7 years before the actual hosting of the Olympic Games, thus at the time when the announcement of the winner is made. And, the peak response occurs at about five years before the actual hosting of the Games. Hence, while both prices and quantities react positively to the positive expected demand shock, the timing is such that the change in prices occurs before the change in quantities.

Table 2 examines whether hosting the Olympic Games has significant ex-post growth effects. Columns (1) and (3) show that the effects on output and consumption are positive up to six years after the hosting of the Olympic Games. After six years the growth responses turn negative in sign, but they are statistically insignificant. For private investment, the lagged effects of the Olympic Games are negative in sign already one year after the actual hosting of the Games. Statistically they are insignificant at the 95 percent level. Also, for government expenditures, the consumer price index, and the nominal exchange rate the after-effects of hosting the Olympics are quantitatively small and statistically insignificant. Table 2 therefore shows that the after-effects of hosting the Games are of relatively minor importance when compared to the anticipatory and contemporaneous effects.

The results in Table 2 might justify the findings of many studies (see Owen (2005)) that indicate that the economic benefits of organizing mega events such as the Olympic Games are quantitatively and economically small. Our analysis stresses that the benefits from organizing such events are not contemporaneous, nor lagged. We find that the positive effects of the Olympic Games have to do with the information signal they carry. In Rose and Spiegel (2011) the Olympics carry a signal of trade liberalization; we show that there is more than that: Olympic news is news about increased investment opportunities that the organization of the Olympics may create and this news produce quantitatively

significant anticipation effects.

In Figure 1 we present our findings differently by plotting the cumulative effects (and 90% confidence bands) of the Olympic winner's announcement. The figure is clear about the importance of anticipatory effects: all variables, but government spending, increase significantly prior to hosting with prices and exchange rates reacting more significantly immediately after the announcement.

3.2. Bidding Countries

If anticipation effects are present before the announcement of the winner of the Olympic Games, such anticipation effects should also be present in the bidding countries that did not win the Olympic Games. During the 1950-2006 period, the bidding for the Olympic Games took place about eight to ten years before the actual hosting of the event. If our explanation is correct, from an investor's point of view there is an expected increase in profits because output demand is expected to be higher. It therefore makes sense, given reasonable values of the risk aversion coefficient, of adjustment costs, and of forward looking behavior to observe increases in investment in the countries that bid unsuccessfully for the Olympic Games.

Table 3 shows that indeed output growth, private investment, and private consumption significantly increase during the period that countries bid for the Olympics. In particular, Table 3 shows that there is a significant positive output growth, private investment, and private consumption response in the bidding countries about seven to ten years before the actual hosting of the Games. Private investment responds first, while output and consumption react with one period lag relative to investment to the bidding news.

Differently from the case of the winners, we observe no significant response in government expenditures. This seems to indicate that governments react to the news about the organization of the Games, once the news become certain. In Table 1 we have seen that governments reacted to the news only during the period when the winner of the bidding is announced. Thus governments in our sample typically do not spend resources on the organization of the Games, unless they know with certainty that their investment projects will serve a certain scope.

Table 3 provides us with another interesting piece of information: in the bidding countries (that did not win the hosting of the Olympic Games) private investment decreases after the announcement of the host winner and significantly so five and six years after this announcement. Hence, while during the time of the bidding private investment significantly increases, these investment projects are reversed once it becomes clear that the country is not going to host the Games. This unwinding of investment

projects is also reflected by the estimates in Table 4 that show that the after-effects of bidding for the Olympic Games are negative, and for some lags statistically significant. Thus, most of the investment initiated when the good news generated of the participation of a country to the bidding for the Olympics was reversible. Moreover, the time pattern we discover confirms the presence of significant capital adjustment costs that deter a fast adjustment of investment projects following the revelation of the uncertainty about the returns to investment.

3.3 Legacy Effects

Olympic Games are often associated with a long-term legacy effect. According to the supporters of the Games infrastructure investments lead to improvements in overall production conditions for domestic and foreign enterprises, making investment more attractive and increasing GDP per capita in the long run. We can examine whether the hosting and bidding for the Olympic Games had a long-run effect on the level of GDP per capita and the other variables of interest. We do this by summing up the estimated coefficients, and test whether their sum is significantly different from zero.

Panel A of Table 5 shows that for the hosting countries the sum of the estimated coefficients for the GDP per capita, private consumption, and private investment response are positive and significantly different from zero at the 90 percent level. For the hosting countries the Olympic Games were hence associated with permanently higher levels of GDP per capita, private investment, and private consumption. On the other hand, Panel B shows that for the bidding countries there were no significant long-run effects. The sum of the estimated coefficients is quantitatively small and statistically insignificant at any conventional confidence levels. In Panel C we test for the existence of significant differences between the long-run effects of the Olympic Games in the host countries and the bidding countries. For GDP per capita, private investment and consumption we can reject with over 95 percent confidence that the long-run effects are the same in the host and the bidding countries. Table 6 also shows that these results continue to hold when controlling on the right-hand side of the estimating equation for lags of the dependent variable. In sum, we find that there are significant long-run effects on the level of GDP per capita, consumption, and investment in the countries that hosted the Olympics while in the countries that bid for the Olympics (without hosting these) the effects were only of transitory nature.

In Figure 2 we plot the cumulative multipliers for the host countries (diamonds line) and the bidding countries (circles line) for the variables considered in Tables 1 and 2. Clearly the cumulative responses of all the variables for the periods before the announcement of the winner are similar and we

cannot reject the hypothesis that both winners-hosting countries and losers-bidding countries behave similarly. However, after the announcement of the host, the winners continue increasing per capita GDP and its components while the losers reduce them. This is apparent in the top left-hand panel of Figure 2 where we plot the cumulative effects on output growth. Output increases significantly two periods before the announcement of the winner, but output growth starts immediately to fall after the bad “news” of having lost the bid are revealed. On the other hand, for the hosting countries, output growth increases with a faster pace, and, particularly so, for the four years before the celebration of the Games. For the components of output which are displayed in the next three panels the pattern is similar. Inflation dynamics in the bottom-right panel of Figure 2 seem to be different for hosting and bidding countries but not significantly so. What seems to be different is the behavior of the exchange rate. For both hosting and bidding countries the exchange rate appreciates but it does so more significantly for the bidders relative to the winners. According to Rose and Spiegel (2011) the bidding for the Olympics has a positive impact on national exports. The fact that the exchange rate appreciates during the bidding process and stops doing so after the announcement could possibly explain the positive impact of the Olympics on trade on impact.

In sum, our findings explain the repeated attempts of countries to win the organization of the Olympic Games. The benefits even for bidding for the Olympics in terms of output and investment, although short-lived, are significant. The gains of actually winning the bid are significant, large and permanent and are maximized some years after the announcement of the winner of the bid.

4. Sensitivity Analysis

4.1 The Nature of the Experiment

We started by assuming that the hosting/bidding for the Olympics is a natural experiment. Thus an important issue for our empirical analysis is whether such event can be thought of as randomly assigned. If this assignment is indeed random, then we have a natural experiment in hand which allows us to examine the causal effects that an exogenous anticipated demand shock has on the macroeconomy.

The International Olympic Committee (IOC) which is responsible for making the decision of which country will host the Olympic Games states that: "only rich countries have the means to make a good return on such a large investment [the Olympic Games]." In the cross-section of countries, the random assignment assumption is thus indeed questionable since only countries which are sufficiently developed have the capacity of hosting the Games. Note that all our regressions control for country

fixed effects making the problem less relevant. Indeed, when we run regression (1) excluding developing countries the results we obtain are very similar.²

Another way to check the randomness of the assignment is to examine whether within-country changes in GDP per capita growth are significantly related to the likelihood of hosting or bidding for the Olympic Games. We do this by estimating a conditional logit fixed effects model that has as the dependent variable the hosting and bidding country indicator variable and as the explanatory variable current and lagged within-country changes in GDP per capita growth.³ The results presented in Table 7 indicate that the within-country changes in GDP per capita growth do not significantly predict the hosting or bidding for the Olympic Games. In addition, since the hosting and bidding for the Olympic Games is associated with positive demand effects, the logit estimates are likely to constitute an upper bound for the true average effect that GDP per capita growth has on the likelihood of hosting or bidding for the Games. Since the estimated coefficients on GDP per capita growth are positive but statistically insignificant, the analysis provides reassuring evidence that it is unlikely that there are systematic positive reverse effects of GDP per capita growth on the likelihood of hosting or bidding for the Olympic Games.

If the assignment of the Olympic Games is not random and depends on the economic conditions of the winners, then the ex-ante coefficients for output, investment and consumption growth for the hosting countries should be higher than those for the bidding countries. Thus, as a further check, we test whether the ex-ante coefficients for the hosting and bidding countries are identical. In case they are identical, we can exclude the possibility that macroeconomic conditions in winner countries determine the outcome of the IOC voting. The p-values on the null hypothesis that the coefficients are identical are reported in Table 8. During the bidding period there is a positive expected demand effect which is similar in all countries. But, once the host country is announced the effect in the host countries becomes larger than the effect in the bidding countries. This is indeed what the p-values in Table 8 show. The coefficients that reflect the effect of the Olympic Games on output growth, investment, and private consumption two to seven years before the celebration of the Games are significantly larger in the host countries than in the bidding countries, but the coefficients ten to eight years prior to the event are not statistically different in bidders and winners.

² These results are available from the authors upon request.

³ We use the conditional logit fixed effects model to take into account the binary nature of the dependent variable. We also note that the fixed effects model treats the country-specific effects as non-random so that they can be systematically a function of both the dependent and the explanatory variable.

4.2 Cross-Country Parameter Heterogeneity

In Section 3 we found that the announcement of the Olympic Games winner generates positive investment, private and government consumption and output responses. An interesting question that we can examine is whether the marginal effect of hosting the Olympic Games varies across countries as a function of important features such as government size, trade openness, political institutions, or geography. These variables have been found to be significant determinants of economic growth in the cross-section of countries and it is therefore interesting to examine whether these variables also induce significant heterogeneity in the marginal effect that hosting the Olympic Games has on output growth.

Table 9 presents the results from an empirical specification where the marginal effect of the Olympic Games is allowed to vary across countries⁴. With the exception of political corruption we find that the interaction estimates are statistically insignificant. Since we do not have a precise theory to guide us on the sign or the significance of the interactions it is hard to elaborate on these results. Nevertheless, the significant negative interaction between the hosting of the Olympic Games and cross-country differences in political corruption appears to agree with the conventional wisdom that in countries with high levels of corruption the uncertainty regarding the effects of the Olympics on private demand might discourage investors from reacting positively to the Olympic news. Along these lines, in the political economy literature, Shleifer and Vishny (1993) and Bardhan (1997), among others, point to significant economic costs associated with excessive political corruption.

4.3 Other Mega-Events: International/World Expositions and the World Cup

Events similar to the organization of the Olympics are the hosting of International Expositions (EXPOs) and the World Cup. The character of the EXPOs is different from the other two events, yet the structure followed for competing to host it is similar. The competition for the organization of International Expositions starts nine to five years before the proposed opening date of the exhibition and the announcement of the winner is made four to five years in advance. The World Cup takes place every four years, the competing countries make their bids approximately seven to nine years before hosting and the winner of the bids is announced six years before the actual organization of the event.

In Figure 3 we compare the cumulative responses of output to the hosting of the EXPOs (continuous line) versus the hosting of the Olympics (diamonds line).⁵ As for the Olympic Games,

4 In regressions we do not present here for economy of space we have also tried to group countries according to the characteristics presented in Table 9 (e.g, rich vs. poor, or open vs. closed, etc.) and run separate regressions for the different groups. The binary grouping delivered similar results.

5 Because competition for hosting the International Expos is limited we can only estimate effects of the actual hosting of

countries which hosted International Expos experienced a significant increase in GDP per capita growth ten to eight years before the Expo. However, the patterns of the subsequent responses differ. One year after the announcement of the winner of the EXPO GDP growth stops increasing, while this pattern is not observed in the case of the Olympics hosts. The organization of international expositions seems to have no long lived effects. At the same time, as we show in the appendix, the effects of hosting the Olympics are not significantly different from the effects of hosting the International Expo.

In Panel A of Figure 4 we present cumulative responses of output to the hosting of the World Cup (asterisks line) versus hosting the Olympics (diamonds line) and 90% confidence bands. The anticipatory effects of the World Cup are very small and negative in the early years of the bidding relative to those induced by the bidding for the Olympics. In addition, anticipatory effects become significantly negative three to one year before the celebration of the Cup (see appendix). The fall in output seems to be correlated with the behavior of government consumption. Government consumption increases significantly ten years before hosting and continues to increase significantly up to the moment the announcement of the host city is made, six years before the Cup is celebrated. In Panel B of Figure 4 we present the cumulative responses of government spending in the two groups of hosts: the ex-ante surge in public demand in the two events is not comparable. Government spending increases by much more in the years preceding the celebration of the World Cup relative to the Olympics and significantly so before the host announcement. This surge in public consumption seems to crowd out private demand and output (see the appendix for detailed results). Hence, hosting of the World Cup may not be viewed as an overall positive (private) investment opportunity, but as an occasion for the government to spend money with no positive returns for the private sector. This perception is confirmed even after the organization of the Cup.

4.4 Regional Data

In the empirical models we have considered so far we have only used aggregate data to evaluate the effects of the Olympics. Some of the countries in our sample are quite large and the organization of a mega-event in one region can have positive spillover effects to other regions in that country. Hence, our results reflect country-wide average effects. To examine also regional effects of hosting the Olympics we turn to regional data and use total real gross per capita state product for the US from the Bureau of Economic Analysis.⁶ The USA has hosted 5 Olympic Games in our sample: the 1960 Winter Olympics

the International Expos.

6 Ideally, we would like to perform the same exercise for European regional data for gross domestic product, but, such data are only available since 1995.

in Squaw Valley, CA, the 1980 Winter Olympics in Lake Placid, NY, the 1984 Summer Olympics in Los Angeles, CA, the 1996 Summer Olympics, in Atlanta, GA, and the 2002 Winter Olympics in Salt Lake City, UT.

We repeat our exercise by substituting countries with US states. Results are presented in Tables 10 and 11. According to Panel A of Table 11, hosting the Olympic Games generates increases in GSP growth three years before the actual hosting of the event. GSP growth also increases significantly five years before and is reversed six years before celebration in unsuccessful bidders, thus confirming the presence of anticipation effects (see Panel B of Table 10). The delayed effects of hosting the Olympics are also considerable and last up to three years after the Games. At the peak, US states that organized the Olympics saw their gross state product increase by more than 3.2 percentage points relative to states that did not undertake the organization of these events. In sum, although caution should be exercised because of the small sample of the events, the findings of the baseline analysis are confirmed with regional data: the economy reacts in anticipation to news about changes in future demand.

4.5 Anticipation and Stock prices

Many economists have shown that stock price movements reflect the market's expectation of future developments in the economy (see e.g. Fama (1990) and Schwert (1990)). Given the nature of our exercise and its conclusions it is only natural to ask whether the anticipatory effects for the organization of the Olympic Games are reflected in the movements of the stock market. Using the IFS data on stock price indices for 30 countries in our sample between 1970 and 2006, we can examine whether the Olympic bid has significant anticipatory effects on the evolution of stock prices of the hosting and bidding countries. The results that we present in Table 12 confirm our findings. The anticipatory effects of the Olympics on stock prices are positive and significant nine and eight years before the hosting of the Games for both successful and unsuccessful bidders. These significant positive responses are of similar magnitude in the two groups of countries. The contemporaneous effect of hosting the Games on stock prices is positive and significant indicating that markets perceive the organization of the event as a positive indicator of future profits.

5. Conclusions

Starting from Pigou (1926) and Keynes (1936) until the recent work of Beaudry and Portier (2006, 2007) and Jaimovich and Rebelo (2009), economists have stressed the importance of expectations in determining the evolution of aggregate macroeconomic data. However, we are not aware of any

empirical work that quantifies such effects. In addition, no study has shown so far how the uncertainty about news affects aggregate macroeconomic outcomes and the effects of its resolution. Most of the existing evidence for the presence of anticipation in macroeconomics is indirect. Anticipation effects present serious challenges to empirical research. Recent studies on the identification of fiscal shocks have shown that anticipation effects might be crucial for determining the effects of such shocks in the macroeconomy (see e.g. Ramey (2011) or Mertens and Ravn (2010)).

By treating the hosting and bidding for the Olympic Games as a natural experiment we are able to quantify the effects of anticipatory behavior on macroeconomic aggregates. We find that such effects are economically important and statistically significant. News about increases in future demand make output and investment surge several years in advance of the actual event.

Many studies have claimed that hosting the Olympics has no measurable economic effects, but these studies concentrate on the delayed effect. Our results indicate that the anticipatory effects of the Olympic Games on growth are statistically significant and economically important. Hence, hosting of the Olympic Games involves more benefits than an “olive wreath”.

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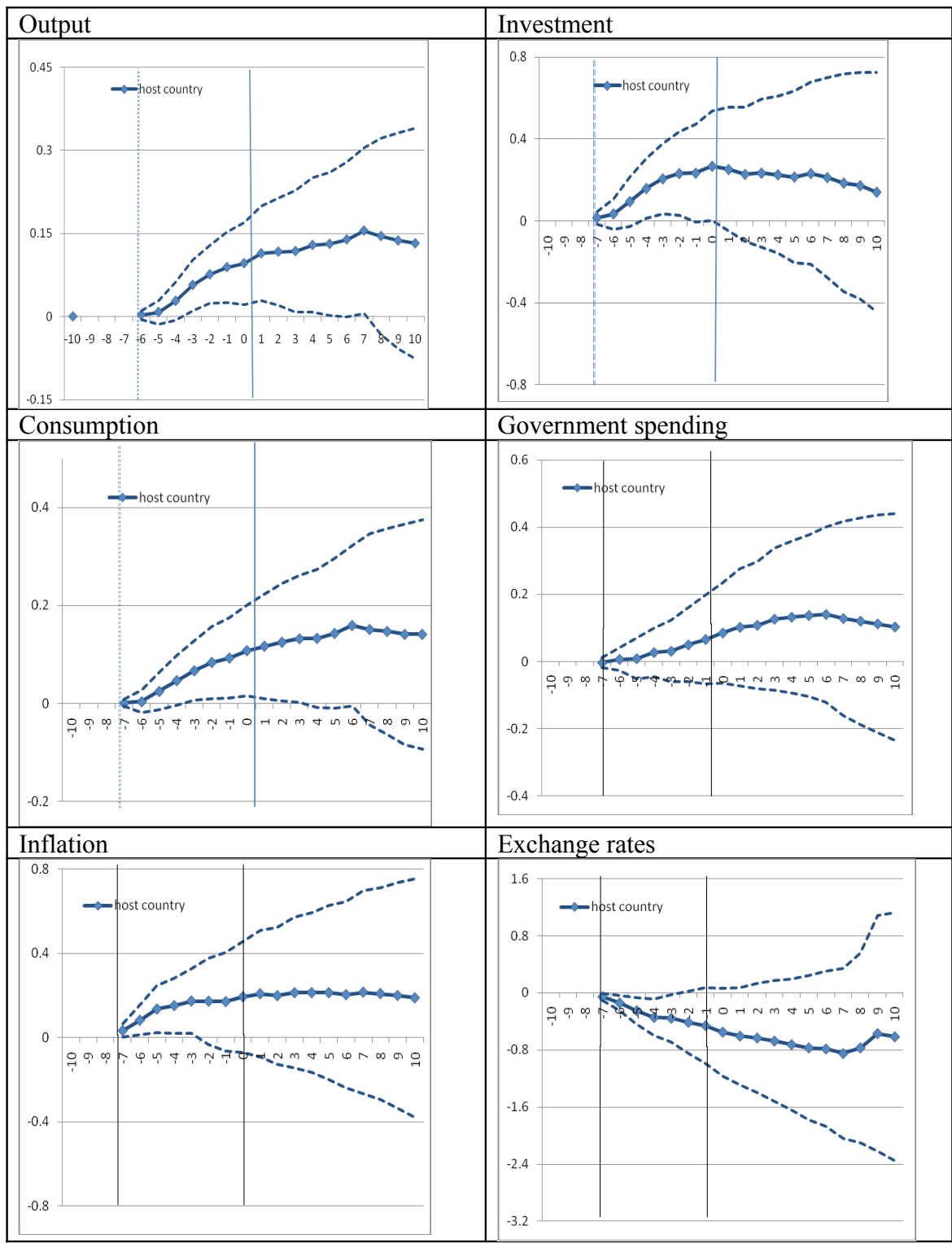


Figure 1: Cumulative Effects Hosting Countries

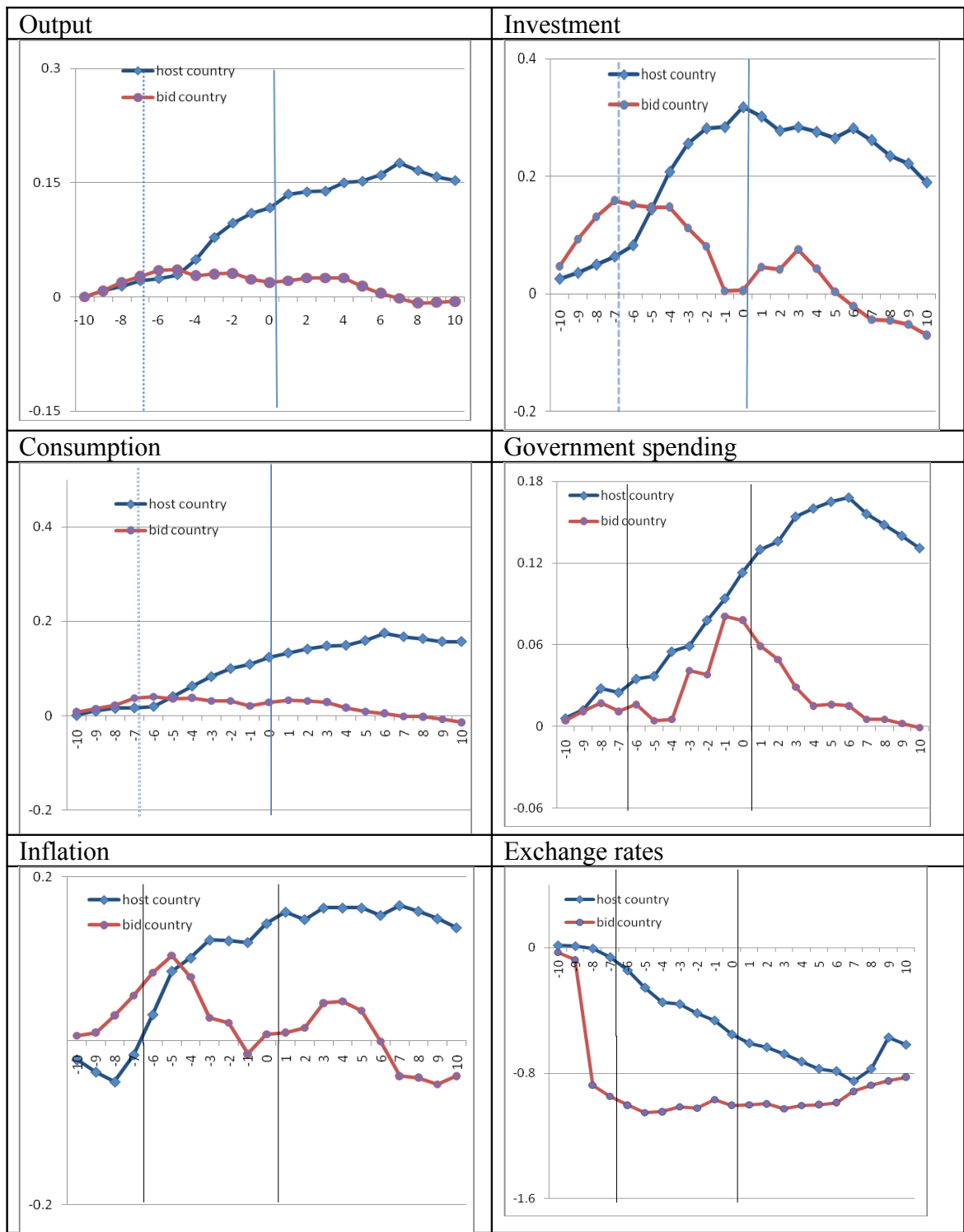


Figure 2: Cumulative Effects Hosting versus Bidding Countries

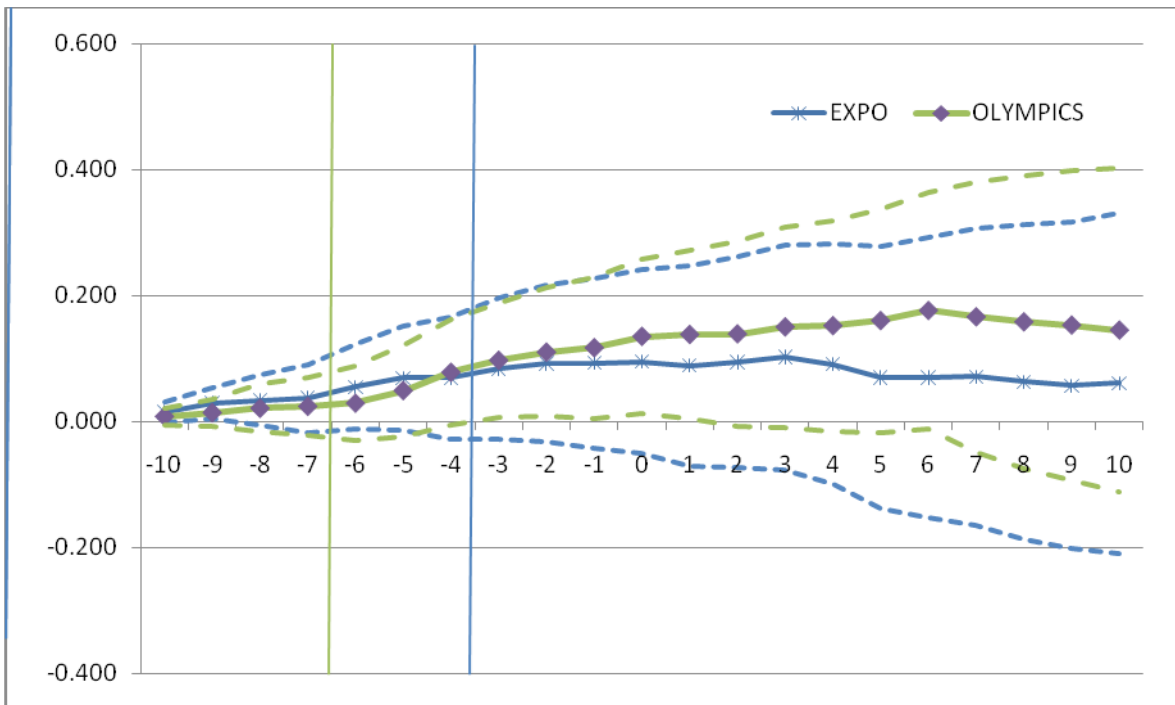


Figure 3: Cumulative Effects on Output Growth: Hosting Olympics versus International Expositions

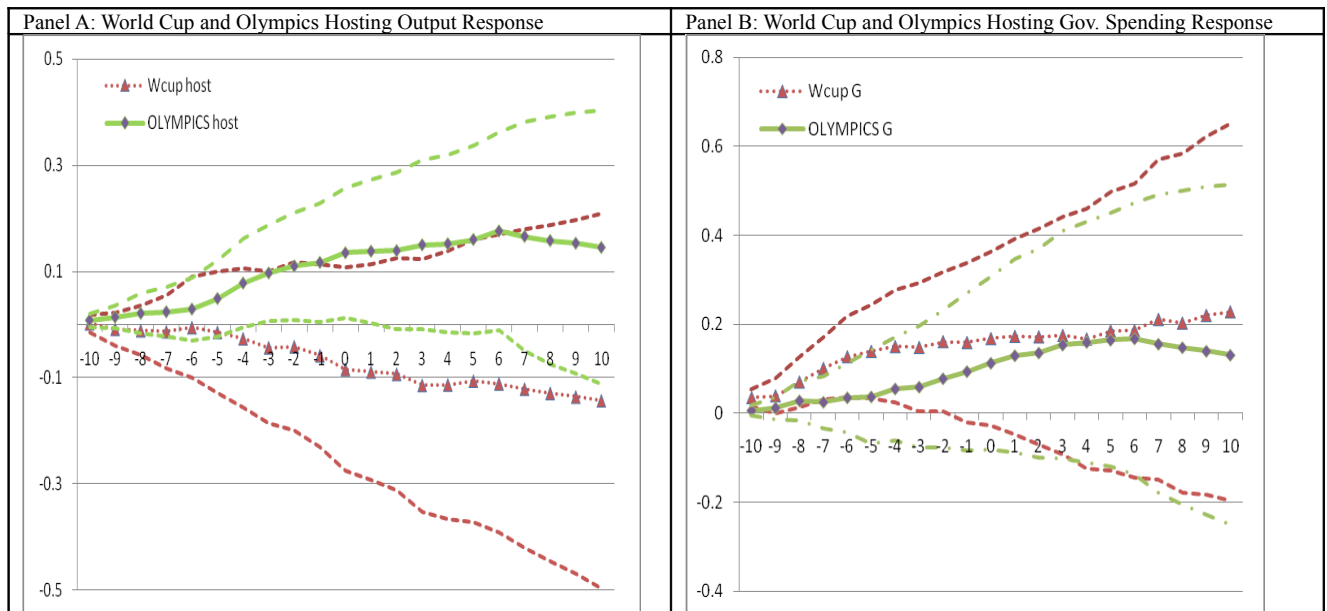


Figure 4: Cumulative Effect: The World Cup

Table 1. The Contemporaneous and Anticipatory Effects of Hosting the Olympics

	$\Delta\text{Log}(\text{GDP})$	$\Delta\text{Log}(\text{Private Investment})$	$\Delta\text{Log}(\text{Private Consumption})$	$\Delta\text{Log}(\text{Government Expenditure})$	$\Delta\text{Log}(\text{Price Level})$	$\Delta\text{Log}(\text{Exchange Rate})$
HostingCountry	0.018** (0.007)	0.034** (0.017)	0.015** (0.006)	0.019* (0.010)	0.023 (0.019)	-0.089* (0.051)
F.HostingCountry	0.007 (0.006)	0.002 (0.022)	0.009* (0.005)	0.016 (0.014)	-0.002 (0.018)	-0.047 (0.057)
F2.HostingCountry	0.013** (0.007)	0.026 (0.020)	0.017** (0.008)	0.019* (0.011)	-0.001 (0.030)	-0.058 (0.065)
F3.HostingCountry	0.019*** (0.004)	0.048*** (0.015)	0.020*** (0.006)	0.004 (0.012)	0.022 (0.014)	-0.110* (0.059)
F4.HostingCountry	0.029*** (0.007)	0.064*** (0.016)	0.022*** (0.008)	0.018*** (0.007)	0.016 (0.012)	-0.094** (0.043)
F5.HostingCountry	0.020** (0.008)	0.061** (0.028)	0.021** (0.009)	0.002 (0.017)	0.052** (0.026)	-0.110** (0.047)
F6.HostingCountry	0.005 (0.008)	0.019 (0.026)	0.003 (0.010)	0.010 (0.011)	0.049** (0.023)	-0.085** (0.036)
F7.HostingCountry	0.003 (0.005)	0.014 (0.019)	0.001 (0.004)	-0.003 (0.009)	0.033* (0.019)	-0.055* (0.029)
F8.HostingCountry	0.007 (0.010)	0.014 (0.029)	0.006 (0.009)	0.016 (0.012)	-0.012 (0.013)	-0.015 (0.035)
F9.HostingCountry	0.006 (0.005)	0.010 (0.013)	0.009* (0.005)	0.006 (0.008)	-0.015 (0.021)	-0.005 (0.037)
F10.HostingCountry	0.008 (0.008)	0.026 (0.023)	0.001 (0.005)	0.006 (0.007)	-0.023* (0.014)	0.016 (0.026)
Country Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	5469	5469	5469	5469	5469	5469
Number of Countries	184	184	184	184	184	184

Note: The method of estimation is least squares. Huber robust standard errors (reported in parentheses) are clustered at the country level. *Significantly different from zero at 90 percent confidence, ** 95 percent confidence, *** 99 percent confidence.

Table 2. The Delayed Effects of Hosting the Olympics

	$\Delta\text{Log}(\text{GDP})$	$\Delta\text{Log}(\text{Private Investment})$	$\Delta\text{Log}(\text{Private Consumption})$	$\Delta\text{Log}(\text{Government Expenditure})$	$\Delta\text{Log}(\text{Price Level})$	$\Delta\text{Log}(\text{Exchange Rate})$
L.HostingCountry	0.003 (0.007)	-0.016 (0.021)	0.009 (0.009)	0.017 (0.015)	0.014 (0.022)	-0.056 (0.041)
L2.HostingCountry	0.001 (0.008)	-0.024 (0.016)	0.008 (0.008)	0.006 (0.010)	-0.009 (0.015)	-0.026 (0.051)
L3.HostingCountry	0.011 (0.007)	0.006 (0.020)	0.007 (0.006)	0.018 (0.013)	0.014 (0.020)	-0.043 (0.048)
L4.HostingCountry	0.002 (0.005)	-0.008 (0.013)	0.001 (0.007)	0.006 (0.009)	-0.000 (0.013)	-0.049 (0.042)
L5.HostingCountry	0.008 (0.006)	-0.011 (0.022)	0.010 (0.007)	0.005 (0.009)	-0.000 (0.021)	-0.046 (0.059)
L6.HostingCountry	0.016*** (0.006)	0.017 (0.016)	0.016** (0.007)	0.003 (0.012)	-0.009 (0.017)	-0.015 (0.044)
L7.HostingCountry	-0.010 (0.017)	-0.020 (0.027)	-0.008 (0.019)	-0.012 (0.018)	0.012 (0.025)	-0.064 (0.066)
L8.HostingCountry	-0.008 (0.011)	-0.027 (0.026)	-0.004 (0.009)	-0.008 (0.011)	-0.007 (0.012)	0.079 (0.083)
L9.HostingCountry	-0.005 (0.008)	-0.013 (0.014)	-0.006 (0.009)	-0.008 (0.010)	-0.009 (0.020)	0.200 (0.196)
L10.HostingCountry	-0.008 (0.007)	-0.032* (0.018)	0.000 (0.006)	-0.009 (0.008)	-0.011 (0.019)	-0.046 (0.054)
Country Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	5469	5469	5469	5469	5469	5469
Number of Countries	184	184	184	184	184	184

Note: The method of estimation is least squares. Huber robust standard errors (reported in parentheses) are clustered at the country level. *Significantly different from zero at 90 percent confidence, ** 95 percent confidence, *** 99 percent confidence.

Table 3. The Contemporaneous and Anticipatory Effects of Bidding for the Olympics

	$\Delta\text{Log}(\text{GDP})$	$\Delta\text{Log}(\text{Private Investment})$	$\Delta\text{Log}(\text{Private Consumption})$	$\Delta\text{Log}(\text{Government Expenditure})$	$\Delta\text{Log}(\text{Price Level})$	$\Delta\text{Log}(\text{Exchange Rate})$
BiddingCountry	0.002 (0.004)	0.010 (0.012)	0.007 (0.004)	-0.003 (0.008)	0.024 (0.016)	-0.036 (0.025)
F.BiddingCountry	-0.004 (0.005)	-0.076* (0.045)	-0.010 (0.006)	0.043 (0.040)	-0.038 (0.029)	0.054 (0.064)
F2.BiddingCountry	-0.008 (0.007)	-0.031** (0.013)	-0.000 (0.004)	-0.003 (0.006)	-0.006 (0.016)	-0.008 (0.034)
F3.BiddingCountry	0.001 (0.004)	-0.036 (0.036)	-0.007 (0.007)	0.036 (0.040)	-0.050 (0.037)	0.031 (0.060)
F4.BiddingCountry	0.002 (0.003)	-0.000 (0.011)	0.002 (0.005)	0.001 (0.005)	-0.026 (0.025)	0.007 (0.033)
F5.BiddingCountry	-0.008 (0.005)	-0.004 (0.019)	-0.004 (0.005)	-0.012 (0.018)	0.021 (0.017)	-0.049* (0.029)
F6.BiddingCountry	0.001 (0.006)	-0.007 (0.020)	0.003 (0.005)	0.005 (0.007)	0.028* (0.016)	-0.056 (0.035)
F7.BiddingCountry	0.008** (0.004)	0.028** (0.012)	0.015*** (0.005)	-0.006 (0.015)	0.024* (0.013)	-0.070** (0.035)
F8.BiddingCountry	0.008*** (0.003)	0.038*** (0.012)	0.007* (0.004)	0.006 (0.005)	0.021 (0.015)	-0.080* (0.041)
F9.BiddingCountry	0.011** (0.004)	0.046** (0.018)	0.007* (0.004)	0.007 (0.007)	0.004 (0.016)	-0.047 (0.042)
F10.BiddingCountry	0.008 (0.006)	0.047** (0.018)	0.008 (0.006)	0.004 (0.006)	0.006 (0.013)	-0.030 (0.027)
Country Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	5469	5469	5469	5469	5469	5469
Number of Countries	184	184	184	184	184	184

Note: The method of estimation is least squares. Huber robust standard errors (reported in parentheses) are clustered at the country level. *Significantly different from zero at 90 percent confidence, ** 95 percent confidence, *** 99 percent confidence.

Table 4. The Delayed Effects of Bidding for the Olympics

	$\Delta\text{Log}(\text{GDP})$	$\Delta\text{Log}(\text{Private Investment})$	$\Delta\text{Log}(\text{Private Consumption})$	$\Delta\text{Log}(\text{Government Expenditure})$	$\Delta\text{Log}(\text{Price Level})$	$\Delta\text{Log}(\text{Exchange Rate})$
L.BiddingCountry	0.004 (0.004)	0.040* (0.022)	0.005 (0.005)	-0.019 (0.021)	0.002 (0.029)	0.002 (0.024)
L2.BiddingCountry	0.000 (0.005)	-0.004 (0.029)	-0.002 (0.005)	-0.010 (0.013)	0.006 (0.012)	0.007 (0.041)
L3.BiddingCountry	-0.000 (0.004)	0.034 (0.027)	-0.002 (0.004)	-0.020 (0.017)	0.030 (0.023)	-0.032 (0.041)
L4.BiddingCountry	-0.011 (0.007)	-0.033 (0.026)	-0.012** (0.005)	-0.014 (0.009)	0.002 (0.012)	0.020 (0.047)
L5.BiddingCountry	-0.009** (0.004)	-0.039*** (0.013)	-0.008* (0.004)	0.001 (0.006)	-0.011 (0.016)	0.007 (0.047)
L6.BiddingCountry	-0.007 (0.004)	-0.025* (0.014)	-0.004 (0.004)	-0.001 (0.007)	-0.038*** (0.013)	0.012 (0.038)
L7.BiddingCountry	-0.006 (0.004)	-0.023 (0.018)	-0.006 (0.006)	-0.010** (0.004)	-0.042 (0.045)	0.072* (0.040)
L8.BiddingCountry	0.001 (0.005)	-0.001 (0.012)	-0.001 (0.005)	-0.000 (0.006)	-0.002 (0.015)	0.040** (0.017)
L9.BiddingCountry	0.001 (0.006)	-0.007 (0.019)	-0.005 (0.005)	-0.003 (0.004)	-0.008 (0.018)	0.027 (0.020)
L10.BiddingCountry	-0.005 (0.006)	-0.018 (0.017)	-0.007 (0.006)	-0.003 (0.004)	0.010 (0.018)	0.024 (0.030)
Country Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	5469	5469	5469	5469	5469	5469
Number of Countries	184	184	184	184	184	184

Note: The method of estimation is least squares. Huber robust standard errors (reported in parentheses) are clustered at the country level. *Significantly different from zero at 90 percent confidence, ** 95 percent confidence, *** 99 percent confidence.

Table 5. Long-Run Effects of the Olympics

	$\Delta\text{Log}(\text{GDP})$	$\Delta\text{Log}(\text{Private Investment})$	$\Delta\text{Log}(\text{Private Consumption})$	$\Delta\text{Log}(\text{Government Expenditure})$	$\Delta\text{Log}(\text{Price Level})$	$\Delta\text{Log}(\text{Exchange Rate})$
Panel A: Hosting Country						
Sum of coefficients: L10.HostingCountry to F.10HostingCountry	0.145* (1.84)	0.192* (1.70)	0.157** (2.00)	0.132 (1.14)	0.137 (1.02)	-0.723 (-0.98)
Panel B: Bidding Country						
Sum of coefficients: L10.BiddingCountry to F.10BiddingCountry	-0.011 (-0.35)	-0.062 (-0.74)	-0.015 (-0.48)	-0.002 (-0.06)	-0.044 (-0.81)	-0.108 (-0.25)
Panel C: Difference Between Hosting Country and Bidding Country						
Difference Between Panel A and Panel B	0.156** (2.27)	0.253** (2.30)	0.172** (2.44)	0.132 (1.32)	0.182 (1.41)	-0.614 (-0.89)
Country Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	5469	5469	5469	5469	5469	5469
Number of Countries	184	184	184	184	184	184

Note: The method of estimation is least squares. t-values (reported in parentheses) are based on Huber robust standard errors clustered at the country level. *Significantly different from zero at 90 percent confidence, ** 95 percent confidence, *** 99 percent confidence.

Table 6. The Long-Run Effects of the Olympics
(Robustness to Controlling for Lags and Leads of the Dependent Variable)

	$\Delta\text{Log}(\text{GDP})$	$\Delta\text{Log}(\text{Private Investment})$	$\Delta\text{Log}(\text{Private Consumption})$	$\Delta\text{Log}(\text{Government Expenditure})$	$\Delta\text{Log}(\text{Price Level})$	$\Delta\text{Log}(\text{Exchange Rate})$
Panel A: Hosting Country						
Sum of coefficients:	0.305***	0.866***	0.487**	0.457*	0.184	-0.244
L10.HostingCountry to F10.HostingCountry	(3.09)	(3.32)	(3.50)	(1.65)	(0.89)	(-1.08)
Panel B: Bidding Country						
Sum of coefficients:	0.009	0.012	0.018	-0.002	-0.054	-0.080
L10.BiddingCountry to F10.BiddingCountry	(0.31)	(0.11)	(0.35)	(-0.02)	(-0.45)	(-0.76)
Panel C. Difference Between Hosting Country and Bidding Country						
Difference Between Panel A and Panel B	0.297***	0.855**	0.469***	0.459*	0.238	-0.164
	(3.21)	(3.22)	(3.46)	(1.77)	(1.12)	(-0.81)
Country Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	5469	5469	5469	5469	5469	5469
Number of Countries	184	184	184	184	184	184

Note: The method of estimation is least squares. t-values (reported in parentheses) are based on Huber robust standard errors clustered at the country level. Additional control variables (not reported) are lags and leads up to ten years of the dependent variable. *Significantly different from zero at 90 percent confidence, ** 95 percent confidence, *** 99 percent confidence.

Table 7. The Effects of GDP Growth on the Likelihood of Hosting and Bidding for the Olympic Games

	Pr(Olympic Host)	Pr(Olympic Bidder)
$\Delta\text{Log}(\text{GDP})$	0.678 (13.790)	6.399 (7.658)
L. $\Delta\text{Log}(\text{GDP})$	8.084 (13.908)	-4.763 (7.373)
L2. $\Delta\text{Log}(\text{GDP})$	10.452 (12.322)	-2.370 (6.342)
L3. $\Delta\text{Log}(\text{GDP})$	8.827 (16.702)	5.976 (7.610)
L4. $\Delta\text{Log}(\text{GDP})$	27.118 (17.016)	0.392 (6.977)
L5. $\Delta\text{Log}(\text{GDP})$	8.883 (12.490)	-8.937 (6.444)
L6. $\Delta\text{Log}(\text{GDP})$	-1.820 (10.527)	-5.124 (5.840)
L7. $\Delta\text{Log}(\text{GDP})$	-9.207 (12.971)	3.930 (6.859)
L8. $\Delta\text{Log}(\text{GDP})$	-3.384 (9.892)	5.433 (7.414)
L9. $\Delta\text{Log}(\text{GDP})$	-4.981 (12.401)	4.977 (7.081)
L10. $\Delta\text{Log}(\text{GDP})$	1.489 (11.305)	6.770 (5.800)
Country Fixed Effects	Yes	Yes
Year Fixed Effects	Yes	Yes
Observations	6064	6064
Number of Countries	184	184

Note: The method of estimation is maximum likelihood. Coefficients are obtained from a conditional logit fixed effects regression. The dependent variable in column (1) is an indicator variable that is unity if the country hosted the Olympic Games. The dependent variable in column (2) is an indicator variable that is unity if the country bid to host the Olympic Games. *Significantly different from zero at 90 percent confidence, ** 95 percent confidence, *** 99 percent confidence.

Table 8. Test of Difference between Bidding and Hosting Countries

	$\Delta\text{Log}(\text{GDP})$	$\Delta\text{Log}(\text{Private Investment})$	$\Delta\text{Log}(\text{Private Consumption})$	$\Delta\text{Log}(\text{Government Expenditure})$	$\Delta\text{Log}(\text{Price Level})$	$\Delta\text{Log}(\text{Exchange Rate})$
BiddingCountry-HostingCountry	0.05**	0.21	0.26	0.11	0.94	0.26
F.BiddingCountry-F.HostingCountry	0.13	0.07	0.02**	0.51	0.25	0.22
F2.BiddingCountry-F2.HostingCountry	0.02**	0.01***	0.05**	0.08	0.88	0.49
F3.BiddingCountry-F3.HostingCountry	0.00***	0.03**	0.00***	0.48	0.05**	0.10
F4.BiddingCountry-F4.HostingCountry	0.00***	0.00***	0.02**	0.01***	0.12	0.03**
F5.BiddingCountry-F5.HostingCountry	0.00***	0.05**	0.01***	0.30	0.36	0.14
F6.BiddingCountry-F6.HostingCountry	0.69	0.42	0.97	0.59	0.38	0.48
F7.BiddingCountry-F7.HostingCountry	0.30	0.53	0.01***	0.81	0.68	0.71
F8.BiddingCountry-F8.HostingCountry	0.85	0.43	0.86	0.29	0.04**	0.21
F9.BiddingCountry-F9.HostingCountry	0.31	0.08	0.78	0.87	0.31	0.36
F10.BiddingCountry-F10.HostingCountry	0.98	0.41	0.32	0.83	0.09	0.21
Country Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	5469	5469	5469	5469	5469	5469
Number of Countries	184	184	184	184	184	184

Note: The table shows the p-values on the null-hypothesis that the estimated coefficients, reported in Tables 1 and 3, are equal to zero. **Significantly different from zero 95 percent confidence, *** 99 percent confidence.

Table 9. Cross-Country Parameter Heterogeneity

	$\Delta\text{Log}(\text{GDP})$					
Sum of coefficients:	0.222***	0.180***	0.187***	0.214***	0.159**	0.149**
L10.HostingCountry to F.10Hosting Country	(3.17)	(2.87)	(3.18)	(3.84)	(2.11)	(2.00)
Interaction with: Average (EXP+IMP)/GDP	-0.010 (-1.57)					
Interaction with: Average GOV/GDP		-0.052 (-0.65)				
Interaction with: Average GDP Per Capita			0.003 (0.12)			
Interaction with: Average Corruption Score				-0.110** (-2.02)		
Interaction with: Average Polity Score					0.002 (0.05)	
Interaction with: North America Indicator						0.088 (0.71)
Country Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	5469	5469	5469	5469	5469	5469
Number of Countries	184	184	184	184	184	184

Note: The method of estimation is least squares. t-values (reported in parentheses) are based on Huber robust standard errors clustered at the country level.
 *Significantly different from zero at 90 percent confidence, ** 95 percent confidence, *** 99 percent confidence.

Table 10. The Contemporaneous and Before-Effects of Hosting and Bidding for the Olympics
(US Regional Data 1963-2008)

Panel A: Hosting State	$\Delta\text{Log}(\text{GSP})$	Panel B: Bidding State	$\Delta\text{Log}(\text{GSP})$
HostingState	0.023*** (0.006)	BiddingState	-0.020 (0.019)
F.HostingState	0.016** (0.009)	F.BiddingState	-0.049** (0.022)
F2.HostingState	0.012** (0.006)	F2.BiddingState	0.027** (0.011)
F3.HostingState	0.007 (0.007)	F3.BiddingState	-0.031 (0.026)
F4.HostingState	-0.008 (0.011)	F4.BiddingState	-0.015*** (0.006)
F5.HostingState	0.002 (0.007)	F5.BiddingState	0.030*** (0.008)
F6.HostingState	0.002 (0.007)	F6.BiddingState	-0.092 (0.053)
F7.HostingState	-0.011 (0.014)	F7.BiddingState	0.021 (0.018)
F8.HostingState	-0.011 (0.006)	F8.BiddingState	-0.098 (0.057)
F9.HostingState	-0.018 (0.015)	F9.BiddingState	-0.056 (0.032)
F10.HostingState	0.005 (0.024)	F10.BiddingState	-0.017 (0.010)
State Fixed Effects	Yes	State Fixed Effects	Yes
Year Fixed Effects	Yes	Year Fixed Effects	Yes
Observations	2295	Observations	2295
Number of States	51	Number of States	51

Note: The method of estimation is least squares. Huber robust standard errors (reported in parentheses) are clustered at the country level. **Significantly different from zero at 95 percent confidence, *** 99 percent confidence.

Table 11. The After-Effects of Hosting and Bidding for the Olympics
(US Regional Data 1963-2008)

Panel A: Hosting State	$\Delta\text{Log}(\text{GSP})$	Panel B: Bidding State	$\Delta\text{log}(\text{GSP})$
L.HostingState	0.006 (0.005)	L.BiddingState	0.015 (0.011)
L2.HostingState	0.032*** (0.010)	L2.BiddingState	-0.021** (0.008)
L3.HostingState	0.018** (0.008)	L3.BiddingState	0.003 (0.011)
L4.HostingState	0.005 (0.005)	L4.BiddingState	-0.014 (0.029)
L5.HostingState	0.004 (0.005)	L5.BiddingState	-0.012 (0.008)
L6.HostingState	0.009 (0.013)	L6.BiddingState	-0.018 (0.021)
L7.HostingState	-0.011 (0.009)	L7.BiddingState	-0.012 (0.016)
L8.HostingState	-0.006 (0.012)	L8.BiddingState	0.019 (0.012)
L9.HostingState	-0.004 (0.014)	L9.BiddingState	0.002 (0.016)
L10.HostingState	-0.001 (0.014)	L10.BiddingState	0.006 (0.004)
State Fixed Effects	Yes	State Fixed Effects	Yes
Year Fixed Effects	Yes	Year Fixed Effects	Yes
Observations	2295	Observations	2295
Number of States	51	Number of States	51

Note: The method of estimation is least squares. Huber robust standard errors (reported in parentheses) are clustered at the country level. **Significantly different from zero at 95 percent confidence, *** 99 percent confidence.

Table 12. The Contemporaneous and Before-Effects on Stock Prices of Hosting and Bidding for the Olympics

Panel A: Hosting Countries	$\Delta\log(\text{Stock Price Index})$	Panel B: Bidding Countries	$\Delta\log(\text{Stock Price Index})$
HostingCountry	0.103* (0.053)	BiddingCountry	-0.010 (0.045)
F.HostingCountry	-0.057 (0.064)	F.BiddingCountry	0.012 (0.043)
F2.HostingCountry	-0.060 (0.054)	F2.BiddingCountry	0.086* (0.044)
F3.HostingCountry	0.078 (0.047)	F3.BiddingCountry	-0.006 (0.051)
F4.HostingCountry	0.035 (0.059)	F4.BiddingCountry	-0.012 (0.029)
F5.HostingCountry	0.005 (0.076)	F5.BiddingCountry	-0.062 (0.047)
F6.HostingCountry	-0.009 (0.052)	F6.BiddingCountry	0.007 (0.057)
F7.HostingCountry	0.082 (0.070)	F7.BiddingCountry	0.021 (0.036)
F8.HostingCountry	0.088* (0.050)	F8.BiddingCountry	0.077** (0.028)
F9.HostingCountry	0.073* (0.044)	F9.BiddingCountry	0.025 (0.038)
F10.HostingCountry	-0.027 (0.082)	F10.BiddingCountry	0.013 (0.026)
Country Fixed Effects	Yes	Country Fixed Effects	Yes
Year Fixed Effects	Yes	Year Fixed Effects	Yes
Observations	631	Observations	631

Note: The method of estimation is least squares. Huber robust standard errors (reported in parentheses) are clustered at the country level. *Significantly different from zero at 90 percent confidence, **Significantly different from zero at 95 percent confidence, *** 99 percent confidence.

Data Appendix Table 1: List of Bidding and Hosting Countries

Bidding Country	Year	Bidding Country	Year	Hosting Country	Year
Argentina	1956	Mexico	1956	Australia	1956
Argentina	1968	Mexico	1960	Australia	2000
Argentina	2004	Netherlands	1952	Austria	1964
Australia	1992	Netherlands	1992	Austria	1976
Australia	1996	Norway	1968	Bosnia and Herzegovina	1984
Australia	2006	Norway	1992	Canada	1976
Austria	1960	Poland	2006	Canada	1988
Austria	1964	Russia	1976	Finland	1952
Belgium	1960	Serbia and Montenegro	1992	France	1968
Belgium	1964	Serbia and Montenegro	1996	France	1992
Bulgaria	1992	Slovak Republic	2006	Germany	1972
Bulgaria	1994	South Africa	2004	Greece	2004
Canada	1956	Spain	1972	Italy	1956
Canada	1964	Spain	1998	Italy	1960
Canada	1968	Sweden	1964	Italy	2006
Canada	1976	Sweden	1968	Japan	1964
Canada	1996	Sweden	1972	Japan	1972
Canada	2002	Sweden	1984	Japan	1998
China	2000	Sweden	1988	Korea, Republic of	1988
Finland	1976	Sweden	1992	Mexico	1968
Finland	2006	Sweden	1994	Norway	1952
France	1968	Sweden	1998	Norway	1994
France	1992	Sweden	2002	Russia	1980
Germany	1960	Sweden	2004	Spain	1992
Germany	1992	Switzerland	1976	United States	1960
Germany	2000	Switzerland	2002	United States	1980
Greece	1996	Switzerland	2006	United States	1984
Hungary	1960	Turkey	2000	United States	1996
Italy	1952	United Kingdom	1992	United States	2002
Italy	1988	United Kingdom	1996		
Italy	1992	United Kingdom	2000		
Italy	1998	United States	1960		
Italy	2004	United States	1964		
Japan	1960	United States	1980		
Japan	1968	United States	1992		
Japan	1984	United States	1994		
Japan	1988	United States	1998		

Appendix (not intended for publication)

Table A1. The Contemporaneous and Before-Effects of the International Expo

	$\Delta\text{Log}(\text{GDP})$	$\Delta\text{Log}(\text{Private Investment})$	$\Delta\text{Log}(\text{Private Consumption})$	$\Delta\text{Log}(\text{Government Expenditure})$	$\Delta\text{Log}(\text{Price Level})$	$\Delta\text{Log}(\text{Exchange Rate})$
EXPO	0.002 (0.007)	-0.051 (0.045)	-0.004 (0.005)	0.097 (0.071)	-0.037 (0.047)	0.029 (0.055)
F.EXPO	0.001 (0.006)	0.013 (0.017)	0.004 (0.006)	0.010 (0.009)	-0.009 (0.013)	0.008 (0.027)
F2.EXPO	0.008 (0.008)	0.014 (0.022)	0.007 (0.008)	0.015 (0.011)	0.013 (0.016)	-0.026 (0.038)
F3.EXPO	0.015* (0.009)	0.042** (0.019)	0.009 (0.006)	0.020 (0.019)	-0.016 (0.016)	-0.006 (0.035)
F4.EXPO	-0.000 (0.009)	-0.008 (0.034)	-0.002 (0.010)	-0.011 (0.018)	0.019 (0.018)	-0.077 (0.067)
F5.EXPO	0.014 (0.009)	0.046 (0.031)	0.004 (0.009)	0.007 (0.014)	0.051 (0.040)	-0.072 (0.070)
F6.EXPO	0.018** (0.008)	0.029 (0.019)	0.018** (0.008)	0.006 (0.016)	0.014 (0.026)	-0.066 (0.053)
F7.EXPO	0.003 (0.009)	-0.003 (0.027)	0.002 (0.007)	0.008 (0.009)	-0.001 (0.017)	-0.023 (0.033)
F8.EXPO	0.005 (0.009)	0.012 (0.025)	0.005 (0.009)	0.008 (0.015)	-0.025 (0.021)	0.001 (0.039)
F9.EXPO	0.014*** (0.005)	0.028 (0.017)	0.007 (0.005)	0.011 (0.011)	-0.027* (0.015)	0.009 (0.051)
F10.EXPO	0.015 (0.010)	0.058* (0.031)	0.011 (0.008)	-0.018 (0.016)	-0.008 (0.015)	-0.027 (0.042)
Country Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	5469	5469	5469	5469	5469	5469
Number of Countries	184	184	184	184	184	184

Note: The method of estimation is least squares. Huber robust standard errors (reported in parentheses) are clustered at the country level. *Significantly different from zero at 90 percent confidence, ** 95 percent confidence, *** 99 percent confidence.

Table A2. The After-Effects of the International Expo

	$\Delta\text{Log}(\text{GDP})$	$\Delta\text{Log}(\text{Private Investment})$	$\Delta\text{Log}(\text{Private Consumption})$	$\Delta\text{Log}(\text{Government Expenditure})$	$\Delta\text{Log}(\text{Price Level})$	$\Delta\text{Log}(\text{Exchange Rate})$
L.EXPO	-0.006 (0.008)	-0.018 (0.015)	0.003 (0.007)	0.011 (0.008)	0.032 (0.029)	-0.069 (0.046)
L2.EXPO	0.005 (0.005)	-0.006 (0.018)	0.014** (0.006)	-0.004 (0.010)	0.027 (0.018)	-0.073 (0.048)
L3.EXPO	0.008 (0.007)	0.010 (0.015)	0.003 (0.008)	0.007 (0.007)	0.010 (0.012)	-0.027 (0.024)
L4.EXPO	-0.011 (0.007)	0.025 (0.044)	-0.008 (0.007)	-0.014 (0.016)	-0.003 (0.032)	0.004 (0.044)
L5.EXPO	-0.021* (0.011)	-0.070* (0.037)	-0.012* (0.006)	-0.016 (0.020)	-0.083* (0.045)	0.109 (0.076)
L6.EXPO	0.000 (0.009)	-0.068 (0.042)	-0.013 (0.013)	0.066 (0.054)	-0.057 (0.046)	0.201 (0.194)
L7.EXPO	0.001 (0.008)	0.000 (0.024)	0.003 (0.010)	0.003 (0.006)	0.021 (0.020)	-0.027 (0.021)
L8.EXPO	-0.008 (0.008)	-0.023 (0.022)	0.004 (0.006)	-0.015 (0.015)	0.046** (0.023)	-0.068** (0.031)
L9.EXPO	-0.006 (0.006)	-0.026 (0.022)	-0.001 (0.005)	-0.001 (0.007)	-0.057 (0.046)	0.052 (0.061)
L10.EXPO	0.004 (0.007)	-0.029 (0.030)	-0.008 (0.010)	0.063 (0.060)	-0.059 (0.043)	0.098 (0.092)
Country Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	5469	5469	5469	5469	5469	5469
Number of Countries	184	184	184	184	184	184

Note: The method of estimation is least squares. Huber robust standard errors (reported in parentheses) are clustered at the country level. *Significantly different from zero at 90 percent confidence, ** 95 percent confidence, *** 99 percent confidence.

Table A3. Test of Difference in the Effects of the Expo and the Olympics

	$\Delta\text{Log}(\text{GDP})$	$\Delta\text{Log}(\text{Private Investment})$	$\Delta\text{Log}(\text{Private Consumption})$	$\Delta\text{Log}(\text{Government Expenditure})$	$\Delta\text{Log}(\text{Price Level})$	$\Delta\text{Log}(\text{Exchange Rate})$
Panel A: Test of Difference Before Effects						
H0: Effects are the same (p-value)	0.896	0.536	0.653	0.748	0.380	0.531
Panel B: Test of Difference Contemporaneous Effect						
H0: Effects are the same (p-value)	0.215	0.144	0.041**	0.193	0.229	0.180
Panel C: Test of Difference After Effects						
H0: Effects are the same (p-value)	0.353	0.340	0.386	0.312	0.414	0.656
Country Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	5469	5469	5469	5469	5469	5469
Number of Countries	184	184	184	184	184	184

Note: The method of estimation is least squares. t-values (reported in parentheses) are based on Huber robust standard errors clustered at the country level. Panel A reports the p-value on the null hypothesis that the sum of the t+1 to t+10 effects of hosting the Olympics are the same as the sum of the t+1 to t+10 effects of hosting the Expo. Panel B reports the p-value on the null hypothesis that the contemporaneous effect of hosting the Olympics is the same as the contemporaneous effect of hosting the Expo. Panel C reports the p-value on the null hypothesis that the sum of the t-1 to t-10 effects of hosting the Olympics are the same as the sum of the t-1 to t-10 effects of hosting the Expo. *Significantly different from zero at 90 percent confidence, ** 95 percent confidence, *** 99 percent confidence.

Table A4. The Contemporaneous and Before-Effects of Hosting the World Cup

	$\Delta\text{Log}(\text{GDP})$	$\Delta\text{Log}(\text{Private Investment})$	$\Delta\text{Log}(\text{Private Consumption})$	$\Delta\text{Log}(\text{Government Expenditure})$	$\Delta\text{Log}(\text{Price Level})$	$\Delta\text{Log}(\text{Exchange Rate})$
Worldc	-0.026** (0.012)	-0.041 (0.045)	-0.041* (0.022)	0.009 (0.010)	0.018 (0.044)	0.033 (0.110)
F.WorldCup	-0.017** (0.008)	-0.076** (0.031)	0.004 (0.019)	-0.002 (0.013)	-0.003 (0.028)	0.043 (0.097)
F2.WorldCup	0.002 (0.010)	0.040 (0.029)	-0.005 (0.014)	0.013 (0.008)	0.003 (0.027)	0.095 (0.132)
F3.WorldCup	-0.017*** (0.007)	-0.035 (0.027)	-0.014** (0.007)	-0.002 (0.011)	-0.066 (0.086)	0.145 (0.148)
F4.WorldCup	-0.012 (0.010)	-0.031 (0.031)	-0.010 (0.010)	0.011 (0.013)	-0.074 (0.072)	0.008 (0.087)
F5.WorldCup	-0.009 (0.012)	-0.029 (0.032)	-0.018** (0.008)	0.012 (0.008)	-0.019 (0.058)	-0.047 (0.051)
F6.WorldCup	0.008 (0.016)	0.024 (0.030)	-0.001 (0.012)	0.026** (0.013)	0.063 (0.077)	-0.113 (0.126)
F7.WorldCup	-0.002 (0.014)	-0.011 (0.030)	-0.001 (0.013)	0.031*** (0.009)	-0.010 (0.023)	-0.030 (0.051)
F8.WorldCup	-0.003 (0.009)	-0.010 (0.018)	-0.001 (0.010)	0.031*** (0.010)	0.010 (0.023)	-0.194** (0.096)
F9.WorldCup	-0.010 (0.009)	-0.038 (0.023)	-0.005 (0.009)	0.004 (0.012)	0.004 (0.027)	-0.159* (0.095)
F10.WorldCup	0.002 (0.010)	-0.008 (0.035)	0.011 (0.010)	0.035*** (0.012)	-0.004 (0.015)	-0.143** (0.070)
Country Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	5469	5469	5469	5469	5469	5469
Number of Countries	184	184	184	184	184	184

Note: The method of estimation is least squares. Huber robust standard errors (reported in parentheses) are clustered at the country level. *Significantly different from zero at 90 percent confidence, ** 95 percent confidence, *** 99 percent confidence.

Table A5. The After-Effects of Hosting the World Cup

	$\Delta\text{Log}(\text{GDP})$	$\Delta\text{Log}(\text{Private Investment})$	$\Delta\text{Log}(\text{Private Consumption})$	$\Delta\text{Log}(\text{Government Expenditure})$	$\Delta\text{Log}(\text{Price Level})$	$\Delta\text{Log}(\text{Exchange Rate})$
L.WorldCup	-0.005 (0.007)	0.013 (0.016)	-0.010 (0.012)	0.005 (0.015)	0.006 (0.031)	0.054 (0.052)
L2.WorldCup	-0.004 (0.009)	-0.012 (0.047)	0.017 (0.016)	-0.001 (0.014)	-0.008 (0.028)	0.023 (0.064)
L3.WorldCup	-0.021* (0.012)	-0.078*** (0.030)	-0.014 (0.016)	0.003 (0.015)	-0.027 (0.033)	-0.017 (0.041)
L4.WorldCup	0.001 (0.009)	-0.059 (0.060)	0.031 (0.033)	-0.008 (0.015)	-0.047 (0.080)	0.062 (0.125)
L5.WorldCup	0.007 (0.008)	0.036* (0.019)	-0.010 (0.011)	0.018 (0.013)	0.037 (0.025)	0.034 (0.089)
L6.WorldCup	-0.005 (0.009)	-0.002 (0.024)	-0.001 (0.008)	0.001 (0.011)	0.021 (0.018)	0.079 (0.121)
L7.WorldCup	-0.010 (0.012)	-0.029 (0.036)	-0.021 (0.023)	0.025 (0.017)	-0.055 (0.034)	0.231 (0.223)
L8.WorldCup	-0.008 (0.010)	-0.015 (0.029)	0.007 (0.018)	-0.008 (0.013)	0.016 (0.026)	-0.127* (0.074)
L9.WorldCup	-0.007 (0.010)	-0.052 (0.045)	-0.006 (0.015)	0.017 (0.013)	-0.022 (0.032)	0.055 (0.068)
L10.WorldCup	-0.007 (0.012)	-0.031 (0.055)	-0.002 (0.011)	0.008 (0.014)	0.012 (0.057)	0.071 (0.102)
Country Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	5469	5469	5469	5469	5469	5469
Number of Countries	184	184	184	184	184	184

Note: The method of estimation is least squares. Huber robust standard errors (reported in parentheses) are clustered at the country level. *Significantly different from zero at 90 percent confidence, ** 95 percent confidence, *** 99 percent confidence.

Table A6. The Contemporaneous and Before-Effects of Bidding for the World Cup

	$\Delta\text{Log}(\text{GDP})$	$\Delta\text{Log}(\text{Private Investment})$	$\Delta\text{Log}(\text{Private Consumption})$	$\Delta\text{Log}(\text{Government Expenditure})$	$\Delta\text{Log}(\text{Price Level})$	$\Delta\text{Log}(\text{Exchange Rate})$
WorldCupBid	0.003 (0.010)	-0.015 (0.024)	0.010 (0.015)	-0.010 (0.009)	0.031 (0.025)	0.170 (0.228)
F.WorldCupBid	0.002 (0.008)	0.003 (0.030)	0.010 (0.013)	0.003 (0.012)	0.008 (0.026)	0.109 (0.229)
F2.WorldCupBid	0.006 (0.009)	0.048 (0.030)	0.002 (0.007)	-0.006 (0.013)	0.020 (0.023)	0.062 (0.186)
F3.WorldCupBid	-0.003 (0.010)	0.009 (0.035)	0.005 (0.009)	0.007 (0.007)	0.022 (0.018)	-0.057 (0.065)
F4.WorldCupBid	-0.007 (0.009)	-0.017 (0.026)	-0.013 (0.015)	0.021 (0.029)	0.040** (0.020)	-0.115* (0.061)
F5.WorldCupBid	0.008 (0.012)	0.029 (0.022)	0.006 (0.013)	-0.029 (0.023)	0.020 (0.040)	0.048 (0.121)
F6.WorldCupBid	-0.001 (0.008)	0.006 (0.025)	-0.013* (0.007)	0.019* (0.011)	0.012 (0.039)	-0.006 (0.121)
F7.WorldCupBid	-0.026** (0.012)	-0.091* (0.049)	-0.019 (0.013)	0.004 (0.008)	-0.072* (0.037)	0.061 (0.059)
F8.WorldCupBid	0.008 (0.007)	0.009 (0.027)	0.014 (0.009)	-0.005 (0.012)	0.006 (0.018)	-0.076 (0.065)
F9.WorldCupBid	-0.008 (0.006)	-0.015 (0.025)	-0.011 (0.007)	0.007 (0.008)	0.011 (0.023)	-0.075 (0.099)
F10.WorldCupBid	0.004 (0.008)	0.002 (0.023)	0.002 (0.008)	-0.004 (0.007)	0.018 (0.029)	-0.102 (0.071)
Country Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	5469	5469	5469	5469	5469	5469
Number of Countries	184	184	184	184	184	184

Note: The method of estimation is least squares. Huber robust standard errors (reported in parentheses) are clustered at the country level. *Significantly different from zero at 90 percent confidence, ** 95 percent confidence, *** 99 percent confidence.

Table A7. The After-Effects of Bidding for the World Cup

	$\Delta\text{Log}(\text{GDP})$	$\Delta\text{Log}(\text{Private Investment})$	$\Delta\text{Log}(\text{Private Consumption})$	$\Delta\text{Log}(\text{Government Expenditure})$	$\Delta\text{Log}(\text{Price Level})$	$\Delta\text{Log}(\text{Exchange Rate})$
L.WorldCupBid	-0.002 (0.020)	0.034 (0.045)	-0.016 (0.016)	-0.020* (0.011)	-0.008 (0.041)	-0.124 (0.079)
L2.WorldCupBid	-0.010 (0.014)	-0.014 (0.029)	0.012* (0.006)	-0.020 (0.013)	-0.141 (0.191)	0.123 (0.285)
L3.WorldCupBid	0.000 (0.010)	-0.024 (0.024)	0.012 (0.012)	0.010 (0.010)	0.118 (0.120)	-0.099 (0.099)
L4.WorldCupBid	-0.014 (0.010)	-0.085*** (0.033)	0.004 (0.009)	-0.004 (0.015)	0.064 (0.099)	-0.144 (0.124)
L5.WorldCupBid	-0.018** (0.008)	-0.049** (0.025)	-0.022** (0.009)	0.004 (0.010)	-0.041 (0.088)	-0.002 (0.103)
L6.WorldCupBid	-0.004 (0.007)	-0.002 (0.020)	-0.015 (0.012)	0.008 (0.010)	0.062 (0.040)	-0.128 (0.148)
L7.WorldCupBid	0.013 (0.008)	0.074** (0.036)	-0.009 (0.009)	-0.005 (0.009)	-0.012 (0.017)	-0.020 (0.073)
L8.WorldCupBid	-0.006 (0.014)	-0.042 (0.038)	0.005 (0.019)	-0.009 (0.010)	-0.052 (0.042)	-0.019 (0.114)
L9.WorldCupBid	-0.001 (0.013)	-0.016 (0.022)	0.010 (0.017)	-0.003 (0.017)	0.019 (0.046)	-0.000 (0.148)
L10.WorldCupBid	-0.016 (0.012)	-0.010 (0.025)	-0.012 (0.017)	-0.011 (0.014)	0.135 (0.085)	-0.077 (0.142)
Country Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	5469	5469	5469	5469	5469	5469
Number of Countries	184	184	184	184	184	184

Note: The method of estimation is least squares. Huber robust standard errors (reported in parentheses) are clustered at the country level. *Significantly different from zero at 90 percent confidence, ** 95 percent confidence, *** 99 percent confidence.