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THE OLYMPIC EFFECT

Andrew K. Rose
Mark M. Spiegel

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ABSTRACT

Economists are skeptical about the economic benefits of hosting "mega-events" such as the Olympic Games or the World Cup, since such activities have considerable cost and seem to yield few tangible benefits. These doubts are rarely shared by policy-makers and the population, who are typically quite enthusiastic about such spectacles. In this paper, we reconcile these positions by examining the economic impact of hosting mega-events like the Olympics; we focus on trade. Using a variety of trade models, we show that hosting a mega-event like the Olympics has a positive impact on national exports. This effect is statistically robust, permanent, and large; trade is around 30% higher for countries that have hosted the Olympics. Interestingly however, we also find that unsuccessful bids to host the Olympics have a similar positive impact on exports. We conclude that the Olympic effect on trade is attributable to the signal a country sends when bidding to host the games, rather than the act of actually holding a mega-event. We develop a political economy model that formalizes this idea, and derives the conditions under which a signal like this is used by countries wishing to liberalize.

Andrew K. Rose
Haas School of Business Administration
University of California, Berkeley
Berkeley, CA 94720-1900
and NBER
arose@haas.berkeley.edu

Mark M. Spiegel
Federal Reserve Bank of San Francisco
101 Market Street
San Francisco, CA 94105
mark.spiegel@sf.frb.org

"But why, some say, the moon? Why choose this as our goal? ... We choose to go to the moon. We choose to go to the moon in this decade and do the other things, not because they are easy, but because they are hard, because that goal will serve to organize and measure the best of our energies and skills, because that challenge is one that we are willing to accept, one we are unwilling to postpone, and one which we intend to win..."

- John F. Kennedy, Sept 12, 1962

"When the Olympic flame is lit, China will be hoping for a 17-day festival of sport and international friendship. It sees the games as marking not just its re-emergence as a global economic force but also as a country that the rest of the world treats with admiration and respect."

- *Economist*, August 2, 2008

1 Motivation

Economists are usually skeptical of arguments about the public provision of infrastructure for sporting events, and rightly so. Agents that endorse the construction of new sports stadia or the staging of mega-events usually do so out of naivety or self-interest. In practice, these events usually end up imposing large costs on their hosts that are not nearly compensated by either the revenues earned during the event or the legacy of large stadia or obscure facilities (velodromes, aquatic centers, archery ranges, and so forth) that are left behind. Baade and Matheson (2002) estimate that the city of Atlanta and the state of Georgia spent $1.58 billion on the 1996 Olympics, which created 24,742 permanent jobs under their most optimistic scenario, or $63,860 per job. The opening ceremonies of the 2008 Beijing Olympic games are estimated to have cost at least $100 million when around 100 million Chinese live on less than $1/day.[1]

Despite the fact that most economists doubt the wisdom of such policy, there is little question that countries commit substantial resources to become candidates to host mega-events, and much more should they be "fortunate" enough to actually host the event. While there is usually a vocal minority of opponents, the desire to host the Olympic games is widely held by the masses. Moreover, there is a clear perception that national reputations are affected by the experience of hosting the Olympics. Subsequent to learning of his country's failure to win the rights to host the 2012 summer games, the mayor of the first arrondissement of Paris Jean-Francois Legaret lamented

"Somehow, the good name of France seems to be at issue, and that makes the defeat even worse." [Graff (2005)].

This paper examines the possibility that both sides of the argument may be right. In particular, we show that there is a large economic benefit associated with mega-events (justifying the public's enthusiasm), despite the fact that much of the requisite new infrastructure is a net cost (explaining the skepticism of economists).

It is commonly argued that hosting the Olympics will promote a nation's exports. For instance, the International Olympic Committee (IOC) believes that potential visitors will be drawn to Olympic venues after being exposed to them through the games. We are dubious of the practical relevance of this argument, and thus begin by examining it empirically, using a number of different models of trade. Surprisingly, we find strong evidence of a large positive effect of the Olympics on both exports and overall trade. Our results seem robust to a battery of sensitivity exercises including tetradic and matching/treatment estimation; we show that countries which have hosted the games seem to have exports some 30% higher, *ceteris paribus*. Other mega-events such as the World Cup also have large positive effects on trade. Somewhat surprisingly (at least to us), countries that host a mega-event seem to realize an economic benefit in the form of greater openness. If openness enhances growth (e.g., Lucas (2009)), the macroeconomic consequences of mega-events may be large.

While our observed effect is large and robust, it may be argued that it is attributable to unobservable differences between those countries that host the games and those that don't, rather than a "hosting effect." To address this possibility, we compare trade patterns for countries that host the games to those that bid unsuccessfully for the games. In using this alternative group as a control, our methodology follows a large recent literature, such as Jones and Olken (2007).[2] In our case, the operational assumption is that successful and unsuccessful candidates are similar in terms of proclivity towards trade and liberalization, differing only by the experience of actually hosting the Olympic games.

Using this identification strategy, we find that countries that were unsuccessful candidates for the games also experience a positive export effect, one similar in size to that experienced by actual Olympic hosts. These findings cast doubt on the idea that a plausible motivation for hosting a mega-event is any change in a country's fundamentals induced by holding the games (such as construction activity or the resulting infrastructure). Instead, our evidence is consistent with the conclusion that *all* countries that bid for the games experience an increase in outward orientation, not just hosts. This raises two puzzles. Why should bidding for the Olympics be associated with increased openness? And if hosting the games brings no tangible benefits relative to a control group of unsuccessful candidates, why would any country ever bid to hold an expensive mega-event?

We offer an answer to these puzzles below. We explore the possibility that bidding to host an international mega-event such as the Olympics is part of a costly strategy that signals trade liberalization and results in increased openness. We develop a theoretical political-economy model consistent with this conjecture. In the model, we obtain a separating equilibrium where bidding to host a mega-event provides a positive signal about future policy intentions. However, consistent with our empirical findings, hosting the games in and of itself has no impact on a nation's fundamentals or trade.

Our model also suggests an answer to the question "Why a mega-event?" as the choice of a signal of liberalization intentions. We find that countries will be more likely to use the Olympic signal, the greater is the incidence of the expected cost of sending the signal on the group that expects to benefit from future liberalization. Major sporting events like the Olympics are traditionally financed by the relevant city (usually the capital) in conjunction with the central government of the host country. Policy makers from these groups are likely to benefit from liberalization. As such, bidding for the Olympics may serve well as a signal because it aligns the costs and benefits of the signal. To our knowledge, this is the first model where the distributional implications of sending the signal influence the desirability of the signal chosen. Olympic bids are also good signals of liberalization because they are highly visible, infrequent, and have long lead times.

In the next section we briefly review the relevant literatures on mega-events and signaling.

Our empirical investigation of the Olympic effect on trade begins in section 3; sensitivity analysis is provided in the following section, and a comparison between successful and unsuccessful bids for the Olympics follows. After some further robustness checks, we develop a theoretical model whereby countries interested in signalling their future policy intention to liberalize do so by bidding for a mega-event. The paper ends with a brief conclusion.

2 Literature Review

2.1 Literature on "mega events"

A number of studies exist that support local subsidization of sporting events; they often predict large economic benefits. This work is typically commissioned and is not intended for the academic audience, but it is still influential. 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 (2000) estimate that the total economic impact of hosting the 2012 games on the Washington-Baltimore metropolitan area would have been $5.3 billion.

More rigorous studies are skeptical of the net economic benefits of hosting mega-events; see e.g., Baade and Matheson (2002) and Owen (2005). The costs of holding such events seem considerable. Further, any enduring benefits derive mostly from infrastructure investments that the host city could choose to make independently of the games. 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 [e.g., Siegfried and Zimbalist (2000) and Coates and Humphreys (2003)]. Moreover, the projects associated with the games typically seem to be white elephants, such as poorly-used sporting facilities associated with idiosyncratic Olympic sports, or hotels and transportation infrastructure built to accommodate a one-time peak demand of just three weeks.

Some have argued that hosting sporting events yields a non-pecuniary "feel good" benefit to local citizens who are filled with civic pride following a mega-event, even if they do not attend [e.g.

Rappaport and Wilkerson (2001), Carlino and Coulson (2004), or Maennig and du Plessis (2007)]. However, the very existence of this intangible spillover is uncertain, let alone its magnitude. It seems safe to say that a majority of the profession considers it unlikely that these benefits justify the large public expenditures involved in hosting such events [e.g. Coates, Humphreys, and Zimbalist (2006) and Coates (2007)].

2.2 International Signaling Literature

The use of international signals to indicate future policy to prospective foreign investors has been discussed in the literature. Bartolini and Drazen (1997) develop a model where governments with asymmetric information about future fiscal positions signal their expectations through current policies on capital account openness. Open capital accounts are more costly for countries in poor fiscal condition, so those countries that expect to be in good fiscal condition in the future can signal their prospects in ways that cannot be profitably mimicked by countries that expect to face future fiscal difficulties.

The signal we consider below is of a "burning money" type, not informative in its own sense, but informative due to the fact that sending the signal is only attractive to the set of countries that sincerely intend to pursue liberalization. In this sense, it is similar to the costs of delay in a war of attrition model, such as that of the delayed fiscal stabilization in Alesina and Drazen (1991). Other studies go even farther, e.g. Krugman (1998) and Mukand (2006), who argue that countries sometimes pursue policies that are actually perverse in an effort to increase investor confidence. Their argument is that in a globalized environment, policymakers may feel the need to pursue policies that would confirm foreign investors' beliefs about what constitutes good policy. These beliefs may be biased due to herding effects [e.g. Banerjee (1992)], or alternatively because investors may draw incorrect inferences about their impact. As a result, perverse policies may have such an advantage in terms of their impact on agents' expectations that pursuing them may be superior than following the path that would yield the best outcome in terms of domestic economic fundamentals.

One question that naturally arises in these types of models is why one form of signal might be preferred to another. We argue that one attribute of using the Olympics as a signal is the incidence of the cost of sending the signal within the country. In particular, it is likely that the cost of hosting the Olympics is primarily borne by the benefactors of the signaled policy change, limiting the losses to those not favored by the policy. Mega-events like the Olympics are also infrequent, highly visible, and have long lead times, attributes that lend themselves to signals of liberalization.

3 The Olympic Effect on Trade

If the direct economic benefits seem theoretically dubious, and any indirect effects highly uncertain, the willingness of local and federal governments to heavily subsidize sporting activities is a mystery. We now try to tackle this issue empirically. In particular, we take seriously the argument that hosting a mega-event provides visibility to a host country and thus may stimulate global demand for its exports.

3.1 Specification and Data

We start our investigation by using the well-known and widely employed "gravity" model of international trade.[3] This models bilateral trade flows between a pair of countries as a function of the distance between the two countries and their economic "masses." We augment this empirical specification by adding a host of other factors that might also affect their trade intensity. We employ the following specification:

$$
\begin{aligned}
ln(X_{ijt}) &= \beta_0 + \beta_1 ln(D_{ij}) + \beta_2 ln(Pop_{it}) + \beta_3 ln(Pop_{jt}) + \beta_4 ln(GDPpc_{it}) + \beta_5 ln(GDPpc_{jt}) \\
&+ \beta_6 Cont_{ijt} + \beta_7 CU_{ijt} + \beta_8 Lang_{ij} + \beta_9 RTA_{ijt} + \beta_{10} Border_{ij} + \beta_{11} Islands_{ij} \\
&+ \beta_{12} Area_{ij} + \beta_{13} ComCol_{ij} + \beta_{14} Colony_{ijt} + \beta_{15} EverCol_{ij} + \beta_{16} SameCtry_{ijt} \\
&+ \gamma_O Olympics_{it} + \gamma_S Summer_{it} + \gamma_W Winter_{it} + \varepsilon_{ijt}.
\end{aligned} \tag{1}
$$

where i denotes the exporting country, j denotes the importer, t denotes time, $ln(\cdot)$ denotes the natural logarithm operator, and the variables are defined as:

- X_{ijt} denotes real FOB exports from i to j, measured in millions of dollars,
- D is the distance between i and j,
- Pop is population,
- $GDPpc$ is annual real GDP per capita,
- $Cont$ is a binary variable which is unity if i and j share a land border and zero otherwise,
- CU is a binary "dummy" variable which is unity if i and j use the same currency at time t ,
- $Lang$ is a binary variable which is unity if i and j have a common language,
- RTA is a binary variable which is unity if i and j have a regional trade agreement at t,
- $Border$ is a binary variable which is unity if i and j share a land border,
- $Islands$ is the number of island countries in the pair (0/1/2),
- $Area$ is the log of the product of the areas of the countries,
- $ComCol$ is a binary variable which is unity if i and j were both colonized by the same country,

- $Colony$ is a binary variable which is unity if i colonizes j at time t (or vice versa),
- $EverCol$ is a binary variable which is unity if i ever colonized j (or vice versa),
- $SameCtry$ is a binary variable which is unity if i is part of the same country at time t (or vice versa),
- β is a vector of nuisance coefficients,
- $Olympics/Summer/Winter$ are binary variables which are unity if i hosted a post-war Olympics games/Summer games/Winter games at or before time t, and zero otherwise,
- ε represents the omitted other influences on bilateral exports, assumed to be well behaved.

The sources of our bilateral data set are described in more detail in Appendix Table A1. This data set includes annual observations between 1950 and 2006 (though with many missing observations) for some 196 territories and localities (we refer to these as "countries" below). The countries themselves are tabulated in Table A2.

We estimate this equation with OLS, using a robust covariance estimator (clustered by country-pair dyads) to handle heteroskedasticity, adding year-specific fixed effects. We also perturb this specification in two important ways. First, we add a comprehensive set of dyadic-specific fixed effects (i.e., a mutually exclusive and jointly exhaustive set of $\{\beta_{ij}\}$ intercepts) to absorb any time-invariant characteristics that are common to a pair of countries. Second, we add comprehensive sets of exporter and importer fixed effects (i.e., sets of $\{\beta_i\}$ and $\{\beta_j\}$) to take account of any time-invariant country-specific factors. We also show below that our key results are insensitive to the use of other estimation strategies.[4]

We are interested in the $\{\gamma\}$ coefficients. These represent the permanent export effect associated with having hosted the post-war Olympic games, holding other export determinants constant through the gravity model (we try hard not to interpret these coefficients as causal). We estimate these "Olympic effects" in two different ways, either estimating the effects of the Summer and Winter games separately (in which case we set $\gamma_O = 0$) or estimating a single common effect of hosting

either type of games (in this case, we impose $\gamma_S = \gamma_W = 0$). The hosts of post-war Olympics games are tabulated in Appendix Table A3.

3.2 Benchmark Results

The results of estimating our default specification are presented in Table 1. There are six different columns; the equation is estimated with three different sets of fixed effects (none, dyadic, and exporter/importer) for two different sets of Olympic dummy variables (separate and combined Summer/Winter effects).

Before we discuss the coefficients of greatest interest to us, we briefly discuss the other determinants of trade flows. The gravity model seems to work well. It delivers precisely estimated coefficients that are sensible and similar to those estimated by others. For instance, β_1 is consistently estimated to be economically and statistically significant; exports between a pair of countries fall with distance (as previous researchers have found). Similarly, the size and significance of β_3 and β_5 indicates that larger and richer countries both tend to import more. Exports are larger when countries share a money, language, trade agreement, land border, or colonial heritage. Further, the equations fit the (largely cross-sectional) data set well, explaining well over half of the variation in exports. While these results are not of direct interest to us, they do reassure us that our estimates are grounded in a statistical conditioning model that delivers sensible and significant results.

Once the standard trade determinants are accounted for by the gravity model, is there any room left for a permanent export effect of hosting the Olympics? Somewhat surprisingly (at least initially to us), the answer is unambiguously positive. Consider the column on the extreme left-hand side of Table 1, which estimates separate export effects for having hosted either the Summer or the Winter Olympics games. Both estimates are positive and statistically distinguishable from zero at all reasonable significance levels.[5] Further, the "Olympic Effect" is economically large. Consider the point estimate of γ_S, which is .31. Taken literally, this implies that countries that have hosted the summer games have exports that are permanently higher by some $[exp(.31) - 1] = 36\%$! This is

big, broadly comparable in our estimates to, e.g., the effects of a shared regional trade agreement. It is also similar to the effect of hosting either the Summer or Winter games. Reassuringly, including either dyadic or country-specific fixed effects does not change the key results very much. The effects associated with hosting the (summer or either) games is around .3, both statistically and economically different from zero.[6]

We do not estimate strong export effects of hosting the winter games; the coefficients are typically small and usually insignificantly different from zero (especially for the more reliable results that include fixed effects). We do not find this particularly surprising; the scale of the winter Games has always been dwarfed by those of the summer games, and the geographic requirements of the winter games place more constraints on potential hosts. With a few exceptions, the winter games have tended to be held in relatively small towns, often those considered to be winter resorts (especially early on).[7] As a result, there is considerable heterogeneity in the Olympic effect.[8]

It should also be mentioned in passing that any export effect associated with the Olympic games seems to be permanent rather than transitory. In Appendix Table A4, we present an analogue to Table 1, but one where the three key binary variables (Olympics, Summer, and Winter) are redefined to be unity only in the year of the actual games, and zero otherwise. In this case, we find no strong consistent patterns for the three coefficients of interest; γ_O is never significant, while both γ_S and γ_W are significant in one each of the remaining estimates. Both of the latter results are economically small and neither is robust to the exact choice of fixed effects.[9]

4 Sensitivity Analysis

4.1 Robustness of Permanent Effect

Are the (surprisingly) strong linkages between exports and Olympic hosts fragile? Or instead, do small perturbations to the exact sample or choice of conditioning model have a strong effect on the results? No. We provide a battery of robustness checks in Table 2, which is intended to

reassure the skeptical reader that our results are essentially insensitive to minor changes in the exact econometric methodology used to estimate $\{\gamma\}$. Each of the rows in the table corresponds to a different sensitivity check, while the six columns correspond exactly to those of Table 1. We only report estimates for the coefficients of interest $\{\gamma\}$; other controls are included in the regressions as appropriate but not reported.[10]

The first experiment of Table 2 shows the results when exports from i to j are replaced by imports into i from j. The coefficients remain statistically large and positive. Indeed, the point estimates are, if anything, somewhat larger than those associated with exports. This indicates that the Olympics are associated with an increase in the openness of an Olympic host. The Games do not seem to act as simple export promotion, but are instead associated with an increase in two-way trade between the host and the rest of the world.

Next we change the empirical model in two ways. First, we include country-specific linear time-trend terms in place of country-specific intercepts. Secondly, we strip down the gravity model by including only bilateral distance, importer population, and importer income as controls.[11] However, our key finding of strong positive γ_S and γ_O coefficients seems to persist. The same is true when we add regional dummy variables.[12]

Do our results depend sensitively on a small set of observations that might come from a special set of observations? We check by selectively dropping different sets of observations. Since we are interested in exporter effects and only a small number of countries have hosted the Olympics post-war, we begin by dropping different sets of importer observations.[13] We first drop all observations for importers that are industrial. We then successively delete observations for developing countries from: Latin America or the Caribbean; Africa; Asia; or the Middle East.[14] We then successively drop small exporters (defining a small country as one with fewer than a million people), small importers (those with real GDP per capita of less than $1000 per annum), poor importers, and the intersection of these four sets. None of these robustness checks shakes the confidence we have in our basic results. We then check the sensitivity of our results with respect to time. We separately drop late (post-2000) and early (pre-1960) observations; again this does not destroy our findings.

We finish up this analysis with five further experiments. First, we drop outlier observations, defined as those where the residual is far (more than 2.5 standard deviations) away from zero. Second, we weight our regressions by the log of the product of the country-pair real GDP. We then redefine our key Olympics regressor in two ways. First, we construct a variable which is 0 if neither i nor j has hosted the Olympics at or before time t, 1 if *either* i or j has hosted (at or before t), and 2 if both i and j have hosted. Second, we construct a dummy which is 0 if neither i nor j has hosted the Olympics at or before time t, and 1 if *either* i or j has hosted (at or before t). The last variable delivers insignificant results for hosting the summer games when fixed effects are included; otherwise, our results are insensitive. Finally, we use the Glick-Taylor historical data set, which includes bilateral trade (but not export) data stretching back to 1870. Using this long data set allows us to incorporate observations for countries that have hosted the games at any point during the modern Olympiad era, not just from the shorter postwar period. However, our findings remain resilient; countries seem to have permanently higher trade flows after having hosted the games.

We conclude that our results do not seem to result from some small subset of the data set, and are relatively robust to reasonable changes in the sample and exact specification of our empirical model. Countries that have hosted the Olympic games (especially the summer games) seem to have higher trade than others.

4.2 Endogeneity

A question arises immediately: Can the choice of venue for the Olympic games be treated as plausibly exogenous? Perhaps only countries that are open to trade are chosen to host the games? We attempt to address this point more directly below with a treatment methodology that matches Olympic hosts to other countries. Still, we now make several points.

First, the endogeneity critique (along with much of our analysis) is primarily cross-sectional, while the empirical finding is found in the time-series behavior of trade.

Second, our analysis shows that countries become more open after the Olympics. However,

cities (not countries) bid to host the games. Indeed, four American cities vied for the 1948 Olympics (which went to London); five American cities applied in 1952 (again without success), and six in 1956 (also unsuccessfully).[15]

Third, the IOC provides details both on how it awards the games and why a city should be interested. There is a long list of technical criteria which are evaluated by an IOC committee; few of these criteria are closely associated with trade.[16] Informally, there is also geographic balancing, and the IOC seems to award perseverance (a number of cities have applied repeatedly). We also note in passing that there is considerable randomness inherent in the process.[17]

Fourth, our data does allow us to consider the issue of reverse causality directly. In particular, we can statistically examine whether more open countries are more likely to bid for, or obtain hosting rights to the Olympics. We conduct probit tests to that effect in Table A5 in the appendix. In addition to including openness, we control for country size and per capita income. We find that openness enters insignificantly throughout, suggesting that reverse causality is not an issue.[18]

Why does the IOC think that cities should be interested in hosting the Olympics? They state:

> "Apart from the sporting events, the main reason for applying for candidacy lies in the possibilities for economic development and tourism inherent in such an event. For this reason, and also given the high infrastructure costs, only rich countries have the means to make a good return on such a large investment."[19]

> "Two main reasons seem to motivate most applicant cities, namely international recognition and increased opportunities for invigorated urban and regional development. Indeed, the host city hopes to take advantage of the event to maximize its facilities due to the considerable income generated by the Games, and to give itself an enhanced image to attract future visitors, consumers and potential investors ... Organising the Olympic Games is a fantastic advertising opportunity for the host city... Moreover, organising the Olympic Games is an opportunity for the host city and country to show the world their ability to undertake and organise successfully such an important event. This promotional aspect is often motivated by the politicians of the host country, thereby explaining the heavy involvement of national governments in the organisation and financing of Olympic Games"[20]

4.3 Other International "Mega-events"

While the Olympics are highly visible, they are not the only mega-event. Do other events deliver similar results? One obvious alternative to consider is the World Cup, the only serious competitor with the Olympics for title of most important international sporting event.

Like the Olympics, the FIFA World Cup is held every four years. It began in 1930 in much the small-scale way as did the modern Olympics game, with thirteen (mostly Latin American) countries participating in a tournament held in Uruguay. The 1934 and 1938 tournaments were also relatively small and regional, being held in Europe with limited participation by the Latins. The event only really took off in 1950 (the 1942 and 1946 events were canceled for World War II). This was due in part to a new convention of alternating the event between the Americas and Europe.[21] We construct dummy variables for countries that have hosted the World Cup post-war in a manner analogous to those for the Olympic games, and add them to our specification. We report our results in Table 3a.

The results of Table 3a are intriguing. The effect of hosting the Olympics games remains positive and statistically significant for all six of the specifications we estimate; the coefficients continue to average around .3. The effects of hosting the FIFA World cup are similar in sign, size, and statistical precision. Indeed, we can never reject the hypothesis of equal trade effects of hosting the Olympics and the World Cup.

What about international events that do not involve sports? After all, international expositions and world's fairs have a much older pedigree than the modern Olympics, stretching back at least to the 1851 Great Exhibition in London's Crystal Palace.[22] The decline of international communication and transportation costs has largely made world's fairs obsolete, and they have declined in importance and number throughout the post-war period (though Expo 67 in Montreal is widely considered to be the most successful expo ever held). Still, Table 3b adds comparably constructed binary variables for (twenty) post-war expos and world's fairs to our default specification. In all six specifications, the trade effect of hosting a world's fair or expo is positive and

statistically significant, though it is smaller than the Olympic effect on trade.

There seem to be a number of ways in which a country can enhance its trade by hosting an international mega-event. The trade-expanding effects of hosting an event like the Olympics seem to be large, and they are broadly comparable to those associated with hosting the FIFA World Cup. Holding an expo or world's fair also seems to have much the same effect. Given our initial doubts concerning the benefits of hosting a mega-event, we now dive into the issue more deeply.

5 Unsuccessful Candidates

It is difficult for us to believe that hosting the Olympics actually has such a large effect on trade, let alone one that enhances trade permanently. Yet our sensitivity analysis shows that our results are sturdy.

We now take a skeptical look at our results from a different angle. To estimate the effects of the Olympics on trade in the previous section, our statistical model compared hosts with non-hosts. This seems a reasonable strategy, since not all countries have hosted the games (so there is cross-sectional variation), and the countries that host the Olympics do so at different points of time (so there is time-series variation). However, it may be that our regression results are implicitly comparing apples with oranges; countries are not randomly chosen to host the Olympics. One way to get at this issue is to compare the trade patterns of host countries with those that bid unsuccessfully for the games. We refer to the latter as "candidate" countries; candidates are tabulated in Appendix Table A3.[23] Our implicit assumption in comparing the trade effects of Olympic hosting and candidacy is that failed candidacies form a valid quasi-experimental counterfactual control group for Olympic hosts (after the inclusion of other conditioning variables).[24]

In Table 4, we report results when we add a set of binary variables for countries that were unsuccessful candidates to host the Olympics. These have been constructed in the same way as our host dummy variables. For instance, London was awarded the 1948 summer games, so the summer host variable is unity for all British (export) observations from 1948 through the end of the sample.

Since Lausanne was an unsuccessful candidate for the 1948 games, all Swiss observations from 1948 also take the value of unity for the comparable summer candidate variable. We tabulate separate export estimates for: a) being an unsuccessful Olympic candidate; and b) actually hosting the games. Intriguingly, all the effects - that is, both the host and the candidate coefficients - are significantly positive. Indeed, as the tests shown at the bottom of the panel show, they are also typically similar in size; the hypothesis that host and candidate effects are equal cannot be rejected for four of the six estimates. In one of the other cases (no fixed effects, combining the summer and winter Olympic effects) the host effect is bigger than the candidate effect; in another (country-specific fixed effects, separating summer and winter effects), the candidate effect is marginally larger than the host effect.[25]

This is an intriguing result, one which we find reasonably consistently throughout our investigation. It implies that the (sizeable) effect on trade seems to come not from actually hosting the games but from being a country that bids for them. More generally, signaling that the country is capable and willing to host the Olympics through a highly visible international bid for a mega-event seems to be associated with a sizeable trade-expanding effect on trade. Indeed, the effect of sending this signal seems broadly comparable in size to actually hosting the games. This is consistent with our view that any direct trade effect of hosting the games is small.[26] Moreover, it suggests that the observed effects of hosting a mega-event do not seem to stem from a "big push" type of process [e.g. Murphy, Shleifer, and Vishny (1989)].

6 Further Robustness Checks

In this section, we briefly subject our results to three further sensitivity tests. Given our interest in estimating and comparing the effects of both hosting and bidding for a mega-event like the Olympics, we have three particular concerns; a) econometric issues associated with the gravity model; b) econometric issues associated with selection bias and endogeneity; and c) the presence of our finding in multilateral data.

6.1 Tetradic estimates

We begin by dealing with the problem that gravity models like ours may be mis-specificed because of "monadic" problems. These refer to omitted factors that are specific to a single country but may vary over time, such as those associated with "multilateral resistance" to trade [e.g. Anderson and Van Wincoop (2003)].

To deal with the problem, we adopt the "method of tetrads" advocated by Head, Mayer, and Ries (2008). Under this method, consistent estimators of the coefficients of interest can be attained in the presence of multilateral resistance by comparing export observations to exports for a pair of base countries for the same year (the technique is tetradic since one compares trade flows for four countries). This method avoids the large number of coefficient estimates that would be required to estimate the monadic effects using a more conventional fixed effects method, but does not entail non-linear estimation; Head, Mayer, and Ries (2008) provide more details.[27]

One issue that arises in tetradic gravity specifications is the designation of the base countries. To ensure that our results are robust, we use three different pairs of base countries: a) the United States and the United Kingdom; b) Japan and France; and c) Germany and Canada. A second issue is that the error terms in our tetrads are likely to be correlated, as error terms for individual countries appear repeatedly across observations. We therefore use the methodology of Head, Mayer, and Ries (2008) to correct our standard error estimates. Finally, this estimation technique requires variation across both dyads and time, so that the dummy variable we used for Table 1 is inadmissible; we substitute instead a dummy which is 0 if neither i nor j has bid for the Olympics at or before time t, and 1 if *either* i or j has.

Our results are reported in Table 5. It can be seen that we continue to obtain positive and statistically significant effects of either hosting or candidacy for the Olympics, regardless of our choice of base countries. Our point estimates for the combined Winter/Summer Games are close to those of Tables 1-4, though our point estimate for the summer games alone is implausibly large.

6.2 Treatment methodology

We next use a treatment methodology, comparing exports for either hosts or candidate countries with exports for matched counterparts. This allows us to better handle the problem that candidate and host countries for the Olympic games are not randomly selected from our sample. We match observations using a stratification technique. Our variables used for matching country-pair*year observations include the logs of: distance, exporter and importer populations, exporter and importer real GDPs per capita; and dummy variables for sharing a common language or border.

We do two kinds of matching: a) we match actual Olympic host countries to candidates; and b) we match non-candidates to the union of hosts and candidates. If host and candidate countries experience similar trade boosts, we expect the first exercise to lead to small differences in exports. If bidding for a mega-event is key, we expect the second exercise to result in large trade effects.

Our results, along with bootstrapped standard error estimates are shown in Table 6. We find that hosts of the Summer Olympics experience a small increase in exports compared with candidates for the games. This effect is statistically significant at a 5% (but not 1%) confidence level. However, if one compares hosts and candidates for *either* the summer or winter games, this effect becomes statistically insignificant and remains economically small. These weak results are in stark contrast to those which compare hosts and candidates to non-candidate countries. Whether one considers the summer games alone or the combined games, hosts and candidates jointly experience a considerable trade boost compared with non-candidates. These effects are economically large (exports rise by about 20%) and are significant at the 1% confidence level.

6.3 Multilateral data

As a final robustness check, we examine the effect of hosting or being a candidate for the Olympics on the aggregate export/GDP ratio; we also consider being a World Cup host. We do this by simply regressing multilateral data (so that an observation is for a particular country and year) on the Olympic dummies.[28]

Our results are shown in Table 7. We find that countries which have hosted the Olympics have trade approximately 15% (=exp(.14)-1) higher, other things be equal. We obtain qualitatively similar positive coefficients for candidacy, but our large estimated standard errors preclude statistically significant results at standard confidence levels. Still, our results with aggregate data mirror those above in the sense that we cannot reject the hypothesis that the coefficient estimates on hosting and candidacy are positive and equivalent. Finally, we also obtain similar positive and statistically significant coefficient estimates for having hosted the World Cup in all of our reported regressions.

7 A Signaling Model

7.1 Setup

Our results suggest that the Olympic effect on trade in the data is not associated with hosting the games but rather from bidding for them; bidding to host the games seems to send a signal that has a sizeable trade-expanding effect. In this section, we develop a political-economy signaling model consistent with this result. Our model is of the "burning money" type. In keeping with our empirical results, we 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). Under appropriate parameter conditions, we 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. We close with some discussion about why offering to host a mega-event might serve as a desirable signal.[29]

To allow trade liberalization to have distributional consequences, we introduce a two-sector specific factors model of a small open economy in which liberalization increases prices in the export sector and lowers them in the import-competing sector. National governments differ in the degree to which they value gains to the exporting sector, and we assume that they cannot credibly reveal these

valuations to potential investors. The government in each country makes a discrete liberalization and signaling decision based on its expectations concerning the impact of liberalization on its utility.

Both sectors of the economy produce using a fixed domestic factor, which can be considered sector-specific capital. Putty capital, k, is mobile across sectors and earns an international market rate of return, which is fixed at r^*.[30] Real output levels in the export and import-competing sectors satisfy $y_j(k)$, where $y_j' > 0$ and $y_j'' < 0$, $j = x, m$. For simplicity, we assume that all putty capital is imported by domestic entrepreneurs, who have claims on the fixed factors and earn any residual profits from operations.

As the country is small, it takes world prices as given. However, *domestic* prices are a function of the government's liberalization decision. Liberalization raises prices in the export sector and lowers them in the import-competing sector. Prices while the nation is closed to external markets are denoted ${p_x}^c$ and ${p_m}^c$, while after opening they are ${p_x}^o$ and ${p_m}^o$ respectively, where ${p_x}^o > {p_x}^c$ and ${p_m}^o < {p_m}^c$.

The timing of the model is as follows: First, the government decides whether or not to submit a bid to host the Olympics. Next, the private agents make their investment decisions, based on their expectations of the government's liberalization decision. Finally, the government makes its liberalization decision, the winning Olympics host is named, and the payoffs are determined.

To ensure sub-game perfection, we solve the model backwards. Subsequent to receiving the government's signal, foreign putty capital is invested in each sector to equate the value of marginal product in that sector to the world interest rate, such that,

$$ {p_j}^l y_j'(k_j^*)^l) = (1 + r^*);\ j = x, m,\ l = c, o. \tag{2} $$

where k_j^{*l}; $j = x, m$, $l = c, o$ represents the equilibrium amount of putty capital allocated to sector j, i.e. the value satisfying equation (2). Since $dk_j^*/dp_j = -y'/p_j y'' > 0$; $j = x, m$ it follows that $k_x^{*c} < k_x^{*o}$ and ${k_m^*}^c > {k_m^*}^o$.

Given that the government's liberalization decision confirms investor expectations, the return to the domestic entrepreneurs in each sector, ${v_j}^l$, satisfies

$$ {v_j}^l = {p_j}^l y_j(k_j^*) - (1+r^*)k_j^*;\ j = x, m,\ l = c, o. \tag{3} $$

It is easy to show that the return in the export (import-competing) sector is greater (lower) under liberalization

$$ {v_x}^o - {v_x}^c = ({p_x}^o - {p_x}^c)y_x(k_x^{*c}) + \int_{k_x^{*c}}^{k_x^{*o}} [{p_x}^o y_e(\sigma) - (1+r^*)\sigma]d\sigma > 0. \tag{4} $$

$$ {v_m}^o - {v_m}^c = ({p_m}^o - {p_m}^c)y_m({k_m^*}^c) - \int_{{k_m^*}^o}^{{k_m^*}^c} [{p_m}^c y_m(\sigma) - (1+r^*)\sigma]d\sigma < 0. \tag{5} $$

Let c represent the cost of hosting the Olympics, net of any non-pecuniary benefit of hosting the games, such as national pride. Let π represent the probability that a candidate will be awarded the right to host the games conditional on having sent the signal.[31]

We assume that the reputation cost of being awarded the games and backing out is prohibitive. Bidding for the Olympics and not hosting them would be highly embarrassing and would adversely impact a nation's international reputation. These are infrequent, highly visible events with long lead times, features which make them attractive as signals of liberalization.[32] Given this assumption, each nation expects to host the games conditional on being awarded them. The expected cost of sending the signal is therefore equal to πc. The government finances the cost of sending the signal by imposing a lump-sum tax on each sector, where the export sector pays a share γ of the cost of sending the signal, $\gamma\pi c$, and the import-competing sector pays the rest, $(1-\gamma)\pi c$.

The government is assumed to have a utility function that is concave in earnings from each sector. The government's utility function is assumed to satisfy

$$U_g = \sum_j \theta_j u(v_j)\,;\; j = x, m. \tag{6}$$

where $u' \geq 0, u'' \leq 0$.[33] For simplicity, we normalize by setting $\theta_m = 1$, and define $\theta \equiv \theta_x$ as the measure of the degree to which government utility favors the export sector over the import-competing sector. However, we assume there is a continuum of heterogeneous countries $z \in [\underline{z}, \overline{z}]$ that differ in the relative values their governments place on local earnings from these sectors (below, we formally specify that a higher z indicates that the government values export earnings more than those of importers). We assume that θ^z, the value of θ held by the government of country z, is symmetrically distributed on the interval $[\underline{\theta}, \overline{\theta}]$ with mean value 1. For notational simplicity, we drop the z superscripts unless we are comparing decisions across countries.

Prior to sending the signal, U_g then satisfies

$$U_g = \theta u({v_x}^c) + u({v_m}^c). \tag{7}$$

Similarly, let $\hat{U}_g$ represent the government's utility after it sends a credible signal and liberalizes. $\hat{U}_g$ satisfies

$$\hat{U}_g = \theta u({v_x}^o - \gamma\pi c) + u({v_m}^o - (1-\gamma)\pi c). \tag{8}$$

7.2 Equilibrium

An equilibrium is a set of signal and liberalization decisions by each government that maximizes its expected utility, along with a set of investment decisions in the two sectors consistent with maximizing the returns to the domestic entrepreneurs, conditional on the signal of the government.

We first rule out two off-equilibrium path outcomes, where the signal sent by the government fails to match its subsequent liberalization decision. We first examine the condition that ensures

that the government always liberalizes following a bid for the games. Define $\hat{U}_g^c$ as expected government utility subsequent to sending a credible signal and failing to liberalize. $\hat{U}_g^c$ satisfies

$$\hat{U}_g^c = \theta u(\tilde{v}_x^c - \gamma\pi c) + u(\tilde{v}_m^c - (1-\gamma)\pi c) \tag{9}$$

where $\tilde{v}_j^c \equiv v_j^c(k_j^{*o}); j = e, m$. This is the value of revenues in sector j consistent with signaling liberalization and then not liberalizing, i.e. the revenue level conditional on capital consistent with liberalization but prices consistent with remaining closed.[34]

Second, we need to ensure that conditional on not sending the signal, the government does not choose to liberalize. Define U_g^o as the payoff to the government that liberalizes after not sending sending a signal; U_g^o satisfies

$$U_g^o = \theta u(\tilde{v}_x^o) + u(\tilde{v}_m^o) \tag{10}$$

where $\tilde{v}_j^o \equiv v_j^o(k_j^{*c}); j = x, m$, i.e. the value of revenues in sector j consistent with not signaling liberalization and then liberalizing. This will be equal to the revenue level with capital stock levels consistent with remaining closed but prices consistent with liberalization.

Our analysis is aided by a lemma:

Lemma 1 *Given the signal decision, the change in government utility with liberalization is monotonically increasing in θ.*

Proof: Found in Appendix A.6.

By Lemma 1 and equations (8) and (9), $\hat{U}_g \geq \hat{U}_g^c$ if and only if

$$\theta \geq \frac{u(\tilde{v}_m^c - (1-\gamma)\pi c) - u({v_m}^o - (1-\gamma)\pi c)}{u({v_x}^o - \gamma\pi c) - u(\tilde{v}_x^c - \gamma\pi c)} \tag{11}$$

Similarly, by Lemma 1 and equations (7) and (10), $U_g > U_g^o$ if and only if

$$\theta < \frac{u({v_m}^c - u(\tilde{v}_m^o)}{u(\tilde{v}_x^o) - u({v_x}^c)}. \tag{12}$$

If both conditions are satisfied, the government will liberalize after submitting a bid to host the Olympics; it will not liberalize without sending this signal. We can therefore rule out off-equilibrium path behavior among all countries if (11) and (12) are satisfied.

Next we extend our analysis to decisions across a set of heterogeneous countries. We number the countries such that $\theta^z \leq \theta^{z+1}$. Define θ^* as the value of θ^z which leaves the government indifferent between staying closed and not sending the signal, and sending the signal and liberalizing. By Lemma 1 and equations (7) and (8), θ^* satisfies

$$\theta^* = \frac{u({v_m}^c) - u({v_m}^o - (1-\gamma)\pi c)}{u({v_x}^o - \gamma\pi c) - u({v_x}^c)} \tag{13}$$

We first verify that conditions (11) and (12) are satisfied for θ^*. By (13) and (11), a sufficient (but not necessary) condition for θ^* to satisfy (11) is

$${v_x}^c \geq \tilde{v}_x^c - \gamma\pi c. \tag{14}$$

Intuitively, this restriction requires that the earnings of the export sector without liberalization are higher when the government does not send the costly signal. Similarly, a sufficient (but not necessary) condition for θ^* to satisfy (11) is

$$v_x^o - \gamma\pi c \geq \tilde{v}_x^o. \tag{15}$$

Similarly, this restriction requires that the earnings of the export sector with liberalization are higher when the government sends the (costly) signal. Combined, these restrictions imply that revenues in the export sector are lower under both off-equilibrium path strategies.

We adopt these restrictions below (which we reiterate are sufficient but not necessary). This leads to our first proposition:

Proposition 1 *There exists a separating equilibrium where countries with $\theta^z \geq \theta^*$ send the signal and liberalize, and countries with $\theta^z < \theta^*$ neither send the signal nor liberalize.*

Proof: First, consider the set of countries with $\theta^z < \theta^*$. Since the gains from liberalizing are monotonic in θ by Lemma 1 and we have ruled out off-equilibrium path strategies, these countries' governments would prefer to not send the signal. Similarly, the countries with governments holding values of θ^z that satisfy $\theta^z \geq \theta^*$ would choose to send the signal and liberalize. We therefore obtain the separating equilibrium described in the proposition.

7.3 Incidence of Signaling Cost

It can be seen in equation (8) that the desirability of sending the signal and liberalizing is a function of γ, the share of the cost of sending the signal that is borne by the export sector. Since liberalization benefits the export sector and harms the import-competing sector, it seems plausible that the government's preference for liberalizing is increasing in γ, as it mitigates the disadvantages from liberalization to the import-competing sector. However, this must be balanced against the government's preference for revenues from the export sector, parameterized by θ. If the government favors the export sector too heavily, this could outweigh the equilibrating impact of an increase in γ in its utility function, and the desire for liberalization would be decreasing in γ.

More formally, differentiating θ^* with respect to γ in (13) yields

$$\frac{\partial \theta^*}{\partial \gamma} = \frac{\pi c[\theta^* u'({v_x}^o - \gamma \pi c) - u'({v_m}^o - (1-\gamma)\pi c)]}{u({v_x}^o - \gamma \pi c) - u({v_x}^c)}. \tag{16}$$

The denominator is positive, so the sign of the derivative is equal to the sign of the bracketed term in the numerator. There are three terms here: θ^*; the marginal utility of the export sector after liberalization; and the marginal utility of the import sector after liberalization. The entire

term will be negative if and only if

$$\theta^* \leq \frac{u'[{v_m}^o - (1-\gamma)\pi c]}{u'[{v_x}^o - \gamma\pi c]}. \tag{17}$$

Condition (17) requires that θ^* (the relative valuation of export earnings held by the government that is just indifferent between liberalizing and not liberalizing) is less than or equal to the marginal rate of substitution between post-liberalization earnings in the import-competing and export sectors. Intuitively, this restriction implies that post-liberalization earnings in the import-competing sector are sufficiently low relative to those in the export sector, even after adjusting for the relative weight placed on export earnings (θ^*). For example, in the benchmark case where the government values earnings in each sector equally ($\theta^* = 1$), the condition will be satisfied if earnings in the export sector subsequent to liberalization, net of its share of the expected cost of bidding for the games, are less than or equal to those in the import sector, net of their share of the expected signaling costs.

Given this condition, we obtain our second proposition:

Proposition 2 *Given a separating equilibrium for all countries $z \in [\underline{z}, \overline{z}]$, and satisfaction of condition (17), an increase in γ reduces θ^*, raising the set of countries that choose to send the signal and liberalize, while if (17) is violated, an increase in γ increases θ^*.*

The proof follows directly from equations (16) and (17). The intuition behind Proposition 2 lies in the fact that increases in γ improve the alignment between the costs and benefits from liberalization. If the marginal country's government does not favor the export sector too heavily, an increase in γ (the exporters' share of the burden of sending the signal) raises the share of countries choosing to send the signal and liberalize, since the expected losses to the import-competing sector are reduced.

This may favor the use of bidding for the olympics as a signal of openness intentions. The costs of hosting the Games are traditionally borne by the host city (usually the capital) in conjunction

with the central government of the host country. Policy makers from these groups are likely to benefit from liberalization. In terms of our model, "mega-events" like the Olympics may be high γ signals.

To summarize: our model suggests that countries choose to bid for a mega-event in order to signal investors about their future liberalization intentions. Under certain parameter conditions, governments that wish to liberalize can profit from sending the costly signal of bidding to host the games, while those that do not wish to liberalize do not; a separating equilibrium.

Our model shows that the conditions imply that the probability-weighted cost of holding the Olympics must be sufficiently large to dissuade governments that do not wish to liberalize from sending a false signal. This motivates the choice of a costly mega-event as a signal of liberalization intentions.

Further, the model also demonstrates that distributional implications matter; the incidence of the cost of the signal has an impact on its desirability. The signal must be sufficiently costly *to the export sector*, the sector that would benefit from the policy change, not just costly to the nation. Also, if the government does not favor the export sector too greatly, and liberalization has sufficient distributional consequences, an increase in share of expected cost of hosting games borne by the export sector increases the marginal government's willingness to bid. That is, the higher is the expected burden of hosting the Olympics on the exportable sector, the more attractive is a mega-event as a signal of liberalization.

8 Conclusion

In July 2001, Beijing was awarded the right to host the Games of the XXIX Olympiad. Just two months later, China successfully concluded negotiations with the World Trade Organization, thus formalizing its commitment to trade liberalization. Nor is this a once-off coincidence. Rome was awarded the 1960 games in 1955, the same year Italy started to move towards currency convertibility, joined the UN, and, most importantly, began the Messina negotiations that lead two years later

to the Treaty of Rome and the creation of the European Economic Community. The Tokyo games of 1964 coincided with Japanese entry into the IMF and the OECD. Barcelona was awarded the 1992 games in 1986, the same year Spain joined the EEC; the decision to award Korea the 1988 games coincided with Korea's political liberalization. The correlation extends beyond the Olympics; the 1986 World Cup was held in Mexico coincident with its trade liberalization and entry into the GATT.[35] In this paper, we model this linkage between mega-events and liberalization both theoretically and empirically.

The motivation for hosting a mega-event like the Olympics seems elusive to economists. Plausibly measured net economic benefits are rarely large and typically negative; claims of non-economic benefits are difficult to verify. Yet in practice countries compete fiercely for the right to host such events. Why? This paper identifies one potential explanation; countries that host the games enjoy a substantive permanent increase in trade – the "Olympic Effect." Similar increases in openness are observed for countries that host other mega-events, such as the World Cup and, until recently, World's Fairs. For a country pursuing a trade-oriented development strategy, such an outcome would clearly be attractive.

Our empirical results show that the Olympic effect is robust; hosting the games tends to increase a country's openness substantively and permanently. But while hosting the games is sufficient to boost trade, it is not necessary. In practice, we find that countries that bid for the Olympics unsuccessfully also experience a boost in trade, comparable to that received by actual Olympic hosts. This finding implies that the Olympic Effect on trade does not stem from a change in economic fundamentals (which might be associated with a "big push" type of process), caused by the activity or infrastructure associated with hosting the Olympics. Instead, our empirical findings suggest that bidding for the Olympics is a costly policy signal that is followed by future liberalization. We explore this conjecture in a political economy model, where governments choose whether or not to signal future liberalization by hosting the Olympics. We derive the conditions for a separating equilibrium, where only countries that value liberalization choose to send the signal and liberalize. Our model also suggests that the size and distributional consequences of this type

of signal may influence its desirability.

We close with a number of cautions. First, our model makes no clear statement on the merit of public support for hosting mega-events. Second, there are other motivations for hosting mega-events which we have not modeled; for instance, our theory cannot easily explain the behavior of countries that submit repeated or multiple bids for large sporting events. Finally, other signals of and routes to liberalization exist, and our analysis does not examine the relative effectiveness of these paths; we leave such issues to future research.

Table 1: Permanent Effect of Olympics on Exports in Gravity Model

Fixed Effects:	None	None	Dyadic	Dyadic	Exporter, Importer	Exporter, Importer
Summer	.31**		.25**		.31**	
	(.04)		(.03)		(.04)	
Winter	.14**		-.07		-.06	
	(.04)		(.04)		(.05)	
Olympics, Either		.33**		.30**		.38**
		(.03)		(.03)		(.04)
Log Distance	-1.11**	-1.11**			-1.33**	-1.33**
	(.02)	(.02)			(.02)	(.02)
Log Exp Population	1.06**	1.07**	.18**	.20**	-.25**	-.23**
	(.01)	(.01)	(.06)	(.06)	(.06)	(.06)
Log Imp Population	.88**	.89**	.80**	.79**	.45**	.44**
	(.01)	(.01)	(.05)	(.05)	(.05)	(.05)
Log Exp Real GDP p/c	1.54**	1.54**	1.24**	1.23**	1.25**	1.25**
	(.01)	(.01)	(.03)	(.03)	(.03)	(.03)
Log Imp Real GDP p/c	1.18**	1.18**	.87**	.87**	.84**	.84**
	(.01)	(.01)	(.03)	(.03)	(.03)	(.03)
Currency Union	1.02**	1.02**	.56**	.55**	.67**	.67**
	(.10)	(.10)	(.09)	(.09)	(.10)	(.10)
Common Language	.45**	.46**			.35**	.34**
	(.04)	(.04)			(.03)	(.03)
RTA	.28**	.27**	.29**	.29**	.43**	.43**
	(.03)	(.03)	(.02)	(.02)	(.03)	(.03)
Common Border	.68**	.69**			.46**	.46**
	(.08)	(.08)			(.08)	(.08)
No. Islands	.17**	.18**			1.92**	-3.81**
	(.03)	(.03)			(.36)	(.32)
Log Product Area	-.07**	-.07**			.62**	.56**
	(.01)	(.01)			(.05)	(.03)
Common Colonizer	.58**	.58**			.75**	.75**
	(.06)	(.06)			(.05)	(.05)
Currently Colony	.62*	.64**	.39*	.38*	.95**	.95**
	(.24)	(.24)	(.19)	(.19)	(.25)	(.25)
Ever Colony	1.45**	1.43**			1.42**	1.42**
	(0.10)	(0.10)			(.09)	(.09)
Common Country	.09	.09	.27	.27	-.95*	-.95*
	(.71)	(.71)	(.66)	(.66)	(.41)	(.41)
R2	.61	.61	.85	.85	.69	.69
RMSE	2.1823	2.1822	1.3976	1.3975	1.9356	1.9354

Data set includes 449,220 bilateral annual observations covering 196 countries, 1950-2006. Robust standard errors (clustered by country-pairs) in parentheses. Coefficients significant different from 0 at .05 (.01) marked with one (two) asterisk(s). Year effects included but not recorded.

Table 2: Sensitivity Analysis of Permanent Olympic Effect on Exports

Fixed Effects:	None	None	Dyadic	Dyadic	Exporter, Importer	Exporter, Importer
Olympics:	Summer	Either	Summer	Either	Summer	Either
Substitute Imports	.51**	.63**	.45**	.53**	.58**	.71**
for Exports	(.04)	(.04)	(.04)	(.04)	(.05)	(.05)
Exporter-Specific					.15**	.36**
Trends (not levels)					(.04)	(.04)
Stripped Down	2.55**	3.27**	.57**	.69**	.69**	.86**
Gravity Model	(.05)	(.05)	(.04)	(.04)	(.04)	(.04)
Add Regional	.21**	.17**	.25**	.30**	.31**	.38**
Dummies	(.04)	(.03)	(.03)	(.03)	(.04)	(.04)
Drop Industrial	.29**	.31**	.27**	.33**	.30**	.34**
Importers	(.04)	(.04)	(.04)	(.04)	(.04)	(.04)
Drop Latin America,	.26**	.28**	.22**	.32**	.28**	.42**
Caribbean Importers	(.04)	(.04)	(.04)	(.04)	(.04)	(.04)
Drop African	.34**	.35**	.28**	.30**	.36**	.40**
Importers	(.04)	(.04)	(.04)	(.04)	(.04)	(.04)
Drop Asian Importers	.31**	.34**	.27**	.31**	.34**	.39**
	(.04)	(.03)	(.04)	(.04)	(.04)	(.04)
Drop Middle Eastern	.29**	.33**	.26**	.29**	.32**	.37**
Importers	(.04)	(.03)	(.03)	(.03)	(.04)	(.04)
Drop Small Exporters	.26**	.26**	.19**	.24**	.24**	.30**
(Population<1m)	(.04)	(.03)	(.03)	(.03)	(.04)	(.04)
Drop Poor Exporters	.20**	.19**	.20**	.23**	.26**	.30**
(Real GDP p/c<$1000)	(.04)	(.03)	(.03)	(.03)	(.04)	(.04)
Drop Small Importers	.33**	.36**	.26**	.31**	.32**	.41**
(Population<1m)	(.04)	(.04)	(.04)	(.03)	(.04)	(.04)
Drop Poor Importers	.31**	.33**	.27**	.30**	.34**	.40**
(Real GDP p/c<$1000)	(.04)	(.03)	(.04)	(.03)	(.04)	(.04)
Drop poor-poor and	.20**	.22**	.15**	.19**	.23**	.31**
small-small dyads	(.04)	(.03)	(.03)	(.03)	(.04)	(.04)
Drop Late Data	.33**	.35**	.24**	.28**	.27**	.34**
(year>2000)	(.04)	(.03)	(.03)	(.03)	(.04)	(.04)
Drop Early Data	.30**	.32**	.19**	.27**	.27**	.36**
(year<1960)	(.04)	(.03)	(.04)	(.04)	(.04)	(.04)
Drop 2.5σ Outliers	.26**	.26**	.20**	.23**	.27**	.33**
	(.03)	(.03)	(.03)	(.03)	(.04)	(.04)
Weight by Real GDP	.29**	.31**	.23**	.29**	.30**	.37**
	(.04)	(.03)	(.03)	(.03)	(.04)	(.04)
Exporter *plus* Importer	.29**	.37**	.29**	.24**	.44**	.39**
Hosting	(.03)	(.02)	(.03)	(.02)	(.03)	(.02)
Exporter *or* Importer	.23**	.58**	-.00	.29**	.02	.49**
Hosting	(.02)	(.03)	(.01)	(.03)	(.02)	(.03)
Glick-Taylor (1870-1997)	.47**	.58**	.33**	.29**	.37**	.31**
trade effect	(.04)	(.04)	(.04)	(.03)	(.04)	(.04)

Data set includes 449,220 bilateral annual export observations covering 196 countries, 1950-2006. Robust standard errors in parentheses. Coefficients significant different from 0 at .05 (.01) marked with one (two) asterisk(s). Regressors included but not recorded: Log Distance; Log Exporter Population; Log Importer Population; Log Exporter Real GDP p/c; Log Importer Real GDP p/c; Currency Union dummy; Common Language dummy; Regional Trade Agreement dummy; Common Border dummy; # Islands; Log Product Area; Common Colonizer dummy; Currently Colony dummy; Ever Colony dummy; and Common Country dummy. Winter Olympics dummy also included but not recorded in Summer Olympics columns. Year effects included but not recorded.

Table 3: The Effects of Other Mega-Events on Exports in the Gravity Model

A. Effects of Hosting Olympics and World Cup on Exports

Fixed Effects:	None	None	Dyadic	Dyadic	Exporter, Importer	Exporter, Importer
Olympics:	Summer	Either	Summer	Either	Summer	Either
Olympic Effect	.25**	.33**	.20**	.27**	.23**	.33**
	(.04)	(.03)	(.03)	(.03)	(.04)	(.04)
World Cup Effect	.34**	.34**	.18**	.19**	.27**	.27**
	(.03)	(.03)	(.03)	(.03)	(.03)	(.03)
Olympic=World Cup?	.11	.79	.76	.08	.45	.25
(p-value)						

B. Effects of Expos/World Fairs on Exports

Fixed Effects:	None	None	Dyadic	Dyadic	Exporter, Importer	Exporter, Importer
Olympics:	Summer	Either	Summer	Either	Summer	Either
Olympic Effect	.24**	.28**	.08**	.28**	.28**	.35**
	(.04)	(.03)	(.03)	(.03)	(.04)	(.04)
Worlds Fair/Expo Effect	.19**	.22**	.22**	.06*	.09**	.06*
	(.04)	(.04)	(.03)	(.03)	(.03)	(.03)
Olympic=Worlds Fair?	.45	.27	.00**	.00**	.00**	.00**
(p-value)						

Data set includes 449,220 bilateral annual export observations covering 196 countries, 1950-2006. Robust standard errors in parentheses. Coefficients significant different from 0 at .05 (.01) marked with one (two) asterisk(s). Regressors included but not recorded: Log Distance; Log Exporter Population; Log Importer Population; Log Exporter Real GDP p/c; Log Importer Real GDP p/c; Currency Union dummy; Common Language dummy; Regional Trade Agreement dummy; Common Border dummy; # Islands; Log Product Area; Common Colonizer dummy; Currently Colony dummy; Ever Colony dummy; and Common Country dummy. Winter Olympics dummy also included but not recorded in summer Olympics columns. Year effects included but not recorded.

Table 4: Effects of Olympic Hosting and Candidacy on Exports

Fixed Effects:	None	None	Dyadic	Dyadic	Exporter, Importer	Exporter, Importer
Olympics:	Summer	Either	Summer	Either	Summer	Either
Hosts	.15**	.28**	.20**	.25**	.26**	.31**
	(.04)	(.03)	(.03)	(.03)	(.04)	(.04)
Candidates	.16**	.14**	.27**	.21**	.36**	.27**
	(.03)	(.03)	(.03)	(.03)	(.03)	(.03)
Host=Candidate?	.79	.01**	.11	.31	.02*	0.37
(p-value)						

Data set includes 449,220 bilateral annual export observations covering 196 countries, 1950-2006. Robust standard errors in parentheses. Coefficients significant different from 0 at .05 (.01) marked with one (two) asterisk(s). Regressors included but not recorded: Log Distance; Log Exporter Population; Log Importer Population; Log Exporter Real GDP p/c; Log Importer Real GDP p/c; Currency Union dummy; Common Language dummy; Regional Trade Agreement dummy; Common Border dummy; # Islands; Log Product Area; Common Colonizer dummy; Currently Colony dummy; Ever Colony dummy; and Common Country dummy. Winter Olympics dummy also included but not recorded in Summer Olympics columns. Year effects included but not recorded.

Table 5: Tetradic Estimates of Olympic Hosting/Candidacy Effect on Exports

Olympics:	Summer	Either	Summer	Either	Summer	Either
Base Exporter	USA	USA	Japan	Japan	Germany	Germany
Base Importer	UK	UK	France	France	Canada	Canada
Effect of Host/Candidacy	.61**	.38**	.65**	.38**	.81**	.38**
	(.04)	(.04)	(.04)	(.04)	(.04)	(.04)
Observations	534,820	534,500	521,887	523,207	515,063	513,628

Bilateral data set covers 196 countries, 1950-2006. Robust standard errors in parentheses. Coefficients significantly different from 0 at .05 (.01) marked with one (two) asterisk(s). Regressors included but not recorded: Currency Union dummy; and Regional Trade Agreement dummy. Winter Olympics dummy also included but not recorded in Summer Olympics columns. Year effects included but not recorded.

Table 6: Using a Treatment Methodology for Export Effects

	Olympics:	Summer	Either
Treatment	Control		
Host	Candidate	.08*	.05
		(.04)	(.04)
Host or Candidate	Non-Candidate	.18**	.19**
		(.07)	(.03)

Average Effect of treatment on treated for bilateral exports, stratification estimator. Matching variables: Log Distance; Log Exporter Population; Log Importer Population; Log Exporter Real GDP p/c; Log Importer Real GDP p/c; Common Language dummy; and Common Border dummy. Bootstrapped errors in parentheses. Annual observations on exports to developed countries.

Table 7: Aggregate Effects using Multilateral Data

A. Aggregate Effects on Export/GDP ratio using Multilateral Data

	Summer Games	Summer or Winter	World Cup	Any Event
Host Olympics	.14*	.14*		
	(.06)	(.07)		
Candidate for Olympics	.14	.10		
	(.08)	(.07)		
Host or Candidate for Olympics	.14	.14		
	(.06)	(.08)		
World Cup			.18**	
			(.06)	

B. Comparing Effects of Different Events on Aggregate Export/GDP Ratio

	Summer Games	Summer or Winter	World Cup	Any Event
(1)	.12		.16**	
	(.08)		(.06)	
(2)		.13	.17**	
		(.08)	(.06)	
(3)				.19*
				(.08)

Each *cell* in A represents a separate OLS estimation, while each *row* in B represents a separate OLS estimation. Robust standard errors in parentheses. Controls included but not recorded: log of population; log of real GDP per capita; year effects; country effects. Annual data 1950-2006 for 182 countries.

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Appendix

Table A.1: Data Sources

Bilateral Data Set

- FOB exports and CIF imports are measured in US$, taken from IFS *Direction of Trade* CD-ROM, deflated by US CPI for All Urban Consumers (CPI-U), all items, 1982-84=100.
- Population and real GDP per capita (rgdpl) taken from *PWT Mark 6.2*. If PWT data are unavailable, we use *World Development Indicators*.
- Country-specific data (on location, area, island-nation status, contiguity, language, colonizer, and independence) taken from CIA *World Factbook* website.
- Currency-union data taken from Glick-Rose (2002).
- Regional trade agreements taken from WTO website `http://www.wto.org/english/tratop_e/region_e/eif_e.xls`
- Olympic hosts and candidate cities available from official Olympics website `http://www.olympic.org/uk/games/past/index_uk.asp?OLGT=1&OLGY=1992`
- World Cup hosting: `http://www.fifa.com/worldcup/archive/index.html`

Multilateral Data Set

- *PWT Mark 6.2*: Population; nominal GDP; nominal and real openness (exports plus imports as percentage of GDP); real GDP p/c (PPP-adjusted)
- When PWT data are unavailable, we use *World Development Indicators*: Exports and Imports (measured as percentages of GDP); Population; and Real GDP p/c (PPP).

Table A.2: Country List

Afghanistan	Congo, Dem. Rep.	Honduras
Albania	Congo, Republic Of	Hong Kong
Algeria	Costa Rica	Hungary
American Samoa	Cote D'Ivoire	Iceland
Andorra (*a*)	Croatia	India
Angola	Cuba	Indonesia
Antigua & Barbuda	Cyprus	Iran
Argentina	Czech Rep	Iraq
Armenia	Czechoslovakia (*b*)	Ireland
Aruba	Denmark	Israel
Australia	Djibouti	Isle Of Man (*a*)
Austria	Dominica	Italy
Azerbaijan	Dominican Rep.	Jamaica
Bahamas	Ecuador	Japan
Bahrain	Egypt	Jordan
Bangladesh	El Salvador	Kazakhstan
Barbados	Eq. Guinea	Kenya
Belarus	Eritrea	Kiribati
Belgium	Estonia	Korea, Rep.
Belize	Ethiopia	Korea N
Benin	Faeroe Islands	Kuwait
Bermuda	Falk Is (*b*)	Kyrgyzstan
Bhutan	Fiji	Laos
Bolivia	Finland	Latvia
Bosnia & Herzegovina	Fr Guiana (*b*)	Lebanon
Botswana	France	Lesotho
Brazil	French Polynesia (*b*)	Liberia
Brunei	Gabon	Libya
Bulgaria	Gambia	Liechtenstein (*a*)
Burkina Faso	Georgia	Lithuania
Burundi	Germany	Luxembourg
Cambodia	Ghana	Macau
Cameroon	Gibraltar (*b*)	Macedonia (FYR)
Canada	Greece	Madagascar
Cape Verde	Greenland	Malawi
Cayman Islands (*a*)	Grenada	Malaysia
C.A.R.	Guadalupe (*b*)	Maldives
Chad	Guam	Mali
Channel Islands (*a*)	Guatemala	Malta
Chile	Guinea	Marshall Islands (*a*)
China	Guinea-Bissau	Martinique (*b*)
Colombia	Guyana	Mauritania
Comoros	Haiti	Mauritius

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Table A.2 – Continued

Mayotte (a)	Qatar	Tajikistan
Mexico	Reunion (b)	Tanzania
Micronesia. (*a*)	Romania	Thailand
Moldova	Russia	Timor-Leste
Monaco (*a*)	Rwanda	Togo
Mongolia	Samoa (*a*)	Tonga
Montenegro (*b*)	San Marino (*a*)	Trinidad & Tobago
Morocco	Sao Tome & Principe	Tunisia
Mozambique	Saudi Arabia	Turkey
Myanmar	Senegal	Turkmenistan
Namibia	Serbia	Tuvalu
Nauru (*b*)	Seychelles	U.A.E.
Nepal	Sierra Leone	U.K.
Netherlands	Singapore	U.S.A.
Netherlands Antilles	Slovakia	Uganda
New Caledonia	Slovenia	Ukraine
New Zealand	Solomon Is.	Uruguay
Nicaragua	Somalia	Uzbekistan
Niger	South Africa	Vanuatu
Nigeria	Spain	Venezuela
North. Mariana Isl. (*a*)	Sri Lanka	Vietnam
Norway	St. Helena (*b*)	Virgin Isl. (U.S.) (*a*)
Oman	St. Kitts & Nevis	Wallis & Futuna
Pakistan	St. Lucia	West Bank & Gaza
Palau	St. Pierre & Miquelon (*b*)	Western Samoa
Panama	St. Vincent & Gren.	Yemen
Papua N.Guinea	Sudan	Yemen N (*b*)
Paraguay	Suriname	Yemen S (*b*)
Peru	Swaziland	Yugoslavia
Philippines	Sweden	Zambia
Poland	Switzerland	Zimbabwe
Portugal	Syria	
Puerto Rico (*a*)	Taiwan (*a*)	

Note: (*a*) means aggregate date only; (*b*) means bilateral data only

Table A.3: Hosts and Candidate Cities for Post-War Olympic Games

Year	Summer Host	Other Summer Candidates	Winter Host	Other Winter Candidates
1948	London, UK	Baltimore, Lausanne, Los Angeles, Minneapolis, Philadelphia	St. Moritz, Switzerland	Lake Placid.
1952	Helsinki, Finland	Amsterdam, Chicago, Detroit, Los Angeles, Minneapolis, Philadelphia	Oslo, Norway	Cortina d'Ampezzo, Lake Placid
1956	Melbourne, Australia	Buenos Aires, Chicago, Detroit, Los Angeles, Mexico City, Minneapolis, Philadelphia, San Francisco	Cortina d'Ampezzo, Italy	Colorado Springs, Lake Placid, Montreal
1960	Rome, Italy	Brussels, Budapest, Detroit, Lausanne, Mexico City, Tokyo	Squaw Valley, USA	Innsbruck, Garmisch-Partenkirchen, St. Moritz
1964	Tokyo, Japan	Brussels, Detroit, Vienna	Innsbruck, Austria	Calgary, Lahti/Are
1968	Mexico City, Mexico	Buenos Aires, Detroit, Lyon	Grenoble, France	Calgary, Lahti/Are, Lake Placid, Oslo, Sapporo
1972	Munich, Germany	Detroit, Madrid, Montreal	Sapporo, Japan	Banff, Lahti/Are, Salt Lake City
1976	Montreal, Canada	Los Angeles, Moscow	Innsbruck, Austria Originally Denver	Denver, Sion, Tampere/Are, Vancouver
1980	Moscow, Russia/USSR	Los Angeles	Lake Placid, USA	Vancouver-Garibaldi withdrew before final vote
1984	Los Angeles, USA	None	Sarajevo, Bosnia-Herzegovina/Yugoslavia	Falun/Gteborg, Sapporo
1988	Seoul, Korea	Nagoya	Calgary, Canada	Cortina d'Ampezzo, Falun
1992	Barcelona, Spain	Amsterdam, Belgrade, Birmingham, Brisbane, Paris	Albertville, France	Anchorage, Berchtesgaden, Cortina d'Ampezzo, Falun, Lillehammer, Sofia
1994			Lillehammer, Norway	Anchorage, Oestersund/Are, Sofia
1996	Atlanta, USA	Athens, Belgrade, Manchester, Melbourne, Toronto	Nagano, Japan (1998)	Aoste, Jaca, Oestersund, Salt Lake City
2000	Sydney, Australia	Beijing, Berlin, Istanbul, Manchester	Salt Lake City, USA (2002)	Oestersund, Quebec City, Sion
2004	Athens, Greece	Buenos Aires, CapeTown, Rome, Stockholm	Turin, Italy (2006)	Helsinki, Klagenfurt, Poprad-Tatry, Sion, Zakopane

Table A.4: Transitory Effect of Olympics in Gravity Model

Fixed Effects:	None	None	Dyadic	Dyadic	Exporter, Importer	Exporter, Importer
Summer	-.01		.04		.07**	
	(.04)		(.02)		(.03)	
Winter	.10**		.02		-.01	
	(.04)		(.02)		(.02)	
Olympics		-.05		.03		.03
		(.03)		(.02)		(.02)
R2	.61	.61	.85	.85	.69	.69
RMSE	2.1843	2.1843	1.398	1.398	1.936	1.936

449,220 annual observations covering 196 countries, 1950-2006. Robust standard errors in parentheses. Coefficients significant different from 0 at .05 (.01) marked with one (two) asterisk(s). Regressors included but not recorded: Log Distance; Log Exporter Population; Log Importer Population; Log Exporter Real GDP p/c; Log Importer Real GDP p/c; Currency Union dummy; Common Language dummy; Regional Trade Agreement dummy; Common Border dummy; # Islands; Log Product Area; Common Colonizer dummy; Currently Colony dummy; Ever Colony dummy; and Common Country dummy. Year effects included but not recorded.

Table A.5: Determinants of Bidding for and Winning the Olympic Games

A. Probit Models of Bidding for and Winning the Olympic Games

Treatment	Control	Log(population)	Log(Real GDP p/c)	Log(Export/GDP)
Summer	No Summer	.42**	1.01**	-.31
Bid	Bid	(.09)	(.15)	(.20)
Winter	No Winter	.29**	1.48**	-.23
Bid	Bid	(.09)	(.21)	(.21)
Olympic	No Olympic	.36**	1.22**	-.27
Bid	Bid	(.07)	(.13)	(.16)
Summer	Failed	-.23	-.43	-.64
Host	Summer Bid	(.28)	(.52)	(.63)
Winter	Failed	-.27	-.36	-1.37
Host	Winter Bid	(.52)	(.98)	(1.34)
Olympic	Failed	-.10	-.05	-.90
Host	Olympic Bid	(.22)	(.44)	(.53)

Probit estimation. Year effects included but not recorded.

Coefficients significantly different from 0 at .05 (.01) marked with one (two) asterisk(s).

B. T-tests of Bidding for and Winning the Olympic Games

Treatment	Control	Log(population)	Log(Real GDP p/c)	Log(Export/GDP)
Summer	No Summer	9.1**	7.2**	-4.5**
Bid	Bid			
Winter	No Winter	7.8**	10.0**	-2.4*
Bid	Bid			
Olympic	No Olympic	10.9**	11.4**	-3.9**
Bid	Bid			
Summer	Failed	-.0	.1	-.8
Host	Summer Bid			
Winter	Failed	.9	-.4	-2.0
Host	Winter Bid			
Olympic	Failed	1.1	.0	-2.6*
Host	Olympic Bid			

Coefficients significantly different from 0 at .05 (.01) marked with one (two) asterisk(s).

Appendix A.6: Proof of Lemma 1

Proof: By equations (7) and (10), the difference in government utility from liberalizing subsequent to not sending the signal satisfies

$$U_g^o - U_g = \theta[u(\tilde{v}_x^o) - u({v_x}^c)] + u(\tilde{v}_m^o) - u({v_m}^c). \tag{A.1}$$

Differentiating with respect to θ yields

$$\frac{\partial(U_g^o - U_g)}{\partial\theta} = u({p_x}^o y_x(k_x^{*o}) - \phi) - u({p_x}^c y_x(k_x^{*o}) - \phi) \geq 0. \tag{A.2}$$

where $\phi \equiv (1 + r^*)k_x^{*o}$. By equations (8) and (9), the difference in government utility from liberalizing subsequent to sending the signal satisfies

$$\hat{U}_g - \hat{U}_g^c = \theta[u({v_x}^o - \gamma\pi c) - u(\tilde{v}_x^c - \gamma\pi c)] + [u({v_m}^o - (1-\gamma)\pi c) - u(\tilde{v}_m^c - (1-\gamma)\pi c)]. \tag{A.3}$$

Differentiating with respect to θ yields

$$\frac{\partial(\hat{U}_g - \hat{U}_g^c)}{\partial\theta} = u({v_x}^o - \gamma\pi c) - u(\tilde{v}_x^c - \gamma\pi c) \geq 0. \tag{A.4}$$

since ${v_x}^o \geq \tilde{v}_x^c$. This proves Lemma 1.

Notes

[1]Wikipedia provides estimates of the cost of the opening ceremony, while Table 2 of the 2008 *World Development Report* reports that in Table 2, around a tenth of the 1.3 billion Chinese lived on less than $1/day.

[2]Another related reference is Greenestone, Hornbeck, and Moretti (2008), who identify productivity spillovers from new manufacturing plants by comparing the performance of incumbent plants in counties where new plants locate to finalist "losing counties."

[3]We focus our attention on the *effects* of mega-events on trade rather than trade *policy* since the latter is difficult to measure. We have experimented with the Wacziarg-Welch measure of trade liberalization, and find that it is significantly and positively correlated with past Olympic hosting or candidacy, taking into account time- and country-effects and controlling for country size and income. This result is quite consistent with the model we develop below. However, we do not consider this avenue of research to be worth pursuing until we have better empirical measures and models of trade liberalization.

[4]We have also clustered our standard errors in other ways, such as by (exporter x year) without changing our results substantively.

[5]Even if our standard errors are off by a factor of two or three, the results remain significant.

[6]If we advance the timing of the Olympic game dummies by five years (to correspond to the typical gap between a city's being awarded the games and actually hosting them), essentially no results are changed.

[7]The IOC states "From 1924 to 1960, all the Winter Olympics, with the exception of Oslo in 1952, were organized in winter sports resorts."

[8]Indeed, the effects of different summer games are also heterogeneous across years; the hypothesis of equal export effects from all games can be easily rejected at any reasonable significance level. The effects of the Tokyo and Seoul games is typically estimated to be substantially larger than other effects; the games of Mexico City seem to have had a smaller effect than most others. This might be an interesting issue to pursue in future research.

[9]We have also tried to estimate the Olympic effect with short distributed lag models, without much success.

[10]For the sake of brevity, we do not report estimates for Y_W; we rarely find it to be statistically significant.

[11]That is, we set $\beta_2 = \beta_4 = \beta_6 = \beta_7 = \beta_8 = \beta_9 = \beta_{10} = \beta_{11} = \beta_{12} = \beta_{13} = \beta_{14} = \beta_{15} = 0$.

[12]We take our regional groupings from the World Bank, so that they include only developing countries. In particular, we include dummy variables for: East Asia and the Pacific; Europe and Central Asia; Latin American and the Caribbean; the Middle East and North Africa; South Asia; and Sub-Saharan Africa.

[13]Thirteen countries hosted the postwar summer Olympics in our sample, and an additional five have hosted games but only in the Winter (a number of countries have hosted both, including Canada, Japan, and the USA).

[14]We use country codes from the IMF's *International Financial Statistics* for these classifications.

[15]Still, the games have recently become so expensive that support from the national authorities is virtually considered a prerequisite for a successful application.

[16]These include information related to: travel times; accommodation; taxes; technology; security; natural disasters; public opinion; the torch relay; test events; government support; customs formalities; the environment; marketing; Paralympics; medical services; the Olympic village; media operations; and so forth.

[17]For instance, neither Sweden nor Finland have ever hosted the winter games, despite: a) numerous candidacies (five by Swedish cities, six by Finnish cities), b) the fact that both countries have successfully hosted the summer games, c) long winter sporting traditions, and d) the successful hosting of the winter games by a geographically and economically similar country (Norway).

[18]Other results suggest that large, wealthier, and more *closed* countries are more likely to bid for and be awarded either the Summer or Winter Olympics, relative to countries who do not bid. However, we find no measurable effect of any characteristic on the determinants of success in being awarded the games, conditional on making a bid.

[19] P1 of "Candidate Cities and Venues for the Winter Olympics" available at

http : *//multimedia.olympic.org/pdf/en_report_*666*.pdf*

[20]Pp 4-5 of "Candidate Cities and Venues for the Winter Olympics" available at *http* : *//multimedia.olympic.org/pdf/en_report_*666*.pdf* which continues: "Cities often apply to host the Olympic Games in order to bring their urban and regional land development status more up to date. Two different types of development can be distinguished: developments directly linked to the Games, such as sports facilities and, parallel developments, such as communications, telecommunications networks, public buildings, etc. These various developments bring hope that the benefits in terms of employment will be considerable (especially in the building industry and engineering, commerce and touristic sectors), and more generally, that there will be an increase in the local and regional economy and tourist trade. They are a long-term investment. The investments necessary are such that the organising country, as well as the local authorities at all levels, have to make quite a significant financial effort. The Olympic "frenzy" makes it possible to accelerate the pace of ongoing developments, since the expenses are covered by special funds."

[21]This system worked smoothly through the joint hosting of the 2002 games by Korea and Japan, with only one exception (the 1954 event was held in Switzerland, while the 1958 event was held in Sweden). We also note in passing that there has been relatively little competition to host the World Cup, so that we are unable to plausibly compare hosts and unsuccessful candidates, as we do below for the Olympics. Bids to host the World Cup were unopposed for: 1950, 1954, 1958, 1974, 1978, 1982, and 1986 (first round). In most of the other years, only two candidates were prepared to host the World Cup. More details are available at *http* : *//en.wikipedia.org/wiki/FIFA_World_Cup_hosts*.

[22]There were world's fairs as far back as mid-eighteenth century, but these are less well-known.

[23]Using "candidates" to refer to locales that bid for but were not awarded the games is not rigorous Olympic jargon. The broadest set of cities is currently referred to by the Olympic movement as the set of "Applicant" cities, which are potential hosts nominated by national Olympic committees. After a phase of about ten months some of these are then chosen to become "Candidate" cities on the basis of a questionnaire and technical assessments. The relevant criteria investigated include: government support, public opinion, general infrastructure, security, venues, accommodation and transport. The candidate cities then go through a second phase of investigation by an evaluation commission which includes another questionnaire and a site inspection. This information forms the basis for a report issued by the commission, and the IOC then votes on the basis of the report. So, strictly speaking, "candidates" include all finalists, both successful and unsuccessful.

[24]This is analogous to, e.g., the use of losing finalist counties in Greenestone, Hornbeck, and Moretti (2008) as the counterfactual to measure productivity spillovers from new manufacturing plants.

[25]Twenty-five countries have either bid for or hosted the summer games since WWII.

[26]Indeed, a similar argument has been made recently of the ongoing Asian race to put a man on the moon. In "Why China wants to win" published in the *International Herald Tribune* on November 12, 2008, John Lee notes that a moon-shot costs in excess of $100 billion, with little to show in the way of direct economic benefit. However, he argues that the prestige associated with getting to moon matters for national pride "which can serve as a unifying force" as well as to enhance the "soft power" of the nation and command respect from foreign powers. He writes that "Growing its economic and military might is about demonstrating the country's capability."

[27]Estimating our model with the non-linear method of Anderson and Van Wincoop (2003) would be computationally challenging in the extreme, as would be including a comprehensive set of time-varying exporter- and importer-specific fixed effects.

[28]We also include as controls the logs of population, real GDP per capita, and include year and country fixed-effects.

[29]We assume that bidding has no effect *per se* on the economy's fundamentals.

[30]We assume that capital markets are open throughout (while liberalization only takes place in goods markets) for simplicity. The effect of generalizing the model to allow for liberalization of frictions in international capital movements would be ambiguous, depending on whether opening capital markets would favor the import or export sectors. This could depend in part on the relative capital intensity of these sectors. However, in cases where the liberalization of capital markets would favor the export sector, the results should mirror those we find for trade liberalization.

[31]As discussed above, the IOC has explicit criteria for selecting the Olympic host. Almost all these criteria concern a candidate's abilities to host the games successfully, ignoring any benefit that the candidate might receive from hosting

the games. We could easily augment the model by making the selection process a function of these characteristics. This would not change our qualitative results, as long as there was some residual amount of uncertainty about the selection. As noted above, there seems to be a considerable amount of such randomness.

[32]We know of only one counter-example; Denver backed out of hosting the winter games in 1976 when voters rejected a bond issue to finance the event. Similarly, we also rule out signals by countries that have no chance of winning the rights to host the games. This assumption is implicit in our specification that π, the probability of winning hosting rights conditional on bidding, is common across countries. By way of contrast, many countries have promised to liberalize trade without following through.

[33]The welfare function is specified in terms of earnings in each sector for simplicity. This function is assumed to encompass all proceeds in these sectors relevant for the consumption of private agents, including any redistribution of government tariff revenues and the effects of other trade distortions that yield differential valuations of domestic prices under closed and open policies.

[34]In practice, the false signal could also affect domestic prices, as it affects the domestic capital allocation across sector. As a result, the "closed prices" under off-equilibrium path strategies may differ from those specified above. Accordingly, we state our conditions for separating equilibria below in terms of sectoral revenues under these strategies, which implicitly include any secondary price distortions associated with capital allocations due to false signaling.

[35]There are also examples of unsuccessful Olympic candidates who liberalized. For instance, South Africa began a dramatic trade liberalization in the mid 1990s while it mounted (and lost) its bid to host the 2004 Olympics (the choice of Athens was announced in September 1997). In the words of the WTO "South Africas average most favoured nation (MFN) tariff rates for all goods fell from over 14% in 1996 to 8% in 2001; the MFN rates for industrial goods also fell by 50% and 55% for textiles and clothing respectively over the same period..."
$http://www.wto.org/english/res_e/booksp_e/casestudies_e/case38_e.htm$