


Changing Traditions: Examining the Factors That Determine the Probability of Bidding to Host the Olympic Games Over Time

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Jessie R. Dickens
University of Central Florida

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CHANGING TRADITIONS: EXAMINING THE FACTORS THAT
DETERMINE THE PROBABILITY OF BIDDING TO HOST THE OLYMPIC
GAMES OVER TIME

by

JESSIE DICKENS

A thesis submitted in partial fulfillment of the requirements
for the Honors in the Major Program in Economics
in the College of Business Administration
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Thesis Chair: Dr. Richard Hofler

ABSTRACT

In September 2017, the International Olympic Committee (IOC) announced that, for the first time in its history, it would award the hosting of two different Olympic Games at the same time, giving the 2024 and 2028 Summer Olympic Games to Paris and Los Angeles respectively. As a result, the question is raised as to why the IOC broke tradition in its host city selection process. The break of tradition is presumably due to a lack of candidates to host the 2028 Summer Olympics. With prior host cities reporting astronomical costs and high debt balances associated with hosting, many cities have retracted their bids or have refused to submit candidature bids altogether. The Olympics are one of the largest, most economically impactful mega-events in modern culture. While hosting does provide a nation with the opportunity to show off its infrastructure and culture before millions of people worldwide, the costs to host the event have steadily risen as the Olympics have become a larger and larger spectacle. This study uses a logistic regression model to determine the relative factors that determine a city's willingness to bid and uses the results to draw conclusions as to why the willingness to host has fluctuated across time. The results show a definite change in the probabilities of a potential city bidding to host the Olympic Games across time and also provide insight into the factors that determine these changes in probabilities. By determining these conclusions, this study hopes to provide insight into ways that hosting the Olympics can become accessible to all prospective host cities so that there is increased competition in the host city selection process.

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I. Introduction

1.1 Background

On September 13, 2017, for the first time in history, the hosting of two Olympic Games was awarded at the same time during the 131st International Olympic Committee (IOC) session in Lima, Peru. At this session, the 2024 and 2028 Summer Olympic Games formally awarded to Paris and Los Angeles respectively, which caused some question as to why the IOC broke tradition in its host city selection process. The answer to this question lies in the fact that the bidding contest to host the Games, usually tightly contested by a myriad of potential hosts, saw no legitimate bidders besides the two aforementioned cities. This study aims to provide an explanation for the decrease in bidding candidates and examine the various factors that determine the likelihood that any chosen country will or will not bid.

Local governments are often enticed to bid for the Olympic Games because of their prestige and spectacle on the global scale. There are typically both economic and political reasons that governments use to garner support amongst the people of a prospective city and justify the use of public funds to finance the carrying out of the Olympic Games. On an economic level, *ex ante* economic impact studies are often used to project massive increases in economic activity and economic prosperity within a region. The prospect of being able to show off the positive sides of one's city in front of the whole world is also alluring when considering a potential bid. Economic impact studies generally project massive increases in tourism as well as positive trade balances stemming from the enhanced image of Olympic host cities in the eyes of

the world. Local businesses such as hotels and restaurants are promised higher demand for their services and increased profits as a result of hosting the Olympics. Cities also take the opportunity to host the Olympic Games as a justification to overhaul the infrastructure within a city and modernize the facilities that exist. All of these factors, coupled with the excitement and pride of having an event with the magnitude of the Olympics hosted in one's city, makes voters excited to support their local government in submitting a bid.

Despite all of the aforementioned factors, the Olympics has become a riskier investment as the event has become modernized and this has caused some citizens to publicly undermine their government's desire to host. For example, the United States Olympic Committee pulled a recent bid for Boston to host the 2024 Summer Olympics due to "[not being] able to get a majority of the citizens of Boston to support hosting". At the time the bid was pulled, WBUR, a local Boston radio station sponsored by NPR, found that only 40% of people in Boston supported the bid while 53% opposed it. This lack of public support is very telling and highlights many of the underlying problems that exist with hosting the Olympics and points to a larger issue that is resulting in a decrease of the number of cities that submit bids for hosting. These issues are highlighted directly below to provide a proper background for further investigation.

Despite the litany of ex ante economic impact studies that are created to garner support for hosting the Olympics, many economists are skeptical about the methods used to create the projections and criticize the underlying economic theory. Prior research provides many reasons as to why the economic effects of hosting the Olympics are often greatly exaggerated and why the underlying economic theory used to generate these numbers is flawed. Furthermore, many ex

post studies show that the few host cities that experience profits typically receive profits that are much lower than that which is typically projected and that overwhelmingly a majority of host cities experience huge losses that are borne by their citizens for decades. Compounding the lower than expected revenues from the Olympics are massive costs incurred by Organizing Committees for the Olympic Games (OCOG) that generally exceed the costs that are budgeted. The result of this is an impact on the local hosting economy that is often detrimental rather than the boost that is promised by politicians to local citizens. Olympics-specific economic data is of particular interest for the purposes of this study and will be discussed at length throughout the study.

The basic framework for this study is as follows. We begin by laying out more relevant and factual information that is needed to get a full grasp on the Olympic process and the importance of mega-events like the Olympics in the global realm. A review of the current literature pertaining to the economics of bidding for and hosting the Olympics Games will paint a fuller picture on that which has already been discovered and will illuminate some of the questions that still exist surrounding the bidding and hosting process. To our knowledge, there is no existing literature that actively examines and discusses the decrease in bidding countries or that determines the factors that make a prospective city more or less likely to bid. Thus, this study aims to provide a different lens through which to evaluate the bidding process and addresses many economic issues that have not previously been addressed.

The study will determine key factors through the development of regression models that examine the impact of a variety of variables on a sample city's likelihood of bidding. Not only does the model aim to provide a determination of the explanatory variables that impact the

dependent variable, it also provides data that show the increases and decreases of a city's likelihood to bid over time. This transposes the data collected to provide an answer to the overall research question that asks why the number of bids has decreased to the level that it has in recent years. The study will conclude with a discussion of the results and the implications that can be drawn for future bidders of the Olympic Games. The results will hopefully be useful in predicting future trends for the number of bidding cities and can be used to provide recommendations for creating a process that encourages cities to bid.

1.2 A Brief History of the Olympic Games

The tradition of the Olympic Games dates back to 776 BC and is an important part of Greek history. While the Ancient Olympic Games were far from the mass spectacle that they are today, they were still the most famous and popular form of entertainment that existed in Greek society. The Games had a much more religious focus in ancient times and was focused primarily on honoring the gods (Preuss, 2004). However, much like they are today, the Olympic Games were an important part of the Greek culture and provided a large platform for messaging and expression.

The modern-day Olympics were revived at the end of the late 19th century with the formation of the International Olympic Committee (IOC) by Frenchmen Baron Pierre de Coubertin. The IOC is a non-profit organization comprised of volunteers that serves as the governing body for the modern-day Olympic Games (IOC, 2018). The creation of the IOC culminated in the official revival of the Olympics during the 1896 Olympic which were held in Athens, Greece. The 1896 Games were extremely successful in capturing enthusiasm from the

general public and served as the launch pad for the Games as we know them today.

The Games have evolved drastically throughout modern history with the development of technology, radio, television and the quality of infrastructure. For the purposes of this study, all Games before 1950 are not examined due to a lack of availability of economic data as well as the fact that the structuring of the games, the expenditure and revenues brought in aren't necessarily analogous to the Games that are held today. In the research novel *The Economics of Staging the Olympics*, sports economist Holger Preuss divides the history of the modern-day Olympics into a few key phases.

Phase I encompasses the Games that occurred up through the 1968 Olympic Games held in Mexico City, Mexico. These Games are characterized by diverse methods of financing and “economic impacts were given almost no attention at all” (Preuss, 2004). These Games experienced the beginning of media attention with some live broadcasting occurring but these Games were not nearly the media spectacle that the Games are today. The economics and financing of the Olympics transformed during Phase II which encompassed the period of 1969-1980. During this time period, the advent of television rights and corporate sponsors changed the landscape of hosting the Olympic Games and gave cities a variety of options for financing the mega-events. This made the idea of hosting the Games much more attractive and gave host cities a larger platform during hosting.

A key turning point in the economic history of the Olympics came with the 1976 Olympic Games held in Montreal, Canada. These Games, almost exclusively financed publicly by the city of Montreal, left the city with a massive amount of debt in excess of \$2.7 billion US Dollars. The massive amount of debt was caused by extremely high levels of investment in

infrastructure and an agreement that the federal government would bear no responsibility in paying off any deficits associated with the Olympic Games (Preuss, 2004). The level of debt was damaging to Montreal's economy and the burden of the debt was placed on taxpayers through higher tax rates for 30 year following the event.

After the economic debacle that was the 1976 Olympic Games, the number of cities that were interested in bidding for and hosting the Olympics dropped significantly. Another turning point came in 1984 when the Olympics were hosted by Los Angeles, United States. This served as the starting point for Phase III of the Olympic Games which covers the period from 1981-2000. Similarly to the upcoming 2028 Olympic Games, Los Angeles was the only city to bid for the 1984 Summer Games. However, the fact that Los Angeles was the only city that was bidding also gave the people of Los Angeles significant bargaining power when it came to negotiating the terms of hosting. Los Angeles hosted the Games under the conditions that the government would not be required to finance the Games publicly and received a much higher financial contribution from both the IOC and the OCOG. The end result was an economic surplus and profits from hosting that were distributed amongst the city of Los Angeles and the United States Olympic Committee. The city of Los Angeles was also able to fund the renovation of some of its infrastructure using some money from the OCOG. These Games renewed interest worldwide in hosting the Olympics and the number of cities bidding increased as a result. These Games also signified a further modernization of the Games through increased commercialization and international attention that was paid to the Games.

The final phase encompasses 2001 through today. These Olympics are characterized by lavish spending and the creation of sports facilities that showcase luxury, wealth and a

nationalistic sense of culture. These Games are marked by high cost overruns and economic losses, despite the optimism of economic impact studies. The Games themselves have transformed into a large spectacle with extravagant ceremonies captured by widespread media coverage broadcasted for the world to see. Governments have used these ceremonies for political messaging and propaganda and there has been an increase in bids from less developed nations that have been selected as host cities. This has led to a positive reception for the Olympics in the eyes of the public and has caused larger cities like London and Paris to bid (Shoval, 2002). The circumstances surrounding the bidding cycle and hosting of these Olympic Games will be of particular importance when evaluating the impact on the 2024 and 2028 bidding cycles.

Logistically, the Olympics are categorized into four year cycles called Olympiads, which begin on January 1 of each year that the Summer Olympics are held. Thus, the Summer Olympics are held every four years with rotating host cities to prevent the domination of any one city as a host. The Winter Olympic Games began in 1924 and originally were held on the same year as the Summer Games. This custom changed following the 1992 Winter Olympics and the Winter Games are now held on alternating even numbered years from the Summer Games. Both the Summer and the Winter Olympic Games will be considered in this study and different models will be developed to examine each.

1.3 An Overview of the Bidding Process

In order to have a productive discussion about the reasons for the decreased number of bidders to host the Olympic Games, it is important to first understand the process by which nations bid and a host city is selected. While the official Candidature Process document

published by the IOC has been revised several times since 1950, the general steps to becoming a host city have remained relatively the same. The bidding process begins about nine years before the actual staging of the Games with the National Olympic Committee (NOC) of each interested city submitting an initial application to become a candidate. This application is accompanied by a basic questionnaire that allows the IOC to evaluate whether the nation meets the minimum requirements to host (IOC, 2016).

Once a city passes this initial phase, it is officially considered a candidate. The city then completes a more detailed questionnaire that documents the key information regarding the city's plans for hosting. Candidate cities must provide information on their vision and concept for the Games, their envisioned Games experience, plans for the Paralympic Games, and the sustainability of the Games including their intended legacy (IOC, 2016). The questionnaire also asks for information regarding the logistics of the event including transportation, lodging, infrastructure, safety, security, public support and maybe most importantly- plans for the financing of the Games. The IOC Evaluation Commission, comprised of IOC officials, NOCs, athletes and international experts, then evaluates these questionnaires and make personal visits to inspect each of the cities. The evaluation occurs based on a fixed set of criteria that includes general infrastructure, Olympic Village, transportation and government support among other things. Finally, the IOC Evaluation Commission votes on the cities until one receives the absolute majority and is chosen as the host country (2016). This typically occurs about seven years before the hosting of the Games. Once the city is selected, the city signs a host city contract with the IOC that determines the conditions for the organization of the Games.

The host city is then responsible for forming the OCOG that assumes responsibility for

the planning and financing of the Games (2016). Economic liability is transferred to the host city and the OCOG which are both jointly liable for all financial aspects of the Games. The contract lays out what amount of financial contribution the IOC will provide to the host city and to the OCOG and also lays out how any potential revenues will be split up. The IOC is also generally responsible for the transferring additional knowledge to the OCOG based on the experience of previous organizing committees. The contract also binds the host city to many of the things that it stated in its bid pertaining to sustainability, human rights and security associated with the Games. Following this contract, the host city is free to begin building new infrastructure and making the necessary preparations for the Games that will occur.

II. Literature Review

2.1 Criticisms of Ex Ante Economic Impact Studies

While much of the literature that exists on the bidding and hosting of the Olympic Games is mixed when examining factors such as cost, benefits and economic effects, the previous findings of economists are helpful when it comes to evaluating the factors that would make a country more or less likely to bid. Theoretically from an economic standpoint, a country should (and would) bid to host an Olympic Games as long as the Net Present Value of hosting is at least greater than 0. This can be difficult to determine, however, as it is difficult to predict actual levels of expenditure and revenue. Compounding this difficulty is the fact that a country must take into account the opportunity cost of hosting the Olympics and consider all other projects that could be undertaken should they not host the Olympics and whether public funds could be better spent. A main problem that economists face whenever evaluating the Olympic Games and comparing their differences over the time is the fact that the landscape of hosting the Olympic Games as well as the overall economic landscape is dynamic and changes over time. Thus, there are very few studies that provide an accurate comparison of expenditures and economic growth related to the Olympics over time. Most of the literature that exists on the Olympic Games instead takes a case study approach and evaluates the economic success of different Olympic Games separately. This study takes the opposite approach and attempts to determine outcomes as a result of changing economic conditions over time by placing each Games on a level playing field and evaluating the factors across time that impact a city's likelihood to bid. This will be discussed in more depth when developing the model.

As stated previously, there are many flawed uses of economic theory that are associated with Olympic economic impact studies. These are widely documented and critiqued by economists that attempt to capture economic impact and draw conclusions about the circumstances of hosting. Exaggerated economic impact studies released ex ante by organizing officials make sense due to the inherent bias and conflict of interest that exists given the nature of their position. The same officials that are planning the Olympic Games are understandably optimistic when projecting economic figures to the people of a host city because they are looking to gain support and the use of public funds to help complete the project. Economist Jeffrey Owen discusses flawed economic impact studies at length in his essay *Estimating the Cost and Benefit of Hosting Olympic Games*.

Owen argues that the main reason that economic impact is overstated and that projected economic benefits never actually materialize is that cities often treat things that should be considered economic transfers as benefits (Owen, 2005). For example, officials often justify the use of public funds for the building of stadiums and Olympic facilities by pointing out the need for revamping infrastructure and modernizing the facilities of the city. The exorbitant costs that are associated with building infrastructure are largely ignored and instead the luxurious new facilities are pointed out as an urban and economic success. Economic impact projections will point out that the new facilities will be used to attract other large events (sporting or otherwise) which will continue tourism spending and economic growth. However, research shows that many of the facilities used to host Olympic events are rendered useless due to their unique nature and end up either having to be adapted to host a wider variety of events or are left completely unused. The city and ultimately taxpayers are then left paying maintenance costs on a facility

that provides little to no economic benefit. The increased economic activity caused by the expenditure on the stadium is actually just a transfer as the public funds used to finance the project likely would have been spent on other things. This intuitively leads into the point Olympic organizers often ignore opportunity costs in their ex ante studies. Instead of using money to finance a large project like an Olympic stadium, the funds could have instead been used to increase other infrastructure such as hospitals, schools, etc. Ex ante studies don't take these opportunity costs into account when projecting economic costs and benefits.

Another flaw associated by economic impact studies is the crowding out effect that is often ignored. Local businesses like hotels are often supportive of Olympic bids because of the promised increased occupancy rates that will occur as a result of the mega-event occurring within the city. The expectation of increased traffic is natural given the level of tourism and the number of spectators that come to the city to observe and be a part of the Olympic movement. However, the observed levels of tourism always tend to be lower than expected because of the crowding out effect that occurs. While business owners will typically charge higher per-unit price levels due to expected increases in demand, studies show that quantity demanded actually tends to be lower. For example, during 2002, when Salt Lake City hosted the Winter Olympics, ski resorts experienced a 9.9% decrease in visits compared to the year prior (Baade & Matheson, 2016). Thus many of the perceived economic benefits never materialize because the tourists that would usually visit the city stay away due to the traffic and spectacle associated with the Olympic event.

Economists also find that economic benefits are often misstated because of the misuse and exaggeration of economic multipliers. Spending can be split into two categories- direct

spending that is related to the Olympic event such as ticket sales, and indirect spending that occurs within the city as a result of people attending the event such as lodging, transportation, food, etc. On a basic reporting level, the formula for an applied economic multiplier is:

$\text{Multiplier} = (\text{Indirect Spending} + \text{Direct Spending}) / \text{Direct Spending}$ (Matheson, 2004). This determines the actual level of economic activity and expenditure that occurs within a city as a result of hosting the Olympics. On a more detailed, analytical level economists use multipliers from input-output tables to serve as the basis for economic impact studies:

Input-output tables provide final-demand output multipliers for 473 detailed industries, including hotel accommodations, eating and drinking establishments, and arts, entertainment, and recreation. These multipliers (...) are based upon inter-industry relationships within regions based upon an economic area's normal production patterns. (Matheson, 2016).

However, these tables provide multipliers for economic activity during normal conditions which are not present during mega-events like the Olympics. This produces economic data that is inaccurate and often overstated.

A key observation relevant to our study is that less developed economies typically experience more positive economic impacts due to the fact that they have more to gain. This is counterintuitive when thinking about Olympic hosts, because we tend to think of the world's grandest cities as the ideal hosts for the Olympics and as the cities that are usually chosen by the IOC. Bids from large cities like London and Paris are "paradoxical" in a sense because these cities are already at the top of the global urban hierarchy and will not necessarily feel some of the primary benefits that the Games provide (Shoval, 2002). The world already holds these cities in high esteem and thus their image won't be enhanced simply by hosting a mega-event like the Olympics. In fact, the opposite effect is more likely where their image may be tarnished on the

global scale should something go wrong. Instead, an argument is made that large cities bid not to boost their economic stature but to fend off competition from quickly developing cities (Shoval, 2002). It is of interest to this study to determine how key economic indicators of the relative development of different cities impact their willingness to bid.

2.2 Cost-Benefit Analysis Methods

Besides multiplier analysis using input-output tables, the other main way of evaluating economic success is through cost-benefit analysis. When evaluating a potential Olympic bid, prospective candidates theoretically weigh all of the marginal benefits associated with hosting against the marginal cost and would only choose to host if the marginal benefits outweighed marginal costs. The next session of the literature review examines the methods that economists have used to carry out cost-benefit analyses.

The costs and benefits of hosting the Olympics are typically very difficult to quantify. This is due to a variety of reasons; it is hard to tell whether a cost/benefit is strictly attributable to the Olympics or whether it is simply a reallocation, economic data is often misreported in official post-Olympic reports to make the economic impact seem more favorable for the host nation and many of the benefits are so called “legacy effects” that are nearly impossible to quantify. While there are many different ways that costs and benefits can be looked at in the realm of hosting the Olympic Games, there are a few standard categories that exist when economists have performed cost-benefit analysis. Costs are generally grouped into direct capital or sports infrastructure costs, indirect capital or general infrastructure costs, and operational or administrative costs (Preuss, 2004). Benefits are typically examined as short-run benefits such as tourism, long-run benefits

such as infrastructure and increased trade, and intangible or feel good benefits (Baade & Matheson, 2016).

Based on these groupings of benefits and costs, the overall consensus is that hosting the Olympics tends to be more of an economic risk than a surefire economic solution to issues facing a specific city (Baade & Matheson, 2016). The study conducted by Baade and Matheson highlights the changing composition of cities that submit bids to host over time, which is of particular interest to our study. The study also highlights the fact that the amount and breadth of costs has increased dramatically over the years which also plays a large factor in the likelihood of cities to bid in the future. These exorbitant costs exist not only to host the Olympics but even just to bid for them. Baade and Matheson also draw the conclusion that the Olympics is most economically beneficial when a city is in the midst of a recession or a period of high unemployment due to its “expansionary effect” (2016). During any other economic state, hosting the Olympics generally leads to unused infrastructure, crowding out and the reallocation of labor rather than any true economic benefits that would outweigh the costs.

Another factor that has been studied by economists is not just the costs that are associated with the Olympic Games but also the cost overrun that occurs during the preparation for hosting the Games. Olympic Organizing Committees typically lay out a budget that they are expected to adhere to during the bidding phase. However, these budgets are often manipulated and used more as suggested benchmarks rather than firm budget caps. Essentially all Olympic Games, Winter and Summer, experience some form of cost overrun during the planning, construction and actual holding the event with the average cost overrun being over 150% of budget on average

(Flyvbjerg & Stewart, 2016). Olympic Games have the highest average cost overrun of any type of megaproject due to the fixed deadline of the event which leads governments to take on any expenditure needed to make the event a success. This cost overrun is what often results in the negative fiscal effect and leads to high levels of debt Post-Olympics. The IOC exacerbates this issue by choosing inexperienced cities and doing little to facilitate the transfer of knowledge from one host city to the next. The high levels of reported cost overrun may ultimately be an important factor that deters cities from hosting in the future.

Despite much of the literature concluding that hosting the Olympics is a risky proposition, there are a few studies that determine favorable economic aspects of hosting the Olympics. Although the increases in tourism benefits are often not as high as expected, hosting the Olympics does result in a positive impact in terms of trade with foreign nations. On average, after hosting the Olympics trade output increases by 36% in host nations (Rose & Spiegel, 2009). Rose and Spiegel used an alteration of a bilateral “gravity” model to measure international trade and mixed in a variety of Olympic-related variables to measure their effect (2009). This model determined that hosting a mega-event like the Olympics or FIFA World Cup provides a signaling effect to other nations that the host nation is becoming increasingly liberal towards trade which results in higher imports and exports and overall trade levels. The study also found that the increased effect was permanent which could be attractive to cities looking to enhance trade and economic partnership.

Another study found that hosting the Olympics has more of a positive ex ante economic effect rather than an ex post economic effect. This is due to a so-called “news shock” effect that

increases economic expenditure before the event even occurs (Bruckner & Pappa, 2015). This study utilized panel data to examine the economic impact that occurs over time to determine the effect that occurs on a specific city between the years 1950-2009 (2015). The model examines a variety of related variables to determine exactly when the positive economic effect occurs, controlling for country and year fixed effects (2015). The results show that the peak effects in GDP per capita growth and economic activity occur about 4-5 years before the actual Olympics is held. The study finds that ex post effects that are usually examined in economic impact studies are typically minor compared to ex ante effects. This is because expectations about the upcoming bidding/hosting of the Olympics causes a country to experience the impact before the event which makes sense when taking into account the fact that most consumption and investment spending occurs before the event occurs. A key feature of this model is to experience the changing effects from a time series perspective. By building in leading and lagging effects, Bruckner and Pappa were able to accurately analyze the panel data and draw conclusions based on the findings of the model.

One final consideration to take into account is the fact that Olympic Games are hosted by cities, not entire countries. While most of the literature focuses on determining economic impacts on the host country, it is more pertinent to examine the effects on a more regional level. In a 2004 study, Holger Preuss accomplishes this by combining the aforementioned input-output models with the cost-benefit analysis models to regionalize the impact. Preuss categorizes streams of money based on their origins and their final destinations, ultimately excluding those that are reallocations and those that occur exclusively outside of the region. Preuss then uses this data to determine the multiplied effect using an input-output table. Preuss repeats this

methodology with all cost and revenue streams separating each into either “goal attainments” (benefits) or “goal violations” (costs) based on a goal system and a welfare function. By determining the difference between the goal attainments and the goal violations, Preuss determines the overall regional primary economic impact. The conclusions of this study are that the Olympics typically have a low opportunity cost because of the autonomous streams of money from the IOC and other third parties that are provided to a host city. However, the study ultimately finds that the Olympics provide a one-time economic impact that leaves the region due to imports and taxes. In order for long term success to be felt by the region, the city must create infrastructure that is sustainable, which often involves high costs.

While all of the literature discussed is illuminating and instructive as to the various methodologies used to evaluate the hosting of an Olympic Games, those studies still do not provide an answer to our primary research question of why the number of bids has decreased in recent years. While models have examined the economic impact of the Olympics from a variety of lenses and have even examined the factors that make a bidding city successful at being chosen to host, there is no prior literature that determines how these findings apply to a city that is considering whether or not to submit a bid to host. Our study combines some of the methodologies used in the studies above to apply their findings to the specific research question and draw conclusions. The specific methodology is discussed below.

III. Methodology

3.1 Overview

Given the findings of the literature review above and the stark decrease in the number of cities that have submitted bids to host the Olympic Games in previous years, the research question becomes, “How has the number of bids to host the Olympic Games fluctuated over time and what factors make a country more or less likely to bid causing that fluctuation?”. Because the research question inherently lends itself to both a cross-sectional and a time series analysis, this question will be modelled and analyzed using panel data. This allows us to analyze a variety of cities and how their probability of submitting a bid changes over time. The time period for our studied has been determined as 1972-2028 (bid cycles 1962-2018).

3.2 Unit of Observation

The unit of observation that will be utilized during this study is the specific city that is being studied. Given the nature of this study, using the city as the unit of observation makes the most sense given that the explanatory (independent) variables and the outcome (dependent variable) both are related to the specific city that is being studied.

The sample used will contain three types of cities: cities that have hosted the Olympics, cities that have bid but not been selected to host and cities that have never bid at all. Any city that has hosted or bid for the Olympics since 1950 was included in the potential pool for cities that were examined. The non-bidding cities were selected randomly as controls from a pool of cities that had similarities in terms of region/continent that they are a part of and population

(size). The population used for comparison was the metropolitan area population rather than simply the city population. This is due to the fact that the Olympics are a wide-ranging event that are held in numerous venues throughout the host city area. Thus, to simply use only the city population doesn't account for all of the people that will be economically impacted by the bidding and hosting of the Olympics and the metropolitan area is a more suitable measure. The final pool contained 16 cities that had previously hosted, 11 cities that had previously bid but never hosted, and 9 cities that had never bid. These cities were all chosen at random from the various respective pools of potential cities. The listing of cities for the Summer Olympics regression can be found in Appendix A.

3.3 Overview of the Variables

Given the breadth of the prior literature that exists, it is clear that there are a variety of different approaches that could be taken to answer the research question presented. In an effort to create as holistic of a study as possible and to avoid omitted variable bias to the maximum extent possible, three categories of variables will be used during the regression analysis. The categories of variables are general economic variables, geopolitical variables and Olympics-specific variables. Each one of these categories contains several variables that are possibly factors in determining whether a city is likely to submit a bid.

General economic variables are used as potential determinants of a city's likelihood to bid because bidding for the Olympics is a huge economic undertaking that has potentially massive economic impacts. As noted throughout the study, the cities that typically submit bids are those that are larger and more economically developed. However, the cities that have the

most to gain are those that are not the world's premiere cities and that are economically developing. The composition of cities that have submitted bids has also evolved throughout the past few decades and more developing cities have begun to submit bids (Baade and Matheson, 2016). Thus, the economic state of a potential bidding city both during the bidding period and before it is worth examining. The economic variables that will be examined are the Unemployment Rate, Gross Domestic Product (GDP) per Capita, Exports as a Percentage of GDP and Inflation of Consumer Prices and Real GDP (RGDP). These variables were selected because they provide an insight not only into the economic state of a nation but also into the quality of life for the citizens of that country. The literature suggests that countries with high unemployment rates, low per capita variables and low net exports tend to stand the most to gain from hosting so it will be interesting to see if these variables have a significant impact on whether a prospective city will bid.

Geopolitical variables were also chosen because official bidding and financing of the Olympics involves the governmental regime and system of the specific nation that is considering a bid. The IOC has established baseline requirements for bidding and will generally only select cities that have governments that will legitimately be able to host the Games. Thus, the political state of a country possibly plays an impact in whether or not it will bid. Additionally, the IOC tends to rotate the region that the Games is hosted in which may play a role in whether a city will bid or not. Thus, the geopolitical variables that are selected for examination are the region that a prospective city is in, the human capital index, and the metropolitan area population.

Finally, and perhaps most importantly, reported statistics regarding previous Olympics

also are likely to play a crucial role in whether or not a city will bid. These variables are split into two categories, bidding and hosting history variables and economic performance variables. The history variables that are selected are:

- Whether the city has bid before ($X=0$ if they haven't, $X=1$ if they have)
- Whether the city has hosted before ($X=0$ if they haven't, $X=1$ if they have)
- Whether the city bid in the previous cycle ($X=0$ if no, $X=1$ if yes)
- Whether the city's region hosted the previous Olympics ($X=0$ if no, $X=1$ if yes)

This allows us to determine if city's that recently hosted are less likely to bid and if those that have bid recently but were not selected are more likely to bid again. The economic Olympics-related variables are as follows:

- The number of cities that bid in the previous cycles $t-2$, $t-3$ and $t-4$
- The percentage of marketing revenue taken by the IOC in Olympic cycles $t-2$ and $t-3$
- The percentage of venues that were newly built (not already existing) in Olympic cycles $t-2$ and $t-3$
- The reported cost of hosting for host cities in Olympic cycles $t-2$ and $t-3$

These variables allow us to draw conclusions over whether cities truly take the past economic performance of other host cities into account or whether there are other motivations at play.

While there are certainly other causes that are likely to impact whether or not cities are willing to host, this is a comprehensive list to serve as a starting point. The results after running

the regression may shed more light onto what sort of variables warrant further study. The outcome variable will also be binary and will represent whether or not the specific city will bid at that point in time. The value of $Y=0$ represents the fact that the city did/will not bid for that specific point in time and $Y=1$ represents the city submitting a bid.

3.4 An Aside About Timing

As noted at the beginning of this paper, bidding for the city generally occurs about 7-10 years before the year that the Olympics is actually held in. Thus, it is almost certain that planning to submit a bid begins even before the actual bidding process. This must be taken into account when examining the Olympics-specific variables. Previous literature has typically used 10 years prior to the bid as the typical standard for examining economic impact that may have an effect on whether or not the city bid (Bruckner & Pappa, 2015) . The time series nature of this data will be built into the model and will be discussed at length below.

To provide an example, consider that we are evaluating the bidding for the 2016 Summer Olympics that recently occurred. The bidding period for this Olympics occurred in the years 2007-2009. Thus, it does not follow logic to examine economic variables from the 2012 Olympics cycle (which would have occurred before 2016) because the bidding and selection of the host city has already occurred. Instead, prospective bidders most likely examined economic data from the 2000, 2004 and 2008 Summer Olympics instead when making their decision on whether or not to bid. To account for this and to provide consistent notation throughout the paper, when examining a specific Olympic Games (say 2016), that year will be designated by the value t . Thus, in developing the explanatory variables, data from the cycle $t-2$ (2008), $t-3$ (2004),

t-4 (2000), etc. cycles will be used. This allows us to accurately examine the bidding decision through the same lens that decision makers would have used.

3.5 The Model

Given the binary nature of our outcome variable, a logit regression model is used. This allows us to determine and aggregate the probability of bidding between our pool of cities for any year that is chosen. Our model takes the following form:

$$(1) \Pr(\text{Bid}_{it}=1 | x_1, x_2, \dots, x_{22}) = F(\beta_0 + \beta_1 \text{Unemp}_{it} + \beta_2 \text{ExportsGDP}_{it} + \beta_3 \text{GDPperCap}_{3it} + \beta_4 \text{InflationCP}_{it} + \beta_5 \text{RealGDP}_{it} + \beta_6 \text{GDPGrowth}_{it} + \beta_7 \text{Region}_{it} + \beta_8 \text{HCI}_{it} + \beta_9 \text{Pop}_{it} + \beta_{10} \text{NumBids}_{t-2} + \beta_{11} \text{NumBids}_{t-3} + \beta_{12} \text{NumBids}_{t-4} + \beta_{13} \text{RevenueShare}_{-2} + \beta_{14} \text{RevenueShare}_{t3} + \beta_{15} \text{Venues}_{t2} + \beta_{16} \text{Venues}_{t3} + \beta_{17} \text{Cost}_{t2} + \beta_{18} \text{Cost}_{t3} + \beta_{19} \text{PrevBid}_{it} + \beta_{20} \text{PrevHost}_{it} + \beta_{21} \text{BidPrevCycle}_{it} + \beta_{22} \text{RegionPrev}_t + u_{it})$$

where i =the country observed and t =the year in which it is being observed.

The variable names in the model all correspond to those listed above, however a full table of the variables and their correlating measures can be found in Appendix B to avoid confusion.

The maximum number of lags chosen within the logistic regression variables is four, ignoring $t-1$ which occurs after the bidding cycle, as this provides us with 16 years of previous Games to examine when making the decision to bid. It is likely that data before this is irrelevant due to the dynamic, fast-changing nature of both the economy and the Olympic landscape.

The logit function of our regression equation will allow us to analyze the aggregate probability of our pool of cities submitting a bid. The fluctuations over time will allow us to

compare how the relative probability of submitting a bid either increases or decreases compared to other time periods. By calculating the coefficients of the explanatory variables through maximum likelihood estimation, it will allow us to determine the cause of these fluctuations and draw conclusions based on our findings. In drawing these conclusions, some light will hopefully be shed on how to improve the bidding process so as to attract more cities to bid and to avoid the issues that occurred with the previous bidding cycle.

Before moving into the actual analysis of the data, we would be remiss to not acknowledge the fact that there are certainly qualitative and situational factors that may affect the number of bids in any given bidding cycle. While these are not built into our model, these will be discussed at length during our findings. This will allow us to make observations as to potential opportunity costs associated with bidding in any given cycle and will allow for a more comprehensive analysis of our research question.

IV. Data Compilation and Results

4.1 Compiling the Data

Data for each nation was compiled from a variety of sources. The economic data was compiled primarily from two main sources. National values were used for each city as it was difficult to find certain economic data values on the city or local level. The value for Real GDP was taken from the Penn World Table V9.0 and represents the reported expenditure side RGDP for each bidding city's nation. The unemployment rate, exports as a percentage of GDP, GDP per Capita, inflation of consumer prices, and GDP growth rates were all compiled from the World Development Indicators database provided by the World Bank. Data was compiled for the years 1962-2018, with four-year gaps between each year (i.e. 1962, 1966, 1970, etc.) for each city. These variables are designed to serve as proxies for the economic state of each city at a given point in time, how economically liberal they are and the regression will measure how this impact a city's probability of bidding across time.

Geopolitical variables also came from a variety of sources. The Human Capital Index (HCI) was also taken from the Penn World Table V9.0 and serves as a proxy for the level of development and quality of life within each city. Higher levels of human capital indicate higher levels of education and more developed skills within a city's population. Population figures were taken from World Population Review historical counts for each city. All other variables are related to the Olympics and were taken from official reports published by the Organizing Committees for the Olympic Games (OCOGs) of each host city as well as *The Economics of Staging the Olympics* by Holger Preuss (2004). Olympics specific variables are identical for each

host city examined.

4.2 Omitted Data

When analyzing the levels of missing data for the initial regression, there are 209 observations containing missing values and 346 that are missing no values. The variables with the most missing values are the *Cost_t2*, *Cost_t3*, *Venues_t2*, and *RevenueShare_t2* variables with 74, 74, 37 and 37 missing values respectively. This is due to the fact that t-2 data is unavailable for the 2028 Summer Olympic bidding cycle as the 2020 Summer Olympics have not yet been held. Additionally, cost data is unavailable for the 1960 and 1968 Summer Olympic Games. This is due to a lack of reporting by the host city OCOGs. Other missing data is related to economic variables, such as unemployment and inflation which were unavailable. Overall, the missing variables do not impact the ability of the model to be used as the 346 observations with no missing values is sufficiently large to attain accurate data.

4.3 Bid Probability Results

The first piece of data analysis that is critical to answering our question is establishing that the probability of bidding to host the Olympic Games does in fact change over time. The model yields that the overall probability of a nation with the chosen independent variables submitting a bid to host the Olympic Games is 10.12%. The following table summarizes the probability results for submitting a bid.

Table 1 Descriptive Statistics of the Probability to Bid for the Olympics Over Time

Bid Year	Observations	Mean	Std. Dev
1962	0	-	-
1966	0	-	-
1970	0	-	-
1974	27	0.0305708	0.0578568
1978	27	0.0382953	0.167075
1982	28	0.0815909	0.1356036
1986	29	0.0712328	0.1156513
1990	32	0.0347575	0.0663915
1994	33	0.2062938	0.1809256
1998	33	0.1891113	0.2285448
2002	34	0.1789394	0.1451504
2006	34	0.0530115	0.0736542
2010	34	0.0578427	0.0585824
2014	35	0.136478	0.2055467
2018	0	-	-

*This table highlights the fluctuating probabilities of a given country choosing to submit a bid to host the Olympic Games across time.

The differences in the mean probabilities suggest that the likelihood of submitting a bid from year to year differs based on factors that exist within the environment. While there are years with 0 observations due to missing data values, the probabilities for the years that were captured show a fluctuation around the overall mean for submitting a bid. The actual number of bids submitted for each cycle seems to be reflected in the mean probabilities that are presented. For example, the mean probability of submitting a bid in the 1974 bidding cycle for the 1984 Olympics was 0.0306. In this cycle, only Los Angeles, the eventual host, submitted a bid, so we would expect a relatively low mean probability. Conversely, bidding cycles such as 1994 and 1998, in which 11 and 10 bids were submitted to host respectively, experienced much higher mean probabilities of 0.2063 and 0.1891 respectively, as we would expect.

These results are insightful as we begin to analyze the results of our regression model. With the mean probability results providing evidence that the likelihood of bidding across time differs in the aggregate, we now turn our attention to the second part of the research question and attempt to determine what factors cause the differences in probability or likelihood of submitting a bid over time. Determining what factors play a role in affecting these probabilities will provide insight into the reasons that some years experience very low bid probabilities while other years experience much higher bid probabilities.

4.4 Regression Results

We analyze the hypothesized factors that impact the probability of bidding to host the Games in a given cycle using a fixed effects logistic regression model for panel data. The fixed effects model was chosen because it allows for us to control for stable characteristics within the model environment. The results of the regression are as follows:

Table 2 Logistic Regression Results

Conditional fixed-effects logistic regression					Number of obs	=	212
Group variable: CountryCode					Number of groups	=	21
Bid	Coef.	Std. Err	z	P> z	[95% Conf. Interval]		
Unemp	-0.0437748	0.0887783	-0.49	0.622	-0.217777	0.1302275	
ExportsGDP**	0.1224233	0.0714226	1.71	0.087	-0.017562	0.262409	
GDPperCap	-0.0000201	0.0000833	-0.24	0.809	-0.000184	0.0001433	
InflationCP	0.0007031	0.0009225	0.76	0.446	-0.001105	0.0025111	
RealGDP	0.000000365	3.33E-07	1.1	0.273	-2.88E-07	0.00000102	
GDPGrowth	-0.0128285	0.0734093	-0.17	0.861	-0.156708	0.131051	
Region	0 (Omitted)						
HCI**	9.970978	5.313357	1.88	0.061	-0.443009	20.38497	
Pop	0.000000566	3.4E-07	1.66	0.096	-1.01E-07	0.00000123	
NumBids_t2	1.694794	1.354879	1.25	0.211	-0.960719	4.350307	
NumBids_t3	0.6683386	0.6292061	1.06	0.288	-0.564883	1.90156	
NumBids_t4	0.0787882	0.285895	0.28	0.783	-0.481556	0.6391321	
RevenueShare_t2	-0.4939319	0.4290759	-1.15	0.25	-1.334905	0.3470414	
RevenueShare_t3	-0.1439551	0.1371401	-1.05	0.294	-0.412745	0.1248345	
Venues_t2**	-0.0724434	0.042606	-1.7	0.089	-0.15595	0.0110628	
Venues_t3*	-0.1262071	0.0825491	-1.53	0.126	-0.288004	0.0355862	
Cost_t2	-0.2575548	0.2003079	-1.29	0.199	-0.650151	0.1350415	
Cost_t3*	-0.6684631	0.4633139	-1.44	0.149	-1.576542	0.2396155	
PrevBid***	-4.601049	1.604324	-2.87	0.004	-7.745467	-1.456631	
PrevHost	-25.60485	4051.129	-0.01	0.995	-7965.673	7914.463	
BidPrevCycle	0.1107897	0.7247447	0.15	0.879	-1.309684	1.531263	
RegionPrev*	-1.23095	0.7684373	-1.6	0.109	-2.737059	0.2751599	

This table presents the results for each explanatory variable run in the logistic regression
 *Significant at 85% Threshold
 ** Significant at 90% Threshold
 *** Significant at 95% Threshold

A few things are noteworthy here. The first thing that should be noted is that the Region variable is omitted from the regression results because the variance that exists within the data values for each group has a value of 0. This prevents meaningful testing of this variable. The rest of the

variables were evaluated at the 85%, 90% and 95% significance level for a statistically significant impact on the probability of bidding. The Venues_t3, Cost_t3, and RegionPrev variables are all significant at the 85% level. The ExportsGDP, HCI, Pop, and Venues_t2 variables were all significant at the 90% level and the PrevBid variable was significant at the 95% level. These variables and their impacts will be discussed at length during the analysis portion of the study.

4.5 Additional Statistical Analysis

After examining the results of the model, the variables were tested for multicollinearity using variance initiation factor (VIF) testing to determine if any of the independent variables experienced positive correlation. The results yielded a few variables with VIFs greater than 5. These variables include NumBids_t2, NumBids_t3, NumBids_t4, RevenueShare_t2, RevenueShare_t3, Venues_t3 and Cost_t3. It is important to note that this result is likely due to the fact that the values for these variables are repeated across different observations due to their time series nature. For example, the value for the NumBids_t2 variable in a given year (say 1966) would become the value for the NumBids_t3 variable in the next given year (1968). This likely contributed to the high levels of correlation seen within some of the variables. The presence of multicollinearity suggests a need for further testing of the variables to confirm that they are, in fact, significant in affecting the outcome variable and that their correlation with other variables did not impact the results.

4.6 Developing an Alternative Model and Results

To address the problem of multicollinearity, an alternative model was developed that

addressed the variables with high VIF scores. For the time series variables, an alternative to listing out several variations of the variable across time (i.e. NumBids_t2, NumBids_t3, NumBids_t4) an average of the historical results that were examined in the first regression model were taken for each new bidding cycle. For example, NumBidsPrev, a new variable, was created using the average of the three aforementioned variables that were subject to high multicollinearity values. Additionally, the Unemp and InflationCP variables were both dropped from the new regression model as they both constituted large sources of missing values and tested as largely insignificant in the first model. The new logistic regression equation that was developed is represented by:

$$(2) \Pr(\text{Bid}_{it}=1 | x_1, x_2, \dots, x_{17}) = F(\beta_0 + \beta_1 \text{ExportsGDP}_{it} + \beta_2 \text{GDPperCap}_{3it} + \beta_3 \text{RealGDP}_{it} + \beta_4 \text{GDPGrowth}_{it} + \beta_5 \text{Region}_{it} + \beta_6 \text{HCI}_{it} + \beta_7 \text{Pop}_{it} + \beta_8 \text{NumBidsPrev} + \beta_9 \text{RevenueShare_Avg} + \beta_{10} \text{AvgVenues} + \beta_{11} \text{AvgCost} + \beta_{12} \text{PrevBid}_{it} + \beta_{13} \text{PrevHost}_{it} + \beta_{14} \text{BidPrevCycle}_{it} + \beta_{15} \text{RegionPrev}_t + u_{it})$$

Using averages for Olympics specific variables also helps address the number of observations with missing values that were contained within the first regression model as we were able to use the averages to estimate values that were previously missing. In the new regression model containing no multicollinearity and a few dropped values, there are only 15 observations with missing values and 525 observations with no missing values. The results of this regression model are summarized in the table below:

Table 3 Logistic Regression Results Using Second Model

Conditional fixed-effects logistic regression					Number of obs = 360	
Group variable: CountryCode					Number of groups = 24	
Bid	Coef.	Std. Err	z	P> z	[95% Conf. Interval]	
ExportsGDP	0.0837235	0.03899	2.15	0.032	0.0073045	0.1601426
GDPperCap	-0.0000771	0.0000469	-1.64	0.100	-0.0001691	0.0000149
RealGDP	6.19E-08	1.79E-07	0.35	0.729	-2.88E-07	4.12E-07
Region	0 (Omitted)					
HCI	0.923843	1.90067	0.49	0.627	-2.801401	4.649088
Pop	4.20E-07	2.10E-07	2.00	0.046	8.00E-09	8.32E-07
NumBidsPrev	0.1964404	0.1306561	1.50	0.133	-0.0596408	0.4525216
RevenueShare_Avg	0.0078094	0.034558	0.23	0.821	-0.0599229	0.0755418
AvgVenues	-0.0680393	0.0208079	-3.27	0.001	-0.108822	-0.0272566
AvgCost	-0.0728299	0.1034413	-0.70	0.481	-0.2755711	0.1299113
PrevBid	-3.950559	1.263499	-3.13	0.002	-6.426973	-1.474146
PrevHost	-20.44565	1784.172	-0.01	0.991	-3517.358	3476.467
BidPrevCycle	1.133619	0.5905424	1.92	0.055	-0.0238225	2.291061
RegionPrev	-1.462559	0.6776873	-2.16	0.031	-2.790802	-0.1343167

This table presents the results for each explanatory variable run in the second logistic regression model

*Significant at 85% Threshold
** Significant at 90% Threshold
*** Significant at 95% Threshold

In this model, the NumBidsPrev variable is significant at the 85% threshold, the GDPperCap and BidPrevCycle variable are significant at the 90% threshold and the ExportsGDP, Pop, AvgVenues, PrevBid and RegionPrev variables are significant at the 95% level. Many of these significant variables are the same as were seen in the results of the first model which provides evidence that they do indeed have a strong significant effect on the outcome variable. Some variables that weren't significant before now test as significant and one variable (HCI) that was previously significant is no longer. These variables will all be discussed during the analysis

portion of the study.

4.7 Choosing a Model and Goodness of Fit

In order to determine what model represents the data and the relationship between the covariates and the outcome variable best, a variety of Pseudo R^2 tests were performed to examine each model's goodness of fit. These tests include McFadden's R^2 , Maximum Likelihood R^2 , the Akaike Information Criterion (AIC) and Bayesian Information Criterion (BIC). The results are summarized in the table below.

Table 4 Model Goodness of Fit Comparison

Goodness of Fit Test	Model 1	Model 2
McFadden's R^2	0.385	0.341
Maximum Likelihood R^2	0.908	0.929
AIC	5.91	6.287
BIC	83.165	91.099

*This table presents goodness of fit statistics for both models to provide a basis for comparison

Both models experience relatively strong values of McFadden's R^2 values as well as Maximum Likelihood R^2 values. Model 1 experiences a higher McFadden's R^2 while Model 2 has a higher Maximum Likelihood R^2 value. Both the AIC and the BIC would suggest that Model 1 provides a better fitting model. It is worth noting, however, that due to the presence of less missing values and more complete observations in Model 2, the values of AIC and BIC may have been affected causing them to be higher than the values in Model 1. This is because both become bigger with the number of parameters (AIC) or observations (BIC) that exist within the model.

After comparing the results, the goodness of fit statistics are close enough that, coupled

with the levels of multicollinearity experienced by some of the predictor variables in Model 1, Model 2 is likely preferred in terms of determining the true effects of the independent variables on the outcome variable. However, due to the ambiguity of the goodness of fit statistics, coupled with the overlap of some of the significant variables, we choose to provide commentary on significant variables found within both models as they provide insight and allow us to make inferences surrounding our research question.

V. Analysis

5.1 Analysis of the Variables

Economic Variables

The hope in examining the economic variables was to determine a profile of the economic state of cities and nations that submitted bids to host the Olympic Games. Our regression results yield that the ExportsGDP was significant in both models while GDPperCap was significant in the second model. The rest of the economic variables were statistically insignificant in both models. This provides us with a few key insights.

The use of the ExportsGDP variable was designed to serve as a proxy for the level of liberalism in economic policy put forth by a potential bidding city. Countries with higher levels of exports as a percentage of GDP are thought to be more economically liberal in terms of their interactions with other nations and their exchange of goods and services. While prior literature has concluded that hosting the Olympics has a positive effect on the level of exports or economic liberalism (Rose and Spiegel, 2009), this model suggests that the level of exports also plays a role in whether a country will even submit a bid to host in the first place. This is understandable as preparing for the Olympics is a huge undertaking, both financially and in terms of infrastructure, and countries will have to rely on trade with other nations in order to successfully complete the project in the tight amount of time allotted.

GDPperCap was designed to serve as an indicator of the economic quality of life within cities that bid to host the Olympic Games. Model Two provides an interesting result as the GDPperCap variable tests significant at the 90% level, but appears to have a negative effect on

the probability of submitting a bid. This would imply that countries with relatively lower GDP per capita levels tend to be slightly more likely to submit bids to host the Olympic Games than countries with relatively higher GDP per capita levels. This makes sense to an extent as nations that host the Olympic Games are hoping for huge economic returns on their investment in hosting that will enhance the quality of life for citizens through enhanced employment opportunities and opportunities for economic advancement. Additionally, nations with higher GDP per capita levels have more to lose if the Games are an economic disaster as evidenced by the 1976 Summer Olympics in Montreal and thus may be apprehensive to submit a bid if they already have a strong economy. This is a key insight that explains why the probability of submitting a bid fluctuates over time and has decreased over time as the developed economies that once submitted bids to host are no longer doing so.

Overall, the biggest conclusion that can be drawn from the results is that there does not seem to be a large difference regarding the extent to which the economic state of a city or country impacts the probability that they will submit a bid. This is not as surprising as one might think, given the changing composition of cities that vie for the opportunity to host the Olympic Games. In recent history, bidding for the Olympics has become much more common for cities in developing economies than it was back at the beginning of the modern Olympic Games. Cities such as Beijing, which successfully bid to host the Olympic Games in 2008, now have the opportunity to submit bids in the hopes of being able to develop their infrastructure and present their culture on a global scale. While the economic state of a nation has been proven to play a role in whether a city is selected to host the Olympic Games (Maennig and Vierhaus, 2016), it does not appear to hinder them in submitting a bid. Thus we can conclude that there are likely

two economic rationales behind submitting a bid to host the Olympics. Developed nations with strong economies submit bids in order to maintain strong economic returns and showcase high economic quality of life while developing nations submit bids in the hopes that it will boost their economic status and opportunities within the global economy. Conversely, the probability of submitting a bid likely has gone down as developed nations are not willing to take the economic risk associated with the Olympics and developing nations may be unable to feasibly submit a bid or host the Olympic Games in the first place.

Geopolitical Variables

For the selected geopolitical variables, population tested significant in both models while the Human Capital Index tested significant in the first model but not the second. Both of these measures have a positive relationship with the outcome variable. The models both suggest that cities with larger populations tend to be more likely to submit bids to host the Olympic Games. This is intuitive as the cities that typically host the Olympics are either capital cities or host nations or cities that are large enough to support the event. Millions of people visit the host city while attending the Olympics each cycle (IOC, 2016) and cities need to be able to accommodate these people in a variety of facets including lodging, transportation, food, etc. Thus, it is much easier for a city with a large population to support the hosting of the Olympics as they are more likely to already have much of the infrastructure in place to accommodate the mega-event.

The Human Capital Index (HCI) which is based on the average years of schooling and an assumed rate of return to education (PWT9.0, 2018) suggests that cities with a more educated and skilled population are more likely to submit bids to host the Olympic Games in Model One.

A higher human capital index suggests that the individual citizens of a nation are able to provide “more global economic value” through their knowledge and skills (World Economic Forum, 2017). Having high human capital is important during preparations for the Olympics as lots of infrastructure construction must be completed and local businesses must prepare themselves for the mega-event that is to come. The data in Model One suggests that cities take into account their capability of completing these preparations based on the level of human capital that exists prior to submitting a bid to host.

Olympics Specific Variables

In both models the variables that relate to venues, the *PrevBid* variable and the *RegionPrev* variable test significant. The *Cost_t3* variable tests significant in the first model while the *BidPrevCycle* variable tests significant in the second model. The result for the *RegionPrev* model is intuitive as cities from the same continent are not likely to be selected to host in back to back cycles. Thus, a city is unlikely to even submit a bid if another city from their same region or continent hosted the Games in the previous cycle.

The *PrevBid* variable provides interesting insight. This variable tested strongly significant in both models and has a negative relationship with submitting a bid to host the Games. This would suggest that nations that have bid once are less likely to submit another bid than nations that have never bid before. This is likely for two reasons. If a city bids and is selected to host the Games, they are highly unlikely to submit another bid in the close future. Very few cities have hosted the Games more than once and those that have typically do so decades (if not centuries in the case of Athens) apart. The other, and more impactful, reason that

previous bidders are unlikely to do again is the fact that the cost of bidding has drastically increased (Giesecke & Madden, 2011). There have been many high-profile cases of nations pulling out in the midst of submitting bids due to the high costs incurred, such as Boston's bid for the 2024 Olympics. Thus, a city who pours a significant amount of resources into an unsuccessful bid may not submit another bid if they do not feel that they can be successful.

On the contrary, there have been many cases of cities that will bid in the very next cycle after submitting an unsuccessful bid. This is evidenced by the significance of the *BidPrevCycle* variable. In recent history, large, developed cities such as Tokyo, Paris and Los Angeles have submit bids in cycles directly seceding a cycle where they bid unsuccessfully. It is worth noting that the second bids have been generally successful (as evidenced by their selection to host the 2020, 2024 and 2028 Olympic Games) and thus these cities were likely confident in their abilities to be selected as hosts. These cities also likely have the resources to maintain and build on the preparations that they had made in the previous bidding cycle.

The significance of the *Venues_t2* and *Venues_t3* variables in Model One as well as the *AvgVenues* variable in Model Two suggests that the percentage of venues that were newly built in previous cycles has a negative impact on the probability of bidding. These variables, along with the *NumBids* variables, are designed to proxy the relative level of bargaining power that the IOC possesses in the bidding and preparation process as well as the costs incurred by host nations. In cycles where there are many bidders, the IOC has relatively more bargaining power and are able to dictate the terms of hosting to a greater extent (Preuss, 2004). When they have higher bargaining power, the IOC is able to mandate the construction of new facilities, including

Olympic villages and stadiums, as part of the agreement when selecting a nation to host. This drastically drives up costs for host nations and makes hosting less economically appealing. As a result of the low power that the host city possesses along with the higher costs that they are required to incur, the economic performance of the Games is typically lower, and nations are left with debts for years to come as they must finance the maintenance of stadiums that may or may not be used again following the Games. Conversely, in years where there are few bidders, the host city has relatively more bargaining power and is able to use many of their existing venues which keeps costs down. This allows these nations to turn higher economic profits and be saddled with less long-term debt (Preuss, 2004). This makes hosting the Olympics more appealing the potential bidders and increases the probability that they will bid. The regression results suggest that this plays a large role in determining the probability that a city will host the Olympic Games. This suggests that the probability of bidding is cyclical to some extent. There will be a cycle where many nations submit bids and the IOC has higher bargaining power leading to higher costs and lower returns. This causes few nations to bid which gives the eventual host more bargaining power, lowering costs and raising economic returns. Potential bidding cities see the results and the probability of bidding once again goes up, and the cycle repeats.

The final variable is the *Cost_t3* variable that tested significant in the first model. While the *Cost_t2* variable did not test significant at the 85% level it was also relatively close ($P > |z| = 0.199$) to meeting the significance threshold. Similarly to the Venues variable, this variable tests the extent to which potential bidders take outright cost into consideration when making their decision to bid. While the model would suggest that a potential city does consider cost to a certain extent, the model also suggests that a city considers *how* the costs were incurred and the

level of control that they have in determining their spending amounts should they be selected to host. The cost of hosting the Olympics has grown substantially in recent history (Flyvbjerg 2016) but each Olympics is also very unique in the level of spending on each facet of hosting. This makes it difficult to get true cost estimates of hosting the Olympics besides those which are reported in official OCOG reports (which Flyvbjerg notes are often understated to make the Games appear to be more of a financial success). Thus, while cost likely serves as a good starting point for a potential bidder, they clearly take other factors into consideration when determining their decision for submitting a bid.

5.2 Limitations of the Model and Next Steps

It is a difficult undertaking to capture exactly how the variables impact the probability of submitting a bid across time in the aggregate because each potential bidder and each Olympic bidding cycle is unique. The bidding environment that exists today is not nearly the same as it was a few decades ago and this makes it difficult to draw conclusions about what factors are at the forefront of impacting the probability to bid. Technological advancements also make it difficult to attain data that is present for all Games by which you can compare their decision-making process. For example, a large consideration in the decision to host today's Olympic Games is the level of revenue share from television and media rights deals that go to the IOC versus the share that goes to the host nation. This isn't a consideration that would have taken into account several decades ago, so this makes a comparison difficult and also limits the ability to find a perfect model that determines the factors that make up a country's decision to bid. However, the variables that were chosen are variables that are common across the time frame selected and that provide an accurate basis for comparison.

The lack of available accurate data from the OCOGs of host cities also provides a challenge in determining the extent to which information is available to the decision-makers on Olympic Bid Committees. While these decision-makers may have more resources available to them in determining what the true expenditures on previous Olympic were, they are likely making their decisions while facing at least some level of asymmetric information. The lack of public available knowledge creates its own challenges in determining true values for variables.

Going forward, it would be interesting to apply the model to other large scale mega-event such as the FIFA World Cup or Winter Olympic Games to see if the variables that impact the probability of submitting a bid for the Summer Olympic Games also impact the probability of bidding for these events. Hosting these events provides similar challenges to hosting the Summer Olympics but all are unique in the factors that play into the decision to host (Mills & Rosentraub, 2013). It would also be interesting to change the composition of the cities that are studied by the model to see if this impacts the significance of certain variables or even the probabilities of submitting a bid in the first place. While the sample size used in this study is sufficiently large, increasing it could provide additional valuable insights into the analysis of the research question.

5.3 Qualitative Factors

Another challenge in determining all of the factors that determine the relative probability for submitting a bid over time is the inclusion of qualitative factors into the model. Cities that are considering a bid to host the Olympic Games often take a perceived “legacy effect” into consideration when making the decision to bid or not (Kasimati & Dawson, 2009). Hosting the Olympics provides a large stage on which a host city can showcase itself to the world. Given the

historical significance of the Games, cities are often eager to have the opportunity to carry on the tradition of hosting and showcase their culture to the world. Governments also likely take the “feel good” effect into consideration when pushing to submit a bid for the Olympic Games or any mega-event (Maennig & Porsche, 2008). The feel-good effect is a social effect that takes place within a city or a nation following the hosting of a mega-event like the Olympics. The citizens of that city may feel an enhanced sense of national pride as a result of having the experience to play a role in such an important global cultural event. This may have positive implications for the success of cities or their governmental regimes.

Along the same lines, governments may view the large stage of the Olympics as an opportunity to send the messages that they want to send throughout the whole world. An example of this comes from Beijing’s hosting of the 2008 Summer Olympics. Outside of the economic prospects, Beijing used the 2008 Summer Olympics (and especially the widely viewed opening ceremonies) as an opportunity to paint a positive picture of the quality of life for Chinese people on a global scale (Owen, 2005). The opening ceremony was widely regarded as spectacular throughout the world and overshadowed many of the other issues such as human rights issues that had been alleged prior to the start of the event. Governments likely have this opportunity as an ulterior motive they consider when making the decision to submit a bid.

VI. Conclusion

Overall, the model that was constructed provides us with some key insights regarding our research question and regarding the ways that bidding for the Olympic Games can become more accessible and attractive to potential bidders. The model suggests that the fluctuating number of bids across time, including years where they may be just one bidder, do not occur simply randomly and many factors play into the increased or decreased relative probability of bidding in a given cycle. This conclusion is key as it allows us to study the factors which play the largest role in determining these probabilities and determine a change in any one of the factors will make bidders more or less likely to actually bid.

While there is a vast amount of literature that studies the ex post economic effects of hosting the Olympic Games there are not very many that study the bidding process and the ex-ante variables that play a role. Additionally, there are very few studies in any realm that examine the ex post or ex ante effects surrounding the bidding and hosting of the Olympic Games across time. The longitudinal structure of our data provides a unique opportunity to study both of these little studied areas and draw the conclusions surrounding our variables that were detailed in the analysis portion.

While it is notably difficult to draw conclusions as to the single most important factors that determine the probability of submitting a bid at any one point in time given the diverse composition of potential cities and changing dynamics over time, there are several variables that are constant throughout time and play a consistent role in the decision-making process. The

relative development of a city both socially and economically, the inherent economic risks and potential benefits detailed in previous literature as well as the qualitative factors associated with bidding all surely play a role in each committee's decision to submit a bid. However, our model coupled with data regarding the number of cities that bid in each cycle points to the fact that each potential bidder goes through a unique decision-making process and weigh the risks and benefits differently.

In order to maintain the long-term success of the Olympics, it will surely be necessary to address the rising costs of hosting the Olympics. The IOC is aware of this as evidenced by the strategic planning information contained within their Annual Review and their Olympic Agenda 2020 (IOC, 2018). Finding ways to decrease the costs of bidding and hosting will likely entice more nations to bid from all parts of the world and make hosting the Olympics more accessible and financially feasible. Our model suggests that increasing the probability of bidding and alleviating the situation that occurred with the 2024 and 2028 Olympic bidding cycles will come if the IOC is able to make the adjustments and provide more economic as well as sociocultural benefits to nations that are considering a bid.

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**APPENDIX A- CITIES USED IN THE SUMMER OLYMPIC BID
REGRESSION MODEL**

Table 5 List of Cities Observed in Logistic Regression Model

City	Country	Country Code	Host, Bid, Never Bid
Helsinki	Finland	1	Host
Paris	France	2	Host
Melbourne	Australia	3	Host
Rome	Italy	4	Host
Tokyo	Japan	5	Host
Mexico City	Mexico	6	Host
Munich	Germany	7	Host
Montreal	Canada	8	Host
Los Angeles	United States	9	Host
Seoul	South Korea	10	Host
Barcelona	Spain	11	Host
Atlanta	United States	12	Host
Athens	Greece	13	Host
Beijing	China	14	Host
London	United Kingdom	15	Host
Rio de Janeiro	Brazil	16	Host
Detroit	United States	17	Bid
Buenos Aires	Argentina	18	Bid
Brussels	Belgium	19	Bid
Tehran	Iran	20	Bid
Amsterdam	Netherlands	21	Bid
Istanbul	Turkey	22	Bid
Bangkok	Thailand	23	Bid
Cairo	Egypt	24	Bid
Cape Town	South Africa	25	Bid
Kuala Lumpur	Malaysia	26	Bid
Stockholm	Sweden	27	Bid
Houston	United States	28	Never Bid
Caracas	Venezuela	29	Never Bid
Lima	Peru	30	Never Bid
Lisbon	Portugal	31	Never Bid
Dublin	Ireland	32	Never Bid
Jakarta	Indonesia	33	Never Bid
Manila	Philippines	34	Never Bid
Nairobi	Kenya	35	Never Bid
Riyadh	Saudi Arabia	36	Never Bid

APPENDIX B- VARIABLES USED, LOGISTIC REGRESSION

MODEL

Bid (Outcome Variable)- Whether city i bid during time t

Unemp- The unemployment rate in country i at time t (WorldBank)

ExportsGDP- Exports as a percentage of GDP in country i at time t (WorldBank)

GDPperCap- PPP-adjusted GDP per capita in country i at time t (WorldBank)

InflationCP- Inflation of Consumer Prices in country i at time t (WorldBank)

RealGDP- Expenditure side real Gross Domestic Product in country i at time t (PWT V9.0)

GDPGrowth- The annual growth rate of Real GDP in country i at time t (World Bank)

Region- The indexed region of the world that city i is in (North America=1, Europe=2, Australia/Oceania=3, Asia=4, South America=5, Africa=6, Middle East=7, Antarctica=8)

HCI- The Human Capital Index, a measure of the level of education and educational returns in country i at time t (PWT V9.0)

NumBids_t2- The number of bids submitted in bidding cycle t-2 from current cycle (IOC)

NumBids_t3- The number of bids submitted in bidding cycle t-3 from current cycle (IOC)

NumBids_t4- The number of bids submitted in bidding cycle t-4 from current cycle (IOC)

RevenueShare_t2- The percentage of media revenue kept by the IOC in Olympic cycle t-2 from current cycle (Preuss 2004)

RevenueShare_t3- The percentage of media revenue kept by the IOC in Olympic cycle t-3 from current cycle (Preuss 2004)

Venues_t2- The percentage of Olympic venues that were newly constructed prior to hosting the Olympics in Olympic cycle t-2 from current cycle (Preuss 2004)

Venues_t3- The percentage of Olympic venues that were newly constructed prior to hosting the Olympics in Olympic cycle t-3 from current cycle (Preuss 2004)

Cost_t2- The reported cost of hosting the Olympic Games in cycle t-2 from current cycle (OCOG Official Reports)

Cost_t3- The reported cost of hosting the Olympic Games in cycle t-3 from current cycle (OCOG Official Reports)

PrevBid- Whether country i has previously bid for the Olympic Games as of time t (IOC)

PrevHost- Whether country i has previously hosted the Olympic Games as of time t (IOC)

BidPrevCycle- Whether country i bid for the Olympic Games in the cycle directly prior to time t

(IOC)

RegionPrev- Whether the host nation of the Olympic Games prior to time t is in the same region as country i (IOC)