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### ***Discussion Paper 2010– 01***

### ***Hunting for the Olympics Bounce: Any Evidence in Real Estate***

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## Introduction

Local backers of a city's bid to host the Olympic Games promote the Games as an engine of economic growth that will generate billions of dollars for the local economy.<sup>1</sup> If true, real estate in the host city will become more valuable. In this study we look at housing markets before during and after a city hosts the Olympic Games to see if there is any evidence of an Olympic bounce through an increase in house prices. We find none. Construction employment in the years prior to the Games is higher though in a host city. However, in contrast to the shrill warnings of the anti-games Cassandra's, we also find no evidence of a downturn or slowing in housing price growth following the Games. More than anything else our findings argue that hosting the Olympic Games is not about economic benefits. Instead, the focus in hosting the Games should be on the opportunity to celebrate excellence and achievement, and to capture our collective imaginations. For the host city and region, the Games offers a singular opportunity to celebrate and present before others what they believe to be the best in themselves.

The Olympics turn the world's spotlight on a single city for a concentrated two-week period. This the central theme that local Olympic organizing committees use in promoting the economic benefits of the Olympic Games to the citizens

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<sup>1</sup> For example, a \$5.1 billion short-term predicted benefit from the 1996 Games to Atlanta (Humphreys and Plummer, 1995), the more modest Vancouver Winter Olympics were pitched to have as much as a \$C 10.7 billion dollar impact (InterVISTAS, 2002), while the study for Chicago Organizing Committee predicted a benefit of \$US 22.5 billion in increased economic activity (Tootelian and Varshney, 2009).

who will bear any cost over-runs and inconveniences from being the host city.<sup>2</sup>

The Olympics are touted as a marketing vehicle to increase tourism and investment as the world becomes “aware” of the city’s attributes. The Olympics also serve as the catalyst for broader public investment in a city.<sup>3</sup> The list of claimed benefits includes effects on health and lifestyle.<sup>4</sup> In this study we limit our formal analysis to those aspects that affect the host city’s economy and the appeal of living there, elements that would be expected to affect housing prices in the area.

What distinguishes our work from previous studies of the economic benefits of Olympics is our use of movements in real estate prices to identify an “Olympic effect.” House prices are often used to evaluate the effects of events unique to a location such as school quality, environmental effects, or location-specific government policies. Changes in house prices are an effective tool to identify benefits unique to a particular location because they have been shown to monetize an area’s enhanced future economic opportunities from expected increases in employment opportunities, wages, and higher local business earnings. Critically, they will also rise from any increased quality of life that results from Olympic infrastructure spending and legacy facilities. A variety of

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<sup>2</sup> Cost will depend not just on what venues and Olympics related capital expenditures are built, security and operational costs, the opportunity cost of funds, but also the share of these costs allocated among different levels of government and the International Olympic Committee (IOC). In Vancouver, the IOC did step in and cover a portion of the cost overruns because the global economic downturn reduced corporate sponsorship revenues.

<sup>3</sup> : “...Dallas 2012 says landing the Olympic bid would give the city a specific reason to improve local infrastructure...” (in Baade and Matheson. 2002).

<sup>4</sup> Sir Liam Donaldson, the chief medical officer for England in *The Guardian*, Wednesday 6 July, 2005,: “Winning this bid will give a huge boost to improving the health and well being not just of Londoners but of people across England.

<http://www.guardian.co.uk/society/2005/jul/06/olympics2012.communities>

authors have used alternative methodologies to estimate the economic impact of the Olympics without reaching a clear consensus.<sup>5</sup> Part of the failure to find clear signs in this work may be that since Olympics Games are hosted by large open economies, the economic impact of hosting the Olympics is likely to be too small relative to the national economy to be picked up in broad national indicators total employment, GDP or by the stock market. Our focus on the economic effect on the host city, in comparison to other cities in the host country, should avoid this weakness in the existing research.

Using data from Australia, Canada, and the US, we examine whether house prices and construction employment grew faster in cities that hosted the Olympics than in those cities that were not hosts.<sup>6</sup> We find no consistent evidence that house prices rose faster in a host city at the time of the announcement, lead-up, or period following the Olympic Games, when compared with other non-Olympic cities in the same country. However, in contrast to the claims of Games opponents, there is no conclusive evidence of a negative effect of the games either. There is no post-Olympic bust in housing markets. Hosting the Olympics did consistently increases the rate of growth in construction employment in the period prior to the games.

The Olympic Games may well increase participation in sports and enhance wellness; be a means to move forward on delayed infrastructure improvements;

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<sup>5</sup> See Berman et al (2000), Veraros, Kasimati, and Dawson (2004), and Rose and Spiegel (2009).

<sup>6</sup> The Olympic cities in our data are Atlanta, Calgary, Los Angeles, Salt Lake City, Sydney, and Vancouver (the latter just for the effect prior to hosting the games).

provide a meaningful boost to a city, region, or country's identity and sense of self; signal a country's openness to the rest of the world or that it has arrived on the world stage; or just be a means for a very public celebration. They offer a chance to inspire us and to spark our imagination of what we can achieve. However, our findings argue that selling and promoting the Games as an explicit tool for economic development is inconsistent with the evidence from housing markets.

## Theory

It is not unreasonable to believe that hosting the Olympic Games would yield minimal economic benefits. The Olympics are "supplied" by a monopoly, the International Olympic Committee (IOC). Multiple cities compete to host these games.<sup>7</sup> With enough information, the supplier the IOC, could well demand a high enough "price," expressed in terms of Games related infrastructure and amenities, share of revenues from media and licensing, and other elements of the bid, to extract all of the economic benefit that might be expected to accrue to the host city. In addition, if the backers of the bids see reasons to pay for the Games that have nothing to do with the economic benefits to the community as a whole, the bid price could exceed the eventual economic benefits. Finally myopic governments may formulate a bid based on current boom conditions that may be atypical for the economy.<sup>8</sup>

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<sup>7</sup> Rio de Janeiro (the winner), Chicago, Madrid, and Tokyo all bid to host the 2016 Summer Games. Sochi (the winner), PyeongChang, and Salzburg were the final bidders to host the 2014 Winter Games.

<sup>8</sup> A description that may reflect Sochi's bid for the 2014 Winter Olympics.

One of the challenges in assessing the economics of hosting the Games is the timeline for the analysis. While it is possible to estimate permanent changes in the number of tourists, formalizing the effects on increased investment stemming from the enhanced profile of a city are much harder to specify. Furthermore, if the Olympics increase the value of living in the city to residents, the effects of this value need not result in immediate discernable changes in overall employment.<sup>9</sup>

House prices offer a number of benefits as a tool to identify a potential Olympic effect. First, unlike exports, they can be specifically identified for the host city distinct from other locations. Second, as an asset, we expect house prices to capture the sum of all future costs and benefits associated with a city. This includes any changes to the general attractiveness of the city resulting from the Olympics as well as any nuisances resulting from being the host city. The former would represent a benefit, even if overall incomes and employment did not change.

One disadvantage to using local real estate markets to assess the impact of the Olympics is that the allocation of costs is the outcome of a political rather than an economic process. To the extent that a state or central government picks up a disproportionately large part of the games related expenses, the allocation of costs between local, state, and national levels will not reflect the distribution of

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<sup>9</sup> There are also issues of the distribution of benefits. Infrastructure investments can benefit certain areas of a metropolitan area over others resulting in changes in the relative prices and sizes of different areas.

the benefits of the Games.<sup>10</sup> In this case, house prices in the host city would reflect the full benefits but only a portion of the Games related costs. The estimated effect of the Olympics would appear to be more positive than it really is because of a subsidy from higher levels of government to the host city.

## **Existing Research**

There are two types of studies that analyze of the economic impact of the Olympics. One estimates in advance, the likely impact of the Olympics given a set of assumptions about the cost of the Olympics, the type of investments made, and the affects on tourism. The second type, which includes most academic studies, look after the fact to see whether there is any observable effect of the Olympics on aggregate economic measures.

Local economic area studies by consulting firms or government entities typically undertaken around or just after the Olympics also tend to find positive economic benefits.<sup>11</sup> Owen (2005) provides a concise criticism of the methods used in these types of economic impact studies that effectively calls into question their fundamental value. The methodologies are effectively designed to find a positive economic benefit, treating costs as benefits and ignoring the opportunity costs of the resources expended on the Games, and lack more general rigour.

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<sup>10</sup> For the Vancouver 2010 Games, the Canadian federal government is providing 53 percent of the funding for Olympic specific venues construction (Vanoc 2009)

<sup>11</sup> Examples include economic growth in a range around \$7 billion for the Sydney 2000 Olympics, from increased tourism and the associated new job creation (KPMG, 1993; New South Wales Treasury, 1997; Arthur Andersen, 1999). Two studies cited Veraros, Kasimati, and Dawson (2004) suggested that the Athens 2004 Olympics would increase Greek GDP by over \$10 billion

Academic studies of the economic effects of the Olympics have not found clear evidence of a consistent effect. One approach uses the “event study” methodology to see whether the announcement awarding the Olympics has a positive effect of the country’s stock market. If stock markets incorporate relevant information about the prospects of firms listed on the exchange and the Olympics convey a positive benefit, then the announcement should be accompanied by a rise in the host city’s national stock exchange. Berman, Brooks, and Davidson (2000) do not find an overall reaction in the Sydney stock market (Australia’s national stock market) to the announcement that Sydney would host the 2000 Summer Games, but there was a positive reaction to the news for building materials firms and builders and developers, and this was concentrated among firms located in the same state as Sydney. In contrast, Veraros, Kasimati, and Dawson (2004) find a positive announcement effect on the Athens stock market with the announcement of the 2004 Olympics to Athens. However, it is not accompanied by a negative effect on the Milan exchange for the losing bidder Rome. The disadvantage of this approach is that even if hosting the Olympics does yield positive economic effects, national stock exchanges may simply be not sufficiently geographically targeted to identify positive benefits concentrated in the host city.

Rose and Spiegel (2009) test whether hosting the Olympics generates a positive effect of country exports. They present a framework that posits that hosting the Olympics signals a degree of trade liberalization and openness (the Moscow 1980 Games excluded) conducive to investment and trade. While they find that



hosting the Olympics increases a country's exports, they also find the same effect for countries with cities that lost their bid to host the Games. This finding rejects a distinct effect of hosting the Olympics but does say much about the countries that choose to compete to host the Games.

In the context of sports teams, different papers have suggested that the effects may go beyond explicit job creation to enhancing the quality of life in a city (Rappaport and Wilkerson, 2001). In an analytical approach similar to ours, Carlino and Coulson (2004) examine whether house rents and urban wages are higher or lower in cities with professional football teams. They find central cities with NFL teams have 8 percent higher rents without any corresponding statistically significant effect on wages, suggesting the people value living in a city with a team.

One non-academic study has attempted to identify whether hosting the Olympic Games affects a host city's use housing markets. Phillips, Hager & North (PH&N), a Vancouver based investment firm, produced a report in 2008 that compared the house price history in four North American Olympic cities with the history in an alternative area with the objective of assessing whether hosting the Games would make Vancouver a more attractive site for real estate investment.<sup>12</sup> They find no visual evidence that the Olympics effects housing prices. The PH&N report lacks the rigour of the aforementioned academic studies or of the work we conduct here, but their methodological approach of

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<sup>12</sup> Los Angeles with San Francisco, CA and the State of California, Atlanta with Birmingham, AL and the State of Georgia, Salt Lake City with the State of Utah, and Calgary with Edmonton, AB.

comparing a city that receives a treatment (the Games) with a similar one that does not is a sound and valid strategy. The weakness in the study is there is no sound statistical basis by which the evaluation technique and the process by which the matching city or area for the host city were implemented. For instance, comparing Salt Lake City to the state of Utah will be unlikely to find a difference because the Salt Lake City area dominates the state's economy and population base.

## **Data and Methods**

We analyze the effect of hosting the Olympics on house prices and construction employment in a set of Australian, Canadian, and US cities. Our effective question is whether the rate of growth in house prices and construction employment is higher in an Olympic city than a non-Olympic city at the time of the announcement of the awarding of the Games, the subsequent years leading up to the Games, or for a six year period afterwards. The Summer Olympics cities in our analysis are Atlanta (1996), Los Angeles (1984), and Sydney (2000). Calgary (1988), Salt Lake City (2002), and Vancouver (2010) are the Winter Olympics cities.<sup>13</sup> In the Appendix we list the sources of data by country and measure.

We analyze the data separately for each country and look to identify an effect unique to cities that host the Olympics. The economic models are fairly straightforward: the growth rate in house prices or construction employment as a

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<sup>13</sup> For Vancouver we can only test the effect of the Games on pre-event measures.

function of the past rates of growth in that variable in that city, interest rates, and the growth in employment. Our data is quarterly and the time period varies by country: 1978-2009 for Canada, 1980-2009 for the US, and 1984-2009 for Australia, though data is not available for all cities in all periods. For the US we include over 300 metropolitan areas, nine major cities in Canada, and the eight state capitals in Australia.<sup>14</sup>

Employment is a problematic explanatory variable. If the Games have a positive economic effect, then growth in employment would reflect this just as much as house prices. Consequently, in the statistical analysis, the growth in total employment variable might mask the effect of the Olympics on the real estate market because the effect could operate through employment. To obviate this problem, we estimate the growth rate of employment in a manner that is independent of any local conditions. This approach applies a weighted average of the national growth rate in each of the major employment activity sectors that results in a unique city growth rate because the weights are a given city's shares of its employment in each of those categories. If nationally finance employment is growing faster than average, then a city with a greater share of its employment in finance will have a greater estimated growth rate in employment. This measure of employment growth is independent of any effect of a purely local event like the Olympics.<sup>15</sup>

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<sup>14</sup> For Canada: Calgary, Edmonton, Halifax, Montreal, Ottawa, Regina, Toronto, Vancouver, and Winnipeg. For Australia: Adelaide, Brisbane, Canberra, Darwin, Hobart, Melbourne, Perth, and Sydney. For the US, quarterly construction employment is available for only available for 42 of these metropolitan areas

<sup>15</sup> Categories for Canada are agriculture, natural resources, utilities, construction, manufacturing, trade, transportation, finance, professional activities, business services, education, health, information, accommodation, public administration, and other.

In the analysis, to specifically identify the Olympic effect we create identifiers unique to the group of Olympic cities in each country. These capture any difference in the growth rates in the Olympic cities at the year of announcement and the following year, the period from the announcement until the year the Games were held, and the six years following the year of the Games. These measures should capture an average Olympic effect for the collection of Olympic cities, distinct from the effect of estimated employment growth, interest rates, and past changes in the measures of interest (price changes or construction employment growth).<sup>17</sup>

## Results

The most persuasive evidence from real estate markets of a positive impact of the Olympics on the host city's economy would be statistically significant increase in house prices. To be persuasive, this would have to occur across different Olympic cities. Such a rise could reflect either high current and future net economic growth or an increase in the attractiveness of the host city as a destination for real estate investment or as a place to live.

Table 1 summarizes the statistical analysis for the different types of price effects from hosting the Olympic games. There is no consistent evidence that hosting the Olympic games results in either higher or lower house prices and as well

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<sup>17</sup> All regressions include city specific fixed effects (which adjust for the average level in each city) and year and quarterly fixed effects (which adjust for average effects across all cities in a given year or by season). For the US, these year effects are unique to each of the four census regions.

there is, no pattern for an effect during the announcement period, the lead-up to the Games, or the period following. The announcement of the awarding of the Games had a small but still statistically non-zero effect in Australia (Sydney), but nowhere else. The US host cities had higher price growth following the Olympics, but this was not statistically different from the price growth in the three similar cities that did not host the Games.<sup>18</sup> These positive effects, though, are neither consistent enough across cities, or distinct enough from the matching cities, to constitute robust evidence of a positive effect of hosting the Games on local real estate prices.

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<sup>18</sup> A “placebo test” rejects the finding of a unique Olympic effect.

**Table 1 Hosting the Olympics: Effect on House Prices**  
**Percentage Point Change per Year in Price Growth**

|                                                                                                                                                                                                                                                                                                                                                        | Australia                    | Canada                | US                                   |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------|-----------------------|--------------------------------------|
| Announcement                                                                                                                                                                                                                                                                                                                                           | 0.7 percentage points higher | No significant effect | No significant effect                |
| Announcement to Olympic Year                                                                                                                                                                                                                                                                                                                           | No significant effect        | No significant effect | No significant effect                |
| Six Years Following Olympic Year                                                                                                                                                                                                                                                                                                                       | No significant effect        | No significant effect | No distinct effect*                  |
| Years                                                                                                                                                                                                                                                                                                                                                  | 1988-2009                    | 1978-2009             | 1981-2009                            |
| Olympic Cities                                                                                                                                                                                                                                                                                                                                         | Sydney                       | Calgary, Vancouver    | Atlanta, Los Angeles, Salt Lake City |
| Notes                                                                                                                                                                                                                                                                                                                                                  |                              |                       |                                      |
| 1) “*” Indicates that the growth rate in house prices was higher, but that it was not different from a similar city that did not host the Olympics                                                                                                                                                                                                     |                              |                       |                                      |
| 2) Regression model dependent variable is percent change in house prices from previous year. All regression models include city and quarter fixed effects. Australia and Canada include year effects. The US includes region specific year effects (four census regions) and dummies for sand states pre (2004-06) and post (2007-09) subprime crisis. |                              |                       |                                      |

Construction employment should be the one sector of the economy that is positively affected by the Games. The need to construct venues and the infrastructure improvements that accompany hosting all increase the level of construction activity. It would be surprising if the Games related construction completely crowded out other activity yielding no net change in construction

employment. Table 2 shows the effects of hosting the Games on the rate of growth in construction employment. Across all countries, construction employment growth is significantly higher in the period leading up to the Olympics. While not surprising, it does serve as a confirmation off the validity of our methodology. Any post-Olympic effects are not as consistent, though interestingly there is no evidence of any negative “bust” effect on construction employment.

**Table 2: Hosting the Olympic Games: Effect on Construction Employment Percentage Point Change per Year in Employment Growth**

|                                  | Australia                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Canada                       | US                           |
|----------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------|------------------------------|
| Announcement to Olympic Year     | 1.7 percentage points higher                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 4.3 percentage points higher | 3.9 percentage points higher |
| Six Years Following Olympic Year | No significant effect                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | No significant effect        | 2.9 percentage points higher |
| Years                            | 1988-2009                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 1988-2009                    | 1990-2009                    |
| Olympic Cities                   | Sydney                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Calgary, Vancouver*          | Atlanta, Salt Lake City**    |
| Notes                            | <p>1) * - For Canada, pre-Games is based on Vancouver, post-Games on Calgary data.</p> <p>2) ** - For the US, there was no counter-factual analysis with Olympics assumed to be held in a different, but similar city, because of a lack of data</p> <p>3) Regression model dependent variable is percent change in construction employment from previous year. All regression models include city and quarter fixed effects. Australia and Canada include year effects. The US includes region specific year effects (four census regions) and dummies for sand states pre (2004-06) and post (2007-09) subprime crisis.</p> |                              |                              |

Our methodological approach involves comparing the Olympic cities in a country as a group against the non-Olympic cities and seeing if the difference in growth rates in periods leading up to and following the games meets the standard statistical tests for a valid difference. For price growth they did not. It is instructive to see this visually as well. Below we present figures that compare price growth for five Olympic cities with a non-Olympic city that is “similar.” This presentation is conceptually identical to the PH&N (2008) report, though we make a much more objective effort to define similar based on geography, size, and industrial composition.<sup>19</sup> Our comparison is entirely visual with no statistical tests.

We did use these cities to perform “placebo” tests. In this approach the treatment, hosting the Games, is given to the similar cities instead of the actual hosts. The statistical analysis is re-run with the Olympic identifiers “mis-applied” to the matching cities instead of the actual host Olympic host cities. In these we found not statistical evidence of higher or lower growth in house prices than we found with the analysis applied to the actual host cities. However, growth in construction employment was consistently higher in the actual Olympic city in the period leading up to the Games and not in the matching cities.

Figure 1 compares Calgary with Edmonton. Both are of similar size and in the

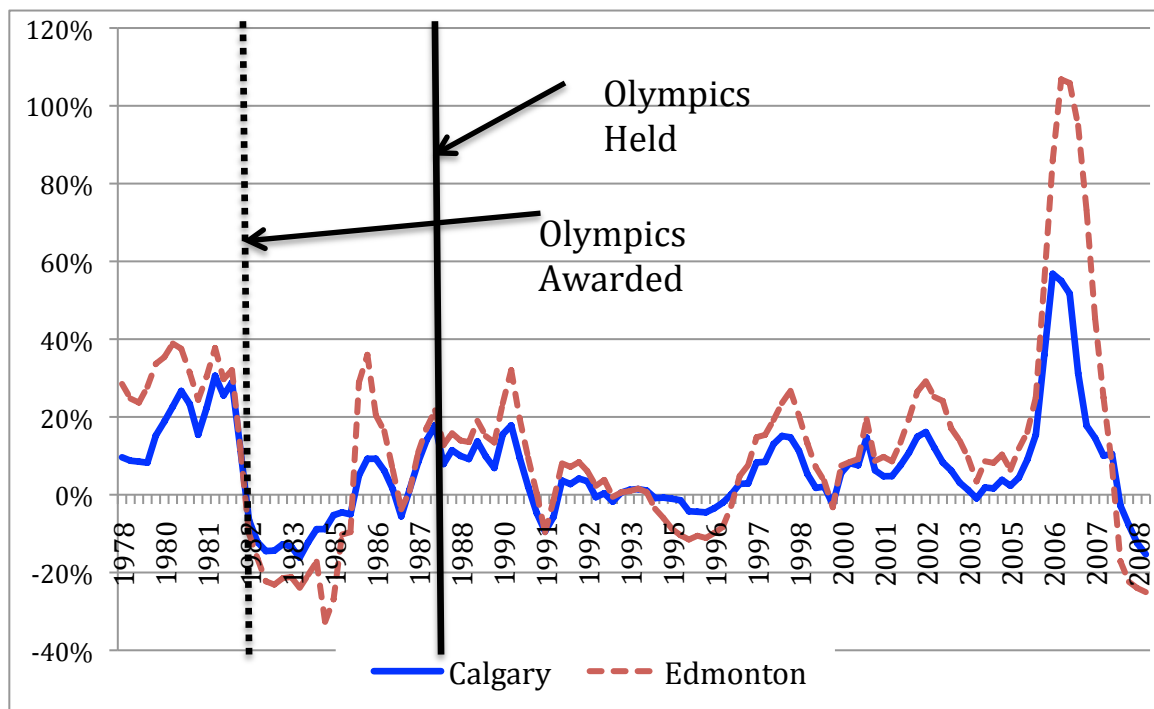
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<sup>19</sup> For industrial composition we identify cities with the lowest sum of the squared deviation in industrial shares when compared with our Olympic city and then pick the city closest in size and geography.



same Canadian province. While Calgary had faster house price growth immediately prior to the Olympics, this just offsets the lower growth rate in the years prior to that and after the awarding of the Games.

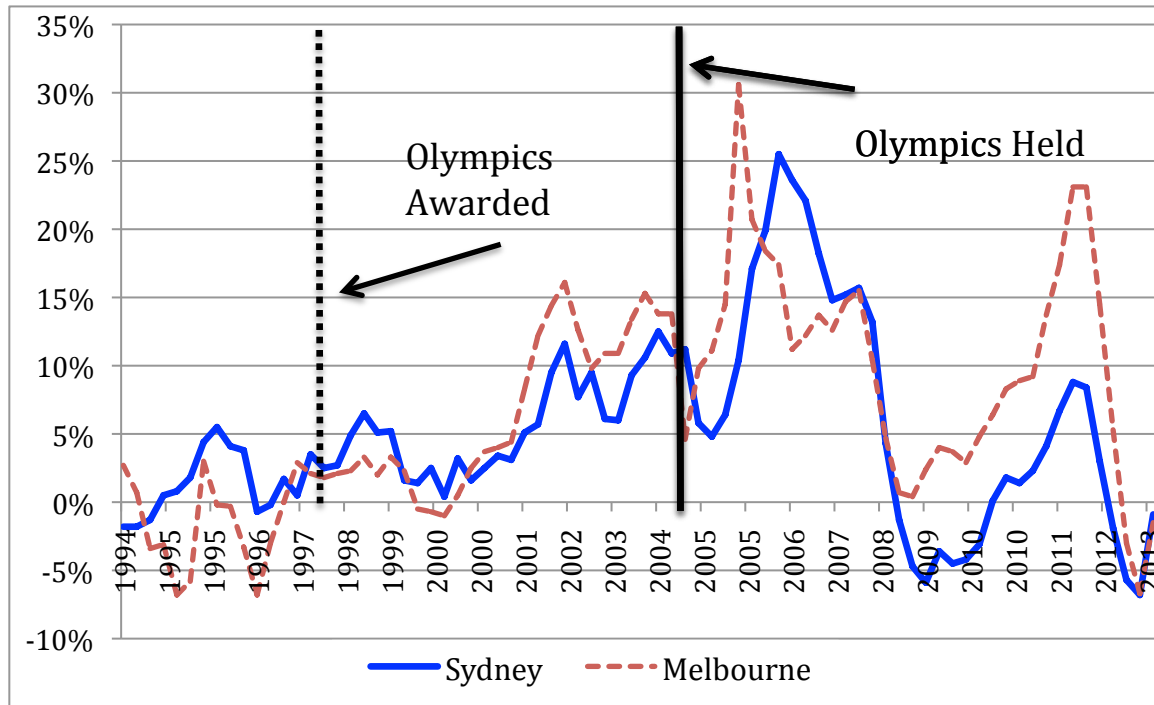
**Figure 1: Comparing Price Growth  
Calgary vs. Edmonton**



Source: UBC Centre for Urban Economics and Real Estate calculations of Royal LePage Survey of Canadian House Price data

In Figure 2 we do the same comparison for Australia: matching Sydney and Melbourne. Melbourne is really the only other city in Australia that might be compared with Sydney, second in size and importance as a business centre. If anything, Figure 2 suggests better house price performance in Melbourne than in Sydney in both the lead-up and then period immediately following the Games.

**Figure 2: Comparing Price Growth  
Sydney vs. Melbourne**



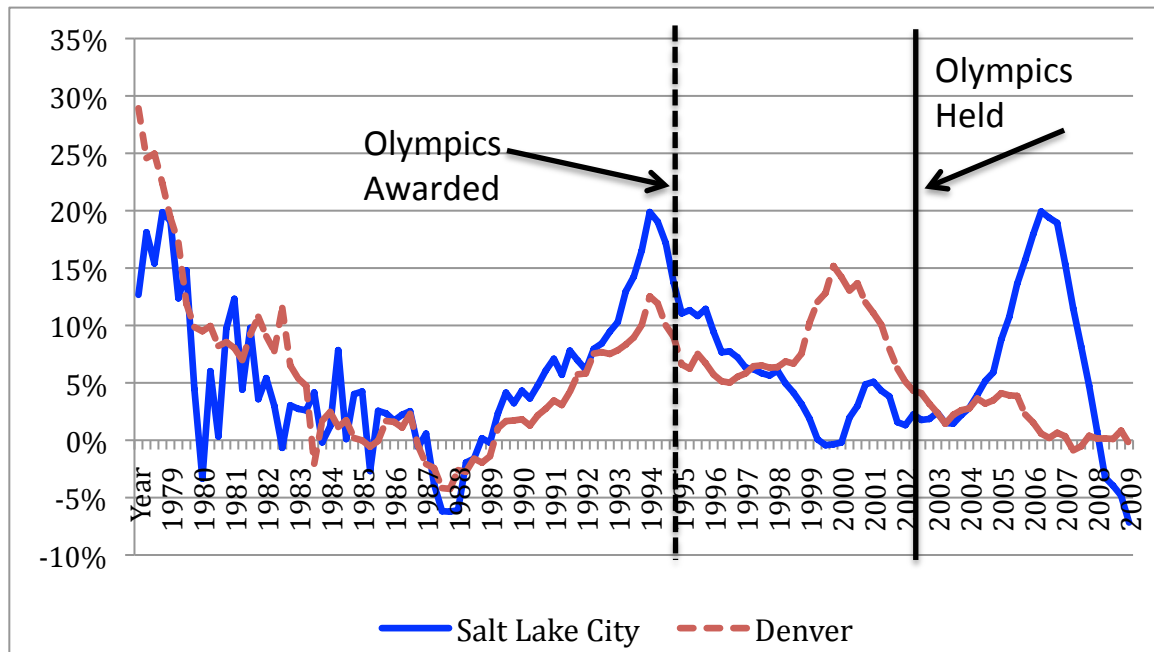
Source: Australian Bureau of Statistics.

The sample of US metropolitan cities is so large that to match an Olympic city with a pair, we used similarity of the local economy as the first criteria: identifying other cities whose shares of employment in each industrial classification category is statistically similar to that of the host city. Then identifying cities in the same broad region and where possible similar in size. The pairing for Atlanta is Dallas, for Los Angeles is Seattle, and for Salt Lake City, Denver. Figures 3A-3C present the price growth comparisons for the US cities.

In Figure 3A we compare Salt Lake City and Denver. In the pre-Olympic period, there are years when each city has faster price growth than the other. In the four years preceding and three years following the Games, Salt Lake City did not have a higher house price growth rate than did Denver. The faster growth rate at and following the announcement is no different than the higher growth rate prior to announcement and offset by the slower growth in the later lead-up period. While it appears Salt Lake City had a noticeably higher house price growth rate in part of the post-Olympic period (after 2004), this is also the sub-prime house price growth period.

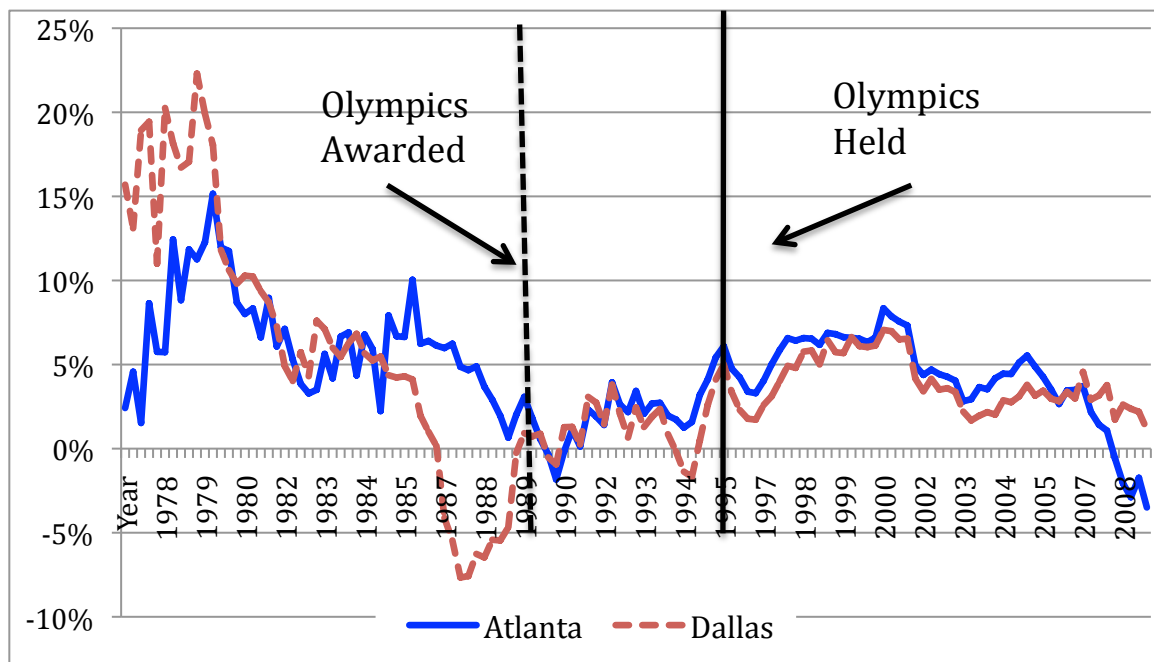
Figure 3B makes the same type of comparison, this time between Atlanta and Dallas. With the exception of one quarter during 1994, two years prior to the games, the house price growth rates for the two cities between 1989 and 2003 are practically indistinguishable .

**Figure 3A: Comparing Price Growth  
Salt Lake City vs. Denver**



Source: Federal Housing Finance Agency (FHFA).

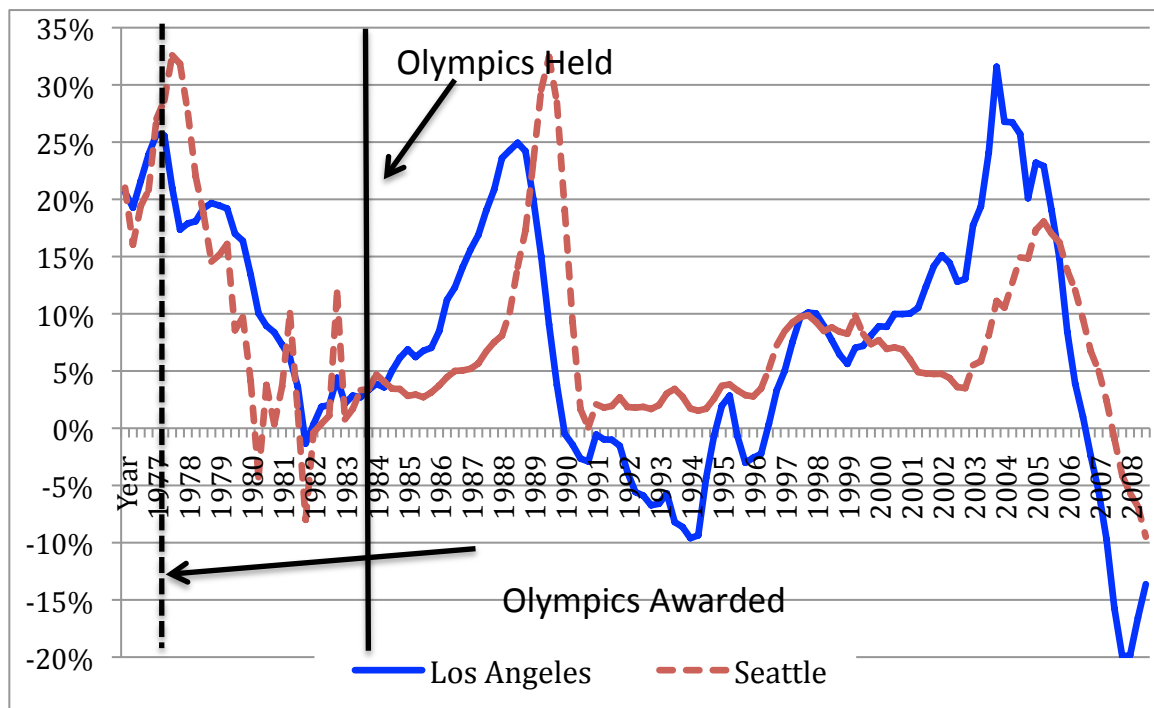
**Figure 3B: Comparing Price Growth  
Atlanta vs. Dallas**



Source: Federal Housing Finance Agency (FHFA).

Finally, Figure 3C makes the same pairwise visual comparison, this time between Los Angeles and Seattle. Los Angeles is the most difficult city to pair because only New York and Chicago are comparable in size. Surprisingly, though Seattle's industrial mix most closely matches Los Angeles's of all the cities in the data and both are West Coast cities. In the first few years after the awarding of the Games, Seattle had a higher rate of house price growth, though Los Angeles's rate was higher for several of the pre Games years. Los Angeles, does clearly have a higher post Games growth rate, but is the only Olympic city in our study with this clear difference.

**Figure 3C: Comparing Price Growth  
Los Angeles vs. Seattle**



Source: Federal Housing Finance Agency (FHFA).

## Conclusion

Our paper is unique in that it is the first to rigorously use real estate variables as a proxy to test for whether hosting the Olympic Games has a material economic impact on the host city. Our analysis leverages the unique characteristics of real estate as an asset class, and housing in particular, to capture any significant *local* variation resulting from a wealth or amenity effect. We do not find support for the argument of host city backers that the hosting the Olympics delivers positive economic benefits, nor of the arguments made by opponents that there is some post-Olympic bust. Our results conclusively demonstrate that while construction employment dramatically increases in the period prior to the Games, house prices are the same as they would be in the absence of the Games.

This study suggests that there is not an economic argument that justifies pursuing hosting the Games. We do not feel that economics alone need be the litmus test for hosting the Games. Parties, festivals, and celebrations may not meet an economics test, but they do make life interesting to live. The decision to pursue excellence in sport is not a rational economic decision for the majority of the competing athletes. The Olympics provide a reminder to us all as to the importance of commitment and dedication in the pursuit of a goal and the disregard for the odds. The athletes spark our collective imagination and inspire us. While the impact of this intangible element on the public conscious can never be quantified it is the strength of the Olympic Movement and a reason why hosting and participating in the games carries so much prestige.



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## Data Appendix

### **Metropolitan Areas**

*Australia:* Capital cities of each of the eight Australian States: Adelaide, Brisbane, Canberra, Darwin, Hobart, Melbourne, Perth, and Sydney.

*Canada:* Selected by size and for national scope. Calgary, Edmonton, Halifax, Montreal, Ottawa, Regina, Toronto, Vancouver, and Winnipeg.

*US:* All US metropolitan areas (CBSAs) with available price data in the Federal Housing Finance Agency house price index data.

### **House Prices**

Nominal prices, not seasonally adjusted

*Australia:* Australian Bureau of Statistics, established houses, house price index for eight capital cities.

<http://www.abs.gov.au/AUSSTATS/abs@.nsf/DetailsPage/6416.0Sep%202009?OpenDocument>

*Canada:* UBC Centre for Urban Economics and Real Estate calculations using Royal LePage Survey of Canadian House Prices data.

<http://cuer.sauder.ubc.ca/cma/index.html>

*US:* Federal Housing Finance Agency <http://www.fhfa.gov/Default.aspx?Page=14> . All transactions index.

### **Construction Employment**

Not seasonally adjusted

*Australia:* Australia Bureau of Statistics. Employed total in construction. Found in 6291.0.55.003 Labour Force, Australia, Detailed, Quarter:

<http://www.abs.gov.au/AUSSTATS/abs@.nsf/Lookup/6291.0.55.003Main+Features1Nov%202009?OpenDocument>

*Canada:* Data accessed by Cansim II. All series from [Table 2820056](#) - Labour force survey estimates (LFS), employment by census metropolitan area and North American Industry Classification System (NAICS), 3-month moving average, unadjusted for seasonality, monthly (Persons).

*US:* US Bureau of Labor Statistics, Employment, Hours, and Earnings - State and Metro Area (Current Employment Statistics - CES), supersector 20.

<ftp://ftp.bls.gov/pub/time.series/sm/>. Quarterly construction employment is only available for a limited number of metropolitan areas.

### **Interest Rates**

*Australia:* Reserve Bank of Australia, banks standard variable housing loan rate

<http://www.rba.gov.au/statistics/by-subject.html>

*Canada:* Bank of Canada, Average residential mortgage lending rate, chartered banks, 5 year, Cansim II Series V122497. Chartered banks, prime lending rate, Cansim II Series V122495.

*US:* Board of Governors, Federal Reserve System, 30-Year Conventional Mortgage Rate and Bank Prime Loan Rate: <http://research.stlouisfed.org/fred2>

### **Estimated Employment**

Not seasonally adjusted. Calculated by taking the share of employment in a given industrial class, and then using this as weights when multiplying by the national growth rate in employment in each of those classes.

*Australia:* Australia Bureau of Statistics. 06291.0.55.003 Labour Force, Australia, Detailed, Quarter:

<http://www.abs.gov.au/AUSSTATS/abs@.nsf/Lookup/6291.0.55.003Main+Features1Nov%202009?OpenDocument>

*Canada:* Shares based on 1987-09 average share by sector by census metropolitan area. Statistics Canada, Labour force survey estimates (LFS), employment by census metropolitan area and North American Industry Classification System (NAICS), 3-month moving average, unadjusted for seasonality, monthly (Persons). Data accessed by Cansim II. All series from [Table 2820056](#) -

*US:* Shares based on 2006-08 average share by sector by metropolitan area. Metropolitan area and national data from the US Bureau of Labor Statistics:

<http://www.bls.gov/data/#employment> .

### **Housing Starts**

Not seasonally adjusted

*Australia:* Australia Bureau of Statistics. 8731.0 - Building Approvals. Table 10. Number of Dwelling Units Approved, By Capital City Statistical Division:

<http://www.abs.gov.au/AUSSTATS/abs@.nsf/DetailsPage/8731.0Oct%202009?OpenDocument>

*Canada:* Canada Mortgage and Housing Corporation, housing starts, under construction and completions in selected census metropolitan areas, monthly (Units). Accessed by Cansim II. All series from [Table 270048](#)

*US:* US Census Bureau, Manufacturing, Mining, and Construction Statistics. All data annual building permits, total. <http://www.census.gov/const/www/permitsindex.html>