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## Estimating the Value of Medal Success at the 2010 Winter Olympic Games

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**Abstract:** We estimate Canadians' willingness to pay (WTP) for success by Team Canada in the 2010 Winter Olympics. The Canadian government subsidized elite athletes in the run up to the 2010 Games through the *Own the Podium* program, which was designed to increase Canada's medal count. WTP estimates from a contingent valuation method (CVM) study using data from nationally representative surveys before and after the Games suggest that *Own the Podium* generated intangible benefits of between 3 and 5 times its cost. The aggregate value of the intangible benefits generated by the program was between \$719 million and \$3.4 billion.

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## **I. Introduction**

Many national governments subsidize elite athletes to make them more competitive in international competition, especially the Olympic Games. For example, Germany has spent hundreds of millions of dollars on schools developed to identify and train elite athletes. China subsidizes talent identification and coaching, especially in sports that Western nations neglect. Australia began a similar strategy after failing to win a gold medal in the 1976 Summer Olympic Games. Japan in 2000 spent \$185 million on a National Training Center and in 2003 began spending about \$5 million per year in subsidies to athletes judged to be potential medal winners. (I. Johnson, 2008, p.A1). Swiss federal and cantonal governments directly and indirectly provide about \$35 million per year to Swiss Olympic, the Swiss National Olympic Committee, with medium-term goals to place in the top 8 Winter and top 25 Summer medal counts (Swiss Olympic, 2010, pp. 6, 10).

The Canadian government, through Sport Canada, operates three programs designed to develop and support elite athletes: the Sport Support Program, the Hosting Event Program, and the Athlete Assistance Program. In 2007-08, Sport Canada provided these programs a total of \$119.6 million in support. In addition, Canada spent \$110 million on its *Own the Podium* program, geared specifically toward enhancing Canadian performance in the 2010 Vancouver Winter Olympics. To that point, Canada was one of only two host nations not to win a gold medal at its own Olympics, and had the dubious distinction of being the only host to be shut out twice at home, at both the 1976 Summer Games in Montreal and the 1988 Winter Games in Calgary. Created in 2005, *Own the Podium* was intended to help Canada achieve a best-ever finish in the medal count in Vancouver. Whether due to *Own the Podium* or not, Canada did extremely well in the Vancouver Games, winning an all-time, all-nation, Winter Olympics record 14 gold medals, and finishing third behind the United States and Germany in the overall medal count with 26.

Before the Vancouver Games, many Canadians approved of government spending to support elite athletes. In July of 2006, a survey by NRG Research Group found that 73 percent of Canadians approved of the *Own the Podium* program's goal of making Canada win the medal count and place in the top three countries in gold medals in 2010. In addition, 69 percent of Canadians reported that it was important for Canada to be the top medal finisher in 2010 (NRG Research Group, 2006). While Canadians and others clearly approve of the use of public funds to support their nations' elite athletes, to this point there has been no attempt to compare this support to the actual level of spending on elite athletics by national governments. In other words, do the benefits exceed the costs in this case?

The economic benefits of Olympic success for a nation's athletes would come primarily from public goods such as national pride.<sup>a</sup> In this paper, we undertake a Contingent Valuation Method (CVM) study of the intangible benefits generated by the performance of Canadian athletes in the 2010 Vancouver Winter Olympic Games. This project represents an important extension of sports CVM research into a previously unexamined area. Based on data from two nationwide surveys, estimates suggest that the benefits of Canadian spending on elite athletes far exceed the costs. This finding stands in stark contrast to those in nearly every other published CVM analysis of the benefits of sports-related public goods, which almost invariably find that costs exceed benefits.<sup>b</sup>

## **II. CVM and willingness to pay for sport success**

The contingent valuation method (CVM) is a survey technique widely used by economists to measure the value of public goods, first adapted to sports by Johnson and Whitehead (2000). The idea behind CVM research is straightforward. Respondents are presented with a hypothetical market in which they can pay for a specified increase in a public good or pay to avoid a specified loss of a public good. Their willingness to pay is contingent upon the hypothetical scenarios and markets described to them in the survey, hence the name "contingent valuation method" (Mitchell and Carson, 1989). An example would be a scenario suggesting that a professional sports team might relocate unless the team is purchased by the host city; to buy the team, a yearly tax on local households would be required (see, for example, Johnson, Mondello & Whitehead, 2007).

Sports CVM research covering a diverse set of scenarios have been conducted, analyzing willingness to pay for public goods produced by the National Hockey League's Pittsburgh Penguins (Johnson, Groothuis, and Whitehead, 2001), the National Football League's Jacksonville Jaguars (Johnson, Mondello, and Whitehead, 2007), a hypothetical National Basketball Association team in Jacksonville, Florida (Johnson, Mondello, and Whitehead, 2007), a hypothetical Major League Baseball team in Portland, Oregon (Santo, 2007), the NFL's Minnesota Vikings (Fenn and Crooker, 2009), a college basketball arena and a minor league baseball team in Lexington, Kentucky (Johnson and Whitehead, 2000), and amateur sports and recreation programs in Alberta, Canada (Johnson, Whitehead, Mason, and Walker, 2007).

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<sup>a</sup> Other benefits include reduced health care costs associated with Canadians becoming inspired by the athletic performances of elite athletes and becoming more active themselves.

<sup>b</sup> A notable exception is Fenn and Crooker, (2009), who found that the benefits of keeping the Minnesota Vikings in the state roughly equaled the cost of a new stadium.

The CVM has recently been used to value the intangibles of hosting major world sporting events. Atkinson, Mourato, Szymanski, and Ozdemiroglu (2008) surveyed residents in London, Glasgow, and Manchester, UK, and estimated that Britons were willing to pay in excess of \$3 billion for the intangible benefits generated by hosting the 2012 Summer Olympics in London. Walton, Longo, and Dawson (2008) surveyed people from Bath and southwest England and also found substantial willingness to pay for the intangible benefits generated by the London Olympics. Sussmuth, Heyne and Maennig, (2010) surveyed Germans' willingness to pay to host the 2006 FIFA World Cup football tournament. Their survey conducted before the Cup found a willingness to pay of \$467 million for the "feel-good" factor of hosting the World Cup. A follow-up survey conducted after the Cup found willingness to pay had risen to \$1.1 billion.

To date, no CVM study has estimated the value of national pride and unity generated by watching fellow citizens win Olympic medals. Certainly, much anecdotal evidence suggests that people value their nation's elite athletic success. For example, the 1972 Summit Series hockey games between Canada and the Soviet Union are regarded as a defining moment in Canadian history. In the Olympics, a similar response was engendered by the gold medal success of both the Canadian men's and women's ice hockey teams at the 2002 Games in Salt Lake City. Many people consider the 1980 Olympic hockey victory of the United States over the Soviet Union one of America's greatest sporting triumphs. Fans around the world follow the daily medal counts during the Olympics to see where their nations stand. People seem pleased when their nation does better than expected and displeased when it underperforms. Television ratings spike if a nation's athletes are contending for the gold medal. This obvious interest is invoked to justify the subsidies governments provide to aspiring Olympians who will represent their countries. The CVM analysis in this study will allow comparison of the costs of Canada's subsidies to the benefits, as measured by the estimated willingness to pay for national pride and unity generated by Olympic gold.

### **The theoretical basis for CVM analysis**

Suppose survey respondents possess a utility function  $u = u(x, b, z)$  where  $u$  is increasing in  $x$ ,  $b$ , and  $z$ ;  $x$  measures consumption of sporting events,  $b$  captures the existence of sports public goods, which is increasing in the Olympic medal count, and  $z$  is a composite commodity of market goods. Sport produces both public and private goods. The budget constraint is  $y = z + px$  where  $y$  is income and  $p$  is the money cost of sports consumption, including ticket prices and costs of travel to

sporting events. The price of the composite commodity is normalized to one and the existence of sports public goods is an unpriced non-market good.

Solving the utility maximization problem yields the indirect utility function,  $u = v(p, h, y)$ , which is decreasing in  $p$  and increasing in  $h$  and  $y$ . If respondents minimize expenditures,  $z + px$ , subject to the utility constraint, the resulting expenditure function is  $e = e(p, h, u)$ . The expenditure function is increasing in  $p$  and  $u$  and decreasing in  $h$ . With the elimination of sports ( $h = 0$ ), the expenditures necessary to reach the reference utility level increase. The difference between expenditure functions is the willingness to pay for sports

$$(1) \quad \text{WTP} = e(p', 0, u) - e(p, h, u)$$

where WTP is willingness to pay and  $p'$  is the price at which no sports are consumed. Substitution of  $v(p, h, y)$  into (1) for  $u$  yields the compensating variation (CV) function

$$(2) \quad \text{CV} = e(p', 0, v(p, h, y)) - y$$

where  $\text{CV}(p, h, y)$  is the variation function and  $y = e(p, h, v(p, h, y))$ . The effect of changes in income on the compensating variation can be found from

$$(3) \quad \partial \text{CV} / \partial y = (\partial e' / \partial v)(\partial v / \partial y) - 1 = (\partial e' / \partial v) / (\partial e / \partial v) - 1$$

where  $e' = e(p', 0, v(p, h, y))$ . If  $h$  is a normal good, the marginal cost of utility is lower with the existence and availability of sports,  $(\partial e' / \partial v) / (\partial e / \partial v) > 1$ , and the income effect is positive,  $\partial \text{CV} / \partial y > 0$ . If  $h$  is an inferior good the income effect is negative.

The valuation function can be decomposed into use and nonuse values. Nonuse value (NUV) is the amount of money people are willing to pay when attendance is zero

$$(4) \quad \text{NUV} = e(p', 0, v(p, h, y)) - e(p', h, v(p, h, y)).$$

Note that the choke price is invoked in each expenditure function. Use value is the willingness to pay for attendance at a sporting event. Use value (UV) is the difference between equations (2) and (4)

$$(5) \quad \text{UV} = e(p', h, v(p, h, y)) - y.$$

Use value is the willingness to pay to avoid the choke price with sports remaining available.

By correlating the willingness to pay responses with responses about sports public goods consumption, the relationship between household willingness to pay and consumption of such public goods as civic or national pride can be determined. Willingness to pay can also be correlated to such personal and demographic characteristics as sex, age, race, income and education.

### III. Methodology

To assess Canadian households' willingness to pay for Olympic medal success, we conducted two nationally representative surveys, one before the Games, in October and early November 2009, and the other after the Games, in April and May 2010. The random digit dial telephone surveys contacted samples stratified by region and gender, including a large subsample of respondents contacted in both surveys.

The survey began with a series of 17 questions to get respondents thinking about the 2010 Winter Olympic Games and ended with the usual questions about respondents' socio-economic and demographic characteristics.

The heart of the survey revolved around the hypothetical scenarios and questions eliciting willingness to pay for Olympic success. Before the Games, the survey informed respondents that Canadians ranked third in total medals at the 2006 Winter Olympic Games and asked how satisfied they were with that performance. After the Games, it informed respondents about Canada's 2010 performance. It then informed them that the federal government spends about C\$120 million per year, or about C\$10 per household to support athletes participating in both the Summer and Winter Olympic Games. Respondents were asked whether they supported such spending. Then they were told that the *Own the Podium* program accounts for \$3 of annual spending per Canadian household and were asked whether they thought the *Own the Podium* program could increase the number of Olympic medals won by Canadians in Vancouver. Those responding yes were led through a series of questions to determine how many more gold and total medals Canadians might be expected to win as a result of the *Own the Podium* program.

These questions set up the following hypothetical scenario:

*Suppose that continuing to use federal money to fund the training of elite athletes for the Olympic Games were put to a vote. If more than half of all voters were in favour of the proposal then it would pass. Remember, if the proposal passed a typical household would continue to pay about \$13 per year. If the proposal does not pass, the typical household would have about \$13 more to spend on other things each year. Do you think that you would vote for or against the proposal?*

This scenario allows us to estimate willingness to pay for success in the Vancouver Games and conduct a simple cost-benefit analysis of the *Own the Podium* program.

Next the respondents were presented with a hypothetical scenario about expanded funding of *Own the Podium* for the 2014 Winter Olympic Games. They were told that the extended program

would be financed by an annual income tax surcharge for three years of one of the following amounts: \$10, \$25, \$35, \$50 or \$65. They were asked if they thought this could increase the number of medals won by Canadians in the 2014 Winter Games. If they said yes, they were asked a series of follow-up questions to determine how many more total and gold medals Canadians might win, and whether they would be satisfied with these increases.

Then the respondents were asked how they would vote in a referendum on the income tax surcharge in one of various amounts. If they said they would vote for the proposal, they were asked whether they would be willing to pay more and, if yes, “How high would it be before you voted against the proposal?” If their initial answer was no, they were asked if they would vote for the proposal with a lower surcharge, and if so, “How low would it need to go before you voted for the proposal?”

The survey responses allow estimation of willingness to pay for Canadian medal success and to what extent it varies with personal and regional characteristics. The panel nature of these data allow a test of the temporal reliability of willingness to pay (Carson et al. 1997). In other words, is willingness to pay stable over time? Temporal reliability is not necessarily an expected CVM result when a significant intervening variable such as the 2010 Winter Games arises (Whitehead and Hoban, 1999). The only other test of temporal reliability in a sport CVM analysis, Sussmuth, Heyne and Maennig, (2010), found that Germans’ willingness to pay to host the 2006 FIFA World Cup Championship more than doubled after the tournament.

#### **IV. Results**

The response rate to the pre-Olympic survey, calculated as the percentage of eligible phone numbers contacted who completed the interview, was 19.6 percent. 1,540 Canadians answered the pre-Olympic Games survey. The response rate for those called the first time in the post-Olympic survey was slightly higher than in the earlier survey, about 22 percent. After the Olympics, 1,660 answered, including 758 who responded to the first survey. The sample was stratified by region and gender to represent the Canadian population. Residents of British Columbia were oversampled to gain additional information about the use value of the Olympic Games.

Table 1 summarizes responses to several questions about pride in Canada’s success at, and hosting of, the Olympic Games. Before the Games, 88 percent of respondents were proud to host the Games. Nearly as many expected to feel proud if Canadians won more gold medals than US



athletes, nearly 92 percent if Canadians won more gold than any other country's athletes, and more than 94 percent whenever a Canadian won gold. The answers were not much different after the Games, with the percentage changes in proud responses ranging from -3.9 percent to +6.3 percent.

Not only are Canadians proud of their Olympic success, they also think it is important. Table 2 summarizes the responses, before and after the Olympics, to three questions about the importance of winning Olympic medals. Before the Games, about 59 percent of respondents agreed that it was important for Canadians to win the most gold medals. The percentage rose to nearly 68 percent after the Games. The responses to whether it was important to win more gold than Americans were similar, at about 53 percent before and about 65 percent after the Olympics. As to whether Canada's medal count was important to its standing in the world, the percentage agreeing rose from 67.3 to 84.0, an increase of 24.8 percent.

Clearly, respondents thought Olympic medals are important to Canada, especially after experiencing such great success in Vancouver. But it costs respondents nothing to say they think medals are important. Would they put their money where their mouths were?

To determine whether the benefits of Canadian medal success exceed the costs of existing subsidies, including *Own the Podium*, respondents were asked if they would vote in favor of a referendum to continue paying taxes of \$13 per household per year, the current level of federal spending on elite athletes. Adjusting for certainty to mitigate hypothetical bias<sup>a</sup>, 54.3 percent said before the Games that they would vote yes. After the Games, support increased significantly, with 80.9 percent<sup>a</sup>, adjusted for certainty, willing to vote yes.

The large increase in the percentage of people willing to continue funding at the current level suggests that the “feel-good” effects detected by Sussmuth, et al. (2010) after the 2006 FIFA World Cup in Germany appear to be operating in Canada, as well. It also suggests an increase in the willingness to pay for Olympic success. To quantify the willingness to pay beyond the current level, before the Olympics, respondents were also asked whether they would support increased funding of *Own the Podium* for the 2014 Winter Olympics at levels of \$5, \$10, \$20, \$30, \$35, \$50 or \$65 per year over three years through an income tax surcharge. After the Olympics the tax surcharge amounts

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<sup>a</sup> Fifty-nine percent said they would vote in favor of the referendum. They were asked to rate, on a scale of 1 to 10, how certain they were that they would really vote yes in a referendum. After recoding as no the yes votes of the uncertain responders (those indicating certainty less than 7), 54.3 percent would vote yes. Recoding for certainty mitigates hypothetical bias, the tendency of survey respondents to overstate their willingness to pay in hypothetical situations (Loomis 2011).

were adjusted upward to \$15, \$25, \$35, \$50, \$65, \$75, \$100, and \$150 because early responses indicated an apparently much higher willingness to pay than before the Olympics.

Table 3 summarizes the responses, both before and after the Games, and before and after adjusting for certainty. The percentage of those voting for drops as the bid amount increases, consistent with economic theory. Even after adjusting for certainty, more than half the respondents in the pre-Olympics survey said they would vote for higher taxes to extend *Own the Podium* for the 2014 Winter Olympics. Adjusted for certainty, the percentage of respondents who said they would vote for higher taxes rose from 52 percent before the Games to 58 percent after. The percentage in favor rose despite the fact that hypothetical tax increases rose after the Olympics, with bid amounts ranging from \$15 to \$150 in the spring as opposed to the autumn range of \$5 to \$65. While most bid amounts from the first survey were not used again in the second, three were: \$35, \$50, and \$65. The percent voting yes at each of these bid levels rose substantially after the Games. For instance, 39 percent were certain they would vote yes at \$65 before the Games, while 55 percent would have voted yes after the Games.

Average household willingness to pay for *Own the Podium* can be estimated with a probit model of the referendum decision, where an indicator variable identifying individuals who reported they were certain they would vote in favor of a referendum for higher taxes is regressed on the amount of the proposed tax:

$$(6) \quad \text{FORSURE} = f(\text{TAX}, e)$$

Where  $e$  is a mean zero, constant variance, random variable capturing other factors that affect a respondent's voting behavior. FORSURE is equal to 1 if the respondent is certain she would vote in favor of the referendum for higher taxes and 0 otherwise. TAX is the dollar amount by which respondent's annual household tax bill would rise if referendum passed. This probit model was estimated with data from two samples, one using all responses to the pre-Olympic survey and the other using all responses to the post-Olympic survey. Because of item non-response to some important demographic questions asked later in the survey, the sample for the pre-Olympic survey dropped from 1,540 to 1,253 while the sample for the post-Olympic survey dropped from 1,660 to 1,514. Table 4 lists variable names, definitions, and expected signs of all variables used in the estimation of willingness to pay to support *Own the Podium* for the 2014 Winter Olympics. Table 5

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<sup>a</sup> 87.7 percent were in favor before adjusting for certainty.

shows the summary statistics for those variables for respondents to the pre-Olympic survey and the same for respondents to the post-Olympic survey.

The estimates of average household WTP appear in Table 6. Willingness to pay is estimated from the probit coefficients using the procedures described in Cameron and James (1987). The standard errors for willingness to pay and marginal effects on willingness to pay are obtained from the asymptotic covariance matrix by the Delta method (Cameron, 1991). As the bid amount increases, the probability of voting in favor falls, consistent with the summary statistics reported in Table 3. The average willingness to pay rose dramatically after the Olympics, from about \$45 per household to about \$91. Even before the Olympics, Canadians' willingness to pay for Olympic medals far exceeded federal government spending to promote Canadian elite athletic success. Based on about 12.5 million households<sup>a</sup>, aggregate ex ante willingness to pay has an upper bound of about \$562 million, using data from the pre-Olympic survey. Because the hypothetical called for a three-year surcharge, the undiscounted total willingness to pay based on the preliminary results from the pretest is roughly \$1.68 billion. Discounting at 5 percent, the present discounted value of ex ante WTP is not much different, about \$562m + \$535m + \$510m, or about \$1.6 billion, which is shown on the next to last line of Table 5.

Assuming survey non-respondents have a willingness to pay of zero, a highly conservative estimate of aggregate willingness to pay would be 19.6 percent of the estimates above, or \$110 million per year with a present discounted value of about \$315 million. This can be interpreted as a lower bound on total WTP. Even the lower bound estimates would be large enough to justify continuing the Own the Podium program at present levels of government funding.

The ex post average WTP leads to much larger aggregate WTP figures. After the Olympics, the average WTP of about \$91 per household leads to an ex post annual aggregate WTP of about \$1,143 million, and a three-year undiscounted WTP of \$3,429 million. Discounting at 5 percent for three years yields a present value of about \$3,268 million. This estimated willingness to pay is slightly larger than the estimated WTP found by Atkinson, et al. (2008) in the UK associated with hosting the 2012 Olympic Games in London, 2 billion Pound Sterling, which is about 3.25 billion Canadian dollars at current exchange rates. However, the Atkinson, et al. (2008) WTP estimate is for hosting, while this estimate is for success in the games.

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<sup>a</sup> According to Statistics Canada, based on the 2006 census.

Again assuming survey non-respondents have a willingness to pay of zero, this implies that the lower bound estimates for aggregate WTP after the Olympics increased to about \$251 million per year with a present discounted value of about \$719 million.

The results in Table 6 clearly show a lack of temporal reliability in the CVM estimates of WTP, as expected. The estimated willingness to pay for the *Own the Podium* program from both before and after the Olympics suggest that winning so many Olympic medals is an experience good. Canadians knew, because they had experienced disappointing medal counts in earlier Olympic Games, that they valued superior performances, but since they had never experienced such a showing, they could not accurately estimate just how much they really would be willing to pay until they could see how they felt after experiencing a record-setting gold medal count. Sussmuth, et al. (2010) found a similar lack of temporal reliability in their CVM estimates of the value of hosting the 1996 World Cup in Germany.

The regression results in Table 6 allow an estimate of the average household WTP for a repeat of the 2010 medal performance in 2014, but they cannot be used to estimate the marginal value of another gold medal, nor can they identify respondent characteristics correlated with WTP. For that, the other covariates listed in Table 4 were added to the probit models. The additional covariates include some variables not seen before in sport CVM studies, such as respondents' self-reported health status and life satisfaction. Poor health and low satisfaction could impair a person's ability to enjoy sporting events, and may lead to different preferences than those of healthier or more satisfied people. A variable to measure the effect of national pride on willingness to pay, PRESTIGE, is also included. Respondents were asked if they agree that Canada's standing in the world was affected by its medal count in the winter Olympics. Also included in the model, but not shown here, were provincial dummy variables to control for unobservable heterogeneity in factors affecting WTP across provinces.

Identical models were estimated using data from the pre-Olympic sample and the post-Olympic sample. The results appear in Table 7. There are many similarities between the two sets of results. Both before and after the Olympics, respondents were less likely to vote in favor the higher the proposed tax increase. The more gold, silver, and bronze medals respondents thought *Own the Podium* would generate, the more likely they were to vote for the proposal with higher taxes. Likewise, the higher their income and the higher their self-reported life satisfaction, the more likely they were to support the referendum. Older respondents were more likely to vote in favor of higher

taxes, as were people who agreed that Canada's world standing is affected positively by their Olympic medal count.

Some variables were insignificant both before and after the Olympics. Respondents' self-reported state of health, their employment status, and education level had no statistically significant relationship to their willingness to vote for higher taxes. Nor was planned or actual attendance at the Olympics a factor, implying that enjoyment of Canadian medal success is in no way diminished or enhanced by viewing it in person.

There were a few notable differences in the results before and after the Olympics. While being married had a negative impact on probability of voting for the proposal and higher taxes both before and after, it was statistically significant only after the Olympics, but only at the 10 percent level. In cases where respondents refused to divulge their household incomes, we imputed income using a regression of income on demographic variables. We included a dummy variable, MISSINC, in the probit models to account for the possibility that some systematic error in our income imputation might affect the results. That dummy was insignificant before the Games, but significant after, with a much larger coefficient.

One of the public goods produced by success at the Olympic Games is national unity. The differing effect of gender on willingness to support the referendum may indicate the greater sense of unity produced by Canada's success. Before the Games, males were much more likely to vote for higher taxes than females, and the result was significant at nearly the 1 percent level if the prior is that males are more likely to support spending on sports. But after the Games, males and females were equally likely to support higher taxes for the *Own the Podium* proposal. The parameter estimate on MALE is indistinguishable from zero..

The pre- and post-Olympic probit regression results estimates in Table 7 allow estimation of the marginal values of gold, silver, and bronze medals won by the Canadian Olympic Team. Before the Olympics, respondents' marginal value of an additional gold medal was about \$13.26 ( $t=3.96$ ), while the marginal value of an additional silver or bronze medal was about \$6.10 ( $t=3.49$ ). After the Games, the marginal values rose to \$25.91 ( $t=5.06$ ) for a gold and \$22.78 ( $t=5.21$ ) for a silver and bronze medal. Not only did marginal values rise substantially, but the relative values of gold and other medals changed. Before the Games, respondents valued an additional gold medal more than twice as much as another silver or bronze. The gold and other medals regression coefficients are significantly different at the  $p=.05$  level. After the Games, gold medals were valued at about 13 percent more than silver and bronze and the regression coefficients are not statistically different.

This could be due to the fact that Canada had the highest gold medal count, but not the highest overall medal count at the Vancouver Games. After the Games, silver and bronze medals became relatively more valuable because Canadians felt that if they had won more silver and bronze medals, they would have had the highest overall medal count as well.

Before the Olympics, an increase of one point on the ten point life satisfaction scale increased estimated willingness to pay to support *Own the Podium* by about \$10. After the Olympics, it increased WTP by about \$17. While the Olympic experience increased the willingness to pay at any given level of satisfaction, however, it seems to have had no discernible effect on life satisfaction. The mean level of self-reported life satisfaction remained virtually unchanged, at about 8.54 before the Games and about 8.59 after. It is impossible to say whether that difference, if it is even statistically significant, has anything to do with the outcome of the Vancouver Games. Even if it did, it would add less than a dollar to mean WTP.

## **V. Conclusions**

We performed a CVM analysis of a sports mega-event in a novel context. Previous CVM studies of sporting events estimated the WTP for the presence of a team, or the presence of a mega-event like the Olympic Games or the FIFA World Cup in a country. We focused on WTP for success, in terms of the host national team winning gold medals in the Olympic Games. Canada experienced little success when hosting previous Olympic Games in 1976 and 1988. In response to this lack of success, funding for elite athletes was increased in the run up to the 2010 Games in Vancouver, and the rationale for this increased expenditure was to foster improved performance by Canadian athletes in those Games. In this sense, we analyzed the effects of a successful government sponsored subsidization program, where the program has the ability to affect national pride and identity. *Own the Podium* appears to have generated substantial intangible benefits.

Our results confirm that CVM estimates of the intangible benefits generated by a sports mega-event show a lack of temporal reliability. Sussmuth, et al. (2010) found that the willingness to pay estimates from hosting the FIFA World Cup increased substantially after the Cup. We find that the willingness to pay estimates from medal success increased substantially after the Games. CVM studies are an increasingly important tool for assessing subsidies for professional sports, and for sports mega-events. Temporal reliability problems suggest that CVM estimates of willingness to pay should be assessed carefully, since the estimates generated will change depending on the time frame.

Our results suggest that Canadians believed, even before the 2010 Vancouver Olympics, that the intangible benefits generated by the *Own the Podium* program far exceeded the costs of operating the program. Their experience with the 2010 Winter Olympics caused them to reassess and conclude that the benefits were even higher than they previously expected. In the small but growing CVM sports literature, no other example of the willingness to pay for sports public goods unambiguously exceeding the cost of the subsidies granted have been found, and certainly no case of the benefits being a multiple of 3 to 8 times the subsidy cost has ever been found. No previous study analyzed outcomes of sporting events. Seeing the national team succeed, where others had not, clearly has the potential to generate significant intangible benefits relative to winning the rights to host a mega-event and then seeing it take place.

Do the results mean that the policies aimed at improving the performance of elite athletes pursued by the Canadian government are economically efficient? Not necessarily. Respondents were not asked whether they value alternative uses of their tax dollars by more than they value Olympic medals. Furthermore, there is no evidence that the Canadian medal performance was affected by *Own the Podium*. Concluding that *Own the Podium* led to a higher medal count risks the post hoc ergo propter hoc fallacy. Even if *Own the Podium* led to more medals in the 2010 Games, that program is Canada's response to an international arms race. As such, it is a product of a prisoner's dilemma type game where countries compete for a fixed number of gold medals by spending more and more on elite athletes. The results here should not be used to justify additional spending to enhance the performance of elite athletes in other countries. All parties would be better off ending the race, since returns to this type of spending will diminish quickly if other countries adopt a similar policy.

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Table 1 <i>Pride in the Vancouver Games and Canadian Performance</i>			
Question	Percent Yes		Percent Change
	Pre-Olympics	Post-Olympics	
Are you proud that Vancouver is host to the 2010 Winter Olympics?	88.3	93.9	6.3
Do you feel proud when a Canadian wins a gold medal?	94.3	95.6	1.4
Proud if/that Canada won more gold medals than any other country?	91.6	88.0	-3.9
Will/Did you feel proud if Canadians win more gold medals than U.S. athletes?	86.7	83.4	-3.8
Note: The wording of the questions in Table 1 has been edited to fit the available space.			

Table 2			
<i>Attitudes about the Importance of the Vancouver Games</i>			
	Percent Agree or Strongly Agree		
Question	Pre-Olympics	Post-Olympics	Percent Change
It is important that Canadians win the most gold medals.	59.3	67.8	14.3
It is important that Canadians win more gold medals than	53.2	64.7	21.6
Canada's medal count is important to Canada's standing in the world.	67.3	84.0	24.8

Table 3

*Response to the Referendum Valuation Question*

Pre-Olympic Games Survey				Post-Olympic Games Survey			
Tax	N	%For	%Sure	Bid	N	%For	%Sure
\$5	334	67	59				
\$10	12	67	67				
				\$15	180	77	73
\$20	333	62	57				
				\$25	255	73	67
\$30	11	64	55				
\$35	332	59	54	\$35	249	68	61
\$50	322	49	44	\$50	251	56	51
\$65	206	44	39	\$65	22	55	55
				\$75	244	59	59
				\$100	232	53	53
				\$150	75	52	52
Total	1540	57	52	Total	1508	63	58

Table 4

*Variable Definitions*

TAX	Dollar amount by which respondent's annual household tax bill would rise if referendum passes.
FORSURE	Equal to 1 if respondent is certain she would vote in favor of referendum for higher taxes, 0 otherwise
GOLD	The number of gold medals respondent thinks Canada can win in 2014 if Own the Podium is continued.
OTHMEDAL	The number of gold medals respondent thinks Canada can win in 2014 if Own the Podium is continued.
BOTH	Equal to 1 if respondent participated in both pre- and post-Olympic surveys, 0 otherwise.
EDUC	Respondent's number of years of formal education
ATTEND	Equal to 1 if pre-Olympic respondent expects to attend the Games or if post-Olympic respondent did attend the Games, 0 otherwise.
MARRIED	Equal to 1 if respondent is married, 0 otherwise.
INCOME	Respondent's income in thousands of dollars. If respondent did not answer, income was imputed from a regression of income on economic and demographic variables.
MISSINC	Equal to 1 if respondent's income was imputed, 0 otherwise.
SATISFY	Respondent's overall life satisfaction, reported on scale of 1(low) to 10(high)
MALE	Equal to 1 if respondent is male, 0 otherwise.
AGE	Respondent's age in years
HEALTH	Respondent's state of health, reported on a scale of 1(bad) to 10(excellent)
EMPLOYED	Equal to 1 if respondent is employed, 0 otherwise
PRESTIGE	Equal to 1 if respondent agrees or strongly agrees that Canada's Olympic medal count is important to Canada's standing in the world.

Table 5

*Summary Statistics*

Variable	Pre-Olympic survey				Post-Olympic Survey			
	Mean	Std.Dev.	Min	Max	Mean	Std. Dev.	Min	Max
TAX	31.8	20.0	5	65	56.0	35.17	15	150
FORSURE	0.54	0.50	0	1	0.58	0.49	0	1
GOLD	11.4	6.10	7	50	15.5	2.82	14	35
OTHMEDAL	18.1	5.86	0	78	12.5	3.33	0	35
EDUC	14.5	2.39	10	20	14.5	2.38	10	20
ATTEND	0.05	0.21	0	1	0.05	0.21	0	1
MARRIED	0.65	0.48	0	1	0.71	0.46	0	1
INCOME	51.3	47.47	0	150	58.3	47.17	0	150
MISSINC	0.26	0.44	0	1	0.19	0.39	0	1
SATISFY	8.5	1.34	6	10	8.6	1.34	6	10
MALE	0.51	0.50	0	1	0.50	0.50	0	1
AGE	50.1	15.53	19	89	51.2	14.80	19	92
HEALTH	8.1	1.65	1	10	8.1	1.61	1	10
EMPLOYED	0.66	0.47	0	1	0.66	0.47	0	1
PRESTIGE	0.68	0.47	0	1	0.84	0.37	0	1
Both					0.45	0.50	0	1
Sample Size	1253				1514			

Table 6				
<i>Probit Model Results and WTP Estimates</i>				
	Pre-Olympics		Post-Olympics	
Variable	Parameter	Standard Error	Parameter	Standard Error
Intercept	0.377	0.067	0.503	0.066
TAX	-0.008	0.002	-0.006	0.001
N	1253		1514	
Household WTP	\$44.96	5.073	\$91.42	8.346
Aggregate Annual WTP (millions)	Upper Bound	\$562	Upper Bound	\$1143
	Lower Bound	\$110	Lower Bound	\$251
Present Value WTP (millions)	Upper Bound	\$1607	Upper Bound	\$3268
	Lower Bound	\$315	Lower Bound	\$719

**Assumptions:** For the upper bound figures, annual pre-Olympics household WTP of \$44.96 and annual post-Olympics household WTP of \$91.42 were multiplied by 12.5 million households, the number of Canadian households. The lower bound figures equal the upper bound figures times 19.6 percent before the Games and 22 percent after the Games, the response rates for the two surveys. This is equivalent to assuming that the WTP for people who did not want to answer the survey was \$0. All dollar figures are expressed in Canadian dollars.

Table 7				
<i>Probit Model Results</i>				
Variable	Pre-Olympics		Post-Olympics	
	Parameter	Standard Error	Parameter	Standard Error
Intercept	-4.107*	0.476	-5.233*	0.487
TAX	-0.008*	0.002	-0.006*	0.001
GOLD	0.110*	0.009	0.149*	0.015
OTHMEDAL	0.051*	0.009	0.139*	0.012
EDUC	0.008	0.018	-0.015	0.016
ATTEND	0.167	0.198	0.037	0.178
MARRIED	-0.113	0.088	-0.159	0.085
INCOME	0.006*	0.001	0.007*	0.001
MISSINC	0.053	0.126	0.251	0.122
SATISFY	0.085*	0.032	0.100*	0.029
MALE	0.185	0.080	-0.001	0.073
AGE	0.015*	0.003	0.011*	0.003
HEALTH	0.016	0.027	-0.034	0.025
EMPLOYED	0.133	0.099	0.055	0.089
PRESTIGE	0.403*	0.087	0.561*	0.099
Pseudo-R <sup>2</sup>	0.211		0.213	
N	1253		1514	

\*: Significant at 1% level