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A Cost-Benefit Analysis of an Olympic Games

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A COST-BENEFIT ANALYSIS OF AN OLYMPIC GAMES

by

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To the heterodox economists

whose writings kept me sane.

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Introduction

Every two years, the International Olympic Committee convenes to select the next host city for a Summer or Winter Olympic Games, and these decisions are preceded by strenuous marketing efforts by candidate cities anxious to land the Games. The economic virtues of hosting the event are loudly extolled by those who are endeavouring to hold it, but from a correct economic cost-benefit analysis (CBA[1]) perspective, does an Olympic Games generate positive net benefits for the host nation?

The evaluation of the "Olympic Project" (for lack of a better term) is unique in the number of challenges it poses for the practitioner of CBA.

One interesting problem is the *complexity* and *interdependence* of the various activities required. Hosting the Olympics is not merely a public project, it is *many* public projects. Venues must be built. Infrastructure must be improved. Housing must be provided. Projects which might have happened anyway are redesigned or rescheduled in order to accommodate the Games. All of these capital investments have benefits besides that of enabling the city to host the Games. How should the costs and benefits of *holding the Games themselves* be distinguished from the costs and benefits of the *capital investments* required to hold them?

Another interesting problem is that many of the most important advertised benefits of holding the Olympic Games are extraordinarily difficult to quantify. What is the benefit of "increased international visibility"? It may certainly lead to an increase in tourist visits and tourist expenditure, but is there a net benefit from this increased tourism? What is "the pride of hosting the Games" worth? If the investments in the

[1] Throughout the document, the 'CBA' acronym will be used interchangeably to refer to the process of cost-benefit analysis, and as a generic label for any study which contains cost-benefit techniques.

facilities for the Games lead to greater successes for national amateur athletes in the future, what's that worth? The questions are endless.

In short, the quantification of the costs and benefits of holding the Olympics touches upon almost every aspect of CBA theory.

It is rather surprising to this author that a methodologically correct and complete Cost/Benefit analysis for such a large, visible, and important undertaking seems never to have been attempted. The more typical approach by Games proponents is to conduct an ex ante 'economic impact study', such as the one written by the BC Government Capital Projects Branch (2002) (and updated in Intervistas (2002)) [2] for the 2010 Games in Vancouver. This study contains a wealth of information and analysis, but unfortunately differs from a Cost/Benefit analysis in several important ways which this paper will explore.

The Canadian Center for Policy Alternatives (CCPA, 2003) used data from Intervistas to create the outline of a "Multiple Account Evaluation" (MAE). This form of study approaches costs and benefits in a spirit more in keeping with that of true CBA, but places these costs and benefits in different "evaluation accounts" (such as 'government financial' , 'resident/consumer', 'environmental', 'economic development' and 'social') rather than unifying them under a single perspective (as CBA would do). An MAE also permits the analyst to avoid monetizing any hard-to-monetize cost or benefit, instead leaving the entries of different accounts in incompatible units where desired and explicitly leaving the reader with the task of weighing 'apples and oranges'. As befits their 'opposition' perspective, the CCPA study also neglected the non-Olympic benefits

[2] Both the BC Government and Intervistas expressly acknowledge that their documents are not attempts at Cost/Benefit analysis and should not be read as such.

of Games-related capital expenditures, which led to an understatement of the net benefits of the Games.

The most complete ex post study of a Games is usually the Official Report released for the Games. Unfortunately, the economic analysis in this document is really a *financial* analysis, which considers costs and benefits from the point of view of the organizing committee rather than society as a whole. Using such an analysis, which explicitly treats direct government contributions as revenue and ignores any capital cost not incurred by the organizing committee, the Official Report for the XV Winter Olympic Games in Calgary (1988) concluded that the games had made a 'profit' of $30 million dollars.

To correct all of these shortcomings and create a *complete* and *correct* CBA of an Olympic Games (either ex ante for an upcoming Games or ex post for a completed Games) would be a heroic task. However, this paper will attempt, in the context of the upcoming 2010 Winter Olympics in Vancouver/Whistler, to rigorously address a representative cross-section of those topics that should be found in a full blown Olympic CBA, including:

1. Dealing with project dependency via a framework for the classification of costs and benefits into the categories of "event specific" and "infrastructure related"
2. Rules for identification and treatment of "related" infrastructure projects
3. Evaluating the net benefit of "the Olympic Spectacle"
4. Evaluating the net benefit of the pride engendered by the Games for local citizens, which we might call "the Olympic Halo"
5. Valuing the net benefit (*not* economic impact) of induced Olympic Tourism

Primary sources of estimates for the 2010 Games are the Bid Book which VANOC (the Vancouver Olympic Committee) was required to submit to the IOC, the Intervistas paper referred to above, and the Auditor General (2002) review of the Games estimates. The comparison of ex ante estimates and ex post data from a completed Olympics (such as the 1988 Calgary Winter Games) would have permitted additional lines of inquiry, particularly the investigation of any systematic underestimation of capital construction costs or tourist visits. However, for space reasons, this paper will not concern itself with those issues; all published estimates for the 2010 Games will be taken at face value. The focus of this paper is the accurate conceptual treatment of the data, not the accuracy of the data itself.

The paper will, however, combine conclusions drawn in each of its sections above with published estimates to produce a modified "bottom line" for the 2010 Winter Games which is more in line with what a full blown CBA study would produce.

To do so, it is necessary to consider the timing of expenditures and realized benefits. Correct discounting and treatment of inflation must be applied to each of the individual costs and benefits in order to permit a meaningful assessment of the project as a whole. When using estimates prepared by others (as this paper attempts to do), an additional difficulty arises, as it is necessary to understand what assumptions regarding discounting and inflation are *already* embodied in those estimates, and what additional manipulations are required to make them consistent and correct for use in a CBA framework.[3]

All financial values quoted in the paper are in 2002 Canadian dollars. The Bid Book is mandated by the IOC to contain estimates in 2002 US dollars. The Bid Committee

[3] This interpretation can be particularly difficult when using estimates which were not prepared with CBA in mind.

used an exchange rate of 1.55 CAD/USD to convert their original CAD estimates to US dollars, and to recover those original estimates this paper has used the same exchange rate to convert back to Canadian dollars (except where otherwise noted). Generally, the estimates which are drawn from sources other than the Bid Book are generally already consistent with the Bid Book with respect to inflation, and this paper will perform little extra manipulation in that regard.

Discounting is more problematic. Generally the estimates used here were not generated with any discounting methodology at all; therefore, wherever possible, this paper identifies the *timing* of costs and benefits, and discounts them to reflect present values as of 2010, using a discount rate of 10%.

Finally, as in any CBA, it is important to define the point of view the analysis will take. The question of point of view in CBA is also known as the *question of standing.* Only those people whose preferences are deemed relevant to the CBA have standing, while the impacts on others, whether positive or negative, are ignored. Maintaining a consistent point of view is essential for any correct CBA, and doubly so for a project such as the Olympics, with large size, substantial tourism impacts, and multiple levels of government involvement.

Olympic advocates often prefer to look at the Games from the *provincial* perspective, the *regional* perspective, or even the *private* perspective, [4] and these points of view are conceptually consistent even if they are almost universally frowned upon by CBA advocates in practice. This paper will follow generally accepted CBA practice in viewing all costs and benefits from the national perspective, and make all necessary corrections to

[4] Using the private perspective renders CBA indistinguishable from standard financial accounting – indeed, CBA has often been described simply as 'project accounting from a national perspective'.

existing data and estimates which, at least for the 2010 Games in Vancouver, are entirely conducted from a provincial point of view.

Section 1 - Project Scope, Scale, and Integration in Olympic CBA

As mentioned in the Introduction, the Olympic Project does not consist of a single project, but is a bewildering array of associated public projects, each with costs and benefits. The benefits of *all* of these associated projects are often ascribed to the *Olympics*, such that it is said that the Olympics will "leave a legacy" of improved housing and transit infrastructure. But is this accurate? In order to answer this question, the analyst must:

- Clearly identify the *scope* of the "Olympic project"
- If any related projects are necessary for the Olympic project but have benefits even without the Olympics, rules must be developed to a)identify those projects and b)attribute their costs and benefits to the Olympics.

The Olympics is not just one project but many – it's an integrated project. The conventional CBA practice, as described in Jenkins (Cambridge 2004), for dealing with integrated projects is to identify the components which generate negative returns, drop those components, and proceed with the project configuration which generates the highest NPV.

However, this simple approach neglects project dependency. It is not generally possible to drop any arbitrary subset of projects from the Olympic portfolio of projects. You can have roads and stadiums without the Olympics, but you generally cannot have the Olympics without new roads and stadiums.[5]

[5] Optimal Project Scale refers to the idea that a project can be different sizes. There are readily available techniques in CBA to 'pick the right scale for the project', i.e. the scale that maximizes NPV. It could be argued that the proper goal of this exercise would be to find the optimal size (in terms of level of surrounding infrastructure) of an Olympic Games (choosing from such scenarios as "none", "modest",

The first challenge for the CBA analyst is to correctly distinguish the boundaries of the analysis. *Our interest here is a CBA study of holding the Games*, not a study of building roads or stadiums.

What does it mean to "hold the Games"? For the purposes of this paper, "Holding the Games" is *the act of inviting world-class athletes, television crews, and tourists to your city for two weeks to compete.*

The 'definition' of holding the Games above immediately suggests a useful categorization of the costs and benefits. The 'benefits' of the Olympics can be subdivided into Event Benefits and Infrastructure Benefits. The former are those benefits which are *only* attained if the Olympics are held. (That is, are only attained if athletes and media are invited to the city for two weeks of athletic competition). Plainly, direct benefits such as ticket sales, 'national pride', Olympic tourism, and Olympic merchandise sales fit into this category.

Many of the other touted benefits of the Olympics, such as 'improved roads', and 'better housing' can be had without 'inviting the world', and thus should be considered as 'Infrastructure Benefits'.

The definition of 'Event Costs' will be all of those costs which are necessary to attain the Event Benefits, but not necessary to attain the 'Infrastructure Benefits'. Security costs and marketing costs fit into this category. Other costs can be termed 'Infrastructure Costs'.

"moderate", and "gargantuan"), and that it is unfair to dismiss the *idea* of holding an Olympics because of the negative NPV for a *particular* Games, as some other size of Games might have had a *positive* NPV. However, in practice, the question of 'optimal scale' for the Olympics is probably moot - if the planned Games are not the size that the IOC wants them to be, they will be awarded to another city. It is certainly probable that the IOC's size preferences are motivated more by political considerations than by sound CBA technique, but in any event they should be considered as an exogenous variable in this analysis; the *planned* Games are as big as they need to be in order to win the bidding process, and cannot be any other size. The question this paper will consider then, is: 'to hold the Games at the scale that the IOC prefers, or not?'

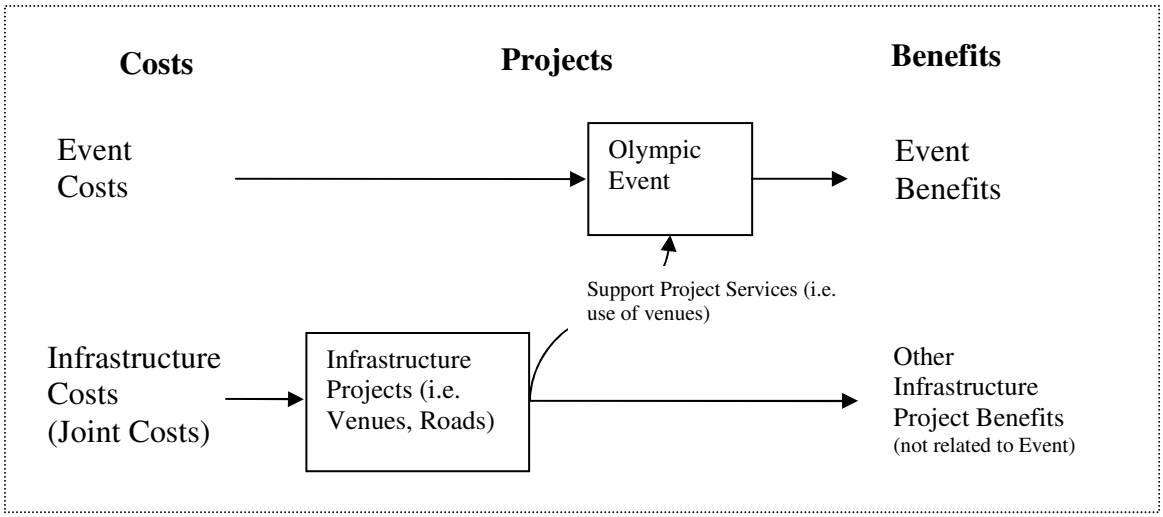

Figure 1: Event and Infrastructure Costs/Benefits

The following table uses this taxonomy to enumerate all the associated costs and benefits. Some of these costs and benefits, notably the "Olympic Halo" referred to below, will be further clarified in subsequent sections.

Event Costs	**Event Benefits**
• Bid costs • Security • Congestion externalities • Administrative costs • Translation costs • Promotion (i.e.: the torch relay) • Advertising • Opening/Closing ceremony costs • Insurance	The Olympic Spectacle • Viewing pleasure of ticket audience • Television Spectacle (translates into TV revenue) • "Promotion of sporty lifestyles" • Positive externality accruing to Olympic Athletes who compete in their home country. • Housing services for athletes during the games. (since most of them don't have standing and are only housed for a short time, this can likely be ignored). Induced secondary effects of direct outputs • Stimulated tourism demand (also a secondary effect of Halo) Primary effects of Halo • "Pride" externality accruing to citizens of the host city/province/nation. • Surplus accruing to volunteers who enjoy the experience Intangible Secondary Effects of Halo • "Cachet services" (i.e. – sponsorship, sales of commemorative coins)
Infrastructure Costs • Construction of housing • Construction of supporting transit infrastructure (transit lines, highways) • Construction of venues	**Infrastructure Benefits (Benefits that could be realized simply by building the infrastructure and not holding the Games at all)** • Future social housing • Future athlete use of infrastructure • Future public use of infrastructure • Future transit use

Table 1: A Taxonomy of Olympic Costs and Benefits

The handling of Event Costs and Event Benefits is obvious enough (they should be charged directly to the Games), but what about the infrastructure costs and benefits? As mentioned, an easy (and common) conceptual mistake is to conflate the benefits of the

Games themselves with the benefits of the associated infrastructure projects. From the point of view of evaluating the Games project itself, this is incorrect: the benefits of the infrastructure could be realized by building the infrastructure alone (perhaps with a different design or schedule) and *not holding the Games at all*. On the other hand, the costs and benefits of the Infrastructure Projects cannot simply be ignored either, since the benefits of the Event project cannot be realized without the infrastructure project. How is this to be approached?

In CBA methodology, any cost (such as the Infrastructure Costs described above) which cannot be associated with a single project is called a *joint cost*, also known as a *non-separable* cost. The published CBA guidelines of California Transit[6] have the following to say on the subject of joint and sunk costs (in the context of transportation projects):

> *"There is no theoretically correct basis for allocating non-separable costs. However whatever method is used should stand the tests of reasonableness and fairness. ...Reasonable approaches include allocating joint costs in proportion to other costs, in proportion to benefits, or in proportion to some combination of these."*

However, since the Olympic Event is dependent upon the Infrastructure projects (but not vice versa), the following is a suggested categorization of Infrastructure projects. Each category of infrastructure project should have a different method of accounting.

Each project can be categorized on the basis of two questions:

- Was it worth building anyway? (i.e.: would the project have had a positive NPV without the Olympics)

[6] http://www.dot.ca.gov/hq/tpp/offices/ote/Benefit_Cost/calculations/joint_sunk.html

- Would it have been built anyway? (i.e.: would it have been built given the existing decision making structure that exists in government at that time)

From these two questions, four separate categories of infrastructure projects can be devised:

1. Infrastructure projects that would have been built (and were worth building) with the same design and schedule, even without the Olympic Bid. If a project would have been built even without the Olympics, the Olympic project cannot take the credit (or the blame) for the project's other successes. The cost of using these facilities should be evaluated at their opportunity cost – that is, the highest value use foregone as the result of the Games.

This category likely includes facilities already built when the Games are announced, but specifically does not include infrastructure that was built for the purpose of attracting the Games. (This is necessarily a subjective judgment). It has been speculated that some cities may engage in signaling behaviour in the period leading-up to the bid, building infrastructure which would not otherwise be built in the hopes of attracting the Games.[7] It is plain that this dynamic was in effect in Calgary. The Official Report of the Calgary Games (1988) explicitly states: "The fact that (the Calgary Olympic Saddledome) was already being built added credibility to the bid and proved to be a positive factor in demonstrating Calgary's commitment to hosting the Games. Construction of the Saddledome was initiated by the desire to have a state-of-the-art arena under construction in order to enhance its Olympic bid..."

[7] See Macho-Stadler & Perez-Castrillo, An Introduction to the Economics of Information, 2nd ed., Oxford University Press 2001.

2. Infrastructure projects that would not have been built without the Olympic Bid attempt, and were not otherwise worth building.

In this case, the full difference between the non-Olympic project benefits and the project costs (which is negative by definition for projects which are not worth building without the Olympic Games) should be charged as a cost of the Olympics. Conceptually, this is identical to the treatment it would get if both its costs and benefits were simply considered 'part of the Olympics'.

This category implicitly includes infrastructure projects for which the non-Olympic benefits are zero, in which case the project is simply treated as though it were an Event Cost. This category also includes those projects for which the non-Olympic operating costs exceed the non-Olympic operating benefits (in which case the infrastructure should be torn down after the Games). If this is not done due to political difficulties, the negative NPV of the project if it had been torn down should be charged to the Olympics, rather than the actual NPV of the project.

3. Infrastructure projects which were worth building even without the games (have a positive NPV even when considering only non-Olympic benefits), but would not have been built without the Olympics.

The Games are often touted as a way to 'get things built'. If the Games provide a spur to build projects that are legitimately worthwhile from a national point of view but are not built due to government failure, then there is some merit to this categorization, in which case the surplus generated by such projects should be counted as another benefit of the Olympics. Referring to the earlier discussion of standing, the author believes that the

more likely scenario is that the Olympics are a way to 'get projects built' which are only worthwhile from a *subnational*, rather than *national*, perspective.

4. Infrastructure projects which are built with a different design, schedule or location that they otherwise would have been, due to the Games.

From a CBA perspective, a change in the design, schedule or location of an infrastructure project implies a change in the stream of costs and benefits of the project, and a corresponding change (likely a decrease) in the NPV. The difference between the NPV of the original project and the new one should be charged to the Olympic project.

Categorizing the Vancouver 2010 Olympic Infrastructure Projects

The infrastructure projects for an Olympic Games consist of transportation, housing, and athletic facility construction and/or improvements. This paper does not attempt the rigorous analysis of each project necessary to apply the categorization above, but some of the major projects of the Vancouver Games, their costs, and observations about their expected non-Olympic utility are listed below. No detailed data about the expected timing of capital expenditures is available, making correct discounting problematic. The implications of this will be revisited in the final section of the paper.

Transportation Projects

There are two major transportation infrastructure projects underway in the Vancouver area:

- The upgrade to the Vancouver/Whistler highway (a $600m project in 2002 dollars) is a project whose schedule is expressly motivated by the Olympics, and its costs are included in the Bid Book. Approaches to this project have ranged from "ignore its impact on the Olympic Games" (the Bid Book), to "charge its

cost to the Games but ignore all non-Olympic project benefits" (CCPA 2002). Neither approach is correct: this project should likely be categorized as "worth building, but would have been built to a different schedule without the Games".

- In contrast to the highway upgrade, the Airport/Vancouver rapid transit line (approximately $1.9bn in 2003 dollars)[8] is ostensibly *not* an "Olympic project" (and therefore would not normally merit consideration in a CBA study of the Olympic Games). However, Redlin (2003) has expressed concern that the compressed planning of this project to allow for (and perhaps justify) completion of the project before the Games has led to suboptimal financing and planning decisions. If borne out by further analysis, these "hidden costs" should rightly be included as costs in Olympic CBA.

Athletic Venues

The Olympic Bid book indicates the capital budget for athletic venues for the Vancouver Olympics is $366m (2002 CDN). It seems probable that many of these venues will have limited utility after the Games compared to their sometimes lavish costs, and would therefore be categorized as "not worth building, and would not have been built without the Games."[9], such that the entire difference between their construction cost and their (minimal) non-Olympic uses would be charged as a cost of the Games.

Housing

The Olympic Bid book indicates the capital budget for athletic venues for the Vancouver Olympics is $265m (2002 CDN). As housing costs are extremely high in both Vancouver and Whistler, it seems probable that the non-Games related utility of this

[8] http://www.ravprapidtransit.com/aboutFinancing.asp

[9] Even the value of these facilities for training future Canadian Olympic athletes is greatly limited by the fact that identical facilities already exist in Calgary!

housing will be substantial, such that the difference between their construction cost and their non-Olympic uses would only contribute minimally to an overall CBA of the Games.

Section 2 - Valuing the Spectacle

Recall from the introduction that one of the primary outputs of an Olympic Games is the spectacle itself. This section will attempt to estimate the WTP (that is, the gross benefit) of the Vancouver Olympic spectacle[10]. This spectacle may be viewed either in-person or on television, and the WTP for the two experiences will be considered separately.

The revenue generated from ticket sales is easily estimated and is commonly included in estimates of "economic impact" of the Olympics, but of course it is not conceptually correct to use project revenue as the measure of gross social surplus, unless none of the consumers of the project output have standing in the analysis (i.e. the project creates a good intended solely for export). The conceptually correct measure of gross benefit is the area under the demand curve, therefore the actual gross benefit is generally greater than the ticket revenue alone. If we imagine differently-priced ticket categories for a particular Olympic event, the gross benefit of the spectacle of a particular Olympic event could be represented in the familiar diagram of Figure 2 below as the sum of the grey areas (ticket revenue) and the white areas (consumer surplus). (As will be discussed, the demand curve for Olympic tickets need not touch the edges of the 'revenue areas').

[10] This will include all Olympic sporting events and the opening/closing ceremonies, but not include the Paralympic Games or Olympic medal ceremonies.

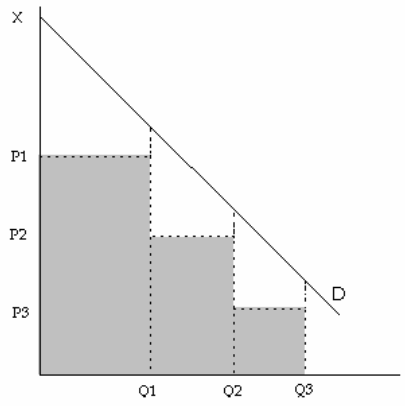

Figure 2: Revenue and Consumer Surplus for Olympic Tickets

Ordinarily, valuing this project output would merely consist of estimating demand curves for each event, and tallying the combined surplus for all events. However, there are some additional complexities imposed by the Olympics, which affect a) the estimation of the demand curve and b) the interpretation of the area under it.

Estimation of the demand curve for the in-person spectacle

According to Boardman, most practical techniques of demand curve estimation start with a direct observation of the actual price P and quantity Q (which is assumed to be market-clearing for the market under study), some assumption regarding functional form for the demand curve (such as linear, constant elasticity, etc), and then some estimates of elasticity or other points on the curve derived from observations of "similar" markets. These estimates, along with the direct observation of P and Q, can be algebraically plugged into the chosen functional form[11].

[11] Of course, if a sufficient number of market clearing price and quantity observations for this market are available, econometric techniques can be used instead.

The first impediment to obtaining market-clearing price/quantity information for Vancouver Olympic tickets is that ticket prices and buying policies have not yet been set for those Games. However, numbers of tickets available for each event and estimates of overall revenue are available. In addition, ticket prices (in Euros) from the Turin 2006 Winter Games are available, and these prices can be used as a gauge of the relative prices of tickets at the Vancouver Games.[12] Combined with the other data available for the Vancouver Games, individual ticket prices can then be estimated.

This information alone, however, will not allow us to observe true market-clearing prices and quantities for Olympic tickets. The supply of tickets and their official selling price is fixed in advance (and is often driven by the political urge to make tickets "affordable"), therefore the marginal benefit of the last ticket sold may well exceed the official selling price.

An alternative source of data which would better reflect actual valuations would be the prices collected in the aftermarket (i.e.: "scalping"). Reliable historical data series for aftermarket prices in each Olympic event and ticket category would obviously make the valuation task much easier, but unsurprisingly given the generally illicit nature of these markets, such data is difficult to come by and is largely anecdotal and thus unreliable.

In the absence of reliable aftermarket data, the points on the demand curve for Olympic tickets will need to be estimated relative to official (observable) ticket prices. This process is complicated by official ticket bundling policies. These can and do vary from Games to Games: for the most recent Games, the Turin Winter Games in 2006, events were categorized by the organizers as "type 1" (high expected demand) and "type

[12] All Turin policy and price information in this section is from UK Sportsworld (2005).

2" (low expected demand), and every type 1 ticket buyer was required to purchase a type 2 ticket as well (type 2 ticket purchases were unrestricted).

The implication of this policy is that not only can we not assume the prices and quantities purchased clear the market, we cannot even assume that the willingness to pay for "type 2" events is above the price paid, even if the event is ostensibly sold out! (This is supported by anecdotal evidence (Isidore 2002) of widespread secondary market activity at the Salt Lake City Games in 2002, where nearly every single event was "sold out", yet aftermarket tickets were available for well below cost.) For this reason, whether or not an event 'sells out' or not will not be used to judge the actually popularity of the event.

As the ticket bundling policy for the Vancouver Games is not yet set, an assumption will be made for those Games: only international buyers are forced to purchase a type 2 ticket for each type 1 ticket purchased[13]. While such a policy requires that official ticket sales be limited to licensed agents who can attempt to restrict sales geographically, ticket resale between foreigners and Canadians will likely occur nonetheless, and the economic impact of this activity is discussed later in this section.

No figure for proportion of tickets sold to internationals (either estimated or actual) has been published, as once again, most figures for the Calgary Olympics (actual) or the Vancouver Olympics (estimated) take the subnational perspective, breaking down the number of visitors as in-province or out-of-province. According to the Calgary

[13] The assumption that this restriction is limited to international buyers only is motivated by two simple considerations:. First, given the seating capacities for the 2010 Games venues, and assuming that the same Type 1/Type 2 event categorizations used in the 2006 Games were used in the 2010 Games, there are actually more Type 1 than Type 2 tickets at the Vancouver 2010 Games, making it impossible to impose this ticket buying scheme on every ticket purchaser. This also appears to have been the policy in Turin – there is no mention in the Turin Olympic literature of local buyers facing the type 1/type 2 ticket purchase requirement.

OCOG (1989), in Calgary the visitors were 77% Albertans, while a visitor survey quoted in Intervistas (2002) reported 31% of the others were other Canadians (i.e. 7%), implying 16% were foreigners. Intervistas (2002) also estimates that 70% of ticket buyers will be from British Columbia. Using the 31% figure above implies 10% of the visitors would be other Canadians, for a total breakdown of 80% Canadian and 20% foreign. However, given that all foreign visitors to the Olympics have both sufficient income and sufficient interest in the Games to make the trip in the first place, it is reasonable to assume that on average they would buy more tickets than locals, which perhaps implies that only 70% of all tickets will be sold to Canadians, with 30% sold to foreigners.

With these preliminaries out of the way, we are ready to start estimating some demand curves. Firstly, a simple linear demand curve will be assumed. Given the uncertain nature of the other estimates here this is unlikely to be a significant source of error.

Anecdotal data for aftermarket prices obtained for tickets to popular events at previous Games suggests that a reasonable estimate for the highest WTP for a ticket would be 50% above the official price for Type 1 events, while the lowest WTP for a ticket would be 15%. For an event with a single price category the situation would be as shown:

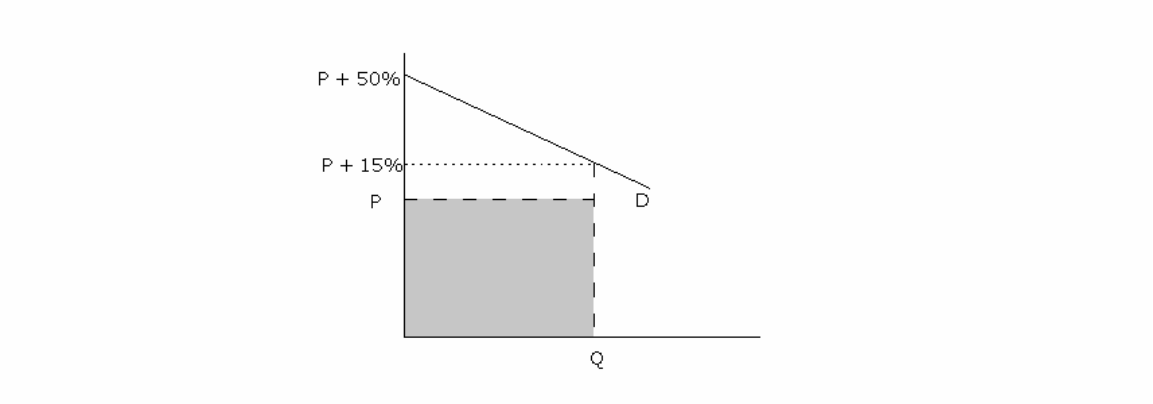

Figure 3: Estimated demand Curve for Type 1 (high demand) events, relative to revenue

What about type 2 events? If we assume that part of the demand curve for these events is below the price paid, the number of buyers whose WTP is below the price they actually pay can be no more than the proportion of foreign ticket buyers, as they are the ones constrained by the bundling scheme.

We also know (since some of the foreign buyers may be purchasing type 2 tickets 'under duress') that the proportion of foreign buyers may be higher in the type 2 ticket market than the type 1 ticket market. If the overall proportion of tickets sold to foreigners is 30% (as previously estimated), we can assume 25% of type 1 tickets are sold to foreigners and 35% of type 2 tickets are sold to foreigners. However, 35% is an upper bound on the portion of the demand curve below the price in Figure 4 below, as some of the foreign type 2 ticket buyers actually do have a positive willingness to pay. We may assume the total proportion (out of the 35% of buyers who are foreign) which is below the line is 25%. For the other end of the demand curve, we may assume that peak WTP is 15% above the price[14]. The end result would be as shown in Figure 4. No attempt is

[14] It may be argued, that since all the athletes competing in type 2 events have parents and relatives who presumably have a very high willingness to pay (even if nobody else does), that this estimate of peak willingness to pay as 15% over the price is too low. To anticipate the next section, since these relatives are predominantly foreign by definition (since most athletes competing in the games are foreign), their surplus is not included in the analysis and can be ignored.

being made to estimate the region of the demand curve below P, for reasons which will be clear.

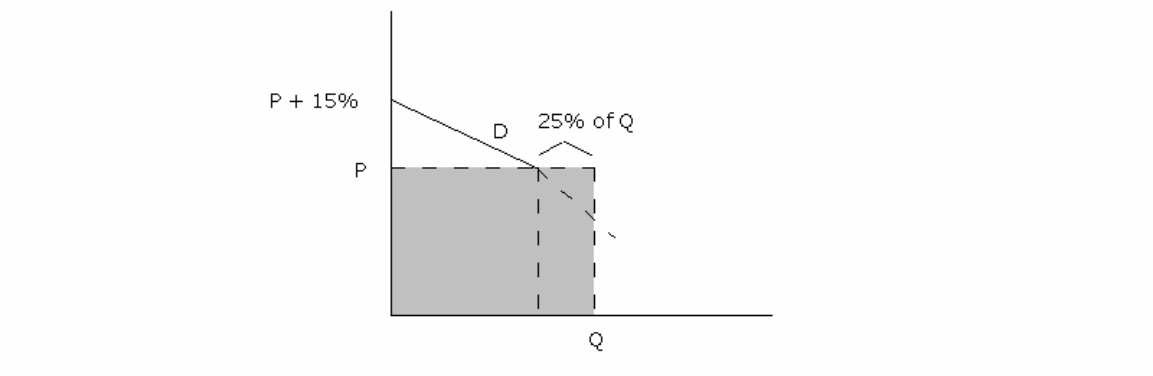

Figure 4: Estimation of demand curve for Type 2 (low demand) events

Interpreting the area under the demand curve

It is also important to note that not all ticket buyers have standing in the analysis. This is a challenging situation for conventional CBA techniques to address. Olympic tickets are not a non-traded good (since foreigners consume it as well) but the conventional treatment of tradable goods in CBA relies on the existence of a world price, which doesn't apply in this situation.

For type 1 events, where the foreigner is not constrained, the approach that will be followed here is to discount a portion of surplus (above revenue) from the estimate equal to the proportion of foreigners in that market. This method assumes that the WTP of the average foreign ticket buyer is the same as the WTP of the average domestic buyer.[15]

When interpreting the area under the "type 2" demand curve, it can be seen that the "ticket-bundling" policy is really a mechanism for extracting additional surplus from foreign ticket purchasers. If a ticket buyer with standing in the analysis were "forced"

[15] Given that the foreigner has signalled a relatively high income and enthusiasm for the Games by making the trip in the first place, this assumption may be dubious.

(by their own strong desire to purchase a "Type 1" ticket) to pay $20 for a Type 2 ticket which is only worth $16 to them, the gross social benefit represented by that particular transaction is still just $16 ($20 in revenue to the local Olympic Organizing committee, $4 in lost surplus for the buyer). However, this situation will never arise given our ticket bundling assumptions. On the other hand, if an international buyer (without standing) is similarly "forced" to buy a Type 2 ticket, their lost surplus ($4) is irrelevant, and the revenue ($20) for the organizing committee can be used as the gross benefit (in other words an additional amount of their surplus from type 1 events is captured by the local Olympic organizers).[16]

This implies that all of the grey triangle above the demand curve for type 2 tickets should be counted, as shown in Figure 5 below. Meanwhile, if foreigners with WTP below price represent 25% of the type 2 ticket market (which has 35% foreign participation in total), then of then 75% of the type 2 demand curve is above the price, of which 65/75ths (~87%) represents local ticket buyers and should be counted.

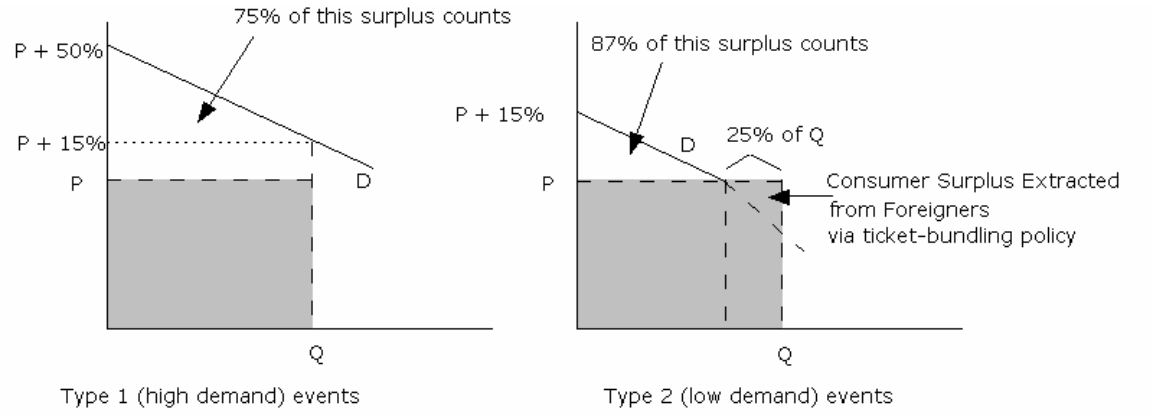

Figure 5: Interpreting Consumer Surplus for Type 1 and Type 2 Olympic Events

[16] Tickets, hotels, and airfare are often bundled together by tour operators in one package, but as the purchasers of such packages will be overwhelmingly foreign, the discussion of the producer surplus of such packages can be deferred until the section on tourism later in the document.

Therefore, the gross benefit (revenue plus social surplus) of a Type 1 sport with N individual scheduled and ticketed events and two ticket price categories would be calculated with the following formula:

$$N * (p_1q_1 + p_2q_2 + .75*(\tfrac{1}{2} q_1 (.5 + .15)p_1 + \tfrac{1}{2} q_2 (.5 + .15)p_2)) \quad (eq.1)$$

while the gross benefit of a Type 2 sport with N ticketed events and two ticket price categories would be calculated using the following formula:

$$N * (p_1q_1 + p_2q_2 + .87*(\tfrac{1}{2}*.75* q_1 * .15*p_1 + \tfrac{1}{2}*.75* q_2 * .15*p_2)) \quad (eq.2)$$

Where:

q_1, q_2 – number of publicly sold venue seats in each price category

p_1, p_2 – estimated price of venue seats in each price category

Additional considerations

There are two additional considerations: seating at Olympic events which is not sold to the public, and the economic effect of scalpers.

The Vancouver Bid Book does not explicitly list the numbers of seats available which are not for sale to the public, but presumably, there are such seats, which are given away to volunteers, VIPs, and Olympic sponsors. As these seats are not included in the 'tickets sold' data which was used above to derive demand curves for Olympic tickets, the surplus accruing to viewers in these "free" seats has not yet been accounted for.
To correctly account for this surplus would require assumptions for the following:

- The number of free seats at each event. (This can be calculated later, once the total number of tickets sold at each event is determined and compared to venue capacity).

- The quality (i.e. price category) of these seats. These will all be assumed to be in the highest price category.
- The proportion of free seats at each event which are occupied. For simplicity, we will assume that all of these seats are occupied.
- The proportion of the occupants of the free seats with standing. This is difficult to ascertain. On one hand, many of the occupants will presumably be local dignitaries and local volunteers (of whom there are expected to be 25,000)[17]. On the other hand, many members of the "Olympic family" will presumably also be given seats. All in all, the ratio of "free seat" holders with standing will be assumed to be 50%.
- The WTP of those occupants. Presumably, those users of free seats who have standing are either local dignitaries (i.e.: have reasonably high incomes) or are Olympic volunteers (i.e.: have a high degree of enthusiasm for the Games). Either way, they are likely to derive a fairly high amount of benefit from their Olympic experience, and so will be estimated to have a WTP of 50% greater than the official price of the highest ticket category.

The end result is that additional surplus accruing to occupants of "free" seats at each event will be estimated with the following formula:

$$S * (1 + .5) * p_1 * .5 \quad (eq.3)$$

Where:

S – number of free seats at the event

p_1 – price for top price category at each venue

[17] As reported on the official website of the Vancouver Olympics: http://www.vancouver2010.com/en/Participation/VolunteerOpportunities

Finally, the impact of scalping on the accounting must be considered. As discussed, full data series for prices of tickets obtained in the aftermarket are obviously not available. However, crude estimates of proportions of foreign/domestic involvement in the aftermarket, combined with our preceding calculations, might add usefully to our overall estimates.

What is important here is not whether the participants in these transactions are "professional scalpers", but whether each side in the transaction has standing.

If a foreigner resells a ticket to another foreigner, or if a Canadian resells a ticket to another Canadian, such transactions are irrelevant in CBA, as they merely represent transfers rather than changes in social surplus. On the other hand, there are two types of transactions that *do* result in changes in social surplus:

1. A Canadian sells to foreigners for a scalping price more than face value. This increases benefit to Canada by difference between scalping price and face value of ticket. In other words, this claws back some of the surplus lost. The total gain in surplus resulting from such transactions over our previous calculations equals net profits for Canadian "scalpers" on ticket sales to foreigners.
2. Foreigner (without standing) obtains a ticket at face value, then resells it to a Canadian. This is basically two transactions: the first is the simple export of a ticket, where face value of the ticket accrues to Canada. This transaction represents a gross benefit to Canada equal to the face value of the ticket, and has already been captured in our previous calculations. The second transaction is the IMPORT of the (same) ticket. The difference between the WTP of the Canadian purchaser and the price paid is the gain in surplus represented by this transaction

(as the surplus gain of any import would be calculated). (Note that the price paid in the resale of type 2 tickets may not be as high as the original face value, since the foreign scalper may simply have bought the ticket as a means of buying a type 1 ticket. This does not matter, and the surplus change from the resale transaction (Foreigner resells ticket to Canadian) should be treated as though we are importing a completely different good). This type of transaction represents a surplus gain as well (over our previous calculations) equal to the difference between the willingness to pay for the tickets and the price collected (by the foreign seller).

In practice, the accounting for these transactions could grow rather complicated. Blocks of tickets are initially sold to travel industry, sponsors, and other national Olympic committees. All of these sales represent 'export sales' as in case 1 above. Many of the organizations who purchase such tickets end up reselling them:

- To local scalpers (as in case 2 above), at which point they might then be resold to other locals (irrelevant from a CBA perspective) or foreigners (yet another export as in case 1).
- To foreign scalpers (irrelevant from a CBA perspective), at which point they might be resold to other foreigners (irrelevant from a CBA perspective) or to locals (as in case 2 above).

To account for this, we need to estimate the following:

- How many of the tickets that Canadians buy end up being "scalped" to foreigners, and for how much?

- How many of the tickets that foreigners buy end up being "scalped" back to Canadians, and for how much?

For simplicity, only scalping transactions for Type 1 (high demand) tickets will be considered. (Although it may well be that foreign buyers in particular are interested in scalping type 2 tickets, as they were likely "coerced" into buying many of these tickets as described above.) It will also be assumed that each ticket is "scalped" from a foreigner to a Canadian or vice versa at most once (to avoid having to account for the net surplus generated by a ticket which is sold to a foreign company, which resells it to a Canadian scalper, who resells it again to a foreign tourist, etc...)

Tickets purchased by Canadians but "scalped" to foreigners: Recall that Canadian buyers are already assumed to be the initial purchasers of 75% of Type 1 tickets. It will be assumed that 5% of those Type 1 tickets (i.e.: 3.75% of the total) that are sold to Canadians are subsequently scalped to foreigners. This scalping is assumed to take place at "street" level, therefore these foreigners pay a fairly high price, halfway between their WTP and the face value of the ticket. The effect of this transaction is that half of the surplus (i.e.: 50% of 3.75% = 1.875% of surplus) from the sales of these tickets now accrues to foreigners instead (and thus no longer counts), as the surplus for that ticket is divided equally between the Canadian scalper and the foreign spectator, instead of being entirely experienced by Canadians.

Tickets purchased by foreigners but "scalped" to Canadians: Meanwhile, foreign buyers are already assumed to be the initial purchasers 25% of Type 1. Due to the high level of institutional buying by foreigners, it will be assumed that 20% of each type (i.e.: 5% of all Type 1 tickets) are scalped back to Canadians (who might either be locals who

intend to use the tickets or "professional scalpers" who do not), and that this is done in a "wholesale" way such that Canadians pay a fairly low price for these "scalped" tickets, 50% below the face value.

Therefore, of the 25% of surplus from type 1 tickets that accrues to foreigners (and thus is not counted in the analysis), 20% of this (i.e. 5% of total) would entirely revert back to Canadians. In addition, because the tickets are assumed to be sold back to Canadians at 50% below face value, an *additional* surplus equal to 50% of the original revenue of these tickets (i.e. 50% of 5% or 2.5% of Type 1 revenue) accrues to Canadians.

Since the 75% factor from equation 1 is being modified by (5%-1.875% = 3.125%), and adding the additional portion of revenue as surplus as described above, the gross benefit (revenue plus social surplus) of a Type 1 sport with N individual scheduled and ticketed events and two ticket price categories would become (with changes due to scalping in bold):

$$N * \mathbf{1.025} *(p_1q_1 + p_2q_2)+ \mathbf{.78125}*(\tfrac{1}{2} q_1 (.5 + .15)p_1 + \tfrac{1}{2} q_2 (.5 + .15)p_2) \quad) \quad (eq.4)$$

Conclusion: valuing the in-person spectacle

Table 2 below summarizes all of the above discussion. Some explanatory notes for the chart are as follows, with each number corresponding to an area of the chart. (To clarify: the value of the spectacle of the *Vancouver* Games is being estimated here, while data from the *Turin* Games is used to generate that estimate.)

Data given from the Vancouver Bid Book:

(1) Seating capacity at each venue.

(2) Number of events of each sport type at each venue.

(3) Fact that 1.8million tickets will be sold for the 170 sporting events alone[18] (not counting the opening/closing ceremonies)

(4) Fact that expected revenue for sporting events AND opening/closing ceremonies is $218.222m CAD.[19]

Data from the Turin Games:

(5) Ticket price categories for each event in Turin. Some venues had two price categories, and others had three.

(6)Event classifications (type 1/type 2) from the Turin Winter Games, where type 1 is expected to be a 'high demand' event (this applies to all price categories at a particular event), and type 2 is expected to be a low demand event. (See preceding discussion).

Note that most sports have more than one price category and or classification, i.e.:

- tickets to the preliminary rounds of curling at Turin cost either 40 (category 1) or 20 Euros (category 2), and those preliminary rounds were designated 'type 2' (with no ticket purchase restrictions)
- Tickets to the final rounds of curling cost either 70 (category 1) or 40 (category 2), with these final rounds designated as 'type 1' (that is, foreign purchasers were required to purchase a corresponding type 2 ticket for each type 1 ticket).

Event/price category combinations are referred to as *demand categories* and are listed separately in the chart).

(7) Amount of public and non-public seating at each venue (calculated) [20]

[18] Source for 3 and 4: personal correspondence with VANOC
[19] Source: bid book, chapter 6.
[20] While the bid book categorizes each venue's capacity as "general public tickets", "seat kills including non-revenue tickets", and "sponsors and broadcast guests", it is not clear what these categories mean, and in any event, the number of "general public tickets" is not compatible with VANOC's stated claim that 1.8m tickets will be sold for the sporting events alone. Therefore, for the purposes of this paper I have

(8) Estimate proportions of each venue at the Vancouver games that will be dedicated to seats in each of the various price categories (note that I assume this proportion is the same for all venues).

(9) From those proportions, assuming similar price and demand categories exist for each event at Vancouver as at Turin, calculate the set of Canadian prices which would

- maintain the same relative prices for all demand categories of all events as in Turin
- produce the expected revenue for the Vancouver games (as mentioned in 4 above) given Vancouver venue public seating capacities estimated in (7)

The venue high price/low price seating proportions in (8) was calibrated in order to make at least some of the ticket prices derived with this method come out at below $50 and/or $100 dollars[21]. It was found that 70/30 splits (for events with two price categories) and 50/30/20 splits (for events with three price categories) made the various official estimates of revenue and tickets sold compatible with the price estimates generated in (9)

(10) Calculate the consumer surplus for each demand category using the formulae in equations 1 and 2.

(11) Add the amount of surplus from "free seats" as in equation 3.

(12) Add the scalper adjustment for Type 1 events as described above. It can be seen that under the assumptions made above, about $6m in extra economic benefit is generated from ticket resale activities.

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ignored the categorizations provided in the bid book, and used the 1.8m figure to determined the amount of venue seating that must be "public" or "non public" (that is, occupied but not sold or counted as revenue).

[21] As per correspondence with VANOC, it is estimated that many of the tickets sold will be priced in these ranges.

We can see from the bottom-right entry of Table 2 that the gross benefit of the in-person viewing of the Olympic spectacle is not the estimated $218m in revenue, but rather the figure of approximately $306m, which takes into account all ticket revenue plus all social surplus accruing to paying and non-paying spectators with standing.

Event	Number of events in each demand category (2) (5)	Total Seating Capacity At Venue (1)	Public seating (7)	Non public seating (7)	seats sold to public in this demand category (7)	Price Categories Turin 2006 - Euros (5) 1	2	3	Price Categories (9) Vancouver 2010 - Estimated (CAD) 1	2	3	demand type (6)	Est. revenue (Vancouver) C$ (9) A	TOTAL SUPLUS	SURPLUS (for those with standing) (10) B	SURPLUS from free seats (11) C	SCALPER ADJUSTMENT (12) D	GROSS BENEFIT OF IN-PERSON SPECTACLE A + B + C + D
Curling	28	6000	5280	720	147840	40	20		$ 45.49	$ 22.74		2	$ 5,716,111	600,192	522,167	687,767	-	6,926,045
	3	6000	5280	720	15840	60	30		$ 68.23	$ 34.12		1	$ 918,661	298,565	223,924	110,534	34,536	1,287,654
	1	6000	5280	720	5280	70	40		$ 79.60	$ 45.49		1	$ 366,263	119,036	89,277	42,985	13,769	512,295
Figure Skating	5	15000	12660	2340	63300	280	170	70	$ 318.41	$ 193.32	$ 79.60	1	$ 14,756,635	4,795,906	3,596,930	2,794,055	554,757	21,702,377
	4	15000	12660	2340	50640	300	190	100	$ 341.15	$ 216.06	$ 113.72	1	$ 13,072,219	4,248,471	3,186,353	2,394,904	491,434	19,144,910
	1	15000	12660	2340	12660	370	250	120	$ 420.76	$ 284.30	$ 136.46	1	$ 4,088,668	1,328,817	996,613	738,429	153,708	5,977,418
Short Track speed skating	5	15000	12660	2340	63300	90	70	40	$ 102.35	$ 79.60	$ 45.49	1	$ 5,326,785	1,731,205	1,298,404	898,089	200,254	7,723,532
Long track speed skating	8	8000	6770	1230	54160	85	40		$ 96.66	$ 45.49		1	$ 4,403,667	1,431,192	1,073,394	713,354	165,550	6,355,965
	4	8000	6770	1230	27080	95	50		$ 108.03	$ 56.86		1	$ 2,509,782	815,679	611,759	398,639	94,352	3,614,533
Freestyle Skiing	4	12000	10628	1373	42510	90	30		$ 102.35	$ 34.12		1	$ 3,480,594	1,131,193	848,395	421,411	130,849	4,881,248
	2	12000	10628	1373	21255	60	20		$ 68.23	$ 22.74		2	$ 1,160,198	121,821	105,984	140,470	-	1,406,652
Snowboard	4	12000	10628	1373	42510	90	35		$ 102.35	$ 39.80		1	$ 3,553,106	1,154,760	866,070	421,411	133,575	4,974,162
Hockey – Large Venue	1	17832	15051	2781	15051	350	200		$ 398.01	$ 227.44		1	$ 5,220,398	1,696,629	1,272,472	830,067	196,254	7,519,192
	3	17832	15051	2781	45154	240	140		$ 272.92	$ 159.21		1	$ 10,783,117	3,504,513	2,628,385	1,707,567	405,378	15,524,447
	4	17832	15051	2781	60205	150	100		$ 170.58	$ 113.72		1	$ 9,242,672	3,003,868	2,252,901	1,422,972	347,467	13,266,012
	1	17832	15051	2781	15051	120	70		$ 136.46	$ 79.60		1	$ 1,797,186	584,086	438,064	284,594	67,563	2,587,408
	1	17832	15051	2781	15051	80	40		$ 90.97	$ 45.49		1	$ 1,163,892	378,265	283,699	189,730	43,755	1,681,075
	21	17832	15051	2781	316077	80	40		$ 90.97	$ 45.49		2	$ 24,441,732	2,566,382	2,232,752	3,984,322	-	30,658,807
Hockey – Small	24	8000	6923	1077	166152	40	20		$ 45.49	$ 22.74		2	$ 6,424,129	674,534	586,844	881,816	-	7,892,789
Alpine Downhill	6	15000	12660	2340	75960	110	30		$ 125.09	$ 34.12		1	$ 7,428,706	2,414,329	1,810,747	1,317,197	279,273	10,835,923
Various Slalom	6	15000	13200	1800	79200	110	30		$ 125.09	$ 34.12		1	$ 7,745,570	2,517,310	1,887,983	1,013,229	291,185	10,937,967
Biathalon	5	15000	13200	1800	66000	50	40	20	$ 56.86	$ 45.49	$ 22.74	1	$ 3,077,213	1,000,094	750,071	383,799	115,684	4,326,766
	2	15000	13200	1800	26400	50	40	20	$ 56.86	$ 45.49	$ 22.74	2	$ 1,230,885	236,420	205,685	153,519	-	1,590,090
Cross Country	4	15000	13200	1800	52800	70	60	30	$ 79.60	$ 68.23	$ 34.12	1	$ 3,542,548	1,151,328	863,496	429,855	133,178	4,969,076
	3	15000	13200	1800	39600	70	60	30	$ 79.60	$ 68.23	$ 34.12	2	$ 2,656,911	496,482	431,939	322,391	-	3,411,241
Ski Jumping	2	15000	13200	1800	26400	110	70	35	$ 125.09	$ 79.60	$ 39.80	2	$ 2,491,792	520,124	452,508	337,743	-	3,282,043
	3	15000	13200	1800	39600	150	110	45	$ 170.58	$ 125.09	$ 51.17	1	$ 5,268,789	1,712,356	1,284,267	690,838	198,074	7,441,968
Nordic combined	3	15000	13200	1800	39600	90	60		$ 102.35	$ 68.23		2	$ 3,647,623	383,000	333,210	414,503	-	4,395,336
Bobsleigh	3	12000	10560	1440	31680	40	25		$ 45.49	$ 28.43		2	$ 1,278,920	134,287	116,829	147,379	-	1,543,128
	3	12000	10560	1440	31680	50	35		$ 56.86	$ 39.80		1	$ 1,639,179	532,733	399,550	184,223	61,623	2,284,575
Skeleton	2	12000	10560	1440	21120	50	35		$ 56.86	$ 39.80		1	$ 1,092,786	355,155	266,367	122,816	41,082	1,523,050
Luge	2	12000	10560	1440	21120	40	25		$ 45.49	$ 28.43		2	$ 852,613	89,524	77,886	98,252	-	1,028,752
	2	12000	10560	1440	21120	50	35		$ 56.86	$ 39.80		1	$ 1,092,786	355,155	266,367	122,816	41,082	1,523,050
Opening Ceremonies	1	55300	46640	8660	46640	850	500	250	$ 966.60	$ 568.59	$ 284.30	1	$ 33,148,839	10,773,373	8,080,030	6,350,590	1,246,189	48,825,648
Closing Ceremonies	1	55300	46640	8660	46640	600	350	200	$ 682.31	$ 398.01	$ 227.44	1	$ 23,601,974	7,670,641	5,752,981	4,482,769	887,287	34,725,011
GRAND TOTAL	**172**				**1,751,397** (3)								**$ 218,222,950** (9)	**60,527,427**	**46,094,302**	**35,635,035**	**6,327,857**	**306,280,143**

Price scaling factor calculations: (9)

Vancouver Revenue (if Turin prices were used)	€ 191,898,091.80
Vancouver Olympic ticket revenue (est, 2002 USD)	$ 140,789,000.00
- in Canadian$	218,222,950.00
Price Scaling Factor (B/A)	1.137

Seating Proportions for venues with 2 or 3 price categories (8)

cat 1/2	0.7
cat 2/2	0.3
cat 1/3	0.5
cat 2/3	0.3
cat 3/3	0.2

Table 2: Summary of surplus calculations for the "In-Person Olympic Spectacle"

Valuing the gross benefit of the televised Olympic spectacle

Boardman's conception of gross benefit of a project output – revenue plus change in social surplus – is the most conceptually useful place to start in valuing the televised Olympic Spectacle[22].

Revenue

According to the Bid Book, the IOC will collect an estimated $800m US from the various networks, and give half of that ($400m 2010 USD) to the host city.[23] Appropriate[24] adjustment for inflation yields a figure of $348m 2002 USD, or $400m 2002 CAD[25]. Since the IOC share of this money would be given to the IOC regardless of where the Olympics is, and since the costs the IOC incurs to administer the Olympics are not counted as part of the cost of hosting the Olympics, only the city's share of the television revenue should be counted as project revenue.

Changes in social surplus

Most of the change in social surplus from the ability to watch the Games on television accrues to people who do not have standing – foreigners – and therefore can be ignored.

[22] The alternative approach, as described in Jenkins (Cambridge 2004) would be to calculate the economic price of the televised spectacle, as opposed to its financial price.
[23] Some reports indicate that these initial estimates of television revenue for the Vancouver Winter Games may have been considerably lower than what is now expected.
[24] The Auditor General reports that VANOC "discounted the $400m amount appropriately, as instructed by the IOC" to arrive at the $348m 2002 USD figure. It is apparent that this means adjusting only for inflation, rather than discounting to match the base year for the present value of all project costs and benefits. As this 'benefit' will be realized in 2010, the same year to which this paper discounts other costs and benefits which do not occur in 2010, no further discounting or adjustment is necessary.
[25] An exchange rate of 1.15 CAD/USD (not 1.55) is used for this conversion. As the original estimate was provided in USD there is no need to use an outdated exchange rate to recover an original Canadian figure.

While the surplus which accrues to Canadians as the result of their being able to watch an Olympic Games on television is substantial[26], it *cannot* correctly be considered as a benefit of holding the Games in Canada, since the Games will always be held and televised from *somewhere*. Therefore, this surplus would accrue to Canadian television viewers regardless of whether the Games were held in Canada or not.[27]

In conclusion, then, the value of the televised spectacle is one area where a correctly-performed CBA gives a result identical with the existing 'economic impact' studies – the value of the televised Games spectacle is exactly equal to the revenue given to the city by the IOC.

[26] The Men's Hockey Final in the 2002 Winter Games was the most watched television program in Canadian history.

[27] In fact, if any of the events were blacked-out in Canada in order to boost ticket sales, the surplus of the televised spectacle would actually be *less* than it would be otherwise and would count as a *cost* of the Games. It is unlikely such black-outs will be in effect.

Section 3 – The "Olympic Halo": The Measurement of Non-Use Values of the Olympics

> *"The Olympics, for some reason, seems to throw rational thought out the window. I call it the 'goose bump effect'. The Olympics is built on this sentiment: 'I had goose bumps being at the Games, competing in the Games and so on.' It trumps all rational arguments."*
>
> *Helen Lenskyj, Professor of Sociology, University of Toronto*[28]

The above quote seems to capture an important perceived benefit of the Olympic Games. When the Olympic Games are awarded to a host city, the public enthusiasm that greets the news seems well out of proportion to any of the tangible benefits of the Olympic project which are enumerated elsewhere in this paper (such as the ability to attend Olympic sporting events locally). It seems clear that one of the benefits many citizens derive from hosting the Games is the simple and unabashed pleasure of being validated as a 'world-class city' by the IOC, and the prospect having the attention of the entire world for several weeks.

The willingness-to-pay (and therefore the benefit) of most project outputs can be inferred from the changes in prices and quantities resulting from the project. However, the pleasure a resident takes from simply having the Olympics in their city is non-rivalrous and non-excludable: a classic public good. This value is not something that can be traded on markets; it is *non-use value,* also known in the literature as *existence value.* Since this value cannot, by definition, be captured in markets, economic theory tells us it will likely be underprovided without government subsidy.[29]

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[28] As quoted in "Hosting the Olympics Doesn't Always Make Cents". Capital Times, Madison Wisconsin August 3, 2004.

[29] This argument is not lost on Games proponents.

It is not the proper role of the analyst who is endeavouring to conduct an honest and objective CBA to discount or dismiss these preferences, which are widely held by the public[30], but they do pose formidable measurement challenges.

The literature on techniques for the measurement of existence value was concerned at first with the measurement of environmental valuation: how much value does society place in the *mere existence* of a rare species or an old-growth forest, *aside from* the tourism/recreational opportunities it may afford? While there has been as of yet no attempt to apply these techniques to the valuation of Olympic intangibles, and it would be well beyond the scope of this paper to attempt to do so in any rigorous way, there is a small related body of literature on the measurement of existence value for professional sports franchises, which we may draw on to provide rough estimates for the non-use benefits of hosting an Olympic Games.

According to Boardman, most practitioners of CBA feel that *contingent valuation surveys* are the only way to elicit the magnitude of existence values[31], in spite of the fact that these surveys have numerous well-known shortcomings [32]. Johnson et al (2001) used a contingent valuation survey to estimate the per capita yearly existence value of the Pittsburgh Penguins hockey team (that is, the value of the team above and beyond the surplus derived from viewing their games) to be $5.77.

---

[30] It might be argued that the personal gratification that **decision-makers** derive from winning the Games is far more important to whether or not an Olympic bid is launched in the first place that the gratification derived by the public. While intriguing, this observation is well beyond the scope of this paper.

[31] A second method, inferring non-use value from the behavioural traces found in the market consumption of related complementary items (i.e. secondary markets) has been proposed by Larson (1993). This point will be revisited in the next section, where the impact on the secondary markets related to tourism will be expressly addressed.

[32] Some of these disadvantages only occur in situations where existence value can be assigned to incremental units of the public good (i.e. "there are five units of habitat left, what would you pay to ensure the preservation of three more?"), and are mitigated somewhat when the surveys are used for the Olympics, which is an all-or-nothing undertaking.

Any direct comparison between the yearly existence value of hosting a professional sports team (which is an ongoing enterprise) and hosting the Olympics (which is a one-time event) is problematic. It is likely that the existence value of hosting any event is much higher if it is not a regular occurrence, in which case the $5.77 figure would be biased downwards from the "true" existence value of the Olympic Games. However, it is not clear how this bias would be corrected[33], so in the absence of a more appropriate figure, we will make use of Johnson's result to estimate the value of the pride engendered by the Olympic Games. Firstly, given the regional rivalries extant within Canada, it is assumed the Halo primarily applies to B.C. residents (residents of other provinces would largely see the Games as the "B.C. Games" and take much less pride in them.) We might assume, then, that other residents of Canada would only feel the Halo one-half as strongly, i.e.: $2.50 per capita. As the population of British Columbia is approximately 4m and the remaining population of Canada is approximately 26m, under these assumptions the "Olympic Halo" would be worth: 4m x $5.77/per capita + 26m x $2.50/per capita, which works out to approximately $88m. In the final section of this paper, this figure will be compared and contrasted with the level of public subsidy provided to the Olympics.

[33] Correct currency conversion and discounting are also problematic, and none will be attempted here.

Section 4 – "Economic Impact" and the Correct Valuation of Secondary Market Effects in Olympic CBA

> *"The Province is responsible for estimating and paying for the Olympic-related costs that the IOC does not assign to the local Olympic Organizing Committee. The Province expects the Games will stimulate economic activity, and resulting increases in tax revenues will help pay for its Games-related costs."*
>
> *Auditor-General of British Columbia*

As mentioned in the introduction, most studies of the Olympic Games concentrate on "economic impact" rather than *net benefit* as a CBA study would. The contribution of tourism to "economic impact" in such studies is often substantial. According to Intervistas (2002), under the "medium-high tourism scenario"[34], it is expected that the Olympic Games will induce 2.7m additional international tourist visits over the timespan 2008-2015 (which is of course much longer than the Games themselves). If this forecasted scenario is accurate, the Intervistas study estimates the total "economic impact" of this induced tourism to be $2.2bn.

What is the relevance of these "induced" economic effects in CBA? In the cost/benefit literature, the various demands by induced Olympic visitors for restaurant meals, accommodations, and so on are examples of *second-round effects,* also known as *secondary*, *spillover, pecuniary, indirect,* or *side effects.* The Olympic project concerns itself only with stadiums, roads, housing, and security (these might be called primary

[34] The Intervistas study names four "tourism scenarios", namely "low", "medium", "medium-high", and "high", without providing any estimated probabilities for each of the outcomes. As the "medium-high" scenario is often used as the point estimate of Olympic tourism, this paper will use that scenario as its starting point as well. Again, it is assumed that such estimates are trustworthy, as the purpose of this paper is to conduct some elements of a methodologically sound CBA (as opposed to economic impact) study, rather than to second-guess the data and estimates provided by others. However, it should be noted that the probability of the various tourist outcomes are considered to be contingent on additional tourism marketing efforts in conjunction with the 2010 Games. In other words, it is not entirely correct to attribute the benefits of additional tourism (however measured) to the Olympics. Since the costs and scope of such additional tourism marketing efforts are not being considered in this paper, the conclusions of this section should be viewed with the appropriate degree of caution.

markets), but the markets for hotel stays and restaurant meals (called secondary markets) are affected nonetheless. How should these secondary effects of the Olympic Games be treated in an Olympic CBA?

This section will briefly outline the generally accepted CBA methodology for secondary markets, discuss its applicability to the Olympic context, and then reinterpret some of the data from the Intervistas study in a way which is consistent with that methodology.

To begin, consider a highly simplified version of the Olympics which creates as its single output a generic "Olympic experience", and also boosts demand in a single secondary market for "hotel stays". Assuming constant marginal costs (to allow consideration of consumer surplus only), perfect competition, and no distortions (including externalities), the two markets might be represented by Figure 6. [35]

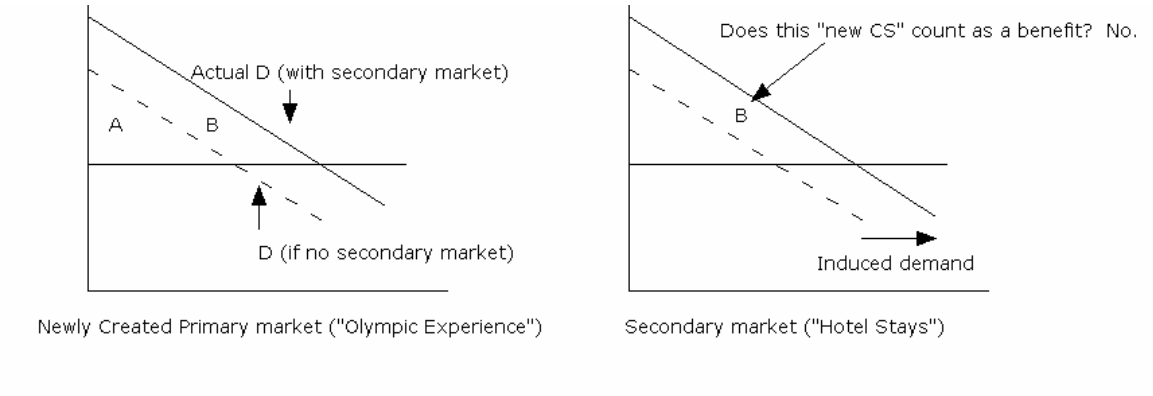

Figure 6: Primary and Secondary Markets

A standard finding in CBA practice is that if three conditions are met:

1. the change in consumer surplus in the primary market *is already being measured*,
2. There are no distortions in the secondary market

[35] The treatment here expands on the usual treatment in CBA texts by using graphs to explicitly display the 'double counting' of benefits in primary and secondary markets.

3. There are no price changes in the secondary market

we should NOT measure consumer surplus created by new demand induced in the secondary markets – to do otherwise would be double counting.[36] We can now ask if each of these conditions are fulfilled in the context of Olympic CBA.

Is all surplus in primary markets already being measured?

In order to answer this question, it is important to first identify the primary markets (i.e. the project outputs) which induce the tourism in the first place. The Olympic Spectacle (the net benefit of which has been estimated in section 2 of this paper) would seem to be the obvious candidate. Certainly, any secondary market effects during the Games could probably be attributed to the effects of the Spectacle alone, and thus be estimated in the standard way using the assumption that all surplus in the primary markets is being captured. However, as mentioned in the first paragraph of this section, not all of the induced tourist visits which are ascribed to the Olympic Games actually occur during the Olympics. What are the 'primary goods' which induced these "before and after the Games" effects? Can we be sure that the surplus changes in secondary markets before/after the Games can be ignored?

There are some potential approaches to the problem of secondary markets before and after the Games. The first solution, if a primary good which induces demand in

[36] Referring to Figure 6, if the secondary market (hotels) did not exist, the demand for the Olympic experience itself would be lower, represented by the dotted line, and the consumer surplus from the Olympic experience would only be A. (The reader is invited to imagine how the desirability, and hence the willingness to pay, of the "Olympic Experience" would be affected if there were no hotels in the area!) We see that the existence of the hotel market does not directly affect the Olympic experience but *inflates* the WTP for the Olympic experience all the same. The change of consumer surplus engendered by this project can be divided into two components: The first is the contribution of the Olympic experience itself (A), and the second is that of the hotel market (B). However, both of these contributions are already reflected by the demand curve for the Olympic experience itself, and to count the surplus gains in the secondary market would be to double-count the amount of consumer surplus contribution (B) of the hotel market.

secondary markets cannot be identified or analyzed, would be to count some of the surplus change in the secondary markets as net benefit (since not all of the surplus change in the primary markets is being identified, this is not "double counting")[37].

The second solution, and the one that will be followed here, is to posit some other good (namely "the Halo" discussed in section 3) as an additional "primary good" which induces demand in tourist markets, and ensure that the surplus change in that market is being captured. Although the Halo disregards the surplus which accrues to those tourists from outside of Canada, this is not a problem, since CBA analysis ignores surplus which accrues to people from outside Canada in the first place. Therefore, this analysis will proceed as though all surplus is being captured in primary markets.

Price changes in secondary market

If the constant marginal cost assumption in the secondary market is relaxed, the standard CBA treatment of changes of surplus in secondary markets is reflected in the following diagram.[38]

[37] As alluded to in the previous section on "the Halo", Larson (1993) suggested exactly this technique as an alternative to contingent valuation surveys for the measurement of the otherwise invisible primary good known as "existence value".

[38] Boardman follows a different treatment, by using the concept of an 'effective' or 'observed' demand curve (i.e. the demand curve before and after the introduction of the good into the market) in the primary market, which approximates the shaded area in the secondary market. This also allows the analyst to ignore the secondary market, but this approach is not helpful when considering a primary market which is newly created by the project under analysis, as we are here, since there is no 'before' and 'after' demand to observe.

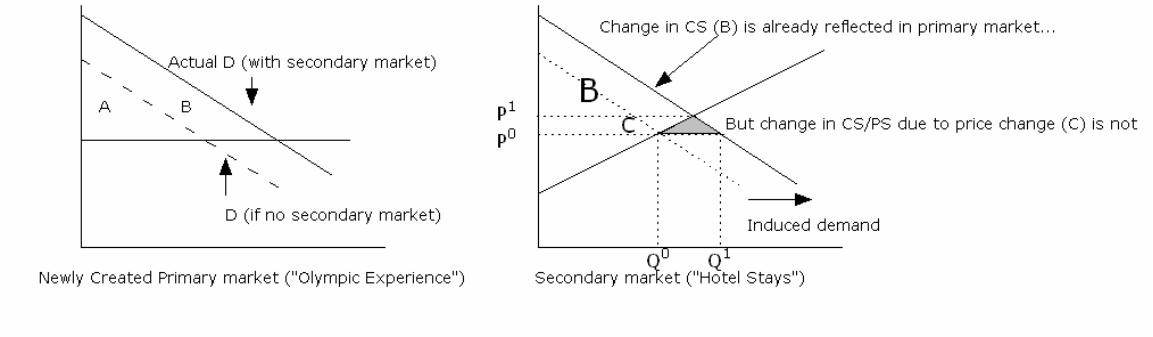

Figure 7: Primary and Secondary Markets with Price Changes in the Secondary Markets

Since a price increase causes a loss of CS and a smaller gain in PS as in area C, the standard CBA approach treats the shaded triangle above as the net change (in fact, a loss) in surplus in the secondary market, to be counted in addition to the change of surplus in the primary market.

Jenkins provides the following formula (note that the $P^0 - P^1$ term is in fact negative)

$$\textit{Gross Benefits} = \textit{benefits in primary market} + \tfrac{1}{2}(P^0 - P^1)(Q^1 - Q^0) \quad \textit{(eq.5)}$$

However, this assumes that all consumers in the secondary markets have standing, and if this is not the case then some of the lost consumer surplus in area C does NOT offset the gains in producer surplus in the same area. Some of the producer surplus gain in area C should be counted as a gain (note the positive sign of the $P^1 - P^0$ term below) if the proportion of consumers in the secondary market with standing is X, the formula should then be:

$$\textit{Gross Benefits} = \textit{benefits in primary market} + (1 - X)(P^1 - P^0)(Q^0 + Q^2)/2 + \tfrac{1}{2}(P^0 - P^1)(Q^1 - Q^0) \quad \textit{(eq.6)}$$

Graphically, this is represented as follows:

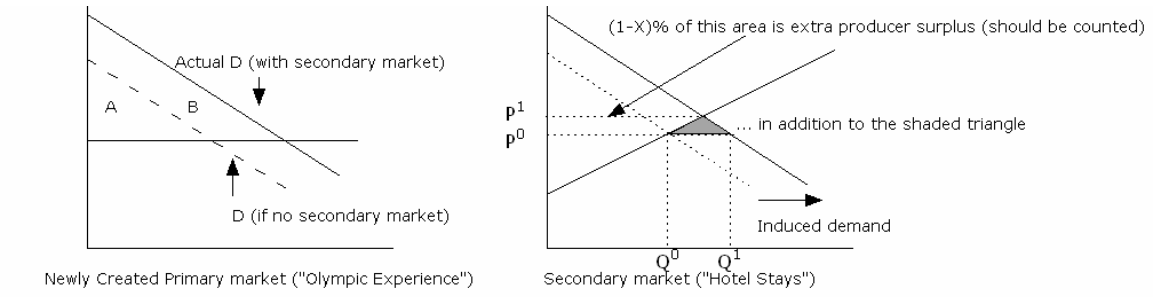

Figure 8: Secondary Market effects (where X% of consumers have standing)

Distortions in secondary markets

In the context of Olympic CBA, secondary market distortions exist in the form of consumption taxes on hotel stays, restaurant meals, etc.

Jenkins, assuming constant marginal costs as in Figure 6, graphically derives the following formula: [39]

Gross Benefits = benefits in primary market + $(Q^2 - Q^0)T$ (eq.7)

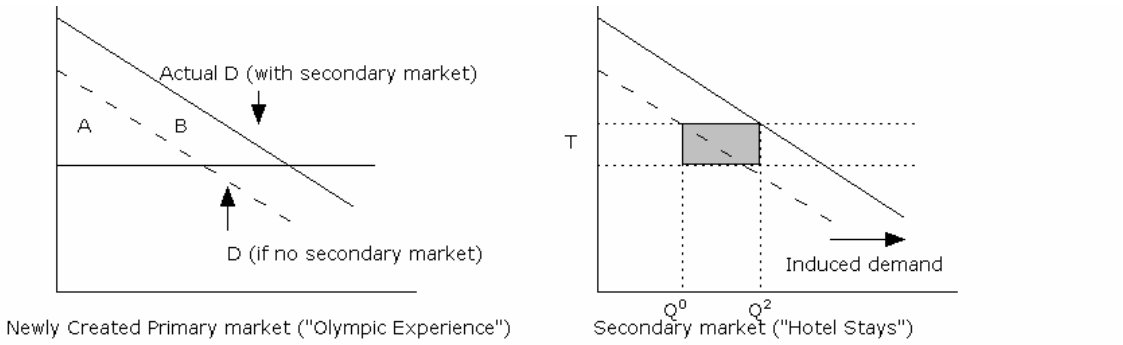

Figure 9: Secondary Markets with Distortions

[39] As an alternative approach to dealing with secondary markets in CBA, a general term $W_x^d P_x^m d^*$ can be added to the economic price of the primary market good to account for demand that is diverted to (in the case of project inputs) or from (in the case of project outputs) the rest of the economy. In that term, W_x^d is the proportion of project output which represents increased demand for the primary good (and thus less demand for everything else in the economy), and d* is the general level of distortion in the economy. This technique assumes that there are no price changes in the rest of the economy as the result of project output, but since this assumption does not hold for goods which are close substitutes or complements of project output (the very goods we are considering in this section) now, this method is too limited to be useful here.

Combining the effects of distortions and price changes is straightforward, as shown in Figure 10 below (where the N subscript denotes demand net of taxes, the G subscript denotes demand inclusive of all taxes, and the 0 and 1 superscripts denote without and with the Games respectively):

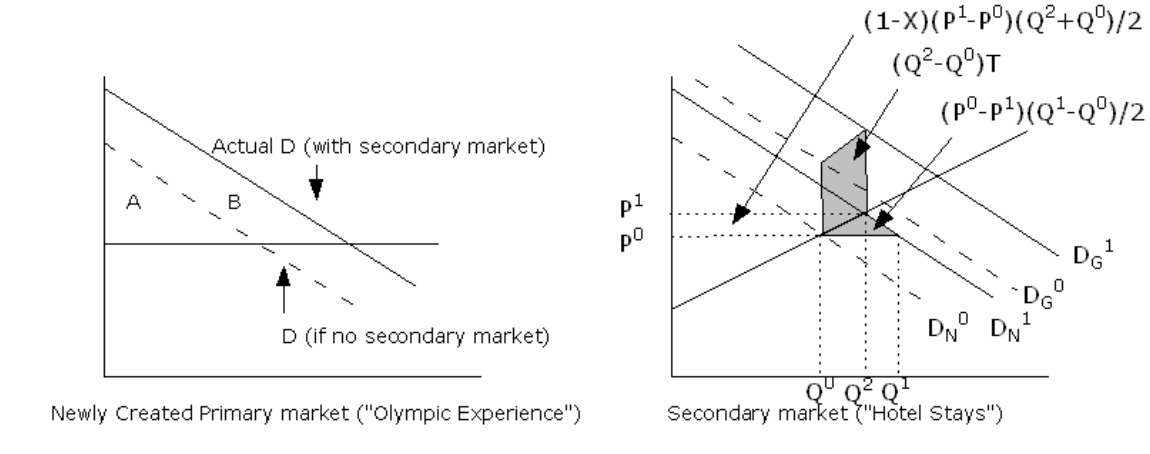

Figure 10: Secondary Markets with price changes and distortions

$$\textit{Gross Benefits} = \textit{benefits in primary market} + (1 - X)(P^1 - P^0)(Q^0 + Q^2)/2 + \tfrac{1}{2}(P^0 - P^1)(Q^0 - Q^1) + (Q^2 - Q^0)T \quad (eq.8)$$

Note that Q^1 is the new quantity demanded as it *would have been* without price changes, and a close inspection of Figure 10 will reveal that this quantity cannot be observed and must necessarily be estimated. On the other hand, Q^2 represents the actual observed quantity with price changes. We will return to this problem of estimating Q^1 shortly.

Measuring secondary surplus generated by Olympic tourism – general approach

With the theory out of the way, we can now proceed with estimating the surplus generated in secondary markets by the Olympic Games. So far in the discussion, the

identity of the good in the secondary markets has been left unspecified. Secondary market analysis for tourism is complicated by the fact that there is not one single "secondary good", but many, such as hotel visits, restaurant stays, and transportation. This problem can be solved by treating "tourism goods" as a sort of composite good which costs $1 per unit normally before taxes. P^0 is then simply $1, and Q^0 is the amount that is normally spent (before taxes) on such goods per period.

The next consideration is which of the scenarios described above (no price changes, price changes and distortions, or distortions only) are relevant. BC currently has consumption taxes imposed both at the provincial and federal levels, and we may safely assume that these will remain throughout the period in question at 7.5% provincially and 5% federally (assuming the recently announced Federal GST cut proceeds as scheduled). Therefore, distortions will always need to be accounted for.

What about price changes? As discussed in the introduction, the impact of induced tourism is expected to extend over the period 2008-2015. According to Intervistas, under the medium-high tourist visits scenario there will be 2.7m international induced tourist visits in total, of which 600k will occur in 2010 itself. This implies that the remaining 2.1m visits which occur before/after the Olympics would be spread over 7 years, for an average of 300k additional visits per year. Since, according to Tourism BC, the base of tourism in BC is 10 million international visitors per year[40], it may be safely assumed that this low level of additional visits before and after the games will not be sufficient to generate any price changes in the relevant markets, in which case equation 7 may be used to assess the surplus changes for those visits.

[40] As reported by Intervistas.

However, during the Games year itself, 600k additional international visitors will descend on Vancouver, a large number of them during the short period the Games are being held. Because the Olympics only lasts a few weeks, it is unlikely the private sector will add extra capacity just for the Olympics (although some facilities will presumably be moved ahead in time to handle the pre/post Olympic "shoulders" of extra induced demand from 2008-2015.) As a result, there will certainly be an impact on prices charged in various tourism-related sectors during the Games itself. Stories of "price gouging" during the Olympics are legion in every Olympic host city. It will be assumed that the price rise will be 25% in the Lower Mainland/Whistler area during the Games themselves. This, combined with the presence of distortions, implies that equation 8 should be used for the secondary market effects during the Games themselves.

While this paper does not contain a full-blown distributional analysis, it is interesting to consider the question of how this extra surplus is distributed. If prices get bid up and stay up for the long run, over time factor prices rise, and the end result is that this increase in producer surplus winds up going to the factors of production, not the producers. However, if prices get bid up in the short run (as is the case in the Olympics), factor prices do not correspondingly rise, and the increase in producer surplus is entirely economic rent.[41]

Secondary surplus for tourist activity during the Games

Now we will attempt to use the total amount of induced tourist spending during the Games (the best available estimate for this is from Intervistas, which was prepared

[41] This is no doubt part of the reason for the enthusiastic support that the Games receive from many in the business community.

from an "economic impact" point of view) to obtain parameters X, P^0, P^1, Q^0, Q^1, and Q^2 for equation 8, as shown in Figure 11.

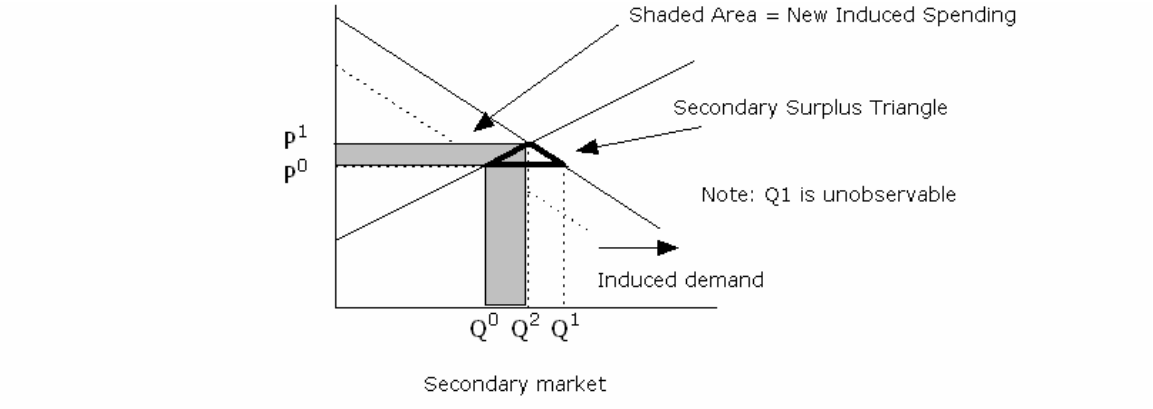

Figure 11: From "Economic Impact" to Net Benefit in Secondary Markets

As we are treating "tourism goods" as a composite good which costs $1 per unit normally ($P^0$), a price change of 25% implies that the good will cost $1.25 during the Olympics (P^1).

To estimate the initial quantity Q^0 of the "composite tourist good" consumed, the concept of "Tourist GDP" may be used. According to StatsCan (2006), Tourism GDP "is the unduplicated value of production, within the boundaries of a region, of goods and services purchased by tourists."

According to the above reference, tourist GDP in Canada was $5.1bn (nominal 2006 dollars, NSA[42]) in Q1 2006. Unfortunately there is no data for provincial tourist GDP available from StatsCan, and it will be assumed that ¼ of all Canadian tourist GDP for the quarter was generated in BC ($1.25bn). Here, we are only looking at the period for which induced tourist spending is sufficient to induce price changes (i.e. during the

[42] Given that the Olympics occur in the same quarter as the data we are using, it is undesirable to seasonally adjust our base figure. Also, this figure is before indirect taxes, and thus is appropriate to use as the measure of Q^0 before taxes, as in Figure 10 above.

Games themselves), therefore we want to look at a period shorter than one quarter. A third of a quarter (a month) yields an approximate figure for Q^0 of (1/3 * $1.25bn) = $420m.

As for X, Q^1 (unobservable, must be estimated), and Q^2 (directly observable) these can be derived from estimates of total induced tourist spending during the Games, and total induced tourist spending during the Games by people without standing, as described below.

We see from inspection of Figure 11 that Q^2 satisfies equation 9 below, given the estimates for P0, P1, and Q0 already discussed.

$$\textit{Total Induced Spending} = Q^2 * P^1 - Q^0 * P^0 \qquad \textit{(eq.9)}$$

X would be found from the formula

$$X = \textit{Induced spending by consumers with standing/All induced spending} \quad \textit{(eq.10)}$$

Finally, to estimate the unobservable Q^1, it would be assumed that the new demand curve for tourist goods is relatively inelastic (.5) over the relevant range, as consumers in the grip of a once-in-a-lifetime bout of "Olympic Fever" are unlikely to be overly concerned about price.

Estimates of tourist spending can (with difficulty) be derived from the Intervistas data. The Intervistas data categorizes participants in Olympic-related secondary markets as follows:

- Local Spectators live in the local area and do not require accommodation. As Intervistas does, the secondary market impact of the 'local spectators' category is ignored. Local spectators don't need hotels, and it is assumed that if their use of other tourist related goods and services does not change appreciably as a result of

the Olympics. In other words, their spending is already counted in the base tourism GDP figure, and may be ignored.

- Resident Visitors. Residents of BC from outside the immediate Games area visiting the games who require paid overnight accommodation, minus induced resident exits (residents of BC who "would have" vacationed in BC but leave to avoid the Games). Their spending is treated differently than that of local spectators because they require paid overnight accommodation, and thus spend more on secondary tourist goods than they normally would.
- External Visitors - athletes, media, Olympic officials.
- External tourists are tourists from outside BC who visit the Olympic area, either before, during, or after the Games, as a result of the Games, minus "induced non-visits".

Various adjustments need to be made when using this spending data:

1. Standing – the study takes the provincial perspective and so no distinction is made for non-BC Canadians. Based on the discussion in section 2 of this document, it will usually be assumed here that 30% of all external spending (whether visitors or tourists) is by non-BC Canadians (with standing) while the remainder is by non-Canadians without standing.[43]
2. It is not clear to what extent the Intervistas estimates for tourist visits and induced resident exits take into account the redirection of demand from other parts of Canada and/or other years. What portion of induced tourist visits (or induced resident exits *from*) the Olympic city would have occurred anyway, but in

[43] For many of these categories, Intervistas supplies more complicated estimates of proportion of Canadians/non-Canadians in the spending figures, but for simplicity the 30% figure will generally be used.

another year? What portion would have been to another part of the host nation instead? It appears that such considerations are part of the motivation for Intervistas' largely undocumented use of "multipliers" in order to obtain economic impact.[44] For simplicity, this paper will only adjust the external tourists category, to account for those who change the timing of their visit (i.e. they would have visited Vancouver/Whistler in 2011, but choose to visit in 2010 instead to see the Games) and for those who would have visited another part of Canada if not for the Olympics. The external tourists number is downward 15% for each factor (30% in total). No adjustment for redirected demand is made to the 'External visitors' category, as these are largely "working visits" which do not change the scheduling of vacation trips.

3. Timing of visits during the Games year – Intervistas provides estimates on total tourist visits and spending in the Games year, but makes no distinction between induced spending during the 2-week period of the Games itself, and induced spending during the remainder of the Games year (2010). I will assume arbitrarily that 50% of induced Games year spending as estimated by Intervistas takes place during the Games itself (and is thus subject to the price increases discussed above), while 50% does not.

The raw Intervistas data for number of visitors, days per visit, and spending per day (and therefore total spending), along with the various modifications discussed above, is shown in Table 3 below.

[44] Which, in turn, explains why figures for total spending induced in secondary markets as shown in Table 3 and Table 4 combined of roughly $3bn (based on data in the Intervistas report) exceed figures for economic impact of tourism of $2.2bn (taken from Intervistas as well).

	Number of Induced Visitors In Each Category *(as per Intervistas)*	*(Adjusted)*	Days per visit *(as per Intervistas)*	$ per day	Total Spendi
Resident Visitors (BC residents outside the Vancouver/Whistler area)					
During the Games (Feb 2010)	23,500	23,500	8	200	$
External Visitors (non-tourists)					
During the Games (Feb 2010)					
Media	7,000	7,000	20	100	$
Atheletes (2)	4,500	4,500	10	100	$
Olympic Officials (2)	2,000	2,000	20	250	$
Sponsors	3,000	3,000	20	500	$
External Tourists		-			$
During the Games (Feb 2010) (1)	600,000	210,000	10	329	$
Total Induced Spending During the Games				**(A)**	**$**

(1) Intervistas estimated 600k induced visits during Games year. 50% of these during games - 30% reduction for de
(2) Intervistas asserted that spending by visiting atheletes and Olympic officials should not be counted, as expenses
(however, the purpose of this exercise is to measure surplus, not spending)
(The surplus gains in secondary markets are real, regardless of who pays for them, and should be counted).

RESULTS

Q0, as calculated in text
T (as discussed in text)
Estimated price elasticity E for composite tourist good during Olympics (as discussed in text)
(equation 9): Q2 = (Total Induced Spending (A) + Q0*P0)/P1 (see text for discussion)
(equation 10) Proportion X of all induced Olympic Spending During the Games by people with "standing" in
Estimation of Q1 (% change in Q1 from Q2 found by E*20%) (see discussion in text)
(equation 8) benefits in secondary market = (1 – X) (P1 – P0)(Q0+Q2)/2 + ½ (P0 – P1)(Q1 – Q0) + (Q2 – Q0)T

Table 3: Intervistas Data and related calculations for Olympic-Induced to

We see from Table 3 that the shaded area of Figure 11, representing total induced spending during the Olympics Games, is $787m, while induced spending by visitors with standing is $260m. Applying the induced spending figure to equation 9 gives an estimate for Q^2 (the number of "units of the composite tourist good" sold during the Games themselves, *not* total revenue) of 965m. Is this reasonable? Recall that the base figure (Q^0) for tourist good consumption for one winter month in BC was estimated to be 420m "units", so an estimate of 965m implies that hotels, restaurants, and other tourist-oriented industries will be twice as busy during the Games as they otherwise would be, even with the estimated 25% price increase. Is there enough spare capacity in "tourist good producing" industries to make this possible? The answer is likely yes. The Games will be held both in the ski resort of Whistler and the nearby city of Vancouver in February 2010, and while February is the height of "tourist season" at Whistler, it is definitely <u>not</u> so in Vancouver; on the aggregate, a doubling of "tourist good" output is probably possible.

As for Q^1 (the unobservable quantity demanded of the composite tourist good if its price did NOT change from $1 to $1.25 during the Olympic Games), our previous estimate of price elasticity for such goods (.5) implies a percentage change in Q^1 of (-.5)(20%) = 10%, and a figure for Q1 of 1.062bn "units".

Finally, our proportion X of induced spending incurred by people with standing is seen from Table 3 to be 33%.

At last, we see that the correctly-calculated secondary market benefit from Olympic-induced tourism during the Games themselves is a mere $103m. As all of this benefit is realized during the "base year" of 2010, no further discounting is required.

Secondary surplus for tourist activity before/after the Games

Recall that even before and after the Games, an estimated 1.68m extra visitors will visit the Games area as the result of the Olympics (for details of this estimate, see Table 4). Estimating the quantity of extra surplus in secondary markets by these visits is a relatively simple problem, as neither price changes nor the question of how many market participants have "standing" need not be considered. We need only use Figure 9 and equation 7 as our guide, although it is important to clarify the time period that the simple supply/demand diagram is meant to represent.

Intervistas asserts that the impact of tourism is felt from 2008 to 2015 (including visits during 2010 which fall outside the Games, assumed to be 50% of the Games year visits), therefore some assumptions about the timing of these visits is necessary in order to discount the benefits of these visits to 2010. The assumptions of proportions of overall visits for each year are shown in table 4.

We can define Q^0 in our market as the amount of tourist goods sold in BC from 2008-2015. Recalling our previous estimate for tourist GDP for BC in Q1 2006 of 1.25bn, and making the simplifying assumption that this base figure would remain constant over the years 2008-15 in the absence of the Games, we obtain a figure for Q^0 of 8*1.25bn = 10bn.

Using a similar methodology as in the previous section, Table 2 tells us that an additional 2.3bn units of the composite tourist good will be consumed as the result of the Olympics, yielding a figure for Q2 of 12.3bn "units" of the composite tourist good.[45] At

[45] It can easily be seen that the quantity (Q^2 -Q^0) is simply equal to "induced spending" which we are already calculating directly. The only benefit of looking at Q^2 and Q^0 directly is to ensure that the amount of induced spending for tourism outside of the Games is low enough to assume that no price changes are likely to take place as a result of it.

a T of 12.5%, equation 7 applied to the spending for each year (and then discounted appropriately at 10% to bring all values to present value as of 2010) yields a figure for secondary surplus for induced tourism before/after the Games of $258m.

Conclusion – net benefits of tourism

Combining properly discounted figures for net benefit of tourism both during and before/after the games yields a figure of (258m + 103m), or $361m. This figure, while impressive, is a far cry from the billion-dollar figures for "economic impact of tourism" touted by Games proponents, and should be set against the full spectrum of costs and benefits for the Olympic Games, which the next and final section of this paper will do.

	Number of Induced Visitors In Each Category		Days per visit
	(as per Intervistas)	*(Adjusted)*	*(as per I*
Resident Visitors (BC residents outside the Vancouver/Whistler area)			
Before/After Games (2008-2015)	34,500	34,500	2
External Visitors (non-tourists)			
Before/After Games (2008-2015)			
Media	1,100	1,100	2
Olympic Officials	1,000	1,000	5
Sponsors	1,500	1,500	1
External Tourists			
Before/After Games (2008-2015) (1), of which….	2,100,000	1,680,000	
2008 (5% of total visits)		84,000	1
2009 (5%"")		84,000	1
2010 (20% outside of the Games Period itself (February))		336,000	1
2011 (20%)		336,000	1
2012 (20%)		336,000	1
2013 (15%)		252,000	1
2014 (10%)		168,000	1
2015(5%)		84,000	1

Total Induced Spending Before/After the Games

(1) Intervistas estimated 2.1m induced tourist visits during years 2008-15 (not incl. 2010). Move 50% of 2010 visits to this category (3
(2) No attempt is being made to specify the timing of spending in Resident Visitor or External Visitor categories, it is all assumed to ta

Q0, as calculated in text
T (as discussed in text)
Q2 = Total Induced Spending + Q0

(equation 7) benefits in secondary market in 2008 = 2008 induced spending * T
(equation 7) benefits in secondary market in 2009 = 2009 induced spending * T
(equation 7) benefits in secondary market in 2010 = 2010 induced spending (see note 2) * T
(equation 7) benefits in secondary market in 2011 = 2011 induced spending * T
(equation 7) benefits in secondary market in 2012 = 2012 induced spending * T
(equation 7) benefits in secondary market in 2013 = 2013 induced spending * T
(equation 7) benefits in secondary market in 2014 = 2014 induced spending * T
(equation 7) benefits in secondary market in 2015 = 2015 induced spending * T

NET BENEFIT OF INDUCED TOURIST SPENDING BEFORE/AFTER GAMES

Table 4: Intervistas Data and Calculations: Induced Tourist

Section 5 - Are the Olympics a Worthwhile Public Project?

> *"Economic theory casts doubt on a substantial windfall for the host city from the Olympic Games. Cities competing with one another for the Games would theoretically bid until their expected return reached zero."*
>
> *Rob Baade*

While the main thrust of this paper has been devoted to providing estimates for particular Event Benefits of the Olympic Games, namely the Spectacle, the Halo, and the net benefit of stimulated tourism, it is worthwhile to try to integrate these estimates together with other published figures for Event Costs, to provide an approximation of the true costs and benefits of the 2010 Vancouver Winter Games from a correct CBA perspective. In particular, this section provides an opportunity to enumerate some additional considerations in Olympic CBA which this paper did not have space to address.

Event Costs		**Event Benefits**	
Operations Costs listed in Bid Book	1507	Televised spectacle (section 2)	400
Risk	139	In person spectacle (section 2)	306
Bid Costs	35	"Halo" (section 3)	88
Additional Operating Costs paid for by Province		Induced tourism (section 4)	361
Medical	13	Sponsorship	
Security	88	International Sponsorship	130
		Local Sponsorship	395
Congestion Externalities	N/A		
Total Event Costs	**1782**	**Total Event Benefits**	**1680**
Event Benefits - Event Costs	**-101**		
(Note: Net Infrastructure Cost was not quantified in this paper, but would also be charged against the Olympics as discussed in section 2)			

All figures in 2002 $m CAD.

Table 5: Summary of Olympic costs and benefit estimates

Event Costs

As described in section 1, Event Costs are those which are directly required to attain the Event Benefits of hosting the Games, but are not required to attain the Infrastructure Benefits. Many of these costs are directly incurred by the organizing committee and therefore are listed in the committee's "Olympic Budget" contained in the Bid Book. No attempt has been made here to compute economic (as opposed to financial) values for these costs: published figures have been taken directly from the Bid Book. However, a number of Event Costs are omitted from the Olympic Budget but are included here:

- The cost of the original bid ($35m)
- Additional operating costs which are the responsibility of the province, namely security and additional medical facilities.
- Risk: it is the responsibility of the host region to cover any shortfalls in the operating budget of the Organizing Committee. Such estimates are inherently uncertain, and the contingency allowance made by the Province is listed here.[46]
- Congestion externalities were not estimated, although it might be argued that these are partially captured by considering the secondary impact of BC residents who leave the province to avoid the Games.

As discussed in the Introduction, a meaningful comparison of Event Costs and Event Benefits requires that they be discounted or cumulated to a common base year if their timing differs. Most Event Costs are incurred in 2010 and therefore do not need any discounting in order to be compared with the present values of Event Benefits. However, to the extent that some Event Costs (such as advertising, salaries of VANOC employees,

[46] It should be noted that the Auditor General's report states: "we have been unable to find a reasoned methodology to support that amount, and are concerned that it may be insufficient."

etc) are incurred before 2010, the figures used understate the present values of those costs as of 2010. This consideration applies even more forcefully to Infrastructure Costs and Benefits, where the costs precede the non-Olympic benefits by many years.

Event Benefits

The primary benefits of holding the Olympic Games are the benefit of the Spectacle, the Halo, and the secondary market effects of induced tourism, and these are estimated in sections 2 through 4.

In addition, a very large component of VANOC's projected revenue is derived from sponsorship, which is the exchange of goods or money in return for the right for a company to associate itself with the Olympics. This "benefit" that is generated by the Olympics can be thought of as the corporate counterpart to the "Halo" of section 4, which considered the value of "being associated with the Olympics" for residents of the host region themselves. However, the Auditor General points out that a very large component of sponsorship "revenue" actually consists of goods provided for free by the sponsoring corporation, and since these are usually valued at full retail price rather than their true economic value, these sponsorship figures should be interpreted with a healthy degree of scepticism.[47] That being said, the fact that most of these sponsorship benefits are generated before 2010 means that here too, the figures used understate the present values of these benefits as of 2010.

[47] Another reason for scepticism: the Auditor General's report suggests that targets for local sponsorship are extremely optimistic.

Conclusion

As we see from Table 5 above, even the most generous measure of net benefit of the Olympics – Event Benefits minus Event Costs – is negative (-$101m), although by a lesser amount than was anticipated at the beginning of the project. This figure is "helped" by fully evaluating the extra surplus from the spectacle and the Halo.

However, there are a number of factors which push the actual net benefit of this much-celebrated project even further into the red. The first, of course, are the infrastructure costs discussed in section 1. While this paper did not rigorously assess these, a casual perusal of the Infrastructure Costs and the non-Olympic Infrastructure Benefits which might be expected reveals that the net contribution of Infrastructure to the Olympic "bottom line" will be negative by hundreds of millions of dollars. While these costs are obvious, the standard counter-argument is that they will be offset by the "economic impact" of the Games. However, section 4 of this paper revealed that "economic impact", when correctly accounted for, is not nearly as large as is generally assumed. When combined with the substantial upside risks inherent in costs of public works projects[48], the expected overall net benefit of hosting an Olympic Games is substantially negative.

[48] Redlin (2003) quotes research by Bend Flyvberg of Aalborg University, who has found that 90% of large public works projects exceed their initial cost estimates.

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