Johnson, B.K., Groothuis, P.A., and Whitehead, J.C. (2001), The Value of Public Goods Generated by a Major League Sports Team: The CVM Approach. **Journal of Sports Economics**, 2(1): 6-21 (Feb 2001). Published by SAGE. doi:10.1177/152700250100200102

# The Value of Public Goods Generated by a Major League Sports Team: The CVM Approach

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**ABSTRACT**

This article reports an application of the contingent valuation method to measure the value of public goods generated by a professional sports team, the Pittsburgh Penguins of the National Hockey League. The data and analysis indicate that a major league sports team can produce widely consumed public goods such as civic pride and community spirit and that the value of those public goods may be substantial. However, in the case of the Penguins, the value of the public goods is far less than the cost of building a new arena. Although the analysis of public goods generated by other teams in other cities might lead to different results, the results of this article call into question the widespread practice of government funding of sports stadiums and arenas because it appears that the costs borne by taxpayers exceed the benefits received.

## 1. INTRODUCTION

Most arenas and stadiums built for American major league sports teams in recent decades have received large government subsidies. Between 1990 and 1998, 46 stadiums and arenas were built or substantially renovated for teams in the four major league sports. At the end of 1999, an additional 49 sports buildings were under construction or in the planning stages. About two thirds of the $21.7 billion spent on these 95 buildings will have come from government sources by the time construction is complete (Siegfried & Zimbalist, 2000, p. 95).

Governments justify their subsidies of buildings for sports teams because, they claim, teams generate large positive externalities. Because teams cannot capture the benefits of those externalities through the market, the only way many cities can attract or keep a team is to subsidize construction of buildings for the teams to play in. Sports teams allegedly generate two types of external benefits. First, they allegedly increase an area's aggregate income through additional tourism. Much of the increased spending on lodging, meals, and other travel and entertainment, if it occurs, will take place outside the stadium or arena and will not accrue to the team or building owners.

But the research is clear. Stadiums and professional sports do not generate significant increases in income (Baade & Dye, 1990; Baade & Sanderson, 1997; Noll &Zimbalist, 1997; Rosentraub, 1996). Because the spending multipliers of professional sports teams may be lower than those for most other industries (Noll & Zimbalist, 1997, pp. 74-75) and because teams may divert significant spending from other activities, sports teams may even reduce area income. Some weak evidence is consistent with this. In particular, Baade and Sanderson (1997, p. 105) find that in some cities, a city's share of its state's employment in leisure and recreation tended to fall with the addition of a team or new stadium.

The second type of positive externality generated by sports teams occurs if a team produces public goods. Local unity, fan loyalty, and civic pride are nonrivalrous and nonexcludable. People talk about their team, cheer for its success, and celebrate its victories and may do so without buying tickets or making any payment to the team. Perhaps the most spectacular manifestations of such public goods are the raucous street parties and demonstrations by hundreds of thousands of fans in cities whose teams win league championships. Economists acknowledge that the cultural significance of sports probably exceeds its business significance (Noll & Zimbalist, 1997, p. 56; Quirk & Fort, 1992, p. 58).

Even though the value of sports public goods may be large, economists have rarely attempted to measure them. This article applies the contingent valuation method (CVM) to measure the value of public goods generated by a major league sports team. The CVM has been designed to measure the value of goods not traded in markets and has been widely used in the environmental economic literature to measure the value of environmental public goods. Recent applications of CVM to policy analysis include siting of a hazardous waste disposal facility (Groothuis,Van Houtven, & Whitehead, 1998) and historical site preservation (Chambers, Chambers,& Whitehead, 1998). Johnson and Whitehead (2000) first applied it to sports. They determined the value of public goods generated by two proposed projects in Lexington, Kentucky: a new arena for the University of Kentucky basketball team

and a stadium to attract a minor league baseball team. They found that neither project generated sufficiently large positive externalities to justify substantial public financing of the projects.

Neither project studied by Johnson and Whitehead (2000) involved an established major league team that presented a credible threat to move to another city. Although Johnson and Whitehead showed the feasibility of using CVM for sports, they did not answer the questions most relevant to the stadium subsidy issue: How valuable are the public goods generated by major league sports teams, and how widely are these public goods consumed by a city's population? This article attempts to answer those questions.

## 2. PITTSBURGH PENGUINS

This article applies CVM to measure the value of public goods generated by the Pittsburgh Penguins of the National Hockey League (NHL) for residents of the Pittsburgh Metropolitan Statistical Area (MSA). The Penguins declared Chapter 11 bankruptcy in October 1998 and were at risk of moving to another city or being disbanded by the NHL.

In March 1999, U.S. Bankruptcy Judge Bernard Markovitz issued a permanent injunction against any owners, present or future, from discussing a possible sale to owners who would move the Penguins to another city. Markovitz wrote,

> The Penguins are as much a part of the warp and woof (*sic*) of this community as are its other professional sports teams, museums, parks, theaters and ethnic neighborhoods.
> As important as [the creditors'] interests are, they may have to give way when the interest of the community at large so dictates. In this case, it so dictates. ("Penguins Must Stay in Pittsburgh," 1999, p. G2)

At a hearing on May 28, 1999, Judge Markovitz said the Penguins "are woven into the fabric of the city and county and surrounding counties" ("Power Play," 1999, p. A14).

Markovitz's contention that the Penguins are part of the fabric of metropolitan Pittsburgh is consistent with the claim that the Penguins generate valuable and widely consumed public goods. Markovitz believes the public goods are so valuable that he enjoined the team from leaving Pittsburgh, even though potential buyers who wanted to move the team to another city had reportedly offered $85 million for the team (Barnes, 1999, p. B1).

Why might Markovitz believe the Penguins generate valuable public goods? The Penguins flourished on the ice in the 1990s. They won the Stanley Cup in 1991 and 1992 and contended in other years. Without an NBA team to compete for fans, Pittsburgh hockey received an unusually high level of attention, and Pittsburgh was regarded as one of the most enthusiastic hockey towns in the NHL (Lapointe, 1998, p. D5).

In June 1999, Markovitz accepted an offer from a consortium of local investors to buy the team for $65 million, plus the conversion of $20 million debt to Mario Lemieux into equity. The team owed the retired player more than $30 million in deferred salary. Lemieux agreed to convert $20 million of his deferred salary into an equity interest in the team (Sandomir, 1999, p. D3).

The circumstances surrounding the Penguins in 1998-1999 provided an ideal background in which to conduct a CVM analysis of the value of public goods generated by a sports team. At no time during the bankruptcy proceedings did the Penguins or the NHL demand or request that Pittsburgh build a new arena for the Penguins. Thus, a hypothetical scenario for the CVM survey could concentrate on one question—what are the Penguins worth to Pittsburgh, instead of what are the Penguins and a new arena worth?

## 3. THEORY

Suppose survey respondents possess the utility function $u = u(x, h, z)$, where $u$ is increasing in $x$, $h$, and $z$; $x$ measures consumption of Penguins hockey games, $h$ is the existence of hockey in Pittsburgh, and $z$ is a composite commodity of market goods. The existence of hockey results in both public and private goods being produced. The budget constraint is $y = z + px$, where $y$ is income and $p$ is the money cost of hockey game consumption, including ticket prices and travel costs. The price of the composite commodity is normalized at 1, and the existence of hockey public goods is an unpriced nonmarket good.

Solving the utility maximization problem yields the indirect utility function, $u = v(p, h, y)$, which is decreasing in $p$ and increasing in $h$ and $y$. If respondents minimize expenditures, $z + px$, subject to the utility constraint, the expenditure function results, $e = e(p, h, u)$. The expenditure function is increasing in $p$ and $u$ and decreasing in $h$.

With the loss of hockey in Pittsburgh ($h = 0$), the expenditures necessary to reach the reference utility level increase. The difference between expenditure functions is the willingness to pay for Penguins hockey,

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

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

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

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

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

where $e' = e(p', 0, v(p, h, y))$. If $h$ is a normal good, the marginal cost of utility is

lower with the existence and availability of hockey, $(\partial e'/\partial v)/(\partial e/\partial v) > 1$, and the income effect is positive, $\partial CV/\partial y > 0$. If $h$ is an inferior good, the income effect is negative.

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

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

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

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

Use value is the willingness to pay to avoid the choke price with hockey remaining in Pittsburgh.

## 4. SURVEY

To obtain information on the value that citizens place on professional sports teams, we developed a CVM survey questionnaire. The definitions and descriptive statistics of the variables taken from the survey and used throughout this article appear in Table 1. This section describes additional details about the survey.

The CVM captures both use and nonuse values (Mitchell & Carson, 1989). Use value is the portion of willingness to pay generated by the revealed behavior of attending games (i.e., consuming private goods). Nonuse value is the portion of willingness to pay coming from consumption of public goods, such as talking about the team with friends and family. Our CVM survey presented a contingent valuation scenario designed to elicit WTP for Penguins hockey, as defined in equation (5). Empirical procedures are used to determine what portion of WTP is for public goods (equation (4)) and what portion is for private goods (equation (5)).

The survey was organized into five sections, three of which provide the data for this article. After a brief section about professional football and baseball in Pittsburgh, the survey asked respondents about their consumption of Penguins hockey. Questions asked how many games they attend each season at Civic Arena and how many theywatch onTV. The survey asked howoften they read about and discuss the Penguins during the hockey season. Questions asked respondents to describe their level of interest in the Penguins and to indicate how the quality of life in western Pennsylvania would change if the Penguins left.

The third section of the survey covered the valuation of Pittsburgh Penguins hockey. The valuation section began with some background information:

> The Pittsburgh Penguins declared bankruptcy last year in federal court and almost left Pittsburgh. The federal judge handling the case declared that the Penguins are too

> important to Pittsburgh to allow them to leave. After several months, a local group headed by former Penguin star Mario Lemieux took over the team and promised to keep the Penguins in Pittsburgh.

Respondents were then asked whether keeping the Penguins in Pittsburgh is important and whether they thought losing the Penguins would hurt Pittsburgh's image as a major city.

The survey then presented respondents with a scenario in which the Penguins might leave Pittsburgh:

> The Penguins continue to play in one of the worst arenas in the NHL and Pittsburgh is a fairly small market. The new owners might not have enough money to support a payroll
> for a team that could challenge for the Stanley Cup. If more local investors are not found, the team may leave Pittsburgh. Some say this would damage Pittsburgh's national image and it would mean the city would never have the excitement of a Stanley Cup championship again.

The survey offered an alternative scenario in which the Penguins would become publicly owned at a cost to taxpayers:

> If the city of Pittsburgh were to buy the team, it would never leave Pittsburgh. But in order for the city to buy the team, pay off its debts, and challenge for the Stanley Cup, taxpayer money will be needed. One estimate is that each Pittsburgh household would have to pay $TAX each year in higher city taxes.

The four $TAX amounts ($1, $5, $10, and $25) were randomly assigned. Then respondents were asked the discrete-choice willingness-to-pay question—" Would you be willing to pay $TAX each year out of your own household budget in higher city taxes to help keep the Penguins in Pittsburgh?"—and were given three response categories: "Yes," "No," and "I don't know." All respondents were then asked the open-ended willingness-to-pay question: "What is the most you would be willing to pay out of your own household budget each year in higher city taxes to keep the Penguins in Pittsburgh?" They were presented with the following "payment card" categories to choose in response to the question: "Zero," "Between $0.01 and $4.99," "Between $5 and $14.99," "Between $15 and $29.99," "Between $30 and $49.99," "Between $50 and $75," and "More than $75." Debriefing questions followed, asking why they were willing or not to pay taxes to keep the Penguins from leaving.

The third section of the survey concluded with two questions asking whether respondents had lived in Pittsburgh when the Penguins won the Stanley Cup in 1991 and 1992 and how they had celebrated the Cup victories. Respondents could answer that they did not watch or celebrate, that they celebrated by consuming public goods (e.g., watched games at a sports bar, celebrated with friends, partied in the streets, etc.), or that they celebrated by consuming private goods, namely, attended Stanley Cup games in person.

TABLE 1: Variable Definitions and Summary Statistics

| *Variable* | *Definition* | *Mean* | *Standard Deviation* | *Minimum* | *Maximum* |
|---|---|---|---|---|---|
| WTPM | Amount in dollars respondent *i* is willing to pay per year for new Penguins arena | 7.27 | 14.35 | 0 | 75 |
| TAX | $1, $5, $10, or $25, depending on the amount requested from respondent on the discrete-choice willingness-to-pay (WTP) new arena question | 10.82 | 9.53 | 1 | 25 |
| USE | 1 if respondent attended a Penguins game in 1999-2000 season | 0.39 | 0.49 | 0 | 1 |
| GAMES | Number of Penquins games attended | 1.75 | 5.39 | 0 | 42 |
| WATCH | Number of Penquins games watched on TV | 10.72 | 16.23 | 0 | 95 |
| READ | 1 if "a few days per week" or "daily" | 0.44 | 0.50 | 0 | 1 |
| TALK | 1 if "a few days per week" or "daily" | 0.33 | 0.47 | 0 | 1 |
| INTER | 1 if "I'm a diehard/casual fan" | 0.72 | 0.45 | 0 | 1 |
| QUAL | 1 if "fall slightly/great deal" | 0.42 | 0.50 | 0 | 1 |
| PUBGOOD | Sum of four dummy variables measuring consumption of public goods generated by Penguins | 1.92 | 1.44 | 0 | 4 |
| STANCUP | 1 if attended or watched Stanley Cup games | 0.54 | 0.50 | 0 | 1 |
| CELEBRATE | 1 if celebrated Stanley Cup win in the streets, with friends, or at city parade | 0.19 | 0.39 | 0 | 1 |
| INCOME | 1999 self-reported household income | 49.70 | 20.99 | 15 | 75 |
| HOUSE | Number of people normally living in the same household as respondent | 2.68 | 1.36 | 1 | 8 |
| GENDER | 1 if respondent is male, 0 if female | 0.73 | 0.44 | 0 | 1 |
| RACE | 1 if respondent is White, 0 otherwise | 0.94 | 0.24 | 0 | 1 |
| AGE | Age in years of respondent | 52.37 | 15.69 | 19 | 89 |
| EDUC | Years of formal education | 14.43 | 2.50 | 10 | 18 |
| WINDSHIELD | 1 if windshield sample | 0.07 | 0.26 | 0 | 1 |

NOTE: Number of cases = 226.

The fourth section of the survey asked respondents several questions about the impact of various Pittsburgh-area institutions on civic pride. The fifth and concluding section of the survey asked about household size, gender, race, age, tenure in western Pennsylvania, education, and income.

## 5. DATA

In February 2000, we sent a CVM survey to a sample, purchased from a professional sampling firm, of 900 randomly selected households in the Pittsburgh MSA. Seventy-eight surveys of the 900 mailed out proved undeliverable. Of the 822 delivered, respondents returned 293, a response rate of 35.6%.We also placed 200 surveys on windshields of cars parked at Civic Arena during the Penguins' game on April 1. Sixteen cases are included from this survey. The empirical analysis uses all 226 surveys in which respondents answered every question but income. As is typical with CVM surveys, the valuation and income questions create the greatest

nonresponse problems. In this survey, 5.4% ($n$ = 16) and 11.9% ($n$ = 35) of the sample did not answer the open-ended valuation and income questions. These two questions account for most of the item nonresponse.

In cases where all but the income questions were answered, income was estimated as a function of the demographic characteristics reported in the sample. Using estimated income, the number of usable responses increases by 24 to 226. A summary of the variables, their description, and summary statistics is presented in Table 1.

In this sample, respondents attend an average of 1.75 Penguins games per year, with a range of 0 to 42. Most respondents (61%) attend zero games. About 31% attend fewer than 5 games. They watch an average of just under 11 games, with a range from 0 to 95, on television. More than 36%watch zero games, and the median number of games watched is about 4. The correlation between games watched and attended is 0.427.

Forty-four percent of respondents said they read about the Penguins at least a few days per week, whereas 33% said they talk with friends about the Penguins. Seventy-two percent identified themselves as Penguins fans, and 42% said the quality of life in Pittsburgh would fall if the Penguins left.

The average tax amount presented to respondents is $10.82, with between 21% and 29% of respondents receiving each of the four tax amounts. Thirty-eight percent of the sample said that they would pay the tax amount, but 49% said they would not pay and 13% said they did not know. On the payment card question immediately following, 48.5% said they would not be willing to pay anything. After coding the maximum willingness-to-pay values at the midpoint of the offered intervals and conservatively coding the highest amount at $75, the average maximum willingness to pay is $7.11.

As in many CVM surveys, the average respondent is somewhat older than is the average resident. The average respondent in this sample is 52.4 years old, whereas 59.7% of the MSA population in 1997was younger than age 45. Seventy-three percent of the respondents were male, compared to 48.1% of the Pennsylvania population. The empirical model is weighted to account for the overrepresentation of males in the sample. But in other respects, the sample appears typical of the Pittsburgh MSA. The average household size in the sample was 2.68 compared to 2.25 in the MSA. Ninety-four percent of the sample identified themselves as White, compared to 90.5% in the MSA. The sample's average income was $49,700, compared to the MSA average of $55,779.

## 6. EMPIRICAL MODEL

Using standard CVM methodology, the survey results can reveal whether people are willing to pay to keep a team in town. Furthermore, WTP can be decomposed into use value and nonuse value components. In the present case, the use value represents WTP for attendance at Penguins games. The nonuse value measures the

WTP for the consumption of public goods resulting from having the Penguins in Pittsburgh.

To derive such results, a WTP model for the Penguins was specified as

$$\text{WTP} = f(\$\text{TAX}, \text{INCOME}, \text{USE}, \text{GAMES}, \text{WATCH}, \text{PUBGOOD}, \text{STANCUP}, \text{CELEBRATE}, \text{WINDSHIELD}, \mathbf{D}), \quad (6)$$

where $TAX is the amount of yearly tax the respondent was asked to pay for the Penguins, and INCOME measures ability to pay the increased taxes. Theory suggests that the exogenous access price should be included as an independent variable. However, in our sample, there is little variation in the ticket price and travel costs of game attendance. Therefore, we include two variables to account for choke and access prices. The dummy variable USE takes a value of 1 if the respondent attends one or more hockey games per year. The number of Penguins games attended during the past year is GAMES and allows a distinction between those who are frequent attenders and those who are not. This specification follows Johnson and Whitehead (2000). The number of games watched on TV is measured by WATCH, and PUBGOOD is a variable that represents the public good aspects of the Penguins.

The variable STANCUP takes a value of 1 if the respondent said he or she attended or watched on TV the Penguins' Stanley Cup championships in 1991 and 1992. The variable CELEBRATE takes a value of 1 if the respondent said he or she celebrated the championships by consuming public goods such as attending a victory parade or celebrating in the streets. The vector **D** contains standard demographic variables concerning age, sex, race, and the like. Complete definitions and summary statistics of all variables used are given in Table 1.

If hockey is a normal good, WTP should increase with income. The expected effects of other demographic variables, with the possible exception of sex, are ambiguous. WTP should be higher for those who attend games than for those who do not, and more frequent attenders should be willing to pay more than less frequent attenders. The more games a person watches onTV, the higher the WTP should be. Each of these variables allows measurement of the use value of Penguins hockey. The nonuse value can be calculated as the residual difference between WTP and use value and is measured by setting USE and GAMES equal to zero. The public good characteristics of the Penguins were measured with a series of behavioral and attitudinal questions. Dummy variables measuring the importance of activities related to the Penguins were summed to form a scale variable, PUBGOOD. The first component of PUBGOOD measured the amount of reading done about the Penguins: "During the season, how often do you read about the Penguins in newspapers or in magazines?" The choices were "never," "rarely," "a few days per week," and "daily." The variable READ is equal to zero if the respondent answered "never" or "rarely" and is equal to 1 otherwise. Forty-four percent of the sample reads about the Penguins at least a few days per week.

The second variable measures the amount of conversation about the Penguins. Respondents were asked how often they discuss the Penguins with others and were given the same choices they had in the READ question. TALK is defined parallel to

READ. Thirty-four percent of the sample talks about the Penguins at least a few days per week.

The third component of the PUBGOOD variable measures the respondents' overall level of interest in the Penguins. For those who identified themselves as "diehard fans" or "casual fans," INTEREST equals 1, whereas for those who "don't pay any attention" or are "tired of hearing about the Penguins," INTEREST equals zero. Seventy-two percent identified themselves as Penguins fans.

The fourth variable making up PUBGOOD measures attitudes about the Penguins' contribution to overall quality of life in western Pennsylvania. If respondents said they believe the quality of life would fall "slightly" or "a great deal" if the Penguins left, then QUAL takes a value of 1. If they answered that the quality of life would "remain unchanged," "improve slightly," or "improve a great deal" without the Penguins, QUAL takes a value of zero. Forty-two percent of respondents thought losing the Penguins would harm the quality of life in Pittsburgh.

The variable PUBGOOD equals the sum of READ, TALK, INTEREST, and QUAL and is increasing in the consumption of public goods produced by the Penguins. Considering the small sample size, the scale is reliable according to Cronbach's alpha ($\alpha = 0.74$).

In addition to PUBGOOD, another variable is used to measure public good consumption. In championship seasons, the excitement surrounding teams increases, and many people may become fans who otherwise would pay little attention to the team. Longtime fans of the team may become even more enthusiastic supporters. Spontaneous street celebrations often break out when the home team clinches a championship, and cities routinely stage parades in honor of the championship teams. Both the quantity and quality of public goods generated by a champion may differ from those generated by an also-ran.

The survey asked respondents whether and how they celebrated the Penguins' Stanley Cup titles in 1991 and 1992. They could answer that they did not celebrate, that they attended the title games in person, or that they watched the games on TV in bars, partied in the streets, celebrated with friends, or attended a city parade in honor of the team. CELEBRATE equals 1 if they reported celebrating in the streets, celebrating with friends, or attending a city parade and zero otherwise.

## 7. EMPIRICAL RESULTS

The initial test of the willingness-to-pay data is whether the discrete-choice responses conform to economic theory, with the percentage yes responses falling as the tax amount increases. This is tested with the multinomial logit model with YES as the dependent variable, allowing the coefficient vectors of the "no" and "don't know" responses to be different. The percentage of "no" and "don't know" responses both increase as the tax amount increases. The results are significant at the 1% level. This result indicates that respondents are rationally responsive to price.

Due to the prevalence of zero willingness-to-pay values, the willingness-to-pay data are analyzed with the Tobit model. Because WTP and GAMES are potentially determined jointly, the simultaneous-equations version of Tobit was used first to test for exogeneity. The exogeneity of GAMES could not be rejected, so the results appearing in Table 2 are based on GAMES being exogenous. Willingness to pay is specified to depend on hockey consumption and socioeconomic variables. Because the coefficient on the tax amount variable is not statistically significant, we conclude that the tax amount proposed in the survey does not influence the amount of the final willingness to pay.

The positive income coefficient is statistically insignificant. The joint hypotheses that all of the other demographic coefficients equal zero could not be rejected, and those variables were dropped from the model. Also, the coefficient on the WINDSHIELD variable is not statistically significant, indicating that the willingness-to-pay values from the mail and windshield survey respondents are similar.

The coefficient on USE is positive and significant, with a one-tail probability value of 0.027. The marginal effect of USE indicates that a person who attends at least one game per year is willing to pay $2.88 per year in higher taxes to keep the Penguins from moving. The coefficient on GAMES is positive and significant, with a marginal effect of 0.32. Assuming that the marginal effect is equal to the average, a person attending 10 games per year would thus be willing to pay, ceteris paribus, $3.20 per year in higher taxes in addition to the $2.88 from participation (USE). The coefficient on WATCH is zero and insignificant, indicating that TV viewership has no effect on WTP. The coefficient on PUBGOOD is positive and significant. Its marginal effect indicates that WTP increases by $2.31 for each of the four types of public goods included in PUBGOOD.

The coefficient on STANCUP is positive and highly significant, with a marginal effect of $4.47. Coupled with the results on CELEBRATE, which is insignificant, this suggests that experiencing a championship significantly increases the WTP for a sports team but only if a person views the games. The celebration afterward seems to have no impact on WTP.

TABLE 2: Determinants of Willingness to Pay

| *Variable* | *Coefficient* | *Standard Error* | *t-Ratio* | *Marginal Effects* |
|---|---|---|---|---|
| Constant | –24.78 | 4.85 | –5.11 | –10.83 |
| TAX | –0.15 | 0.15 | –1.05 | –0.07 |
| USE | 6.58 | 3.41 | 1.93 | 2.88 |
| GAMES | 0.73 | 0.23 | 3.11 | 0.32 |
| WATCH | 0.00 | 0.11 | 0.01 | 0.00 |
| PUBGOOD | 5.29 | 1.32 | 4.01 | 2.31 |
| STANCUP | 10.23 | 3.00 | 3.41 | 4.47 |
| CELEBRATE | –0.40 | 3.93 | –0.10 | –0.18 |
| INCOME | 0.10 | 0.07 | 1.40 | 0.04 |
| WINDSHIELD | 2.69 | 4.99 | 0.54 | 1.17 |
| Sigma | 17.12 | 1.18 | 14.53 | |
| Log-likelihood function | –540.89 | | | |

NOTE: For definitions of variables, see Table 1.

Mean WTP, use and nonuse value, and 95% confidence intervals are estimated by evaluating the coefficients from the Tobit model at the mean of the independent variables. Table 3 presents the results. Nonuse value estimates were found by setting the user status and the number of games attended equal to zero. Use value is then estimated as the difference between the mean WTP and the estimated nonuse value. WTP for the Penguins is $5.57, which decomposes into a nonuse value of $4.08 and a use value of $1.49. Both the use and nonuse values are statistically significant at the 1% level. Nonuse value placed on the Penguins is about 2.7 times the use value. The difference in use value and nonuse value is significant at the 95% confidence level.

## 8. POLICY IMPLICATIONS

Do the WTP estimates derived here help explain the widespread support for the public subsidy of sports facilities? Was Judge Markovitz on firm footing when he asserted the Penguins' importance to the civic fabric of Pittsburgh?

To answer these questions, the annual WTP must be aggregated for the entirehttp://www.tribuy.com/items/3038.jpg population. If aggregate WTP is interpreted as the annual flow of benefits generated by the team, the present discounted value of the stream of future benefits can be interpreted as the capital value of the benefits generated by the team. If the capital value of the nonuse, or public good, benefits generated by a team exceeds the subsidies paid to the team, and if the team would otherwise not locate in the city, then the subsidy may appear desirable to local politicians and their constituents. The subsidy may or may not be economically efficient, depending on whether the benefits are greater than the costs. Also, the subsidy may or may not be equitable, depending on whether those who bear the cost of the subsidy are those who receive the benefits from the team.

The aggregate annual WTP, as well as its use value and nonuse value components, is shown in Table 4.We employ two conservative aggregation rules in order to not overstate the value of the Penguins. Typically, a menu of public projects will pass the benefit-cost test. However, the menu of projects is not affordable with public funds.With conservative aggregation rules, we avoid potentially recommending the expenditure of public funds for a project (at the expense of other worthy projects) that does not pass the benefit-cost test.

TABLE 3: Willingness to Pay, Use Value, and Nonuse Value Estimates

| *Variable* | *Mean* | *Standard Error* | *t-Ratio* | *95% Confidence Interval* | |
|---|---|---|---|---|---|
| | | | | *Upper Bound* | *Lower Bound* |
| Willingness to pay | 5.57 | 0.70 | 7.97 | 6.94 | 4.20 |
| Nonuse value | 4.08 | 0.77 | 5.33 | 5.58 | 2.58 |
| Use value | 1.49 | 0.47 | 3.18 | 2.40 | 0.57 |

TABLE 4: Aggregate Willingness to Pay, Use Value, and Nonuse Value Estimates

| | *Annual Aggregate*[a] | | *8% Amortization Rate* | |
|---|---|---|---|---|
| | *Upper Bound* | *Lower Bound* | *Upper Bound* | *Lower Bound* |
| Willingness to pay | 5,277,575 | 1,878,817 | 65,969,688 | 23,485,209 |
| Nonuse value | 3,865,800 | 1,376,225 | 48,322,500 | 17,202,810 |
| Use value | 1,411,775 | 502,592 | 17,647,188 | 6,282,399 |

a. 1997 estimated number of households was 947,500.

To estimate the net present value of the benefits generated by the Penguins in Pittsburgh, we multiplied the mean WTP estimates by the number of households in the MSA in 1997. This aggregation rule downwardly biases the aggregate benefits if households outside the Pittsburgh MSA value the Penguins. However, further extrapolating the WTP values outside the Pittsburgh MSA will lead to upward-biased aggregate WTP estimates if those outside the Pittsburgh MSA place a lower value on the Penguins. Also, without information on the relationship between distance and WTP, the geographic extent of the Penguins market is uncertain.

Following standard survey research results, we expect nonrespondents to have WTP values less than or equal to the WTP values of the respondents. The upper-bound WTP estimates were calculated by multiplying the number of households by the estimated WTP, assuming that nonrespondent WTP is equal to respondent WTP. Because only 35.6% of the mail surveys were returned, the lower-bound figures are 35.6% of the upper-bound figures. The 64.4% of the sample who failed to return the surveys are assumed to have no interest in the Penguins and, following the practice recommended by Mitchell and Carson (1989, p. 282), are assumed to have zero WTP. The true value of aggregate WTP lies between the upper and lower bounds.

The upper-bound aggregate WTP is about $5.3 million. The lower-bound aggregate WTP is about $1.9 million. These figures can be regarded as annual benefit streams to be received in perpetuity because the hypothetical scenario presented in the survey said “the team would never leave Pittsburgh,” and the present discounted

values can be easily calculated. Table 4 presents upper- and lower-bound values discounted at 8%. Under these assumptions, present discounted value of aggregate benefits could range from about $23.5 million to $66 million.

Table 4 also shows the capitalized use and nonuse value components of WTP. The upper-bound present value of nonuse value, discounted at 8%, is about $48.3 million. The lower bound is about $17.2 million. Clearly, even the most conservative estimate of nonuse value indicates that the Penguins generate substantial benefits from public goods. A lower bound of $17.2 million is about 20% of the market value of the team, whereas the upper bound of $48.3 million is about 57% of the market value. These lower and upper bounds are based entirely on the value of the *public* goods associated with the team.

Of course, Judge Markovitz ignored potential nonuse benefits that would have accrued to another city, such as Portland, Oregon, had the Penguins relocated. It is possible that the nonuse benefits would be larger elsewhere than in Pittsburgh. But Markovitz was correct in asserting that the total value of the Penguins significantly exceeded their market value.

The nonuse values also shed light on the question of whether subsidized arenas and stadiums to attract or keep teams are justified. The Penguins do not generate enough public goods to justify complete public financing of a new arena, typically costing $180 million to $220 million.

If per capita WTP in Pittsburgh is typical of WTP in other metropolitan areas, it is possible that in a few large cities, WTP is sufficiently large to justify full subsidy of an arena. If the upper-bound NUV reported in Table 4 accurately measures nonuse values, then a city with a population four times as great as Pittsburgh's could justify a properly designed subsidy equal to the cost of a new arena. But there are only two metropolitan areas with as much as four times Pittsburgh's population—Los Angeles and New York.

It is likely that the true nonuse value WTP is somewhere between the upper and lower bounds reported in Table 4. If the lower-bound estimate, which avoids potential sample selection bias, is a more accurate measure, then the value of public goods generated by a sports team would not be large enough even in New York to justify a subsidy as large as $200 million.

If the upper-bound estimate is accurate, the value of public goods generated in Los Angeles or New York, though larger than the cost of most new arenas, could justify such a large subsidy only if it were critical to attracting or keeping a team. Given the large market sizes of Los Angeles and New York, they are the least likely cities to require a subsidy to attract or keep a team.

Even if the WTP nonuse values equaled or exceeded the cost of building an arena, the decision to subsidize the arena would reduce the welfare of some if those willing to pay zero were taxed, a likely event because about half the respondents indicated their maximum WTP was zero. Unless some mechanism for identifying and taxing only those with positive WTP could be found, it is unlikely that any partial or total subsidy of an arena would be a Pareto improvement.

Yet most arenas and stadiums are heavily subsidized. Local and state elected officials all across the country have enthusiastically courted teams with new buildings

and generous leases. They must believe that the political benefits exceed the political costs. The most likely explanation, if the WTP figures for the Penguins are typical for other teams in other cities, is a simple public choice story. Fans of pro sports are easier to identify and organize than are nonfans. They are well aware of the benefits they receive from their teams. They see a subsidy paid for by general tax revenues as an opportunity to shift some of the costs of sports to other groups, and politicians recognize that they will be rewarded at the ballot box if they subsidize an arena.

## 9. CONCLUSIONS

The data and analysis in this article indicate that major league sports teams generate widely consumed public goods for the residents of their cities. With 72% of the respondents identifying themselves as Penguins fans, even though less than 40% attend games, the claim that sports provide a unifying element to civic life is certainly plausible. Furthermore, a little more than half the respondents indicated they would be willing to pay for hockey-related public goods rather than lose them. However, the analysis suggests that the value of public goods generated by major league sports teams may not be large enough to justify the large public subsidies typically offered to most stadiums and arenas built today. Coupled with the overwhelming evidence of previous research that major league sports teams and their stadiums do not generate increased income for their cities, it would seem that publicly financed sport buildings represent a misallocation of resources.

Several caveats are in order. First, although Pittsburgh enjoys a reputation as a good hockey city (Lapointe, 1998, p. D5), hockey remains the least popular of the four major league team sports in the United States. It is possible that the value of the public goods generated by hockey teams falls short of the values generated by other sports teams.

Second, the analysis is based entirely on data from Pittsburgh, and although there is no particular reason to regard Pittsburgh as unusual or atypical in its attitudes toward professional sports, there is no particular reason to regard it as typical either. These results may not be representative of other cities.

Combined with the results of Johnson and Whitehead (2000), the results of this analysis call into question claims that the public goods created by sports teams generally justify large public subsidies. But it is possible that teams in different sports and cities may sometimes produce more valuable public goods. Only further research can answer the question.

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