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Economic value of a local museum Factors of willingness-to-pay

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Abstract

The aim of this paper is to determine the economic value of a local cultural history museum, namely, the Museum of Central Finland in Jyväskylä. This study also seeks to clarify what factors affect the willingness-to-pay for the Museum. Data were gathered from a sample of Jyväskylä residents aged 18 and over via a postal questionnaire in November and December 1997. The results indicate that in reality, Jyväskylä residents contribute less in taxes to the Museum than they report that they are willing to pay. This indicates that at least the present amount of tax revenue can justifiably be directed to the Museum. Maintenance of the Museum can thus be legitimised on the basis of the public's willingness-to-pay.

The difference between users (visitors) and non-users is analysed in detail. The results show that although a large proportion of the respondents had not visited the Museum very often, they nonetheless reported willingness-to-pay for its existence and for the possibility to visit it in the future. The Museum thus has non-use value, i.e. that the non-market benefits of the Museum reported by the local residents can be argued to legitimize public support for the Museum.

A prognostic model of the willingness to maintain the Museum is constructed. The results indicate, firstly, that from the viewpoint of public willingness-to-pay it would be important to encourage the inhabitants of Jyväskylä to visit the Museum of Central Finland and museums in general. Furthermore, the willingness-to-pay for the Museum is explained by other uses of culture, such as visits to art exhibitions and concerts.

Keywords: Economic value; Willingness-to-pay; Local museum; CV method

1. Background and purpose of the study

Museums are significant institutions. As Johnson and Thomas (1998) state, they are felt to be major repositories of a country's stock of objects and specimens of educational and

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cultural value. Johnson and Thomas (1998) also suggest areas where research by economists might prove most fruitful, such as estimating the value visitors place on their visits, through, for example, contingent valuation (CV) studies. Gray (1998) used logistic regression to explore whether early exposure to the arts affects participation as an adult. He found that early exposure results in later participation and that the effect of exposure seems to be strongest in the pre- and post-teen years.

The main purpose of the present study is to clarify the economic value of a local cultural history museum, the Museum of Central Finland in Jyväskylä. In order to determine the value of the Museum to the residents of the town, they were asked how willing they were to pay to keep the Museum in existence. The study also sought to identify the factors which affect the willingness-to-pay (WTP) for the Museum. Willingness-to-pay can be analysed by the CV method. The CV method has to date mostly been applied to the valuation of environmental goods and benefits, and has only occasionally been applied to non-profit cultural organisations. Most of these studies have been directed at publicly supported cultural activities in general. The definitions of the goods in question have been very broad. CV studies connected with culture include those by Throsby and Withers (1983), Morrison and West (1986), Martin (1994) and Bille Hansen (1996, 1997).

Cultural economic research has tended to focus on the issue of the legitimising of public support for the arts. Research in this area can also be brought to bear on the problems of demand and supply and help to resolve questions of funding allocation and public support. Issues connected with efficiency and productivity can also be studied. It is, however, surprising how few CV studies have been done on the value of culture (or non-profit cultural organisations). The question of public support for culture has been much debated. In addition to the existence of a finance gap, studies have also found various positive impacts (externalities) among the most important arguments for public support. Externalities and the surplus of the consumer have, however, only seldom been measured empiricallly, by the CV method.

2. The Museum of Central Finland

The Museum of Central Finland is a museum of cultural history. It was opened to the public in 1932. The Museum acts as a museum for both the town of Jyväskylä and the region of Central Finland. It records, documents and presents the cultural history of the region from prehistoric times up to the present.

In 1996 there were 280 museums in Finland (excluding Ahvenanmaa), consisting of 137 cultural history museums, 71 special museums, 55 art museums and 17 nature science museums. There are 3 national central museums (national history, art and science), 9 national special museums, including the War Museum since 1986, 20 provincial museums and 16 regional art museums. Two thirds of all museums are maintained locally, one fifth by private foundations and associations, and 12% by the nation (Museum Statistics, 1996).

In 1996 the total cost of the Museum of Central Finland was MFIM 6.7 of which salaries accounted for about MFIM 3.5 and buildings for about MFIM 2. About MFIM 4.3 of these costs were met by the local authority. The Museum's share of national funds was MFIM 1.8. The Museum generated income of about MFIM 0.5 in addition to ticket sales of FIM 51,000.

The cost of Finland's museums altogether was about MFIM 467. Nearly half of this amount went on salaries, one-fourth on buildings and about 3% (MFIM 13) on acquisitions. Caring for collections and the cost of exhibitions, research activities and publications accounted for about a one-quarter. About 41% of the total costs were met by the state and another 41% by the municipalities. About 13% of costs were financed by the museum themselves. Sponsorship accounted for about 3.5 million marks altogether. In 1996 state subsidies went to 110 museums, including the Museum of Central Finland. The state subsidy is calculated in man-years. In 1996 some 1226 persons worked full-time in Finland's museums (average 9 per museum). In the provincial museums and in the regional art museums the average number of employees was 14.

Nearly 3.9 million visits (mean 14,279 per museum) were made to museums in Finland of which 14% were by schoolchildren or students. Forty-one percent of the museums had under 5000 visitors per year, nearly one-fifth had 5001–10,000 visitors and nearly one-fourth 10,001–20,000 visitors. Seven percent of the museums had more than 40,000 visitors and only four museums more than 100,000 visitors. The share of visitors of provincial museums and regional art museums was 38%, of local museums 36% and of the national museums 21%. In 1996 the total number of visitors to the Museum of Central Finland was 26,280.

3. The CV method

The purpose of this study was to estimate the economic value of the Museum of Central Finland to the residents of Jyväskylä. Since the Museum is rather well known, the CV scenario could be presented to respondents without elaborate description. It is assumed that its supply is technically effective in the sense that improvements are not possible without giving up some other aim (Bille Hansen, 1997).

Foreign tourists and Finnish citizens other than the residents of Jyväskylä may be willing to support the Museum but they do not pay local income tax. Although the Museum receives direct grants from the state, local funding is the primary source of the Museum's income.[1] For these reasons the survey was restricted to Jyväskylä taxpayers aged 18 years or more.

A random sample of 800 Jyväskylä residents aged 18 years or more was taken and a questionnaire mailed to them in November and December 1997.

In the CV method (for more detail see Mitchell and Carson, 1989), a hypothetical market for cultural services is created. The willingness of customers to pay these services and the amount of tax resources they are prepared to invest in them is analysed. In such an analysis the consumers' willingness-to-pay, for example, for the availability (or licence) of a certain commodity in relation to changes in its price or quality, is measured. Respondents must also be informed about the institutional conditions related to the supply of the commodity and what they get in return for the amount they are willing to pay. However, according to Portney (1994) there are no standard approaches to the design of a CV study.

When measuring the value of the Museum of Central Finland to the inhabitants of Jyväskylä the first alternative is to estimate the smallest possible amount of money which a person will accept as compensation for the alternative that no corresponding good would

[1] In 1996 of the total funding received from tax revenues, 70% came from the local authority.

exist. Here, the question is the compensation the respondent would require if the Museum of Central Finland were to be closed, i.e. the question is about the loss of the respondent's welfare in the event of the Museum leaving to exist. An alternative approach is to ask how much the respondent is willing to pay in the term of taxes in order to keep the Museum of Central Finland in operation.

Studies which have used willingness-to-accept have achieved clearly bigger values than inquiries about willingness-to-pay (Kahneman et al., 1990). The difference may be due to one or more of the following reasons: (1) the respondent rejects the proprietorship connected with the willingness to accept; (2) the respondent acts more cautiously in questions of willingness-to-pay; (3) the respondent's behaviour is strategic; (4) the respondent does not want to take any risks, or (5) income flexibility in the demand for the goods in question is big or the substitution effect of the goods is small (Hoehn and Randall, 1987).

As the data were collected through a postal questionnaire, some of the questioning techniques associated with the CV method, such as bidding game, the pay-card technique and the bidding tree technique, could not be utilised. The CV techniques available were thus direct questioning and discrete selection. According to Loomis (1990), they tend to underestimate willingness-to-pay and to invite a greater proportion of protest answers. However both techniques were used in this study. In this article, we only report the results received with the open-ended method.

It helps if the means of payment used in the CV method is realistic and neutral (Mitchell and Carson, 1989; Bishop and Heberlein, 1979). For this study, we chose income tax as the means of payment. This choice was also made because the respondents are already paying for the upkeep of the Museum through direct taxation. Respondents were informed that the costs of running the Museum were about MFIM 6.7 in 1996. In the same year the Museum generated an income of FIM 513,00 and received state funding amounting to approximately MFIM 1.8. The city of Jyväskylä supplied MFIM 4.3, which included an amount of around FIM 617,00 to cover the costs incurred in mounting the permanent exhibition.

The interviewees were first asked an open-ended question: "Taxes paid by the residents of Jyväskylä go towards the maintenance of the Museum of Central Finland. How much at most would you be willing to pay in taxes annually to keep the Museum functioning?" The respondents could state their willingness-to-pay either in Finnish marks or ring the alternative "cannot say".

Respondents were also asked: "Has the Museum of Central Finland value to people other than just to those who visit it?" and "When did you last visit the Museum of Central Finland?" In relation to their last visit the respondents' were asked about the size of their party, the amount of money spent, when they expected they would visit the Museum again and whether the visit to the Museum met their expectations.

An attempt was made to locate the Museum among the interviewees' preferences by comparing visiting that museum with the use of other museums and cultural services. The interviewees were also asked their thought whether their taxes were used excessively, appropriately or too little for the maintenance of various cultural services.

Among the questions relating to museums in general the interviewees were asked what types of museums they are interested in and to respond to various agree/disagree statements about museums. The respondents were also asked for background information about their sex, age, education, profession, income, household income, number of family members

and number of persons in the household who are currently employed on a fixed-term contract.

4. Willingness-to-pay for the Museum of Central Finland

The individual willingness-to-pay for the Museum of Central Finland varied from FIM 0 to FIM 1000. The average WTP to keep the Museum in existence was FIM 103 (median FIM 50). Fig. 1 presents the distribution of the willingness-to-pay responses.

Nearly 30% of the respondents gave a WTP for the Museum of Central Finland of FIM 0 (Fig. 2). The proportion of zero bids appears rather large. On the other hand 46% of

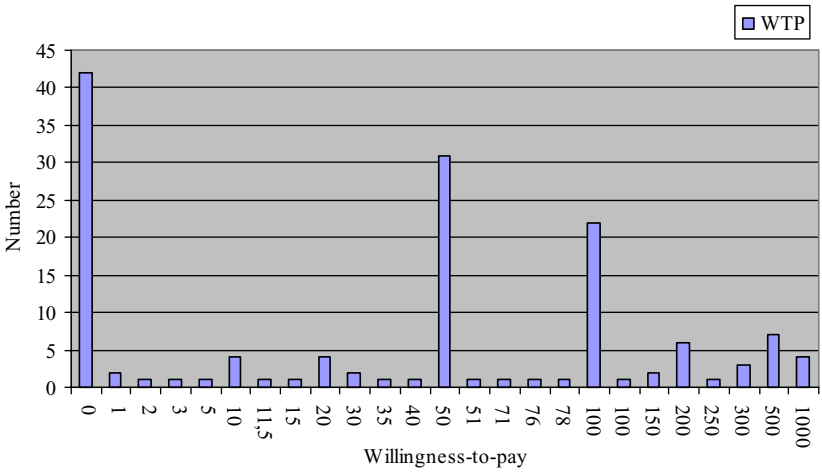

Fig. 1. Distribution of willingness-to-pay bids.

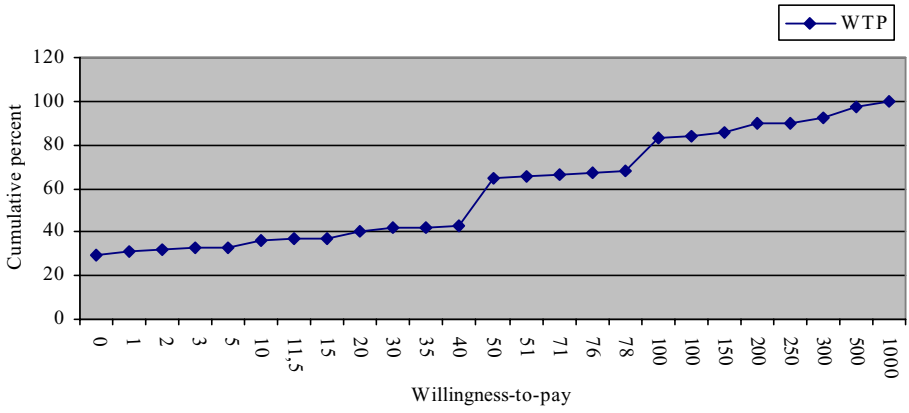

Fig. 2. Cumulative percentages of individuals' willingness-to-pay.

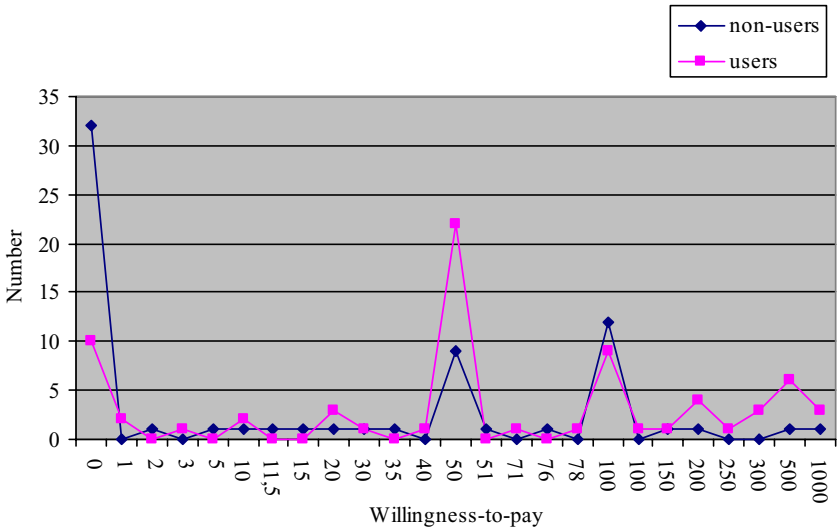

Fig. 3. Willingness-to-pay for users and non-users.

respondents had never visited the Museum. Once assumption that "non-users" feel that they gain zero utility, the proportion of zero bids might have been expected to be even larger.

Nearly 50% of the respondents who had never visited the Museum of Central Finland gave a WTP of FIM 0. The average WTP of non-users to keep the Museum in existence was FIM 56 (median FIM 5).

The average amount transferred to the Museum of Central Finland for each 18-year-old citizen in 1996 was FIM 78. The average amount the residents reported being willing to pay to keep the Museum open was FIM 103. As might be expected, users showed greater willingness-to-pay than non-users (Fig. 3).

For non-users the average WTP to keep the Museum in existence was FIM 56. Although a large proportion of the respondents had not visited the Museum very often, they nonetheless reported some willingness-to-pay for its continued existence and for the possibility to make a visit in the future.

5. The logistic regression model for willingness-to-pay

Here, we estimate the logistic regression model that predicts positive willingness-to-pay for the Museum of Central Finland from a constant and several variables. The dependent variable, willingness-to-pay for the Museum of Central Finland, is dichotomous, coded 0 (pays nothing) or 1 (positive willingness-to-pay). In the logistic regression model, we estimate the probability that a respondent has a positive willingness-to-pay for the Museum. In the case of a single independent variable, the model can be written as:

$$\text{Probability(event)} = \frac{1}{1 + e^{-(B_0 + B_1 X)}},$$

where B_0 and B_1 are coefficients estimated from the data, X is the independent variable, and e is the base of the natural logarithm, approximately 2.718.

For more than one independent variable the model can be written as:

$$\text{Probability(event)} = \frac{1}{1 + e^{-z}},$$

where $z = B_0 + B_1X_1 + B_2X_2 + \cdots + B_pX_p$.

In linear regression, we estimate the parameters of the model using the least-squares method, i.e. selecting the regression coefficients that result in the smallest sums of the squared distances between the observed and the predicted values of the dependent variable. In logistic regression, we estimate the parameters of the model using the maximum-likelihood method. That means that the coefficients that render our observed results most likely are selected. The logistic regression model is non-linear.

In logistic regression the codes for the independent variables must be meaningful. We cannot incorporate a nominal variable like gender into the model. We need to recode the values of the independent variable by creating a new set of variables which in some way correspond to the original categories. These we code as dummy variables. If, for example, we have the two-category variable gender, we can code each case as 0 or 1 to indicate either female or male. The interpretation of the resulting coefficient for tax money tells us the difference between the log odds when a case is a member of the category and when it is not.

Table 1 shows the estimated coefficients and related statistics from the logistic regression model that predicts a positive willingness-to-pay for the Museum of Central Finland from a constant and several variables (see Appendix A). The Wald test measures the significance of the coefficients of the variables. When, furthermore, the model is interpreted, the standard errors of the variables must be smaller than the coefficients.

Given these coefficients, the logistic regression equation for the probability of a positive WTP can be written as:

$$\text{Probability(positive WTP)} = \frac{1}{1 + e^{-z}},$$

where $z = 5.5076 + 1.9445 \times (\text{art exhibition}) - 2.4223 \times (\text{tax opinion}) + 3.9391 \times (\text{tax money}) - 1.4365 \times (\text{concert}) - 0.7691 \times (\text{age}) + 0.6475 \times (\text{visit})$.

Table 1
Variables, parameter estimates (*B*), standard errors (S.E.), Wald statistic (Wald), degrees of freedom (d.f.) and level of significance for the Wald statistic (sig)

Variable	*B*	S.E.	Wald	d.f.	sig
Art exhibition	1.9445	0.7576	6.5883	1	0.0103
Tax opinion	−2.4223	0.9876	6.0152	1	0.0142
Tax money	3.9391	1.5371	6.5673	1	0.0104
Concert	−1.4365	0.7137	4.0510	1	0.0441
Age	−0.7691	0.4440	3.0000	1	0.0833
Visit	0.6475	0.3806	2.8939	1	0.0889
Constant	5.5076	2.8200	3.8143	1	0.0508

If we apply this to a woman or a man who has visited an art exhibition on two occasions during the preceding year (art exhibition = 3), her/his opinion is that too little taxpayers' money is spent on the Museum of Central Finland (tax opinion = 1), she/he intends to visit the Museum within 1 month (visit = 2), she/he has attended one concert (excluding symphony concerts) (concert = 2) and she/he is age 40–49 years (age = 3).

We find

$$z = 5.5076 + 1.9445 \times (3) - 2.4223 \times (1) - 1.4365 \times (2) - 0.7691 \times (3) + 0.6475 \times (2) = 5.034.$$

The probability of a positive willingness-to-pay for the Museum of Central Finland is then estimated to be

$$\text{Probability(positive WTP)} = \frac{1}{1 + e^{-(5.0335)}} = \frac{1}{1.0065194} = 0.9935229.$$

In general, if the estimated probability of the event is less than 0.5, we predict that the event will not occur. If the estimated probability of the event is exactly 0.5, we can make our prediction by flipping a coin.

5.1. Interpretation of the logistic coefficients

In multiple linear regression, the interpretation of the regression coefficient tells us how much change will occur in the dependent variable following a one-unit change in the independent variable. To interpret the logistic coefficient, the logistic model can be rewritten in terms of the odds of an event occurring. The estimated probability of a positive WTP is 0.9935229. The probability of not having a positive WTP is $(1 - 0.9935229 = 0.0064771)$. The odds in favour of having a positive WTP are then estimated as:

$$\text{Odds} = \frac{\text{Probability(event)}}{\text{Probability(no event)}} = \frac{0.9935229}{0.0064771} = 153.39008.$$

Let us apply this to a woman/man who has visited an art exhibition once (art exhibition = 2). The estimated probability of a positive WTP is 0.9564. Then, the estimated odds are 21.93578. Decreasing the value of the independent variable from 3 to 2 will change the odds from 153.39008 to 21.93578. They decrease by a factor of about 6.9926888 (Table 2).

Table 2
The interpretation of the logistic coefficients

Variable	Change in the value of the independent variable	Change in odds
Art exhibition	$3 \Rightarrow 2$	6.99
Tax opinion	$1 \Rightarrow 0$	11.27
Visit	$2 \Rightarrow 1$	1.91
Concert	$2 \Rightarrow 1$	0.24
Age	$3 \Rightarrow 2$	0.46
Tax money	$1 \Rightarrow 0$	0.02

Table 3
Classification table

Observed	Predicted		%
	Pays nothing	Positive sum	
Pays nothing	12	4	75.00
Positive sum overall	3	61	95.31
			91.25

For variable concert the change is 0.2378, for age it is 0.4634, for visit it is 1.9107, for tax opinion it is 11.269 and for tax money it is 0.0195.

As we can see in Table 2, the biggest change in the dependent variable following a one-unit change in the independent variable is caused by variables tax opinion and art exhibition (see Appendix A).

5.2. *The goodness-of-fit of the model*

We now assess whether or not the model fits the data. One way to assess how well the model fits is to compare the predictions with the observed outcomes (Table 3).

From the table we can see that over 95% of those who do not have a positive willingness-to-pay were correctly predicted by the model. Only seven women/men were misclassified by the model. In all, 91% of the 80 cases were correctly classified. The table shows only whether the estimated probability is less or more than one-half. We cannot tell from the table whether probabilities of the three women/men who were wrongly assigned (pays nothing) were near 50% or were low. In an ideal situation we would obtain two groups of very different estimated probabilities: small probabilities of a positive willingness-to-pay for all those who did not report a positive willingness-to-pay and large estimated probabilities for all those who reported a positive willingness-to-pay.

Another way of assessing the goodness-of-fit of the model is to examine how likely the sample results are, given the parameter estimates. The probability of the observed results, given the parameter estimates, is known as the likelihood. We use -2 times the log likelihood (-2LL) as a measure of how well the estimated model fits the data. If a model fits perfectly, the likelihood is one and -2 times the log likelihood is 0. For the logistic regression model that contains only the constant, -2LL is 80.06. For the model with all independent variables, -2LL is 29.521.

The model chi-square (χ^2) is the difference between -2LL for the model with only a constant and -2LL for the current model. The model chi-square tests the null hypothesis that the coefficients for all the terms in the current model, except for the constant, are 0. This is comparable to the overall F-test for regression. The degrees of freedom for the model chi-square are given by the difference between the number of parameters in the two models. The low level of significance ($\text{sig} = 0.000 < 0.05$) means that we can reject the null hypothesis that the coefficients for all the terms in the current model are 0.

The improvement test is the change in -2LL obtained from successive steps in building the model. It tests the null hypothesis that the coefficients for the variable added at the last step are 0. Now, we have only two models: the constant-only model and the model

with a constant and six independent variables. The model chi-square and the improvement chi-square values are the same. If we consider more than these two models, using backward or forward variable selection, the model chi-square and improvement chi-square will differ. The improvement chi-square test is comparable to the *F*-change test in multiple regression.

5.3. Diagnostic of the model

5.3.1. Residual

The residual is the difference between the observed probability of the event and the predicted probability of the event based on the model. If we predict the probability of a positive WTP to be 0.60 for a woman/man who has a positive WTP, the residual is then $1 - 0.60 = 0.40$. The standardised residual is the residual divided by an estimate of its standard deviation. In this case, it is

$$Z_i = \frac{\text{residual}_i}{(p_i(1 - p_i))^{0.5}}.$$

If the sample size is large, which is not the case in this study, the standardised residuals should be approximately normally distributed ($\mu = 0, \delta = 1$). The standardised residuals in our model are approximately normally distributed as because of their mean, $\mu = -0.044$, and standard deviation, $\delta = 0.615$.

5.3.2. Deviance

For each case the deviance is computed as: deviance $= -2 \times$ log (predicted probability for the observed group). The deviance is calculated by taking the square root of the above statistic and attaching a negative sign if the event did not occur for that case. Large values for deviance indicate that the model does not fit the case well. The deviance is approximately normally distributed for large samples. In our model, the mean of the deviance is $\mu = -0.05$ and the standard deviation $\delta = 0.609$. No large values emerged for deviance.

6. Conclusions

In reality, Jyväskylä residents contribute less in taxes to the Museum of Central Finland than they report that they are willing to pay. Hence, on the basis of this study, directing at least the present amount of tax revenue to the Museum can be justified. Maintenance of the Museum is legitimised on the basis of the willingness-to-pay of the public. The CV method can thus be used to aid in decision-making regarding the amounts and targets of financial support.

A prognosis model was obtained for willingness-to-pay to maintain the Museum of Central Finland. From the viewpoint of a positive willingness-to-pay it would seem to be important that the residents of Jyväskylä visit the Museum of Central Finland, if not, museums in general. Furthermore, willingness-to-pay was explained by other uses of culture, such as visiting art exhibitions and going to concerts.

Participating in cultural events would seem to create a positive attitude towards culture generally. Thus, encouraging acquaintanceship with the Museum of Central Finland and

culture more generally, such as arranging visits for schools and cheaper (or free) tickets for cultural events, is worthwhile.

The majority (93%) of the respondents were of the opinion that the Museum of Central Finland also has value to people other than to those who actually visit it. Although a large proportion of the respondents had not visited the Museum very often, they were nonetheless willing to pay a substantial amount to guarantee continued existence of the Museum and for the possibility to visit the Museum in the future. This indicates that the Museum of Central Finland has non-use value. Thus, the non-market benefits of the Museum reported by the inhabitants of the region can be adduced to legitimize continued support for the Museum from public funds.

Appendix A. Variables used in logistic regression model

Variable	Values of variable
• Tax opinion = Jyväskylä taxpayers' money is used to support the Museum of Central Finland	•1 = too little, 2 = just right, 3 = too much
• Art exhibition = number of visits to an art exhibition	• 1 = no visits, 2 = one visit, 3 = two visits, 4 = three or more visits
• Concert = attendance at a concert (excluding symphony concerts) during past year	• 1 = none, 2 = once, 3 = twice, 4 = three times or more
• Age = age	• 1 = under 30 years, 2 = 30–39 years, 3 = 40–49 years, 4 = 50–59 years, 5 = over 60 years
• Visit = when the respondent intends to visit the Museum of Central Finland next	• 1 = does not intend to visit the museum, 2 = within a month, 3 = within 1–6 months, 4 = within 6–12 months, 5 = after a year
• Tax money = how much tax money per taxpayer (aged 18 or more) the respondent thinks goes towards supporting the Museum of Central Finland	•1 = positive amount, 0 = nothing

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