The Effects of Visual Information on Willingness to Pay for a Recreational Site Improvement in Chile

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LOS EFECTOS DE LA INFORMACIÓN VISUAL SOBRE LA DISPOSICIÓN A PAGAR POR LA MEJORA DE UN LUGAR RECREATIVO EN CHILE

RESUMEN: Este artículo examina el efecto de la información visual sobre la disposición de las personas a pagar por mejoras en la infraestructura y calidad del agua en un lugar de recreación urbana. Aplicamos la metodología de valoración contingente sobre dos grupos de personas en la ciudad de Talca, Chile. El grupo de control recibió información por escrito sobre una mejora de un sitio recreativo mientras que el grupo tratado recibió información visual y escrita sobre la mejora. Encontramos que las personas a las que se les muestran ilustraciones visuales están dispuestas a dar más dinero para apoyar el proyecto que las personas a las que no se les muestra esta información adicional. También encontramos que, dependiendo de las características de los encuestados, el intervalo de confianza de la disposición a pagar es menor para las personas que reciben las ilustraciones visuales que para las que no. Adicionalmente, los usuarios en el grupo tratado tienen una mayor probabilidad de pagar por una mejora y una menor respuesta de protesta.

PALABRAS CLAVE: valoración contingente, información visual, sesgos de la muestra.

LES EFFETS DE L'INFORMATION VISUELLE SUR LA DISPOSITION À PAYER POUR L'AMÉLIORATION D'UN CENTRE DE LOISIR AU CHILI

RÉSUMÉ : cet article examine l'effet de l'information visuelle sur la disposition des personnes à payer pour les améliorations d'infrastructure et de la qualité de l'eau dans un centre de loisir urbain. Nous utilisons la méthodologie d'évaluation contingente sur des groupes de personnes de la ville de Talca, au Chili. Le groupe témoin a reçu l'information par écrit sur une amélioration d'un centre de loisir alors que le groupe traité l'a reçue avec une information visuelle et écrite. Nous avons constaté que les personnes ayant reçu des informations visuelles ont été disposées à donner plus d'argent pour soutenir le projet que celles qui n'avaient pas reçu cette information complémentaire. Nous avons également constaté que, selon les caractéristiques des personnes enquêtées, le niveau de confiance de la disposition à payer est moindre chez les personnes qui reçoivent les illustrations que chez celles qui ne les reçoivent pas. En outre, les usagers du groupe traité ont une plus grande probabilité de payer pour une amélioration et moins de réponses de protestation.

MOTS-CLÉS : Evaluation contingente ; information visuelle ; biais d'échantillonnage.

OS EFEITOS DA INFORMAÇÃO VISUAL SOBRE A DISPOSIÇÃO A PAGAR PELA MELHORA DE UM LOCAL PARA O LAZER NO CHILE

RESUMO: Este artigo examina o efeito da informação visual sobre a disposição das pessoas a pagar por melhoras na infraestrutura e qualidade da água em um local urbano para o lazer. Aplicamos a metodologia de avaliação contingente sobre dois grupos de pessoas na cidade de Talca, Chile. O grupo de controle recebeu informação por escrito sobre uma melhora de um local para o lazer enquanto o grupo tratado recebeu informação visual e escrita sobre a melhora. Encontramos que as pessoas às quais lhes são mostradas ilustrações visuais estão dispostas a dar mais dinheiro para apoiar o projeto do que as pessoas às quais não lhes é mostrada esta informação adicional. Também encontramos que, dependendo das características dos pesquisados, o intervalo de confiança da disposição a pagar é menor para as pessoas que recebem as ilustrações visuais do que para as que não as recebem. Adicionalmente, os usuários no grupo tratado têm maior probabilidade de pagar por uma melhora e menor resposta de protesto.

PALAVRAS-CHAVE: avaliação contingente, informação visual, tendências da amostra.

ABSTRACT: This article examines the effect of visual information on people's willingness to pay (WTP) for improvements to the infrastructure and water quality of an urban recreation site. We applied the contingent valuation methodology to two groups of people in the City of Talca, Chile. The control group received written information about improvements to be made to a recreational site, whereas the treated group received written and visual information. We found that people who were shown visual illustrations were willing to give more money to support the project than people who were not shown this additional information. We also found that, depending on respondent characteristics, the confidence interval of WTP was lower for people who were provided with visual illustrations than for those who were not. Additionally, users in the treated group were more likely to pay for improvements to be made and lower protest responses.

KEY WORDS: Contingent valuation, visual information, sample biases.

Introduction

The contingent valuation method (CVM) is a stated preference approach commonly used for valuing the provision or characteristic changes of a non-marketable good (Freeman, 2003). Despite its ability to supply information for the decision making process involved in providing a recreational public good, CVM has generated extensive discussion about whether the measurement of willingness to pay is biased (Arrow, Solow, Portney, Leamer, Radmer, & Schuman, 1993; Meyerhoff & Liebe, 2006). Several studies have shown that the level and type of information provided may have an impact

on WTP estimates. Some of the topics discussed in this regard are as follows: quantity and information complexity (Bergstrom, Stoll, & Randall, 1990; Samples, Dixon, & Gowen, 1986); question ordering, interviewees' experience with environmental goods (Boyle, Welsh, & Bishop, 1993; Boyle, 1989; Cameron & Englin, 1997); information quality (Blomquist & Whitehead, 1998; Hoehn & Randall, 2002); related goods information (Loomis, Caban, & Gregory, 1994; Whitehead & Blomquist, 1991); information and uncertainty about environmental costs and benefits (Macmillan, Hanley,& Buckland, 1996; McCarville, 1991); and changes in market structure (Ajzen, Brown, & Rosenthal, 1996; Cummings, Brookshire, & Schulze, 1986).

Ajzen et al. (1996) concluded that the recommendation to provide detailed information to a given hypothetical market does not offer a satisfactory solution to the information-bias problem. However, other authors consider that the difference in WTP associated with various levels of information is an expected result, which does not constitute a methodological bias (Bergstrom et al., 1989, 1990; Blomquist & Whitehead, 1998). In other words, they expect changes in the market structure to influence individual behavior (Boyle, 1989). Some studies emphasize issues related to the way in which the interviewees incorporate new information, how this information is combined with previous knowledge of the good and how this information is used in the decision making process (Hoehn et al, 2002; Schkade & Payne, 1994; Tkac, 1998).

The respondent's familiarity with a potential site improvement may impact WTP estimates (Cameron & Englin, 1997). Being a resource user constitutes an unambiguous and simple indicator of familiarity (Kniivila, 2006). The validity, reliability and accuracy of WTP estimates have been discussed in relation to non-users' valuation (Cummings et al., 1986; Diamond & Hausman, 1993). However, while the condition of being a user guarantees some knowledge of the place, it does not necessarily reflect enough knowledge on the user's part to evaluate potential site improvements. Therefore, the information provided to respondents—both users and non-users—should contain sufficient detail to adequately explain a given site improvement.

The information must include the amount, quality and probability of the improvement being implemented. This is presented or displayed in verbal or written form, possibly supported with graphs, photographs or other elements that provide the interviewee with a better image of the amenity being evaluated (Boyle, 2003). Some of these studies include maps or graphs showing the physical areas to be valued (Ahearn et al., 2003; Boyle 1989). An important number of studies provide only written or verbal

information, which may result in a significant bias due to contingent market scenarios (Vásquez et al., 2007).

Several studies carried out in Chile have applied the contingent valuation method; however, we are not aware of any of them having using visual information. For the site where this study was applied (Río Claro recreation site), only two water quality related studies (Dumont & Rojas, 1999; Puentes, 1999) were undertaken. Both studies used explanatory cards but no "real" visual information or photos of the improvement project.

The purpose of this study was to test the role of familiarity through visual information and experience (users of the river) on recreational values. Specifically, the objective of this study was to estimate the impact on the mean and variance estimates of WTP for an improvement to the infrastructure and water quality of the recreation site resulting from changes in information provided to respondents. In this case, photos of the site before and after the improvement project were used. The hypothesis was that the more information is provided (verbal and photos), the greater and more stable is the level of WTP. Similarly, respondents who use the recreation site may increase the probability of WTP estimates, given their knowledge of the site. Additionally, a lower level of protest responses is expected to occur when people have more information.

We attempted to clarify the previous issues by administering two surveys to elicit the value of recreational improvements to people using a recreational site in the city of Talca, located south of Santiago, Chile.

Some of the respondents were shown visual informational in the form of computer-generated graphic image. This allowed us to test the effect of visual information on responses and to determine whether the elicited value is different for people who were not shown this additional information.

We tested the effects of visual illustrations on responses in two ways. First, we examined whether mean WTP, dependent on a vector of respondent characteristics (age, income, marital status, etc.), varied between the two groups. One might, for example, expect that people given visual information would be willing to pay more to support the project than people who are not provided with this additional visual information. Second, we tested whether visual information affects WTP confidence intervals. One might expect that an image would reduce the variance in responses if the latter reflects random noise. Additionally, we tested to determine whether users presented a greater probability of WTP and less protest responses for the site improvement.

This article is organized as follows. In section 2, we describe the project, methods and data. The main results and analysis are presented in section 3 including tests of the effects of visual information. Our conclusions are presented in the final section.

Methods

The case used in the study is a hypothetical improvement of the environmental infrastructure and water quality at the Río Claro tourist site in the city of Talca, Chile. We designed two experiments, which were applied to two simple, stratified, random samples. The respondents of one group (the control group) were provided written but not visual information about the improvement. The respondents of the second group (the treated group), in addition to written information, were provided with visual information consisting of six digital photographs of the current infrastructure and six digital images of the future improvements created using Photoshop. A CVM, in double-bounded dichotomous choice format, was used for the estimation. A linear functional form of the indirect utility function was assumed with a logistic

distribution. Additionally, estimations were made using an expanded CVM (Cooper & Hellerstein, 1994).

Site Description

The case to which the questionnaires referred was an improvement project for quality of environmental infrastructure and water quality at the Río Claro recreational site in the city of Talca, Chile, about 250 km south of Santiago. Visitors to the recreational site are mainly from its surrounding area. The site's attractions include restaurants and pubs and recreational activities include boat rides and horseback riding.

Sample

The sampling calculation was obtained assuming maximum variance, a sampling error of 5% and a confidence level of 95%. This resulted in two samples each consisting of 383 individuals.

A simple random sample, stratified by socioeconomic level, was applied in this study to obtain two representative

samples from the population of Talca[1]. The city's total population is of around 200.000 people. The distribution of socioeconomic levels—from highest to lowest—in the city is presented in Table 1.

TABLE 1. Socioeconomic Distribution, City of Talca

Level (Highest to lowest)	Share
ABC1	5.6%
C2	15.4%
C3	26.4%
D	35.9%
E	16.7%

Source: National Statistics Institute (2002), Chilean National Census.

Pre-survey and Bid Vector

In order to obtain information to estimate the bid vectors to be used in the final survey for both samples, an open-ended preliminary survey questionnaire was generated and applied to 200 respondents. One hundred of the respondents were provided written information about the improvement project. The other group, in addition to written information, were provided with six digital photographs of the current state fo the site and its state after the implementation of the improvement project. The survey was applied as in-person interviews following Arrow et al. (1993). The pre-survey questionnaires were applied in April 2009.

The optimal bid vector (b_t) was obtained using the recommendation of Cooper (1993), with information from the preliminary questionnaires. The Bid Distribution with Equal Area Bid Selection (DWEABS) routine (Cooper & Hellerstein, 1994) was applied to the data. DWEABS is an iterative technique for finding the sample design, which minimizes the mean square error (MSE) for a dichotomous, choice-contingent valuation model survey. In addition, the DWEABS procedure enabled us to obtain the optimal sample associated with each optimal bid value, which minimizes the mean square error of the welfare measures. The final survey used these optimal bid values, in a dichotomous-choice question, to obtain the WTP.

Design of Final Surveys and Study

Final survey questionnaires were applied the last two weeks of May 2009 through in-person interviews at the respondents' homes. The questionnaire had three main parts. The first part featured questions about site uses, the second part provided a description of the present situation, and the third part described the contingent market and asked several questions about the respondent's socioeconomic profile. This last part also included questions about protest responses to identify those respondents who rejected the contingent market for economic reasons. Some authors have suggested those respondents should be included in the final data in the no-no response category.

As with the preliminary questionnaire, in the main survey two experimental designs were presented to respondents: a design with images and a design without images, with a double-bounded dichotomous choice format. The latter survey explains the current situation in 139 words and the contingent situation in 315 words, with and without photographs. It included information about the payment vehicle (water bill), income restrictions, substitute goods reminding, project cost, and the organization in charge of the project, protest responses for economic reasons, among other aspects.

Estimation Method

The model applied was based on a difference in the utility function model (Hanemann, 1984). In the estimate of the contingent valuation model, in its double-bounded dichotomous choice format (Hannemann, 1984; Hanneman et al, 1991), and assuming a linear functional form for the indirect utility function with a logistic distribution, the CVM program of Cooper and Hellerstein (1994) was used. This program uses maximum likelihood estimation with the analytic first and second derivatives from Hanemann, Loomis, and Kanninen (1991). The confidence intervals related to the willingness to pay measurement are constructed using the Krinsky and Robb approach (Park et al., 1991). Additionally, estimates are also made using an expanded CV model (Cooper & Hellerstein, 1994).

Given that a linear utility function is assumed, the difference in the utility function can be expressed as , $\Delta v = \alpha_1 - \beta_1 b_i$, where b_i correspond to the bid vector, which represents the different "prices" asked to individuals to obtain a change in infrastructure and water quality (Cerda et al., 2012). In this study, we calculated the restricted mean of WTP (positive integral) with the expression $ln(1 + \exp \alpha)/abs(\beta_1)$, because it is consistent with theoretical constraints (Lee and Mjelde, 2007). Also, the confidence intervals for the welfare mean measurement were obtained using the Krinsky and Robb approach (Park et al., 1991) and Cameron's approach (Cameron, 1991). All calculations were made following Cooper and Hellerstein (1994).

Additionally, an expanded model was estimated and expressed as $\Delta v = \alpha - \beta_i Z_i$ where Zi is any variable explaining

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[1]   See Ruesink (1980) for an introduction to sampling theory.

the WTP (Cooper & Hellerstein, 1994); in this case, it is expressed as: $\Delta v = \alpha_1 - \beta_1 b_i + \beta_2 \text{INC} + \beta_3 \text{AGE} + \beta_4 \text{GEN} + \beta_5 \text{ACT} + \beta_6 \text{EDU} + \eta$ where INC: average family income; AGE: age; EDU: level of education; GEN: gender, female=0, male=1; ACT: participates in activities on the site or know the site, yes=1, no=0. The same welfare measure is calculated assuming $\alpha = \alpha_1 + \beta_2 \text{INC} + \beta_3 \text{AGE} + \beta_4 \text{GEN} + \beta_5 \text{ACT} + \beta_6 \text{EDU}$, and $\beta = \beta_1$ which allows for consistency with the linear model.

Results and analysis

The principal results from the implementation of the methodology to the control and to the treated group are presented in Table 2. Columns (1) and (2) present the estimates using the control and treated groups respectively for the traditional Hanemann model. Columns (3) and (4) show the estimates to both groups for the expanded model. Finally, column (5) merges the control and treated groups and includes a dummy to show differential responses between both groups. Also, a variable to differentiate users from non-users is included.

TABLE 2. Main Variables Description

| INC (Income in Chilean pesos)	< $200,000 = 17.7% $200,000- $400,000 = 35.9% $400,000- $600,000 = 25.9% $600,000- $1,700,000 = 14.9% > $1,700,000 = 5.6%
AGE	18-29 = 10.7% 30-39 = 28.8% 40-49 = 32.9% 50-59 = 17.3% > 60 = 10.2%
GEN (Gender)	Women = 56.9% Men = 43.1%
ACT (person has developed activities in the recreational site)	Yes = 57.7% No = 42.3%
EDU (Level of education)	Primary = 12.7% Lower secondary = 33.6% Upper secondary = 23.6% Bachelor or equivalent = 30.0% Master or equivalent = 0.1%

Source: Prepared by author.

The signs of the coefficients are as expected and significant. For instance; the greater the bid (price associated to improve the site), the less the likelihood that people will pay for the proposed change. The expanded model shows some difference between the respondents who were shown the photographs and those who weren't in terms of the variables that explain the WTP. For instance, for those who were shown the photographs, the significant

variables are income and the dichotomous variable, which shows that the person had participated in activities on the river. In contrast, for those who were not shown the photo, those variables were not statistically significant, unlike level of education, which was statistically significant for this group. Additionally, the dummy variable identifying site users was statistically significant and it have a positive sign, as the literature has shown; users are more likely to pay for environmental improvement.

A general description of the variables considered is presented in Table 2, where we can see that the majority of respondents are women (56.9%) and 57.7% of them are users of the recreational site. Figure 1 shows the main variables and the expected signs with respect to WTP. The decision making process is complex for respondents and, it is expected that WTP will increase as individuals receive more information (Bergström & Stoll, 1990). Our study supports this statement showing that WTP for the control group (without inclusion of visual information) was lower than the treated group (with the inclusion of visual information). Moreover, in Table 4, we can observe a reduction in protest responses from 119 to 64 respondents, when visual information is included.

FIGURE 1. Main Variables and Spected Signs of the Expanded Model
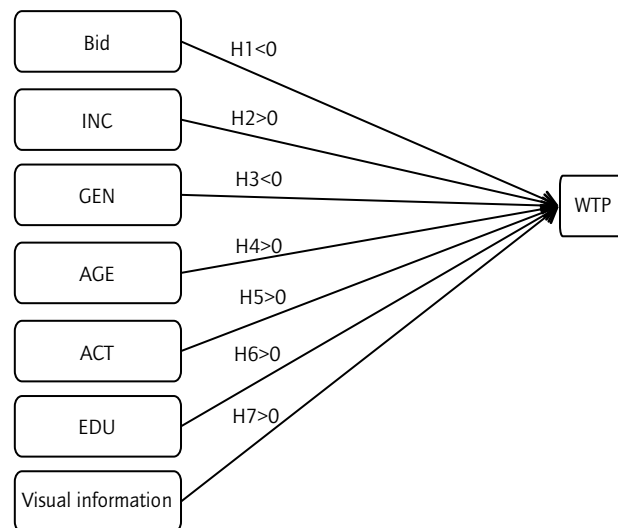
Source: Prepared by author.

The difference in WTP between both groups is displayed in Table 5. The point estimates for both models show that WTP is greater for the treated group (with visual information). The restricted WTP point estimates are outside of the confidence intervals in both cases and the confidence intervals are not coincident at all. Moreover, this study shows that the more information the respondents received, the greater their WTP.

TABLE 3. Traditional and Expanded Model Estimations

	Traditional Hanemann model		Expanded model		Joint Model****
Variable	With photo (1)	Without photo (2)	With photo (3)	Without photo (4)	(5)
Constant	2.1222	1.531	1.1256	0.1233	0.576
	11.86**	0.8705**	4.453**	0.3454**	1.271**
Bi	-0.0009	-0.0009	-0.001	-0.0009	-0.001
	-13.19**	-11.18**	-13.19**	-11.19**	-17.21
INC	-	-	1.58E-06	-	-0.019
			5.134**		-2.597
AGE	-	-	-	-	
GEN	-	-	-	-	
ACT	-	-	0.5759	-	0.700
			2.55**		8.113
EDU	-	-	-	0.5156	
				4.353**	
Dummy with visual information					0.691 4.113
Likelihood	-316.67	-371.82	-402.51	-361.66	- 744.64
Final sample***	320	265	320	265	577

** Denotes significance at the 5% level.

*** Originally both samples were similar (384 individuals), but final samples differ because no users have a higher level of protest responses.

**** Model including samples with and without photos.

Source: Prepared by author. t-values below the coefficients---.

According to our findings, people show a greater sensitivity when they receive more information, in this case, by observing photos of the possible result of the improvement project. The results show that the probability of WTP increases from 1946 to 2386 Chilean pesos in the traditional Hanemann model. It also increases in the expanded model from 1919 to 2356 Chilean pesos. Sample et al. (1986) found that welfare measures are highly sensitive to the information provided to respondents, which is consistent with our results. Additionally, Boyle and Bishop (1988) show that welfare measure efficiencies increased as the respondents were given more information, which is what occurred in our study, with a reduction in the confidence intervals range from 398 to 370 for the Hanemann model (1984). Also, the dummy variable identifying respondents which observed photos of the improvement, or people who appeal to an additional sense by visual information, are more likely to pay for environmental improvements to be made.

TABLE 4. Response Distribution

Variable	Without photos	With photos
Yes-yes	71 (18.5%)	105 (27.4%)
Yes-no	67 (17.5%)	83 (21.6%)
No-yes	48 (12.5%)	63 (8.6%)
No-no	79 (20.5%)	69 (18.9%)
Original sample	384 (100%)	384 (100%)
Final sample = n	265 (69.1%)	320 (83.3%)
Protest responses for non-economic reason	119 (30.9%)	64 (16.7%)

Source: Prepared by author. Final sample is lower than original sample because it does not consider protest responses for estimations.

TABLE 5. Welfare Measures for Traditional and Expanded Model With and Without Photos

Variable	Traditional Hanemann model		Expanded Model		Joint model
	Without photos (2)	With photo (1)	Without photo (4)	With photo (3)	
Restricted WTP point estimate	1946	2386	1919	2356	2219
90% C.I.	1768-2166	2210-2580	1742-2124	2196-2535 at 90%	2068-2396
90% C.I range	398	370	382	339	328

Source: Prepared by author.

Conclusion

The hypothesis bias is a well-known problem in contingent valuation studies and several authors have explored the issue and have proposed methods to reduce this bias. The present study is a contribution in this area because it tests the idea that visual information can help to mitigate the bias.

Examining the willingness to pay (WTP) of people in Talca, Chile for an improvement in infrastructure and water quality of an urban recreation site, we applied the contingent valuation methodology to two groups of people in the city of Talca, Chile. We found that people for whom written information is supplemented with visual information about the project improvement are willing to give more money and have lower variance in their answers than people in a control group supplied only with written information. We also found that users of the recreational site are more likely to pay for an improvement and present fewer protest responses.

How to increase the accuracy of contingent valuation methods is an important issue of study. We present evidence that visual information helps in this sense; however, more research in this area is necessary to corroborate this fact to a more general scale not only restricted to a local community as is the case in this study. However, based on this study, the contingent valuation studies that do not include visual information, should be considered with care given that those studies may have a bias estimation of the WTP.

Also as a referee correctly pointed out that it is necessary to explore more variables that can shed light on the willingness to pay for improvements to be made in recreational sites. For example, an interesting issue to explore is the interaction between visual information and previous knowledge of the site. It will be possible then to see whether the marginal impact of visual information is higher for non-users than for users. Additionally, an interesting aspect to consider in future research is the impact of interviewer influences o characteristics on willingness to pay estimates.

Some of the limitations of this study are that respondents' answers may be affected by the weather conditions as well the alternative sites available to them, and these aspects were not considered in this case.

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