IR-1.4 A Study on Applicability of Contingent valuation Method in Japan
(Final Report)

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Abstract:

This study focuses on the three major elicitation methods of willingness-to pay (WTP) used in contingent valuation approach and compares their performance in an empirical test. This study treats open-ended (OE) question format, payment card (PC) question format and double-bounded dichotomous (DD) question format. An empirical survey was conducted in 1998 asking the economic value of preserving River Satsunai. Among the households in the river basin, 1200 households were randomly chosen and 694 could be interviewed in person. DD format produced highest mean and median WTP being consistent with a theoretical prediction. There was no sign of people telling a lie in DD format judging from respondents' confidence on their stated yen amounts. One potential drawback of DD format was found, that was the increases of protest answers in high bid amounts. This fact suggested that people who did not want to accept the bid tended to choose protest answers rather than rejection. This tendency limited the effective number of respondents and lessened the generality of estimated WTP. To reduce the effect of this tendency, a change of DD format is proposed.

Key Words: Contingent Valuation Method, Elicitation Method, Impure Altruism, Willingness-to-Pay

1. Introduction

Contingent Valuation (CV) Method is a way to evaluate economic values of environmental goods. In particular it is powerful when eliciting the non-use value of environmental goods. Early research on CV was conducted in the United States in 1960's. They have been developed in 1980's in the US and some European countries. The method is based upon a survey approach. The applicability of the method is subject to the socio-cultural attitude towards questionnaire surveys. The findings of the existing studies are limited to the US and European context. Thus it is important to test those results in Japanese context and alter their findings when necessary.

2. Research objective

The purpose of this study is to compare three major elicitation methods of willingness-to pay (WTP) from the view point of their performance and to find out their strength and weakness. The elicitation methods discussed in this study are open-ended (OE) question format, payment card (PC) question format and double-bounded dichotomous (DD) question format.

Theoretically DD format is the most accurate method and reflects true WTP. While, DD and PC formats give an incentive to state respondents' WTP lower than their true WTP (Hoehn and Randall 1987[1]). This result is also proved by some empirical studies in the United States and some European countries (Lunander 1998[2], Kristrøm 1993[3], Kealy and Turner 1993[4], Boyle and Bishop 1988[5]). Thus most CV related literatures recommend the use of dichotomous choice format. This study empirically tests this proposition and furthermore investigates if there is any shortcomings in the DD approach in Japanese context.

3. Survey design

3.1 Outline

To compare the three elicitation formats, a contingent valuation survey was designed and accomplished in 1998. The survey asked the economic value of preserving River Satsunai. Among the households in the river basin, 1200 households were randomly selected from Jyumin Kihon Daicho that is a complete listing of dwellers. Among them 694 could be interviewed in person.

Split survey design was employed. Three questionnaires were prepared and each questionnaire contained a WTP question in one of the three elicitation formats. One of

the questionnaires is randomly assigned to the respondents.

Interviewers' idea on the goods in question may affect peoples' answers. To avoid this problem, a respondent was asked to fill his/her answer in a questionnaire by himself. Interviewers were instructed not to see respondents' answers.

3.2 Questionnaire

The environmental goods in question were preserving the clean water and natural landscape of River Satsunai, whose water quality had proved to be the best in Japan by the Ministry of Construction for recent two years. Although the quality of water is very clean at present, there is a fear of contamination by wasted water from farmlands and Obihiro City. Furthermore, increases in the number of people visiting the river will increase illegal dumps of trashes, which will spoil the natural beauty of the river. The possible future situation of contaminated river was explained using a map of River Satsunai and two photos showing damaged riverfronts. In addition to the contamination, predicted extinction of some rare species was explained. Respondents were also told that the situation would not be worse than the described damage level.

A hypothetical preservation project was explained in the questionnaire and then peoples' WTP were asked. The project is the prevention of wasted water flow and periodical collection of dumped trashes. Donated money is used as the financial source of the project and the project lasts for 20 years after the first collection of money. During the project term, the water quality and landscape will be kept in current condition. Following this explanation, respondents were asked how much they would be willing to donate for the project. Here, to make the scenario realistic, respondents were told to donate the same amount of money for consecutive five years with one payment in each year. Respondents were reminded that budget constraints applied to this decision.

Two questions to certify respondents' stated WTP followed this WTP elicitation question. The first question asked reasons of zero-WTP answers to identify protest-zero answers. The second question asked an interviewee's confidence on the payment of his/her stated yen amount.

4.Result

Table 1 shows the distribution of protest-zero answers by elicitation methods. Observed significance of Pearson chi-square test is well below 0.01 indicating strong relationship

between the distribution and elicitation formats. Table 1 shows that DD format produced more protest zero answers. This phenomenon will be investigated latter in this chapter.

Table 1. Protest zeros by elicitation methods

	OE	PC	DD
Scenario accepted	164(0.75)	186(0.83)	132(0.58)
Protest-zero	55(0.25)	37(0.17)	96(0.42)
Sum	219(1.00)	223(1.00)	228(1.00)

Ratios in prentices

Table 2 shows the levels of subjective confidence on respondents' stated yen amounts. No significant difference was found among the three elicitation methods, since observed significance of Pearson chi-square test is 0.48.

Table 2. Subjective confidence by elicitation methods

	I will definitely pay	May be I will pay	Difficult to decide / May be I will not pay / I will not pay
OE	51	26	85
PC	49	26	105
DD	42	15	57

Table 3 shows mean and median WTP from three of the question formats. Simple non-weighted mean WTP and median WTP were estimated from OE data set. While mean WTP and median WTP from PC and DD data sets were estimated by means of life curves. A non-parametric estimation method described in Terawaki (1997)[6] was used to determine a life curve from DD data set.

Table 3. WTP estimations by elicitation methods

		All answer	Non-protest-zero
OE	Mean	2616	3410
	Median	1000	1000
PC	Mean	3189	3802
	Median	1421	1841
DD	Mean	6867	11908
	Median	948	4709

This estimation is based on the amount donated in the first year of payment period.

DD method produced highest mean value from both data sets of all answers and non-protest zero answers. This result confirms to the theoretical proposition based on rational choice behaviors. Median WTP of DD format using non-protest-zero answers

shows same tendency. While median WTP of DD format involving all answers was lower than those estimated by two other formats. As described in Terawaki (1997) this median estimator is very sensitive to the assumption of a life curve shape, thus one can not conclude by this result that theoretical prediction was violated.

The obviously larger figures of WTP by DD method from non-protest data set were caused by high probability of accepting bids at high amounts. Life curves shown in Figure 1 describe this phenomenon. When a bid amount is high, life curve produced by DD method runs well above the other two curves.
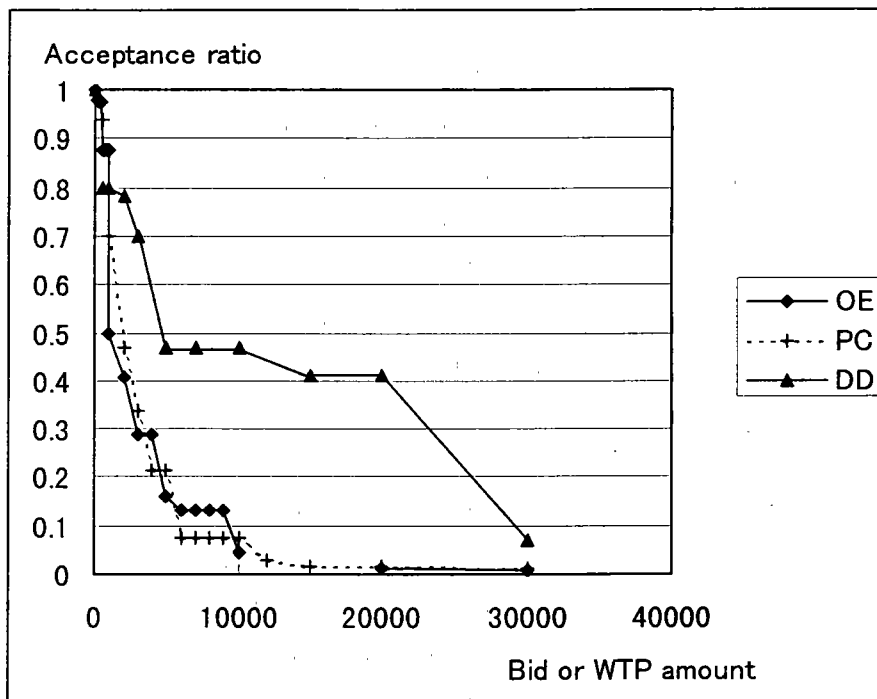

Figure 1. Life curves

High acceptance ratio of higher amount bids is the consequence of producing more protest-zero answers. Table 4 suggests that when people face a high amount bid, that they do not want to pay for, they tend to choose protest-zero answer rather than simple rejection. The difference between the two categories is statistically significant, as Person chi-square significance is 0.02.

Table 4. Protest zeros by bid amounts.

First bid amount	Non-protest-zeros	Protest-zeros
Less than ¥7000	81(0.35)	44(0.65)
More than or equal ¥7000	51(0.50)	52(0.50)

5.Discussion

Some useful information on the choice of elicitation methods was obtained from this survey. Mean WTP values elicited by the three question formats were consistent with theoretical proposition being the highest value produced by DD method. Although DD format WTP was significantly larger than those by the other two methods, there was no evidence of people telling a lie. The level of subjective confidence on the stated amounts was not different among the three elicitation methods, and moreover it did not decrease among the respondents accepting high bid amounts offered in DD elicitation method.

One potential drawback of DD method was found, producing large number of protest-zeros when offering high bid amounts. This tendency was described in Laughland et al. (1994)[7] , which was based on the results of an experimental CV survey in the United States. It is generally said that Japanese people hesitate to express complete disagreements. This tendency would strengthen the incentive to choose protest-zeros. The problem of this increase in the number of protest-answers is that DD result from non-protest-zero data set only represents a small portion of respondents. In other words, the economic value produced by this method is realized only when people completely agreed to the project in question.

Small change in the design of WTP question may be effective to reduce the effect of this drawback of DD method. The idea is to identify the answers being non-protest but the rejection of offered bid amounts. Traditional expression of binary choice asking people to choose acceptance or rejection may drive pure rejection answers to be expressed as protests. Giving an option like "I will pay if the bid amount is less expensive" would help to capture these rejection answers, since respondents do not have to express obvious disagreement to the proposed project.

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