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Abstract:

Though contingent valuation is the dominant technique for the valuation of public projects, especially in the environmental sector, the high costs of contingent valuation surveys prevent the use of this method for the assessment of relatively small projects. The reason for this cost problem is that typically only contingent valuation studies which are based on face-to-face interviews are accepted as leading to valid results. Especially in countries with high wages face-to-face surveys are extremely costly considering that for a valid contingent valuation study a minimum of 1,000 completed face-to-face interviews is required. In this paper we try a rehabilitation of mail surveys as low-budget substitutes for costly face-to-face surveys. Based on an empirical contingent valuation study in Northern Thailand we show that the validity of mail surveys can be improved significantly if so-called citizen expert groups are employed for a thorough survey design.

JEL-classification: D6, H4, L3, Q25, Q51

1. Introduction

In spite of many years of worldwide research on the improvement of validity and reliability of the Contingent Valuation Method (CVM) its acceptance as a decision tool for practical policy consultancy is still astonishingly low. One of the reasons for this is that the costs of CVM studies meeting the typically required quality standards as laid down by the NOAA panel (1993) are rather high, so that in spite of its widely accepted merits this valuation technique is simply too costly for a large-scale application of the CVM in the public sector.

The decisive cost driver is the NOAA requirement that for a valid CVM survey 1,000 completed face-to-face interviews are necessary (if the single-bounded dichotomous choice format is used - cf. NOAA 1993, p. 4611). Given the cost of personal interviews this requirement increases survey costs as compared to a mail survey dramatically. Already years ago the authors of this study had to pay more than 54,000 Euros for 1,000 completed face-to-face interviews in the context of a CVM survey in Germany (cf. Ahlheim et al. 2004) which makes clear that CVM surveys based on face-to-face interviews cannot be used for the economic assessment of smaller projects. A considerable cost cut could be achieved if the costly face-to-face interviews were substituted by mail interviews. But since this option was explicitly ruled out by the NOAA panel ("The Panel believes it unlikely that reliable estimates of values could be elicited with mail surveys. Face-to-face interviews are usually preferable ..." – NOAA 1993, p. 4611) mail surveys are typically considered a poor, since unreliable, assessment technique. In this paper we try to rehabilitate the mail survey method as a serious alternative to face-to-face surveys for CVM studies.

In the course of CVM interviews respondents are asked their willingness to pay (WTP) for some public project, i. e. the maximum amount of money they would be willing to pay for the realization of that project rather than go without it. The estimated mean WTP of a representative sample of all households affected by that project is then aggregated to derive its social value. Based on neoclassical welfare theory a person's WTP is interpreted as her or his Hicksian Compensating Variation (HCV), i. e. as the monetary equivalent of the utility accruing to her or him from the project in question. The Contingent Valuation Method aims at the empirical assessment of this monetary expression for the utility change a household will experience if the project in question is realized (see e.g. Ahlheim and Frör, 2003). Since nobody can look inside other people's heads it is obvious that no practical assessment technique can accomplish this theoretical goal perfectly and a person's "true" HCV will never be known for certain. All that can be hoped for is to approximate these potential individual utility gains as closely as possible.

There has been a long-ongoing debate about the appropriate interview form in CVM surveys. Apart from face-to-face interviews mail, telephone and mall-stop interviews have been proposed, where telephone and mall-stop surveys are typically ruled out for serious CVM studies. As mentioned above, also CVM studies using mail surveys (MS) are often considered less reliable than studies using face-to-face interviews (FtF) due to self-selection of respondents returning the questionnaires (Whitehead et al., 1993), low return rates, limited possibilities of conveying a complex valuation scenario to the respondent, and fewer possibilities to urge respondents to strictly follow the standardized order of questions in the questionnaire (e.g. Cameron et al., 1999; Ethier et al., 2000). On the other hand, however, mail surveys have a number of often overlooked advantages that make their use attractive:

they are considerably less expensive than FtF surveys; and respondents are much more likely to respond truthfully to personal and attitudinal questions, since the problem of social desirability and interviewer biases, both well-known problems of FtF surveys, can be avoided (e.g. Krysan, 1994). Also, with mail surveys respondents can take as much time as they need to think about the proposed scenario and about their answer to the WTP elicitation question (e.g. Dillman, 2000). As was shown e. g. by Macmillan et al. (2006) more time to think means better results of CVM surveys, a result that clearly speaks in favor of mail surveys.

In this paper we show how the validity of mail surveys can be improved significantly by using an appropriate survey design. We found that the employment of so-called citizen expert groups (CEG) can be a powerful tool for an improvement of the validity of CVM results. CEGs are representative groups of citizens who are accompanying the process of survey and questionnaire design. The members of these citizen groups are not experts with respect to the project to be valued (like e. g. flood protection, rehabilitation of devastated landscapes etc.) but they are regarded as experts with respect to the attitudes, cognitive abilities and cultural background of the population to be interviewed in a specific CVM survey.

In an empirical study in Northern Thailand we test the impact of CEGs on the validity of CVM mail surveys. Since, as already mentioned, people's "true" WTP for a public good or project will never be known with certainty we cannot use it as a benchmark for the validity of the results of a CVM study. Therefore, we choose convergent validity as a criterion for the quality of CVM surveys which seems to be a suitable complement to the statistical quality measures (cf. e.g. Kanninen and Khawaja, 1995; Herriges, 1999). According to Summers and MacKay "convergent validity typically is used when there is no acceptable single method to serve as an absolute valid standard for measuring the construct of interest. If the results of the two maximally different independent methods are in close agreement, both are said to share in establishing convergent validity." (Summers and MacKay, 1977, p. 263). We use this criterion for the comparison between a mail survey and a face-to-face survey in order to test the validity of the results obtained by both interview methods.

Our research setting is the following: In a first round of our study we assess the WTP for improved tap water quality in a suburb of Chiang Mai in Northern Thailand with two parallel CVM surveys, one with face-to-face interviews and one by mail. Both surveys were designed in accordance with the standard rules recommended for CVM surveys. The face-to-face and mail survey yielded results that were far apart from each other though both were internally consistent. After the evaluation of the first round of surveys we developed a new questionnaire and survey design for the same project together with two parallel citizen expert groups. Based on this new survey design we conducted another face-to-face and mail survey and this time we obtained nearly the same WTP results for both surveys. The fact that this time our CVM results turned out to be independent of the interview form was taken as an indication for the validity of the results in the sense of the convergent validity criterion with respect to the interview form (see e. g. Bishop et al., 1995, p. 642). Another indication for the validity of the results of our second round of surveys is that the average WTP yielded by the first and the second face-to-face survey are rather close to each other which corroborates the widespread perception that face-to-face interviews lead to valid and reliable (in the sense of test-retest reliability) results. Face-to-face survey results can, therefore, be used as a

benchmark for CVM results which are assessed by other elicitation techniques like mail interviews. This is the approach followed here.

A possible consequence of our results, if they can be corroborated and generalized in further studies, might be that in the future mail surveys could be used instead of the rather costly face-to-face interviews in order to save cost without loss of validity of CVM results. This could be an important step towards a wider acceptance of CVM as a decision tool in public policy.

The remainder of the paper is organized as follows: In the next section we analyze the main sources of errors and biases in practical CVM studies in order to identify the crucial points which have to be addressed when improving the validity and reliability of mail surveys. Section 3 offers an overview over different participatory valuation techniques discussed in the literature and introduces the concept of citizen expert groups (CEG) as a possibility for improving the design of CVM studies. In section 4 we present our empirical CVM study aiming at the assessment of improved tap water quality in Northern Thailand. In section 5 we discuss the results of our empirical study while section 6 contains some concluding remarks.

2. Problem analysis: the main sources of CVM failure

The basis for our attempt to improve the validity of CVM mail surveys was a process analysis of CVM surveys in general. With this analysis we wanted to detect the main sources of errors and biases of CVM results as shown in fig. 1 below.

In fig. 1 the course of a typical CVM interview – no matter if face-to-face or mail interview – is sketched and the several sources of error that might turn up in the run of such an interview are marked. The first step in a CVM interview consists of a thorough description of the project to be valued on the one hand and the intellectual processing of this information by the respondents on the other. Based on this information respondents form an idea of the benefits they might expect from that project and of the value this project might have to them. In the next step they are asked their WTP for this project where the respective amount is interpreted as expressing the expected benefits in monetary terms (in the sense of a Hicksian Compensating Variation). In a CVM survey WTP cannot be elicited from all people potentially affected by a project but, instead, a representative sample of these people or households is interviewed. The average WTP stated by this sample is then multiplied by the number of all people potentially affected by the project under consideration in order to obtain its social value.

The first source of error (**SoE 1**) in this process stems from the fact that it might be pretty hard for people to form an exact enough idea of the future benefits they may expect from an environmental project that does not yet exist and, therefore, cannot be inspected before they have to state their WTP for its realization. It takes some mental effort to form a reliable idea of an environmental change that has not yet taken place and to imagine what the specific advantages and disadvantages of that change might be. In order to obtain reliable answers regarding people's WTP for a project it is, therefore, necessary to raise their interest in that project so that they find it worthwhile to think about it thoroughly and to consider its importance for them carefully. This is, typically, one of the main problems of designing a CVM questionnaire.

The WTP for an environmental project will typically depend on its specific features, on the utility a person might obtain from its direct use (use values) and, additionally, from the benefits accruing from the mere existence of that project (non-use values). Different people will appreciate different features of such a project, and this poses a rather complex information problem regarding the questionnaire design, especially in a mail survey where respondents cannot ask any questions regarding the understanding of the project scenario.

The questionnaire must provide a description of the planned project that allows all kinds of respondents, no matter what their educational and social background is, to form an exact as possible idea of the project features which are relevant for their personal appreciation of the project. The typical dilemma regarding the formulation of a project scenario is that on the one hand it should be as exact as possible and convey as much information about the project as possible, and on the other hand it must not demand too much of the intellectual capacity of respondents. This means that information should be kept short and simple. It is extremely difficult to arrive at a compromise between these two contradictory goals, especially, since it is not enough to aim at the intellectual capacity of some 'average' citizen, because that would mean excluding half of the population from the survey. If the information contained in the project scenario is too superficial (and therefore easy to grasp), people's valuation of the project will be superficial, too. In such a case, one cannot really attribute their stated WTP to the specific features of the project to be valued, since they do not know these features in detail. If, on the other hand, information is really comprehensive, the danger arises that it is too complicated for respondents with a weak educational background and that the text is too long, so that, especially in a mail survey, people will stop reading it and the non-response rate will increase. Apart from these points, it is obvious that the formulation of the scenario must not be suggestive in the sense that it guides respondents' judgment on the project emotionally in one direction or the other. The question which formulations might seem suggestive to respondents depends critically on their cultural background which has been scrutinized by researchers when designing a CVM questionnaire. Examples for the different biases that might arise from the first source of error are stated in fig. 1.

A second main source of a whole class of errors (**SoE 2**) arises from the fact that, even if people know exactly what benefits they expect from some environmental project and how to express them in WTP terms, they might not be ready to state this WTP correctly in a CVM survey. In general, the fact that environmental goods are typically available for free makes it difficult to convey the idea to respondents that they should express their appreciation of an environmental project in terms of willingness to pay (cf. e.g. Ahlheim, 1998). A convincing payment scenario and an adequate choice of payment vehicle are essential in this context.

There are many reasons discussed in the literature for deliberate misstatements of WTP, some of them strategically motivated (e.g. Brookshire et al., 1980; Mitchell and Carson, 1989; Champ and Bishop, 2006), others arising more or less by chance if respondents do not like the person of the interviewer in face-to-face interviews, or if their religious, ethical or political convictions and feelings are hurt by formulations or statements in the questionnaire (e.g. Ethier et al. 2000; Leggett et al., 2003). Obviously, a CVM questionnaire should not contain any facts or formulations offending people's feelings because this will lead to an antipathy towards the project and to a downward bias of stated WTP. But even if respondents have no emotional reason to state a wrong WTP deliberately, they might be misled in their judgment unintentionally by some formulation in the questionnaire which they

interpret as suggesting that a certain amount of WTP is considered 'adequate' by the interviewers, or by anchoring effects due to the chosen elicitation question format. Again, detailed knowledge of the cultural background of the society in which the CVM survey takes place is therefore necessary. This is especially true if the survey is carried out in a cultural environment that is foreign to the CVM researchers (cf. e.g. Ahlheim et al., 2006).

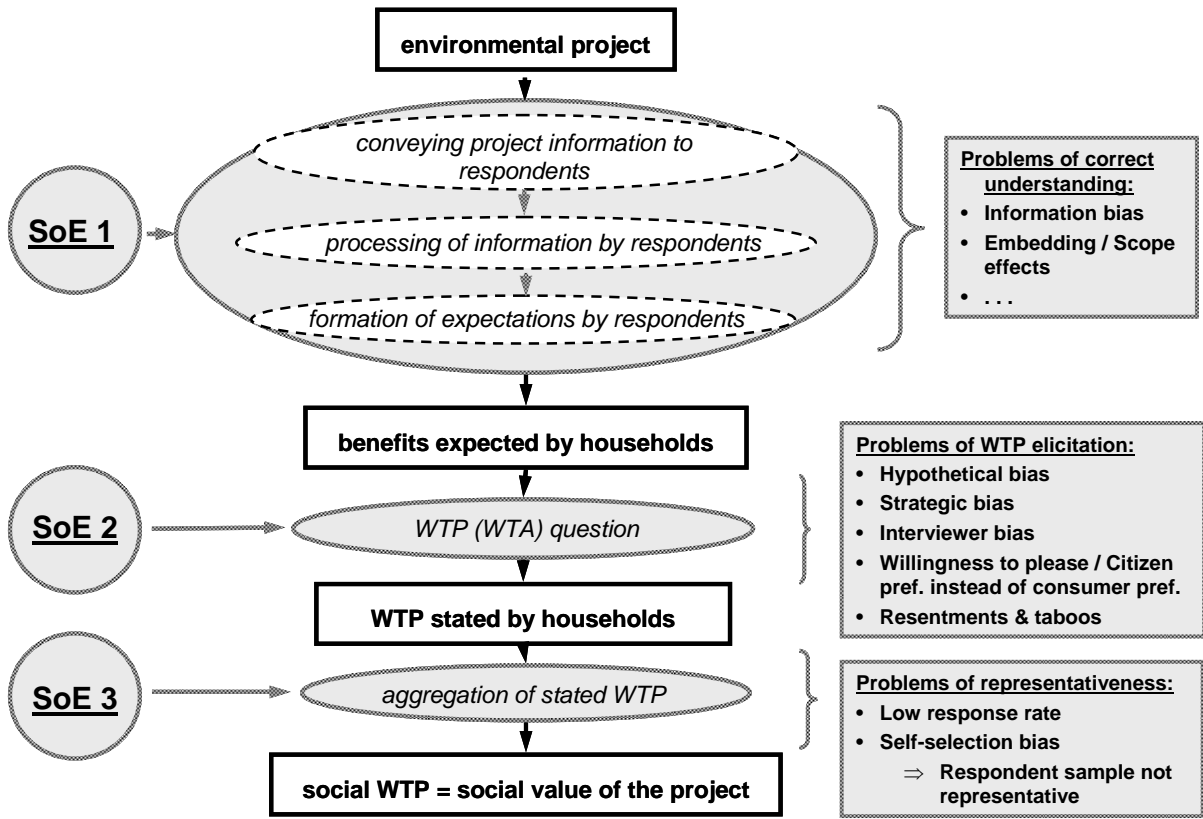


Fig. 1 - Sources of error in CVM surveys

The third general weakness of CVM studies (**SoE 3**) lies in the aggregation of individual WTPs and their extrapolation to a social WTP which is interpreted as the social value of the project under consideration. As explained above, a representative random sample of all households affected by a project is chosen for the CVM interviews and the mean or, in some cases, the median of the WTPs stated by the interviewed households is multiplied by the number of all affected households to obtain the social value of the project. Clearly, this aggregation procedure is justified only if the group of households actually interviewed is representative of the whole population affected by the project, i.e. it is not enough to approach a representative household group about being interviewed, the decisive point is that the group that is finally interviewed is representative. Especially in mail surveys, where the social pressure to comply with the request to fill in the questionnaire is rather low, the design of the project scenario and of the questionnaire is essential for raising respondents' interest in order to attain a satisfactory response rate. A sufficiently high response rate and a

representative sample of respondents who actually complete the questionnaire are necessary for the aggregation of individual WTPs to be meaningful. Therefore, all facts that may motivate respondents to comply or that potentially might keep them from complying have to be considered for the survey design.

An important instrument for the minimization of the different sources of error described here is the use of participatory instruments in CVM studies. In our empirical study described in section 4 we use a special form of citizen participation, so-called citizen expert groups, i.e. groups of people who are willing to get involved in a CVM survey and to cooperate with the CVM researchers. In the next section we give a short overview of the role participatory processes can play in CVM studies. After that, we introduce citizen expert groups as a special case of stakeholder participation in environmental valuation.

3. Participatory group processes in CVM

The idea of making use of group processes in the context of environmental valuation is not new. A variety of techniques where groups of respondents from a sample population are interviewed instead of just single individuals has been developed and analyzed in the literature. This idea is based on the assumption that social interaction in the form of discussions and an exchange of personal views and opinions among the group members generates insights that would have remained hidden in purely individual interviews. By allowing them to build their thinking on other group members' ideas, participants are enabled to better reflect on their impressions of the project and this, ultimately, will lead to better value judgments.

The most popular techniques are the so-called focus groups, which originated in sociological research (e.g. Krueger, 1998; Morgan, 1996) and are now widely used in marketing research. As purely qualitative techniques, they can either be employed in the pre-survey phase for aiding and improving the process of CVM questionnaire design, or as post-survey focus groups to gain insights into respondents' reasoning during the survey for an assessment of the validity of the survey results. A different type of participation groups aimed at elicitation of WTP in valuation workshops has been termed the 'market stall' technique and is becoming increasingly popular among CVM researchers (Macmillan et al., 2002). Among these different types of groups, the pre-survey focus groups are the most widely employed. Today they represent a standard procedure for CVM questionnaire design and subsequent pre-testing (e.g. Painter et al., 2002; Hanley et al., 1998; Hutchinson et al., 1995; Chilton and Hutchinson 1999a, b, Christie et al., 2006, Kaplowitz, 2000). A number of studies employing focus groups in a post-survey phase have been carried out with the objective of receiving feedback from respondents to be used as a diagnostic tool for judging the reliability of the responses (cf. e. g. Powe et al., 2005; Blamey, 1998; Brouwer et al., 1999; Clark et al., 2000).

Another type of group processes in CVM, the valuation workshop, is becoming more and more popular but remains controversial (Niemeyer and Spash, 2001; Söderholm, 2001). In contrast to focus groups, which assess qualitative information regarding people's perceptions of environmental issues and of the specific project under consideration, valuation workshops aim at a quantitative, i.e. monetary, value assessment like in a regular CVM survey. These

workshops, which represent a quantitative extension of the method of citizen juries in public decision-making (e.g. Kenyon et al., 2001, Kenyon and Nevin, 2001), have become known as the 'market stall' method (cf, e. g. Macmillan et al., 2002; Macmillan et al., 2006; Philip and Macmillan, 2005; Álvarez-Farizo and Hanley, 2006).

The concept of citizen expert groups (CEG) as used in our study combines the advantages of the three participatory approaches described above while avoiding their potential pitfalls. The idea is to form a group of citizens affected by the environmental project to be valued who have already shown a personal interest in this project and acquired a certain level of knowledge about it. In our study this interest had been shown by the fact that the members of our CEGs were recruited from the group of people who had participated in a preliminary mail survey dealing with our project and had returned the respective questionnaire. In a sequence of meetings, the group discussed the whole range of different aspects concerning the environmental, social, economic and political background of the project. Also, personal experiences with the environmental issue under consideration were exchanged among the group members. Additionally, government officials, scientists and members of the public administration were invited to feed in outside information and expert knowledge. After this information phase, group members obtained detailed information on the principles of CVM and on the planned valuation survey. Then they were asked to discuss the various aspects of this CVM survey and, especially, to comment on different drafts of the questionnaire.

We argue that a group of highly motivated and committed citizens like a CEG is an ideal forum for discussing these issues and for developing strategies to cope with the problems arising from the three main sources of CVM errors. In the first phase of such a cooperation between CVM researchers and citizens, when the group discusses personal experience and attitudes towards the project, the group is more or less an object of observation for the researchers. In the second phase, when the specific details of the survey design and the formulation of the scenario and the questionnaire are discussed, they 'change sides' and become part of the research team, and their advice influences the whole study directly. This part seems to make participation in a citizen expert group attractive, as we found. In the next section we will show how the CEGs helped to improve our empirical CVM survey in Northern Thailand.

4. Designing a valid CVM survey in Northern Thailand

As explained above, the general objective of this study is to scrutinize the possibilities of using citizen expert groups to optimize the design of CVM surveys. Particularly, the employment of CEGs should improve the quality of CVM results in the sense that the social WTP assessed in a CVM study is independent of the chosen interview form (face-to-face or mail survey) so that the criterion of convergent validity is fulfilled.

If, with the help of CEGs, it becomes possible to find a standard procedure to design CVM surveys so that face-to-face and mail interviews lead to the same social WTP, this procedure would (1) improve the reliability of CVM studies in general and (2) open up new possibilities for decreasing the cost of CVM surveys without loss of validity because possibly in the future mail surveys could be used instead of costly face-to-face surveys.

The project scenario

The study site for our empirical CVM survey was a watershed in Northern Thailand near Chiang Mai. The main river of this watershed is the Mae Sa river, which connects the agricultural region upstream with the suburb Mae Rim, which lies downstream. Obviously, the quality of household tap water obtained from the Mae Sa river in the downstream area depends critically on the agriculture practiced upstream.

The empirical objective of the research project was to assess the social benefits accruing to the population of Mae Rim from improved tap water quality and service. The downstream water quality depends heavily on the pest management and soil conservation practiced in the uplands of the watershed. The population of downstream Mae Rim, more specifically the customers of the Mae Rim Water Works (MRWW) with whom the survey was conducted, would benefit directly from the upstream improvements through better, i.e. drinkable, tap water quality. In addition to these direct private benefits, MRWW customers could also be expected to derive indirect benefits from this program, since it would lead to a general reduction of pesticide levels in fruits, vegetables and the whole environment, and to reduced soil erosion in the uplands. Since these benefits are non-rival and nobody can be excluded from experiencing them, they can be viewed as typical public benefits accruing at the same time to customers and non-customers of MRWW, as well as to future generations. These characteristic features of the project under consideration were described in the project scenario contained in the survey questionnaire.

The payment scenario suggested that this program would have to be financed by increased water bills for MRWW customers, and people were asked which maximum increase in their water bill they would be willing to tolerate in order to make the implementation of this program possible. According to the scenario, the total benefits they might expect in return would consist of direct private benefits (improved tap water quality, less pesticide contamination of fruits and vegetables they eat etc.) and public benefits (less pesticide contamination of the whole environment, reduced soil erosion in the uplands, etc.), that would be shared also by non-customers of MRWW and even future generations.

Survey structure

The intended comparison of the two different interview forms makes it necessary to divide the overall household sample chosen for the CVM interviews into two sub-samples, where one sample of households is interviewed face-to-face and the other by mail survey. This separation makes it possible to compare the respective results of the two interview forms.

Since the elicitation question format is well known to influence CVM results at least potentially we split the two samples further in order to test different elicitation question formats in combination with the different interview forms. According to the empirical evidence of the last two decades, the most promising 'candidates' for a useful elicitation question format are the various forms of dichotomous choice (DC) format (single-bounded, double-bounded and DeShazo style) on the one hand, and the payment card (PC) format as a modified version of an open-ended question format on the other. Most empirical studies found that WTP elicited by the DC format is significantly higher than if the PC or other open-

ended formats are used. This result seems to be due to anchoring and 'yea'-saying effects (cf. e.g. Frykblom and Shogren, 2000, Holmes and Kramer, 1995; Blamey et al., 1999).

Since it is not clear a priori which elicitation question format, closed-ended or open-ended, is more appropriate to elicit people's 'true' WTP, we tested both. For this purpose we formed two representative sub-samples of the FtF sample and the MS sample, respectively. Respondents of one sub-sample in the FtF sample and in the MS sample were confronted with the DC question format, while the members of the other sub-samples had to choose their WTP from a payment card. For the decision regarding which elicitation question format is more valid, the convergent validity criterion is employed again: we postulate that the 'correct' question format should lead to the same social WTP for both interview forms.

The empirical study included three main phases: after conducting expert interviews and two rounds of pretests, an initial CVM survey was conducted with a random sample of our survey population, the customers of a local water supplier near the city of Chiang Mai in Northern Thailand. A split sample design was used, in which 562 personal interviews were conducted and 1200 mail questionnaires following the procedure recommended by Dillman (2000) were sent. For both interview forms, the samples were divided into respondents receiving the DC elicitation format and others receiving the PC format. In the DC format, they were asked if they agreed to the proposed program (improvement of tap water quality in a suburb of Chiang Mai) if they had to pay a surcharge of a specified amount on their water bill. The DC question was asked in its double-bounded form, i.e. a follow-up payment question was asked with a higher/lower amount depending on the answer to the first payment question. In the PC format, respondents were asked to specify the payment interval from a given list that contains the maximum amount of money they would be willing to pay as such a surcharge to make the proposed program possible.

After the evaluation of the results of this initial survey, two rounds of CEG meetings with those respondents of the mail survey agreeing to take part were conducted on two consecutive weekends. The objective pursued with these group meetings was to improve the questionnaire design in order to increase its comprehensibility and to reduce possible biases in respondents' answers.

In the first round of group meetings, participants were asked to comment on the proposed project and discuss its elements in the group with the help of a moderator. At the beginning of the group meetings, participants' perceptions of the project description in the mail questionnaire were tested. Subsequently, participants' information on the program was updated and its details and chances of practical implementation were discussed in the group. Following this exchange of arguments and points of view regarding the proposed program, participants were given a copy of the mail questionnaire and asked to comment on its design and suggest improvements. This was intended to detect resentments, taboos and other misleading formulations in the questionnaire that might induce respondents either to not return the questionnaires or to report untruthful results. Finally, the CEG members were asked to discuss the issues raised in the group meeting with their friends and family at home before the next group meeting and to write down the ensuing results. All meetings were videotaped and fully transcribed in Thai and English to allow systematic analysis of the observations and of the qualitative data.

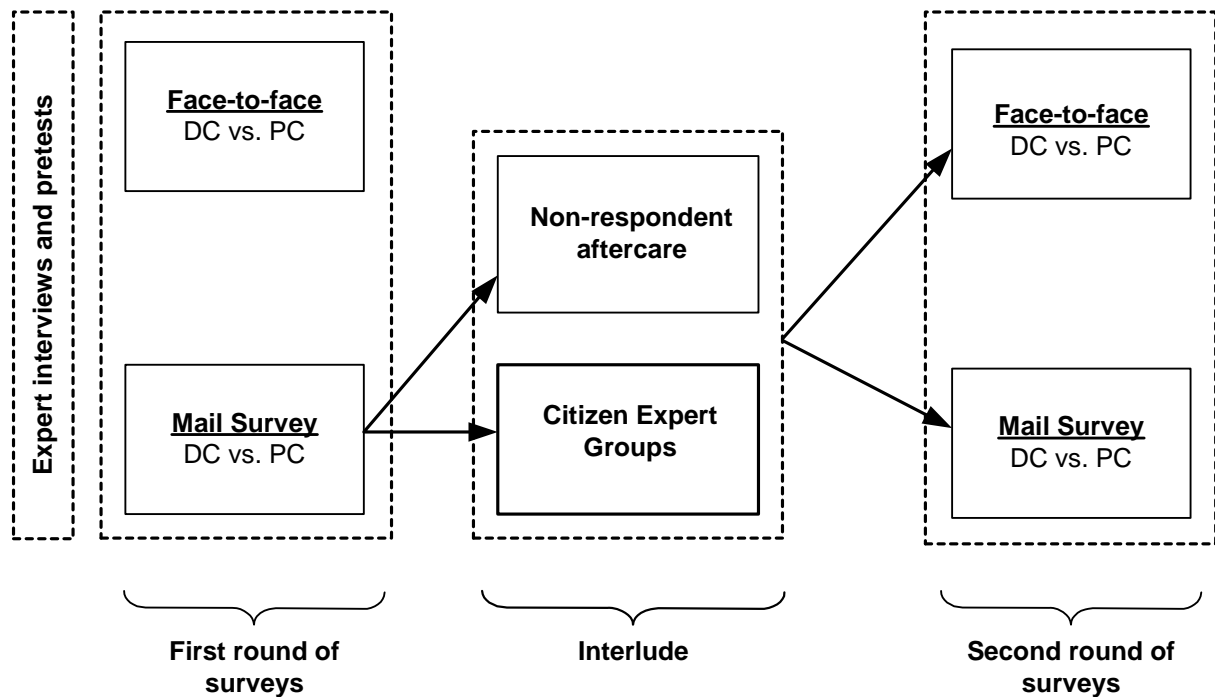


Fig. 2 - Structure of the study.

The objective of the second round of group meetings held on the following weekend was to confront the participants with an external expert, in our case the director of the local water supplier, in order to increase their understanding of the water supply system and the measures to be carried out. Further, this was intended to enable detection of areas of conflict between the water users and the water supplier. It is hypothesized that these hidden conflicts have a considerable influence on the response behavior of the water users, both in face-to-face and in mail surveys. Thus, detecting and anticipating these conflicts could improve the scenario description and formulations in the questionnaire to a large extent, so that protest responses would be mitigated. After the detailed presentation by the expert, participants were given the possibility to ask questions and discuss issues of water supply, quality monitoring and water policy in every detail. By the end of the session, participants were asked to set out their own thoughts and the considerations of their friends and family regarding the project, which they had written down at home after the last meeting.

A decisive problem with the formation of successful CEGs, which we also had to deal with, is finding suitable candidates. After the first survey round, we approached the respondents of the mail survey sub-sample and asked them to take part in a citizen expert group. The objectives of the group meetings were explained to them and as an additional incentive they were offered a free meal at the Chiang Mai University campus (where the CEG meetings took place) after each meeting. It was interesting that those former MS respondents who were rather critical of our tap water improvement project were especially willing to participate in the CEGs. This turned out to be a great advantage for the group discussions, since their critical attitude made them very active discussants and conscientious advisers to our survey.

Since we felt that we should also consult those citizens who refused to return our mail questionnaire, we traced them back and visited them in their homes to ask them the reasons

for their non-compliance. Combining the opinions of compliant and non-compliant citizens gave us an excellent picture of what went wrong in the first wave of our survey.

Subsequently, the questionnaires for the FtF survey and the MS were revised according to the results and implications from the participatory group meetings. The same split sample design was employed as in the initial survey round, but now 823 personal interviews were conducted and 1150 mail questionnaires were sent to the customers of the local water supplier. The structure of the whole study is shown in Fig. 2.

5. Results and discussion

The results of the first survey are shown in Table 1. As expected, the return rate of 28.8 % of the MS was quite low, although this figure is well within the range of typical response rates in mail surveys. For the analysis of possible anchoring effects, the answers to the DC questions were evaluated using three different evaluation methods simulating three different hypothetical question formats: (1) single-bounded: for the single-bounded method only the answers to the first payment question were used, (2) double-bounded: for the double-bounded method both answers (first payment question and follow-up question) were taken into account, and (3) DeShazo: for the DeShazo method the answer to the follow-up question was ignored whenever the first payment amount was accepted. As argued by DeShazo (2002), this procedure should eliminate any anchoring effects that result from respondents' reluctance to enter into some kind of bargaining process once having already accepted the first proposed payment. The PC responses were evaluated by estimating a probit model of response probability following Cameron and Huppert (1989). Confidence intervals were computed by the bootstrap method based on Park et al. (1991). In table 1 the figures given in square brackets are the WTP estimates of the mail survey that have been statistically corrected for non-response bias by using the parameter estimates of the MS sample with the population means of the explanatory variables, i.e. the means as assessed by the randomly selected FtF sample (cf. Edwards and Anderson 1987). For the DC format the lower figures of the corrected WTP result from a higher average level of education of the mail survey respondents as compared to the face-to-face respondents.

The FtF-DC results reflect our expectations perfectly: WTP estimated by the double-bounded method is significantly lower than WTP estimated by the single-bounded and the DeShazo methods. This same pattern is observed for the MS-DC results. It can thus be concluded that anchoring effects associated with the higher follow-up bid, as explained above, are strong, so the double-bounded DC format should not be used here. A comparison of the DC with the PC WTP results reveals a dramatic discrepancy. However, while higher WTP estimates for the DC format were expected according to the literature, such a large difference is astonishing and needs to be explored further. Significant differences in the WTP estimates were found for both elicitation question formats between the FtF survey and the MS so that the criterion of convergent validity is definitely violated here. In particular, for the DC format it turned out that the MS results were significantly lower than the FtF results which stems from the fact that for the high bid versions of the questionnaire the rejection rates were much higher than in the FtF survey. This puzzling result remains to be explained. For the PC format, the MS results are significantly higher than those of the FtF survey. This effect might be explained by the fact that only those MS respondents who were particularly interested in

the tap water improvement sent back the questionnaire (in the version used for this first round of MS), while the others did not care to answer. It will be shown that this kind of self-selection effect especially could be eliminated by using the participatory techniques to improve the questionnaire.

Table 1 - Summary of the WTP results of the first survey (figures in Thai Baht/month)

| Format | Evaluation method | Face-to-face (FtF) | Mail survey (MS) |
|--------|-------------------|------------------------------------|--|
| | | mean WTP (95%-confid. interval) | mean WTP [corrected] (95%-confid. interval) |
| DC | Single-bounded | 233 (199-272) | 163 [102] (105-222) |
| | Double-bounded | 176 (154-198) | 148* (101-198) |
| | DeShazo | 227 (203-257) | 168 [142] (136-200) |
| PC | | 62 (48-75) | 100 [97] (63-137) |

* The double-bounded regression model yielded no significant explanatory variables so no corrected WTP can be computed in this case.

A comparison of the main socio-economic and demographic characteristics between the FtF and the MS samples revealed the self-selection effect of MS-respondents. Most importantly, the sample differed in the variables 'sex' and 'age', where significantly more men responded to the mail questionnaires than were interviewed face-to-face. Also, in the comparison between the two survey types, respondents of the mail survey were significantly older. Table 2 exhibits the results of probit regression models using the socio-economic and demographic characteristics of respondents as explanatory variables for WTP.

From Table 2 it can be observed that the socio-economic and demographic variables have only little influence on stated WTP in this survey. In the FtF-DC model, income was found to have a significantly positive effect on WTP, while in the other models this was not the case. Furthermore, income had no significant effect in the MS-DC model where, instead, education was found to be significantly positively related with WTP. In the FtF-PC model, respondents' levels of education had a significantly positive effect, which also seems to be plausible. In the MS-PC model, household size showed a significantly positive effect on WTP, while having children showed a negative effect in the FtF-PC model. This combination of results is puzzling since one would expect just the opposite signs: for big households, the budget constraint might reasonably be expected to be tighter than for smaller households, so that their stated willingness to pay might be limited by their ability to pay. Overall, no clear patterns can be detected when comparing the models pertaining to the FtF survey on the one hand and the MS on the other. As will be shown below, these results improve considerably after employing the citizen expert groups.

Table 2 - Socio-economic characteristics as explanatory variables of the WTP models (first survey, DeShazo-model)

| Variable | FtF-DC | FtF-PC | MS-DC | MS-PC |
|-----------------|----------------------------------|----------------------------------|---------------------------------|---------------------------------|
| | Coefficient (p-value) | Coefficient (p-value) | Coefficient (p-value) | Coefficient (p-value) |
| Bid | -565.58 ^{**} (.0000) | -15.24 ^{**} (.0000) | -4.73 ^{**} (.0015) | -11.33 ^{**} (.0000) |
| Income | .11 ^{**} (.0395) | -.13 (.8683) | .017 (.3327) | -5.53 (.4483) |
| Household size | 85.17 (.1880) | -28.30 (.6516) | 64.84 (.5453) | 361.37 ^{**} (.0000) |
| Education | -508.44 (.8964) | 73.57 [*] (.0747) | 249.99 ^{**} (.0150) | 51.65 (.4306) |
| Sex (1 = male) | -126.17 (.2351) | 30.11 (.8324) | 282.34 (.4732) | 98.54 (.6635) |
| Age | -104.22 (.1756) | -.93 (.9147) | -7.18 (.7656) | 2.09 (.8490) |
| Married | 14.62 (.9431) | 34.25 (.8534) | -81.49 (.8367) | 272.50 (.4422) |
| Children | -252.59 (.2798) | -255.71 ^{**} (.0261) | -436.67 (.6107) | -185.20 (.5599) |
| N | 337 | 225 | 93 | 113 |
| Log-Likelihood | -292.44 | -765.89 | -46.78 | -388.10 |
| χ^2 - test | 585 (df=9, p<.001) | 1531 (df=9, p<.001) | 94 (df=9, p<.001) | 776 (df=9, p<.001) |

^{**}) significant at the 5 % level

^{*}) significant at the 10 % level

The CEG meetings held after the first survey round revealed a considerable lack of understanding of the proposed valuation scenario, resentments against MRWW, i.e. the public authority in charge of implementing the proposed program, doubts regarding the possibilities of implementing this program, and substantial misconceptions concerning the purpose of the study. This was rather astonishing because several rounds of expert interviews and of thorough pre-testing of the questionnaire had taken place before the first main survey as recommended in the literature. Participants of the CEGs had quite a good understanding of the private benefits of the program, whereas an understanding of the associated public benefits required discussion in the group. Moreover, respondents seemed to have had bad experience with the service and the reliability of MRWW, which had already been revealed in the first round of meetings. These issues were even more intensively discussed in the second round in direct confrontation with the MRWW director. Further, participants placed considerable importance on control and monitoring measures in order to be assured that the proposed program would actually be implemented as promised and maintained in the long run. Finally, the inclusion of a set of personal questions in the mail questionnaire referring to people's attitudes regarding the environment, government and spending behavior had created the perception that the tap water improvement program was just a pretext for sounding out the population on personal and private issues.

These insights gained from the citizen expert group meetings formed the basis for revision and refinement of the questionnaires to be used in the subsequent FtF survey and MS study. First of all, the scenario was reformulated to include a clearer description of the public benefits and to stress the control and monitoring measures proposed by the groups. As suggested by CEG participants, the scenario was structured in a ‘question-and-answer’ manner, such as, for example *"What is the idea of the program?" – " The idea is that all MRWW customers should enjoy an uninterrupted supply of tap water which is also drinkable"*, since it was argued that this structure would better reflect the respondents’ main concerns regarding the project. Second, the number of personal questions was reduced and their purpose for the study was explained more thoroughly to reduce respondents’ reluctance to provide such personal information and, thus, to increase the likelihood of response. Further, the DC question format was changed to the DeShazo format, i.e. the higher follow-up question was eliminated, in order to account for the anchoring effects found in the first survey.

Table 3 – Socio-economic characteristics as explanatory variables of the WTP models (second survey, DeShazo method)

| Variable | FtF-DC | FtF-PC | MS-DC | MS-PC |
|-----------------|----------------------------------|----------------------------------|--------------------------------|---------------------------------|
| | Coefficient (p-value) | Coefficient (p-value) | Coefficient (p-value) | Coefficient (p-value) |
| Bid | -5.87 ^{**} (.0000) | -11.80 ^{**} (.0000) | -7.75 ^{**} (.0000) | -12.86 ^{**} (.0000) |
| Income | .64 (.1821) | 2.88 ^{**} (.0000) | 1.35 ^{**} (.0104) | 1.50 ^{**} (.0082) |
| Household size | 8.79 (.7390) | 31.19 (.3400) | -31.06 (.5926) | 44.27 (.4230) |
| Education | 109.60 ^{**} (.0007) | -4.90 (.8724) | 81.48 ^{**} (.0442) | -34.05 (.4216) |
| Sex (1 = male) | -226.96 ^{**} (.0466) | 179.20 [*] (.0898) | -29.14 (.8272) | 73.58 (.6348) |
| Age | -4.48 (.3940) | -16.54 ^{**} (.0006) | 8.87 (.2417) | -6.60 (.5344) |
| Married | -104.38 (.5046) | -377.99 ^{**} (.0284) | -8.06 (.9615) | -.41 (.9984) |
| Children | 579.71 ^{**} (.0016) | 305.19 [*] (.0866) | 74.90 (.6978) | 149.86 (.5513) |
| N | 337 | 345 | 363 | 222 |
| Log-Likelihood | -433.58 | -1311.30 | -502.43 | -813.70 |
| χ^2 - test | 585 (df=9, p<.001) | 2622 (df=9, p<.001) | 1004 (df=9, p<.001) | 1627 (df=9, p<.001) |

^{**}) significant at the 5 % level

^{*}) significant at the 10 % level

The most striking improvement of the survey results brought about by the CEGs in the second survey can be observed by comparing the WTP estimates of the various survey versions in Table 4. While considerable differences in WTP between the face-to-face and the mail survey still exist for the DC format, (near) equality of WTP estimates was achieved for the PC format after correcting for non-response bias. That means that with the payment card

elicitation question format our survey obviously fulfills the convergent validity criterion for the two interview forms tested here, i. e. face-to-face and mail survey. The actual result of an average WTP of around 66 to 68 THB is also credible in the sense that it lies in the 95%-confidence intervals of both payment card results (face-to-face and mail survey) from the first round of the survey (cf. table 1).

The increase of the return rate of the mail survey from 28.8 % in the first survey to 50.5 % in the second survey shows that the representativeness of the returned questionnaires and the results obtained from them have increased dramatically. It seems that the improvement of the questionnaire design based on the participatory group meetings eliminated the self-selection effect that, even after statistical correction for non-response, was responsible for the mail survey results of the PC format being significantly higher than the face-to-face results. The improvement of the MS design resulting from the recommendations of the CEG participants obviously induced many more people to return their questionnaires than in the first survey, so that now not only the stated WTP of those most interested in the program (and who consequently have the highest WTPs) is considered in the study as it was the case in the first mail survey.

This increase in representativeness of the mail survey might also explain the fact that the average WTP of 68 THB in the second mail survey is quite close to the average WTP obtained in the first face-to-face survey of 62 THB using the PC question format. The relative stability of the FtF-results in this format over the two surveys seems to corroborate the general belief that face-to-face surveys yield valid and reliable results (in the sense of test-retest reliability). It also shows that the design of our first survey (without CEG support) was already of a high standard, at least with respect to the validity and reliability of face-to-face interviews. The improvements of the survey design brought in by the CEGs were mainly effective with respect to the validity of the mail survey. This underpins our conviction that CEGs are an extremely valuable instrument for the improvement of mail surveys up to the point where this low-budget version of a CVM survey can replace costly face-to-face surveys for the assessment of smaller projects.

**Table 4 - Summary of the WTP results of the second survey
(figures in Thai Baht/month)**

| Format | Evaluation method | FtF | MS |
|--------|-------------------|------------------------------------|--|
| | | mean WTP (95%-confid. interval) | mean WTP [corrected] (95%-confid. interval) |
| DC | Single-bounded | 196 (164-232) | 45 [21] (17 – 79) |
| | DeShazo | 193 (154-226) | 89 [89] (68-108) |
| PC | Probit | 66 (47-82) | 68 [67] (49-83) |

A further indication for the quality of the WTP responses in the PC format is the absence of any range bias, i.e. a systematic effect of the range of the specified payment intervals in the payment card on stated WTP as sometimes detected in the literature (cf. Frew et al., 2003), in our payment card data. In our split sample design respondents receiving a cut-off point of 2000 THB stated, on average, the same WTP as respondents receiving the 400 THB cut-off. For the DC format, however, a large discrepancy between FtF and MS results remains although the representativeness of the sample has increased substantially as can be observed by the absence of any non-response bias, at least for the DeShazo format. A plausible explanation for this phenomenon is still lacking and requires further research. Furthermore, a significant starting-point bias, i.e. an effect of 'anchoring' the response to the WTP question on the proposed payment amount, could be detected from the DC data in both interview forms. These results underscore our recommendation that, in the socio-cultural context of Thailand, the PC format is clearly superior to the DC format.

6. Conclusions

Our empirical study showed how citizen expert groups can be used to improve the design of CVM surveys and the validity and reliability of CVM results significantly. It turned out that, after a thorough revision of the original project scenario and of the questionnaire in cooperation with the citizen expert groups, the results of the CVM study became stable with respect to the interview form used in the survey. This independence of the estimated social WTP of the chosen interview form was taken as an indicator for the quality of our study results in the sense of convergent validity related to interview forms.

During the group meetings in Chiang Mai University the discussions among the group participants and with the officials from the Mae Rim Water Works revealed two important points that turned out to be very valuable for the revision of the questionnaires: firstly, the pre-information of the participants of the group meetings stemming from the preceding mail survey was particularly helpful for efficient and competent discussion in the groups, and, secondly, the fact that mostly critical and skeptical respondents from the mail survey agreed to join the meetings was advantageous, because it allowed us to address especially the concerns of those people who were typical candidates for non-response due to their critical overall attitude towards the program. In order to attract this respondent group to the participatory meetings, it turned out to be a good idea to announce the participation of an official from the local water authority to whom they could convey their misgivings and complaints regarding the Mae Rim water supply, and with whom they could discuss the possibilities of implementing the water improvement program in practice. This procedure distinguishes the CEG approach significantly from the standard focus group approach.

Testing different elicitation question formats after having discussed them with the CEG members showed that the payment card format seems to be significantly superior to the dichotomous choice format in the socio-economic and cultural context of Thailand. Apparently, the anchoring effects arising from DC questions are quite strong, so that CVM results are severely biased if this question format is used.

The fact that the face-to-face survey results were relatively stable from the first to the second survey corroborates the general belief (shared also by the NOAA panel 1993) that a well-designed face-to-face survey yields valid and reliable CVM results. It also shows that the

quality of our initial survey design was absolutely sufficient to get good results from face-to-face interviews. But it obviously failed to yield satisfactory results from the parallel mail survey. This means that the design of a mail survey leading to valid results requires additional efforts for which we recommend the employment of citizen expert groups. This research also shows clearly that using simple statistical procedures for the correction of non-response bias in mail surveys as done here is not sufficient for eliminating the associated sample selection error. In CVM surveys such correction is often limited by the generally small number of significant explanatory variables. It is, therefore, indispensable to put strong efforts into the increase of response rates in mail surveys, in our case a response rate greater than 50% could be achieved. Furthermore, the reward for this effort is a significant decrease in survey costs which is especially important in high-wage countries where CVM surveys on a face-to-face basis cannot be used for the assessment of smaller projects (a rough estimate for Germany suggests that survey costs of a mail survey are only about 20% of the costs of a face-to-face survey). Of course, further research is needed with respect to the improvement of mail surveys where the use of CEGs has already proven to be a quite promising instrument to reach this goal.

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