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## Contingent valuation responses and hypothetical bias: mitigation effects of certainty question, cheap talk, and pledging

### Abstract

The contingent valuation method suffers from hypothetical bias in which respondents usually overstate their WTP values, which leads to overvaluation of the environmental good or service in question and consequent inefficiencies in resource allocation. In this paper, results from a study conducted in Chiang Mai, Thailand in 2008/09 are presented to examine the effectiveness of the widely used hypothetical bias mitigation techniques namely: follow up certainty question and cheap talk, and a newly introduced ex-post mitigation technique called 'pledging'. Mean willingness to pay (WTP) values calibrated at a cut off certainty value of 8 and above were statistically distinguishable from the hypothetical all yes (HY) responses. Mean WTP values using cheap talk were not statistically different from HY. On the other hand, mean WTP values calibrated using pledging were significantly lower than HY. This demonstrates that certainty question and pledging could effectively reduce hypothetical bias, while cheaptalk did not have statistically significant effect. Further explanation is provided on factors that affect the likelihood of taking pledge is provided.

**Keywords:** contingent valuation, hypothetical bias, certainty question, cheap talk, pledging.

**JEL Classification:** Q51, Q57.

### Introduction

Natural ecosystems play a central role in maintaining the wellbeing of humans through provision of a wide array of services ranging from general life support and inputs to our economic systems to waste assimilation and recreational activities. However, humans have changed ecosystems more rapidly and extensively now than in any comparable period in human history, largely to meet fast-growing demands for food, fresh water, timber, fiber, and fuel (Millennium Ecosystem Assessment, 2005). Such alteration and degradation of natural ecosystems is mainly due to underestimation or undervaluation of the value of the environment. With an intention to solve this challenge, economists more than any other professionals in other fields of study, have developed a complex methodology to put a price tag on natural environments.

To achieve a desired environmental quality involves significant expenditures from both the public and the private sectors (Mohammed, 2009). Because there is potential for substantial gain through more effective utilization of the resources devoted to environmental quality improvement, the judicious use of the principles of cost-benefit analysis in evaluating policy alternatives can therefore contribute to more effective resource utilization. Therefore, economic or monetary measurement of benefits of environmental quality improvement provides decision-makers with vital information on the cost and benefits of alternative use options that would otherwise not be taken into account in development decisions (Lambert, 2003).

There are both market and nonmarket valuation techniques to estimate the monetary value of the environment. The most widely used nonmarket valuation method is the contingent valuation method (CVM) (Venkatachalam, 2004). Even though CVM has been widely used, the method is not immune to criticism. Some detractors of the method argue that hypothetically stated willingness to pay (WTP) are often (if not always) higher than actual payments (Arrow et al., 1993). Such divergence between hypothetical responses and actual payments is known as hypothetical bias (Cummings et al., 1986; Neil et al., 1994; List and Gallet, 2001; Murphy et al., 2005; Blumenschein et al., 2008). Except for few minorities such as Smith and Mansfield (1998), and Farmer and Lipscomb (2008) the majority of studies done to investigate the divergence between hypothetical and actual payments find upward bias. Obviously the former being greater than the later. The first meta-analysis work done in an attempt to explain the existence of hypothetical bias was done by List and Gallet (2001), followed by updates made by Little and Berrens (2003), and Murphy et al. (2005). They all suggest the existence of positive and upward hypothetical bias. Harrison and Rutstrom (2008) also found a positive bias in 32 out of 39 observations.

Thus criticism over hypothetical bias is valid since overstatement of WTP leads to overvaluation of the environmental good in question. What is so bad about overvaluation? Blomquist et al. (2008) provide an answer to this question stating that – as undervaluation leads to missed opportunities for worthwhile investment or consumption, overvaluation leads to investment or consumption which costs too much in terms of other valuable options (Blomquist et al., 2008). Therefore, neither undervaluation

nor overvaluation of the value of environmental goods and services is desirable in tailoring an efficient and environmental policy.

The reason why respondents overstate their WTP is still unresolved issue. While hypothetical bias may occur for several reasons, some of the documented arguments state that “familiarity” plays a significant role. Venkatachalam (2004) stated that familiarity issue plays a dominant role in minimizing hypothetical bias. The same argument is made by Mitchell and Carson (1989), who depict that the more a respondent is familiar with the good, the less will be the level of hypothetical bias in a CV response. This implies that the WTP values elicited for those public goods, which are traded in the markets or which the individuals are familiar with, would be free from hypothetical bias (Whittington et al., 1991). Murphy and Stevens (2004) in their attempt to explain hypothetical bias argue that if a respondent has a positive value for the good, and if his/her response to the valuation question may increase the likelihood of the good’s provision at little or no cost to him/her, then it makes sense to him/her to report an inflated value.

The National Oceanographic and Atmospheric Administration’s (NOAA) blue-ribbon panel recommended that hypothetical bids from surveys can be calibrated using a divide by two rule, unless these bids can be adjusted using actual market data (Arrow, 1993). According to Maler and Vincent (2006) the NOAA rule has served as an ad hoc placeholder to motivate more research into the nature of calibrating hypothetical and actual values. This is done by comparing hypothetical statements and real economic commitments. Unlike conventional market goods, where markets exist to put a price tag on them, it is difficult to compare hypothetical statements with real or actual payments for environmental goods. Instead, assuming there exists hypothetical bias in CV responses for environmental goods, other calibration techniques are developed; the most commonly used are follow up certainty questions and cheap talk script.

In this study a survey was conducted in Chiang Mai, Thailand, to examine the effectiveness of certainty question, Cheap talk, and a newly introduced technique – pledging, in mitigating hypothetical bias. It is well worth noting that in this paper it is assumed that there exists a hypothetical bias; therefore, calibrated responses are compared with hypothetical all yes answers. Effectiveness of the techniques is defined by their ability to reduce hypothetical WTP statements to a statistically distinguishable level.

### 1. Mitigation techniques

Several efforts have been made to mitigate hypothetical bias. Two calibration instruments, namely: cheap talk and uncertainty adjustment, are now be-

ing widely used to correct for hypothetical bias. These techniques are classified as ex-ante and ex-post mitigation techniques by Blomquist et al. (2008). Ex-ante mitigation includes state of the art survey design that incorporates reminders of closely-related goods, especially substitutes, and reminders of the individual or household budget constraint (ibid.). The premise behind this technique as explained by Brummert et al. (2007) is that one might be able to reduce or eliminate hypothetical bias by simply making respondents aware of it regardless of its underlying causes. Therefore, this technique involves a cheap talk script which precedes the elicitation of WTP, and subjects are told what hypothetical bias is, that it is a common problem in hypothetical valuation questions, and why it might occur. Furthermore, subjects are asked to adjust for hypothetical bias in responding to the WTP question (Blumenschein et al., 2008).

However, the effectiveness of cheap talk has been debated and the outcomes of several studies done are mixed. The technique was first implemented in environmental economics studies by Cummings and Taylor (1999) where they found promising result. As a new debate emerged on how long should the cheap talk script be and what kind of information to include, quite a number of studies were conducted to investigate the effectiveness of the technique in general and the length of the script in particular. From the studies done so far, it is difficult to draw a conclusion on the effectiveness of cheap talk script in mitigating hypothetical bias.

Table 1. Effectiveness of cheap talk mitigation technique

Author(s)	Effectiveness	Remarks
Champ et al. (2004)	Yes	
Poe et al. (2002)	No	Short script was not effective
Aadland and Caplan (2003)	Yes	Short script was effective
Lusk (2003)	Yes	
List (2001)	No	Long script did not reduce hypothetical bias with experienced subjects
Brown et al.(2003)	Yes	Long scripts were effective but only for high payment amounts

As the name indicates, an ex-post mitigation technique asks how certain the respondents are about their statements as a follow up question for the payment question. This technique typically involves a follow up question asking respondents just how certain they are (Little and Barrents, 2004). Those respondents who are “sufficiently” certain are considered as giving a true yes response (Blomquist et al., 2008). Calibration using follow up certainty questions is based on the idea that the individual has a value for the good and compares the distributions of values to the prices.

Follow up certainty question takes two forms. One way to determine if respondents are sufficiently sure is to follow up and ask if they are probably sure or definitely sure (*ibid*). Based on comparisons between hypothetical and real purchases decisions Blumenschein et al. (2008, 2001, 1998) find that WTP can be elicited without bias if only “yes” responses by individuals who are definitely sure are considered true yes responses. The second way of asking how certain respondents are that they would actually pay is by using a 10-point Likert scale, where 1 is very uncertain and 10 is very certain (Champ et al., 2004) and ask them to indicate their certainty level (Blomquist et al., 2008). The information on reported levels of certainty is used to re-code responses to the WTP question to provide an estimate of mean WTP similar to the actual payment treatment (Champ et al., 2004). Murphy et al. (2004) argue that this recoding scheme has effectively calibrated hypothetical responses in a number of studies, but the cut-off point at which this technique works varies. For example, Champ et al. (1997) concluded that 10 was an appropriate cut off, Champ et al. (2001, 2004) used a cut off of 8 and above, and Poe et al. (2002) chose 7. Studies done so far indicate that a fairly high cut off point of 7 or 8 and above can effectively mitigate hypothetical bias.

Another criticism of CV responses and obviously the cause of hypothetical bias as noted by Arrow et al. (1993) is that respondents fail to take CV questions seriously because the results of the surveys are not binding. Murphy et al. (2004) further back this argument and state that lack of a consequential economic commitment in CV surveys often leads to hypothetical bias in which economic values are overstated. Therefore, to mitigate this problem, a technique should be developed to make the respondents feel responsible and committed to the payment statements they make. In this study a new ex-post mitigation technique is introduced, in which respondents are asked to sign a pledge as a commitment and make them feel compelled to make the payment of the amount stated. In such a way, it is expected that the respondents will take the CV questions seriously and would take the pledge if they are confident that they would make the payment. Therefore, taking a pledge would be used to calibrate hypothetical statements; and hence, only those who took the pledge are considered as stating true WTP or at least close to the true WTP.

## 2. Methodology

**2.1. Survey design.** This study took the case of Ping River, one of the major tributaries of Chao Phraya River; the largest river in Thailand. The Ping River, which is known as the life line of Chiang Mai, is 560 km long and has its sources in the mountains of Chiang Dao, in the northernmost part of Chiang Mai

Province. Based on a preliminary survey conducted in October 2008, which asked the interviewees and focus group discussion participants to identify both direct and indirect uses of the river, key problems, and possible solutions, a scenario was developed to design a hypothetical market which proposed a hypothetical Ping River Quality Improvement Program. The hypothetical program is aimed at restoring the river quality at a fishable and swimmable level, and reducing the occurrence of flood.

Through the focus group discussions conducted the use values of the river were identified as follows: (1) a source of water for household use, irrigation, groundwater recharge, and municipal use such as firefighting, cleaning, etc.; (2) tourist attraction: the river is used by visitors to enjoy cruising, and there are many riverside restaurants and entertainment areas which attract tourists; (3) cultural importance: two of the most significant festivals, namely, LoiKra Throng and Song Kran are held by that river; and (4) fishing: there are some small artisan fishermen who fish for subsistence use and income generation. In addition, some engage in sport fishing; (5) importantly, many see the river as a symbol of Chiang Mai and simply want the river to be conserved.

In line with the above mentioned values and functions of the river, the respondents identified the following key problems that the river is facing. The sources of the problems were identified as upstream and in-stream. The upstream problems were deforestation and the use of chemical fertilisers and pesticides. Deforestation increased siltation, and intensified river velocity. The absence of trees serving as biological filters degraded the river water quality. Likewise, the use of chemicals in upstream farms reduced fish stock. This happened either directly through affected fish or by disrupted ecosystems which led to disrupting the food chain and the life cycle of the aquatic organisms. In-stream problems mentioned by the subjects were mainly direct domestic and industrial waste disposal, river bank reclamation (encroachment) and gravel mining for construction purposes. Direct domestic and industrial waste disposal affects the river by increasing eutrophication, and polluting the water with chemicals which have negative biological, chemical and physical effects. This has resulted in some parts of the river having a bad odour and consequently becoming less swimmable and fishable. In addition, reclamation of river banks has narrowed the width of the river and exacerbated flooding. Moreover, some also recognized the negative impact of uncontrolled gravel mining in the river. There is no any policy or regulation per se to control gravel mining from rivers in Chiang Mai. Therefore, miners have continued to extract gravel and sand for construction purposes recklessly. Usually the

extraction is done from the active stream channel. Consequently, the natural habitats of many aquatic flora and fauna have been destroyed. Uncontrolled gravel mining has also contributed to the turbidity of the river water. Participants of the focus group discussion and respondents from the preliminary survey underlined that gravel mining should be controlled at its maximum sustainable level. Little is known about the quantity of sand and gravel deposited. Therefore, research is needed to estimate the quantity and quality of the sand and gravel available, and limit the extraction to a point that does not harm the physical, biological and chemical nature of the river.

The majority of the respondents from the preliminary survey and participants of focus group discussions identified four key priority solutions as follows:

- ◆ restoring the reclaimed sections of the river;
- ◆ promoting awareness and controlling direct waste disposal (both domestic and industrial);
- ◆ controlling gravel mining; and
- ◆ promoting afforestation programs and controlling the use of chemical fertilizers and pesticides in upstream farms.

The above identified uses, problems and solutions were the main inputs in designing the hypothetical river water improvement program. A hypothetical Ping River Quality Improvement Program was presented to respondents as is shown in Box 1. The actual questionnaire was translated into the local Thai language and local research assistants with experience in questionnaire survey were employed.

#### **Box 1. Hypothetical scenario**

This survey intends to value a possible new *Ping River Quality Improvement Program*. The program is aimed at maintaining the river by restoring the reclaimed part of the river bank at its critical level, promoting awareness of citizens to halt domestic waste disposal and pass strict measures against direct industrial waste disposal. Moreover, the program plans to control gravel mining at its maximum sustainable level, and promote afforestation program upstream which helps to serve as a biological filter and maintain the hydrology of the river, and control the use of chemicals in upstream farms to combat further pollution.

*Your opinions about this program are important. Please answer all questions in the space provided in the booklet. If you are not certain, the best answer is the one which most closely reflects your own feelings and beliefs.*

Subjects were told to assume they were to make a real payment in that hypothetical situation. Immediately

after presenting the hypothetical program, subjects were asked some attitudinal and behavioral questions. This was done because it was expected that some attitudinal and behavioral factors would affect their statement. Likewise, respondents' socioeconomic characteristics are also expected to affect their WTP statement, therefore, questions about their age, level of education, occupation, family size and income were asked.

Prior to the payment section of the questionnaire, a payment vehicle which was found as the most reasonable during the preliminary survey was used. Subjects were clearly told that it is planned that the (hypothetical) Ping River Quality Improvement Program would be funded through imposing an additional payment on their monthly water utility bills. Therefore, the residents of Chiang Mai City would pay an additional fixed amount of money each month from their income for an unlimited period of time. It was explained that the amount of money allocated would be used to restore the environmental quality of the Ping River.

The most critical section is the elicitation part. There are several ways of eliciting the payment, which range from open-ended to referendum voting/bidding; all with their strengths and weaknesses. Arrow et al. (1993) in their panel suggest that referendum voting should be used because it is incentive compatible and can reduce hypothetical bias. Therefore, during the preliminary study, referendum voting was used to elicit the payment. However, many respondents found it difficult to comprehend what they were expected to do; hence, a less confusing alternative – from the local people's perspective, payment card was chosen, where respondents found it easier to understand and consumed less time.

Great emphasis was put on whether the respondents have clearly understood the task and felt comfortable with the format. If survey instruments are not well understood by respondents, errors are likely to be prominent. In addition, bidding games suffer from starting point bias. Therefore, following Carson et al. (1993), the study applied an elicitation procedure which is a grounded payment card format that was designed to cover the likely range of responses, based on pre-test surveys. There are concerns that payment cards used in CVM studies may be subject to range and centering bias (Rowe et al., 1996); however, this is not the central objective of the study. The payment card elicitation part was presented as is shown in Box 2.

In the payment card approach, each respondent's WTP is bound by the highest bid the subject accepts and the lowest bid they do not accept. Following Cameron et

al. (1989), an interval estimation approach to analyze the interval data was going to be applied. However, since sample size determines the accuracy of an estimator, and the sample size of the study was not large enough, a mid-point value between the amount stated and the next highest bid was applied to represent the true WTP of the respondent.

#### Box 2. Payment card

What is the highest amount of money in Thai Baht, if anything, that your household would pay each month to make the Ping River Quality Improvement Program possible? *(Please circle the highest amount that your household would still vote for the program)*

0	5	10	20	40	60	80
100	150	200	250	300	350	400
450	500	>500				

A questionnaire based in-person interview with representatives of households was conducted. The questionnaire included attitudinal and behavioral part followed by payment elicitation part, and finally socioeconomic and demographic characteristics of the respondents were asked, which are summarized and presented in Table 2. Three types of questionnaires were designed. All sets of questionnaires had identical components except that they deferred in the mitigation techniques adopted. One set of questionnaire asked a follow up (after WTP statement) certainty question in a Likert scale of 10. The follow up question was presented in this format.

#### Box 3. Certainty question

How certain are you of your decision about how much you would pay? Please circle ONE number from 1 to 10, with 1 indicating very uncertain and 10 indicating very certain.

Very uncertain					Very certain				
1	2	3	4	5	6	7	8	9	10

The second set of questionnaire presented a cheap talk script prior to the payment part. As discussed earlier in the introduction part, some surveys use relatively longer script, such as Blumeschein et al. (2008) who used around 1000 words, others use relatively shorter script, such as Brummett et al. (2007) who used around 130 words. During the preliminary survey, a script with a medium length of 500 words was used and pretested; however, respondents showed some fatigue and lost interest in the interview. Therefore, a shorter version of cheap talk script was used and presented as shown in Box 4. The local research assistants were reminded to make sure that the subjects clearly understand the

script and provide clear answer should the respondents have questions.

#### Box 4. Cheap talk script

Many similar surveys find that when respondents are asked how much they are willing to pay to realize a suggested program, in most of the cases, they overstate their willingness to pay. Overstating willingness to pay is seen as a serious problem in such kind of surveys and they are undesirable. If I were you I would consider the effect of the stated amount of payment in my household economy. For example, if I pay some amount of money for this program, I will have to give up the money I was supposed to spend on leisure or other purposes. So please assume that you are in a real situation where you are expected to make payment in cash, and answer the following question (Q-6) without any exaggeration.

The last set of questionnaire asked respondents to take a pledge after they stated their WTP. They were given the choice to take or not to take the pledge, and were reminded that their payment will be considered as null if they fail to sign the pledge. The pledge part was shown in the format shown in Box 5. This approach was followed to obtain strong commitment from respondents and state WTP values close to their 'true' WTP. Jacquemet et al. (2010) document several social-psychological studies and depict that commitment is stronger if it has been made freely and has consequences; as opposed to being obtained under pressure or being without consequences. Therefore, respondents were reminded that they are free to take or not the pledge (voluntary), and if they do they are bound to pay the stated amount (consequence) within a defined period of time.

#### Box 5. Pledge

If you do not take the pledge, your stated payment will be considered as null.

I, the undersigned, hereby attest that:

- 1) I fully understand the aim of the Ping River Quality Improvement Program;
- 2) I am bound by the payment amount I stated;
- 3) And will pay the above stated payment to realize the Ping River Quality Improvement Program within six months after the implementation process takes effect.

Name: \_\_\_\_\_ Address: \_\_\_\_\_

**2.2. Sampling design.** Sampling design involves deciding what types of people, and how many of them

should be interviewed. The guiding principle is to select a subset of the target population such that the results of the survey can be accurately extrapolated to the entire population (Bateman et al, 2002). Mitchell et al. (1989) assert that payments for most pure public goods are made at the household level. Therefore, representatives of households who are 18 years of age and above were interviewed. Chiang Mai District is composed of 16 administrative sub-districts. To have a good representation of the residents of the district, equal weight was given in which 21 to 22 households were picked from each sub-district. The households from within each sub-district were chosen randomly. Therefore, a stratified random sampling technique was applied, which is a common practice in many CV studies.

### 3. Study results and discussion

A total of 349 households were interviewed, in which 113, 119, and 117 households were subjected to a follow up certainty question (HY), cheap talk script (CT), and pledge (PL), respectively. The means of behavioral, attitudinal, and socioeconomic and demographic factors are given in Table 2. The same table

also shows us that the means of each explanatory variable for the three subgroups are not statistically significant, which implies that the sampling design followed was acceptable. Furthermore, mean values of some of the variables (household size, educational attainment, and income level) were cross checked with the municipal average and were found to be very similar or at least statistically not distinguishable.

Since the purpose of this study is to examine the effectiveness of follow up certainty question, cheap talk script, and pledging in mitigating hypothetical bias, mean WTP values from three sub-groups, namely: hypothetical yes (HY), cheap talk (CT), and pledge (PL) were compared. It is assumed that hypothetical bias exists in the first place, therefore, the HY group without any certainty calibration (hypothetical all yes) are considered as the group with bias. The distribution of certainty levels shows us that the respondents are fairly certain, as expressed in Champ et al. (2004), of their answers, as 88% of the respondents circled 5 or above. The mean and median of certainty level are found to be 6.38 and 7 respectively, which are both above the middle possible response of 5.

Table 1. Variable definitions and sub-sample means and standard errors

Variable	Definition	Mean (Strd. error)			p-value
		HY	CT	PL	
Affiliation	1 = if the respondent is a member of any group (NPO, NGO, etc.) closely working for the conservation of Mae Ping 0 = otherwise	.09 (.29)	.13 (.34)	.12 (.326)	.567
SerProb	1 = if the respondent thinks the Ping River is facing serious problems 0 = otherwise	.87 (.34)	.85 (.36)	.89 (.316)	.660
Distance	Distance of the respondent's residence from the Ping River in km	6.07 (12.58)	4.61 (7.51)	5.76 (7.84)	.432
Water	1 = if the respondent uses the river as source of water for household use 0 = otherwise	.47 (.50)	.40 (.49)	.42 (.49)	.781
Fishing	1 = if the respondent uses the river for fishing 0 = otherwise	.72 (.45)	.66 (.48)	.69 (.46)	.612
Recreation	1 = if the respondent uses the river for recreation 0 = otherwise	.33 (.47)	.28 (.45)	.32 (.47)	.586
Other	1 = if the respondent uses the river for other purposes 0 = otherwise	.26 (.44)	.34 (.48)	.36 (.64)	.366
Agree	Rate level of agreement with the suggested Mae Ping Conservation program ('1' indicates you completely disagree, and '5' indicates you absolutely agree)	4.60 (.77)	4.71 (.759)	4.69 (1.57)	.816
wtpMP	WTP statement (Mid-point payment card, in Thai Baht)	83.72 (91.11)	75.61 (88.75)	60.79 (80.40)	.230
Gender	1 = if male 0 = otherwise	.43 (.49)	.47 (.50)	.36 (.48)	.334
Age	Age of respondent in years	39.39 (13.05)	45.83 (13.88)	37.08 (12.99)	.195
Employe	1 = if formally employed 0 = otherwise	.40 (.49)	.32 (.47)	.50 (.50)	.323
SelfEmpl	1 = if self-employed 0 = otherwise	.47 (.50)	.52 (.50)	.34 (.476)	.403
HHmem	Household size	4.26 (1.78)	3.87 (1.88)	3.93 (2.03)	.623
Education	Year of schooling	13.64 (4.39)	12.18 (4.97)	12.97 (4.65)	.106
Income	Total household monthly income in Thai Baht	14100 (8637.8)	13700 (8465.4)	11300 (8341.4)	.120
N	Number of observations	113	119	117	

A cut off point of 7 was used to calibrate the hypothetical yes answer; however, the calibrated mean was statistically undistinguishable from the mean value of HY. Therefore, as show in Table 3 a cut off certainty value of 8 (CC8) was used where WTP statements of respondents who rated their certainty level 7 and below were considered as zero values. The calibrated mean WTP value was estimated to be 42.48 Baht<sup>1</sup> which is significantly lower than HY. The same is true for CC9 and CC10 which used a cut off certainty value of 9 and 10 respectively to calibrate estimated mean value for HY. This implies that follow up certainty question can effectively mitigate hypothetical bias if a relatively higher cut off certainty value (8 or higher) is used. This finding is consistent with the conclusion drawn by Champ et al. (2004).

Table 3. Hypothetical and calibrated mean values, and calibration factor

		Mean (St. er.)	Calibration factor
Hypothetical all yes (HY)		82.03 (88.85)	1.00
Calibrated with certainty scale	CC8	42.48 (85.16)	1.93
	CC9	35.61 (84.34)	2.30
	CC10	27.66 (69.00)	2.97
Cheap talk (CT)		75.61 (88.75)	1.08
Pledging (PL)		60.79 (80.73)	1.35
Calibrated with pledging (CPL)		30.41 (70.20)	2.70

As can be seen from Table 3, using a cut off certainty value of 8 calibrates estimated mean hypothetical all yes WTP (HY) by 1.93. Even though different elicitation technique was used in this study, this is close to the calibration factor suggested by Arrow et al. (1993). Likewise, using a cut off certainty value of 9 and 10 calibrated HY by 2.30 and 2.97 respectively. Harrison and Rustrom (2008) found that the mean bias in their 39 observations was about 300%, which suggested that a cut off value of 10 was not as conservative as it was expected and resulted in a reasonable calibration factor.

As discussed earlier, the cheap talk script has given mixed results from different studies. In this study, estimated mean WTP was statistically not distinguishable from HY. This can be seen in Table 4. The calibration factor also shows that the HY to CT ratio is almost one. Therefore, it can be concluded that the cheap talk script was not effective in mitigating or calibrating hypothetical bias. Again as

explained earlier, the effectiveness of cheap talk is supported by findings from the pioneers, Cummings and Taylor (1999), followed by Aadland and Caplan (2003) and Champ et al. (2004). Others such as Lusk (2003) and Brown et al. (2003) give another dimension on the effectiveness of the technique based on the length of the script. Therefore, the effectiveness of cheap talk script in mitigating hypothetical bias remains to be an open question. Therefore, from this specific study, all that can be indicated is that the relatively short cheap talk script used did not result in statistically distinguishable WTP statements from the hypothetical all yes group.

Respondents who were asked to take a pledge after stating their WTP had relatively but not statistically distinguishable lower mean WTP values as compared to HY and CT (see Table 4). The relatively lower WTP statements could mainly be due to the fact that their average income is lower than respondents who were subjected to certainty question and cheap talk mitigation techniques. When the WTP statements are recoded with taking the pledge or not, where WTP statements of those who did not take the pledge were regarded as zero, the calibrated value (CPL) was found to be significantly lower than HY with a calibration factor of 2.70. The calibration factor lies between the calibration factors for CC9 and CC10, which are both higher cut off points. Therefore, we can conclude that using pledging as a tool to calibrate hypothetical bias is as effective as follow up certainty question. Just a word of caution though, some individuals may not be prepared to participate if they must sign a pledge; which can be another sources of bias. However, this is beyond the scope of the study and therefore more studies need to be done to examine how effectively pledges can mitigate hypothetical bias without being sources of another form of bias.

Table 4. Analysis of variance between hypothetical all yes (HY), pledging (PL), and cheap talk (CT), calibrated hypothetical all yes responses (HY-cl), and calibrated pledging (PL-cl)

Variable	Sum of squares (df)			p-value
	Between group	Within group	Total	
HY x PL x CT	32167.14 (2)	2609146.64 (354)	2641313.78 (356)	0.1143
HY x HY-CL	90931.26 (1)	1808454.20 (236)	1899385.46 (237)	0.0007
HY x PL-CL	169101.66 (1)	1493100.90 (236)	1662202.56 (237)	0.0000

In this paper, how respondent's characteristics affect the likelihood or probability of a person to take (or not to take) a pledge is explained. A logistic regression was run taking pledge as a binary response

<sup>1</sup> 1 USD = 33.5 Baht.



dependent variable against other explanatory variables as is shown in Table 5. Two models are presented. The full model (Model 1) includes all variables; ranging from behavioral and attitudinal factors to socioeconomic and demographic factors. Model 2 presents the best fit model where only statistically significant coefficients are presented.

Both models depict that those who are affiliated to an NGO or NPO or voluntarily working for the conservation of Ping River are significantly more likely to take the pledge than those who are not. Even though the coefficient for attitudinal part, which is those who think the river is facing a serious problem, is not statistically significant, a positive sign indicates that they are more likely to take the pledge than those who do not. Very obviously, though not statistically significant, the coefficient for distance was found to be negative, which can be interpreted as those who live close to the river are more likely to take the pledge. This is usually explained in contingent valuation studies as distance decay. The closer the respondent is to the environmental good in question, the more likely he/she is going to provide relatively higher WTP statements. As for the

usage of the river, both fishing and recreation have positive and significant coefficients. This indicates that those people who reported that they use the river for fishing and recreational activities are more likely to take the pledge than those who do not. The coefficient for water is also positive but not statistically significant. The coefficient for agreement with the proposed program was not significant. This is obvious because around 88% of the respondents circled a subjective scale value of 4 or 5; 5 being absolutely agree. The same was true with WTP statements. The subject's WTP statement does not have significant effect on the likelihood of a person to take the pledge or not. From the socioeconomic and demographic factors only education had a statistically significant and negative coefficient. This can possibly be explained by the fact that relatively highly educated individuals of a society think critically and their awareness of self-defense in case of any consequences of taking the pledge is higher. By and large, as is depicted in both models behavioral factors, the way of usage of the resource, and educational level had significant effects on the likelihood of a subject to take the pledge.

Table 5. Binary logistic regression model; dependent variable: pledge

Predictors	Model 1 (Full model)	Model 2 (Statistical best fit model)
Affiliation	1.95*** (0.75)	1.83** (0.71)
SerProb	0.05 (0.77)	
Distance	-0.04 (0.03)	
Water	0.14 (0.47)	
Fishing	1.34** (0.58)	1.16** (0.53)
Recreation	0.89* (0.48)	0.80* (0.45)
Agree	0.10 (0.38)	
WTP	0.002 (0.003)	
Gender	-0.04 (0.47)	
Age	0.004 (0.02)	
Employed	0.74 (0.52)	
HH size	0.19 (0.12)	
Education	-0.18*** (0.07)	-0.17*** (0.05)
Income	0.000 (0.000)	
Cons.	-1.44 (2.24)	0.000 (0.54)
Prob>LR Chi <sup>2</sup>	0.003	0.000
Loglikelihood	-63.14	-66.40

## Conclusion

In order to not overestimate the value of ecosystem services, it is important that methods to combat hypothetical bias be used. Our research suggests that ex-post certainty question and pledges appear to work better than cheap talk, at least in our case study in a developing country. A follow up certainty question at a cut off certainty values of 8, 9, and 10 with calibration factors of 1.93, 2.30, and 2.97 respectively did effectively reduce hypothetical bias. However, the estimated mean WTP value using cheap talk script was not statistically distinguishable from the mean value without cheap talk. Therefore, in this study cheap talk script was not effective in mitigating hypothetical bias. Yet, we are very reluctant to conclude that the cheap talk script is not effective at all, rather more study needs to be done on the effectiveness of cheap talk script based on its length, and nature of the respondent which still remains to be a debated open question. The

calibrated mean WTP value using pledging was found to be statistically different (lower) than hypothetical all yes mean WTP value at a calibration factor of 2.70. This indicates that pledging can be used as an effective technique to mitigate hypothetical bias. Furthermore, a rational attempt was made to examine how respondents' characteristics affect the likelihood of taking the pledge. It was found that behavioral characteristics (affiliation to an NPO or NGO closely working for the conservation of the river), and usage of the resource (fishing and recreation) had a positive and significant effect in the likelihood of a person to take the pledge. The only significant socioeconomic factor, education level, expressed as year of schooling, reduced the probability of a respondent to take the pledge. Last but not least, we would like to emphasize that even though we can mitigate hypothetical bias, less is known about because and nature of hypothetical bias. Therefore, in depth study must be carried out to explain the nature of hypothetical bias.

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